HEALTH IN OLD AGE

by

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INTRODUCTION.

The purpose of this thesis is to demonstrate the significant extent to which a local health authority can promote the health of the aged, and to draw attention to the rich source of material in the community available for research.

A massive part of the clinical effort of a local health authority is directed towards children. In complete contrast is the barrenness of clinical facilities available for the aged. This is perplexing when it is recognised that, while youth has a positive potential for health, the potential is negative for the aged. This was the illogical situation as I saw it in 1951, and unfortunately for old people the position remains unchanged a decade later.

In 1951 I came to realise that general practitioners only sought my assistance as a Medical Officer of Health when old people were virtually moribund and a hospital bed was not immediately attainable. To my mind this was an untenable situation for a physician responsible for community health. A few years earlier the real value of preventive medicine had been instilled into my thoughts by Professor Charles Cameron at Southfield Sanatorium, Edinburgh. It was only natural, therefore, that I should contemplate the possibility of providing for older people as a whole a clinical and social service based on the dispensary system for tuberculosis. The existence of this thesis indicates that the theorising as between tuberculosis and old age was profitable.

PART I

THE ROLE OF PREVENTIVE MEDICINE IN THE ENHANCEMENT OF HEALTH OF OLDER PEOPLE.

The community services available for the enhancement of the health of older people are immature, and physicians confine their activities largely to the diagnosis and treatment of disease. There is a marked inadequacy of public health clinical facilities for older people. This blank in the provisions of the public health department resembles the early action of society in the past when confronted with the epidemic infectious diseases, tuberculosis, and mental disease. The immediate reaction was to place individuals in hospitals and institutions. It was only later, with the realisation that such diseases had their origins in community life, that efforts were made to deal with adverse environmental factors and to maintain individuals in health. The community has yet to develop fully a similar realisation with reference to the diseases of old age.

The existence of the Rutherglen Consultative Health Centre for older people is dependent on the following hypothesis. The prevalence of disease and disability among older men and women and the demand on hospital beds will be significantly reduced through the routine medico-social assessment of ostensibly healthy older people. I am not alone in holding this concept. Breslow (1954) states "A community which recognises its responsibilities for the aging will surely look to all its resources in attacking the outstanding problems. Such a community will reject the notion that health department services should be restricted to the young or to those affected by the communicable diseases. Communities will find ways to utilise their present health department resources and expand them for the prevention of disease among the aging and for extending and maintaining healthful life."

In 1952 with the above hypothesis as a foundation and the tuberculosis dispensary system as an example of a practical service, I formulated proposals under Section 27 of the National Health Service (Scotland) Act which relates to the prevention of illness, care and after-care. These proposals contained provisions which allowed the local health authority to provide comprehensive medico-social facilities for older people. These proposals were approved by the Secretary of State for Scotland in 1952. The aims were to promote the health of the older people in the community; to mitigate the adverse effects of disease, and to conduct research into the aging process. These objects were attained by applying the fullest clinical facilities to older people who while feeling well desired a careful medical examination or who because of illness, in the opinion of the general practitioners might benefit from our attention.

I was in no doubt that such a complex programme which covered the entire range of clinical and social medicine would never achieve complete success if the local health authority implemented the proposals on its own. This criticism of isolated action applies with equal validity to general practitioners and consultant physicians. The general practitioners within the Rutherglen area considered that my belief in the value of integrated action was rational. It was logical, therefore, that representatives of the general practitioners, Dr. Ferguson Anderson, Adviser in Diseases of Old Age and Chronic Sickness to the Western Regional Hospital Board, and myself met to discuss the type of service which would best serve the older people in the community, and the interests of the physicians in their varying capacities. Arising from this discussion Dr. Ferguson Anderson and myself evolved a system which represents complete integration of effort of the three branches of the Health Service and voluntary endeavour. The service as conceived in 1952 has functioned smoothly throughout the subsequent years and has required no modification. The various aspects are as follows: -

(1) The general practitioner is the only source of patients, and these he introduces by letter or by telephone. The Centre, which in no way detracts from the general practitioner's status in relation to his patient, functions as an advisory service to the general practitioner.

(2) It is essential that all physicians involved in a scheme such as this support each other and thus enhance the prestige of all in the mind of the patient. The patient is thus rendered more receptive to reassurance, explanation and encouragement, and is not baffled and bewildered by differences of opinion from medical men.

(3) In the first instance each new case is seen by the Medical Officer of Health. He performs a general clinical examination and completes a social questionnaire; arranges for postero-anterior and lateral X-ray films of chest to be taken, and also other straight X-ray films of the body which he considers desirable; carries out a haemoglobin estimation and analysis of urine, and decides upon the need for chiropody. He completes the social questionnaire, and attempts to put the old person at ease and allay anxiety. Each patient during his or her talk with the Medical Officer of Health receives a cup of tea and a biscuit, and the individual is permitted to smoke. I have so constructed the social questionnaire that simple questions which relate, for example, to symptoms are intermingled with important personal questions. In this way I find it is possible to obtain more detailed and accurate information concerning the problems of the individual than might otherwise be the case. By such means the old person is discussing delicate personal problems before it is appreciated that the line of investigation has radically changed course. However, there are certain subjects which people will not discuss, and one of these is sexual problems. The scant information which I was able to gather suggests that sexual adjustment with age is no problem, and this is most unlikely to be the true situation.

When the Medical Officer has completed his medico-social assessment he requests the patient to return on the subsequent Friday morning to be seen by Dr. Ferguson Anderson. The consultant physician carries out a further clinical examination with the Medical Officer of Health in attendance. The opinions of both clinicians are incorporated in a letter which is signed by the consultant physician and is sent to the general practitioner. When the consultant physician considers it desirable the patient may be admitted to his geriatric unit or attend there as an out-patient.

(4) Health visitors staff the clinic sessions and gain insight into the health problems of old age.

(5) A chiropodist is employed by the local health authority to treat the feet of the patients who attend the Centre.

(6) A physiotherapist is seconded from Dr. Ferguson Anderson's geriatric unit.

(7) A diagnostic chest clinic and a gynaecological clinic of the Western Regional Hospital Board function within the premises. The facilities of these two clinics are an integral part of the Consultative Health Centre. The facilities offered by the Centre and the diagnostic chest clinic are completely integrated as the Medical Officer of Health is also the chest physician for the Rutherglen area. In my opinion a clinical examination of a patient without an X-ray film taken of the chest is dangerously inadequate. It is comparable to diagnosing a disease without undressing the patient.

(8) Following the initial introduction to the Centre by the general practitioner the patient may be recalled for further assessment at any time in the future without the prior knowledge of the general practitioner. The general practitioners agreed to this procedure recognising the importance of a longitudinal study of the aging process. This aspect of the research work is not considered in this thesis because insufficient time has elapsed to permit of adequate statistical analysis.

(9) Each patient is informed that if any social difficulties arise in the future which cause anxiety the guidance of the physicians is available, and may be obtained in an emergency without prior appointment.

(10) A representative of the Rutherglen Old People's Welfare Committee is seen once each week by the Medical Officer of Health who gives this lady the names of old people whom he considers would benefit from the attentions of this voluntary organisation. This voluntary body provides comprehensive facilities for diversional therapy.

(11) Throughout the years friendly relationships have been established with the clergy whose advice and help is available at any time.

(12) The Centre may be regarded as a peripheral screening extension of the geriatric unit. I consider this to be a most important concept, particularly if it is accepted that geriatric units tend to get their patients later in the evolution of a disease process than is desirable, and that this delay militates against

successful treatment and rehabilitation.

(13) Dr. Ferguson Anderson (1960) has shown that the physical diseases encountered at the Centre occurred in the following order of frequency - hypertension with symptoms, osteoarthritis, iron deficiency anaemia, chronic bronchitis, fibrositis, coronary artery disease (previous coronary thrombosis), intermittent claudication, valvular heart disease, malignant tumours, angina pectoris, diabetes mellitus, pernicious anaemia and a small miscellaneous group.

(14) Dr. Weir of the Psychology Department of the University of Glasgow carried out fundamental research at this Centre. Men and women within the age range 70 to 84 years in good physical health were assessed using the Raven Coloured Progressive Matrices, the Mill Hill Vocabulary Scale, the Rorschach Test and a fact value technique. It was discovered that provided physical health remained good age had no significant adverse influence on mental ability.

(15) The most frequently used medicines were preparations of iron, tolazoline hydrochloride ("priscol"), salicylates, cascara, phenobarbitone, liquid paraffin and antibiotics. Drugs employed on rare occasions were benzhexol hydrochloride ("artane"), ascorbic acid ("vitamin C"), tincture of belladonna, diphenhydramin hydrochloride ("benadryl"), chloral hydrate, chlorothiazide ("saluric"), ergotamine tartrate, gentian violet, intra-articular hydrocortisone, magnesium hydroxide, testosterone propionate, aminophylline, chlorpromazine hydrochloride and thioridazine hydrochloride ("melleril").

(16) Apart from the gynaecologist and general surgeon, reference to other consultants was carried out through the general practitioners. Twenty-two, or 3·8 per cent, of the 582 women in this series were referred to the gynaecologist. Nineteen, or 1·5 per cent, of men and women were sent to the general surgeon. The psychiatrist, dermatologist, the ear, nose and throat consultant, diabetic clinic and ophthalmologist each received less than one per cent of the men and women in this investigation.

(17) Of the 1232 men and women in this series 53, or 4·3 per cent, were admitted to the residential home of the local health authority (Part III accomodation).

(18) The means by which attempts were made to enhance mental health generally, and allay emotional disturbance were as follows: -

(a) To give reassurance on physical health; treat disease where it existed, and advise on the scope of living within the physical capacity of the individual.

(b) To recall the patient for repeated reassurance and continued guidance.

(c) To suggest ways by which interpersonal hostility within the home might be alleviated or eradicated.

(d) To stress the value of the patient's religion.

(e) To request the health visitor to carry out home visitations for a specific purpose.

(f) To arrange admission to the residential home of the local health authority (Part III accomodation).

(g) To refer for psychiatric opinion and treatment.

(h) To introduce the patient to the Old People's Welfare Committee, and where desirable to guide this voluntary body on the best means of aiding a particular patient.

(i) To offer guidance on the development of hobbies and interests.

(j) To provide a home help or district nurse to assist in the care of an invalid relative or of self.

(k) To advise the local health authority on rehousing on the grounds of disability.

(l) To refer the patient to the National Assistance Board.

(m) To give a non-recurrent small sum of money from a private source.

(n) To advise children on the proper course of action in the care of their parents.

This thesis is based on the analysis of 1232 men and women aged 60 to 89 years, of whom 650 are men and 582 are women. Of the 650 men 400 are healthy and 250 have disease, while of the 582 women 404 are healthy and 178 have disease. Each of these groups of women is sub-divided according to the presence or absence of adiposity. The criterion of adiposity is that the individual is 25 per cent or more over ideal weight as estimated from Anderson's nomogram (Greene, 1948). Of the 404 healthy women 293 are non-adipose and 111 are adipose, and of the 178 diseased women 145 are non-adipose and 33 are adipose. None of the healthy men are adipose, and the number of diseased men who are adipose is so small they are not considered as a separate sub-group.

The degree of normality of the 400 men, 293 non-adipose women and 111 adipose women may be further defined by noting that men and women with the following diseases were omitted.

1. Diseases of the cardiovascular system.

Angina pectoris; coronary thrombosis; intermittent claudication; irregularity of cardiac rhythm; thrombosis of popliteal artery; incipient cardiac failure as indicated by breathlessness, neck vein congestion, oedema, enlarged liver or left ventricular strain; cardiac murmurs at any area with the exception of Grade I and II systolic murmurs at the apex as defined by Levine and Harvey (1949).

2. Diseases of the respiratory system.

Pneumonia, chronic bronchitis, emphysema, tuberculosis, industrial lung disease.

3. Diseases of the nervous system.

Affective psychosis; cerebral arteriosclerosis as indicated by dizziness, headache, or confusional state; cerebral thrombosis; paralysis agitans; epilepsy.

4. Diseases of the endocrine system.

Diabetes mellitus, goitre, myxoedema.

5. Diseases of the blood.

Iron deficiency anaemia where haemoglobin was less than 11 g. Sahli, pernicious anaemia.

6. Diseases of the alimentary system.

Cholecystitis, peptic ulceration.

7. <u>Diseases of the genito-urinary system</u>.

   Albuminuria, urinary tract infections, nephritis.

8. <u>Neoplastic disease</u>.

9. <u>Miscellaneous diseases</u>.

   Paget's disease, syphilis.

The general practitioners were invited to refer to the Centre men and women who were apparently healthy and particularly those who appeared to be adipose, while they might also send patients with frank disease if they so desired. The general practitioners faithfully carried out their remit. Thus the men and women who form the basis of this study are a highly selected group, and in no way represent a random sample of the population.

I propose in the first instance to deal with physical attributes and thereafter to consider social data and other factors.

THE INFLUENCE OF AGE ON PHYSICAL ATTRIBUTES IN HEALTHY OLDER PEOPLE.

If disease is to be properly understood it is desirable that the means, absolute and relative variabilities of as many physical attributes as possible, which relate to healthy older people, should be known. It is also necessary to know the manner in which these attributes may vary with age, and the extent to which adiposity is an influencing factor.

Adiposity may markedly influence variables. It is more correct, therefore, in the consideration of the normal frequency distribution of an attribute to exclude healthy adipose individuals. In this way the true characteristics of a variable independent of the influence of weight is more nearly attained. In this thesis there are instances where adiposity per se does not rank for exclusion. Nevertheless, it is prudent to maintain the hypothesis that adiposity is inherently pathological. A decision to exclude certain adipose people from a normal series raises immediate difficulties. What is to be the criterion for exclusion? I have answered this problem in a rather roundabout way. Later in this thesis it will be observed that provided healthy women are less than 25 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948), there is no marked increase in systolic or diastolic blood pressure means. Over 24 per cent ideal weight further increase is paralleled by significant rise in blood pressure. For this reason healthy women more than 24 per cent over ideal weight are excluded from the present normal series. There are no healthy men more than 24 per cent over ideal weight, and thus none require to be excluded. By this means there are in this section of the study 400 healthy men and 293 women who may be termed for brevity non-adipose. Inability to obtain accurate measurements from certain of the X-ray films resulted in their rejection. Consequently, a further deduction in numbers to 363 men and 250 non-adipose women is made for those attributes derived from X-ray films.

METHODS.

The variables were measured as follows: -

1. Height and weight.

Height and weight were assessed with the men and women wearing a minimum of clothing and no footwear. The weighing machine was of the Steelyard platform type reading accurately to 3 oz. (90 g.) with a height measuring attachment. Weight was measured to the nearest quarter pound (120 g.) and height to the nearest quarter of an inch (0·6 cm.).

2. Haemoglobin.

The haemoglobin was estimated using a standard Sahli apparatus.

3. Systolic, diastolic I and diastolic II blood pressures.

Arterial blood pressure was estimated by the auscultatory method to the nearest even number, and a mercury manometer with standard cuff was used. Systolic blood pressure was recorded at the point at which sounds were first heard; diastolic I blood pressure at the point of sudden muffling which occurs prior to the disappearance of the sounds, and diastolic II blood pressure at the point of disappearance of the sounds. The blood pressure of each subject was taken on several occasions and the last one noted in every case was used for the purpose of analysis. The blood pressure recordings were taken with the patient lying rested on an examination couch.

4. <u>Chest girth</u>.

The chest girth was estimated by means of a cloth inch tape held in men anteriorly at the level of the nipples and posteriorly at the lower angles of the scapulae, and in women horizontally at the level of the lower angles of the scapulae. Chest girth provided three measurements, namely, those of maximum inspiration and expiration, and the mean of these two values.

5. <u>Chest expansion</u>.

Chest expansion is the difference between the recordings for chest girth at maximum inspiration and maximum expiration.

6. <u>Pulse rate</u>.

The pulse rate is the number of pulsations counted in one minute while palpating the radial artery at the right wrist, with the patient lying rested on an examination couch.

7. <u>Grip</u>.

The strength of grip was measured by means of a dynamometer.

8. <u>X-ray film measurements</u>.

X-ray films are used extensively in the provision of measurable data referable to the chest and heart. The measurements were assessed to the nearest millimetre from X-ray films taken in the postero-

:anterior position at a distance of two metres with an exposure of 1/25 second at 300 milliamperes. In all the films from which measurements were obtained the cardiac borders were clearly defined. The kyphotic angle was derived from lateral X-ray films of the chest.

Figure 1 shows the various lines drawn with pencil on each postero-anterior X-ray film and these lines were constructed as follows. The uppermost portion of the lower border of the posterior part of the first rib was taken as the superior limit of the thorax. Where the second rib was at a higher level than the first rib because of kyphosis the second rib was used instead of the first rib. A line was drawn connecting the superior limits of the thorax on the right and left sides. A mid-vertical line was drawn downwards to intersect this horizontal line and was continued down to the level of the lowermost costo-phrenic angle. Horizontal lines were drawn to intersect the mid-line of the thorax from the highest points of each lateral half of the diaphragm, and from the lateral costo-phrenic angles. The distances taken vertically in the mid-line between the horizontal plane of the thoracic inlet and the level of the highest part of each lateral half of the diaphragm (AE and AF) were regarded as the vertical heights of the right and left halves of the thorax. The heights of the left and right halves of the dome of the diaphragm were similarly determined, with the vertical distance being between the level of the highest part of each dome and the level of the corresponding lateral costo-phrenic angle (ET and FB).

The maximum transverse diameter of the chest (RS) was measured from the inner surfaces of the ribs on the right and left sides, superior to the costal attachment of the diaphragm at that point where the width of the chest is greatest.

The frontal area of the thorax was measured with a planimeter callibrated in square centimetres. Commencing at the right costo-phrenic angle (G) the line followed by the planimeter was (1) upwards along the internal aspect of the ribs on the right side, (2) to the opposite side along the horizontal line joining the superior limits of the right and left halves of the thorax, (3) downwards along the internal aspect of the ribs on the left side of the chest to the left costo-phrenic angle (H), and (4) to the right along the margin of the left dome of the diaphragm, the lower margin of the cardiac silhouette and the margin of the right dome of the diaphragm to reach the point of commencement (G). It is to be noted that in writing about the movement of the planimeter to right or to left this is in terms of the right or left sides of the chest on the X-ray film, and not in terms of the right or left sides of the reader.

The long diameter of the heart is represented by a line drawn from the lowermost part of the cardiac silhouette to join the notch separating the right auricular and right vascular shadows.

The transverse diameter of the heart was measured as follows. One edge of the right angle of a large transparent set-square is applied to the vertical line on the X-ray film and along the other edge a transparent two foot ruler is placed horizontally. The set-square is moved along the ruler's upper border until the vertical margin of the set-square is in line with the outmost part of the right border of the heart. The set-square is held firmly in this position and the ruler moved until the 10 cm. mark is in line with the vertical edge of the set-square. The ruler is now held in place and the set-square slid to the right until its vertical edge coincides with the outmost part of the left border of the heart. The figure on the ruler immediately below the vertical edge of the set-square less 10 cm. is the maximum transverse diameter of the heart.

The area of the cardiac silhouette was measured with a planimeter callibrated in square centimetres. The dotted part of the outline of the cardiac silhouette as shown in Figure 1 represents the part completed in free hand on the X-ray film.

Lateral X-ray films of chest were used to measure the kyphotic angle. A straight line was drawn downwards through the mid-points of the anterior margins of the second and third thoracic vertebrae. Another straight line was drawn upwards through the mid-points of the anterior margins of the 12th and 11th thoracic vertebrae. These two lines always intersect and the superior angle formed by the intersection of these lines is recorded as the kyphotic angle and is measured in degrees.

RESULTS.

Except for the long heart diameter and diastolic II blood pressure, Figures 2 to 18 are presented to show the means of the variables by five year age groups for men and women together with the fitted regression lines. The equations from which these regression lines are derived are recorded in the text with the correlation coefficients. For the equations age is in completed years, and the correlation coefficients are denoted by the letter r. The significance of each correlation coefficient in this section is assessed with reference to Table 7·6·1 (p. 174) in Statistical Methods by Snedecor. This Table presents correlation coefficients at the 5 per cent and one per cent level of significance in respect of degrees of freedom. Correlation coefficients significant at the 5 per cent level are denoted by ж and those significant at the one per cent level by ж ж. Where there was doubt concerning the linear character of the regression of a variable on age, the significance of the deviations of the means of the variable from linearity was tested by using analysis of variance. There were no significant departures from linearity. In addition, Tables 1 to 25 show the means, standard deviations and coefficients of variation of the several variables for men and women by five year age groups. The standard deviation measures the absolute variability and the coefficient of variation the relative variability. The various attributes are presented in their approximate order of relative variability as follows: -

1. HEIGHT.

MEN Height (in.) = 69·414 - 0·054857 age

WOMEN Height (in.) = 66·509 - 0·084571 age

From these equations are derived the fitted regression lines in Figure 2.

MEN $r = -0{\cdot}1421$ **

WOMEN $r = -0{\cdot}2200$ **

These correlation coefficients indicate that there is a significant decrease in the height of men and women with age. The predicted height of men diminishes from 66·1 in. at 60 years to 64·5 in. at 89 years, and the corresponding values for women at the same ages are 61·4 in. and 59·0 in. respectively. Thus in the 30 years period men show a reduction in height of 1·6 in. compared with 2·4 in. for women.

The absolute variability is similar for men and women and shows little change with age. The relative variability is comparable for men and women; is the most moderate of all the variables under consideration, and takes first place in Table 26.

2. LONG HEART DIAMETER.

The means of the long heart diameter for men and women show no significant variation with age and, therefore, regression equations are not presented. At all ages the average long heart diameter of men of approximately 14 cm. is about one cm. greater than that for women (Table 2).

The absolute variability is similar for men and women and shows little change with age. The relative variability is comparable for men and women and is exceedingly moderate occupying second position in Table 26.

3. TRANSVERSE DIAMETER OF CHEST.

MEN Transverse diameter of chest (cm.) = 29·862 - 0·021714 age

WOMEN Transverse diameter of chest (cm.) = 29·964 - 0·082857 age

From these equations are derived the fitted regression lines in Figure 3.

MEN $r = -0{\cdot}1047$

WOMEN $r = -0{\cdot}2392$ ✱✱

These correlation coefficients indicate that there is a decrease in the transverse diameter of chest with age. A decrease which is significant only for women. The predicted transverse diameter of chest diminishes from 28·6 cm. at 60 years to 27·9 cm. at 89 years for men, and the corresponding values for women at the same ages are 25·0 cm. and 22·6 cm. respectively. Thus in the 30 years period men show a reduction in transverse diameter of chest of 0·7 cm. compared with 2·4 cm. for women.

The absolute variability is similar for men and women and shows little change with age. The relative variability is comparable for men and women, and is in third position in Table 26.

4. CARDIOTHORACIC RATIO.

MEN Cardiothoracic ratio = 0·2826 + 0·002342 age

WOMEN Cardiothoracic ratio = 0·3881 + 0·001714 age

From these equations are derived the fitted regression lines in Figure 4.

MEN $r = 0.3111$ ✱✱ WOMEN $r = 0.3525$ ✱✱

These correlation coefficients indicate that there is a significant increase in the cardiothoracic ratio for men and women with age. The predicted cardiothoracic ratio for men increases from 0·4231 at 60 years to 0·4910 at 89 years, and the corresponding values for women at the same ages are 0·4909 and 0·5406 respectively. Thus in the 30 years period men show an increase in the cardiothoracic ratio of 0·0679 compared with 0·0497 for women.

The absolute variability is similar for men and women and shows little change with age. The relative variability is comparable for men and women, and with an approximate value of 7·7 is exceedingly moderate occupying fourth position in Table 26.

5. TRANSVERSE DIAMETER OF HEART.

MEN Transverse diameter of heart (cm.) = 9·102 + 0·050857 age

WOMEN Transverse diameter of heart (cm.) = 12·002 + 0·002857 age

From these equations are derived the fitted regression lines in Figure 5.

MEN $r = 0{\cdot}2788$ ** WOMEN $r = 0{\cdot}0237$

These correlation coefficients indicate that there is an increase in the transverse diameter of heart with age, and that the increase is significant only for men. The predicted transverse diameter of heart for men increases from 12·1 cm. at 60 years to 13·6 cm. at 89 years, and the corresponding values for women at the same ages are 12·2 cm. and 12·3 cm. respectively. Thus in the 30 years period men show an increase in the transverse diameter of heart of 1·5 cm. compared with 0.1 cm. for women.

The absolute variability is similar for men and women and shows little change with age. The relative variability is slightly greater for men than it is for women, and for the sexes is exceedingly moderate occupying fifth position in Table 26.

6. CHEST GIRTH.

The three criteria of chest girth are similar. It is sufficient, therefore, to consider mean chest girth alone.

MEN Mean chest girth (in.) = 37·045 - 0·017714 age

WOMEN Mean chest girth (in.) = 41·431 - 0·106857 age

From these equations are derived the fitted regression lines in Figure 6.

MEN $r = -0{\cdot}0448$

WOMEN $r = -0{\cdot}2736$ **

These correlation coefficients indicate that there is a decrease in the mean chest girth with age, and that the decrease is significant only for women. The predicted mean chest girth for men diminishes from 36·0 in. at 60 years to 35·5 in. at 89 years, and the corresponding values for women at the same ages are 35·0 in. and 31·9 in. respectively. Thus in the 30 years period men show a reduction in mean chest girth of 0·5 in. compared with 3·1 in. for women.

The absolute variability is similar for men and women and shows no consistent trend with age. The relative variability is comparable for men and women, and it is moderate occupying seventh position in Table 26.

7. DIASTOLIC I BLOOD PRESSURE.

MEN Diastolic (mm. Hg.) = 80·776 + 0·075428 age

WOMEN Diastolic (mm. Hg.) = 68·093 + 0·263428 age

From these equations are derived the fitted regression lines in Figure 7.

MEN $r = 0{\cdot}0612$

WOMEN $r = 0{\cdot}2216$ **

These correlation coefficients indicate that there is an increase in the diastolic I blood pressure with age, and that the increase is significant only for women. The predicted diastolic I blood pressure for men increases from 85·3 mm. at 60 years to 87·5 mm. at 89 years, and the corresponding values at the same ages for women are 83·9 mm. and 91·5 mm. respectively. Thus in the 30 years period men show an increase in diastolic I blood pressure of 2·2 mm. compared with 7·6 mm. for women.

The absolute variability is similar for men and women, and shows a slight increase with age. The relative variability is comparable for men and women and shows a slight variation with age. The relative variability is moderate occupying ninth position in Table 26.

8. HAEMOGLOBIN.

MEN Haemoglobin % = 100·324 - 0·155428 age

WOMEN Haemoglobin % = 94·405 - 0·114285 age

(100 per cent = 14 g. per 100 c. cm.)

From these equations are derived the fitted regression lines in Figure 8.

MEN $r = -0{\cdot}1387$ **

WOMEN $r = -0{\cdot}1100$

These correlation coefficients indicate that there is a decrease in the haemoglobin with age, and that the decrease is significant only for men. The predicted haemoglobin for men decreases from 12·7 g. at 60 years to 12·1 g. at 89 years, and the corresponding values at the same ages for women are 12·3 g. and 11·8 g. respectively. Thus in the 30 years period men show a decrease in haemoglobin of 0·6 g. compared with 0·5 g. for women.

The absolute variability is similar for men and women, and shows little change with age. The relative variability is comparable for men and women, and is moderate occupying tenth position in Table 26.

9. CARDIOTHORACIC AREA RATIO.

MEN Cardiothoracic area ratio = 0·1122 + 0·001237 age

WOMEN Cardiothoracic area ratio = 0·1721 + 0·000791 age

From these equations are derived the fitted regression lines in Figure 9.

MEN $r = 0{\cdot}3253$ **

WOMEN $r = 0{\cdot}2610$ **

These correlation coefficients indicate that there is an increase in the cardiothoracic area ratio of men and women with age. This increase is significant for men and women. The predicted cardiothoracic area ratio for men increases from 0·1864 at 60 years to 0·2222 at 89 years, and the corresponding values at the same ages for women are 0·2196 and 0·2425 respectively. Thus in the 30 years period men show an increase in cardiothoracic area ratio of 0·0358 compared with 0·0229 for women.

The absolute variability is similar for men and women, and shows a slight increase with age. The relative variability is comparable for men and women within the age range 60 to 74 years. Over 74 years men show a relative variability which is somewhat greater than that for women.

10. HEIGHT OF LEFT HEMITHORAX.

MEN Height of left hemithorax (cm.) = 29·562 - 0·053714 age

WOMEN Height of left hemithorax (cm.) = 22·383 - 0·004000 age

From these equations are derived the fitted regression lines in Figure 10.

MEN r = - 0·1552 **

Women r = - 0·0145

These correlation coefficients indicate that there is a decrease in the height of the left hemithorax with age, and that the decrease is significant for men. The predicted height of the left hemithorax for men decreases from 26·3 cm. at 60 years to 24·8 cm. at 89 years, and the corresponding values at the same ages for women are 22·1 cm. and 22·0 cm. respectively. Thus in the 30 years period men show a decrease in height of the left hemithorax of 1·5 cm. compared with 0·1 cm. for women.

The absolute variability is similar for men and women, and shows little change with age. The relative variability, apart from the age group 85 to 89 years, is similar for men and women, and occupies twelth position in Table 26.

11. HEIGHT OF RIGHT HEMITHORAX.

MEN Height of right hemithorax (cm.) = 27·133 - 0·040000 age

WOMEN Height of right hemithorax (cm.) = 20·102 - 0·002857 age

From these equations are derived the fitted regression lines in Figure 10.

MEN $r = -0{\cdot}1156$ *

Women $r = -0{\cdot}0099$

These correlation coefficients indicate that there is a decrease in the height of the right hemithorax with age, and that the decrease is significant only for men at the 5 per cent level. The predicted height of the right hemithorax for men decreases from 24·7 cm. at 60 years to 23·6 cm. at 89 years, and the corresponding values at the same ages for women are 20·3 cm. and 20·3 cm. respectively. Thus in the 30 years period men show a decrease in height of the right hemithorax of 1·1 cm. compared with 0·0 cm. for women.

The absolute variability for men shows an increase with age, while there is no change with age for women. The relative variability for men shows an increase with age, which is not apparent for women. The relative variability is in thirteenth position in Table 26.

12. AREA OF CARDIAC SILHOUETTE.

MEN Area of cardiac silhouette (sq. cm.) = 101·138 + 0·325714 age

WOMEN Area of cardiac silhouette (sq. cm.) = 109·862 - 0·045714 age

From these equations are derived the regression lines fitted in Figure 11.

MEN $r = + 0{\cdot}0867$

WOMEN $r = - 0{\cdot}0322$

These correlation coefficients indicate that any variation in the area of the cardiac silhouette of men and women with age is not significant. The predicted area of the cardiac silhouette for men is 120·7 sq. cm. at 60 years and 130·1 sq. cm. at 89 years, and the corresponding values for women at the same ages are 107·1 sq. cm. and 105·8 sq. cm. respectively. Thus in the 30 years period men show an increase of 9·4 sq. cm. in the area of the cardiac silhouette compared with a decrease of 1·3 sq. cm. for women.

The absolute and relative variabilities are somewhat greater for men than they are for women, and in both sexes these variabilities show an increase with age. The relative variability is fourteenth in position in Table 26 and is moderate.

13. DIASTOLIC II BLOOD PRESSURE.

The discrepancies between the numbers of men and women in the age groups compared with those forming the total series are due to the existence of individuals in whom sounds exist down to zero reading on the mercury manometer. For this reason particularly I regard diastolic I as the criterion of choice for estimating diastolic blood pressure. Consequently diastolic II is considered briefly, and is only included for completeness.

There is little increase in the average values of diastolic II blood pressure with age for men and women.

The absolute variability is similar for men and women, and increases with age. The relative variability, which is comparable for the sexes and increases with age, is fifteenth in position in Table 26. While the relative variability is moderate it is, nevertheless, greater than that for diastolic I blood pressure.

14. SYSTOLIC BLOOD PRESSURE.

MEN Systolic blood pressure (mm. Hg.) = 113·240 + 0·656571 age

WOMEN Systolic blood pressure (mm. Hg.) = 98·052 + 0·982857 age

From these equations are derived the fitted regression lines in Figure 7.

MEN $r = 0{\cdot}2054$ * *

WOMEN $r = 0{\cdot}2913$ * *

These correlation coefficients indicate that there is a significant increase in the systolic blood pressure of men and women with age. The predicted systolic blood pressure of men increases from 152·6 mm. at 60 years to 171·7 mm. at 89 years, and the corresponding values for women at the same ages are 157·0 mm. and 185·5 mm. respectively. Thus in the 30 years period men show an increase in systolic blood pressure of 19·1 mm. compared with 28·5 mm. for women.

Apart from age group 60 to 64 years the absolute variability is similar for the sexes, and the marked disparity noted in this age group may be regarded as fortuitous. There is no consistent trend with age. The relative variability is on the whole comparable for men and women, and can be regarded as quite large being in sixteenth position in Table 26.

15. GRIP.

MEN	Right hand (pressure in pounds)	= 151·259 – 0·904571 age
WOMEN	Right hand (pressure in pounds)	= 94·145 – 0·379047 age
MEN	Left hand (pressure in pounds)	= 141·150 – 0·813333 age
WOMEN	Left hand (pressure in pounds)	= 94·869 – 0·445142 age

From these equations are derived the fitted regression lines in Figure 12.

MEN	$r = -0{\cdot}5162$	**	Right hand
WOMEN	$r = -0{\cdot}3300$	**	Right hand
MEN	$r = -0{\cdot}4672$	**	Left hand
WOMEN	$r = -0{\cdot}3977$	**	Left hand

These correlation coefficients indicate that there is a significant decrease in the power of the grip for the right and left hands of men and women. The predicted power of the grip of the right hand of men decreases from 97·0 lb. at 60 years to 70·7 lb. at 89 years, and the corresponding values at the same ages for women are 71·4 lb. and 60·4 lb. respectively. The predicted power of the grip of the left hand of men decreases from 92·3 lb. at 60 years to 68·8 lb. at 89 years, and the corresponding values at the same ages for women are 68·2 lb. and 55·2 lb. respectively. Thus in the 30 years period men show a decrease in the power of the right and left hands of 26·3 lb. and 23·5 lb. respectively. The corresponding decreases in the power of grip for women are 11·0 lb. and 13·0 lb. respectively.

The absolute variability of the power of the grip of the left hand is similar to that of the right hand; for both hands it is greater for men than it is for women, and in both sexes it decreases with increase in age.

The relative variabilities of the left and right hands are comparable, and are greater for men than women. They are in seventeenth and eighteenth positions respectively in Table 26.

16. FRONTAL AREA OF THORAX.

MEN Frontal area of thorax (sq. cm.) = 771·261 - 2·053710 age

WOMEN Frontal area of thorax (sq. cm.) = 603·386 - 1·865142 age

From these equations are derived the fitted regression lines in Figure 13.

MEN $r = -0{\cdot}1891$ **

WOMEN $r = -0{\cdot}2246$ **

These correlation coefficients indicate that there is a significant decrease in the frontal area of the thorax of men and women with age. The predicted frontal area of the thorax of men decreases from 648·0 sq. cm. at 60 years to 588·5 sq. cm. at 89 years, and the corresponding values for women at the same ages are 491·5 sq. cm. and 437·4 sq. cm. respectively. Thus in the 30 years period men show a decrease in the frontal area of the thorax of 59·5 sq. cm. compared with 54·1 sq. cm. for women.

The absolute variability is greater for men than it is for women, and while it appears to increase with age for men there is no consistent trend for women. The relative variability is comparable for the sexes and is in nineteenth position in Table 26.

17. PULSE RATE.

MEN Pulse rate per minute = 79·298 − 0·090857 age

WOMEN Pulse rate per minute = 89·167 − 0·168000 age

From these equations are derived the fitted regression lines in Figure 14.

MEN $r = -0\cdot 0645$

WOMEN $r = -0\cdot 1394$ *

These correlation coefficients indicate that there is a decrease in the pulse rate with age, and that the decrease is significant only for women at the 5 per cent level. The predicted pulse rate of men decreases from 73·8 per minute at 60 years to 71·2 per minute at 89 years, and the corresponding values for women at the same ages are 79·1 and 74·2 respectively. Thus in the 30 years period the men show a decrease in pulse rate of 2·6 per minute compared with 4·9 per minute for women.

The absolute variability is slightly greater for men than it is for women, and shows a slight decrease with age. The relative variability, which is slightly greater for men, is in twentieth position in Table 26.

18. WEIGHT.

MEN Weight (lb.) = 151·362 − 0·173714 age

WOMEN Weight (lb.) = 174·205 − 0·674285 age

From these equations are derived the fitted regression lines in Figure 15.

MEN $r = -0 \cdot 0576$

WOMEN $r = -0 \cdot 2538$ ※ ※

These correlation coefficients indicate that there is a decrease in weight with age, which is significant for women. The predicted weight of men decreases from 140·9 lb. at 60 years to 135·9 lb. at 89 years, and the corresponding values for women at the same ages are 133·7 lb. and 114·2 lb. respectively. Thus in the 30 years period men show a decrease in weight of 5·0 lb. compared with 19·5 lb. for women.

The absolute variability, which is slightly greater for men than women, shows no consistent trend with age. The relative variability, which is similar for men and women, is in the twenty-:first position in Table 26.

19. HEIGHT OF DOMES OF DIAPHRAGM.

MEN Height of left dome of diaphragm (cm.) = 6·281 - 0·030857 age

WOMEN Height of left dome of diaphragm (cm.) = 5·526 - 0·032571 age

MEN Height of right dome of diaphargm (cm.) = 7·002 - 0·029142 age

WOMEN Height of right dome of diaphragm (cm.) = 7·178 - 0·041714 age

From these equations are derived the fitted regression lines in Figure 16.

MEN $r = -0 \cdot 2147$ ※ ※ (left dome of diaphragm)

WOMEN $r = -0 \cdot 2982$ ※ ※ (left dome of diaphragm)

MEN $r = -0 \cdot 1528$ ※ (right dome of diaphragm)

WOMEN $r = -0 \cdot 3616$ ※ ※ (right dome of diaphragm)

These correlation coefficients indicate that there is a significant decrease in the heights of the left and right domes of the diaphragm of men and women with age. The predicted height of the left dome of the diaphragm of men decreases from 4·4 cm. at 60 years to 3·5 cm. at 89 years, and the corresponding values for women at the same ages are 3·6 cm. and 2·6 cm. respectively. The predicted height of the right dome of the diaphragm of men decreases from 5·2 cm. at 60 years to 4·4 cm. at 89 years, and the corresponding values for women at the same ages are 4·7 cm. and 3·5 cm. respectively. Thus in the 30 years period men show a decrease in the heights of the left and right domes of the diaphragm of 0·9 cm. and 0·8 cm. respectively. The corresponding decreases in the heights of the left and right domes of the diaphragm for women are 1·0 cm. and 1·2 cm. respectively.

The absolute variability is similar for men and women and shows little change with age. The relative variability is comparable for men and women, and it is a large variability. These variables are in the twenty-second and twenty-third positions in Table 26.

20. KYPHOTIC ANGLE.

MEN Kyphotic angle (degrees) = – 0·533 + 0·656000 age

WOMEN Kyphotic angle (degrees) = 6·226 + 0·655428 age

The fitted regression lines in Figure 17 are derived from these equations.

MEN $r = 0\cdot3340$ **

WOMEN $r = 0\cdot3514$ **

These correlation coefficients indicate that there is a significant increase in the kyphotic angle of men and women with age. The predicted kyphotic angle of men increases from 38.8° at 60 years to 57.8° at 89 years, and the corresponding values for women at the same ages are $45{\cdot}5^{\circ}$ and $64{\cdot}6^{\circ}$ respectively. Thus in the 30 years period men show an increase in kyphotic angle of $19{\cdot}0^{\circ}$ compared with $19{\cdot}1^{\circ}$ for women.

The absolute variability is slightly greater for men than it is for women, and both sexes show a slight increase with age. The relative variability, which is greater for men, is large and is in twenty-fourth position in Table 26.

21. CHEST EXPANSION.

MEN Chest expansion (in.) = 3·788 - 0·030285 age

WOMEN Chest expansion (in.) = 2·098 - 0·010857 age

From these equations are derived the regression lines fitted in Figure 18.

MEN $r = -0{\cdot}3124$ **

WOMEN $r = -0{\cdot}1327$ *

These correlation coefficients indicate that there is a significant decrease in the chest expansion of men and women with age. The predicted chest expansion of men decreases from 1·97 in. at 60 years to 1·09 in. at 89 years, and the corresponding values for women at the same ages are 1·45 in. and 1·13 in. respectively. Thus in the 30 years period there is a reduction in the chest expansion of men of 0·88 in. compared with 0·32 in. for women.

The absolute variability is somewhat greater for men than it is for women. It decreases with age in women, but shows no consistent trend for men. The relative variability is very great, and this variable is in twenty-fifth position in Table 26.

DISCUSSION.

The following discussion deals with the variables in associated groups rather than as presented in the results section according to degrees of relative variability.

1. HEIGHT, BODY-WEIGHT, CHEST GIRTH AND EXPANSION.

In men and women there is a significant decrease in height with age. Although men are on average taller than women, the decrease in height over the age range 60 to 89 years is greater for women - 2·4 in. compared with 1·6 in. for men. This is doubtless related to the occurrence of the larger kyphotic angles in women at all ages. For example, at 60 years the predicted kyphotic angles for men and women are approximately 39° and 58° respectively.

Men show a decrease in predicted weight of 5·0 lb. over the 30 years period which is not significant. On the other hand, the decrease for women over the same age range of 19·5 lb. is highly significant. The men are on average heavier than women at all ages. The reasons for the significant difference in the regressions of weight on age as between the sexes are difficult to explain. It is tempting to consider the existence of a selective mortality affecting the more obese women. It is known that obesity predisposes to more serious disorders and shortens the span of life (Greene, 1948). The statistics of Life Assurance Companies indicate clearly the significant relationship between increase in weight and mortality rates. Sinclair (1955) quotes Dublin who states that obese people who lose weight live longer than they would otherwise have done if they had not reduced. Parkes

(1955), however, believes that this premise is very difficult to prove.

In this series there is a significant decline with increase in age in the number of women more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948). Thus the more obese women are concentrated in the younger age groups, the more will the negative regression of weight on age be accentuated. In a previous paper (Cowan, 1956) I carried out a similar statistical study on healthy women including those who were adipose. The weight loss over the age range 60 to 89 years was 33·9 lb. compared with the 19·5 lb. of the present investigation, and the regression equation was weight (lb.) = 220·460 - 1·1278 age. Since with the elimination of the adipose subjects the significant downward weight trend with age is not eliminated, it is probable that another factor is in evidence. The weight loss observed as older women age may be a normal phenomenon, and the work of Hobson and Pemberton (1955) is possibly relevant. They assessed the amount of subcutaneous fat in older women and came to the conclusion that there is a real decrease in subcutaneous fat in women with age, but that this is not so with men.

The significant decrease in mean chest girth of women, which is not observed for men, is probably due to the loss of subcutaneous fat discussed above. Clements and Pickett (1954) in a study of chest girth in men aged 19 to 42 years found that the mean chest girth in men by age groups shows an upward trend until about 30 years of age, which is succeeded by a slow downward trend. Their mean chest girth for the age group 40 to 42 years was 35·50 ± 0·36 in. In the present study the predicted mean chest girth varies from 36.0 in. at 60 years to 35·5 in. at 89 years. While I am unable to find in the literature information concerning the mean chest girth with reference to the age range 42 to 60 years, it seems that the downward trend in the mean chest girth noted by Clements and Pickett (1954) does not continue as a significant entity beyond the age of 42 years in men.

Men and women show a significant decrease in chest expansion with age. The predicted reduction in chest expansion over the 30 years period is 0·88 in. for men and 0·32 in. for women. This trend is not surprising as it was a common occurrence to observe patients clinically in the older age groups who on extreme inspiration exhibited negligible chest movement. Such patients with no respiratory or cardiovascular disease may experience breathlessness on exertion. Breathing exercises improve the chest expansion of such people and diminish their breathlessness on exertion.

2. KYPHOTIC ANGLE.

I can find no information in the literature which would be useful as an amplification of the kyphotic angle values recorded in this thesis. I devised my own method of measuring this variable because I required an index of the degree of kyphosis. There is the possibility that kyphosis may influence the areas of the cardiac silhouette and chest as measured on a postero-anterior X-ray film. Kyphosis alters the shape of the thorax as seen on an X-ray film, and it may also change the position of the heart within the intrathoracic space.

There is a highly significant increase in the degree of kyphosis with age for men and women. Women are on average more kyphotic than men, and at all ages the average kyphosis of women exceeds that of men by about $6{\cdot}7^{\circ}$. Further study of younger age groups is desirable to show if the sex difference in the predicted kyphotic angle values implies that kyphosis develops in women at an earlier age than it does in men.

3. LONG HEART DIAMETER.

The long heart diameter shows no change with age for men and women, and the average length of 14 cm. for men is about one cm. greater than that recorded for women. The relative variability is exceedingly moderate at approximately 6·0. However, the transverse diameter of the heart is measured with greater accuracy than the long heart diameter and has a comparable moderate relative variability. Furthermore, the absence of change in the long heart diameter with age may be misleading. Assessments of lateral X-ray films of the chest suggest that with age there is a backward tilt of the heart on its lower pole which acts as a pivot. This cardiac displacement is associated with kyphosis which alters the shape of the outline of the intrathoracic space. Statistical proof of this observation is not presented because the angle of cardiac inclination could not be measured with accuracy from the X-ray films of older people. It is reasonable to assume that the backward displacement of the heart results in a foreshortening of the long heart diameter. On the other hand, the transverse diameter of the heart is a horizontal measurement and must be subject to less distortion. It is, therefore, apparent that of these two attributes the criterion of choice in estimating heart size is the transverse diameter of heart.

4. (a) TRANSVERSE DIAMETERS OF HEART AND OF CHEST AND THE CARDIOTHORACIC RATIO.

(b) FRONTAL AREAS OF HEART AND OF CHEST AND THE CARDIOTHORACIC AREA RATIO.

These variables, which are of importance in the estimation of heart size, are considered later following the presentation of further statistical data.

5. SYSTOLIC, DIASTOLIC I AND DIASTOLIC II BLOOD PRESSURES.

Diastolic II blood pressure observations are analysed for completeness. Master, Lasser and Jaffe (1958) and others prefer diastolic II blood pressure as the more accurate criterion of diastolic blood pressure. There are objections, however, to its use in older years. With age there is an increase in the frequency of zero readings on the mercury manometer, and it is reasonable to assume that auditory acuity varies as between observers. Furthermore, diastolic I blood pressure is recommended by the Committee concerned with the standardization of methods of measuring the arterial blood pressure (1939). I personally prefer to use diastolic I blood pressure.

The absolute and relative variabilities of systolic and diastolic I blood pressure found in this study are less than those noted by other investigators (Hamilton et al. (1954); Master et al. (1958); Saller (1928) and Wetherby (1932)). This difference from other surveys is the result possibly of the following factors. The non-exclusion from other surveys of those who are adipose; less strict criteria for the exclusion of cases on the grounds of disease; occasional assessment of means based on few observations, and the taking of readings by numerous observers.

Dr. Ferguson Anderson and myself (1959) studied the arterial pressure in healthy older people. The present systolic and diastolic I blood pressure means are comparable to those of the 1959 investigation, in which it was noted that for men the systolic and diastolic blood pressure means are similar to those recorded by Hamilton et al. (1954) and Wetherby (1932), but are higher than those for the total series analysed by Robinson and Brucer (1939), and those for systolic blood pressure observed by Master et al. (1958). For women the systolic means are lower than those of Hamilton et al. (1954), comparable to those of Wetherby (1932), and higher than those of Robinson and Brucer (1939) and of Master et al. (1958). The diastolic means for women are lower than those of Hamilton et al. (1954) and of Wetherby (1932), but are higher than those of Robinson and Brucer (1939).

We (1959) concluded that the range of blood pressure in healthy old people is wide and systolic blood pressure readings in the highest age range (80 - 89 years) reach a figure higher than 200 mm. Hg. for men and women. Irrespective of age diastolic blood pressures of up to 104 mm. Hg. for men and 108 mm. Hg. for women may be found in individuals who are healthy.

6. HAEMOGLOBIN.

The Sahli instrument used was calibrated so that 100 per cent = 14 g. haemoglobin in 100 c. cm. of blood. The overall average values of about 12·5 g. for men and 12·0 g. for women do not differ greatly from the 14 g. level. I can offer no explanation as to why the decrease in haemoglobin with age which occurs in both sexes is significant only for men.

7. HEIGHTS OF THE LEFT AND RIGHT HALVES OF THE THORAX, AND THE LEFT AND RIGHT DOMES OF THE DIAPHRAGM.

There is a significant decrease in the vertical heights of the left and right halves of the thorax with age for men but not for women, while the decrease in the vertical heights of the left and right domes of the diaphragm is significant for men and women. Since the vertical distance between the superior limit of the thorax and a costo-phrenic angle is equal to the sum of the vertical heights of the hemithorax and dome of diaphragm on that side of the chest, decrease in vertical height of a hemithorax is subject to at least two factors, namely, the degree of kyphosis and the flattening of the diaphragm. Increased kyphosis should decrease and diaphragmatic flattening should increase thoracic height. Diaphragmatic flattening increases significantly with age for both sexes, and kyphosis is more marked for women. Thus it might be expected that the decrease in thoracic height with age should be more marked for women, and this is not the case. The reason for this unexpected sex difference is, therefore, speculative. Possibly it is at least partly related to the fact that when kyphosis is so marked that the first rib comes to lie below the second rib, the selection of the lower margin of the second rib as the superior limit of the thorax nullifies the total influence of marked kyphosis.

Tirman and Hamilton (1952), in a study of men aged 20 to 75 years and with only 10 men in the 60 to 75 years age group, found a significant increase in the vertical height of the thorax by the seventh decade, and their mean heights of the left and right halves of the thorax were 24·1 ± 0·67 cm. and 25·6 ± 0·63 cm. respectively for the older age group. The significant downward trend in hemithoracic height observed in the present study for the age range 60 to 89 years suggests that the increase recorded by Tirman and Hamilton (1952) does not continue beyond the seventh decade, and that the linear regressions shown in Figure 10 may provide predicted values that are too high in the 60 to 64 years age group. If information were available for people younger than 60 years a non-linear regression might be more appropriate for prediction in the crucial age period 55 to 65 years.

Tirman and Hamilton (1952) also found in the same group of men a decrease in the heights of the left and right domes of the diaphragm with age, which was significant on the right side by the fifth decade and on the left side by the sixth decade. These changes persisted in subsequent decades. Their mean values are comparable to the predicted ones noted in this study of 4·4 cm. and 5·2 cm. for the heights of the left and right domes of the diaphragm at 60 years for men. Thus flattening of the diaphragm in men is observed to commence at an earlier age than decrease in thoracic height.

8. POWER OF GRIP OF LEFT AND RIGHT HANDS.

The data presented confirm what is expected. The power of the grip of both hands for men and women declines significantly with age; the grip of the right hand is stronger than that of the left hand, and at all ages the power of the grip of men is greater than that of women. Furthermore, the decrease in power of the grip of men is double that noted for women over the 30 years period 60 to 89.

9. PULSE RATE.

Women have a higher pulse rate than men, and the decrease in pulse rate with age in both sexes is significant only for women. I am unable to explain these sex differences. The average pulse rate for men is about 72·5 per minute and this is less than the heart rate of 77·3 recorded by McKinlay and Walker (1935) for adult men aged 23·2 ± 4·02 years. It may, therefore, be that the downward trend in pulse rate of men commences before the age of 60 years.

Table 1.

Means, standard deviations and coefficients of variation of the height by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (in.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	65·9 ± 0·35	61·4 ± 0·35	2·9	2·9	4·5	4·7
65 - 69	82	57	65·9 ± 0·30	60·5 ± 0·37	2·7	2·8	4·0	4·6
70 - 74	101	71	65·4 ± 0·23	60·1 ± 0·32	2·3	2·7	3·4	4·4
75 - 79	82	46	65·2 ± 0·28	60·7 ± 0·38	2·5	2·6	3·8	4·4
80 - 84	55	37	64·6 ± 0·40	59·2 ± 0·36	3·0	2·2	4·6	3·7
85 - 89	11	12	64·8 ± 1·11	59·1 ± 0·95	3·7	3·3	5·8	5·6

Table 2.

Means, standard deviations and coefficients of variation of the long heart diameter of heart by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	14·2 ± 0·089	13·2 ± 0·079	0·7	0·6	5·4	4·9
65 - 69	77	48	13·9 ± 0·091	13·1 ± 0·087	0·8	0·6	5·7	4·8
70 - 74	93	59	14·0 ± 0·083	13·1 ± 0·104	0·8	0·8	5·7	6·0
75 - 79	70	41	14·1 ± 0·108	13·1 ± 0·109	0·9	0·7	6·3	5·1
80 - 84	53	34	14·1 ± 0·124	13·1 ± 0·137	0·9	0·8	6·7	6·0
85 - 89	8	10	14·3 ± 0·283	13·1 ± 0·253	0·8	0·8	5·7	5·9

Table 3.

Means, standard deviations and coefficients of variation of the transverse diameter of chest

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Means ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	28·5 ± 0·19	24·8 ± 0·24	1·5	1·8	5·4	7·2
65 - 69	77	48	28·4 ± 0·22	24·0 ± 0·24	1·9	1·7	6·6	7·2
70 - 74	93	59	28·3 ± 0·18	24·4 ± 0·21	1·7	1·6	6·1	6·8
75 - 79	70	41	28·1 ± 0·21	23·6 ± 0·20	1·8	1·3	6·4	5·3
80 - 84	53	34	28·2 ± 0·27	23·1 ± 0·29	2·0	1·7	7·2	7·5
85 - 89	8	10	27·9 ± 0·53	22·6 ± 0·60	1·5	1·9	5·4	8·5

Table 4.

Means, standard deviations and coefficients of variation of the cardiothoracic ratio by sex and five year age groups.

(healthy non-adipose)

Age group	Number		Means ± S.E.		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	0·43 ± 0·0038	0·50 ± 0·0052	0·03	0·04	7·8	8·5
65 - 69	77	48	0·44 ± 0·0034	0·50 ± 0·0058	0·03	0·04	7·6	7·4
70 - 74	93	59	0·45 ± 0·0031	0·51 ± 0·0052	0·03	0·04	6·6	7·1
75 - 79	70	41	0·47 ± 0·0048	0·52 ± 0·0062	0·04	0·04	8·5	7·1
80 - 84	53	34	0·47 ± 0·0069	0·53 ± 0·0069	0·04	0·04	7·7	7·5
85 - 89	8	10	0·49 ± 0·0141	0·54 ± 0·0126	0·04	0·04	8·8	8·3

Table 5.

Means, standard deviations and coefficients of variation of the transverse diameter of heart

by sex and five year age groups.
(healthy non-adipose)

Age Group	Number		Means ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	12·3 ± 0·14	12·3 ± 0·12	1·1	0·9	8·8	7·2
65 - 69	77	48	12·6 ± 0·12	12·0 ± 0·11	1·1	0·8	9·0	6·8
70 - 74	93	59	12·7 ± 0·09	12·3 ± 0·10	0·9	0·8	7·3	6·6
75 - 79	70	41	13·1 ± 0·13	12·2 ± 0·14	1·1	0·9	8·1	7·4
80 - 84	53	34	13·1 ± 0·15	12·2 ± 0·15	1·1	0·9	8·7	7·3
85 - 89	8	10	13·7 ± 0·31	12·3 ± 0·47	0·9	1·5	6·2	11·8

Table 6.

Means, standard deviations and coefficients of variation of the chest girth in maximum expiration by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Means ± S.E. (in.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	35·3 ± 0·32	34·1 ± 0·39	2·7	3·3	7·6	9·6
65 - 69	82	57	35·0 ± 0·34	33·2 ± 0·40	3·1	3·0	9·0	8·9
70 - 74	101	71	34·5 ± 0·28	33·6 ± 0·32	2·8	2·7	8·2	8·0
75 - 79	82	46	34·8 ± 0·30	32·0 ± 0·35	2·7	2·4	7·8	7·6
80 - 84	55	37	34·8 ± 0·38	32·1 ± 0·54	2·8	3·3	8·0	10·2
85 - 89	11	12	35·2 ± 0·81	31.6 ± 0·89	2·7	3.1	7·5	9.8

Table 7.

Means, standard deviations and coefficients of variation of the mean chest girth by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Means ± S.E. (in.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	36·2 ± 0·31	34·9 ± 0·37	2·6	3·1	7·2	8·9
65 - 69	82	57	35·9 ± 0·34	33·9 ± 0·37	3·1	2·8	8·6	8·3
70 - 74	101	71	35·4 ± 0·28	34·2 ± 0·31	2·8	2·6	7·9	7·6
75 - 79	82	46	35·5 ± 0·29	32·6 ± 0·35	2·6	2·4	7·3	7·4
80 - 84	55	37	35·5 ± 0·36	32·7 ± 0·53	2·7	3·2	7·6	9·8
85 - 89	11	12	35·8 ± 0·81	32·2 ± 0·87	2·7	3·0	7·5	9·3

Table 8.

Means, standard deviations and coefficients of variation of the chest girth in maximum inspiration by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (in.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	37·1 ± 0·30	35·6 ± 0·35	2·5	2·9	6·8	8·3
65 - 69	82	57	36·8 ± 0·33	34·6 ± 0·36	3·0	2·7	8·1	7·7
70 - 74	101	71	36·2 ± 0·27	34·8 ± 0·28	2·7	2·4	7·4	6·9
75 - 79	82	46	36·1 ± 0·26	33·2 ± 0·34	2·4	2·3	6·8	7·0
80 - 84	55	37	36·2 ± 0·35	33·3 ± 0·51	2·6	3·1	7·2	9·2
85 - 89	11	12	36·4 ± 0·81	32·8 ± 0·84	2·7	2·9	7·4	8·7

Table 9.

Means, standard deviations and coefficients of variation of the diastolic I blood pressure

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (mm. Hg.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	85·8 ± 0·96	85·7 ± 0·98	8·0	8·2	9·3	9·6
65 - 69	82	57	85·8 ± 0·83	86·2 ± 0·99	7·5	7·5	8·7	8·7
70 - 74	101	71	85·8 ± 0·81	86·5 ± 0·93	8·1	7·8	9·5	9·0
75 - 79	82	46	86·0 ± 1·07	87·1 ± 1·44	9·7	9·8	11·3	11·2
80 - 84	55	37	88·3 ± 1·24	87·2 ± 1·59	9·2	9·7	10·4	11·1
85 - 89	11	12	86·9 ± 3·35	94·3 ± 2·54	11·1	8·8	12·8	9·3

Table 10.

Means, standard deviations and coefficients of variation of the haemoglobin by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (100% = 14 g.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	90·1 ± 0·99	87·6 ± 0·88	8·2	7·4	9·1	8·4
65 - 69	82	57	90·5 ± 0·84	86·1 ± 0·94	7·6	7·1	8·4	8·3
70 - 74	101	71	88·9 ± 0·81	86·8 ± 0·91	8·2	7·7	9·2	8·9
75 - 79	82	46	88·0 ± 0·84	84·7 ± 1·05	7·6	7·1	8·7	8·3
80 - 84	55	37	88·4 ± 1·09	85·3 ± 1·33	8·1	8·1	9·1	9·5
85 - 89	11	12	86·1 ± 1·96	84·5 ± 1·44	6·5	5·0	7·6	5·9

Table 11.

Means, standard deviations and coefficients of variation of the cardiothoracic area ratio by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E.		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	0·1921 ± 0·0022	0·2226 ± 0·0028	0·0175	0·0216	9·1	9·7
65 - 69	77	48	0·1956 ± 0·0023	0·2245 ± 0·0026	0·0205	0·0184	10·5	8·2
70 - 74	93	59	0·1994 ± 0·0017	0·2285 ± 0·0031	0·0162	0·0240	8·1	10·5
75 - 79	70	41	0·2072 ± 0·0026	0·2333 ± 0·0035	0·0215	0·0227	10·4	9·7
80 - 84	53	34	0·2103 ± 0·0032	0·2387 ± 0·0038	0·0235	0·0223	11·2	9·3
85 - 89	8	10	0·2250 ± 0·0084	0·2408 ± 0·0061	0·0237	0·0194	10·5	8·1

Table 12.

Means, standard deviations and coefficients of variation of the height of the left hemithorax

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	26·3 ± 0·28	22·4 ± 0·25	2·2	1·9	8·3	8·5
65 - 69	77	48	25·8 ± 0·27	22·1 ± 0·30	2·4	2·1	9·5	9·4
70 - 74	93	59	25·7 ± 0·24	21·7 ± 0·30	2·3	2·3	8·9	10·5
75 - 79	70	41	25·4 ± 0·31	22·0 ± 0·34	2·6	2·2	10·1	10·2
80 - 84	53	34	25·1 ± 0·30	22·1 ± 0·39	2·2	2·3	8·9	10·7
85 - 89	8	10	24·9 ± 1·38	22·2 ± 0·54	3·9	1·7	15·8	7·6

Table 13.

Means, standard deviations and ooefficients of variation of the height of the right hemithorax

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	24·9 ± 0·29	20·5 ± 0·28	2·3	2·1	9·3	10·1
65 - 69	77	48	24·2 ± 0·27	20·3 ± 0·30	2·4	2·1	9·9	10·3
70 - 74	93	59	24·3 ± 0·24	20·1 ± 0·27	2·3	2·1	9·3	10·7
75 - 79	70	41	23·8 ± 0·30	20·1 ± 0·36	2·5	2·3	10·6	11·6
80 - 84	53	34	23·7 ± 0·34	20·3 ± 0·36	2·5	2·1	10·4	10·3
85 - 89	8	10	23·9 ± 1·45	20·6 ± 0·57	4·1	1·8	17·0	8·9

Table 14.

Means, standard deviations and coefficients of variation of the area of the frontal heart silhouette by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (sq. cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	124·6 ± 1·5	108·9 ± 1·2	11·9	9·5	9·5	8·7
65 - 69	77	48	120·7 ± 1·4	105·0 ± 1·5	12·2	10·2	10·1	9·7
70 - 74	93	59	123·9 ± 1·3	106·2 ± 1·3	12·9	10·3	10·4	9·7
75 - 79	70	41	125·7 ± 1·7	104·9 ± 1·7	14·1	11·2	11·2	10·7
80 - 84	53	34	126·1 ± 1·9	107·6 ± 2·0	14·0	11·8	11·1	10·9
85 - 89	8	10	132·4 ± 4·7	106·0 ± 3·4	13·2	10·8	10·0	10·2

Table 15.

Means, standard deviations and coefficients of variation of the diastolic II blood pressure

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (mm. Hg.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	69	77·2 ± 1·12	76·3 ± 1·03	9·3	8·6	12·0	11·3
65 - 69	80	54	76·7 ± 0·99	75·9 ± 1·14	8·9	8·4	11·6	11·1
70 - 74	95	68	77·5 ± 0·99	78·6 ± 0·98	9·7	8·1	12·5	10·3
75 - 79	71	39	78·2 ± 1·36	77·7 ± 1·68	11·5	10·5	14·7	13·5
80 - 84	47	35	78·3 ± 1·81	76·9 ± 1·88	12·4	11·1	15·8	14·4
85 - 89	9	11	80·4 ± 3·90	89·1 ± 2·71	11·7	9·0	14·5	10·2

Table 16.

Means, standard deviations and coefficients of variation of the systolic blood pressure by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (mm. Hg.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	153·1 ± 2·15	157·7 ± 3·24	17·9	27·1	11·7	17·2
65 - 69	82	57	155·1 ± 2·50	163·9 ± 2·79	22·6	21·1	14·5	12·9
70 - 74	101	71	163·1 ± 2·11	169·8 ± 2·27	21·2	19·1	13·0	11·3
75 - 79	82	46	167·4 ± 2·38	177·0 ± 3·35	21·6	22·7	12·9	12·8
80 - 84	55	37	169·8 ± 2·97	183·0 ± 3·34	22·0	20·3	13·0	11·1
85 - 89	11	12	166·4 ± 9·19	179·2 ± 7·39	30·5	25·6	18·3	14·3

Table 17.

Means, standard deviations and coefficients of variation of the grip of left hand by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (lb.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	90·7 ± 1·46	66·9 ± 0·88	12·1	7·4	13·3	11·1
65 - 69	82	57	85·8 ± 1·13	65·7 ± 1·07	10·2	8·1	11·9	12·3
70 - 74	101	71	82·0 ± 1·10	63·0 ± 0·89	11·1	7·5	13·5	11·9
75 - 79	82	46	77·9 ± 1·28	59·3 ± 1·00	11·6	6·8	14·9	11·4
80 - 84	55	37	74·9 ± 1·15	56·3 ± 0·85	8·5	5·2	11·4	9·2
85 - 89	11	12	69·6 ± 2·65	57·7 ± 1·85	8·8	6·4	12·6	11·0

Table 18.

Means, standard deviations and coefficients of variation of the grip of right hand by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (lb.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	93·8 ± 1·43	71·2 ± 0·93	11·9	7·8	12·7	11·0
65 - 69	82	57	89·7 ± 1·19	69·2 ± 1·14	10·8	8·6	12·0	12·5
70 - 74	101	71	87·0 ± 1·15	66·7 ± 0·87	11·6	7·3	13·4	10·9
75 - 79	82	46	81·4 ± 1·11	63·0 ± 0·99	10·1	6·7	12·4	10·7
80 - 84	55	37	78·8 ± 1·27	60·0 ± 0·92	9·4	5·6	12·0	9·3
85 - 89	11	12	69·8 ± 2·56	64·2 ± 2·19	8·5	7·6	12·2	11·8

Table 19.

Means, standard deviations and coefficients of variation of the frontal area of the thorax

by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (sq. cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	651·6 ± 8·2	493·3 ± 8·0	64·9	60·8	10·0	12·3
65 - 69	77	48	623·1 ± 9·6	471·7 ± 8·8	83·9	61·2	13·5	13·0
70 - 74	93	59	625·4 ± 8·1	467·3 ± 8·0	78·4	61·2	12·5	13·1
75 - 79	70	41	604·0 ± 11·8	452·9 ± 8·6	98·7	55·3	16·3	12·2
80 - 84	53	34	603·6 ± 9·8	454·7 ± 11·3	71·4	65·9	11·8	14·5
85 - 89	8	10	595·7 ± 36·2	441·1 ± 13·6	102·3	42·9	17·2	9·7

Table 20.

Means, standard deviations and coefficients of variation of the pulse rate by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (rate per minute)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	74·5 ± 1·38	77·9 ± 1·02	11·5	8·5	15·4	11·0
65 - 69	82	57	73·4 ± 1·00	77·9 ± 1·26	9·1	9·5	12·3	12·1
70 - 74	101	71	71·5 ± 0·99	77·4 ± 1·10	10·0	9·3	14·0	12·0
75 - 79	82	46	70·7 ± 1·03	77·4 ± 1·19	9·3	8·1	13·2	10·5
80 - 84	55	37	73·2 ± 1·19	75·1 ± 1·30	8·8	7·9	12·0	10·6
85 - 89	11	12	71·6 ± 2·50	73·7 ± 1·96	8·3	6·8	11·6	9·3

Table 21.

Means, standard deviations and coefficients of variation of the weight by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (lb.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	139·1 ± 2·43	133·4 ± 1·92	20·2	16·1	14·5	12·1
65 - 69	82	57	141·2 ± 2·58	125·0 ± 2·74	23·4	20·7	16·6	16·5
70 - 74	101	71	139·0 ± 1·98	128·0 ± 2·03	19·9	17·1	14·3	13·4
75 - 79	82	46	137·7 ± 1·94	121·3 ± 2·71	17·6	18·4	12·8	15·2
80 - 84	55	37	137·5 ± 2·99	119·9 ± 3·21	22·2	19·5	16·2	16·3
85 - 89	11	12	135·5 ± 7·02	114·2 ± 7·33	23·3	25·4	17·2	22·2

Table 22.

Means, standard deviations and coefficients of variation of the height of the left dome of diaphragm by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	4·5 ± 0·13	3·4 ± 0·10	1·0	0·8	23·0	24·2
65 - 69	77	48	4·0 ± 0·10	3·4 ± 0·10	0·9	0·7	23·6	21·9
70 - 74	93	59	3·9 ± 0·10	3·1 ± 0·10	1·0	0·8	25·4	26·8
75 - 79	70	41	4·1 ± 0·12	3·2 ± 0·11	1·0	0·7	24·9	21·6
80 - 84	53	34	3·8 ± 0·12	2·8 ± 0·12	0·9	0·7	23·6	26·5
85 - 89	8	10	3·5 ± 0·32	2·6 ± 0·16	0·9	0·5	25·9	19·8

Table 23.

Means, standard deviations and coefficients of variation of the height of the right dome of diaphragm by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (cm.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	5·1 ± 0·14	4·5 ± 0·14	1·1	1·1	22·4	23·9
65 - 69	77	48	5·1 ± 0·14	4·3 ± 0·14	1·2	1·0	24·1	23·5
70 - 74	93	59	4·7 ± 0·13	4·2 ± 0·12	1·3	0.9	28·8	21·4
75 - 79	70	41	4·9 ± 0·18	4·1 ± 0·17	1·5	1·1	31·0	27·5
80 - 84	53	34	5·0 ± 0·16	3·9 ± 0·19	1·2	1·1	24·2	28·1
85 - 89	8	10	4·1 ± 0·64	3·3 ± 0·32	1·8	1·0	43·9	30·5

Table 24.

Means, standard deviations and coefficients of variation of the kyphotic angle by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (degrees)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	62	58	38·5 ± 0·91	44·6 ± 1·68	7·2	12·8	18·6	28·7
65 - 69	77	48	45·1 ± 1·69	53·6 ± 1·70	14·8	11·8	32·9	21·9
70 - 74	93	59	48·0 ± 1·46	54·5 ± 1·59	14·1	12·2	29·3	22·4
75 - 79	70	41	50·9 ± 2·06	57·2 ± 2·17	17·2	13·9	33·7	24·3
80 - 84	53	34	53·9 ± 2·02	58·1 ± 2·26	14·7	13·2	27·3	22·8
85 - 89	8	10	55·6 ± 6·79	64·3 ± 4·96	19·2	15·7	34·5	24·4

Table 25.

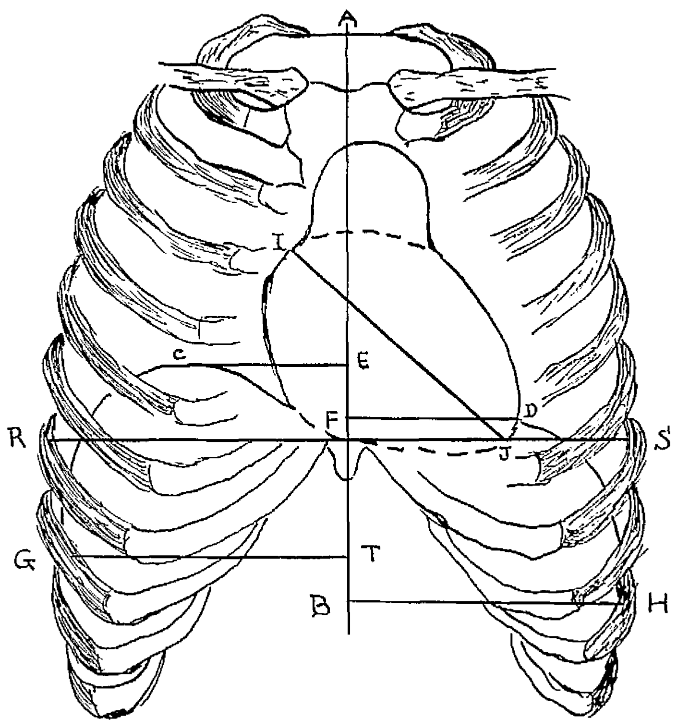
Means, standard deviations and coefficients of variation of the chest expansion by sex and five year age groups.
(healthy non-adipose)

Age group	Number		Mean ± S.E. (in.)		Standard deviation		Coefficient of variation	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	69	70	1·8 ± 0·075	1·4 ± 0·079	0·62	0·66	34·2	45·8
65 - 69	82	57	1·8 ± 0·075	1·5 ± 0·090	0·68	0·59	37·4	40·7
70 - 74	101	71	1·7 ± 0·062	1·2 ± 0·068	0·62	0·57	36·9	45·4
75 - 79	82	46	1·4 ± 0·068	1·2 ± 0·077	0·62	0·52	45·5	42·2
80 - 84	55	37	1·3 ± 0·092	1·2 ± 0.092	0·68	0·56	52·2	48·2
85 - 89	11	12	1·1 ± 0·172	1·2 ± 0·139	0·57	0·48	52·0	40·3

Table 26.

Coefficients of variation for the several variables in approximate order of relative variability for the representative age group 70 to 74 years.

Variable	Coefficient of variation	
	Men	Women
Height	3·4	4·4
Long heart diameter	5·7	6·0
Transverse chest diameter	6·1	6·8
Cardiothoracic ratio	6·6	7·1
Transverse heart diameter	7·3	6·6
Chest girth (maximum inspiration)	7·4	6·9
Mean chest girth	7·9	7·6
Chest girth (maximum expiration)	8·2	8·0
Diastolic blood pressure (I)	9·5	9·0
Haemoglobin	9·2	8·9
Cardiothoracic area ratio	8·1	10·5
Height of left hemithorax	8·9	10·5
Height of right hemithorax	9·3	10·7
Area of cardiac silhouette	10·4	9·7
Diastolic blood pressure (II)	12·5	10·3
Systolic blood pressure	13·0	11·3
Grip - left hand	13·5	11·9
Grip - right hand	13·4	10·9
Frontal area of thorax	12·5	13·1
Pulse rate	14·0	12·0
Weight	14·3	13·4
Height of left dome of diaphragm	25·4	26·8
Height of right dome of diaphragm	28·8	21·4
Kyphotic angle	29·3	22·4
Chest expansion	36·9	45·4



AE - Height of right hemithorax.

AF - Height of left hemithorax.

ET - Height of dome of right diaphragm.

FB - Height of dome of left diaphragm.

RS - Maximum transverse diameter of thorax.

IJ - Long diameter of heart.

Figure 1.

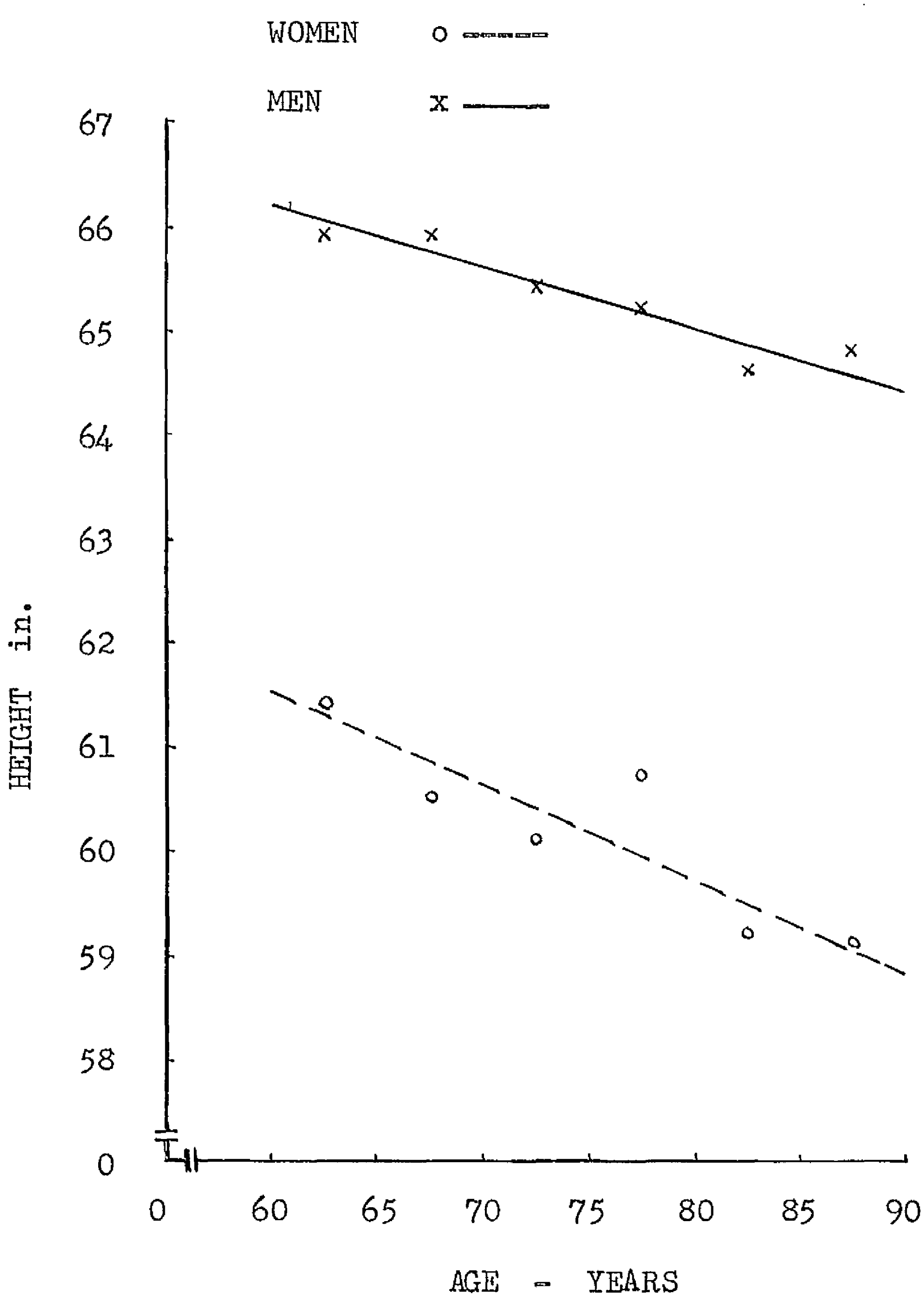


Figure 2. The means of height for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

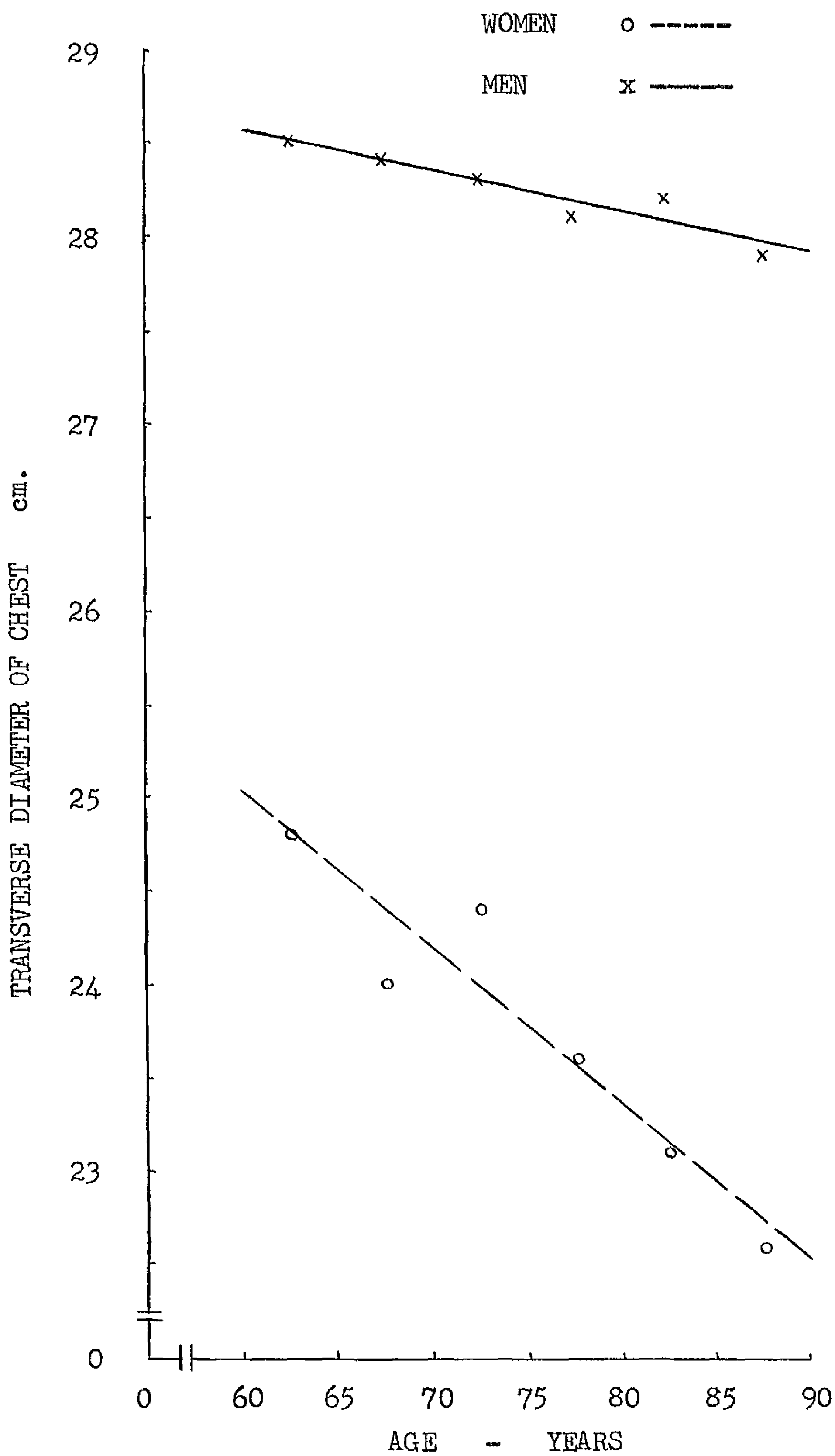


Figure 3. The means of transverse diameter of chest for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

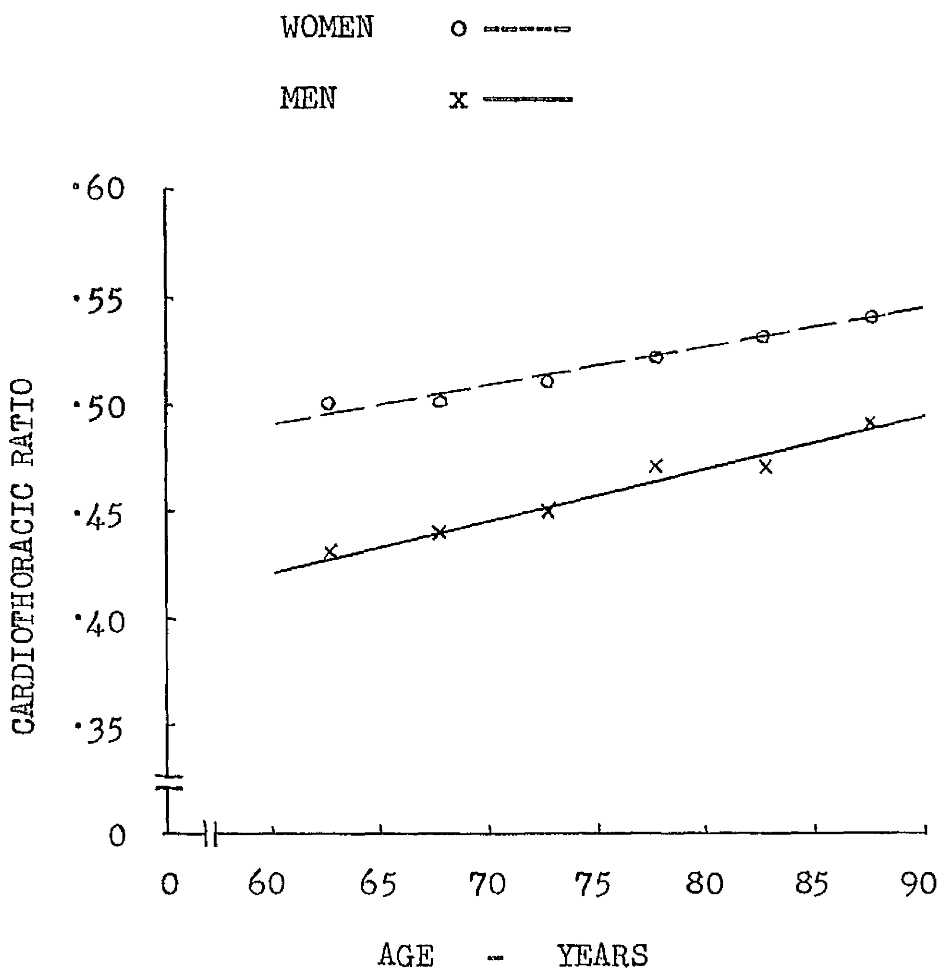


Figure 4. The means of the cardiothoracic ratio for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

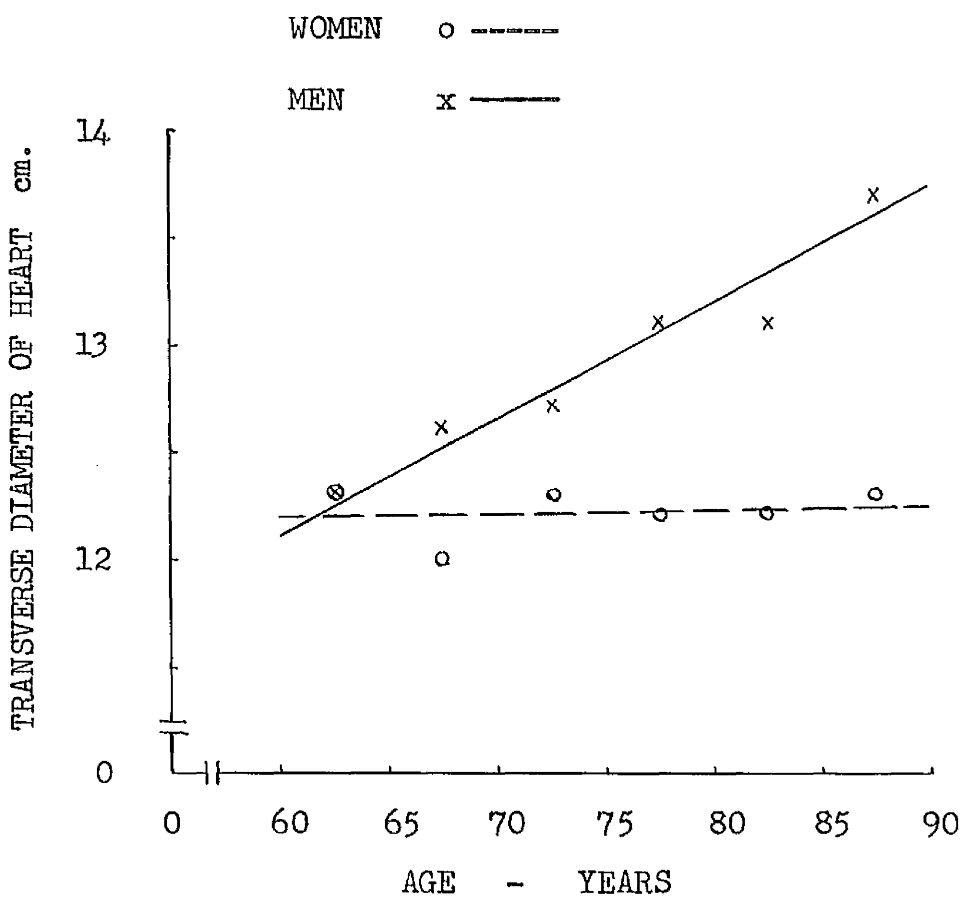


Figure 5. The means of transverse diameter of heart for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

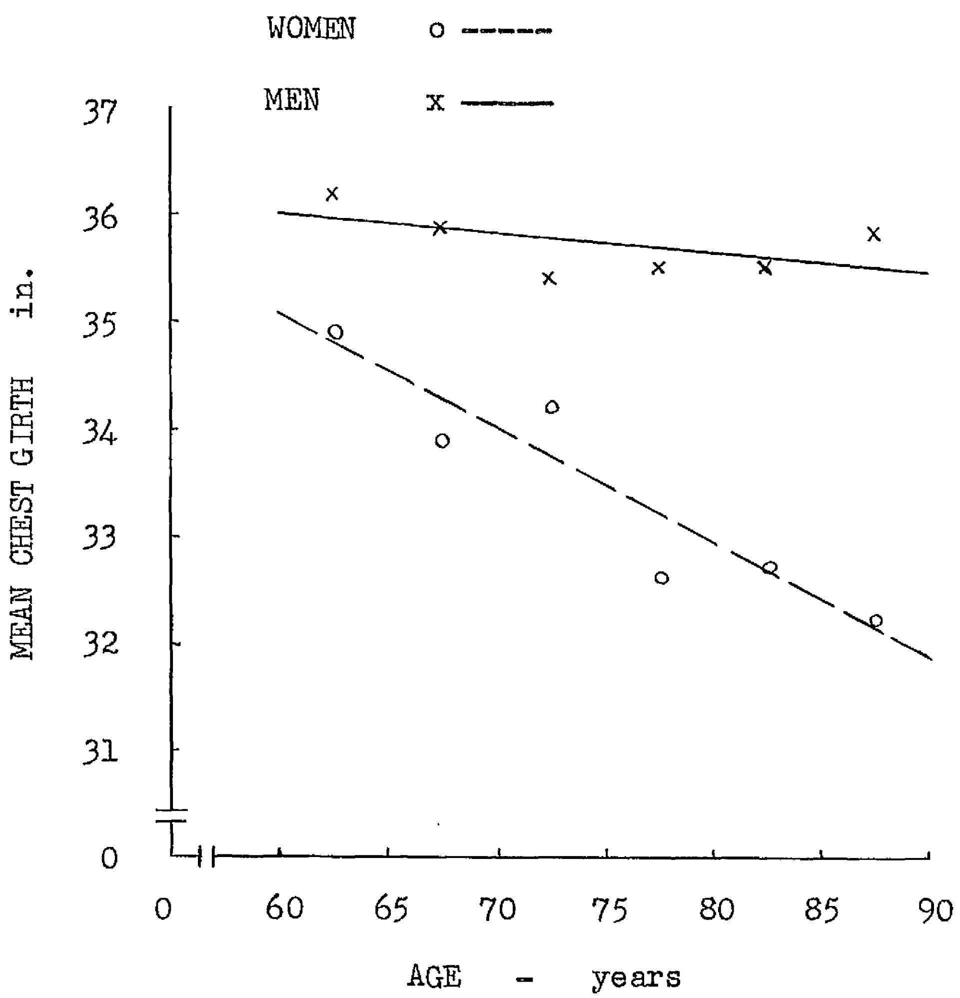


Figure 6. The means of chest girth (mean) for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

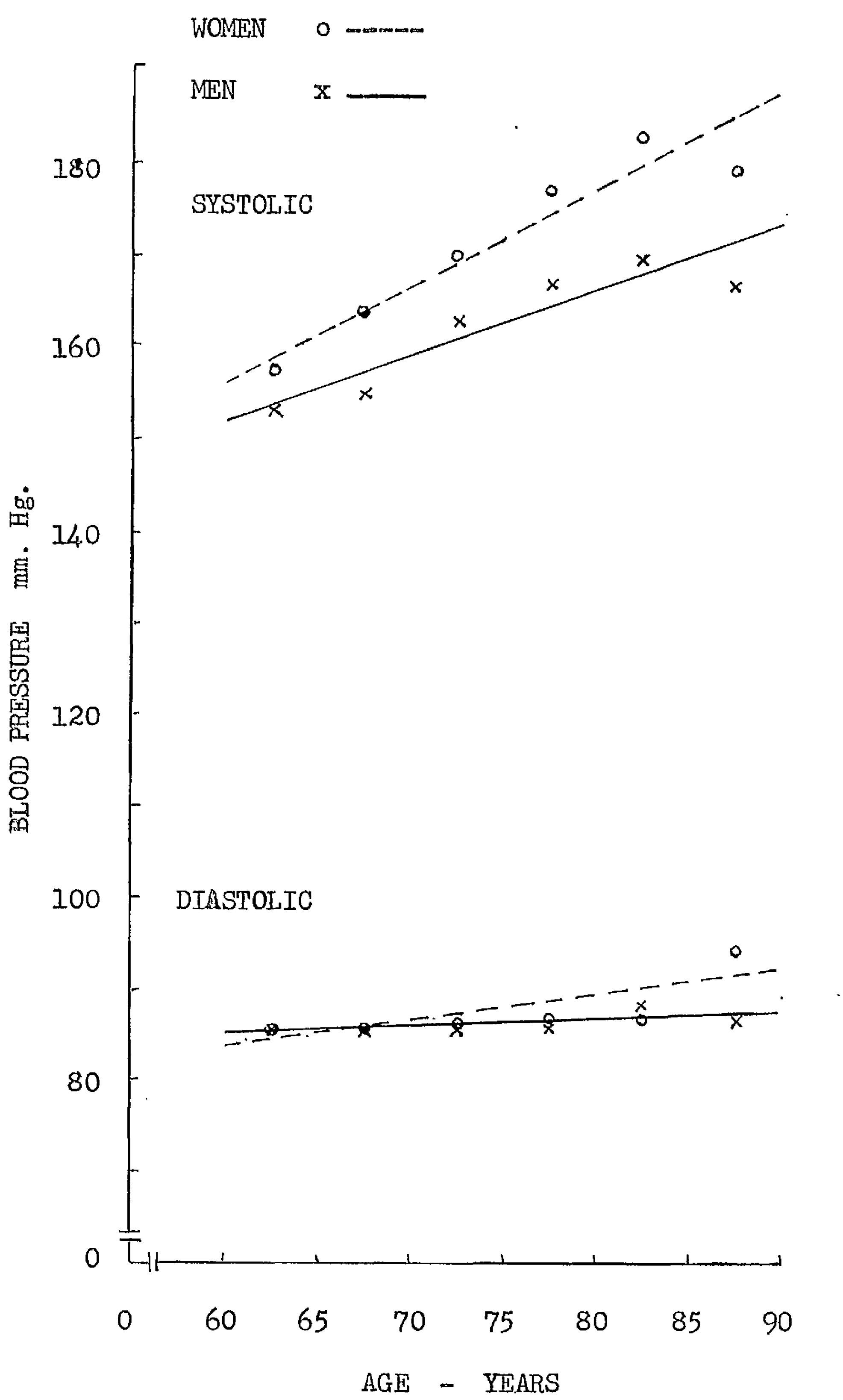


Figure 7. The means of systolic and diastolic blood pressures for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

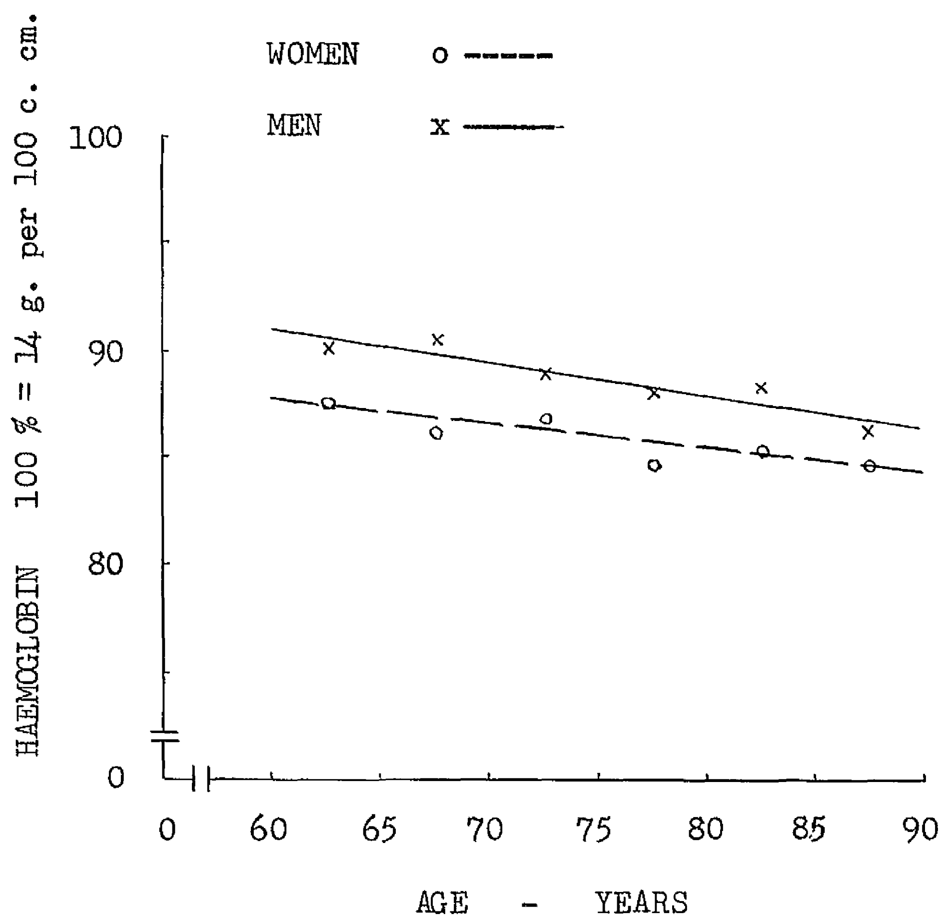


Figure 8. The means of haemoglobin for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

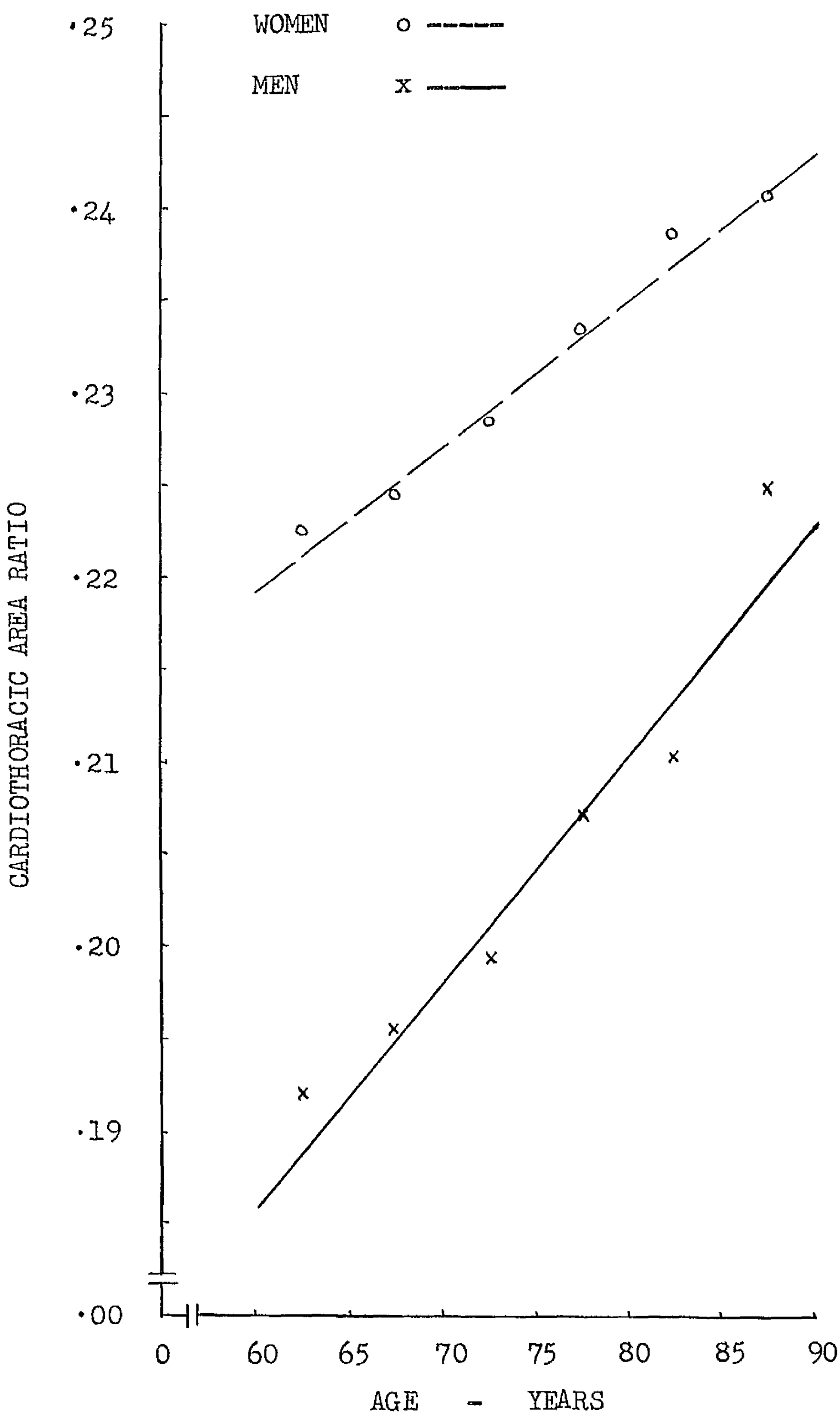


Figure 9. The means of the cardiothoracic area ratio for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

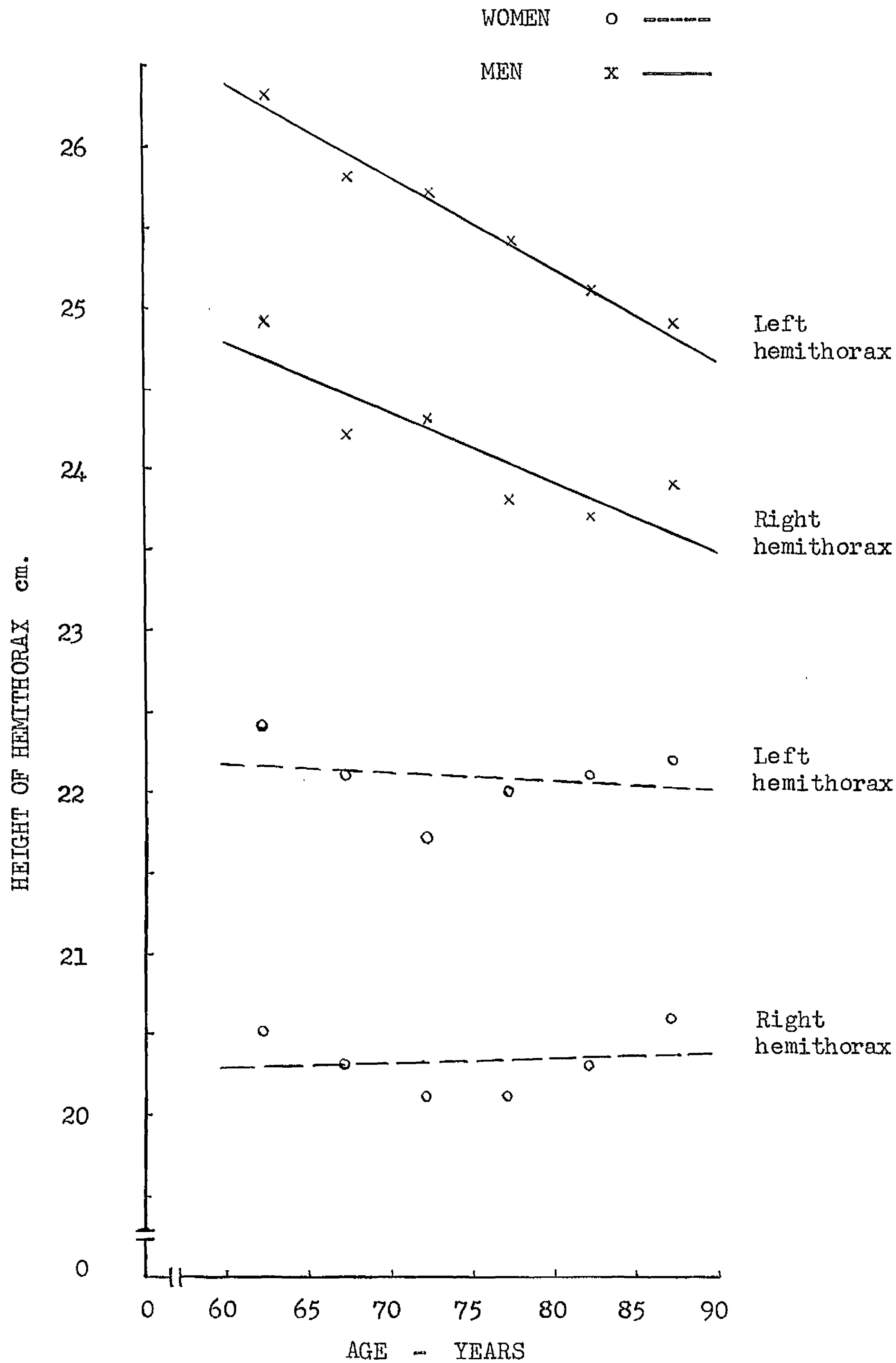


Figure 10. The means of left hemithorax and right hemithorax for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

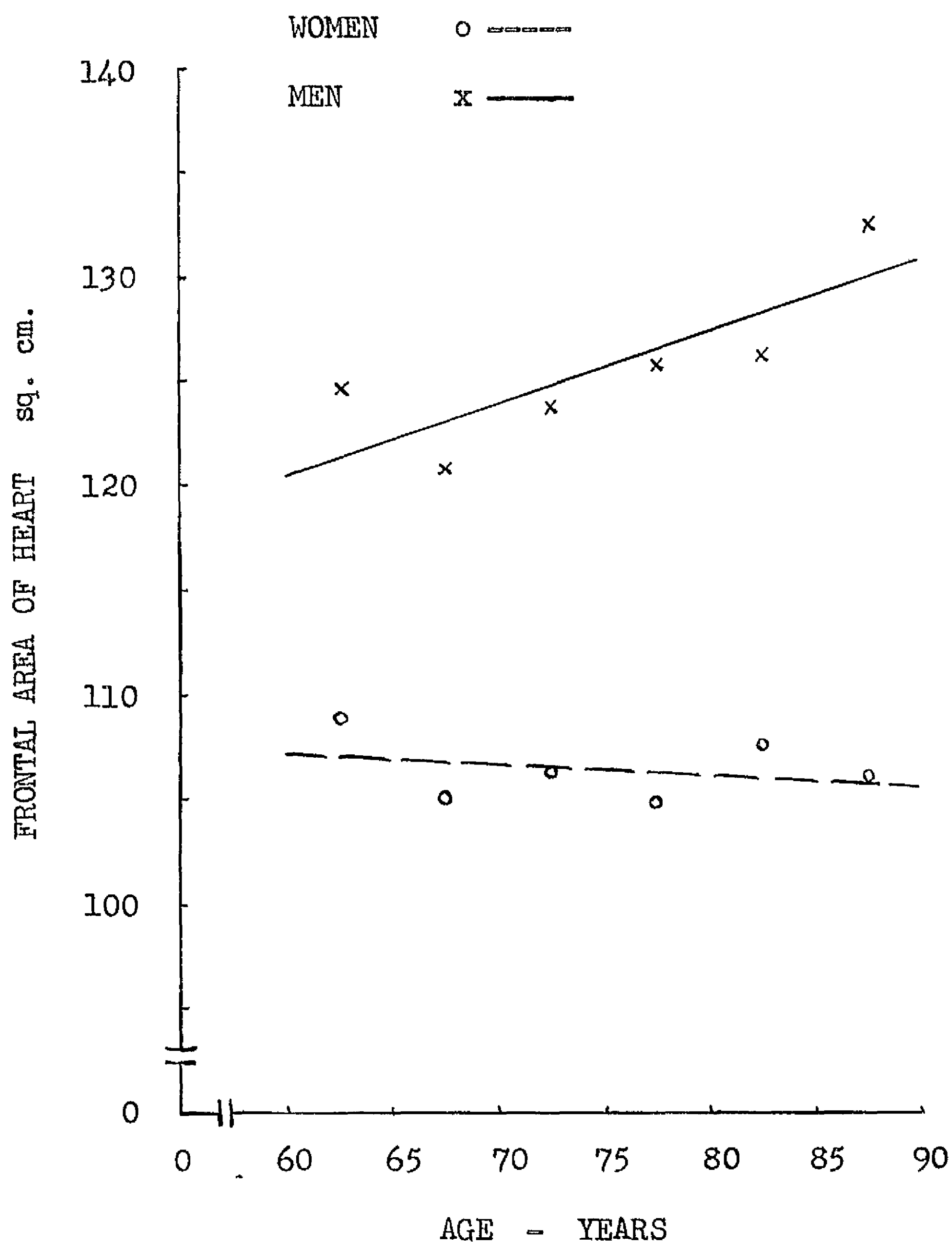


Figure 11. The means of frontal area of heart for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

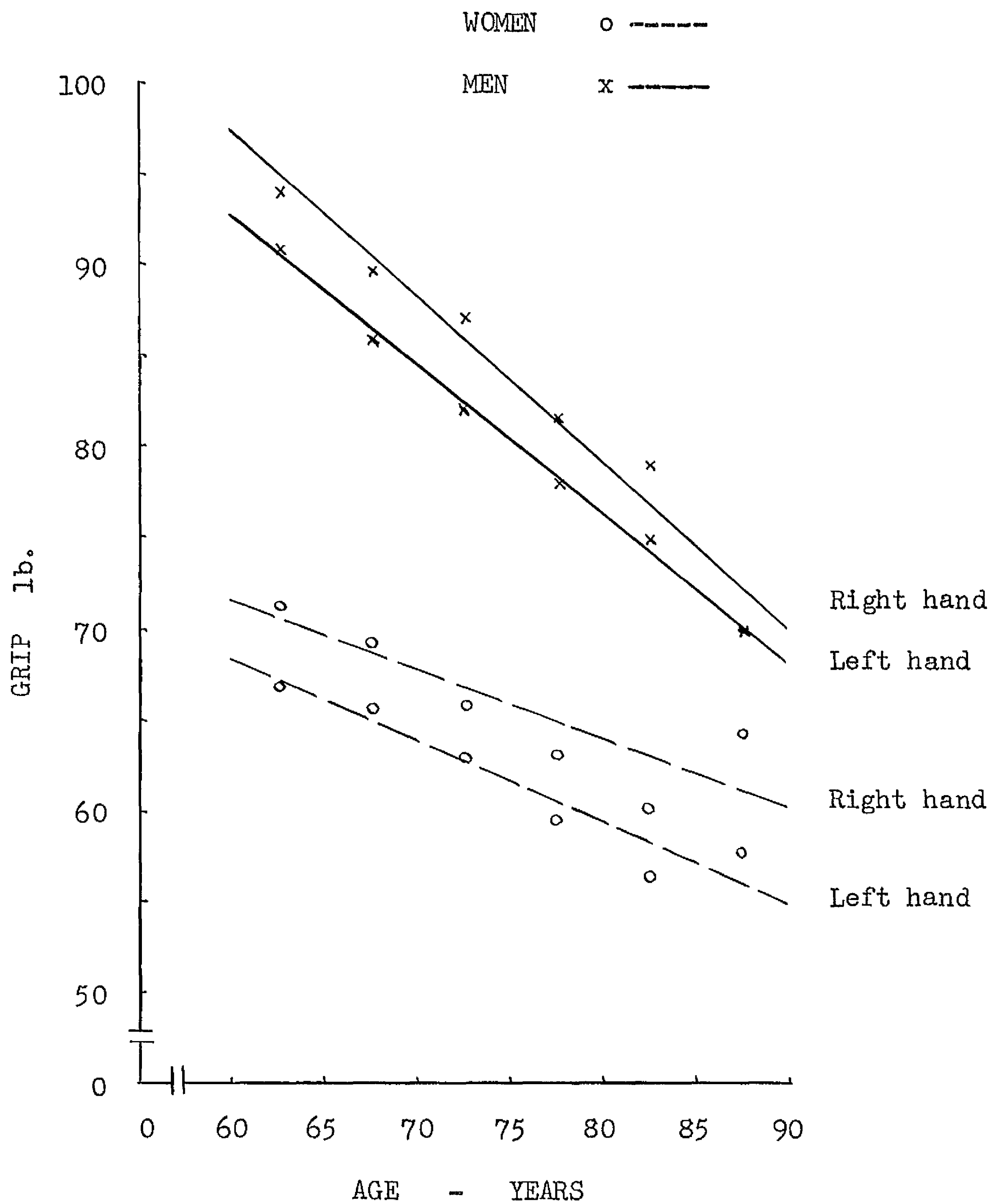


Figure 12. The means of grip of the right and left hands for women (open circles) and men (crosses) for eacg five year age group of the sample together with the fitted regression lines.

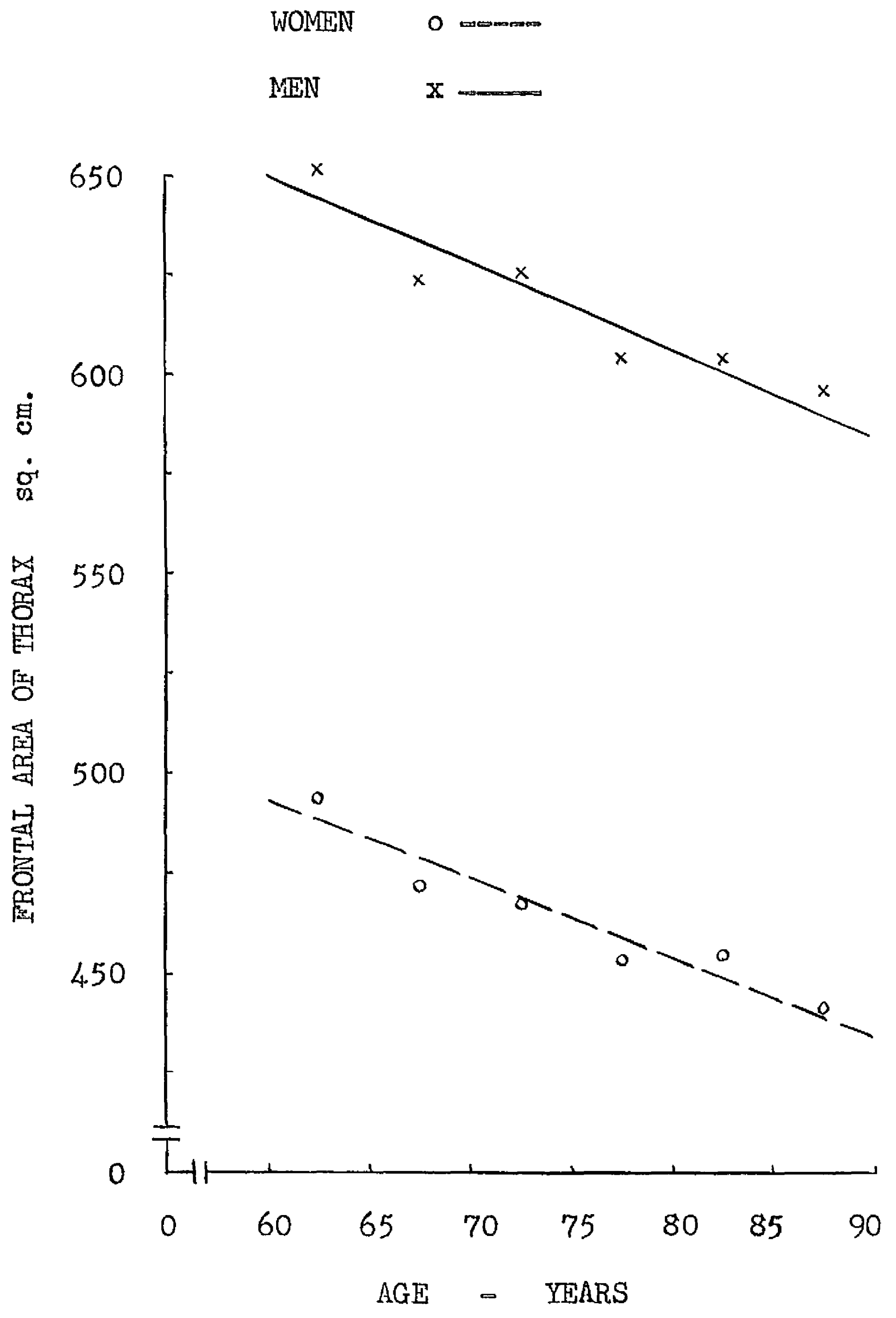


Figure 13. The means of frontal area of thorax for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

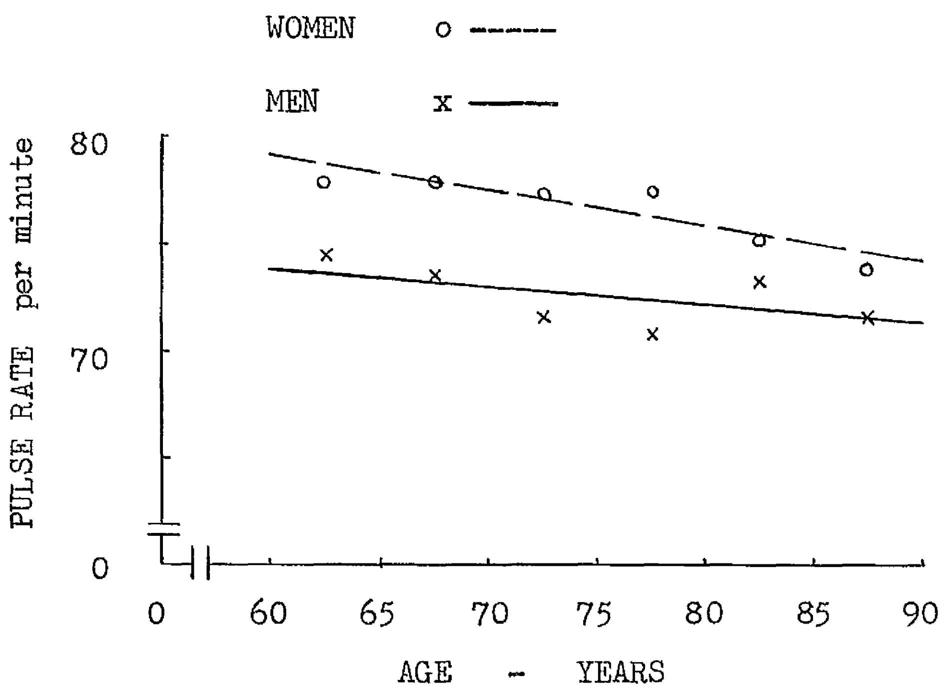


Figure 14. The means of pulse rate for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

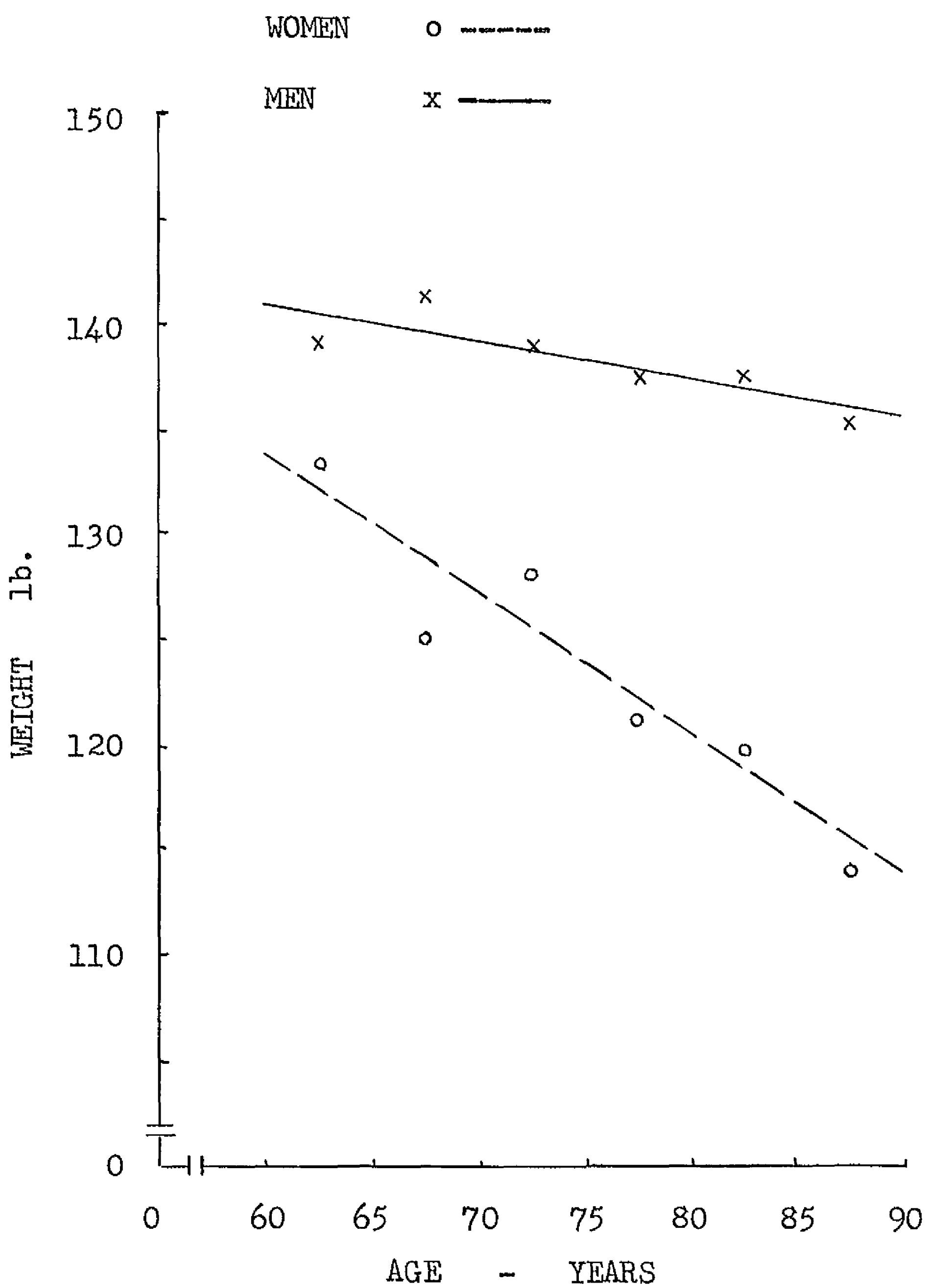


Figure 15. The means of weight for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

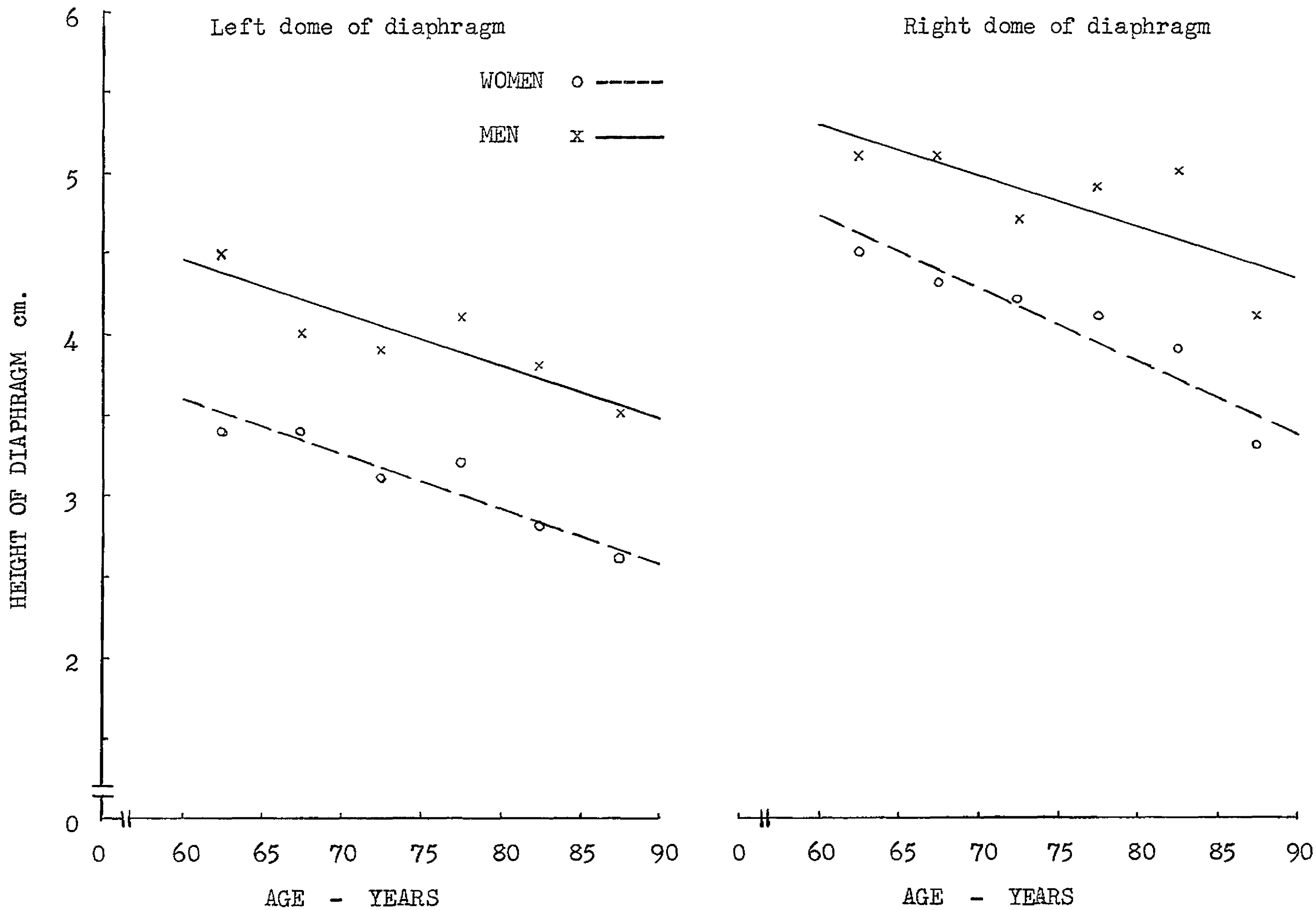


Figure 16. The means of the height of the left and right domes of diaphragm for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

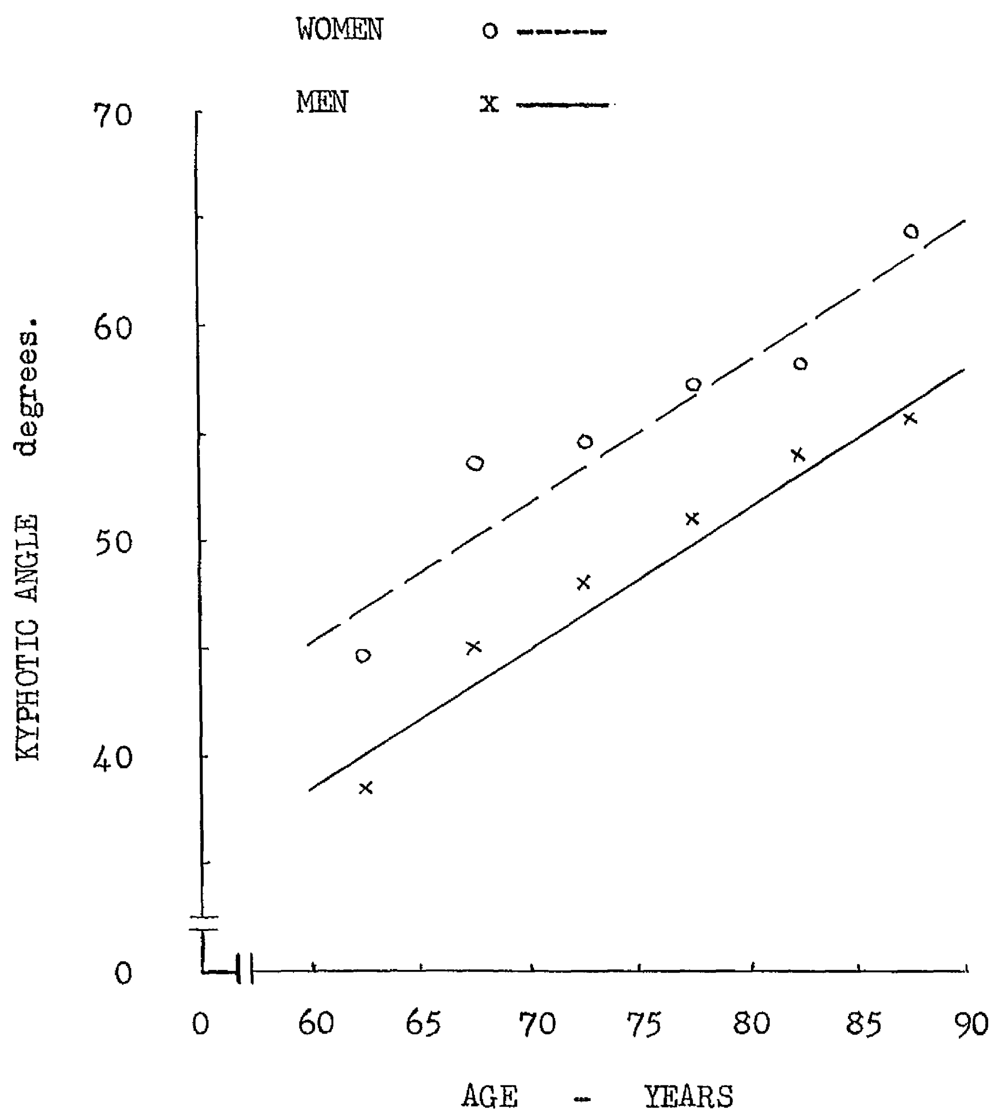


Figure 17. The means of kyphotic angle for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

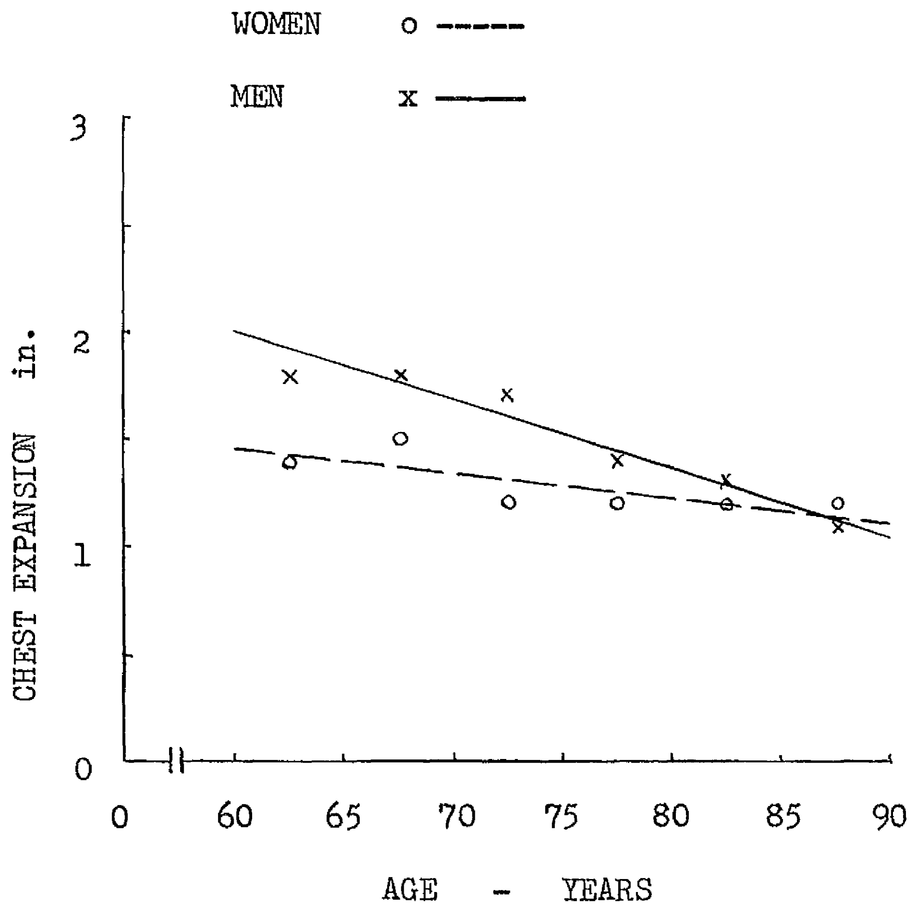


Figure 18. The means of chest expansion for women (open circles) and men (crosses) for each five year age group of the sample together with the fitted regression lines.

The observations of the several variables considered are presented under the following code numbers.

1. Age in completed years.
2. Height (in.).
3. Weight (lb.).
4. Systolic blood pressure (mm. Hg.).
5. Diastolic I blood pressure (mm. Hg.).
6. Diastolic II blood pressure (mm. Hg.).
7. Haemoglobin (100 per cent = 14 g. per 100 c. cm.).
8. Chest girth - inspiration (in.).
9. Chest girth - expiration (in.).
10. Chest expansion (in.).
11. Pulse rate per minute.
12. Grip of left hand (lb.).
13. Grip of right hand (lb.).
14. Transverse diameter of heart (cm.).
15. Transverse diameter of chest (cm.).
16. Cardiothoracic ratio
17. Vertical height of left hemithorax (cm.).
18. Vertical height of right hemithorax (cm.).
19. Vertical height of left dome of diaphragm (cm.).
20. Vertical height of right dome of diaphragm (cm.).
21. Long heart diameter (cm.).
22. Area of frontal cardiac silhouette (sq. cm.).

23. Frontal area of thorax (sq. cm.).

24. Cardiothoracic area ratio

25. Kyphotic angle (degrees).

No. Case number.

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
60	66.50	144	162	82	68	91	40.00	37.25	2.75	61	98	90	1
64	65.25	140	138	78	70	83	38.75	36.50	2.25	63	84	78	2
61	68.25	137	152	84	72	80	37.00	34.00	3.00	79	114	110	3
60	61.75	119	162	84	80	79	36.50	34.00	2.50	90	84	90	4
63	72.50	190	166	80	70	94	41.00	40.00	1.00	61	108	96	5
64	69.00	157	158	96	86	85	43.75	41.00	2.75	93	104	106	6
60	68.00	128	148	92	86	86	36.50	34.75	1.75	78	98	102	7
63	70.50	133	172	88	80	78	36.50	35.25	1.25	96	88	94	8
64	65.75	130	148	88	70	77	36.25	35.00	1.25	74	86	96	9
63	66.00	130	148	68	60	79	38.25	35.00	3.25	87	102	106	10
63	64.75	152	190	92	88	86	39.00	38.50	0.50	73	74	76	11
60	67.50	113	180	96	78	90	34.00	32.50	1.50	94	86	88	12
62	69.50	161	162	93	80	67	39.75	38.25	1.50	55	70	88	13
64	69.75	134	178	96	82	98	38.75	37.00	1.75	72	84	72	14
60	60.25	115	172	90	82	89	37.75	36.25	1.50	89	94	102	15
63	67.00	154	168	96	92	84	40.25	38.75	1.50	97	94	100	16
60	68.75	121	128	92	84	87	37.00	35.00	2.00	84	86	88	17
60	62.25	153	138	74	62	93	39.25	37.75	2.00	95	94	86	18
62	69.25	166	148	100	92	96	42.00	41.50	0.50	71	86	86	19
60	67.50	123	140	96	92	84	36.50	35.50	1.00	78	92	80	20
63	67.25	123	138	78	58	104	36.00	34.50	1.50	81	84	90	21
64	71.00	169	142	92	88	86	38.00	36.25	1.75	72	102	106	22
62	67.00	163	164	94	82	100	37.75	36.00	1.75	77	88	96	23
61	65.50	124	168	98	94	78	35.00	33.00	2.00	74	66	70	24
63	64.50	129	138	74	68	86	36.00	34.50	1.50	65	74	76	25
62	65.50	141	150	80	66	88	37.25	35.75	1.50	56	106	114	26
62	68.25	143	190	84	80	93	37.75	35.75	2.00	71	82	84	27
63	69.75	117	164	92	86	84	33.75	31.75	2.00	75	84	104	28
60	64.25	127	158	86	78	87	34.25	31.50	2.75	79	100	106	29
62	64.00	128	128	80	74	84	37.00	35.75	1.25	71	86	90	30
61	69.00	159	162	92	86	80	39.25	37.00	2.25	79	92	100	31
64	64.50	133	154	88	80	87	38.00	36.50	1.50	63	76	78	32
64	66.50	131	184	96	92	82	36.50	34.00	2.50	64	94	98	33
63	66.50	130	138	78	68	93	38.00	35.50	2.50	69	84	96	34
61	69.75	113	140	82	78	80	34.50	33.25	1.25	98	80	92	35
61	67.50	150	112	68	56	92	37.75	36.50	1.25	62	104	100	36
63	72.50	141	142	88	74	89	35.25	32.75	2.50	63	110	104	37
60	65.50	105	124	88	78	90	35.50	33.50	2.00	79	84	80	38
63	66.25	149	182	94	80	98	39.25	37.00	2.25	87	80	94	39
62	68.25	160	122	78	70	84	39.50	37.75	1.75	64	82	76	40
63	69.50	161	189	94	88	102	33.75	32.50	1.25	77	84	94	41
61	68.00	155	166	88	84	96	36.50	35.25	1.25	65	88	94	42

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
60	68.25	155	152	82	70	92	37.25	34.75	2.50	65	112	108	43
64	61.25	119	142	88	80	86	35.75	34.25	1.50	85	94	106	44
62	65.00	162	142	78	68	83	37.50	35.75	1.75	61	78	84	45
64	67.25	170	138	78	70	85	38.00	35.75	2.25	62	98	102	46
64	61.50	103	160	84	74	97	32.50	30.50	2.00	70	84	90	47
60	64.75	122	124	70	64	84	35.50	33.50	2.00	73	98	104	48
61	68.50	159	142	82	76	96	35.00	32.00	3.00	56	104	116	49
63	63.00	118	154	84	78	105	34.25	32.00	2.25	92	92	90	50
64	63.75	125	170	68	60	80	33.75	32.50	1.25	65	96	108	51
60	65.50	119	152	84	78	102	36.00	34.25	1.75	74	94	92	52
64	62.00	111	150	70	66	105	35.25	32.75	2.50	83	74	80	53
61	62.75	141	150	84	80	98	35.25	33.00	2.25	88	100	104	54
60	61.75	121	190	94	88	75	34.25	32.50	1.75	72	90	94	55
63	67.50	142	164	86	82	101	37.75	36.25	1.50	87	98	90	56
63	62.00	113	168	88	82	80	35.00	34.50	0.50	83	72	70	57
60	68.50	147	138	80	64	95	39.25	37.75	1.50	64	100	102	58
62	65.50	152	148	88	76	95	36.75	35.00	1.75	70	80	74	59
64	60.75	113	158	86	78	89	33.00	31.25	1.75	80	64	72	60
61	63.75	130	162	92	78	88	34.75	33.50	1.25	71	80	92	61
60	71.00	156	140	88	76	91	37.75	35.25	2.50	71	114	112	62
61	64.75	126	142	86	84	108	35.00	32.50	2.50	73	92	90	63
60	69.75	148	128	84	76	103	35.75	34.25	1.50	69	94	102	64
60	69.25	188	188	100	94	103	43.75	42.00	1.75	67	104	104	65
62	67.00	146	158	94	88	99	36.75	34.50	2.25	59	106	106	66
60	58.25	123	132	78	60	105	37.00	35.25	1.75	51	68	92	67
64	64.25	137	130	84	72	90	39.50	38.50	1.00	75	84	86	68
60	68.00	193	144	88	76	84	45.50	45.00	0.50	83	118	120	69
65	72.25	101	124	86	78	91	40.25	37.00	3.25	73	110	118	70
69	61.25	126	162	86	74	82	36.75	35.75	1.00	76	76	80	71
65	66.50	153	148	88	70	92	41.75	40.00	1.75	70	86	82	72
67	67.25	144	154	88	74	67	38.00	37.25	0.75	77	94	96	73
65	66.25	180	162	88	66	98	43.75	43.25	0.50	87	84	86	74
65	64.50	120	122	80	68	80	36.00	35.50	0.50	72	80	86	75
65	67.00	149	118	78	72	85	40.00	38.00	2.00	91	92	98	76
65	64.00	113	146	76	68	78	32.25	31.50	0.75	83	70	72	77
67	65.50	133	142	84	78	85	37.75	35.00	2.75	59	82	98	78
66	69.75	160	142	80	76	98	42.25	40.75	1.50	64	92	104	79
67	69.00	150	140	82	74	77	38.50	36.25	2.25	79	78	72	80
67	65.25	162	172	98	90	84	38.75	38.00	0.75	65	82	88	81
69	65.25	170	160	88	68	92	42.75	42.25	0.50	67	98	100	82
68	67.00	143	208	92	78	93	36.75	35.50	1.25	65	84	86	83

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
67	69.25	133	164	82	0	102	36.75	34.50	2.25	83	84	94	84
67	61.25	104	176	82	60	94	35.00	33.25	1.75	81	83	90	85
65	67.00	147	146	84	80	85	35.00	33.00	2.00	71	84	86	86
67	70.00	161	198	94	90	79	36.50	34.75	1.75	69	92	92	87
67	64.25	124	122	68	64	97	36.00	33.00	3.00	86	90	96	88
67	64.50	132	178	94	88	90	34.25	31.75	2.50	74	102	110	89
66	64.50	133	182	88	0	88	36.50	34.75	1.75	70	84	90	90
69	64.50	114	168	74	66	93	33.75	31.75	2.00	81	60	62	91
69	67.00	160	156	100	94	90	38.00	36.50	1.50	75	106	104	92
67	66.25	129	112	76	70	97	36.25	33.25	3.00	78	78	82	93
67	67.50	160	168	78	72	80	38.75	37.00	1.75	72	86	88	94
66	66.50	150	142	86	74	95	38.25	37.00	1.25	68	74	78	95
66	69.00	152	140	74	70	85	38.50	35.50	3.00	73	94	104	96
69	69.00	119	196	98	66	92	32.25	30.50	1.74	82	68	76	97
69	64.25	105	158	94	84	88	32.50	30.75	1.75	81	92	86	98
68	65.75	112	144	78	62	89	34.50	31.75	2.75	60	82	86	99
66	65.00	160	172	86	66	86	40.50	39.25	1.25	75	82	88	100
67	62.25	114	138	84	78	94	38.75	35.50	3.75	59	86	98	101
65	66.25	140	126	90	84	98	38.00	36.25	1.75	71	76	72	102
65	98.25	162	122	80	76	91	40.50	38.75	1.75	72	82	80	103
66	64.75	123	123	86	74	81	38.25	36.00	2.25	57	86	94	104
65	61.75	116	206	94	80	92	35.50	33.75	1.75	71	82	88	105
67	68.00	184	150	78	74	86	42.50	41.25	1.25	79	86	104	106
68	61.75	115	142	82	72	94	32.75	31.25	1.50	76	84	88	107
69	65.25	148	192	96	88	95	37.75	36.50	1.25	79	88	102	108
65	65.25	106	128	78	72	80	35.00	32.50	2.50	93	78	86	109
68	71.25	171	148	84	76	85	41.50	39.75	1.75	84	82	88	110
67	63.25	117	154	76	64	86	34.25	32.75	1.50	71	100	102	111
66	65.50	144	130	76	60	87	39.00	38.00	1.00	89	92	96	112
68	66.00	101	164	96	92	80	30.50	28.00	2.50	88	92	86	113
65	62.75	128	180	80	74	95	36.50	34.25	2.25	53	74	80	114
66	68.75	152	104	94	86	100	38.00	35.00	3.00	73	88	94	115
68	67.50	163	126	84	82	105	39.25	37.50	1.75	68	80	86	116
67	62.75	104	162	95	84	93	31.75	29.50	2.25	72	74	98	117
69	67.25	136	138	78	72	84	35.00	33.25	1.75	81	88	92	118
65	65.00	158	156	96	90	91	37.00	34.50	2.50	53	96	104	119
65	65.25	153	156	88	84	90	37.75	36.50	1.25	64	64	70	120
68	66.00	165	198	98	88	95	37.25	35.50	1.75	69	104	108	121
67	69.50	145	170	90	86	94	35.75	33.00	2.75	82	92	102	122
67	62.50	109	126	76	62	98	33.50	30.25	3.25	60	80	82	123
68	69.00	155	152	84	76	98	37.50	36.00	1.50	77	84	80	124

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
65	66.25	193	198	86	74	85	35.75	34.75	1.00	84	70	74	125
66	62.00	113	172	88	80	82	33.00	30.25	2.75	65	92	100	126
67	64.50	126	132	80	68	85	34.75	33.25	1.50	68	74	76	127
68	70.00	173	142	92	64	76	38.00	36.50	1.50	79	98	92	128
67	62.50	110	164	88	82	90	33.75	31.50	2.25	63	84	86	129
67	64.50	102	192	68	96	85	29.50	28.25	1.25	72	72	74	130
69	65.25	150	146	90	84	95	36.75	35.50	1.25	85	80	84	131
67	66.75	151	160	94	88	100	36.75	35.00	1.75	65	82	94	132
68	66.00	139	166	94	86	98	37.50	35.00	2.50	66	84	90	133
68	67.75	132	138	78	64	109	33.25	31.25	2.00	87	110	110	134
68	66.00	129	144	82	76	95	35.00	33.25	1.75	62	84	94	135
69	70.75	151	174	74	70	100	37.25	34.75	2.50	72	80	84	136
67	67.00	177	142	78	62	92	37.00	35.50	1.50	72	98	100	137
67	66.50	127	152	88	80	85	32.50	31.00	1.50	83	74	78	138
69	64.25	130	130	82	74	82	35.75	34.00	1.75	64	74	76	139
65	69.25	133	184	92	78	72	36.75	36.25	0.50	61	74	80	140
68	68.25	159	208	98	92	87	36.00	35.25	0.75	77	94	104	141
68	69.75	201	174	86	70	88	39.00	37.75	1.25	66	96	108	142
68	69.50	157	126	88	80	78	39.50	37.25	2.25	65	92	94	143
66	63.75	157	170	84	74	99	38.75	36.75	2.00	53	90	82	144
67	66.50	139	174	92	76	100	35.00	33.00	2.00	62	84	78	145
69	69.50	186	152	90	86	107	41.00	38.75	2.25	65	110	98	146
66	66.75	163	156	86	82	97	39.00	37.25	1.75	67	76	88	147
65	64.75	126	148	86	82	91	35.25	34.00	1.25	83	84	102	148
67	68.25	134	182	98	94	97	35.50	33.50	2.00	81	98	86	149
69	71.75	184	154	96	84	109	43.75	41.50	2.25	75	92	88	150
66	62.50	104	150	80	74	101	32.25	30.00	2.25	67	90	84	151
71	66.25	161	176	90	82	85	36.75	34.00	2.75	78	68	74	152
70	62.50	130	142	84	78	100	35.25	33.00	2.25	67	88	88	153
70	61.50	111	180	84	76	81	33.00	31.00	2.00	74	64	70	154
72	63.25	145	170	90	82	103	36.50	34.25	2.25	57	76	90	155
71	67.50	137	160	72	62	90	35.00	33.25	1.75	64	64	74	156
70	60.25	104	206	98	94	89	30.25	29.00	1.25	61	78	80	157
72	64.50	195	204	104	96	94	35.50	33.75	1.75	72	80	92	158
70	69.00	128	182	96	84	80	34.75	31.75	3.00	85	92	94	159
70	68.00	158	162	98	86	85	37.50	35.50	2.00	60	76	86	160
70	69.50	144	136	88	86	94	35.25	32.00	3.25	76	86	88	161
72	69.25	152	194	96	84	92	36.25	34.00	2.25	65	96	98	162
70	64.50	131	160	86	76	86	36.50	34.25	2.25	52	80	86	163
70	67.25	132	134	72	70	79	33.50	32.00	1.50	73	84	90	164
71	66.00	143	198	72	68	100	35.25	32.75	2.50	77	88	90	165
72	62.50	112	198	74	68	82	34.25	33.00	1.25	72	72	78	166

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
70	66.25	158	162	98	94	82	37.00	35.25	1.75	74	94	102	167
70	67.00	161	168	98	84	88	36.75	36.75	2.50	83	86	94	168
70	63.75	114	192	82	74	81	34.25	32.50	1.75	57	60	68	169
72	62.50	147	198	94	88	90	36.00	35.00	1.00	79	70	84	170
72	66.00	151	144	88	82	89	35.50	34.00	1.50	76	90	86	171
74	66.25	138	150	84	78	83	35.00	33.75	1.25	71	84	94	172
74	61.25	139	154	90	78	76	33.50	32.50	1.00	85	86	98	173
72	66.50	146	168	82	74	85	36.25	34.25	2.00	68	94	102	174
74	65.25	128	156	70	0	100	33.25	31.50	1.75	67	76	80	175
72	66.25	115	164	88	86	96	29.75	28.00	1.75	93	66	84	176
74	65.00	111	168	82	74	88	33.00	31.00	2.00	55	84	86	177
72	65.50	148	128	72	64	90	35.00	34.25	0.75	70	82	76	178
72	66.50	122	202	86	76	80	34.25	32.50	1.75	74	70	70	179
72	66.75	124	162	78	0	106	33.25	31.00	2.25	80	84	88	180
70	63.00	111	204	96	92	94	33.25	31.50	1.75	83	76	80	181
74	63.25	139	180	96	84	80	34.75	33.00	1.75	57	74	76	182
74	66.60	133	164	82	78	91	33.50	32.25	1.25	52	78	82	183
70	64.25	141	158	92	80	85	34.25	32.75	1.50	63	80	86	184
70	66.00	155	180	94	90	90	35.50	33.75	1.75	72	80	88	185
74	62.50	130	160	78	72	104	35.00	33.75	1.25	62	72	74	186
71	64.00	107	158	98	82	83	34.00	31.25	2.75	79	78	86	187
73	66.50	169	186	100	98	88	38.75	36.50	2.25	74	88	98	188
71	66.50	136	168	98	90	93	34.75	33.50	1.25	73	64	68	189
73	62.75	116	162	84	76	85	33.25	31.00	2.25	75	86	100	190
72	65.50	147	194	80	72	83	36.00	34.00	2.00	56	92	100	191
71	65.00	166	138	80	72	92	43.25	41.75	1.50	85	82	94	192
71	68.25	110	186	86	74	89	32.75	31.00	1.75	64	76	80	193
70	66.00	166	168	88	80	113	40.00	38.50	1.50	77	86	94	194
70	65.75	144	148	90	88	102	37.25	36.00	1.25	61	74	74	195
72	65.75	131	118	74	64	83	37.00	34.75	2.25	70	88	86	196
73	70.25	192	166	92	86	93	41.25	40.50	0.75	67	98	94	197
71	63.25	128	136	80	72	109	36.75	34.75	2.00	75	84	82	198
73	63.00	127	184	88	72	103	35.75	35.25	0.50	70	80	84	199
73	67.25	167	162	92	86	99	40.25	39.00	1.25	65	98	104	200
71	62.75	111	108	72	58	103	35.00	33.50	1.50	79	74	76	201
70	65.75	121	164	86	82	104	35.00	32.75	2.25	67	86	78	202
72	67.75	133	158	84	76	93	35.00	33.75	1.25	79	94	86	203
73	64.50	111	162	94	88	93	33.50	32.25	1.25	87	86	82	204
74	68.50	162	204	96	88	90	38.00	35.50	2.50	80	104	100	205
72	70.00	169	178	86	80	86	40.75	38.25	2.50	83	98	108	206
72	64.00	142	148	84	74	97	36.00	33.75	2.25	67	92	98	207

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
74	65.25	143	190	78	60	71	38.75	36.75	2.00	51	82	94	208
72	62.75	111	138	80	76	90	35.75	33.25	2.50	64	88	84	209
72	67.00	152	148	80	0	89	38.75	38.00	0.75	74	70	74	210
70	68.75	198	164	92	90	94	45.00	42.25	2.75	89	84	98	211
71	62.00	145	156	84	72	89	39.75	39.25	0.50	65	76	82	212
72	67.75	140	138	72	0	84	35.00	33.25	1.75	85	100	106	213
70	65.00	151	140	82	72	82	40.00	37.75	2.25	89	80	82	214
71	64.75	132	148	78	62	75	37.50	36.25	1.25	58	84	86	215
71	68.50	147	136	76	68	87	38.00	36.75	1.25	79	82	88	216
74	64.75	137	172	96	54	98	37.50	34.50	3.00	73	80	94	217
71	63.00	92	164	68	62	85	32.00	30.50	1.50	85	66	72	218
73	67.50	151	190	88	86	100	38.50	37.50	1.00	83	80	84	219
73	68.75	154	168	86	60	88	39.75	38.50	1.25	59	84	86	220
70	62.00	118	192	76	0	80	34.50	32.00	2.50	83	66	68	221
70	67.50	107	166	94	90	64	34.25	32.00	2.25	68	76	78	222
72	67.25	159	180	96	92	89	37.00	35.25	1.75	84	84	94	223
71	64.00	150	174	86	80	90	37.25	36.00	1.25	67	74	80	224
70	64.00	123	156	88	80	82	34.25	31.75	1.50	66	98	100	225
72	65.50	170	168	88	84	78	37.50	35.75	1.75	76	90	98	226
73	67.25	161	176	104	100	79	38.00	36.50	1.50	53	74	76	227
70	65.00	116	146	78	60	81	32.50	30.25	2.25	81	74	76	228
73	63.25	134	140	88	78	94	34.25	32.75	1.50	76	94	58	229
74	63.00	119	198	84	60	85	33.00	31.50	1.50	72	70	74	230
72	61.25	133	138	78	70	97	34.25	33.25	1.00	79	66	70	231
74	65.50	140	184	84	76	80	37.00	36.00	1.00	71	62	68	232
71	63.00	137	142	62	70	82	35.75	34.50	1.25	75	68	82	233
74	62.25	131	144	80	72	86	35.00	33.25	1.75	64	84	96	234
74	70.25	147	150	80	74	79	37.00	34.00	3.00	56	108	110	235
73	64.75	125	192	80	74	83	35.75	34.50	1.25	53	86	82	236
73	65.25	165	198	94	86	100	42.50	41.25	1.25	91	74	78	237
72	63.00	131	168	86	74	87	34.75	33.25	1.50	73	104	110	238
71	65.75	170	142	84	76	93	41.00	40.50	0.50	63	90	92	239
71	64.25	170	172	86	76	88	41.00	40.75	0.25	74	86	98	240
70	67.00	129	134	86	80	77	35.75	33.75	2.00	59	94	108	241
70	64.25	127	152	80	74	76	37.50	36.50	1.00	57	70	68	242
73	64.00	149	168	98	88	90	38.50	37.00	1.50	85	82	86	243
70	66.75	119	156	92	84	78	33.25	31.50	1.75	69	68	82	244
74	69.50	152	172	80	66	88	38.75	37.00	1.75	61	84	86	245
70	62.75	124	140	85	80	81	36.25	35.50	0.75	79	80	72	246
72	66.25	192	130	72	62	93	38.50	38.00	0.50	69	112	120	247
70	67.50	137	158	92	0	84	35.00	34.00	1.00	72	80	82	248
72	68.25	164	154	78	72	92	39.50	37.50	2.00	85	94	96	249
74	65.50	198	166	86	76	82	39.75	38.25	1.50	61	86	72	250

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
73	68.50	167	160	78	72	95	38.50	36.75	1.75	71	104	114	251
72	65.25	130	192	92	86	98	33.00	32.00	1.00	76	98	96	252
75	66.00	162	288	90	82	86	40.50	40.00	0.50	61	88	92	253
75	64.75	132	148	96	90	89	37.25	36.75	0.50	61	82	82	254
75	71.00	123	128	82	70	89	34.50	32.00	2.50	67	120	102	255
79	61.25	133	156	76	48	84	39.25	38.00	1.25	65	86	88	256
75	62.00	122	152	74	62	75	37.75	36.25	1.50	68	82	84	257
75	59.75	120	216	98	0	90	36.50	36.25	0.25	65	80	78	258
75	66.75	165	154	86	78	88	38.25	37.75	1.50	81	78	100	259
78	65.00	140	178	96	84	92	37.25	36.50	0.75	79	68	74	260
77	61.75	144	246	68	0	95	38.50	37.75	0.75	62	78	74	261
76	62.00	107	158	76	72	85	34.25	33.50	0.75	85	76	86	262
76	69.25	142	152	90	84	93	39.50	38.75	0.75	75	78	88	263
77	62.75	161	154	84	78	96	40.50	40.50	0	60	62	62	264
76	65.25	133	142	82	64	86	41.00	39.00	1.00	79	84	86	265
78	69.50	143	142	66	0	87	36.75	35.00	1.75	79	96	92	266
75	69.50	154	152	82	74	99	37.75	36.50	1.25	79	78	78	267
78	65.75	125	192	76	64	73	36.50	35.75	0.75	83	64	78	268
78	65.25	108	166	102	96	80	32.00	29.75	2.25	73	70	78	269
76	61.50	150	152	82	74	85	36.25	35.25	1.00	70	74	76	270
76	64.25	138	170	86	78	84	35.25	33.25	2.00	67	80	84	271
75	67.00	168	176	92	86	89	37.50	36.00	1.50	58	76	88	272
78	62.00	143	164	104	96	94	38.00	37.00	1.00	74	58	64	273
78	66.00	151	186	94	88	95	36.50	35.25	1.25	81	92	98	274
78	66.50	143	182	88	80	93	34.50	33.50	1.00	67	84	84	275
75	63.50	125	172	74	68	86	39.50	38.25	1.25	53	88	92	276
75	65.50	124	132	92	88	80	35.25	33.25	2.00	78	64	70	277
76	63.75	118	186	70	0	76	34.50	33.50	1.00	72	70	82	278
77	65.75	144	148	76	64	87	37.25	35.75	1.50	63	82	86	279
78	65.75	125	164	82	0	78	36.00	34.75	1.25	58	84	88	280
75	61.75	114	142	76	68	78	33.50	31.50	2.00	67	68	72	281
79	63.00	120	180	98	92	80	35.25	34.50	0.75	69	58	64	282
78	66.00	153	158	86	70	87	39.75	39.00	0.75	69	74	82	283
76	64.25	127	136	82	76	83	38.00	35.75	2.25	73	88	84	284
78	61.75	101	146	84	80	85	31.75	29.50	2.25	61	78	72	285
75	65.50	159	174	74	68	85	37.25	35.50	1.75	60	64	74	286
78	65.50	133	166	86	74	85	35.75	34.00	1.75	73	82	86	287
78	65.25	114	156	82	74	89	32.75	30.50	2.25	65	90	84	288
78	66.00	157	198	100	96	95	37.50	36.50	1.00	57	74	72	289
79	64.75	130	174	88	84	92	37.50	35.00	2.50	56	66	70	290
75	71.50	145	164	82	70	80	37.50	35.25	2.25	68	90	90	291

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
79	65.00	112	170	88	76	89	33.75	33.00	0.75	75	70	84	292
78	68.25	121	128	72	64	82	32.50	31.50	1.00	70	92	96	293
75	66.50	132	144	80	74	78	33.75	33.00	0.75	83	78	86	294
76	67.50	131	160	82	72	90	33.00	31.25	1.75	72	90	88	295
77	63.00	125	204	102	98	77	33.25	31.50	1.75	60	74	72	296
78	66.25	128	194	100	94	95	35.00	34.00	1.00	73	78	84	297
77	66.50	123	162	96	84	90	34.75	33.25	1.50	72	74	74	298
77	67.00	149	184	98	84	91	37.00	35.50	1.50	77	68	74	299
76	58.50	109	204	98	88	85	32.00	31.25	1.75	68	64	80	300
77	64.00	124	170	88	74	75	31.75	30.25	1.50	83	68	76	301
76	64.75	127	154	76	68	105	32.50	31.50	1.00	76	58	62	302
79	68.25	131	216	94	90	87	35.25	33.75	1.50	74	84	84	303
78	66.75	159	198	96	92	99	37.75	36.25	1.50	79	90	92	304
77	62.25	129	196	96	88	100	34.50	32.50	2.00	75	90	82	305
76	66.00	144	174	96	86	80	34.00	32.00	2.00	81	76	80	306
79	64.50	136	196	92	86	103	36.75	34.50	2.25	56	90	86	307
78	63.25	129	168	68	0	79	33.00	30.00	3.00	52	78	80	308
75	66.00	146	148	78	70	100	35.25	34.25	1.00	89	100	94	309
75	66.25	156	160	84	78	95	37.50	36.50	1.00	74	96	94	310
77	67.00	177	160	72	64	93	39.50	38.50	1.00	57	64	84	311
78	64.50	141	208	98	92	83	35.75	34.50	1.25	52	68	74	312
75	67.00	143	146	78	66	85	33.50	32.50	1.00	73	88	90	313
79	69.25	156	206	106	98	80	35.50	33.50	2.00	68	82	88	314
78	65.00	114	172	90	0	100	33.00	30.50	2.50	80	72	84	315
77	67.50	124	146	80	72	95	33.50	32.25	1.25	84	94	92	316
76	63.75	143	162	98	94	88	36.00	35.25	0.75	75	80	86	317
78	62.50	115	198	86	80	80	34.50	33.00	1.50	56	78	76	318
75	66.50	164	170	98	84	95	38.00	36.75	1.25	72	74	84	319
75	68.00	151	182	94	86	77	36.00	34.25	1.75	77	54	62	320
77	64.00	143	166	84	0	89	37.00	36.75	0.25	95	58	66	321
76	64.25	137	172	86	72	96	37.75	36.75	1.00	69	78	80	322
75	68.00	149	192	94	86	87	36.50	35.25	1.25	81	86	92	323
77	64.00	145	146	84	80	85	36.50	34.00	2.50	77	90	94	324
78	69.25	149	168	88	80	91	38.25	36.00	2.25	64	68	74	325
75	68.75	183	192	86	78	97	39.75	39.00	0.75	72	92	100	326
78	61.75	156	156	90	76	105	36.00	35.50	0.50	85	86	80	327
75	65.75	136	162	70	0	76	37.50	36.50	1.00	77	74	72	328
75	62.75	119	176	82	0	97	34.50	33.50	1.[illegible]	70	70	72	329
76	66.50	151	140	68	58	93	37.50	36.50	1.00	69	86	90	330
78	61.75	117	150	72	40	97	35.25	33.25	2.00	62	50	42	331
75	67.75	118	140	82	74	90	34.00	33.25	0.75	65	72	78	332
75	67.75	175	162	96	90	84	44.75	43.50	1.25	69	80	82	333
76	64.00	149	134	82	0	89	39.50	38.50	1.00	87	78	84	334

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
83	66.50	143	148	88	76	81	34.25	34.00	0.25	83	72	76	335
80	65.00	164	154	94	80	93	40.00	38.50	1.50	87	92	94	336
80	64.25	128	186	94	86	85	32.25	31.00	1.25	84	80	84	337
81	67.75	138	172	88	80	89	35.00	33.00	2.00	83	80	86	338
83	65.50	179	188	86	78	98	37.25	36.25	1.00	76	82	90	339
84	60.50	117	166	88	0	93	34.00	31.00	3.00	93	88	84	340
83	63.75	132	168	74	60	77	31.00	30.00	1.00	65	82	68	341
83	67.25	143	164	94	86	89	34.50	34.00	0.50	70	82	86	342
83	57.00	110	194	96	84	83	34.00	32.50	1.50	71	68	64	343
84	61.00	179	190	84	76	105	39.25	38.25	1.00	79	74	78	344
81	66.75	121	186	94	82	90	35.00	32.00	3.00	70	84	88	345
81	63.25	121	208	98	0	84	35.00	33.25	0.75	57	76	76	346
80	65.50	148	170	90	86	85	35.50	33.50	2.00	74	68	78	347
83	59.00	105	176	102	94	87	32.50	31.25	1.25	67	72	76	348
82	64.50	127	202	105	100	96	34.00	32.25	1.75	62	84	100	349
82	67.50	150	162	88	80	74	36.25	34.00	2.25	81	72	80	350
81	67.00	105	208	104	96	83	31.75	30.50	1.25	68	70	76	351
84	65.50	131	192	100	98	102	35.50	33.50	2.00	80	76	80	352
82	65.00	150	210	98	94	88	38.00	37.00	1.00	67	70	74	353
80	68.25	180	152	86	80	80	40.00	38.25	1.75	67	72	84	354
80	63.25	146	180	80	74	88	37.50	36.00	1.50	72	74	78	355
82	68.00	172	192	98	90	85	39.00	37.25	1.75	67	70	78	356
80	69.00	151	138	86	82	82	37.50	35.50	2.00	77	84	96	357
80	62.50	130	192	86	0	75	34.00	33.25	0.75	65	60	66	358
80	69.00	148	146	76	70	88	36.50	33.50	3.00	78	72	78	359
80	65.75	141	180	94	82	67	35.00	33.50	1.50	65	78	92	360
83	65.50	150	152	88	74	92	37.25	36.00	1.25	67	72	74	361
83	61.25	119	194	102	92	100	33.00	32.25	0.75	87	84	96	362
80	66.50	144	172	100	94	88	34.75	33.50	1.25	74	80	82	363
81	63.00	102	138	86	72	84	34.75	33.25	1.25	68	72	78	364
82	64.25	150	154	86	44	89	40.00	39.25	0.75	79	84	90	365
80	63.75	125	142	88	80	94	36.25	34.00	2.25	73	86	88	366
82	63.00	120	166	90	78	84	34.00	33.75	0.25	51	64	72	367
81	61.75	145	192	92	90	80	41.00	40.50	0.50	75	74	65	368
80	64.00	136	174	90	72	97	38.50	37.50	1.00	76	72	80	369
81	64.00	132	178	84	60	85	38.50	36.75	1.50	85	80	82	370
82	66.25	129	208	106	90	94	35.75	35.00	0.75	74	64	72	371
81	65.75	146	158	90	82	84	35.50	34.00	1.50	91	74	82	372
82	65.50	129	188	92	88	100	34.75	32.75	2.00	67	76	78	373
83	68.00	175	142	78	68	92	39.50	39.00	0.50	79	100	100	374
83	62.75	109	186	94	82	95	34.00	31.75	2.25	87	68	74	375
82	65.75	101	172	88	76	75	33.50	32.00	1.50	59	72	74	376

MEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
84	66.00	132	136	76	70	79	34.50	34.00	0.50	74	74	70	377
84	64.00	161	144	72	0	74	42.50	42.00	0.50	71	74	70	378
80	70.25	117	184	68	0	84	35.50	34.50	1.00	65	56	62	379
82	56.25	117	172	72	0	88	34.75	33.00	1.75	61	72	74	380
84	67.00	156	194	88	0	82	40.25	39.00	1.25	69	66	80	381
84	55.75	97	136	74	62	84	33.50	32.00	1.50	70	72	72	382
82	66.75	135	162	84	76	98	35.75	34.50	1.25	70	74	74	383
81	63.50	132	122	66	60	107	36.25	35.50	0.75	61	72	68	384
80	61.75	128	152	92	60	105	37.25	36.75	0.50	71	56	60	385
82	65.00	128	138	72	0	93	36.50	35.25	1.25	77	86	86	386
82	67.00	167	172	78	66	97	36.50	35.75	0.75	70	58	60	387
83	64.25	145	148	88	72	93	38.25	37.50	0.75	74	82	82	388
82	65.75	176	182	80	50	87	41.75	41.25	0.25	79	72	74	389
85	63.50	123	130	72	60	84	32.75	32.00	0.75	79	76	74	390
85	70.00	148	190	104	92	95	39.00	38.00	1.00	73	72	74	391
85	72.50	162	214	100	86	99	35.75	34.00	1.75	68	74	76	392
88	65.00	151	170	86	80	78	35.25	33.25	2.00	63	70	76	393
85	65.00	180	198	88	84	81	41.25	39.50	1.75	56	80	78	394
89	61.25	118	210	106	102	85	34.50	34.00	0.50	81	70	64	395
88	65.50	102	138	82	76	88	33.75	32.25	1.50	73	46	48	396
86	65.25	130	128	82	70	79	36.75	36.00	0.75	59	66	68	397
88	63.25	132	156	78	0	82	39.50	39.00	0.50	67	70	62	398
86	61.25	136	156	84	74	99	38.25	38.00	0.25	71	78	76	399
89	60.00	109	140	74	0	83	33.25	32.00	1.25	78	64	72	400

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
61	56.25	137	180	86	64	78	37.75	36.50	1.25	65	60	62	401
60	60.25	143	148	72	0	75	39.75	37.25	2.50	91	58	64	402
60	57.50	128	162	82	70	74	39.25	37.00	2.25	75	60	62	403
60	64.50	113	132	90	86	85	36.00	33.75	2.25	73	62	62	404
64	63.00	100	140	88	82	72	33.00	31.50	1.50	73	68	76	405
60	60.00	150	130	72	68	92	35.75	33.25	2.50	77	64	72	406
61	62.00	119	158	84	76	81	34.50	33.25	1.25	81	70	68	407
61	64.75	169	174	94	78	89	39.00	38.75	0.25	99	60	74	408
64	61.50	127	158	72	66	83	36.75	35.50	1.25	83	64	64	409
64	58.50	133	186	92	88	84	36.50	36.25	0.25	83	70	76	420
63	57.25	122	162	88	64	91	36.25	34.00	2.25	81	68	72	411
62	62.50	155	140	78	70	86	41.00	39.75	1.25	79	66	78	412
60	64.25	162	164	94	86	104	38.25	38.00	0.25	76	62	60	413
61	59.50	150	162	94	86	95	38.75	38.25	0.50	75	68	74	414

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
64	56.25	134	188	96	72	88	36.50	36.25	0.25	80	70	82	415
64	62.00	144	142	74	66	101	36.25	34.75	1.50	69	70	74	416
62	62.75	132	196	88	62	87	33.00	31.00	2.00	74	62	64	417
63	59.00	106	198	94	82	86	30.25	29.00	1.25	67	52	66	418
64	65.75	115	138	82	76	93	33.00	30.75	2.25	72	60	64	419
63	62.25	130	144	88	80	90	32.25	29.75	2.50	68	76	80	420
63	61.50	155	138	90	84	93	38.00	36.50	1.50	76	70	74	421
64	60.75	148	154	84	80	78	37.50	36.75	0.75	87	70	80	422
61	65.25	134	178	92	88	75	36.00	34.25	1.75	79	70	78	423
61	60.50	119	134	76	68	84	34.00	32.00	2.00	89	72	76	424
63	59.25	117	158	90	86	86	37.00	35.50	1.50	77	70	78	425
61	64.00	165	152	82	70	94	40.50	39.25	1.25	63	72	74	426
64	57.75	140	176	74	60	85	36.75	35.50	1.25	74	60	65	427
60	70.75	127	164	90	78	82	36.50	34.50	2.00	89	76	82	428
60	60.00	96	170	98	88	93	32.00	30.25	1.75	79	62	64	429
60	62.75	150	148	86	74	86	40.75	40.00	0.75	79	66	72	430
60	61.75	105	140	78	72	86	32.00	30.25	1.75	78	56	60	431
63	62.00	150	160	83	76	83	38.00	37.50	0.50	78	68	72	432
63	63.50	159	196	94	72	90	39.50	38.00	1.50	71	72	84	433
61	60.25	135	126	70	60	85	40.75	40.50	0.25	85	74	76	434
60	60.25	139	118	80	60	82	38.50	37.25	1.25	79	64	68	435
60	63.75	151	122	88	70	87	39.25	38.00	1.25	73	72	80	436
60	58.00	145	128	68	62	86	41.50	41.25	0.25	93	64	68	437
63	60.00	148	148	82	64	80	38.50	38.00	0.50	86	66	72	438
62	60.00	146	168	88	80	85	35.25	34.00	1.25	76	54	58	439
63	58.50	111	150	86	72	78	31.00	28.50	2.50	79	54	58	440
64	64.50	100	140	84	76	89	30.00	27.50	2.50	72	64	72	441
60	57.00	120	158	80	72	93	34.00	31.50	2.50	74	78	74	442
60	61.50	112	144	66	74	89	32.25	30.00	2.25	92	76	82	443
63	59.00	146	162	94	84	100	36.50	35.25	1.25	78	62	68	444
60	62.50	134	132	68	56	97	33.00	31.00	2.00	97	72	74	445
60	61.50	137	162	90	82	90	32.00	30.50	1.50	68	70	76	446
60	63.00	121	140	76	68	85	30.75	29.50	1.25	87	70	78	447
60	65.00	140	156	82	76	92	32.25	30.50	1.75	79	52	58	448
64	52.50	117	170	64	52	78	32.25	30.50	1.75	66	58	60	449
63	64.75	148	164	82	76	97	35.25	34.50	0.75	59	66	70	450
60	60.25	136	168	92	82	83	35.00	34.00	1.00	73	60	68	451
63	56.00	135	152	80	74	78	34.00	32.75	1.25	72	70	72	452
64	62.75	133	174	94	86	104	34.50	33.50	1.00	79	70	68	453
64	58.25	131	186	92	84	95	33.75	32.50	1.25	78	72	76	454
62	59.00	132	194	90	84	85	33.50	31.50	2.00	70	68	74	455
60	60.25	128	192	84	78	81	32.00	30.50	1.50	75	68	70	456
61	61.00	106	168	82	78	90	30.00	29.00	1.00	76	56	56	457

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
63	59.50	138	170	90	82	85	36.50	35.50	1.00	67	78	76	458
60	64.50	137	168	98	86	93	37.00	35.75	1.25	68	60	62	459
64	61.75	146	124	74	68	80	36.75	35.25	1.50	77	66	70	460
64	64.25	130	176	94	86	93	36.50	34.75	1.75	85	72	78	461
63	62.50	126	154	86	76	77	33.00	30.75	2.25	80	60	62	462
64	63.50	132	146	98	82	98	32.25	31.00	1.25	63	56	56	463
61	64.75	132	198	96	84	87	37.25	35.50	1.75	84	76	78	464
61	63.00	124	152	94	88	82	33.50	31.25	2.25	73	64	88	465
63	66.25	156	154	92	84	92	36.00	34.25	1.75	71	68	72	466
60	60.25	139	172	94	90	89	38.25	37.00	1.25	85	78	86	467
62	58.50	134	170	84	76	92	38.75	37.25	1.50	88	58	64	468
63	64.25	110	180	88	82	97	32.75	30.25	2.50	89	80	78	469
62	67.25	148	196	98	82	107	36.00	35.00	1.00	87	82	86	470
68	61.00	149	198	68	64	78	38.50	38.00	0.50	95	64	60	471
65	62.00	103	144	88	80	86	33.25	31.50	1.75	83	56	64	472
69	60.00	134	144	86	72	75	37.50	37.00	0.50	91	64	70	473
67	56.75	102	192	86	0	83	33.00	31.75	1.25	81	62	60	474
66	60.00	72	132	80	76	76	26.75	24.50	2.25	61	58	64	475
67	56.75	96	158	92	70	88	31.00	28.75	2.25	71	68	76	476
67	63.25	128	202	108	102	86	37.75	37.00	0.75	90	66	76	477
65	60.25	144	188	88	78	87	38.50	38.25	0.25	82	66	74	478
65	57.00	109	174	86	68	83	34.00	33.00	1.00	83	74	68	479
68	60.25	129	136	88	72	106	36.75	36.00	0.75	107	58	64	480
67	63.00	143	166	80	0	84	38.00	36.00	2.00	84	72	72	481
69	61.00	154	150	80	72	89	38.75	37.50	1.25	65	78	82	482
69	55.50	99	174	68	82	92	34.75	33.25	1.50	68	60	62	483
67	60.25	126	126	84	80	90	34.00	32.00	2.00	74	80	86	484
67	61.25	134	188	96	94	79	35.25	33.00	2.25	72	80	82	485
67	58.25	143	164	88	74	81	37.25	36.50	0.75	70	58	60	486
68	56.50	100	176	92	82	92	34.25	32.00	2.25	63	56	64	487
68	57.50	118	148	82	76	85	34.25	33.25	1.00	71	68	70	488
69	60.25	126	186	92	84	77	33.50	31.50	2.00	85	70	74	489
68	62.25	156	142	82	76	88	37.50	36.50	1.00	77	72	78	490
66	59.00	81	124	76	68	68	31.00	29.50	1.50	71	52	58	491
66	61.50	139	182	94	82	93	34.00	33.75	0.25	75	66	74	492
68	59.75	111	164	74	70	83	31.00	29.75	1.25	85	58	62	493
68	62.50	115	194	92	84	78	35.50	33.50	2.00	87	70	72	494
65	69.25	143	146	82	74	87	39.50	39.00	0.50	95	62	68	495
65	61.50	115	178	86	82	80	34.25	33.00	1.25	64	80	82	496
65	61.75	107	154	78	72	87	35.00	33.50	1.50	61	68	72	497
69	56.25	102	162	88	78	75	31.25	30.00	1.25	73	68	70	498
68	61.25	134	186	92	58	81	37.75	35.75	2.00	79	72	74	499
66	65.50	169	200	88	80	82	39.00	38.00	1.00	82	80	82	500

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
69	62.75	158	142	82	70	82	39.50	38.25	1.25	80	74	78	501
69	60.25	107	162	88	70	97	32.50	31.25	1.25	89	44	50	502
68	60.00	148	158	92	84	86	37.50	36.00	1.50	78	72	74	503
67	61.50	101	138	80	72	79	30.75	29.00	1.75	70	68	62	504
66	59.75	130	156	66	80	74	32.25	30.50	1.75	73	58	60	505
67	63.00	144	214	108	92	85	35.25	34.00	1.25	84	62	68	506
65	63.50	115	138	88	80	82	33.00	31.00	2.00	72	54	54	507
66	60.00	117	148	78	64	89	32.00	30.25	1.75	83	54	52	508
69	57.50	99	162	88	80	87	31.75	30.00	1.75	75	64	76	509
67	53.75	113	154	84	78	90	32.00	30.25	1.75	73	74	80	510
65	58.50	97	160	85	84	83	31.00	29.00	2.00	67	58	60	511
69	62.00	134	174	90	82	75	35.00	33.00	2.00	89	76	84	512
69	62.75	129	174	84	80	95	34.50	32.00	2.50	65	60	56	513
67	63.00	158	150	78	72	84	35.25	34.00	1.25	81	56	60	514
67	57.75	133	188	90	82	87	32.50	32.00	0.50	75	64	72	515
65	61.25	112	156	84	62	69	33.50	31.00	2.50	63	64	68	516
68	62.75	146	160	84	64	91	37.00	36.50	0.50	75	62	68	517
65	61.00	127	162	98	84	80	35.50	33.75	1.75	61	66	66	518
65	62.50	111	186	84	76	85	30.50	29.00	1.50	64	52	60	519
66	59.75	149	126	82	70	90	36.00	34.50	1.50	87	70	64	520
65	59.50	146	174	86	78	95	34.50	33.50	1.00	95	80	88	521
67	63.75	125	168	92	62	102	36.00	33.75	2.25	69	64	68	522
66	64.25	135	188	98	76	93	36.75	35.25	1.50	73	68	72	523
66	62.75	133	142	66	58	81	35.25	32.75	2.50	79	64	66	524
69	61.50	139	144	82	76	85	33.75	32.75	1.00	76	66	70	525
69	59.75	123	182	88	0	105	35.50	34.00	1.50	82	76	76	526
68	60.00	116	188	84	74	98	33.00	31.50	1.50	73	66	72	527
72	57.00	129	180	100	88	88	38.50	38.00	0.50	68	70	72	528
70	61.00	118	192	92	90	102	36.25	34.75	1.50	101	70	78	529
71	62.25	151	182	80	0	85	40.50	40.50	0.00	95	66	68	530
74	60.25	130	210	96	62	87	37.25	37.00	0.25	72	62	66	531
72	57.00	107	186	80	0	84	32.25	30.75	1.50	71	64	66	532
70	63.75	160	190	88	72	92	37.25	36.75	0.50	80	70	74	533
71	59.00	120	210	102	82	80	36.00	35.75	0.25	71	74	76	534
70	61.75	136	184	94	78	94	37.00	36.25	0.75	79	78	80	535
72	60.75	146	158	86	70	92	34.75	34.50	0.25	71	52	54	536
72	58.75	91	194	88	78	97	31.00	28.75	2.25	86	64	68	537
71	58.75	121	152	82	74	98	36.00	34.25	1.75	79	70	72	538
73	64.50	119	152	78	72	75	31.75	29.25	2.50	72	68	62	539
70	61.00	149	140	84	78	86	36.50	35.00	1.50	78	66	68	540
71	60.50	128	174	92	90	74	35.00	33.00	2.00	76	68	76	541
70	58.00	115	186	102	98	87	32.50	31.00	1.50	69	64	68	542

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
70	63.75	146	152	76	64	85	34.00	33.00	1.00	87	60	64	543
73	59.50	109	148	84	80	80	31.75	30.50	1.25	87	50	58	544
71	59.50	133	190	90	80	89	37.75	36.50	1.25	69	60	62	545
71	63.25	150	162	82	70	84	37.75	37.00	0.75	91	64	70	546
73	63.25	154	168	74	70	80	36.50	34.50	2.00	92	66	72	547
73	58.00	128	188	84	76	84	37.25	36.50	0.75	73	64	68	548
73	55.25	106	208	78	74	77	37.75	37.25	0.50	95	42	48	549
72	61.00	120	182	82	6	75	33.25	31.50	1.75	97	56	58	550
74	60.00	134	194	88	74	76	37.00	36.00	1.00	87	68	72	551
70	55.75	124	136	68	58	87	33.25	32.00	1.25	79	66	70	552
74	65.25	147	150	86	78	81	37.00	36.75	0.25	68	56	60	553
72	55.00	98	195	96	86	78	33.50	32.50	1.00	85	70	72	554
72	64.50	138	165	100	96	86	36.00	34.00	2.00	83	62	68	555
70	62.50	101	145	92	82	94	31.75	29.75	2.00	75	50	62	556
70	59.00	142	180	96	86	84	38.25	38.00	0.25	70	74	70	557
71	57.00	99	172	84	78	76	33.75	33.25	0.50	65	62	70	558
74	64.75	169	154	92	86	105	40.00	39.00	1.00	83	56	60	559
72	63.50	141	160	68	84	88	35.75	34.00	1.75	65	48	52	560
74	57.00	129	158	88	80	88	33.25	32.00	1.25	67	50	54	561
71	57.75	103	140	88	72	97	32.25	30.50	1.75	73	54	58	562
73	58.75	136	138	80	78	75	35.50	34.25	1.25	92	66	78	563
72	63.00	153	154	88	82	80	36.50	35.00	1.50	72	68	70	564
72	61.00	105	156	74	68	79	30.00	28.00	2.00	75	62	76	565
74	60.25	144	164	90	88	87	34.75	34.00	0.75	68	74	82	566
70	61.75	146	146	86	76	93	35.25	33.00	2.25	79	60	54	567
74	56.75	108	194	96	90	77	32.00	30.50	1.50	71	54	58	568
74	58.25	141	174	80	70	90	36.50	35.00	1.50	71	64	68	569
73	57.25	115	184	80	72	80	33.50	32.75	0.75	72	54	56	570
74	61.00	118	140	84	76	98	36.50	34.75	1.75	75	62	70	571
74	60.75	135	144	82	76	83	34.00	33.00	1.00	82	60	64	572
70	62.00	145	156	86	80	82	36.00	35.25	0.75	76	54	58	573
73	59.00	105	188	90	82	95	32.25	30.50	1.75	82	60	64	574
71	67.50	138	144	86	76	104	35.00	32.75	2.25	69	72	66	575
73	63.00	145	170	96	84	97	33.25	31.00	2.25	73	76	76	576
73	59.75	125	156	84	76	83	34.25	32.25	2.00	61	62	64	577
72	60.00	102	190	102	94	95	31.00	29.50	1.50	95	62	60	578
70	66.75	127	194	82	74	90	33.50	32.25	1.25	72	54	58	579
74	58.50	140	180	96	90	93	34.25	33.25	1.00	75	56	58	580
72	[illegible]	133	160	72	64	73	32.25	31.50	0.75	74	58	60	581
70	62.25	107	164	84	78	80	29.50	28.00	1.50	68	60	66	582
74	55.75	102	174	76	74	85	31.50	30.50	1.00	83	62	68	583
72	56.00	138	180	94	68	69	35.00	34.00	1.00	76	60	68	584
72	64.50	139	158	78	70	81	32.75	31.50	1.25	75	72	70	585

NON-ADIPOSE NORM

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
72	59.50	104	142	70	62	80	31.00	30.25	0.75	68	54	62	586
70	57.50	141	168	92	84	100	36.25	35.00	1.25	92	78	76	587
73	58.75	121	140	78	72	85	34.00	32.75	1.25	79	62	68	588
74	60.75	120	146	86	78	87	33.50	31.25	1.25	73	60	66	589
71	58.25	116	170	90	82	81	35.25	33.75	1.50	71	66	70	590
70	58.75	143	180	92	78	92	37.25	36.00	1.25	83	76	72	591
70	55.25	109	153	88	82	89	33.25	32.25	1.00	87	58	62	592
71	61.75	125	184	90	84	84	34.50	33.75	0.75	87	70	72	593
71	60.25	124	148	82	78	103	35.75	34.25	1.50	71	62	64	594
70	63.75	146	174	92	86	87	36.75	35.25	1.50	83	70	76	595
70	59.50	128	186	94	86	86	39.75	38.50	1.25	85	64	68	596
73	61.50	146	182	84	76	95	38.25	36.50	1.75	82	68	78	597
71	64.00	124	192	94	66	93	33.50	32.25	1.25	87	72	74	598
75	60.25	120	210	108	0	89	34.25	34.75	0.50	103	60	62	599
79	59.75	91	158	78	0	78	31.75	30.75	1.00	57	48	54	600
76	60.25	118	186	98	92	82	34.25	33.25	1.00	93	60	60	601
76	58.60	89	156	86	0	79	30.50	30.00	0.50	81	70	66	602
77	56.50	85	186	86	80	87	30.00	28.75	1.25	83	60	64	603
75	64.00	123	216	90	84	80	33.00	31.00	2.00	58	78	82	604
76	64.00	131	214	104	100	89	34.25	32.50	0.75	80	68	70	605
75	61.50	144	190	96	88	89	35.00	34.00	2.00	77	62	64	606
75	57.25	111	188	98	68	82	33.50	32.25	1.25	74	50	58	607
76	65.25	147	172	100	90	66	30.50	34.75	0.75	81	64	68	608
76	60.00	159	208	92	80	77	38.75	37.50	1.25	83	70	72	609
77	59.75	100	168	78	0	78	32.75	31.00	1.75	77	54	62	610
78	58.00	92	178	90	64	84	31.00	29.00	2.00	92	62	70	611
74	59.00	112	144	82	74	81	33.00	32.00	1.00	77	60	62	612
78	62.25	122	170	76	74	90	32.50	31.00	1.50	68	64	70	613
77	66.00	146	172	92	74	89	35.00	34.75	0.25	79	52	54	614
76	62.50	129	182	78	70	82	36.00	35.25	0.75	85	58	60	615
77	61.75	130	162	76	74	95	36.50	36.00	0.50	74	56	58	616
75	65.00	137	148	84	70	75	35.00	33.50	1.50	69	48	50	617
78	60.50	136	134	70	62	78	38.50	38.00	0.50	75	90	92	618
75	59.00	103	192	86	82	89	32.00	30.00	2.00	69	52	60	619
78	60.50	107	212	104	96	79	32.50	30.50	2.00	75	56	64	620
77	60.00	125	156	90	82	87	34.25	32.75	1.50	67	66	74	621
78	60.25	151	154	76	72	80	35.50	34.50	1.00	78	58	60	622
75	61.00	104	216	98	84	84	30.75	28.50	2.25	65	60	62	623
75	58.00	124	172	88	76	75	33.50	31.50	2.00	83	58	66	624
78	57.25	142	164	70	64	81	33.75	32.50	1.25	70	50	56	625
76	62.50	129	192	98	88	94	34.50	33.00	1.50	77	60	68	626

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
77	62.50	157	142	82	74	90	33.50	32.50	1.00	72	64	70	627
76	62.25	132	186	92	86	83	33.00	31.50	1.50	73	74	72	628
77	61.00	127	160	72	64	95	33.00	32.50	0.50	64	64	68	629
78	60.25	129	152	82	74	85	30.50	29.25	1.25	70	60	66	630
75	59.75	114	178	92	86	78	31.50	30.00	1.50	71	62	62	631
77	60.75	140	160	98	90	89	33.25	32.00	1.25	72	56	60	632
77	63.50	125	150	84	80	76	30.00	28.50	1.50	70	52	56	633
79	64.75	133	210	94	88	75	31.50	30.00	1.50	77	64	70	634
77	57.25	114	166	90	62	86	30.50	29.50	1.00	91	60	58	635
78	62.00	127	208	94	86	78	32.50	31.75	0.75	68	64	74	636
78	62.00	93	190	74	62	85	28.25	27.50	0.75	74	52	54	637
79	66.00	143	180	88	78	89	33.50	32.00	1.50	77	56	56	638
77	55.75	87	186	68	52	87	28.00	27.25	0.75	81	50	56	639
77	54.25	99	124	74	68	96	31.50	30.75	0.75	83	52	54	640
75	61.50	125	186	92	0	98	35.25	34.50	0.75	85	58	62	641
77	57.75	120	186	84	72	109	35.50	34.25	1.25	77	58	60	642
75	60.00	115	176	86	0	96	33.75	33.00	0.75	77	60	64	643
75	61.50	112	194	92	0	87	33.75	31.75	2.00	88	64	66	644
80	56.75	87	166	76	64	85	30.75	30.25	0.50	79	56	58	645
81	60.75	126	160	92	80	85	36.00	35.00	1.00	75	58	64	646
80	55.00	123	190	90	84	83	34.00	32.50	1.50	84	54	60	647
80	61.00	118	198	90	80	85	33.00	31.75	1.25	83	54	50	648
80	59.25	96	206	86	74	96	28.25	26.50	1.75	69	52	58	649
82	60.75	131	202	98	84	91	32.50	31.75	0.75	63	64	66	650
81	58.00	109	206	108	98	75	38.00	37.00	1.00	87	60	62	651
80	59.75	149	198	90	88	97	39.00	38.25	0.75	67	58	62	652
84	59.75	142	166	98	90	85	36.25	35.50	0.75	72	64	68	653
82	56.50	106	188	96	86	100	33.25	32.50	0.75	76	50	56	654
80	61.50	145	184	92	80	93	33.25	32.50	0.75	70	56	62	655
81	57.50	111	152	86	80	80	30.50	28.50	2.00	63	60	56	656
80	58.00	108	190	88	84	81	28.75	28.00	0.75	69	60	60	657
83	60.75	134	158	82	78	95	32.75	31.50	1.25	61	56	60	658
82	57.00	97	198	66	50	77	30.00	29.25	0.75	93	50	56	659
81	55.75	130	172	86	78	102	38.75	38.25	0.50	72	48	52	660
80	60.50	143	192	82	76	82	36.25	35.25	1.00	79	62	64	661
81	60.50	137	198	95	90	94	36.50	36.00	0.50	77	56	68	662
82	61.25	138	212	102	94	79	35.50	35.00	0.50	85	50	48	663
80	57.75	97	168	86	0	78	30.00	28.25	1.75	81	60	62	664
80	61.75	151	182	94	80	96	38.00	37.25	0.75	85	46	54	665
82	60.00	107	202	68	0	80	33.50	32.00	1.50	75	64	62	666
81	61.50	140	194	88	76	87	36.25	35.25	1.00	75	62	66	667
81	56.00	106	188	100	84	83	31.00	28.50	2.50	79	46	48	668

NON-ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
82	62.75	129	180	84	78	66	34.00	32.00	2.00	74	56	64	669
81	62.00	93	198	80	72	75	30.50	28.25	2.25	67	58	62	670
80	57.50	116	162	74	60	76	29.50	28.00	1.50	69	50	52	671
80	57.25	139	182	80	66	80	35.25	33.50	1.75	72	52	54	672
81	57.00	140	218	100	76	72	34.50	34.00	0.50	78	64	68	673
84	60.25	124	174	94	86	75	32.50	30.50	2.00	73	58	66	674
80	55.75	95	142	74	64	78	32.00	30.75	1.25	61	52	60	675
81	62.75	153	195	82	68	65	35.25	33.50	1.75	74	56	64	676
80	60.00	105	180	92	84	69	31.75	30.50	1.25	67	64	68	677
83	57.25	115	198	72	60	84	33.25	32.00	1.25	65	58	60	678
80	60.50	109	186	78	60	75	30.25	29.75	0.50	80	56	60	679
84	56.50	89	184	92	84	97	26.50	25.75	0.75	87	52	60	680
82	62.00	116	208	86	52	94	34.25	33.50	0.75	86	60	64	681
85	58.75	82	196	78	70	76	30.25	29.75	0.50	87	68	72	682
88	56.50	108	174	90	82	93	32.50	31.50	1.00	74	54	60	683
88	54.25	86	204	108	102	67	28.50	26.50	2.00	71	66	78	684
87	60.00	133	218	100	94	79	33.75	33.00	0.75	69	56	58	685
87	55.00	124	180	94	90	86	33.50	32.50	1.00	78	58	62	686
86	64.75	150	196	106	102	85	35.50	34.00	1.50	75	60	68	687
85	59.75	105	208	88	84	73	37.00	36.50	0.50	75	56	58	688
85	57.00	90	192	102	90	84	29.25	27.75	1.50	73	52	66	689
85	61.00	136	180	94	92	90	35.00	34.00	1.00	77	60	64	690
85	57.25	84	136	94	88	82	30.25	28.50	1.75	80	52	56	691
85	64.50	152	154	94	86	86	36.50	35.25	1.25	61	46	54	692
89	60.25	119	152	84	0	88	32.00	30.50	1.50	65	64	74	693

ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
61	60.00	160	180	86	82	76	36.25	34.25	2.00	75	70	66	694
61	62.75	180	180	88	76	84	40.25	39.25	1.00	92	70	62	695
60	63.00	178	186	96	90	82	43.75	43.75	0.00	103	68	64	696
61	64.50	278	158	100	94	97	41.75	41.25	0.50	87	66	68	697
61	61.75	162	192	108	76	87	38.25	36.00	2.25	76	70	78	698
61	62.25	154	166	104	100	84	39.50	39.50	0.00	83	80	84	699
60	61.50	166	162	100	96	93	40.00	39.50	0.50	93	78	74	700
64	61.25	162	248	124	98	80	38.50	37.25	1.25	97	64	68	701
64	61.00	170	210	106	98	95	36.00	35.00	1.00	93	46	50	702
60	66.00	278	215	120	114	94	41.50	40.75	0.75	85	72	76	703
60	64.50	223	162	94	82	85	42.00	41.50	0.50	83	66	80	704
63	63.25	180	188	92	86	100	38.50	38.00	0.50	61	66	64	705
64	61.75	164	186	106	104	94	35.25	34.50	0.75	80	68	78	706
62	60.50	159	198	94	82	95	38.00	37.25	0.75	81	64	64	707
62	58.25	149	160	84	76	93	39;25	37.75	1.50	97	74	76	708

ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
62	60.00	159	142	76	56	85	40.50	40.00	0.50	77	68	72	709
64	61.25	156	166	92	80	79	37.75	36.25	1.50	83	58	66	710
63	61.75	165	162	99	84	81	39.00	38.50	0.50	67	72	76	711
60	64.25	165	172	98	78	93	38.25	37.50	0.75	70	66	64	712
64	57.50	149	188	96	64	88	38.50	37.25	1.25	79	68	72	713
60	60.00	193	198	84	58	93	44.50	44.50	0.00	97	70	70	714
61	62.25	205	168	86	78	90	40.50	40.50	0.00	61	76	72	715
62	57.25	165	182	98	56	85	40.00	39.00	1.00	83	64	70	716
62	60.00	175	238	112	95	76	39.75	39.50	0.25	69	60	66	717
61	61.25	164	200	104	98	90	38.75	37.00	1.75	73	58	64	718
61	60.00	195	198	96	74	97	41.25	40.50	0.75	75	60	62	719
61	64.50	194	292	112	102	84	41.50	41.50	0.00	68	74	86	720
60	60.25	174	260	120	112	78	41.00	41.00	0.00	77	72	80	721
62	61.25	183	208	110	98	87	42.00	42.00	0.00	89	62	72	722
60	59.50	174	222	128	105	94	35.50	34.50	1.00	75	68	70	723
63	61.00	165	214	112	104	102	35.75	34.00	1.75	73	74	78	724
64	61.50	165	176	104	94	76	37.25	36.00	1.25	72	64	66	725
60	59.50	204	220	110	104	87	40.00	38.50	1.50	71	80	72	726
61	60.25	168	208	109	92	94	37.00	35.50	1.50	68	68	74	727
60	58.75	183	212	106	100	80	36.50	35.25	1.25	65	74	76	728
64	60.50	157	172	84	80	83	37.50	36.00	1.50	74	66	68	729
61	61.00	171	170	68	54	79	40.00	38.00	2.00	93	65	62	730
60	61.00	222	192	120	112	104	41.25	39.50	1.75	85	74	76	731
66	62.25	173	188	96	0	82	41.25	40.75	0.50	88	60	62	732
67	60.25	153	156	94	88	80	37.75	36.75	1.00	91	62	68	733
65	61.00	155	182	98	95	85	36.25	34.50	1.75	72	66	70	734
65	60.50	157	163	86	80	83	45.25	45.25	0.00	75	62	72	735
69	59.00	155	194	90	82	95	39.00	38.50	0.50	78	60	60	736
65	61.75	139	224	116	108	99	37.50	36.75	0.75	68	68	64	737
69	61.25	182	166	106	100	103	38.50	36.75	1.75	84	70	70	738
63	61.50	177	210	104	95	75	36.50	35.25	1.25	71	56	64	739
65	61.25	194	205	100	94	91	38.75	38.00	0.75	72	64	68	740
66	62.00	168	172	90	85	89	39.50	38.75	0.75	73	74	68	741
69	61.00	176	193	92	80	85	38.00	37.00	1.00	81	56	58	742
67	62.25	205	210	102	94	93	41.00	40.25	0.75	60	64	60	743
65	63.00	235	194	106	92	101	39.75	38.00	1.75	94	64	72	744
65	62.00	195	208	108	104	90	41.50	40.50	1.00	93	58	62	745
67	61.25	153	246	102	78	86	38.00	37.50	0.50	73	58	60	746
68	57.75	167	162	82	78	85	40.75	40.25	0.50	67	50	52	747
69	62.50	164	152	92	86	78	39.00	36.25	2.75	74	60	64	748
68	61.50	159	158	92	82	93	37.75	36.50	1.25	97	68	74	749
68	61.75	170	210	102	94	86	37.00	35.50	1.50	67	62	64	750
66	62.00	211	260	110	100	87	38.00	36.50	1.50	71	62	66	751
65	59.00	161	202	105	92	79	38.50	38.00	0.50	75	70	72	752
66	61.25	169	254	126	118	80	40.00	38.50	1.50	73	72	76	753
65	61.50	174	212	98	90	79	36.50	35.50	1.00	70	70	72	754
66	62.00	169	222	112	100	87	34.50	33.25	1.25	93	60	62	755
65	60.50	169	210	110	102	93	36.00	35.00	1.00	77	56	58	756

ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
67	57.00	182	124	102	86	75	39.50	39.00	0.50	84	68	76	757
69	61.25	169	160	82	78	84	40.75	40.75	0.00	75	74	74	758
66	60.25	153	176	96	90	76	39.50	38.50	1.00	75	68	64	759
66	58.00	179	192	108	98	105	35.50	34.50	1.00	87	58	60	760
67	59.50	162	234	108	96	95	36.75	35.25	1.50	80	62	68	761
65	59.25	174	148	82	76	89	36.50	35.50	1.00	69	52	64	762
67	66.25	183	168	96	93	97	37.75	36.50	1.25	69	60	64	763
65	57.50	146	198	96	78	78	39.00	38.25	0.75	71	65	70	764
68	61.25	167	192	90	78	87	40.25	39.50	0.75	83	68	70	765
69	69.00	171	182	94	88	84	42.00	41.50	0.50	74	64	74	766
71	59.75	169	222	98	86	89	40.00	39.00	1.00	89	60	68	767
74	58.75	155	180	98	86	84	39.75	39.00	0.75	73	62	66	768
70	61.00	160	140	82	76	95	38.00	37.25	0.75	65	64	68	769
70	61.50	205	254	108	102	74	44.25	44.00	0.25	93	78	74	770
72	63.25	164	260	98	90	93	39.25	38.75	0.50	79	62	78	771
73	56.50	149	200	98	80	94	36.25	36.00	0.25	77	62	66	772
71	60.25	168	209	104	98	85	35.75	35.00	0.75	70	52	60	773
70	63.00	223	148	98	92	100	40.25	39.50	0.75	61	74	74	774
72	61.50	180	154	70	42	88	37.50	36.50	1.00	95	64	68	775
74	64.00	183	182	100	94	86	38.25	36.75	0.50	83	62	66	776
72	60.75	161	194	78	72	94	39.00	38.25	0.75	81	60	64	777
71	58.00	146	248	122	108	80	37.00	36.75	0.25	78	52	60	778
70	57.75	192	198	88	76	82	38.00	37.50	0.50	73	60	64	779
70	60.50	208	196	78	70	93	44.50	44.25	0.25	75	60	68	780
70	61.25	231	174	94	0	78	43.00	43.00	0.00	97	72	78	781
70	58.50	185	186	102	98	85	37.00	36.50	0.50	76	60	64	782
71	64.50	175	212	98	88	77	39.75	38.50	1.25	51	64	70	783
70	58.00	146	212	84	80	95	38.75	38.25	0.50	67	62	64	784
73	54.50	165	254	120	112	98	37.00	36.50	0.50	69	65	60	785
73	59.75	152	236	108	102	80	35.00	33.50	1.50	64	58	54	786
73	59.75	152	214	96	82	100	36.50	36.00	0.50	71	72	74	787
71	58.50	159	202	92	86	87	41.75	41.50	0.25	83	62	70	788
71	64.50	168	208	96	88	94	39.00	38.25	0.75	87	70	78	789
72	69.25	161	174	88	80	93	35.75	35.25	0.50	59	64	66	790
70	58.75	180	198	108	102	87	42.50	42.25	0.25	92	68	70	791
78	59.00	159	196	98	86	92	41.00	40.00	1.00	97	65	68	792
78	57.75	146	164	86	80	89	35.00	33.50	1.50	63	58	60	793
77	61.00	186	192	104	98	65	38.25	36.75	1.50	79	54	56	794
75	60.25	175	250	118	106	87	35.00	34.50	0.50	61	52	60	795
76	60.00	219	236	114	108	103	37.25	36.50	0.75	64	60	64	796
78	57.25	194	164	80	76	94	38.75	38.75	0.00	89	60	58	797
78	61.00	168	204	100	92	81	35.50	34.50	1.00	76	56	62	798

ADIPOSE WOMEN

1	2	3	4	5	6	7	8	9	10	11	12	13	No.
76	57.25	164	170	94	86	78	37.00	36.00	1.00	68	48	50	799
77	60.50	163	210	86	78	95	40.50	40.00	0.50	87	64	70	800
78	60.00	172	244	108	100	84	41.75	41.50	0.25	71	62	60	801
79	58.50	165	230	104	94	80	37.00	36.25	0.75	89	56	60	802
76	61.00	168	214	98	86	93	40.50	40.00	0.50	91	70	70	803
75	59.75	173	232	96	82	84	40.25	39.75	0.50	85	64	66	804

14	15	16	17	18	19	20	21	22	23	24	25	No.
12.1	29.6	.4088	25.2	25.1	4.9	5.9	13.6	111.3	646.6	.1721	39	2
11.9	26.9	.4424	25.5	24.2	4.0	4.9	14.3	129.6	624.9	.2074	34	4
14.0	29.7	.4714	28.5	25.4	4.8	5.0	15.7	144.6	724.5	.1996	43	5
12.3	30.2	.4073	23.0	21.5	4.7	6.7	13.3	110.8	583.5	.1899	32	6
11.7	28.6	.4091	28.3	27.4	2.9	4.8	14.9	132.2	739.0	.1789	33	7
11.4	28.6	.3986	31.0	29.9	4.6	4.5	14.1	129.2	816.6	.1582	41	8
12.6	29.3	.4300	25.2	23.8	4.3	3.8	13.7	113.2	617.2	.1834	34	10
13.0	27.5	.4727	22.5	21.1	5.1	5.0	13.7	110.4	513.2	.2151	41	11
10.5	25.9	.4054	26.1	22.9	6.3	5.1	13.2	113.5	620.3	.1830	56	12
12.5	29.4	.4252	27.6	27.1	3.8	5.0	14.1	133.8	710.9	.1882	35	13
11.8	28.8	.4097	25.4	24.5	3.9	4.4	13.1	103.4	597.9	.1729	38	14
11.4	28.4	.4014	29.8	27.6	3.2	3.5	14.4	118.1	698.3	.1691	32	15
12.2	28.1	.4342	20.2	20.7	5.8	3.9	13.7	113.6	533.6	.2129	37	16
13.2	27.3	.4835	28.0	27.1	4.2	4.3	15.2	143.9	724.5	.1986	37	17
12.6	27.6	.4565	25.0	23.3	4.3	4.8	14.0	123.7	582.5	.2124	44	18
12.2	29.5	.4135	25.9	24.6	3.4	4.1	12.9	111.6	629.1	.1774	42	19
10.1	27.8	.3633	28.8	28.7	4.5	3.3	12.5	123.0	733.7	.1685	33	20
12.0	27.3	.4396	29.3	27.5	4.2	4.9	14.2	132.2	700.1	.1888	39	21
12.2	32.5	.3754	26.7	25.7	7.3	7.6	13.4	116.7	744.5	.1567	35	22
14.3	32.0	.4469	24.5	23.6	5.9	6.1	14.4	118.3	626.5	.1888	52	23
11.6	28.4	.4084	27.1	26.3	5.6	4.1	13.7	125.2	697.0	.1796	33	24
11.1	28.7	.3867	26.9	24.7	5.6	6.7	13.8	114.8	656.9	.1748	30	25
11.5	28.1	.4092	29.9	27.5	4.5	5.3	13.9	116.4	733.1	.1588	49	27
11.6	27.1	.4280	27.7	26.6	4.5	4.2	14.7	128.2	678.9	.1888	43	28
12.2	28.2	.4326	23.9	22.8	4.6	5.8	15.0	125.0	619.2	.2019	41	29
12.4	28.7	.4320	26.8	24.8	4.7	6.5	14.5	126.4	672.4	.1880	37	30
12.3	29.8	.4127	22.8	19.0	711	4.7	13.2	109.8	547.9	.2004	27	31
12.2	28.0	.4357	25.9	24.1	3.4	6.5	14.8	127.8	634.5	.2014	44	32
14.5	27.6	.5254	26.0	23.9	4.0	3.5	15.0	132.7	652.8	.2033	31	33
10.8	27.6	.3913	27.3	26.0	4.3	3.7	13.8	113.5	644.4	.1761	40	34
10.9	26.6	.4090	27.2	27.0	6.6	5.3	13.3	116.6	676.2	.1724	45	35
14.1	30.1	.4684	28.9	26.9	3.1	5.6	15.3	144.7	713.7	.2027	31	36
10.9	27.4	.3978	32.1	29.3	4.4	7.5	15.5	131.9	715.5	.1843	40	37
12.3	27.4	.4489	28.5	28.0	3.3	3.6	13.3	119.3	685.9	.1739	37	38
13.9	28.6	.4860	26.2	26.2	4.2	4.3	15.1	141.2	684.9	.2062	42	39
11.8	28.5	.4140	26.9	25.4	4.3	6.6	14.4	144.0	662.6	.2173	39	40
12.7	27.9	.4552	25.7	23.9	4.6	4.5	14.6	135.9	629.0	.2001	54	41
12.5	29.8	.4195	27.0	25.6	3.5	3.8	14.7	129.9	697.4	.1863	39	42
12.5	28.8	.4340	26.2	23.5	3.5	6.0	14.5	121.0	629.8	.1921	30	43
11.5	28.7	.4007	26.5	25.8	3.6	4.8	14.0	111.4	652.9	.1705	37	44
15.6	30.4	.5131	22.5	19.9	4.9	4.3	15.0	132.4	552.4	.2397	42	46
11.8	26.5	.4453	26.3	25.2	5.4	6.4	14.5	125.1	634.2	.1988	42	47

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14	15	16	17	18	19	20	21	22	23	24	25	No.
13.0	29.7	.4377	27.7	25.8	4.3	5.8	15.9	148.7	695.6	.2138	35	48
12.9	29.3	.4403	25.8	23.8	5.9	7.4	14.0	129.9	643.8	.2018	27	49
10.6	27.6	.3840	28.3	26.3	3.9	4.8	14.2	122.3	667.0	.1833	38	51
11.6	30.1	.3854	25.3	22.2	3.3	4.6	13.6	126.7	641.7	.1974	36	52
11.9	27.3	.4359	25.6	24.3	3.5	5.0	14.4	130.8	629.9	.2086	28	53
12.8	29.2	.4383	23.6	22.6	4.0	6.3	13.7	112.3	577.4	.1945	35	54
13.8	28.5	.4842	22.9	22.2	4.2	6.3	13.9	125.3	581.5	.2155	29	55
12.0	27.0	.4444	24.9	23.8	4.2	3.4	13.1	105.9	598.0	.1771	63	56
11.6	25.6	.4531	25.5	25.3	4.1	4.1	14.6	108.5	593.5	.1828	35	57
13.5	31.4	.4299	26.9	25.1	3.6	4.9	14.8	144.3	700.4	.2060	38	58
11.0	26.6	.4135	25.6	24.2	5.5	6.2	13.6	104.0	577.7	.1800	40	60
13.1	27.3	.4798	22.1	21.5	2.7	3.1	13.5	114.2	507.5	.2250	38	61
12.5	28.8	.4340	28.2	27.1	4.8	5.9	15.4	147.1	781.8	.1881	40	62
10.8	26.3	.4106	26.4	26.3	3.8	3.4	14.0	117.6	610.3	.1927	46	63
12.4	26.8	.4627	29.3	27.1	4.3	5.2	14.9	135.1	719.8	.1891	27	64
13.0	31.5	.4127	26.3	24.5	5.4	4.3	14.5	122.9	680.5	.1806	29	65
13.5	28.1	.4804	27.1	25.7	6.7	6.3	15.5	149.7	696.5	.2149	47	66
14.0	27.7	.5054	21.6	20.4	3.2	5.8	14.2	118.9	520.6	.2284	45	67
12.7	30.2	.4205	26.7	25.1	2.8	5.1	14.0	126.8	662.8	.1913	48	68
14.0	32.7	.4281	25.1	22.9	4.2	6.8	14.7	134.8	678.9	.1985	41	69
10.8	27.0	.4000	28.6	27.4	3.6	4.3	12.4	102.7	619.8	.1657	70	70
12.7	27.1	.4686	25.9	23.7	3.3	3.3	14.3	124.3	598.7	.2076	35	71
12.3	29.3	.4198	25.8	23.2	5.8	4.9	13.2	114.4	640.0	.1787	43	72
10.6	26.1	.4061	26.5	24.9	4.1	3.4	13.1	104.1	601.9	.1729	38	73
12.5	28.3	.4417	19.2	19.3	4.0	3.8	12.4	102.6	452.0	.2270	41	74
13.1	27.9	.4695	27.0	25.5	3.9	3.9	13.4	124.1	660.1	.1880	37	75
12.5	29.5	.4237	26.9	26.1	2.7	2.9	14.0	129.9	761.7	.1705	45	76
11.4	27.1	.4207	25.7	24.7	4.1	4.9	14.0	110.1	604.6	.1821	45	77
11.0	27.0	.4074	27.1	25.8	3.8	5.8	13.0	110.1	613.1	.1796	56	78
11.7	29.9	.3913	26.0	25.8	4.6	5.6	13.5	120.9	659.9	.1832	52	79
14.7	30.4	.4835	30.1	28.9	3.4	4.9	15.9	154.4	762.5	.2025	44	80
13.2	27.0	.4889	20.3	19.8	4.0	5.3	13.2	98.9	477.0	.2073	27	81
14.9	31.3	.4760	24.1	22.6	4.5	5.6	14.9	129.7	620.3	.2091	37	82
14.8	28.5	.5193	26.2	25.5	3.0	3.8	14.5	140.6	645.7	.2177	47	83
12.4	27.7	.4476	33.0	29.9	4.1	5.8	16.1	143.2	836.2	.1712	34	84
11.2	24.9	.4498	24.6	23.6	4.9	5.0	13.4	110.9	563.0	.1970	44	85
12.5	31.4	.3981	29.1	25.9	3.6	6.4	13.9	128.6	741.7	.1734	31	86
13.7	29.4	.4660	26.5	24.4	4.4	5.6	14.4	116.4	642.2	.1812	31	87
11.2	29.4	.3809	26.6	24.4	4.5	3.4	13.6	106.9	657.3	.1626	42	88
13.0	29.4	.4422	27.2	25.7	5.3	5.7	13.8	113.7	634.9	.1791	29	89
11.3	28.9	.3910	27.5	26.2	4.7	5.1	13.1	110.4	705.4	.1563	30	90

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14	15	16	17	18	19	20	21	22	23	24	25	No.
12.7	27.2	.4669	25.4	24.2	4.6	3.5	14.4	126.5	623.1	.2030	41	91
14.1	30.8	.4578	26.4	24.4	5.6	7.7	14.8	125.9	678.3	.1856	53	92
12.5	30.5	.4098	27.1	25.3	4.8	6.5	14.0	123.6	722.6	.1710	30	93
11.7	29.4	.3979	25.1	23.3	5.0	5.0	13.2	113.4	651.1	.1742	83	94
12.6	27.1	.4649	22.6	21.2	3.1	3.2	12.7	100.9	489.1	.2063	65	95
13.2	29.4	.4490	29.6	27.4	3.5	4.0	14.3	134.7	732.8	.1838	20	96
12.0	25.7	.4669	27.8	26.4	7.0	6.9	13.6	119.3	612.7	.1947	69	97
11.0	25.7	.4280	26.1	25.9	4.6	6.2	13.5	108.3	646.3	.1676	38	98
10.9	27.1	.4022	27.2	25.7	5.4	5.7	13.5	114.0	656.1	.1737	37	99
13.2	27.8	.4748	23.5	21.4	3.7	4.2	12.9	102.2	506.9	.2016	74	100
12.0	28.4	.4225	24.8	23.0	3.7	5.1	14.0	123.1	611.0	.2047	38	101
12.9	28.2	.4574	25.9	24.9	4.7	6.1	14.1	126.9	641.3	.1979	30	102
14.7	27.3	.5308	22.5	21.6	2.1	3.5	13.6	122.0	478.8	.2548	21	103
11.4	27.7	.4115	26.6	25.1	4.3	6.5	14.3	119.2	643.9	.1851	40	104
12.7	27.1	.4686	21.3	19.8	4.7	5.9	13.7	115.1	490.5	.2346	82	105
14.2	31.9	.4451	23.8	20.9	4.1	7.2	14.9	130.3	602.2	.2164	38	106
12.0	26.9	.4461	24.8	23.1	2.2	5.4	13.7	123.0	571.7	.2151	33	107
12.1	28.9	.4187	23.6	21.5	4.6	6.3	13.6	110.4	505.1	.2186	66	108
13.4	30.4	.4408	26.3	25.4	3.7	5.3	14.7	131.6	704.3	.1871	47	110
12.0	26.3	.4563	27.8	25.2	3.3	5.1	15.2	132.9	634.8	.2093	48	111
13.3	29.2	.4555	28.1	25.2	4.4	6.3	15.4	144.2	690.4	.2089	29	112
10.5	25.7	.4086	27.7	27.0	4.6	4.8	13.0	119.0	652.9	.1823	28	113
11.7	27.7	.4224	25.9	24.3	3.1	4.7	13.5	109.5	583.6	.1876	61	114
13.1	29.6	.4426	25.5	23.8	4.0	6.1	14.4	117.3	609.3	.1925	40	115
12.9	30.8	.4188	26.8	26.8	3.7	5.0	14.2	128.3	681.7	.1882	47	116
12.0	27.5	.4364	27.6	25.9	4.4	5.9	13.2	116.5	638.1	.1826	36	117
12.4	29.2	.4246	24.5	22.5	6.4	7.1	13.5	117.0	593.1	.1973	63	118
14.7	30.0	.4900	23.4	22.7	2.3	5.8	14.8	132.2	565.7	.2337	38	119
14.3	30.7	.4658	22.3	21.2	3.7	4.4	14.1	110.2	542.9	.2030	59	120
13.8	29.2	.4726	28.6	27.3	2.8	4.1	14.8	134.7	711.3	.1894	32	121
12.2	29.9	.4080	29.4	28.1	3.6	3.8	14.0	124.3	726.9	.1710	29	122
10.5	27.8	.3777	26.6	25.6	3.1	4.1	14.0	112.7	643.5	.1751	50	123
13.1	28.7	.4565	24.8	21.8	4.3	5.3	13.5	120.4	542.9	.2218	45	124
11.6	26.6	.4361	22.7	22.2	4.6	4.5	12.7	107.0	561.9	.1904	68	125
12.1	27.0	.4481	27.0	25.0	4.3	4.3	13.8	122.4	633.1	.1933	47	126
12.6	26.7	.4719	27.1	25.3	4.6	4.5	15.5	136.4	602.0	.2266	54	127
13.9	31.8	.4371	28.2	25.7	4.1	5.5	14.8	146.0	771.9	.1891	29	128
12.2	26.1	.4674	22.8	21.8	2.7	4.1	13.5	120.7	520.0	.2321	48	129
10.9	25.0	.4360	27.1	26.8	4.3	4.4	12.4	104.0	597.9	.1739	44	130
13.9	32.8	.4238	26.0	22.6	3.8	8.1	13.9	117.7	656.3	.1793	39	132
13.3	2719	.4767	22.9	22.1	2.7	4.8	13.8	113.4	567.0	.2000	47	133
10.2	27.6	.3696	25.6	23.2	5.2	6.9	13.7	108.3	479.3	.2259	48	134

MEN MEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.4	27.0	.4592	24.3	22.3	4.7	7.3	13.8	119.1	557.7	.2136	47	135
12.4	26.3	.4715	28.5	25.5	3.8	6.3	14.1	127.1	656.6	.1936	34	138
13.0	27.0	.4815	19.8	16.1	2.6	4.0	14.0	97.9	430.7	.2273	48	140
12.6	28.4	.4437	24.1	23.4	4.9	4.0	13.3	111.2	569.4	.1953	65	141
13.3	31.3	.4249	25.5	22.8	3.8	7.0	14.1	132.6	630.8	.2102	36	142
12.9	30.1	.4286	25.7	24.1	3.3	5.6	12.8	116.9	654.2	.1787	43	143
12.2	23.7	.5148	23.4	22.0	3.6	3.1	12.5	107.6	476.6	.2258	80	144
13.8	27.2	.5073	22.6	20.2	3.9	7.4	12.6	121.1	503.6	.2405	51	145
13.5	32.3	.4179	25.7	24.7	2.7	4.8	14.5	134.8	718.2	.1877	24	146
13.3	29.7	.4478	27.00	25.2	3.8	3.9	14.4	131.7	687.5	.1916	44	147
13.1	29.9	.4381	29.0	26.9	3.2	5.2	15.1	144.9	764.2	.1896	25	148
11.9	29.0	.4103	26.3	27.4	5.4	7.2	14.5	134.0	767.3	.1746	38	149
14.4	30.3	.4752	29.1	22.3	2.4	3.2	14.3	129.2	650.4	.1986	90	150
11.9	26.6	.4474	27.4	25.7	3.3	3.9	14.0	123.4	638.2	.1933	51	151
13.3	28.9	.4602	25.9	23.9	4.0	7.0	15.6	133.4	671.0	.1988	24	152
12.7	28.5	.4456	23.1	22.1	3.2	6.2	14.1	123.2	558.7	.2205	27	153
11.4	26.9	.4238	26.4	24.6	4.0	5.3	13.6	117.0	607.0	.1927	30	154
12.8	29.3	.4369	23.4	22.2	3.4	4.2	14.0	121.4	596.3	.2036	51	155
12.5	23.9	.5230	22.5	19.4	4.0	5.6	13.6	99.3	444.0	.2236	65	157
13.0	28.8	.4514	25.5	23.7	5.3	3.7	13.7	119.1	592.4	.2010	42	158
14.2	30.6	.4640	29.9	28.4	3.0	4.0	15.9	168.7	786.1	.2146	28	159
13.7	29.9	.4582	26.9	25.3	2.6	3.1	14.5	142.4	672.4	.2118	32	160
13.2	28.4	.4648	29.4	25.9	3.7	3.5	14.6	134.9	707.2	.1907	61	161
13.5	28.3	.4770	29.9	28.4	4.7	5.8	14.8	134.6	738.5	.1823	42	162
14.4	27.8	.5180	28.1	25.2	3.2	6.1	16.0	159.1	696.7	.2231	31	163
12.5	28.2	.4433	28.3	25.0	5.1	7.2	14.8	139.1	717.2	.1939	46	164
11.8	26.1	.4521	26.3	24.9	4.0	5.7	12.8	112.6	596.2	.1889	77	165
12.8	30.7	.4169	28.0	27.1	3.7	4.0	14.2	130.8	775.3	.1687	32	166
15.0	29.8	.5033	28.3	25.2	3.1	5.9	15.4	141.6	665.9	.2125	49	167
13.0	31.2	.4167	27.3	24.7	4.8	6.4	14.4	132.1	702.1	.1881	44	168
13.2	27.9	.4731	24.7	22.3	2.3	4.1	13.6	119.5	585.9	.2042	56	169
12.8	25.2	.5079	21.0	20.1	3.0	2.8	12.5	104.3	452.1	.2307	69	170
13.2	29.9	.4415	22.1	21.2	3.1	4.5	12.6	108.1	528.9	.2044	72	171
13.1	28.1	.4662	22.6	21.0	6.0	8.7	13.6	111.8	563.9	.1983	43	172
11.3	28.1	.4021	22.9	22.9	2.2	3.6	12.7	110.7	566.5	.1954	32	173
12.0	28.1	.4270	28.0	27.0	4.5	5.2	13.0	115.5	640.7	.1803	47	174
13.2	29.1	.4536	29.1	27.2	4.9	7.9	14.7	134.4	711.7	.1888	47	175
11.4	25.0	.4560	27.9	26.8	5.5	5.4	13.2	116.8	540.1	.2162	62	176
13.4	28.9	.4637	28.2	25.8	3.1	2.7	14.5	131.3	661.0	.1986	51	178
12.0	27.0	.4444	25.8	24.8	4.2	4.3	13.5	119.6	584.0	.2048	46	179
13.2	27.6	.4783	28.1	27.2	4.3	4.6	14.6	144.1	782.8	.1841	35	180

MSN

14	15	16	17	18	19	20	21	22	23	24	25	No.
10.9	25.4	.4291	22.7	21.2	2.5	4.1	13.0	103.9	496.4	.2093	58	181
13.4	27.1	.4945	21.0	20.8	3.2	3.5	14.1	114.1	516.4	.2209	49	182
12.5	26.5	.4717	24.8	23.8	4.1	4.5	13.0	104.9	571.6	.1839	74	183
11.2	25.3	.4427	22.4	20.0	5.6	4.6	12.9	111.8	483.0	.2315	71	185
13.4	30.0	.4467	22.8	21.3	4.4	5.5	13.5	118.9	573.4	.2073	66	188
13.6	29.8	.4564	25.6	23.0	2.9	4.4	14.6	131.1	635.4	.2063	31	191
13.9	30.0	.4633	25.4	24.9	3.4	3.8	14.7	127.7	636.4	.2006	47	192
12.8	27.9	.4588	27.3	27.3	2.1	6.3	14.0	129.0	698.7	.1846	49	193
12.2	27.0	.4518	25.1	22.6	2.0	4.1	13.8	118.7	543.7	.2183	65	194
12.5	28.5	.4386	26.8	25.5	4.4	4.2	14.5	130.6	668.5	.1954	34	195
12.9	29.8	.4329	26.9	25.6	3.9	6.1	14.4	124.3	723.9	.1717	38	196
12.9	29.8	.4329	25.9	24.5	3.2	4.0	14.8	136.3	652.7	.2088	29	197
11.2	27.9	.4014	25.9	24.5	3.5	5.8	13.2	111.0	631.8	.1757	51	198
12.9	27.6	.4674	23.0	22.1	4.3	3.8	14.0	125.3	564.1	.2221	79	199
14.5	30.3	.4785	25.9	23.9	4.1	6.4	14.7	133.8	652.6	.2050	34	200
11.1	28.1	.3950	23.3	22.9	3.4	3.4	13.8	120.5	577.6	.2086	44	201
13.2	26.6	.4962	26.4	25.4	1.9	5.1	14.6	139.1	640.2	.2173	49	202
12.9	29.5	.4373	26.6	25.1	2.4	4.8	14.5	134.4	684.4	.1964	53	203
11.1	25.8	.4302	28.2	26.3	3.5	4.4	13.8	116.1	650.6	.1784	43	204
13.8	30.5	.4525	25.8	24.1	3.5	6.2	14.3	125.3	653.8	.1916	50	205
14.4	31.7	.4542	26.7	24.9	3.2	3.4	14.9	142.5	720.5	.1978	50	206
12.3	25.9	.4749	24.2	24.2	3.6	2.8	14.8	131.2	586.2	.2238	37	207
13.6	26.9	.5056	24.3	23.7	2.5	1.7	15.4	128.9	558.3	.2309	62	208
11.8	26.9	.4387	27.1	26.9	3.4	4.6	13.9	124.2	679.6	.1827	29	209
11.5	27.7	.4152	28.6	28.1	4.0	3.9	14.4	137.7	720.7	.1911	60	210
13.3	31.0	.4290	26.3	25.2	7.1	4.5	14.9	141.5	734.5	.1926	40	211
12.4	29.7	.4175	27.7	25.8	3.3	4.5	13.9	126.5	674.1	.1876	34	212
11.8	29.3	.4027	29.2	27.2	4.4	5.9	14.5	132.4	695.1	.1905	55	213
12.0	28.8	.4167	26.0	23.4	2.6	5.0	14.1	119.1	643.8	.1850	36	214
13.8	28.8	.4792	28.3	27.0	5.1	5.1	14.6	134.2	703.0	.1909	53	215
12.9	28.5	.4526	28.0	27.0	3.8	4.0	14.6	138.0	687.2	.2008	48	216
13.8	29.1	.4742	23.9	23.1	5.3	4.5	13.8	120.5	601.7	.2003	59	217
10.9	26.0	.4192	26.5	25.8	5.7	5.8	12.4	116.9	612.9	.1913	54	218
12.7	27.4	.4635	25.5	25.6	3.7	3.0	13.6	114.1	557.7	.2046	78	219
13.9	29.2	.4760	27.0	25.0	4.4	6.4	15.1	145.6	680.2	.2140	33	220
12.2	26.4	.4621	23.9	20.7	4.3	6.6	13.5	111.2	521.2	.2133	31	221
11.3	27.8	.4065	28.4	27.5	5.7	5.5	14.1	115.7	702.9	.1646	34	222
12.1	29.2	.4144	25.1	24.0	4.4	4.8	13.0	115.2	624.3	.1845	53	223
12.2	30.8	.3961	28.2	27.9	4.2	3.8	13.6	113.7	714.1	.1592	36	224
14.3	30.1	.4767	26.9	24.4	5.9	7.6	14.5	125.2	663.1	.1888	31	225
13.5	29.0	.4655	26.3	23.1	5.3	6.6	14.9	129.2	651.7	.1982	50	226

MEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.8	30.8	.4480	24.9	24.2	3.8	4.7	14.1	126.5	662.2	.1910	27	227
12.1	27.5	.4400	26.2	24.4	4.7	4.6	14.0	122.6	627.9	.1952	46	228
12.8	28.2	.4539	27.5	25.5	4.7	3.1	13.5	115.0	661.0	.1740	45	229
12.9	26.5	.4868	26.5	25.3	4.4	3.2	14.2	121.2	624.4	.1941	41	230
12.5	23.9	.5230	20.8	19.3	3.0	3.5	12.2	93.7	406.9	.2303	58	231
11.8	26.4	.4155	24.4	23.8	4.4	2.7	12.0	97.4	551.8	.1765	66	232
11.7	26.4	.4492	25.1	23.7	3.7	3.6	13.5	107.8	546.0	.1974	44	234
13.5	31.3	.4313	29.9	27.9	4.1	5.4	15.2	148.5	813.9	.1824	38	235
12.6	28.8	.4375	24.6	22.7	4.8	5.0	13.7	120.7	551.1	.2190	75	236
13.1	28.8	.4549	22.3	21.6	3.2	3.6	13.0	108.5	583.5	.1859	66	237
11.5	25.9	.4440	27.6	25.1	4.1	5.0	13.1	113.5	616.2	.1842	39	238
14.4	30.8	.4675	24.0	22.8	3.5	5.9	13.4	130.4	610.4	.2136	46	239
12.9	29.6	.4358	25.3	25.0	2.6	4.4	14.0	120.0	602.9	.1990	24	240
13.2	27.9	.4731	28.3	27.1	4.7	5.4	14.9	143.3	709.4	.2020	34	241
13.5	28.3	.4770	23.6	22.0	3.8	5.8	14.3	123.3	545.9	.2259	68	242
13.2	28.1	.4697	19.7	18.1	2.5	2.7	13.4	110.5	520.3	.2124	35	243
11.4	26.2	.4351	26.2	25.3	3.2	2.7	13.9	111.2	609.5	.1824	47	244
11.6	30.5	.3803	26.9	25.2	4.4	3.6	14.2	123.0	681.7	.1804	41	245
12.3	25.5	.4823	23.1	21.8	2.6	3.1	14.0	113.1	546.4	.2070	71	246
13.1	28.8	.4549	22.1	22.0	3.6	3.4	13.5	120.9	575.5	.2101	68	247
12.8	27.8	.4604	26.6	25.4	3.1	6.8	15.2	136.5	677.5	.2015	35	248
12.5	29.9	.4181	23.4	22.3	4.0	4.6	13.7	116.4	567.4	.2051	60	249
12.6	28.5	.4421	23.9	23.0	3.2	2.6	13.2	113.1	568.2	.1990	64	250
11.3	27.9	.4050	25.8	24.4	3.3	5.9	13.4	122.3	652.8	.1873	52	251
12.8	26.1	.4904	24.0	22.3	3.1	4.5	13.9	119.9	523.9	.2289	53	252
15.8	29.0	.5448	22.6	21.6	3.2	3.0	15.7	138.2	592.4	.2333	41	253
11.7	25.1	.4661	20.5	19.1	3.8	3.5	12.6	100.9	447.4	.2255	91	254
13.1	29.5	.4441	29.7	29.3	2.3	3.9	13.9	145.3	767.9	.1892	32	255
13.3	28.3	.4700	26.2	23.7	4.4	7.6	14.7	133.0	639.7	.2079	54	256
11.5	27.0	.4259	23.8	23.8	5.9	4.4	12.2	103.1	590.2	.1730	81	257
12.6	27.4	.4598	25.9	25.5	3.2	5.1	13.1	115.2	579.0	.1990	23	258
14.5	30.5	.4754	25.2	24.6	4.6	3.9	13.7	122.9	636.9	.1930	40	259
13.1	24.7	.5304	23.1	22.5	3.4	2.2	13.2	107.6	519.8	.2070	68	260
13.5	27.4	.4927	23.3	22.1	4.4	4.9	13.3	118.9	497.4	.2390	47	261
12.8	27.3	.4690	27.8	25.0	4.3	5.7	14.0	132.9	638.7	.2081	46	262
14.4	30.4	.4737	25.4	25.3	3.5	2.7	14.9	146.5	673.9	.2174	38	263
13.5	29.7	.4545	21.8	20.6	3.0	3.0	13.9	112.3	524.9	.2139	89	265
12.3	26.8	.4589	26.8	25.7	4.2	5.9	13.6	120.5	637.3	.1891	45	266
13.2	27.2	.4853	26.1	23.8	4.2	3.9	14.0	124.6	625.4	.1992	23	267
12.0	26.4	.4545	27.7	26.2	6.8	6.5	13.6	127.0	655.4	.1938	65	269

MEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.5	26.8	.5037	20.4	19.2	2.8	3.6	13.7	112.9	436.5	.2586	82	270
12.5	28.2	.4433	25.8	24.4	4.3	6.0	13.7	111.5	605.1	.1843	73	271
13.9	29.9	.4649	29.0	26.1	7.3	7.0	14.9	135.7	692.3	.1960	58	272
12.2	31.1	.3923	24.3	23.0	4.8	5.3	13.8	107.3	620.0	.1731	77	273
12.6	27.8	.4532	28.1	25.2	3.9	4.9	12.8	115.5	659.6	.1751	29	275
13.6	27.7	.4910	26.3	24.3	4.6	6.7	13.6	135.4	648.9	.2087	23	276
10.7	26.7	.4007	29.1	28.8	5.0	4.0	14.6	119.5	679.0	.1760	31	277
15.7	28.4	.5528	25.7	25.5	4.2	5.5	16.5	167.1	632.1	.2643	54	278
11.3	29.2	.3870	26.1	24.0	5.0	9.0	14.9	136.9	659.9	.2074	37	279
12.8	25.8	.4961	25.7	24.2	2.9	6.5	13.9	119.5	613.7	.1947	49	280
13.3	23.1	.5757	22.8	21.9	3.7	2.9	13.8	116.4	502.0	.2319	82	281
12.5	29.0	.4310	24.7	23.6	3.4	5.2	14.3	136.3	619.6	.2199	62	282
13.2	29.8	.4429	27.7	26.7	4.1	4.1	14.8	140.2	703.2	.1994	34	283
11.7	28.8	.4062	25.7	24.0	3.9	4.2	13.6	115.1	627.4	.1834	50	284
11.9	26.5	.4490	25.6	24.2	4.9	5.3	13.4	109.4	573.6	.1907	58	285
14.9	29.9	.4983	23.6	23.2	2.1	3.1	14.3	131.5	613.3	.2144	71	286
13.4	27.5	.4873	24.6	22.8	4.8	5.8	13.8	119.4	595.0	.2007	38	287
12.1	26.8	.4515	28.6	25.9	3.7	5.3	14.6	127.8	646.7	.1976	48	288
15.7	30.2	.5199	24.3	22.5	2.8	4.5	14.8	140.1	623.4	.2247	46	289
13.4	28.2	.4752	26.3	24.0	3.1	4.5	14.6	124.8	602.6	.2071	49	290
14.1	30.8	.4578	27.5	24.0	4.3	6.2	15.2	140.8	718.3	.1960	37	291
12.0	27.0	.4444	25.1	24.6	7.1	5.3	13.0	112.1	610.0	.1838	63	292
11.9	25.9	.4594	23.2	22.0	4.1	5.7	12.9	114.6	547.7	.2092	42	293
12.7	29.3	.4334	32.8	29.7	4.3	2.1	16.1	155.1	835.2	.1857	29	294
14.6	29.0	.5034	29.1	28.4	4.5	6.5	15.5	156.4	751.2	.2082	46	295
12.5	28.7	.4355	23.8	21.9	4.9	7.1	13.2	115.6	592.1	.1952	49	297
14.3	28.4	.5035	23.6	22.2	5.2	6.7	14.2	117.3	641.7	.1828	64	298
12.0	24.9	.4819	26.5	24.1	3.8	5.2	13.5	109.0	512.0	.2129	63	300
12.9	26.9	.4795	26.5	25.5	3.7	4.7	15.1	148.2	604.4	.2452	36	301
13.7	26.2	.5229	21.1	20.4	1.9	2.8	13.8	118.8	501.4	.2369	59	302
12.2	27.3	.4505	26.9	24.9	4.3	2.8	13.8	122.4	684.2	.1789	61	303
12.9	28.9	.4464	24.7	24.6	3.8	4.1	13.9	118.2	617.8	.1913	51	304
13.3	26.1	.5096	23.7	21.6	4.0	4.0	14.3	119.6	517.3	.2312	51	305
15.0	28.6	.5245	26.4	24.1	4.1	4.1	15.1	142.8	613.9	.2326	28	306
13.8	29.6	.4662	26.5	23.7	5.0	7.1	14.9	138.9	627.8	.2212	27	308
14.4	29.9	.4816	22.6	19.9	3.8	2.5	14.4	118.1	505.5	.2336	77	311
13.0	28.7	.4530	24.6	23.3	3.9	4.5	13.9	113.1	519.1	.2179	74	312
13.1	27.5	.4764	24.3	23.0	3.2	4.0	13.0	111.6	570.2	.1957	39	313
13.8	29.4	.4694	28.0	26.6	5.3	7.6	15.7	148.7	723.5	.2055	30	314
12.1	26.7	.4532	29.4	27.0	3.7	5.6	13.0	117.7	660.9	.1781	69	315
11.6	28.8	.4028	29.1	28.7	5.4	5.8	14.3	136.9	742.4	.1844	26	316

MEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.9	31.6	.4209	25.8	21.3	5.2	7.9	14.9	126.5	593.9	.2130	58	319
14.1	28.9	.4982	25.5	24.3	4.3	6.0	14.4	129.3	590.8	.2188	65	320
13.6	27.8	.4892	23.3	22.9	3.9	3.2	13.1	114.1	579.9	.1967	36	321
14.3	29.7	.4815	23.3	22.9	3.4	2.7	14.2	132.6	621.9	.2132	41	322
13.5	29.7	.4545	20.7	27.1	3.4	5.9	15.1	141.0	731.6	.1927	44	324
13.8	25.0	.5520	17.7	16.1	2.6	4.1	13.3	99.4	395.0	.2516	78	325
12.4	31.3	.3962	22.1	21.0	3.8	5.6	12.4	110.6	560.3	.1974	48	327
11.6	26.8	.4328	24.5	23.6	4.2	5.4	13.3	116.9	602.5	.1940	70	328
13.9	26.0	.5346	22.3	20.7	4.4	5.1	14.0	115.6	496.7	.2327	32	329
13.3	30.1	.4419	27.3	24.5	5.1	5.2	14.9	137.7	688.4	.2000	59	330
13.0	27.1	.4797	25.3	24.3	3.2	2.0	13.5	131.6	575.5	.2287	42	331
13.2	26.2	.4681	27.4	25.9	2.9	5.5	14.1	133.4	695.8	.1917	48	332
13.1	32.4	.4043	24.5	23.7	4.3	5.4	14.0	126.5	640.6	.1975	34	333
13.2	28.6	.4615	24.3	20.0	3.8	5.6	15.5	128.3	547.4	.2526	60	334
12.8	29.1	.4399	24.2	22.1	3.6	5.1	14.1	128.8	600.3	.2145	50	335
16.0	31.4	.5095	22.9	21.1	3.1	5.4	17.4	172.8	612.9	.2819	39	336
14.5	31.2	.4647	23.6	22.7	2.8	5.3	15.0	137.7	625.9	.2200	63	339
12.4	26.4	.4697	22.6	21.8	2.7	3.5	13.5	109.9	533.7	.2059	54	340
12.1	24.1	.5021	24.9	24.5	3.8	3.2	12.8	114.2	500.8	.2280	60	341
12.8	28.3	.4523	27.8	25.8	3.5	6.2	15.0	133.5	614.4	.2173	51	342
13.2	27.0	.4889	20.5	18.3	2.5	5.2	13.1	109.0	456.7	.2387	58	343
14.0	31.8	.4402	24.3	22.7	3.9	7.8	14.7	134.9	620.0	.2176	57	344
11.6	27.4	.4233	25.4	27.6	5.9	6.5	13.6	121.5	694.2	.1750	54	345
12.8	25.1	.4904	27.7	25.8	2.6	5.1	14.0	125.1	647.7	.1931	57	346
12.0	25.7	.4161	28.3	26.7	4.8	5.7	14.7	140.8	695.5	.2021	52	347
12.7	25.8	.4922	24.5	22.7	3.0	4.1	13.8	122.2	518.7	.2356	59	348
14.7	26.3	.5539	24.0	24.0	3.1	4.2	14.6	132.9	570.5	.2329	66	349
13.9	29.5	.4712	28.7	27.2	4.2	4.6	14.8	134.0	707.8	.1893	51	350
12.3	25.1	.4713	25.8	24.9	4.2	2.8	13.6	118.6	600.2	.1976	70	351
12.1	29.8	.4060	28.8	25.6	4.3	4.6	14.0	122.7	686.6	.1787	57	352
14.5	29.8	.4866	23.4	21.0	4.2	4.0	15.0	131.4	571.2	.2300	68	353
12.4	31.1	.3957	25.0	23.4	4.5	4.4	12.8	134.3	653.1	.2056	60	354
15.0	30.5	.4918	23.1	23.1	4.4	6.6	15.3	136.1	637.7	.2134	55	355
15.3	31.1	.4920	27.1	25.2	5.2	5.2	15.6	159.6	721.5	.2212	48	356
13.6	29.6	.4594	30.2	29.0	3.9	6.7	16.5	155.3	785.7	.1969	51	357
13.1	28.4	.4613	25.1	23.2	4.9	5.9	13.9	124.2	599.4	.2072	48	358
14.6	28.3	.5159	25.9	24.8	3.9	5.8	15.6	137.4	643.6	.2135	67	359
14.4	29.3	.4915	28.4	27.5	4.3	4.6	14.8	152.1	731.7	.2079	54	360
13.7	29.7	.4613	24.1	20.8	4.1	4.4	14.3	123.7	586.6	.2109	43	361

MEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
12.5	24.1	.5187	24.5	21.9	4.8	6.4	12.7	110.9	502.0	.2209	72	362
13.1	26.0	.5098	25.9	22.0	4.6	8.1	13.8	121.5	531.6	.2285	41	363
12.5	26.2	.4771	22.6	21.1	4.9	4.7	13.3	110.5	544.1	.2031	87	364
12.3	28.8	.4271	23.8	22.0	4.9	4.6	13.7	119.0	573.9	.2073	39	365
11.9	26.7	.4457	24.3	22.3	4.2	6.0	13.7	112.7	541.3	.2082	64	366
13.7	28.2	.4858	23.0	23.1	4.0	5.2	14.7	140.4	581.2	.2416	58	367
13.6	27.6	.4927	22.1	21.2	3.0	4.7	13.8	119.3	524.3	.2275	50	368
12.2	27.6	.4420	24.8	24.4	3.7	3.1	14.0	125.2	620.0	.2019	47	369
11.5	29.3	.3925	25.3	23.2	3.8	5.2	12.9	108.9	584.7	.1862	30	370
14.1	26.7	.5281	26.0	25.2	2.5	5.0	14.9	133.2	630.2	.2114	40	371
12.4	26.3	.4715	23.9	22.1	3.0	4.7	13.4	107.3	538.1	.1994	39	372
13.4	28.6	.4685	25.2	24.7	3.4	3.1	14.3	127.1	601.1	.2114	55	373
13.3	30.3	.4389	21.4	21.2	3.5	5.0	13.6	120.5	594.7	.2026	62	374
12.0	25.3	.4743	25.0	24.1	2.8	5.0	13.8	116.8	573.2	.2038	52	375
12.5	27.2	.4595	28.0	27.6	5.4	2.3	13.4	117.8	657.2	.1792	58	376
12.5	28.4	.4401	27.1	25.2	3.8	5.5	13.9	117.2	625.9	.1872	30	377
13.9	29.9	.4649	22.3	22.3	6.2	5.8	14.2	123.6	559.1	.2211	93	378
10.4	25.6	.4062	26.6	25.4	4.7	4.4	12.7	102.7	610.4	.1682	69	379
14.6	27.9	.5233	23.5	22.5	2.7	3.9	14.7	136.9	540.5	.2533	37	380
14.3	31.6	.4525	26.1	26.1	3.4	4.7	14.7	132.9	725.2	.1832	65	381
12.0	24.3	.4938	26.5	25.4	2.7	2.7	12.2	101.6	530.9	.1914	67	382
11.6	29.1	.3986	25.5	27.1	2.7	4.3	13.5	116.1	685.8	.1693	26	383
13.1	28.3	.4629	26.6	25.6	4.3	5.6	14.3	122.0	619.5	.1969	52	384
12.7	28.3	.4488	22.1	20.8	4.1	6.0	13.6	113.8	541.3	.2102	25	385
12.4	28.1	.4413	26.1	24.8	4.1	6.2	13.7	119.9	653.4	.1835	45	386
14.0	27.4	.5109	21.8	20.5	2.2	3.3	13.9	132.7	497.2	.2669	73	387
12.7	29.2	.4349	27.8	26.1	2.9	5.0	14.5	132.4	690.7	.1917	21	388
15.0	31.8	.4717	21.5	18.1	3.8	5.7	14.5	125.7	492.8	.2551	49	389
12.6	26.0	.4846	25.5	24.3	3.4	5.3	13.8	126.7	571.1	.2218	68	390
12.6	29.0	.4345	31.5	29.5	4.7	7.8	15.5	140.9	801.8	.1757	46	392
14.1	29.2	.4829	27.2	25.5	4.2	3.5	15.4	151.7	671.1	.2260	49	393
14.1	29.9	.4716	24.2	22.3	2.4	4.1	13.8	130.1	581.6	.2237	55	394
13.9	26.8	.5186	27.5	26.4	2.1	3.6	14.0	142.7	615.4	.2319	34	397
15.0	26.3	.5703	23.7	23.1	4.1	2.5	14.2	130.6	532.7	.2452	59	398
14.4	27.0	.5333	21.2	21.8	4.0	3.3	14.5	128.8	501.9	.2566	36	399
13.3	28.7	.4634	18.8	18.1	3.2	2.3	13.2	107.6	490.5	.2194	98	400

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.5	24.0	.5625	23.6	21.2	4.3	324	13.7	113.0	504.9	.2238	31	401
12.8	22.8	.5614	19.1	17.2	2.3	3.9	12.7	100.0	395.8	.2526	38	402
11.9	26.5	.4491	21.9	19.3	4.1	5.7	13.2	115.0	484.1	.2375	33	403
11.9	26.4	.4508	26.5	25.5	3.4	3.6	14.3	131.5	657.3	.2001	26	404
13.0	23.8	.5462	19.3	18.8	3.1	3.2	13.1	104.0	416.5	.2497	34	406
10.2	23.4	.4359	22.9	21.7	3.3	5.4	13.1	97.9	510.8	.1917	48	407
13.6	26.4	.5151	23.0	21.4	2.4	3.8	14.2	121.7	550.9	.2209	67	408
14.0	24.6	.5691	22.6	19.5	2.6	3.7	13.8	125.2	521.3	.2402	31	409
12.8	23.7	.5401	21.9	19.6	1.6	4.2	12.8	104.0	426.5	.2438	38	410
12.3	21.1	.5829	18.5	16.3	2.1	4.9	12.2	87.8	349.8	.2510	73	411
13.1	27.6	.4746	21.2	19.7	4.1	5.0	14.2	118.3	517.5	.2286	23	412
13.9	27.1	.5129	22.7	21.0	3.1	5.1	14.0	125.5	558.9	.2245	38	413
11.9	25.5	.4667	20.8	18.5	4.2	5.7	13.0	102.3	434.2	.2356	32	414
11.2	25.0	.4480	22.8	20.6	2.2	4.8	12.7	98.5	494.0	.1994	50	415
12.1	23.4	.5171	19.6	16.4	2.4	4.3	13.1	99.7	420.5	.2371	57	416
11.5	21.1	.5450	24.1	22.2	3.1	5.3	12.3	99.8	447.3	.2231	70	417
11.8	26.1	.4521	24.0	23.3	5.0	5.7	12.7	106.9	563.9	.1896	30	419
11.4	24.2	.4711	22.3	20.8	5.3	5.6	12.8	104.2	497.8	.2093	47	420
13.5	29.8	.4530	20.4	16.7	4.5	3.7	13.5	107.2	516.3	.2076	43	421
12.2	27.6	.4420	21.9	20.5	4.4	4.8	12.7	104.1	539.4	.1930	53	422
12.5	25.5	.4902	23.5	22.1	3.3	6.1	12.9	110.2	537.7	.2049	30	423
11.1	24.5	.4531	23.8	22.4	3.5	4.8	12.3	101.0	498.7	.2025	45	424
11.8	24.9	.4739	24.5	22.8	4.5	5.1	13.5	111.6	548.2	.2036	33	425
11.5	24.8	.4637	23.9	21.9	3.8	3.6	12.9	101.2	515.8	.1962	38	426
13.7	24.2	.5661	19.3	18.6	2.4	4.0	12.9	107.3	409.9	.2618	38	427
12.3	23.6	.5212	19.0	17.6	2.9	4.8	12.9	97.5	420.8	.2317	36	428
12.0	23.2	.5172	22.9	22.4	3.7	3.0	13.3	105.0	509.1	.2062	45	429
12.7	27.8	.4568	23.0	21.2	3.7	4.1	13.0	110.2	551.1	.2000	27	430
12.0	24.2	.4959	21.1	20.7	5.7	5.1	12.8	102.2	455.4	.2244	50	431
12.2	26.3	.4639	24.0	20.0	3.1	4.9	13.0	107.6	509.1	.2113	36	432
12.4	24.3	.5103	22.1	19.9	3.2	3.5	13.5	103.6	459.0	.2257	48	433
13.4	25.4	.5276	22.2	20.1	3.5	6.1	13.7	112.1	453.7	.2471	40	434
12.3	24.1	.5104	21.1	19.0	2.2	2.8	12.5	101.3	452.8	.2237	38	435
13.3	26.7	.4981	23.7	21.5	4.2	4.1	13.1	106.0	575.4	.1842	58	436
12.4	26.5	.4679	24.1	21.1	4.1	3.7	13.4	107.7	519.6	.2097	54	437
12.6	27.1	.4649	24.7	22.5	3.5	4.3	13.2	111.6	575.9	.1938	34	438
13.2	25.6	.5156	22.2	17.9	3.8	6.3	14.3	118.8	471.4	.2520	30	439
11.9	21.7	.5484	23.3	22.1	3.9	3.8	13.1	106.5	465.7	.2287	62	440
12.6	23.6	.5339	21.9	22.6	3.1	3.3	13.1	112.2	520.1	.2157	54	441
11.2	23.0	.4870	21.8	19.5	3.8	4.8	12.5	105.7	445.2	.2374	37	442

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
11.3	24.4	.4631	23.1	22.6	3.4	5.5	12.0	99.2	497.3	.1995	47	443
13.0	23.8	.5462	21.7	20.2	3.8	4.0	13.3	114.2	448.8	.2545	45	444
12.7	25.2	.4847	23.8	21.0	4.5	8.0	13.9	115.0	537.0	.2141	35	445
13.0	25.5	.5098	24.0	21.1	3.0	4.4	14.0	121.5	524.8	.2315	38	446
10.6	22.5	.4711	23.8	24.8	2.7	2.6	12.4	101.0	513.7	.1966	52	447
11.1	25.8	.4302	25.9	24.0	3.8	6.2	14.4	116.7	612.3	.1906	48	448
13.7	24.4	.5615	21.6	19.5	3.1	5.2	14.4	122.3	461.3	.2651	47	449
12.0	26.2	.4580	23.1	21.7	3.2	5.4	13.5	116.0	504.6	.2299	67	450
12.2	24.1	.5062	21.9	19.6	3.7	6.0	13.3	112.4	458.7	.2472	40	451
11.7	22.8	.5132	20.6	18.4	4.4	3.5	12.9	102.8	413.2	.2488	71	452
13.8	27.7	.4982	24.2	21.6	3.1	4.0	14.5	134.1	596.4	.2248	36	453
12.9	21.7	.5945	20.8	18.6	3.3	5.7	12.6	100.7	410.2	.2455	48	455
10.8	26.8	.4030	23.8	22.7	2.7	3.7	13.0	95.4	532.9	.1846	56	458
13.0	24.7	.5263	24.0	21.1	2.2	2.2	14.1	123.9	495.8	.2499	37	459
11.9	24.1	.4938	18.2	16.9	2.8	4.8	13.2	103.3	423.4	.2440	41	467
11.5	24.4	.4713	19.2	17.8	3.1	3.9	12.3	95.9	422.8	.2292	50	468
11.4	23.1	.4935	25.3	23.2	3.5	4.6	12.4	108.3	508.8	.2128	58	469
11.6	24.4	.4754	24.7	21.0	4.3	4.7	14.2	122.3	560.8	.2181	49	470
12.7	25.1	.5060	17.6	16.4	4.2	4.9	13.3	101.1	413.2	.2447	40	471
11.3	24.8	.4556	23.5	21.6	3.1	4.1	12.9	105.4	552.1	.1909	56	472
12.2	25.6	.4766	21.7	20.2	3.3	3.8	13.0	100.1	473.7	.2113	49	473
11.7	22.9	.5109	22.3	20.8	3.1	3.4	13.1	106.6	453.2	.2352	40	474
11.3	21.2	.5330	23.0	20.2	2.7	5.5	13.2	101.4	406.6	.2494	65	476
13.1	24.8	.5282	23.4	21.4	3.3	5.7	13.7	115.9	531.1	.2182	59	477
12.9	25.1	.5139	23.6	20.3	2.8	3.2	14.3	120.5	497.7	.2421	44	478
12.1	25.1	.4821	22.8	21.3	3.4	4.2	13.2	107.3	475.3	.2257	59	479
13.4	24.3	.5514	20.9	19.4	2.9	2.4	13.3	110.5	482.4	.2291	32	481
12.7	22.7	.5595	17.1	16.4	2.2	2.8	12.0	95.1	364.5	.2609	53	482
11.7	23.7	.4937	22.6	20.9	3.6	4.1	13.0	106.0	444.3	.2386	43	483
11.3	27.9	.4050	23.2	21.1	6.4	6.0	12.2	96.1	518.5	.1892	46	484
13.2	23.6	.5593	21.0	20.7	3.5	5.6	13.2	108.3	461.3	.2348	52	485
12.2	25.3	.4822	20.8	18.5	3.6	4.8	13.2	103.0	461.6	.2231	43	486
11.1	21.0	.5286	19.3	18.2	2.8	3.5	12.1	91.6	375.7	.2438	37	487
11.8	21.6	.5463	22.0	21.1	4.6	4.0	12.3	87.8	395.1	.2227	52	488
11.5	21.3	.5399	22.6	20.2	3.8	4.9	12.7	98.3	430.3	.2284	74	489
12.1	21.9	.5525	19.1	17.3	2.9	2.2	12.4	91.7	383.6	.2390	47	490
9.7	21.3	.4554	21.7	20.3	4.0	4.1	11.9	86.6	437.5	.1979	71	491
12.7	22.1	.5747	23.9	20.6	3.9	4.6	13.4	108.2	483.2	.2239	71	492

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
11.2	22.3	.5022	24.0	21.9	3.2	2.6	12.4	92.5	479.4	.1929	53	493
11.8	25.0	.4720	19.5	17.9	3.0	4.4	12.9	95.9	411.5	.2355	50	495
11.3	22.7	.4978	22.9	20.8	4.5	4.3	13.2	98.7	477.7	.2066	56	496
10.9	25.0	.4360	22.8	21.2	3.1	3.7	12.9	105.4	508.3	.2074	49	497
11.7	20.7	.5652	19.6	16.0	3.5	4.4	12.4	93.3	353.8	.2637	73	498
12.7	25.8	.4922	22.0	19.8	3.4	4.5	13.7	102.0	462.7	.2204	46	499
12.8	24.2	.5289	25.0	22.1	3.1	5.3	13.9	116.4	518.8	.2244	41	500
13.3	26.1	.5096	22.1	18.6	2.8	5.3	14.0	110.3	469.4	.2350	46	501
12.4	27.0	.4593	20.7	19.6	3.3	4.0	12.5	103.0	453.0	.2274	57	503
11.3	23.7	.4768	24.8	23.6	3.7	4.5	12.8	111.6	537.5	.2076	51	504
10.7	22.0	.4864	22.1	20.1	3.9	5.3	12.7	94.6	442.3	.2139	71	505
11.2	23.9	.4686	22.8	21.5	4.4	5.7	12.7	104.0	504.1	.2063	63	506
12.1	25.4	.4764	25.5	24.3	3.2	4.8	13.3	119.1	592.6	.2010	28	507
11.8	22.8	.5175	23.8	21.6	3.2	3.1	13.3	109.9	474.7	.2125	53	508
10.8	22.1	.4867	22.8	20.6	3.1	7.2	13.2	107.3	481.7	.2227	77	509
11.5	24.6	.4675	21.8	21.2	3.7	4.1	12.0	93.2	442.0	.2109	67	510
11.7	22.1	.5294	23.2	21.9	3.5	3.5	13.2	114.6	485.6	.2360	70	511
12.2	24.3	.5021	23.1	21.8	2.9	2.4	13.6	119.0	504.9	.2357	43	512
12.9	25.9	.4981	19.8	17.8	4.5	3.2	12.9	101.5	447.2	.2270	53	513
12.0	23.9	.5021	20.5	16.7	3.3	4.4	13.1	100.7	409.2	.2461	66	514
12.9	23.3	.5536	18.0	16.4	1.7	2.8	12.8	100.3	385.0	.2605	70	515
12.8	24.8	.5161	22.0	20.2	4.6	5.4	13.8	117.8	512.9	.2297	36	516
13.3	26.4	.5038	25.0	23.2	2.2	4.8	15.0	130.6	580.0	.2252	51	517
13.2	25.6	.5156	27.2	26.2	2.9	3.5	14.0	128.4	612.7	.2112	37	519
11.2	25.1	.4462	19.9	18.5	3.8	4.0	12.9	92.5	445.6	.2076	63	521
11.5	25.1	.4582	24.9	23.6	3.3	5.6	12.9	109.1	568.6	.1919	51	522
11.9	25.9	.4595	22.7	21.5	3.2	3.4	13.4	114.7	508.4	.2256	43	526
11.9	23.4	.5085	21.5	18.8	3.4	3.7	13.9	115.2	474.5	.2428	57	527
13.4	23.7	.5654	19.5	17.5	2.6	3.6	13.0	107.3	396.3	.2707	38	528
11.2	26.9	.4164	24.1	23.5	2.9	3.1	13.5	104.1	563.2	.1848	38	529
12.6	24.3	.5185	20.5	20.0	1.6	2.7	12.7	102.4	454.0	.2255	59	530
12.5	25.4	.4921	20.7	19.2	2.8	2.7	13.1	105.8	452.1	.2340	38	531
11.3	21.8	.5184	21.2	20.0	2.1	2.4	12.0	89.1	421.5	.2114	60	532
13.2	24.7	.5344	23.4	21.3	3.6	5.0	13.8	120.4	524.2	.2297	68	533
13.1	22.7	.5771	20.1	17.6	3.0	2.8	13.2	108.5	416.3	.2602	57	534
13.1	24.7	.5304	24.0	22.0	2.8	4.2	14.1	119.8	517.2	.2316	55	535
12.8	22.3	.5740	20.5	20.1	2.1	2.2	12.8	112.0	404.6	.2609	58	536
11.6	22.0	.5273	22.2	21.4	2.4	3.2	12.3	95.5	449.2	.2126	34	537
11.6	23.5	.4936	22.4	21.5	2.0	2.6	12.9	104.4	492.9	.1976	64	538
12.7	22.5	.5644	29.1	25.2	3.9	4.8	15.3	131.2	577.8	.2271	48	539

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.0	26.7	.4669	20.9	18.3	4.2	5.7	13.5	105.0	489.6	.2165	47	540
11.7	23.1	.4561	23.9	21.1	4.3	4.2	12.9	97.7	516.2	.1893	39	541
12.9	22.7	.5683	18.3	19.9	3.0	3.7	13.7	99.2	379.7	.2654	70	542
12.5	23.2	.5388	22.8	20.4	2.7	3.6	12.6	101.0	460.2	.2195	63	543
11.1	21.3	.5211	23.0	21.8	3.0	3.9	11.6	91.0	447.3	.2034	62	544
12.9	24.7	.5223	21.5	18.2	3.5	4.9	14.2	110.8	449.0	.2468	60	545
14.9	29.3	.5085	22.4	22.1	2.5	4.0	15.1	132.3	586.3	.2256	66	546
11.9	26.0	.4577	23.9	20.3	4.7	6.1	13.0	100.7	474.3	.2123	56	547
11.8	23.6	.5000	20.9	19.2	3.7	4.1	13.2	106.5	417.8	.2549	63	548
12.4	23.6	.5254	21.6	19.2	2.7	5.2	12.8	98.9	427.6	.2313	60	549
12.4	24.6	.5041	23.7	21.0	3.3	3.7	13.4	104.8	522.0	.2008	46	550
13.5	25.1	.5172	21.4	19.8	3.1	5.5	13.8	113.5	504.5	.2250	39	551
11.4	22.5	.5067	18.6	19.1	3.1	3.3	11.5	83.4	359.8	.2318	76	552
13.0	26.5	.4906	23.0	21.6	4.6	4.6	14.1	106.5	546.8	.1948	54	553
11.1	24.2	.4587	24.2	22.0	4.4	3.7	11.9	95.7	491.2	.1948	48	555
11.0	23.1	.4762	25.0	23.3	3.4	4.6	13.1	108.9	510.9	.2133	61	556
12.8	25.2	.5079	21.7	20.8	3.0	4.9	13.6	103.4	452.5	.2285	45	557
12.2	25.5	.4784	23.5	20.5	2.8	5.1	12.5	101.2	497.8	.2033	30	558
12.4	24.2	.5124	22.2	19.6	4.6	5.1	13.8	109.2	455.5	.2397	44	560
12.4	24.4	.5082	18.8	16.9	3.2	5.0	12.5	94.4	371.2	.2543	76	561
11.4	24.3	.4691	19.4	18.1	4.3	4.7	12.2	95.6	421.1	.2270	61	562
12.8	24.3	.5267	21.0	19.4	2.9	3.7	13.2	116.6	472.8	.2466	69	563
14.2	28.3	.5018	21.8	21.9	4.0	3.7	14.4	124.7	567.6	.2197	58	564
12.5	23.9	.5230	24.4	21.6	3.3	5.0	14.3	113.3	502.5	.2255	29	565
12.5	26.3	.4753	19.2	18.9	2.9	3.4	12.5	98.1	490.3	.2280	60	566
12.5	25.2	.4960	22.0	20.5	3.3	5.7	13.3	105.6	476.7	.2215	65	567
12.4	22.2	.5586	20.6	19.9	1.8	3.8	13.0	104.8	410.6	.2552	57	568
13.2	24.3	.5432	17.0	15.7	2.7	3.7	13.7	107.9	380.4	.2836	62	569
11.4	22.2	.5135	17.2	16.4	2.1	2.5	11.6	89.8	346.1	.2595	73	570
11.7	25.2	.4643	22.9	20.8	3.2	3.6	13.5	111.1	492.4	.2255	48	572
12.0	23.2	.5172	20.1	17.8	2.3	4.5	12.9	101.9	414.0	.2461	65	573
11.8	22.4	.5668	20.4	16.7	2.6	3.2	12.6	99.0	405.6	.2441	63	574
12.5	25.3	.4941	25.6	22.9	2.7	4.2	14.5	134.9	547.3	.2465	33	576
12.9	25.2	.5120	19.2	18.8	3.8	3.9	13.8	121.2	428.1	.2831	63	577
11.9	23.0	.5174	21.3	21.0	2.2	2.6	12.9	100.5	485.2	.2071	68	578
11.6	24.9	.4659	18.6	17.6	5.0	4.4	12.7	97.8	397.8	.2458	58	579
12.7	26.0	.4885	19.5	18.4	3.4	5.8	12.8	104.6	463.2	.2258	52	583
11.8	25.2	.4682	19.9	18.2	2.8	6.3	12.9	100.7	414.9	.2427	40	584
12.5	21.8	.5734	23.5	21.7	3.3	3.5	13.5	114.4	482.7	.2370	36	586
12.5	25.1	.4980	20.2	18.5	2.6	5.5	12.9	101.9	443.0	.2300	65	591

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
11.8	22.4	.5268	19.3	16.4	1.3	3.3	12.6	95.9	359.5	.2667	65	592
12.3	23.2	.5302	25.3	24.4	2.8	4.0	12.8	115.7	552.4	.2094	39	593
12.6	24.7	.5101	22.3	21.2	2.6	4.7	12.8	109.0	501.7	.2173	41	594
11.0	24.2	.4545	23.2	22.1	3.0	3.2	13.4	105.1	518.4	.1817	44	595
10.7	25.4	.4213	23.6	21.9	2.7	5.8	13.3	104.3	518.0	.2013	43	596
13.4	27.1	.4945	21.3	18.6	5.2	5.8	13.1	111.1	521.0	.2132	70	597
11.3	25.1	.4502	25.6	23.3	3.8	5.6	14.0	115.8	596.1	.1943	45	598
12.5	23.1	.5411	21.9	19.4	2.8	4.0	13.4	113.2	439.8	.2574	71	599
9.7	22.6	.4292	21.7	20.5	3.3	5.2	12.5	84.6	449.2	.1883	60	600
12.9	23.5	.5489	21.7	21.1	3.1	4.0	13.7	115.9	470.5	.2463	65	601
12.6	22.0	.5727	23.2	22.2	3.0	4.6	13.9	114.6	483.2	.2372	40	602
11.5	20.8	.5529	22.7	21.1	2.5	2.7	13.3	107.7	447.3	.2408	55	603
12.5	24.0	.5208	21.3	21.4	2.7	3.3	12.4	107.9	447.4	.2412	75	604
12.9	23.3	.5536	24.7	23.6	3.0	6.6	13.2	107.6	477.1	.2255	43	605
11.3	26.1	.4329	22.6	20.0	4.4	6.3	12.5	91.1	505.6	.1802	42	606
11.6	23.1	.5022	20.7	18.6	3.5	4.3	12.9	95.7	405.6	.2359	74	607
12.7	25.9	.4903	24.8	23.2	3.2	3.3	13.8	116.1	555.2	.2087	67	608
12.9	24.1	.5353	19.8	16.4	3.1	4.4	12.9	97.3	370.5	.2626	53	609
10.4	22.4	.4643	21.4	20.0	2.8	4.6	11.7	87.1	437.6	.1990	81	610
11.6	22.3	.5202	21.1	19.4	3.2	3.4	12.6	95.7	403.7	.2371	83	611
10.8	22.3	.4843	21.9	20.6	3.1	3.3	12.1	87.0	427.5	.2035	58	612
11.6	22.6	.5133	25.1	23.0	3.0	2.7	12.8	104.1	484.2	.2150	47	613
11.9	24.7	.4818	25.8	23.8	5.1	7.3	13.6	110.3	551.9	.1998	34	614
11.7	24.1	.4855	24.9	22.8	3.7	4.6	12.6	102.4	496.1	.2064	53	615
13.1	23.8	.5504	21.0	20.1	4.0	3.3	13.8	101.9	445.6	.2287	50	616
13.4	25.6	.5234	23.7	21.0	4.4	4.6	13.9	118.0	530.4	.2225	62	617
12.7	24.1	.5270	19.0	16.1	3.1	2.6	13.3	101.8	404.9	.2514	73	618
10.7	25.0	.4280	22.1	19.7	4.2	4.2	12.5	97.5	475.8	.2049	59	619
12.3	23.6	.5212	19.8	17.9	2.8	4.7	12.8	95.7	415.2	.2305	77	620
12.6	23.5	.5362	22.8	21.4	3.2	5.2	13.3	109.9	470.6	.2335	38	621
13.0	24.7	.5263	21.2	20.3	3.5	3.9	13.3	108.6	455.6	.2384	42	622
13.1	23.0	.5696	24.6	21.2	2.4	3.5	13.8	111.8	491.5	.2275	60	623
12.6	24.8	.5081	21.3	18.4	3.3	4.7	12.8	101.8	410.9	.2477	69	624
12.4	22.7	.5462	20.7	19.4	3.2	4.0	13.1	100.8	422.3	.2387	68	625
11.4	23.2	.4914	22.6	19.4	3.7	3.8	12.2	103.0	414.8	.2482	42	627
12.9	23.3	.5536	24.2	22.0	3.0	6.4	14.4	124.9	508.4	.2457	64	628
12.4	24.2	.5124	19.6	18.2	2.0	2.7	13.0	97.5	384.9	.2533	49	629
12.6	22.1	.5701	18.3	16.0	3.2	3.1	12.6	95.3	384.9	.2503	67	630

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
10.9	23.1	.4719	23.6	22.0	4.5	3.1	13.0	111.0	463.4	.2395	69	631
13.1	26.1	.5019	22.1	19.0	3.1	5.2	12.9	104.9	467.2	.2141	49	632
12.1	24.4	.4959	24.2	20.7	2.4	4.9	13.5	117.1	487.4	.2402	46	635
12.5	23.7	.5274	20.6	18.9	2.8	3.3	12.9	101.7	432.2	.2353	53	636
12.8	22.3	.5740	23.6	22.1	4.8	4.8	13.6	121.1	473.5	.2557	41	637
10.4	20.7	.5024	15.3	13.4	1.8	4.2	11.5	77.6	280.2	.2769	75	640
12.9	23.5	.5319	20.0	19.0	2.8	2.3	13.1	106.5	444.2	.2397	37	641
13.3	23.8	.5588	18.2	16.4	3.4	3.0	13.1	109.9	375.4	.2927	71	642
12.4	24.1	.5145	23.2	20.5	3.4	4.1	13.5	111.3	487.9	.2281	47	643
13.2	25.0	.5280	25.7	24.1	3.6	3.7	14.1	134.0	568.0	.2359	35	644
10.7	19.8	.5406	21.7	20.9	4.0	3.5	11.2	93.6	411.3	.2276	63	645
13.1	25.5	.5137	20.6	20.3	2.3	4.0	13.2	107.1	481.2	.2226	38	646
11.5	20.6	.5582	18.0	16.1	2.9	3.0	12.2	90.9	333.3	.2727	78	647
12.8	22.0	.5818	23.5	21.7	2.7	2.2	13.1	109.9	455.5	.2413	62	648
12.0	21.0	.5714	26.0	24.2	2.8	4.0	14.1	115.5	512.7	.2253	44	649
12.3	23.4	.5256	20.6	18.2	1.8	3.2	12.8	88.7	408.7	.2170	67	651
13.9	24.2	.5744	19.5	18.6	2.0	2.6	13.5	110.8	416.5	.2660	53	652
12.1	23.8	.5084	20.9	18.6	4.0	7.0	12.2	100.0	411.5	.2430	59	654
12.4	21.2	.5849	21.8	21.6	2.5	2.6	12.2	103.0	397.2	.2593	78	656
11.9	20.0	.5950	21.1	19.9	2.8	3.3	13.1	95.0	364.0	.2610	85	657
11.0	24.6	.4471	20.5	19.1	2.8	5.9	12.7	97.2	447.8	.2171	56	658
11.2	22.2	.5045	24.8	23.4	2.5	4.4	12.7	105.5	501.5	.2124	45	659
14.3	26.0	.5500	22.7	20.0	3.0	3.7	14.3	131.6	475.8	.2766	49	660
12.3	22.0	.5591	23.0	20.5	2.1	4.2	13.3	105.9	435.4	.2432	58	661
13.0	24.6	.5284	22.3	20.4	3.8	4.4	13.7	117.8	477.5	.2467	39	662
11.8	23.3	.5064	22.9	22.8	2.5	3.2	12.5	107.8	475.2	.2268	57	663
10.6	20.9	.5072	24.5	21.6	2.9	4.1	12.1	94.7	448.8	.2110	51	664
12.2	22.5	.5422	18.7	18.1	2.6	3.6	12.6	90.6	406.8	.2227	67	665
10.9	23.2	.4698	20.7	18.4	2.8	4.5	12.2	95.5	438.0	.2180	78	666
13.1	24.1	.5436	24.2	22.2	2.0	4.7	13.2	122.9	486.6	.2526	50	667
12.3	24.5	.5020	24.5	20.9	3.8	6.1	14.6	122.7	593.4	.2300	57	668
11.2	26.5	.4226	23.2	20.1	3.4	5.7	13.4	120.6	594.9	.2253	42	669
11.9	22.4	.5312	24.3	22.7	4.2	3.5	13.5	108.6	500.6	.2169	71	670
13.1	22.3	.5874	21.4	18.3	3.2	2.8	14.1	115.4	419.4	.2751	58	671
12.1	22.3	.5425	15.1	14.9	2.1	1.9	11.9	91.1	320.4	.2843	69	672
11.7	22.8	.5132	20.0	18.1	2.8	3.1	12.8	94.4	376.7	.2506	75	673
12.7	21.8	.5225	20.2	18.8	2.5	3.3	12.9	105.3	412.3	.2554	60	674
13.0	22.2	.5605	23.3	20.7	1.4	3.0	13.3	113.0	465.0	.2430	61	675
13.4	24.6	.5447	23.1	22.0	2.7	3.7	13.7	118.3	488.7	.2421	57	676
12.4	25.7	.4825	24.9	23.1	4.3	4.2	13.5	116.6	572.6	.2036	35	677
12.9	24.3	.5309	19.7	18.8	3.7	4.7	13.3	106.6	433.4	.2460	63	678

NON-ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
12.7	25.5	.4980	24.8	21.9	3.4	4.4	13.9	124.1	645.1	.1924	34	679
11.5	21.9	.5251	23.2	21.7	1.5	3.5	13.1	109.7	454.3	.2415	70	680
13.4	23.5	.5702	24.5	21.4	2.4	5.0	14.2	127.1	518.0	.2454	50	681
10.0	21.4	.4673	22.3	20.3	2.7	4.6	12.7	90.8	428.6	.2118	83	682
11.1	22.0	.5045	21.4	19.2	3.4	3.2	12.5	93.4	399.9	.2336	74	684
12.6	23.6	.5339	21.8	21.3	2.8	2.6	13.0	110.6	480.5	.2302	49	685
12.6	21.2	.5943	20.5	18.8	2.1	4.0	13.4	107.0	397.5	.2692	62	686
12.5	23.7	.5274	22.2	19.5	1.8	4.7	13.6	108.3	455.5	.2378	62	687
13.0	23.8	.5462	25.3	20.3	2.9	4.0	13.4	111.8	500.7	.2233	34	688
10.6	20.7	.5121	24.5	23.3	2.1	3.5	11.9	101.3	445.2	.2275	73	689
12.2	21.3	.5728	19.9	16.2	2.2	1.7	12.5	96.1	379.3	.2534	76	690
13.2	21.3	.6197	22.9	22.2	2.5	2.5	13.4	114.1	424.5	.2688	79	691
15.1	26.9	.5613	21.0	19.9	3.1	2.4	14.7	126.2	499.4	.2527	51	692

ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
14.8	26.7	.5543	22.4	20.2	5.6	5.7	14.6	130.8	500.1	.2615	40	694
13.0	25.7	.5058	23.8	21.9	3.2	4.6	14.1	125.3	527.2	.2396	38	695
13.0	25.6	.5078	25.0	22.6	2.3	4.7	13.9	119.5	501.0	.2385	60	697
12.4	27.6	.4493	23.0	20.8	3.7	6.3	14.6	129.2	553.8	.2333	45	698
12.4	25.4	.4882	20.0	17.3	2.4	3.0	12.8	95.5	429.6	.2293	43	700
12.4	25.2	.4921	21.7	18.5	1.5	6.0	13.4	112.6	462.8	.2433	55	701
12.8	24.6	.5203	19.9	16.2	2.3	3.9	13.9	105.1	405.3	.2618	59	702
13.1	25.4	.5157	17.3	17.2	2.3	4.0	12.7	105.0	446.1	.2354	66	703
12.7	22.7	.5595	19.3	18.2	1.9	2.7	13.2	107.0	407.3	.2627	55	704
13.6	25.7	.5292	21.2	20.7	2.2	3.4	13.2	113.5	501.7	.2262	42	705
12.5	23.9	.5230	20.8	19.4	4.0	5.4	13.7	115.3	462.6	.2492	48	706
13.4	27.2	.4926	20.2	16.7	3.4	6.9	14.0	112.6	433.4	.2598	32	707
12.1	25.2	.4618	18.5	19.1	2.8	3.7	12.4	99.3	431.9	.2304	46	708
15.6	25.6	.5865	18.0	16.1	3.2	4.3	14.8	130.1	420.2	.3096	53	714
12.7	25.5	.4980	20.3	18.4	2.7	2.7	12.9	103.9	399.1	.2603	65	715
13.2	24.0	.5500	20.2	18.2	2.3	3.1	13.7	117.7	435.6	.2702	41	716
14.4	25.6	.5625	18.4	15.7	2.3	2.8	14.0	119.1	415.0	.2870	46	718
13.9	26.5	.5245	21.2	17.4	2.8	4.7	14.5	120.8	451.4	.2676	54	719
15.0	29.5	.5085	21.7	19.3	3.7	4.1	15.9	142.8	551.4	.2508	44	720

ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
14.1	27.4	.5146	22.7	20.2	3.9	3.4	14.2	133.6	514.4	.2597	51	721
13.8	26.7	.5168	23.2	20.5	4.0	4.2	14.1	125.7	499.3	.2517	43	722
13.5	23.6	.5720	20.3	18.8	2.8	2.2	14.3	130.8	460.6	.2840	51	723
12.5	26.7	.4682	23.6	19.9	3.3	4.5	13.9	112.1	484.8	.2312	68	724
12.3	24.8	.4960	18.9	15.7	2.1	2.9	13.2	100.3	427.9	.2344	60	725
13.6	25.5	.5333	16.7	16.9	2.1	3.7	13.5	105.3	391.1	.2692	64	726
10.9	25.1	.4343	21.8	20.6	3.0	4.5	12.4	99.2	469.7	.2112	66	727
13.9	25.5	.5451	18.4	17.8	2.8	2.3	13.7	123.7	420.1	.2944	36	728
13.5	25.9	.5212	19.9	18.2	2.9	4.3	14.0	118.5	430.5	.2753	61	729
13.1	25.2	.5198	20.3	17.6	2.1	5.3	14.1	125.9	453.8	.2774	54	730
13.4	24.8	.5403	24.1	21.4	2.5	4.6	14.4	118.1	495.0	.2386	38	732
12.0	25.3	.4563	20.1	19.2	3.9	5.6	12.7	105.0	466.4	.2251	61	733
13.1	23.9	.5481	23.0	20.0	3.7	4.8	13.6	113.7	466.3	.2438	47	734
14.1	27.2	.5184	21.2	17.3	1.7	4.1	14.3	128.4	458.1	.2803	63	735
13.1	25.9	.5058	20.1	18.2	3.0	4.4	12.5	102.2	431.7	.2367	29	736
13.9	27.3	.5092	18.8	18.5	1.9	3.2	13.5	110.5	476.1	.2321	48	737
13.7	28.3	.4841	22.2	20.2	1.8	3.6	13.6	111.8	516.6	.2164	67	738
13.0	25.9	.5019	19.8	16.0	2.5	3.7	13.2	105.5	414.9	.2543	60	740
12.5	25.5	.4902	19.6	15.5	3.0	6.0	13.1	103.5	419.1	.2470	61	741
12.6	24.5	.5143	21.1	17.2	2.1	3.6	13.4	110.9	423.4	.2619	56	742
14.7	28.1	.5231	22.7	18.9	2.5	5.4	15.4	135.0	530.3	.2546	49	743
12.7	25.1	.5060	24.6	23.4	2.2	3.7	14.5	127.2	524.9	.2423	52	744
14.7	25.2	.5833	21.2	17.8	2.0	3.2	14.7	127.7	451.8	.2826	57	745
12.1	25.4	.4764	24.6	23.0	2.2	3.5	13.6	122.4	551.3	.2220	44	746
14.9	25.7	.5798	22.8	21.1	2.9	2.2	15.3	148.1	511.4	.2896	41	747
13.4	24.6	.5447	20.5	18.1	2.3	3.4	13.4	106.4	448.0	.2375	40	748
12.7	25.3	.5020	24.5	21.2	3.7	6.1	14.2	122.4	533.1	.2296	51	749
13.4	24.5	.5469	23.0	21.3	3.8	3.2	13.9	123.3	476.8	.2586	63	750
15.1	27.8	.5432	25.0	22.1	2.3	4.1	14.9	148.4	584.9	.2537	32	751
11.5	25.9	.4440	23.2	20.3	1.9	3.9	13.1	105.8	484.3	.2185	41	752
13.9	24.6	.5650	16.8	15.2	2.7	3.3	13.6	105.9	395.3	.2679	57	753
13.6	26.9	.5056	21.4	18.8	4.9	6.2	14.2	119.0	491.2	.2423	33	754
12.0	21.8	.5505	18.3	18.4	1.7	1.7	12.3	94.5	380.2	.2485	53	756
13.0	25.1	.5179	21.1	20.2	2.4	2.5	13.5	118.7	457.4	.2595	61	757
12.6	26.1	.4828	22.4	20.7	4.8	5.5	13.4	116.3	500.9	.2322	47	758
12.3	22.5	.5467	21.2	20.5	2.7	2.2	12.9	105.1	427.5	.2458	76	759

ADIPOSE WOMEN

14	15	16	17	18	19	20	21	22	23	24	25	No.
13.7	25.8	.5112	21.4	19.1	4.4	4.9	14.6	129.1	492.4	.2622	31	760
12.9	23.8	.5420	19.3	18.8	2.0	1.7	13.4	111.9	401.5	.2787	71	761
14.0	25.0	.5600	15.5	15.3	2.2	2.9	12.3	102.8	369.6	.2781	58	762
14.1	28.0	.5036	25.4	22.7	2.6	4.8	14.9	146.1	614.4	.2378	51	763
11.7	23.7	.4937	22.1	19.2	3.2	5.0	12.8	102.3	441.2	.2319	47	764
12.5	23.8	.5252	19.9	16.8	3.1	3.8	13.6	113.3	420.1	.2697	47	765
13.2	27.8	.4748	20.9	19.4	3.7	5.8	14.2	119.7	486.0	.2463	41	766
13.3	25.7	.5175	20.1	19.2	3.4	3.7	14.2	127.6	446.3	.2859	53	767
13.2	23.9	.5529	22.5	21.3	1.9	2.7	14.2	121.7	503.5	.2417	39	771
12.6	24.3	.5185	22.7	19.2	4.4	4.7	13.8	109.7	454.2	.2415	58	772
13.4	26.2	.5114	22.1	18.4	1.8	3.9	14.8	125.8	472.6	.2662	46	773
12.5	25.7	.4864	21.9	21.7	2.4	2.5	12.9	107.0	518.5	.2063	41	775
14.7	28.7	.5122	20.8	19.9	2.7	3.8	14.7	126.2	538.2	.2344	50	776
13.3	21.4	.6215	16.1	14.3	1.4	3.4	12.4	99.0	342.5	.2890	56	777
12.8	24.2	.5200	21.9	18.8	2.8	4.6	13.7	113.9	430.5	.2646	58	778
13.3	21.4	.6215	16.6	15.7	2.1	2.3	12.9	103.4	336.7	.2926	86	779
13.6	25.7	.5292	20.0	17.9	1.4	4.1	13.5	114.1	443.4	.2573	60	780
13.1	26.6	.4925	21.6	20.3	2.1	3.0	13.7	123.3	492.9	.2501	37	781
12.7	24.4	.5205	20.1	18.8	2.2	5.2	13.3	102.2	443.0	.2307	69	782
14.2	24.6	.5772	22.1	20.0	2.2	5.2	14.5	125.0	474.7	.2633	31	783
12.2	24.2	.5041	23.4	20.3	3.2	4.4	13.5	124.4	478.7	.2599	55	784
12.9	20.9	.6172	15.6	14.3	1.9	2.6	11.2	85.9	310.0	.2771	75	785
12.4	23.2	.5345	20.1	19.7	1.7	2.4	13.4	115.2	435.9	.2643	46	786
12.4	25.9	.4788	22.2	19.5	2.8	4.7	13.9	116.2	473.8	.2452	44	787
12.4	26.4	.4697	17.5	17.8	2.5	2.3	12.0	95.6	412.3	.2319	63	788
10.9	24.2	.4504	22.6	21.0	3.3	3.7	13.2	109.8	519.9	.2112	61	789
13.2	26.0	.5077	21.9	19.3	2.4	5.9	13.3	113.0	469.0	.2409	57	790
13.1	24.8	.5282	17.3	16.3	3.6	5.0	13.1	109.8	388.1	.2829	51	791
11.9	25.5	.4667	21.5	19.3	4.7	3.1	13.6	113.1	470.0	.2406	61	792
13.7	23.6	.5805	21.4	20.1	2.3	3.5	13.2	120.5	428.8	.2810	78	793
13.5	27.2	.4963	23.4	22.0	1.0	3.3	14.1	127.6	539.2	.2366	34	794
14.8	24.3	.6090	18.2	17.5	1.4	3.3	14.4	123.9	402.6	.3077	67	795
15.3	26.8	.5709	21.7	20.7	2.3	3.6	15.1	143.8	487.4	.2950	39	796
12.6	23.3	.5408	15.1	13.7	2.4	2.9	12.6	104.6	342.8	.3051	63	797
11.9	19.1	.6230	21.2	19.5	1.5	3.2	13.0	112.8	434.6	.2595	84	798
12.1	22.6	.5354	18.8	15.6	0.9	2.3	12.3	93.0	407.0	.2285	69	799
12.9	24.8	.5202	16.9	17.6	2.6	3.9	12.6	95.8	401.9	.2384	50	800
13.2	26.7	.4944	22.4	19.3	2.7	3.5	13.9	118.6	525.4	.2257	54	801
13.7	26.4	.5189	23.1	21.4	2.9	4.5	14.8	138.3	549.1	.2519	44	803
12.4	24.7	.5020	21.1	19.2	3.6	3.8	12.7	104.3	441.5	.2362	77	804

THE INFLUENCE OF ADIPOSITY ON PHYSICAL ATTRIBUTES IN HEALTHY OLDER WOMEN.

In the previous section the means and variabilities of attributes are considered in respect of healthy non-adipose men and women. It has been indicated that adiposity may influence variables. Consequently it is now appropriate to contrast the healthy non-adipose individuals with those who are healthy and adipose, bearing in mind that the criterion of adiposity in this context is that the person is more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948). There are no healthy adipose men in this series. Thus the comparison can be presented only for women.

The subsequent analysis is based on 198 healthy non-adipose women and 98 healthy adipose women within the restricted age range 60 to 74 years to minimise any influence exerted by age. Because of the inability to obtain accurate measurements from X-ray films of the chest in certain of these women, the variables derived from X-ray films of the chest are in terms of 165 healthy non-adipose women and 83 healthy adipose women.

The several variables are measured as previously described (page 14).

RESULTS.

The data in Table 27 (a to u) relate in particular to the means and their differences of the various attributes for non-adipose and adipose women aged 60 to 74 years. No significant mean difference is observed for the following variables.

1. Height.

The height means for the non-adipose and adipose women are 60·68 in. and 60·92 in. respectively.

2. Haemoglobin.

The haemoglobin means for the non-adipose and adipose women are 86·88 per cent and 87·94 per cent respectively. One hundred per cent = 14 g. haemoglobin in 100 c. cm. of blood.

3. Power of grip of left and right hands.

The means of the power of grip of left hand for non-adipose and adipose women are 64·83 lb. and 65·39 lb. respectively, and the corresponding means for the grip of right hand are 68·66 lb. and 68·29 lb.

4. Pulse rate.

The pulse rate for the non-adipose and adipose women presents means of 77·35 and 78·39 per minute respectively.

5. Kyphotic angle.

The kyphotic angle means for the non-adipose and adipose women are 50·78 degrees and 51·78 degrees respectively.

A significant mean difference is recorded for the following variables with the mean of the adipose women showing the greater value.

1. Weight.

The weight means for the non-adipose and adipose women are 129·06 lb. and 175·17 lb. respectively. The purpose of presenting this comparison for body weight is to indicate the real difference which exists between the non-adipose and adipose groups of women, and that these two groups may with reason be regarded as representing two completely different populations.

2. Systolic blood pressure.

The systolic blood pressure means for the non-adipose and adipose women are 163·01 mm. Hg. and 195·61 mm. Hg. respectively. Table 28 and Figure 19 show the systolic blood pressure means for varying degrees of adiposity. Over 24 per cent ideal weight there is a marked increase in systolic blood pressure values. A maximum in the mean values of 204·2 mm. Hg. is attained for systolic blood pressure at 45 - 54 per cent over ideal weight. Thereafter the systolic blood pressure means remain at a high uniform level uninfluenced by further increase in adiposity.

3. Diastolic I blood pressure.

The diastolic I blood pressure means for the non-adipose and adipose women are 86·16 mm. Hg. and 98·65 mm. Hg. respectively. Table 28 and Figure 19 show the diastolic I blood pressure means in relation to the degree of adiposity. These means follow the same trend as described for the systolic blood pressure means, with a maximum average value of 104·5 mm. Hg. at 45 - 54 per cent over ideal weight.

4. Diastolic II blood pressure.

The diastolic II blood pressure means for the non-adipose and adipose women are 77·03 mm. Hg. and 88·69 mm. Hg. respectively.

5. Transverse heart diameter.

The transverse diameter of heart means for the non-adipose and adipose women are 12·22 cm. and 13·16 cm. respectively. Table 29 and Figure 20 show the transverse heart diameter means in relation to the degree of adiposity. With increase in percentage over ideal weight there is an increase in the transverse heart diameter means until a maximum value of 13·8 cm. is reached at 55 - 64 per cent over ideal weight.

6. Transverse diameter of chest.

The transverse chest diameter means for the non-adipose and adipose women are 24·41 cm. and 25·39 cm. respectively.

7. Long heart diameter.

The long heart diameter means for the non-adipose and adipose women are 13·15 cm. and 13·67 cm. respectively.

8. <u>Frontal area of cardiac silhouette</u>.

The frontal cardiac silhouette means for the non-adipose and adipose women are 106·79 sq. cm. and 115·86 sq. cm. respectively. Table 30 and Figure 21 show the frontal cardiac silhouette means for varying degrees of adiposity. These means show no material increase with adiposity until the 24 per cent over ideal weight level is reached. Thereafter increasing degrees of adiposity are significantly related to an increase in the means of the frontal cardiac silhouette, with a maximum in the mean values of 118·6 sq. cm. being attained at 55 - 64 per cent over ideal weight.

9. <u>Cardiothoracic ratio</u>.

The cardiothoracic ratio means for the non-adipose and adipose women are 0·5023 and 0·5196 respectively. Table 31 and Figure 22 show the cardiothoracic ratio means for varying degrees of adiposity. Over 24 per cent ideal weight there is a significant increase in the means with increasing degrees of adiposity, and the maximum mean value of 0·5334 is reached at 55 - 64 per cent over ideal weight.

10. The <u>cardiothoracic area ratio</u> for the non-adipose and adipose women presents means of 0·2252 and 0·2527 respectively. Table 31 and Figure 22 show that the cardiothoracic area ratio means for varying degrees of

adiposity parallel closely the trend observed for the cardiothoracic ratio, with a maximum mean value of 0·2682 being attained at 55 - 64 per cent over ideal weight.

A significant mean difference is recorded for the following variables with the mean of the adipose women showing the lesser value.

1. <u>Height of left hemithorax</u>.

The means of the height of left hemithorax for the non-adipose and adipose women are 22·09 cm. and 20·90 cm. respectively.

2. <u>Height of right hemithorax</u>.

The means of the height of right hemithorax for the non-adipose and adipose women are 20·32 cm. and 18·92 cm. respectively.

3. <u>Height of left diaphragm</u>.

The means of the height of left diaphragm for the non-adipose and adipose women are 3·32 cm. and 2·74 cm. respectively.

4. <u>Height of right diaphragm</u>.

The means of the height of right diaphragm for the non-adipose and adipose women are 4·35 cm. and 4·00 cm. respectively.

5. <u>Frontal area of chest</u>.

The frontal chest area means for the non-adipose and adipose women are 477·74 sq. cm. and 460·44 sq. cm. respectively.

The absolute variability, of which the standard deviation is a measure, may be regarded as comparable for the non-adipose and adipose groups of women for the variables height, pulse rate, transverse heart diameter, transverse chest diameter, heights of the left and right halves of the thorax, heights of the left and right halves of the diaphragm, long heart diameter, cardiothoracic ratio and cardiothoracic area ratio. The absolute variability may be considered as greater in the non-adipose group of women for the variables haemoglobin, power of grip, frontal area of chest and kyphotic angle, and as greater in the adipose group of women for the variables body weight, systolic and diastolic blood pressures, and the area of the frontal cardiac silhouette.

The relative variability, of which the coefficient of variation is a measure, may be regarded as comparable for the non-adipose and adipose groups of women for the variables systolic blood pressure, pulse rate, transverse heart diameter, transverse chest diameter, right hemithorax, long heart diameter, cardiothoracic ratio and cardiothoracic area ratio. The relative variability may be considered as greater in the non-adipose group of women for the variables height, body weight, haemoglobin, power of grip, frontal area of chest and kyphotic angle, and as greater in the adipose group of women for the variables diastolic I blood pressure, diastolic II blood pressure, left hemithorax, left and right halves of diaphragm, and the area of the frontal cardiac silhouette.

DISCUSSION.

The data presented indicate that excessive weight has a significant influence on the average values of certain important variables. It is desirable, therefore, in any study of the frequency distributions of variables, unless the influence of adiposity is taken into account by employing a suitable statistical technique, to exclude those individuals who are adipose. Otherwise erroneous concepts may arise concerning the mean values, absolute and relative variabilities of attributes which are dependent on body weight. I have selected 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948) as the level beyond which healthy adipose people may be rejected from a normal series. This is rather arbitrary, and other investigators might well select some other criterion for the purpose of exclusion. Table 32 and Figure 23, which relate to the kyphotic angle, are presented to show the trend of a variable with increase in adiposity when that variable is uninfluenced by adiposity.

Compared with the non-adipose women, the adipose women show significant decreases in the frontal area of the chest and the heights of the left and right halves of the thorax and diaphragm, and a significant increase in the transverse diameter of the chest. Thus as women become markedly adipose real changes occur in the frontal chest area and in the shape of the thorax as judged from studies of postero-anterior X-ray films of chest. The significant decrease in the frontal area of the chest with adiposity cannot be due to kyphosis, as there is no significant difference between the kyphotic angle means of the non-adipose and adipose women. Consequently the decrease in the frontal chest area may be assumed to be due to elevation of the diaphragm, and this would account for the significant decrease in the heights of the left and right halves of the thorax. However, there is a significant decrease in the heights of the left and right halves of the diaphragm which indicates flattening of the diaphragm. This diaphragmatic flattening seems to be at variance with the postulation of diaphragmatic elevation. This apparent contradiction may be explained by regarding the significant increase of the transverse diameter of the chest with adiposity as indicating a splaying outwards of the lower ribs. This would raise the costo-phrenic angles in relation to the uppermost points of the left and right halves of the diaphragm. In this way flattening of the diaphragm might be associated with its elevation.

SUMMARY.

The means, relative and absolute variabilities of various attributes are contrasted for women in terms of non-adiposity and adiposity. The series is formed by 198 non-adipose and 98 adipose women aged 60 to 74 years for variables not derived from X-ray films, and 165 non-adipose and 83 adipose women for those which are obtained from X-ray films of the chest.

The critical level for adiposity is 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948).

It is shown that the majority of variables considered are significantly influenced by adiposity.

The influence of adiposity on the thoracic measurements is discussed. It is observed that the decrease in the frontal area of the chest associated with adiposity is linked with elevation and flattening of the diaphragm, and with outward displacement of the lower ribs.

Table 27.

(a)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of height for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (in.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (in.)
Non-adipose	198	60.68 ± 0.20	2.79	4.60	+ 0.24 ± 0.28
Adipose	98	60.92 ± 0.20	2.02	3.31	

The mean difference in height is less than its standard error. Thus the non-adipose and adipose women do not differ significantly in height.

(b)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of weight for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (lb.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (lb.)
Non-adipose	198	129.06 ± 1.30	18.23	14.12	+ 46.11 ± 2.60
Adipose	98	175.17 ± 2.26	22.33	12.75	

The mean difference in weight is 17.7 times its standard error. Thus the adipose women are really heavier than the non-adipose women.

(c)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of systolic blood pressure for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (mm. Hg.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (mm. Hg.)
Non-adipose	198	163·01 ± 1·68	23·60	14·48	+ 32·60 ± 3·36
Adipose	98	195·61 ± 2·91	28·86	14·75	

The mean difference in systolic blood pressure is 9·7 times its standard error. Thus the adipose women have a really higher systolic blood pressure than the non-adipose women.

(d)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of diastolic blood pressure for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (mm. Hg.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (mm. Hg.)
Non-adipose	198	86·16 ± 0·56	7·87	9·13	+ 12·49 ± 1·29
Adipose	98	98·65 ± 1·17	11·54	11·70	

The mean difference in diastolic I blood pressure is 9·7 times its standard error. Thus the adipose women have a really higher diastolic I blood pressure than the non-adipose women.

(e)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of diastolic II blood pressure for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (mm. Hg.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (mm. Hg.)
Non-adipose	191	77·03 ± 0·61	8·46	11·0	+ 11·66 ± 1·54
Adipose	96	88·69 ± 1·41	13·80	15·56	

The mean difference in diastolic II blood pressure is 7·6 times its standard error. Thus the adipose women have a really higher diastolic II blood pressure than the non-adipose women.

(f)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of haemoglobin for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (100%=14 g.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (100% = 14 g.)
Non-adipose	198	86·88 ± 0·85	11·94	13·74	+ 1·06 ± 1·16
Adipose	98	87·94 ± 0·78	7·77	8·83	

The mean difference in haemoglobin is less than its standard error. Thus the non-adipose and adipose women show no significant difference between their haemoglobin levels.

(g)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of the power of grip of left hand for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (lb.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (lb.)
Non-adipose	198	64·83 ± 0·64	9·08	14·00	+ 0·56 ± 0·95
Adipose	98	65·39 ± 0·70	6·92	10·58	

The mean difference in the power of grip of left hand is less than its standard error. Thus the non-adipose and adipose women do not differ significantly in the power of the grip of left hand.

(h)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of the power of grip of right hand for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (lb.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (lb.)
Non-adipose	198	68·66 ± 0·95	9·45	13·76	- 0·37 ± 0·95
Adipose	98	68·29 ± 0·67	6·64	9·72	

The mean difference in the power of grip of right hand is less than its standard error. Thus the non-adipose and adipose women do not differ significantly in the power of the grip of right hand.

(i)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of pulse rate for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (rate /min.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (rate per minute)
Non-adipose	198	77·35 ± 1·28	10·62	13·73	+ 1·04 ± 1·28
Adipose	98	78·39 ± 1·03	10·21	13·02	

The mean difference in pulse rate is less than its standard error. Thus the non-adipose and adipose women show no significant difference between their pulse rates.

(j)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of transverse diameter of heart for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	12·22 ± 0·06	0·72	5·89	+ 0·94 ± 0·11
Adipose	83	13·16 ± 0·10	0·90	6·84	

The mean difference is 8·5 times its standard error for transverse diameter of heart. Thus the adipose women have a really greater transverse diameter of heart than the non-adipose women.

(k)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of transverse diameter of chest for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	24·41 ± 0·14	1·74	7·13	+ 0·98 ± 0·22
Adipose	83	25·39 ± 0·18	1·62	6·38	

The mean difference is 4·4 times its standard error for transverse diameter of chest. Thus the adipose women have a really greater transverse diameter of chest than the non-adipose women.

(l)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of height of left hemithorax for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	22·09 ± 0·16	2·10	9·51	- 1·19 ± 0·30
Adipose	83	20·90 ± 0·25	2·25	10·76	

The mean difference is 4·0 times its standard error for height of left hemithorax. Thus the adipose women have a really smaller height of left hemithorax than the non-adipose women.

(m)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of height of right hemithorax for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	20·32 ± 0·16	2·10	10·33	− 1·40 ± 0·27
Adipose	83	18·92 ± 0·22	2·01	10·62	

The mean difference is 5·2 times its standard error for height of right hemithorax. Thus the adipose women have a really smaller height of right hemithorax than the non-adipose women.

(n)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of height of left diaphragm for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	3·32 ± 0·06	0·82	24·70	− 0·58 ± 0·11
Adipose	83	2·74 ± 0·09	0·84	30·66	

The mean difference is 5·3 times its standard error for height of left diaphragm. Thus the adipose women have a really smaller height of left diaphragm than the non-adipose women.

(o)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of height of right diaphragm for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	4·35 ± 0·08	1·00	23·00	- 0·35 ± 0·15
Adipose	83	4·00 ± 0·13	1·19	29·75	

The mean difference is 2·3 times its standard error for height of right diaphragm. Thus the adipose women may be regarded as having a statistically significant smaller height of right diaphragm than the non-adipose women.

(p)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of long heart diameter for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (cm.)
Non-adipose	165	13·15 ± 0·05	0·70	5·32	+ 0·52 ± 0·10
Adipose	83	13·67 ± 0·09	0·81	5·92	

The mean difference is 5·2 times its standard error for long diameter of heart. Thus the adipose women have a really greater long heart diameter than the non-adipose women.

(q)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of frontal area of cardiac silhouette for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (sq. cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (sq. cm.)
Non-adipose	165	106·79 ± 0·78	10·02	9·38	+ 9·07 ± 1·57
Adipose	83	115·86 ± 1·36	12·41	10·71	

The mean difference is 5·8 times its standard error for frontal area of cardiac silhouette. Thus the adipose women have a really greater frontal area of cardiac silhouette than the non-adipose women.

(r)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of frontal area of chest for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (sq. cm.)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (sq. cm.)
Non-adipose	165	477·74 ± 4·77	61·24	12·82	- 17·30 ± 7·59
Adipose	83	460·44 ± 5·91	53·83	11·69	

The mean difference is 2·3 times its standard error for frontal area of chest. Thus the adipose women may be regarded as having a statistically significant smaller frontal area of chest than the non-adipose women.

(s)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of cardiothoracic ratio for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E.	Standard deviations	Coefficients of variation	Mean difference ± S.E.
Non-adipose	165	0·5023 ± 0·0030	0·04	7·96	+ 0·0173 ± 0·0051
Adipose	83	0·5196 ± 0·0041	0·04	7·70	

The mean difference is 3·4 times its standard error for the cardiothoracic ratio. Thus the adipose women have a really greater cardiothoracic ratio than the non-adipose women.

(t)

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of cardiothoracic area ratio for the non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E.	Standard deviations	Coefficients of variation	Mean difference ± S.E.
Non-adipose	165	0·2252 ± 0·0017	0·02	8·89	+ 0·0275 ± 0·0029
Adipose	83	0·2527 ± 0·0024	0·02	7·91	

The mean difference is 9·5 times its standard error for the cardiothoracic area ratio. Thus the adipose women have a really greater cardiothoracic area ratio than the non-adipose women.

The means ± S.E., standard deviations, coefficients of variation and mean difference ± S.E. of kyphotic angle for non-adipose and adipose women aged 60 to 74 years.

	Number	Means ± S.E. (degrees)	Standard deviations	Coefficients of variation	Mean difference ± S.E. (degrees)
Non-adipose	165	50·78 ± 1·01	13·02	25·64	+ 1·00 ± 1·61
Adipose	83	51·78 ± 1·26	11·44	22·09	

The mean difference is less than its standard error for kyphotic angle. Thus the difference between the kyphotic angle means is not significant for non-adipose and adipose women.

Table 28.

The systolic and diastolic I blood pressure means of women aged 60 to 74 years for varying percentages over ideal weight. Estimated from Anderson's nomogram.

	Percentage over ideal weight									
	0 or less	1 - 6	7 - 12	13 - 18	19 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and more
Number of cases	76	28	28	30	36	39	24	16	9	10
Means. mm. Hg.										
Systolic	165·8	156·1	173·6	160·1	161·3	190·7	195·4	204·2	200·0	197·4
Diastolic I	86·4	85·3	87·9	85·1	85·8	95·3	98·1	104·5	98·4	103·8

Table 29.

The transverse heart diameter of women aged 60 to 74 years for varying percentages over ideal weight. Estimated from Anderson's nomogram.

	Percentage over ideal weight									
	0 or less	1 - 6	7 - 12	13 - 18	19 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and more
Number of cases	61	20	25	27	32	31	21	15	9	7
Means. cm.	11·8	12·0	12·5	12·5	12·7	12·8	13·0	13·5	13·8	13·4

Table 30.

The frontal cardiac silhouette means of women aged 60 to 74 years for varying percentages over ideal weight. Estimated from Anderson's nomogram.

	0 or less	1 - 6	7 - 12	13 - 18	19 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and more
Number of cases	61	20	25	27	32	31	21	15	9	7
Means. sq. cm.	105·3	107·7	106·8	108·4	107·7	114·7	115·8	115·5	118·6	118·6

Table 31.

The cardiothoracic ratio and cardiothoracic area ratio means of women aged 60 to 74 years for varying percentages over ideal weight. Estimated from Anderson's nomogram.

	Percentage over ideal weight									
	0 or less	1 - 6	7 - 12	13 - 18	19 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and more
Number of cases	61	20	25	27	32	31	21	15	9	7
Means.										
Cardiothoracic ratio	0·5031	0·4964	0·5116	0·4952	0·5032	0·5098	0·5172	0·5322	0·5334	0·5256
Cardiothoracic area ratio	0·2203	0·2208	0·2314	0·2276	0·2306	0·2456	0·2509	0·2607	0·2682	0·2530

Table 32.

The kyphotic angle means of women aged 60 to 74 years for varying percentages over ideal weight. Estimated from Anderson's nomogram.

	Percentage over ideal weight									
	0 or less	1 - 6	7 - 12	13 - 18	19 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 and more
Number of cases	61	20	25	27	32	31	21	15	9	7
Means. degrees.	51·3	50·0	51·8	52·1	48·2	49·8	51·8	53·1	56·0	52·3

Mean blood pressure values for different percentage over ideal weight ————

Projected mean blood pressure values for non-adipose – – – – –

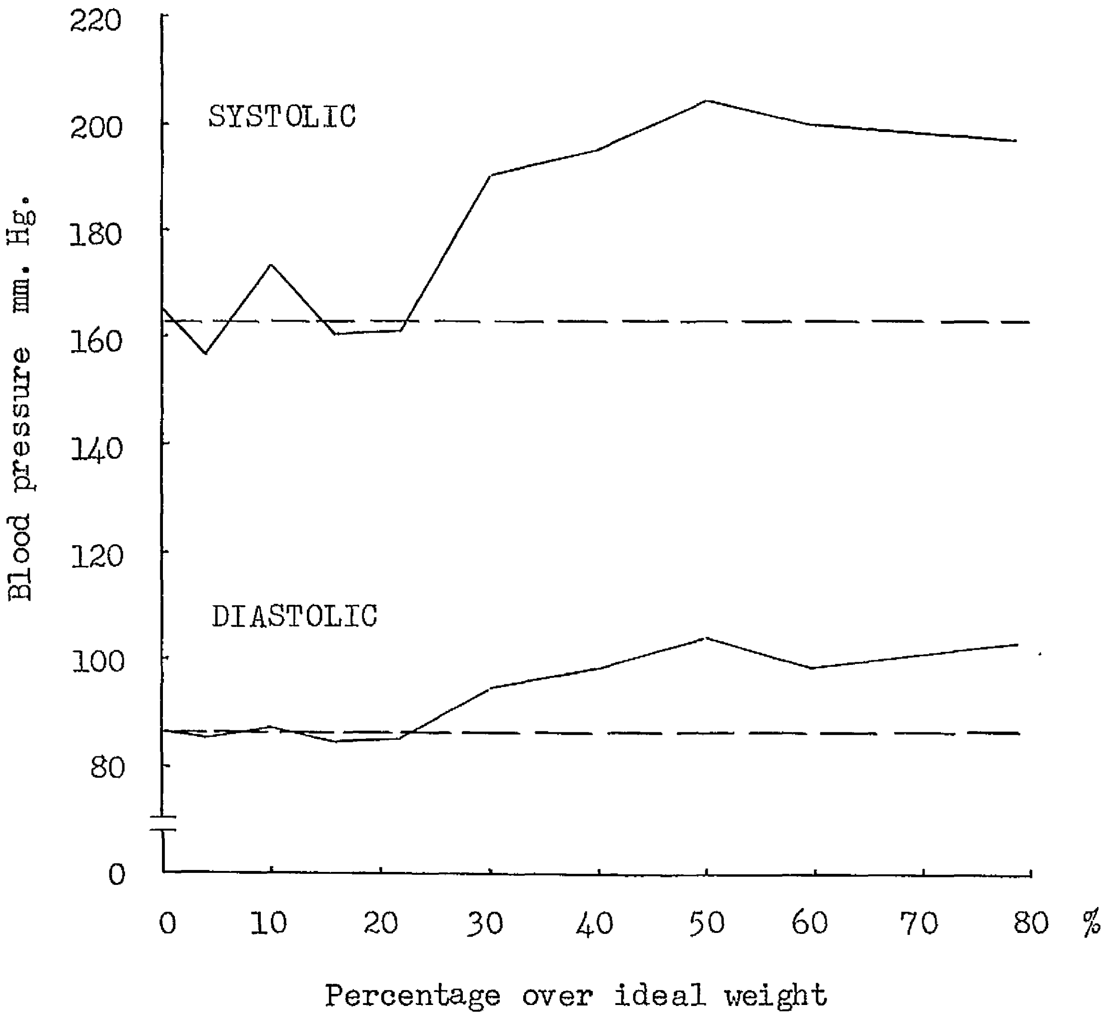


Figure 19. The systolic and diastolic blood pressure means of all the women in the series in relation to the degree of adiposity.

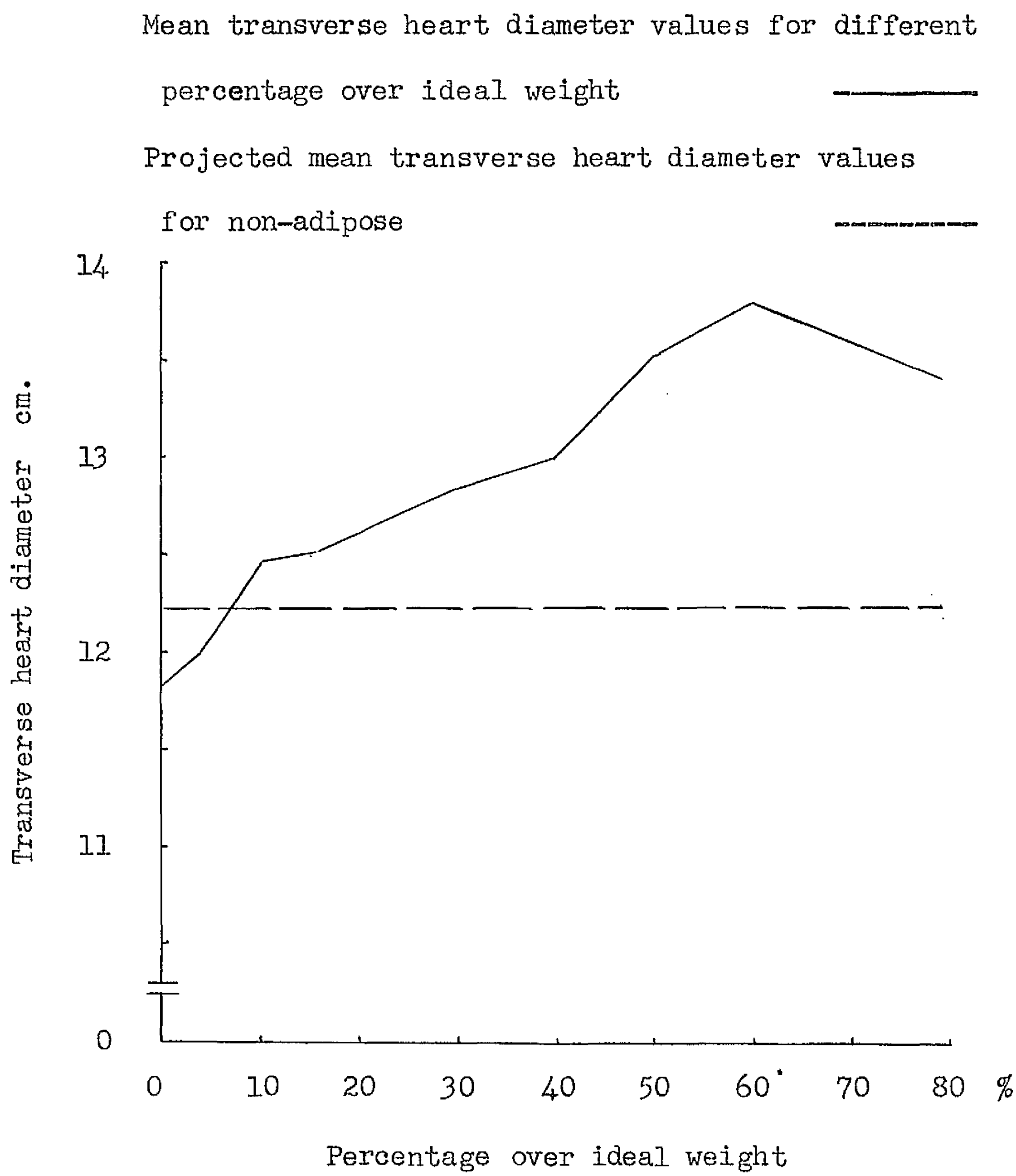


Figure 20. The transverse heart diameter means of all the women in the series in relation to the degree of adiposity.

Mean frontal cardiac silhouette values for different percentage over ideal weight ———

Projected mean frontal cardiac silhouette value for non-adipose – – – –

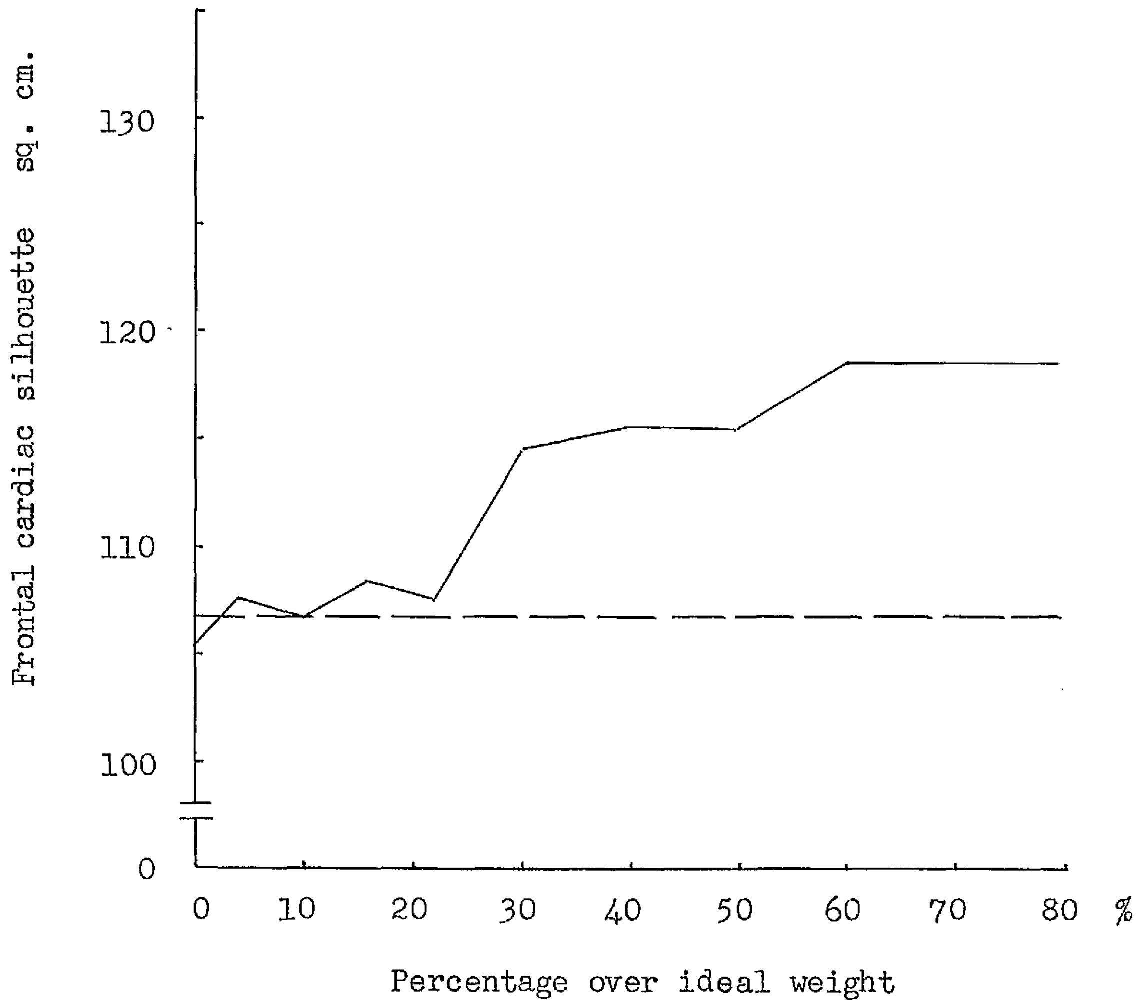


Figure 21. The frontal cardiac silhouette means of all the women in the series in relation to the degree of adiposity.

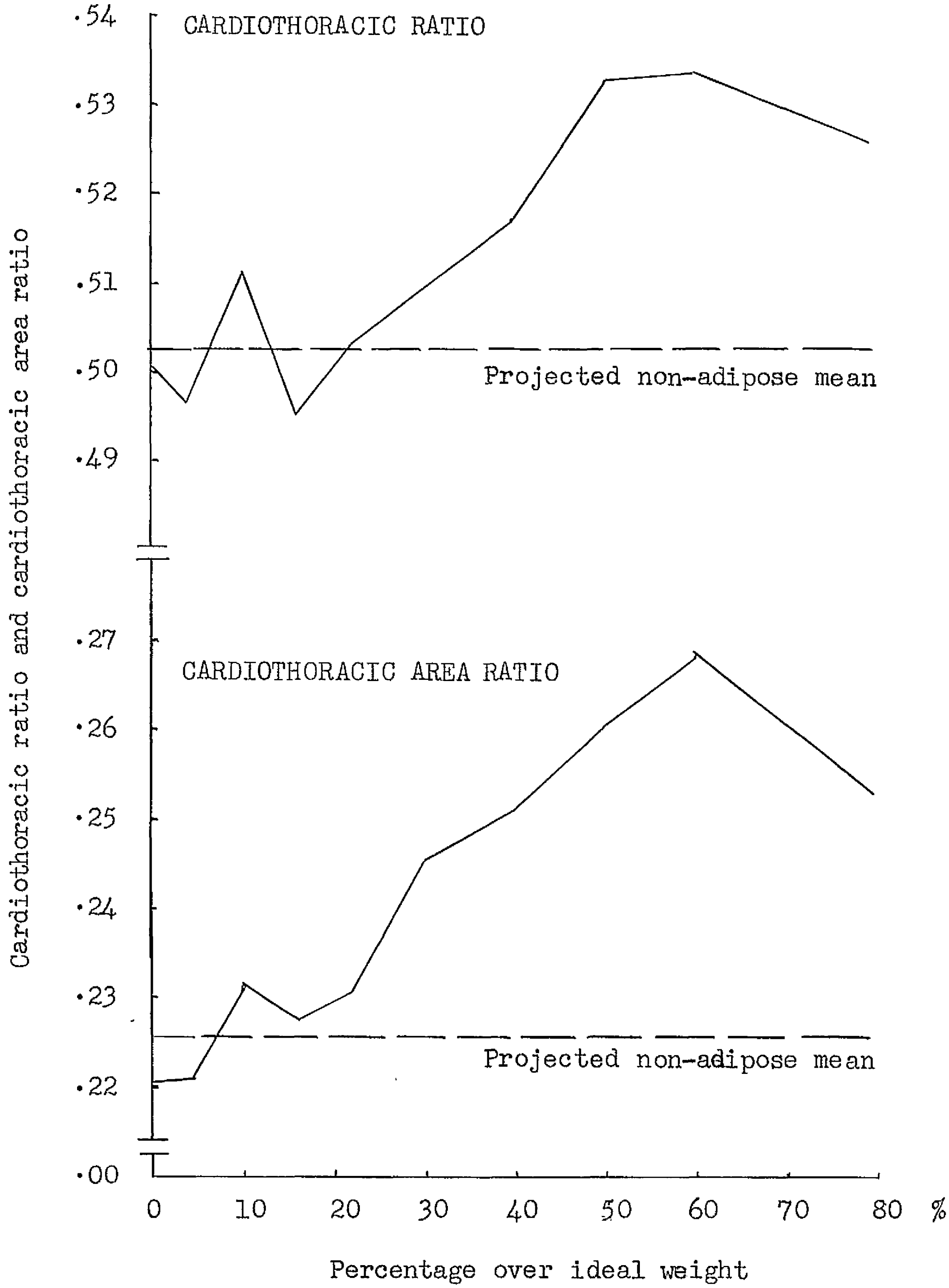


Figure 22. The cardiothoracic ratio and cardiothoracic area ratio means of all the women in the series in relation to the degree of adiposity.

Mean kyphotic angle values for different percentage over ideal weight

Projected mean kyphotic angle value for non-adipose

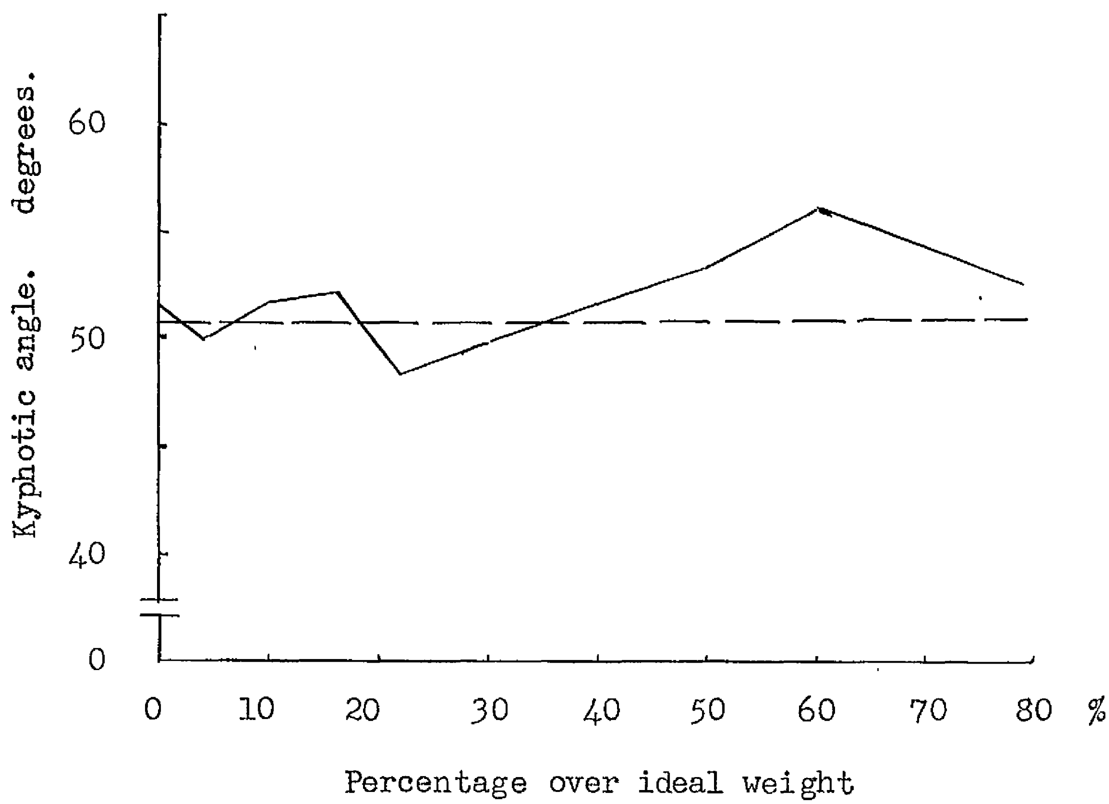


Figure 23. The kyphotic angle means of all the women in the series in relation to the degree of adiposity.

The following is a listing of the percentage over ideal weight values for the 293 healthy non-adipose women and the 111 adipose women otherwise well. The case numbers are also shown. 0 represents ideal weight or less than ideal weight.

NON-ADIPOSE WOMEN.

No.	%	No.	%	No.	%	No.	%	No.	%
401	22	444	24	486	22	528	12	571	0
402	18	445	6	487	0	529	0	572	14
403	14	446	12	488	2	530	20	573	16
404	0	447	0	489	4	531	8	574	0
405	0	448	4	490	24	532	0	575	20
406	24	449	0	491	0	533	24	576	14
407	0	450	10	492	12	534	0	577	4
408	22	451	12	493	0	535	10	578	0
409	2	452	20	494	0	536	20	579	12
410	12	453	4	495	0	537	0	580	20
411	6	454	12	496	0	538	2	581	4
412	22	455	12	497	0	539	0	582	0
413	24	456	6	498	0	540	16	583	0
414	24	457	0	499	8	541	6	584	24
415	18	458	14	500	22	542	0	585	4
416	14	459	4	501	24	543	10	586	0
417	4	460	18	502	0	544	0	587	24
418	0	461	0	503	22	545	12	588	4
419	0	462	0	504	0	546	16	589	0
420	2	463	2	505	0	547	18	590	0
421	24	464	0	506	14	548	10	591	22
422	20	465	0	507	0	549	0	592	0
423	0	466	12	508	0	550	0	593	0
424	0	467	14	509	0	551	10	594	2
425	0	468	14	510	2	552	10	595	12
426	24	469	0	511	0	553	8	596	8
427	18	470	2	512	8	554	0	597	18
428	0			513	0	555	4	598	0
429	0	471	20	514	24	556	0		
430	18	472	0	515	14	557	18	599	0
431	0	473	10	516	0	558	0	600	0
432	20	474	0	517	14	559	24	601	0
433	22	475	0	518	4	560	8	602	0
434	14	476	0	519	0	561	12	603	0
435	14	477	0	520	18	562	0	604	0
436	16	478	18	521	22	563	14	605	0
437	24	479	0	522	0	564	20	606	16
438	22	480	6	523	18	565	0	607	0
439	24	481	12	524	4	566	18	608	8
440	0	482	24	525	12	567	16	609	24
441	0	483	0	526	4	568	0	610	0
442	4	484	4	527	0	569	20	611	0
443	0	485	8			570	0	612	0

NON-ADIPOSE WOMEN.

No.	%	No.	%	No.	%	No.	%	No.	%
613	0	629	4	645	0	661	16	677	0
614	4	630	6	646	0	662	6	678	0
615	2	631	0	647	18	663	12	679	0
616	4	632	14	648	0	664	0	680	0
617	2	633	0	649	0	665	22	681	0
618	4	634	0	650	6	666	0	682	0
619	0	635	0	651	0	667	12	683	0
620	0	636	2	652	24	668	0	684	0
621	4	637	0	653	18	669	0	685	10
622	24	638	4	654	0	670	0	686	12
623	0	639	0	655	16	671	0	687	10
624	6	640	0	656	0	672	24	688	0
625	24	641	2	657	0	673	24	689	0
626	2	642	4	658	8	674	0	690	10
627	24	643	0	659	0	675	0	691	0
628	4	644	0	660	22	676	20	692	12
								693	0

ADIPOSE WOMEN.

694	32	714	62	733	26	753	54	772	32
695	42	715	64	734	26	754	40	773	38
696	42	716	46	735	54	755	36	774	80
697	36	717	46	736	32	756	40	775	46
698	30	718	34	737	52	757	58	776	38
699	26	719	62	738	48	758	34	777	32
700	36	720	46	739	44	759	26	778	30
701	34	721	44	740	60	760	54	779	36
702	38	722	52	741	36	761	52	780	74
703	102	723	46	742	46	762	46	781	104
704	68	724	34	743	64	763	32	782	58
705	42	725	36	744	68	764	28	783	32
706	32	726	72	745	56	765	36	784	36
707	30	727	38	746	26	766	34	785	52
708	28	728	56	747	44			786	26
709	32	729	30	748	32	767	42	787	26
710	26	730	40	749	28	768	32	788	34
711	34	731	82	750	38	769	30	789	26
712	26			751	68	770	68	790	26
713	28	732	38	752	36	771	28	791	54

ADIPOSE WOMEN.

No.	%
792	34
793	26
794	52
795	46
796	84
797	34
798	38
799	42
800	34
801	42
802	58
803	38
804	44

The following is a listing of the observations for certain variables with reference to groups formed from percentages of ideal weight. The age range is 60 to 74 years. The data refer to healthy women.

Systolic and diastolic blood pressure
mm. Hg.

Less than 2 %		Less than 2 %		2 % - 6 %		8 % - 12 %		14 % - 18 %	
Sys.	Dias.	Sys.	Dias.	Sys.	Dias.	Sys.	Dias.	Sys.	Dias.
132	80	202	108	158	72	186	92	148	72
124	76	174	86	162	88	162	90	162	82
132	90	174	88	136	88	164	82	188	96
140	88	176	92	158	80	168	92	142	74
132	82	164	74	144	88	186	92	176	74
164	90	194	92	132	68	194	90	148	86
170	98	146	82	156	82	154	92	126	70
140	78	178	86	174	94	144	86	118	80
140	84	162	88	152	84	166	80	122	88
180	88	162	88	168	98	188	96	170	90
144	88	156	86	146	98	182	94	124	74
158	92	138	88	196	98	186	92	172	94
154	78	148	78	136	88	174	90	170	84
138	80	174	84	126	84	144	82	188	88
162	88	156	84	148	82	186	100	214	108
180	88	186	84	186	92	210	96	188	90
194	88	168	92	154	84	184	94	160	84
148	92	188	84	162	98	152	76	126	82
156	74	152	92	142	66	190	90	182	98
190	102	186	80	182	88	188	84	140	84
164	84	210	102	152	82	194	88	162	82
158	84	152	78	174	92	136	68	168	74
198	94	186	102	166	100	150	86	180	96
178	92	148	84	156	84	160	72	138	80
134	76	208	78	160	72	158	88	164	90
156	96	182	82	158	78	194	82	146	86
150	86	196	96	140	78	174	92	164	82
144	86	172	84	148	82	186	94	150	86
140	76	140	88					170	96
170	64	194	96					182	84
168	82	184	80						
176	94	148	84						
154	86	188	90						
198	96	174	78						
152	94	142	70						
192	86	146	86						
170	90	188	88						
184	90	192	94						

20 % – 24 %		26 % – 34 %		36 % – 44 %		46 % – 54 %		56 % – 64 %	
Sys.	Dias.	Sys.	Dias.	Sys.	Dias.	Sys.	Dias.	Sys.	Dias.
180	88	180	86	180	88	182	98	198	84
130	72	192	108	186	96	238	112	168	86
174	94	166	104	158	100	232	112	198	96
140	78	248	114	162	100	208	110	212	106
164	94	200	104	210	106	222	118	206	100
162	94	214	112	188	92	162	86	210	102
198	90	172	84	260	120	224	116	208	108
154	84	186	106	178	104	168	106	214	102
152	82	198	94	208	100	198	92	186	102
160	88	160	84	170	68	254	126		
196	94	142	76	188	96	192	108		
128	68	166	92	210	104	234	108		
148	82	162	90	172	90	148	82		
168	88	172	98	162	82	154	70		
162	94	188	96	210	102	254	120		
152	80	196	94	202	106	198	108		
138	68	182	98	212	98				
200	86	194	90	222	112				
150	80	246	102	210	110				
164	88	152	92	192	90				
142	82	158	92	222	98				
142	82	160	82	208	104				
158	92	176	96	182	100				
158	78	168	96	198	88				
174	86	198	96						
182	80	182	94						
190	88	180	98						
158	86	140	82						
154	92	260	98						
154	88	200	98						
174	80	194	78						
144	86	248	122						
180	96	212	98						
188	94	212	84						
168	92	236	108						
180	92	214	96						
		202	92						
		208	96						
		174	88						

66 % and more

Sys	Dias.
214	120
162	94
220	110
192	120
194	106
260	110
254	108
148	98
156	78
174	94

Transverse diameter of heart.	cm.
Frontal area of cardiac silhouette.	sq. cm.
Kyphotic angle.	degrees.

Loss than 2 %			Less than 2 %			2 % - 6 %		
T.D.	H. area.	K.A.	T.D.	H. area.	K.A.	T.D.	H. area.	K.A.
11.4	108.3	58	11.9	100.5	68	11.6	122.3	49
13.7	122.3	47	11.8	99.0	63	13.0	123.9	37
10.6	101.0	52	11.4	89.8	73	13.8	134.1	36
11.3	99.2	47	12.4	104.8	57	11.1	116.7	48
12.6	112.2	54	12.5	113.3	29	12.7	115.0	35
11.9	106.5	62	11.4	95.6	61	11.2	105.7	37
12.0	102.2	50	12.2	101.2	30	11.4	104.2	47
12.0	105.0	45	11.0	108.9	61	11.5	99.8	70
12.3	97.5	36	12.4	104.8	46	12.3	87.8	73
11.8	111.6	33	12.4	98.9	60	14.0	125.2	31
11.1	101.0	45	11.1	91.0	62	11.9	114.7	43
12.5	110.2	30	12.9	99.2	70	11.5	93.2	67
11.8	106.9	30	12.7	131.2	48	11.5	98.3	74
10.2	97.9	48	11.6	95.5	34	11.8	87.8	52
11.9	131.5	26	13.1	108.5	57	11.3	98.1	46
11.9	115.2	57	11.3	89.1	60	12.6	109.0	41
11.5	109.1	51	11.2	104.1	38	12.9	121.2	63
13.2	129.4	37				11.1	95.7	48
12.8	117.8	36				11.7	97.7	39
12.9	101.5	53				11.6	104.4	64
11.7	114.6	70						
10.8	107.3	77						
11.8	100.9	53						
12.1	119.1	28						
10.7	94.6	71						
11.3	111.6	51						
11.7	93.3	73						
10.9	105.4	49						
11.3	98.7	56						
11.8	96.9	50						
11.2	92.5	53						
9.7	86.6	71						
11.1	91.6	57						
11.7	106.0	43						
12.1	107.3	59						
13.1	115.9	59						
11.3	101.4	65						
11.7	106.6	40						
11.3	105.4	56						
11.3	115.8	45						
12.3	115.7	39						
11.8	95.9	65						
12.5	114.4	35						
12.7	104.6	52						

Transverse diameter of heart cm.
Frontal area of cardiac silhouette sq. cm.
Kyphotic angle degrees.

8 % – 12 %			14 % – 18 %			20 % – 24 %		
T.D.	H. area.	K.A.	T.D.	H. area.	K.A.	T.D.	H. area.	K.A.
12.9	100.7	48	11.5	96.9	80	11.7	102.8	71
12.2	113.4	40	11.9	103.3	41	13.0	114.2	45
12.0	116.0	67	10.8	98.4	56	13.2	118.8	30
13.0	121.5	38	13.3	106.0	58	12.6	111.6	34
12.8	104.0	28	12.3	101.3	38	12.4	107.7	54
12.2	119.0	43	13.4	112.3	40	12.4	108.6	48
12.7	102.0	46	12.7	120.2	27	12.2	107.6	36
12.7	108.2	71	13.7	107.3	38	11.5	101.2	38
13.2	108.3	52	12.1	99.7	57	12.2	104.1	59
13.4	110.5	22	12.2	78.5	50	13.5	107.2	43
12.2	100.1	49	12.9	115.0	33	11.9	102.9	32
10.7	104.3	43	12.8	100.0	38	13.9	125.5	38
11.0	105.1	44	13.3	130.6	51	13.1	118.3	23
11.6	97.8	58	12.9	100.3	70	13.6	121.7	67
12.4	94.4	76	11.3	104.0	63	13.0	104.0	34
12.4	109.2	44	12.9	120.5	44	13.5	113.0	31
13.0	106.5	54	13.4	111.1	70	11.2	92.5	63
11.4	83.4	76	12.5	134.9	39	12.0	100.7	66
13.5	113.5	59	12.0	101.9	65	12.4	102.0	57
11.8	106.5	63	11.7	111.1	48	13.3	110.3	46
12.9	110.8	60	12.5	105.6	65	12.1	91.7	47
12.5	101.0	63	12.5	98.1	60	12.2	109.0	43
13.1	119.8	55	12.8	116.6	69	12.7	95.1	53
12.5	105.8	38	12.8	103.4	45	12.8	136.4	41
13.4	107.9	38	11.9	100.7	56	12.7	101.1	40
			14.9	132.3	66	12.5	101.9	65
			13.0	105.0	47	11.8	100.7	40
						13.2	107.9	62
						14.2	124.7	58
						12.8	112.0	58
						13.2	120.4	68
						12.6	102.4	59

Transverse diameter of heart. cm.
Frontal area of cardiac silhouette. sq. cm.
Kyphotic angle. degrees.

25 % – 34 %

T.D.	H. area.	K.A.
12.1	99.5	46
13.4	112.6	32
12.5	115.3	48
13.5	118.5	61
12.5	112.1	68
14.4	119.1	46
12.4	112.6	55
12.4	123.2	45
14.8	130.8	40
13.2	119.7	41
11.7	102.3	47
14.1	146.1	51
12.3	105.1	76
12.6	116.3	47
12.7	122.4	51
13.4	106.4	40
12.1	122.4	44
13.1	102.2	29
13.1	113.7	47
12.0	105.0	61
13.2	113.0	57
10.9	109.8	61
12.4	95.6	63
12.4	[illegible]	44
12.4	115.2	46
12.2	124.4	56
14.2	125.0	31
12.8	113.9	58
13.3	99.0	56
12.6	109.7	58
13.2	121.7	39

36 % – 44 %

T.D.	H. area.	K.A.
13.1	125.9	54
10.9	99.2	66
12.3	100.3	60
14.1	133.6	51
13.6	113.5	42
12.8	106.1	59
12.4	98.5	43
13.0	119.5	60
13.0	126.3	38
12.5	113.3	47
12.0	94.5	53
13.6	119.0	33
11.5	105.8	41
13.4	123.3	63
14.9	148.1	41
12.5	108.5	61
13.4	118.1	38
13.3	103.4	88
14.7	126.2	50
13.4	125.8	46
13.3	127.6	53

46 % – 54 %

T.D.	H. area.	K.A.
13.5	150.8	51
13.8	125.7	43
15.0	149.8	44
13.2	117.7	41
14.0	102.8	58
12.9	111.9	71
13.7	129.1	31
13.9	105.9	57
12.6	110.9	56
13.7	111.8	67
13.9	110.5	48
14.1	128.4	63
13.1	109.8	51
12.9	85.9	75
12.5	107.0	41

56 % – 64 %

T.D.	H. area.	K.A.
13.9	123.7	36
13.9	120.8	54
12.7	103.9	65
15.6	130.1	53
13.0	118.7	61
14.7	127.7	57
14.7	135.0	49
13.0	105.5	60
12.7	102.2	69

66 % and more

T.D.	H. area.	K.A.
13.6	105.3	64
12.7	107.0	55
13.1	105.0	66
15.1	148.4	32
12.7	127.2	52
13.1	122.3	37
13.6	114.1	60

Cardiothoracic ratio.
Cardiothoracic area ratio.

Less than 2 %		Less than 2%		2 % - 6 %		8 % - 12%	
C.R.	C.A.R.	C.R.	C.A.R.	C.R.	C.A.R.	C.R.	C.A.R.
.4935	.2128	.4556	.1909	.4754	.2181	.5945	.2455
.5615	.2651	.4502	.1943	.5263	.2499	.5062	.2472
.4711	.1966	.5302	.2094	.4982	.2248	.4580	.2299
.4631	.1995	.5268	.2667	.4302	.1906	.5098	.2315
.5339	.2157	.5734	.2370	.4847	.2141	.5401	.2438
.5484	.2287	.4885	.2258	.4870	.2374	.5021	.2357
.4959	.2244	.5174	.2071	.4711	.2093	.4922	.2204
.5172	.2062	.5668	.2441	.5450	.2231	.5747	.2239
.5212	.2317	.5135	.2595	.5829	.2510	.5593	.2348
.4739	.2036	.5586	.2552	.5691	.2402	.5514	.2291
.4531	.2025	.5230	.2255	.4595	.2256	.4766	.2113
.4902	.2049	.4691	.2270	.4675	.2109	.4213	.2013
.4521	.1896	.4784	.2033	.5399	.2284	.4545	.1817
.4359	.1917	.4762	.2133	.5463	.2217	.4659	.2458
.4508	.2001	.5041	.2008	.4050	.1892	.5082	.2543
.5085	.2428	.5254	.2313	.5101	.2173	.5124	.2397
.4582	.1919	.5211	.2034	.5120	.2831	.4906	.1948
.5156	.2112	.5683	.2654	.4587	.1948	.5067	.2318
.5161	.2297	.5644	.2271	.4661	.1893	.5172	.2250
.4981	.2270	.5273	.2126	.4936	.1976	.5000	.2549
.5294	.2360	.5771	.2602			.5223	.2468
.4887	.2227	.5184	.2114			.5388	.2195
.5175	.2125	.4164	.1848			.5304	.2316
.4764	.2010					.4921	.2340
.4864	.2139					.5654	.2707
.4768	.2076						
.5652	.2637						
.4360	.2074						
.4978	.2066						
.4720	.2355						
.5022	.1929						
.4554	.1979						
.5286	.2438						
.4937	.2386						
.4821	.2257						
.5282	.2182						
.5330	.2494						
.5109	.2352						

Cardiothoracic ratio
Cardiothoracic area ratio

14 % - 18 %		20 % - 24 %		26 % - 34 %		36 % - 44 %	
C.R.	C.A.R.	C.R.	C.A.R.	C.R.	C.A.R.	C.R.	C.A.R.
.4713	.2292	.5132	.2488	.4618	.2304	.5198	.2774
.4938	.2440	.5462	.2545	.4926	.2598	.4343	.2112
.4030	.1846	.5156	.2520	.5230	.2492	.4960	.2344
.4981	.1842	.4649	.1938	.5212	.2753	.5146	.2597
.5104	.2237	.4679	.2097	.4682	.2312	.5292	.2262
.5276	.2471	.5103	.2287	.5625	.2870	.5203	.2618
.4568	.2000	.4639	.2113	.4921	.2433	.4882	.2293
.5661	.2618	.4637	.1962	.4493	.2333	.5078	.2385
.5171	.2371	.4420	.1930	.5543	.2615	.5058	.2396
.4480	.1994	.4530	.2076	.4748	.2463	.5252	.2697
.4491	.2375	.4667	.2356	.4937	.2319	.5505	.2485
.5614	.2526	.5129	.2245	.5036	.2378	.5056	.2423
.5038	.2252	.4746	.2286	.5467	.2458	.4440	.2185
.5536	.2605	.5151	.2209	.4828	.2322	.5469	.2586
.4686	.2063	.5462	.2497	.5020	.2296	.5798	.2896
.5139	.2421	.5625	.2238	.5447	.2375	.4902	.2470
.4945	.2132	.4462	.2076	.4764	.2220	.5403	.2386
.4941	.2465	.5021	.2461	.5058	.2367	.6215	.2926
.5172	.2461	.4593	.2274	.5481	.2438	.5122	.2344
.4643	.2256	.5096	.2350	.4563	.2251	.5114	.2662
.4960	.2215	.5525	.2390	.5077	.2409	.5175	.2859
.4753	.2280	.4822	.2231	.4504	.2112		
.5267	.2466	.5595	.2609	.4697	.2319		
.5079	.2285	.5289	.2244	.4788	.2452		
.4577	.2123	.5060	.2447	.5345	.2643		
.5085	.2256	.4980	.2300	.5041	.2599		
.4869	.2165	.4682	.2427	.5772	.2633		
		.5432	.2836	.5289	.2646		
		.5018	.2197	.6215	.2890		
		.5740	.2609	.5185	.2415		
		.5344	.2297	.5523	.2417		
		.5185	.2255				

Cardiothoracic ratio
Cardiothoracic area ratio

46 % – 54 %		56 % – 64 %		66 % and more	
C.R.	C.A.R.	C.R.	C.A.R.	C.R.	C.A.R.
.5720	.2840	.5451	.2944	.5333	.2692
.5168	.2517	.5245	.2676	.5595	.2627
.5085	.2608	.4980	.2603	.5157	.2354
.5500	.2702	.5865	.3096	.5432	.2537
.5600	.2781	.5179	.2595	.5060	.2423
.5420	.2787	.5833	.2826	.4925	.2501
.5112	.2622	.5231	.2546	.5292	.2573
.5650	.2679	.5019	.2543		
.5143	.2619	.5205	.2307		
.4841	.2164				
.5092	.2321				
.5184	.2803				
.5282	.2829				
.6172	.2771				
.4864	.2063				

Several of the variables previously described are of such importance in the estimation of heart size that I now propose to consider them in greater detail. The variables are presented in the following order: -

1. The cardiothoracic ratio.
2. The transverse diameter of the heart.
3. The frontal cardiac silhouette.
4. The cardiothoracic area ratio.

THE CARDIOTHORACIC RATIO.

This study of the cardiothoracic ratio (Danzer, 1919), which is also known as the heart lung coefficient (Kerley, 1950) and the heart-lung quotient (White, 1945) is based on the 363 men and 250 women who are regarded as healthy. As indicated earlier in this thesis I excluded those who had a haemoglobin under 11 g. Sahli, an apical systolic murmur greater than Grade 2 as described by Levine and Harvey (1949), an asymmetrical chest, and those who were 25 per cent or more over ideal weight as estimated from Anderson's nomogram (1948).

RESULTS.

The frequency distributions of the 363 men and the 250 women by sex and ten year age groups with reference to the cardiothoracic ratio are shown in Table 33. There is an upward trend of the distributions with age and for both sexes. Table 4 shows that the cardiothoracic ratio means for men increase with age from 0·43 for the age group 60 - 64 to 0·49 for the age group 85 - 89, and that the corresponding means for women are 0·50 and 0·54. Thus the means for women are greater than those for men at all ages. The absolute variation, of which the standard deviation is a measure, is similar for the sexes and shows little change with age. The relative variability, as shown by the coefficient of variation, is similar for the sexes and shows a slight increase with age for men.

All the subjects in this series were healthy and thus the entire ranges of the cardiothoracic ratio may be regarded as normal. It is of value, however, to possess upper and lower limits beyond which the occurrence of normal recordings are relatively infrequent. Opinions of what may be regarded as such limits vary from one observer to the next, but the 10th and 90th percentiles are convenient limits. On this criterion the central 80 per cent ranges of the distributions are certainly normal, while observations occurring outside these ranges, though also possibly normal, are more suspect, particularly those within the upper and lower 2·5 per cent extremes of the distributions. Cumulative percentage frequencies were calculated from the frequency distributions shown in Table 33, and the cumulative percentage curves drawn from these data are shown in Figures 24 and 25 for men and women respectively. In addition, the 10th, 50th (median) and 90th percentiles are shown for each age group. From these curves are obtained directly the selected percentile values for the cardiothoracic ratio which are shown in Table 34. Thus the lower and upper limits, as represented by the 10th and 90th percentiles, for the age groups 60 - 69, 70 - 79 and 80 - 89 are for men 0·40 and 0·48, 0·42 and 0·51, and 0·43 and 0·52 respectively. The corresponding figures for the women are 0·45 and 0·56, 0·47 and 0·57, and 0·49 and 0·59. Selected percentile limits are also shown in Figures 26 and 27 for men and women respectively.

The reasons that account for the increase in the cardiothoracic ratio with age are complex, and are not the same for men and women. The coefficients of correlation of the variables to age are of interest (Table 35). There is a significant positive correlation between age and the transverse diameter of the heart for men, but not for women. There is a significant negative correlation between age and the transverse diameter of the chest for women, but not for men. There is a significant positive correlation between age and the cardiothoracic ratio for both sexes.

DISCUSSION.

Opinions differ concerning the value of the cardiothoracic ratio. Kerley (1950) regards the cardiothoracic ratio as a fairly reliable guide to the size of the heart, since the shape of the heart is to a large extent dependent on the shape of the chest. White (1945), however, states that the cardiothoracic ratio is unreliable and unsatisfactory because of the extremely wide range of the normal, while Ungerleider and Gubner (1942) consider that it is crude and inexact, as the width of the chest is only a rough index of body stature and that it is altered in any given case by respiration. The concept of Kerley(1950) seems the most reasonable for more reasons than the one he records. The coefficient of variation is a measure of the relative variability or scatter of frequency distributions, and the approximate coefficient of variation of 7·7 for the cardiothoracic ratio indicates that, far from showing a wide range of normality, it has a most moderate variability. Indeed the other coefficients of variation in this thesis shown in Table 26 and the coefficients of variation for men, that are listed by Pearl (1930), reveal that the characteristics with coefficients of variation less than 7·7 are largely skeletal. Some of the coefficients of variation shown by Pearl (1930) to be greater than 7·7 are the intelligence quotient, 18·01; vital capacity, 17·90, and the respiration rate per minute, 17·80. In addition, the coefficient of variation of the systolic blood pressure of the patients in this series is about 13·0. Considering the assessment of systolic blood pressure no one would suggest that it be discarded, because the scatter of its frequency distribution is almost twice that of the cardiothoracic ratio and its method of recording is notoriously variable. It has been proved that in the recording of systolic blood pressure with the mercury manometer using a standard cuff there is a significant variation between successive recordings by two observers, and this observer difference may be as great as 36 mm. Hg. (Anderson and Cowan, 1961). Much more important than the criticism of the relative variability of the cardiothoracic ratio is the realisation that any range of normality which relates to the cardiovascular system must take cognisance of adiposity. It is known that adiposity exerts a significant influence on the cardiovascular system and, therefore, adiposity must be regarded fundamentally as a pathological entity to which normal limits do not apply. The adverse influence of respiration on the cardiothoracic ratio must be diminished in old age, because there is as I have shown earlier a significant negative correlation between age and chest expansion. Thus it is apparent that the cardiothoracic ratio, used judiciously and in conjunction with other clinical criteria, can be of assistance in the evaluation of borderline cases in the older age groups, where the cardiovascular system is suspect.

Danzer (1919) without stating the age or sex of his cases, recorded a range for the cardiothoracic ratio of 39 to 50 per cent with an average value of 45 per cent. This is similar to the ranges noted in this thesis for men, but is much less than the ranges for women. He stated that anything over 52 per cent was certainly pathological. This statement is not necessarily true for older men and is completely misleading in the case of older women for whom the 90th percentile levels for the age groups 60 - 69, 70 - 79, and 80 - 89 are 0·56, 0·57 and 0·59 respectively.

Tirman and Hamilton (1952) in a study of men aged 20 to 75 years, found no real increase in the average values for the maximum transverse diameter of heart or chest, but suggested that the increase in the size of the heart may be an aging feature, which is late in appearing to a significant extent. In this series, which deals more comprehensively with the higher age ranges, the increase in the transverse diameter of the heart with age is significant, while the average values for the chest diameter remain essentially stationary. This, however, only applies to men, while women show a significant negative correlation between the transverse diameter of the chest and age, with no correlation of any significance between the transverse diameter of the heart and age. Thus the significant positive correlation between the cardiothoracic ratio and age for both sexes is due to different causes. The extent to which adiposity by predisposing to disease and death is a factor in the production of the sex differences of the transverse diameters of heart and of chest in a healthy group of older men and women is speculative. It may be that the more marked kyphosis observed in women is the dominant cause.

SUMMARY.

The value of the cardiothoracic ratio in clinical medicine has been assessed with reference to 363 men and 250 women, aged 60 to 89 years who were in good health.

The 10th and 90th percentile limits of the cardiothoracic ratio for the age groups 60 - 69, 70 - 79, and 80 - 89 are for men 0·40 and 0·48, 0·42 and 0·51, and 0·43 and 0·52 respectively. The corresponding values for women are 0·45 and 0·56, 0·47 and 0·57, and 0·49 and 0·59. The application of the ratio of 1 : 2 to older women as a level of normality will give misleading information concerning the existence of cardiac enlargement.

Both sexes show a significant positive correlation between the cardiothoracic ratio and age. In men this is due to an increase in the maximum transverse diameter of the heart with age, while in women it is the result of a significant negative correlation between the maximum transverse diameter of the chest and age.

Table 33.

The number of cases by sex and ten year age groups with reference to the cardiothoracic ratio.

Cardiothoracic ratio	Men			Women		
	60 - 69 years	70 - 79 years	80 - 89 years	60 - 69 years	70 - 79 years	80 - 89 years
0·35	2					
0·37	6	1				
0·39	24	12	3	2		
0·41	27	13	4		2	1
0·43	35	32	9	4	3	
0·45	20	42	12	18	6	1
0·47	17	33	11	17	11	3
0·49	3	15	12	17	18	4
0·51	4	9	6	19	25	7
0·53	1	3	2	11	16	12
0·55		2	1	13	10	5
0·57		1	1	4	9	7
0·59				1		3
0·61						1
	139	163	61	106	100	44

Table 34.

Selected percentile values for the cardiothoracic ratio derived from the cumulative percentage curves shown in Figures 24 and 25, by sex and ten year age groups.

Percentiles	Men			Women		
	60 - 69 years	70 - 79 years	80 - 89 years	60 - 69 years	70 - 79 years	80 - 89 years
90	0·482	0·506	0·521	0·557	0·568	0·588
80	0·467	0·488	0·506	0·542	0·553	0·574
65	0·448	0·474	0·489	0·522	0·537	0·556
50	0·436	0·462	0·474	0·504	0·522	0·541
35	0·423	0·449	0·458	0·487	0·505	0·526
20	0·408	0·436	0·442	0·467	0·488	0·508
10	0·398	0·418	0·427	0·455	0·468	0·487

MEN

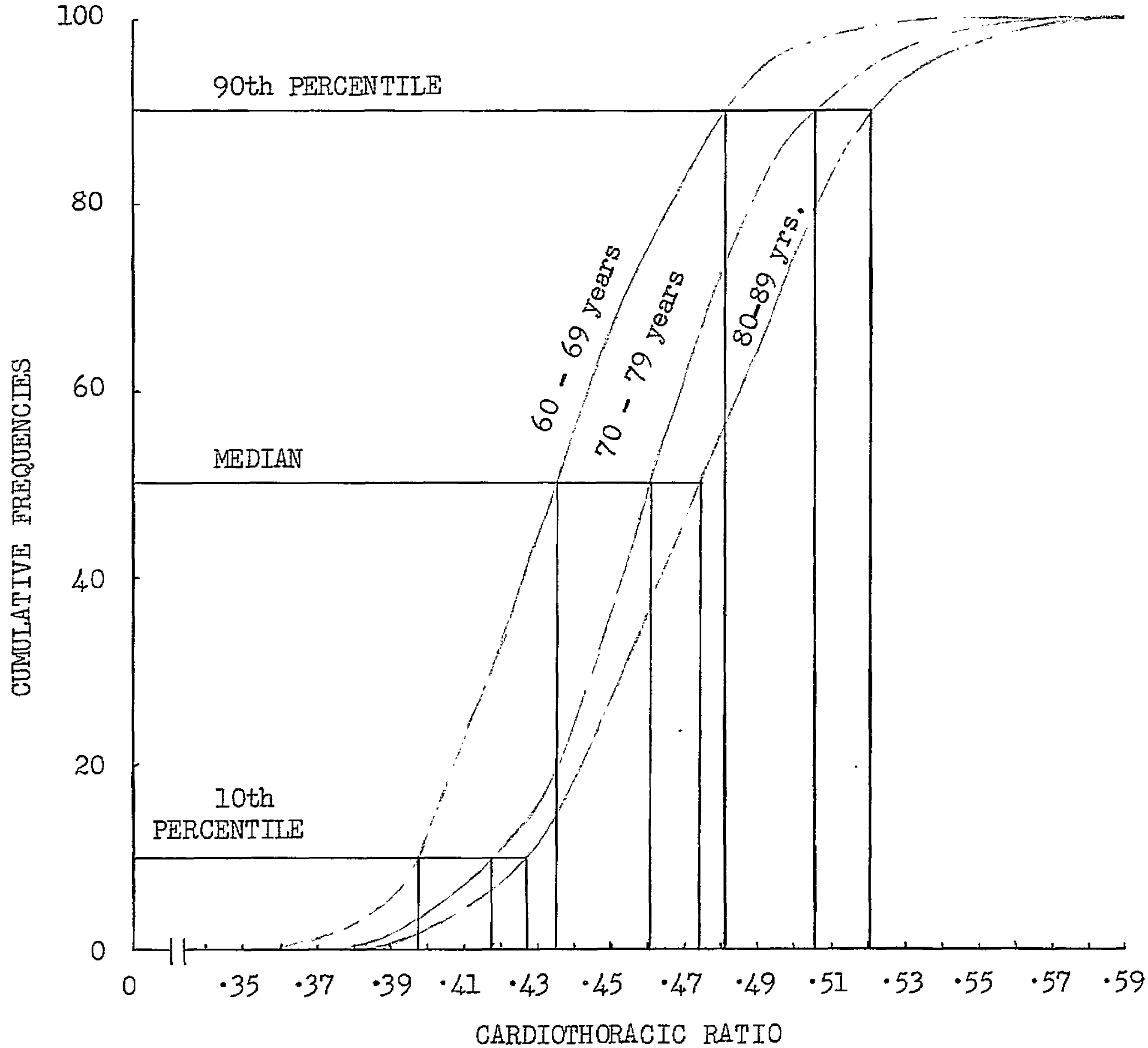


Figure 24. Cumulative frequency curves by ten year age groups of the cardiothoracic ratio for men.

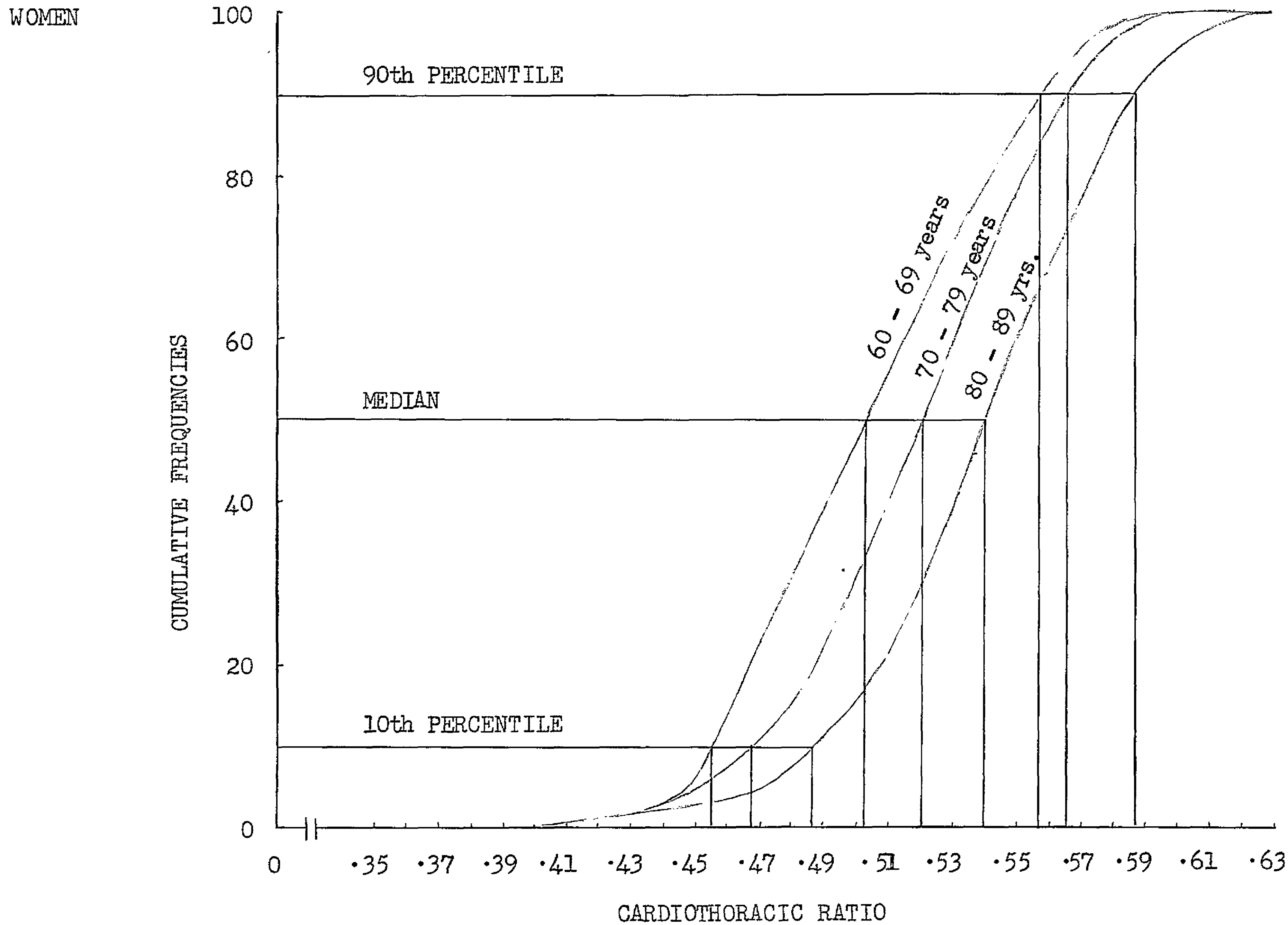


Figure 25. Cumulative frequency curves by ten year age groups of the cardiothoracic ratio for women.

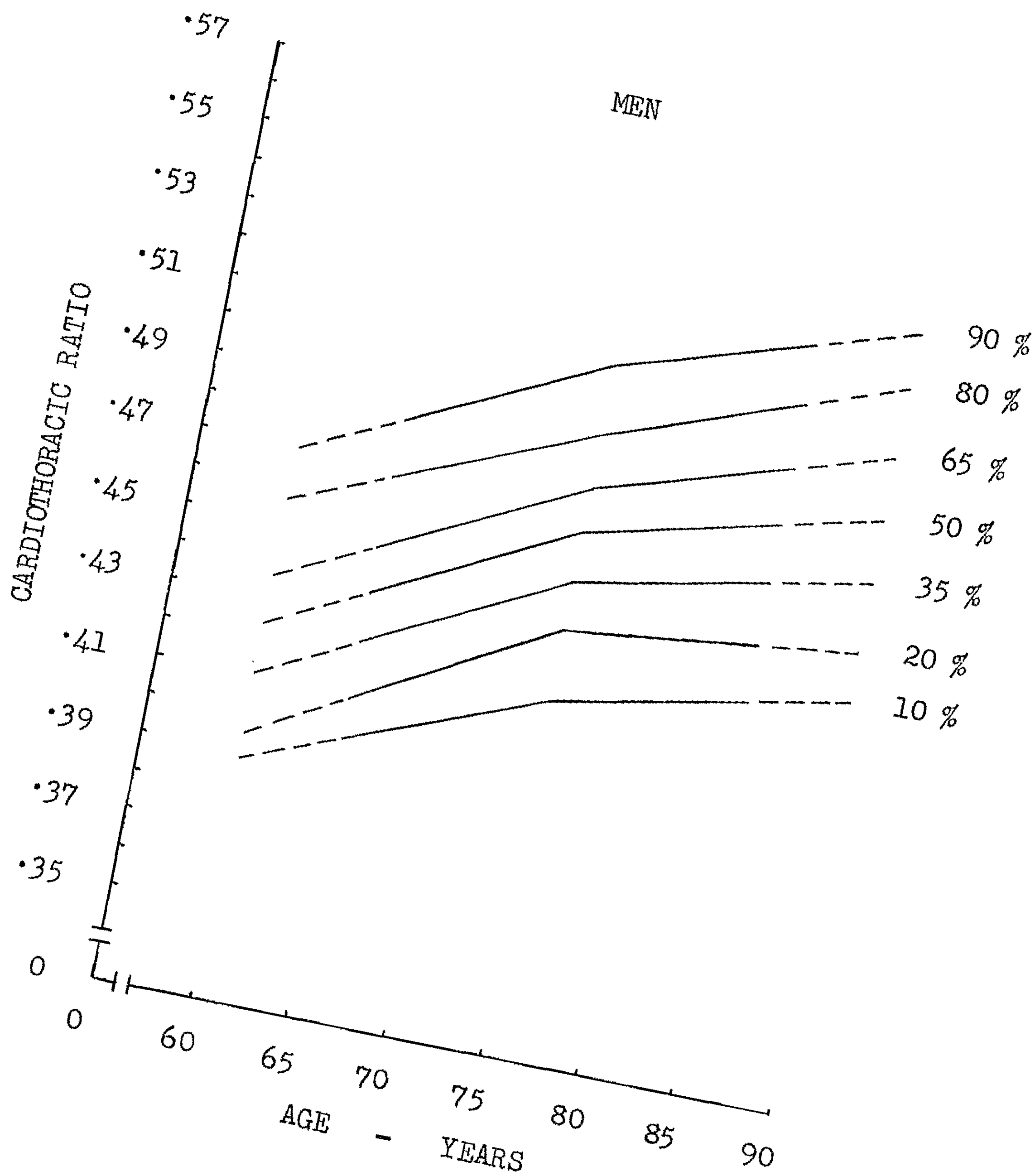


Figure 26. Selected percentile limits of cardiothoracic ratio for men.

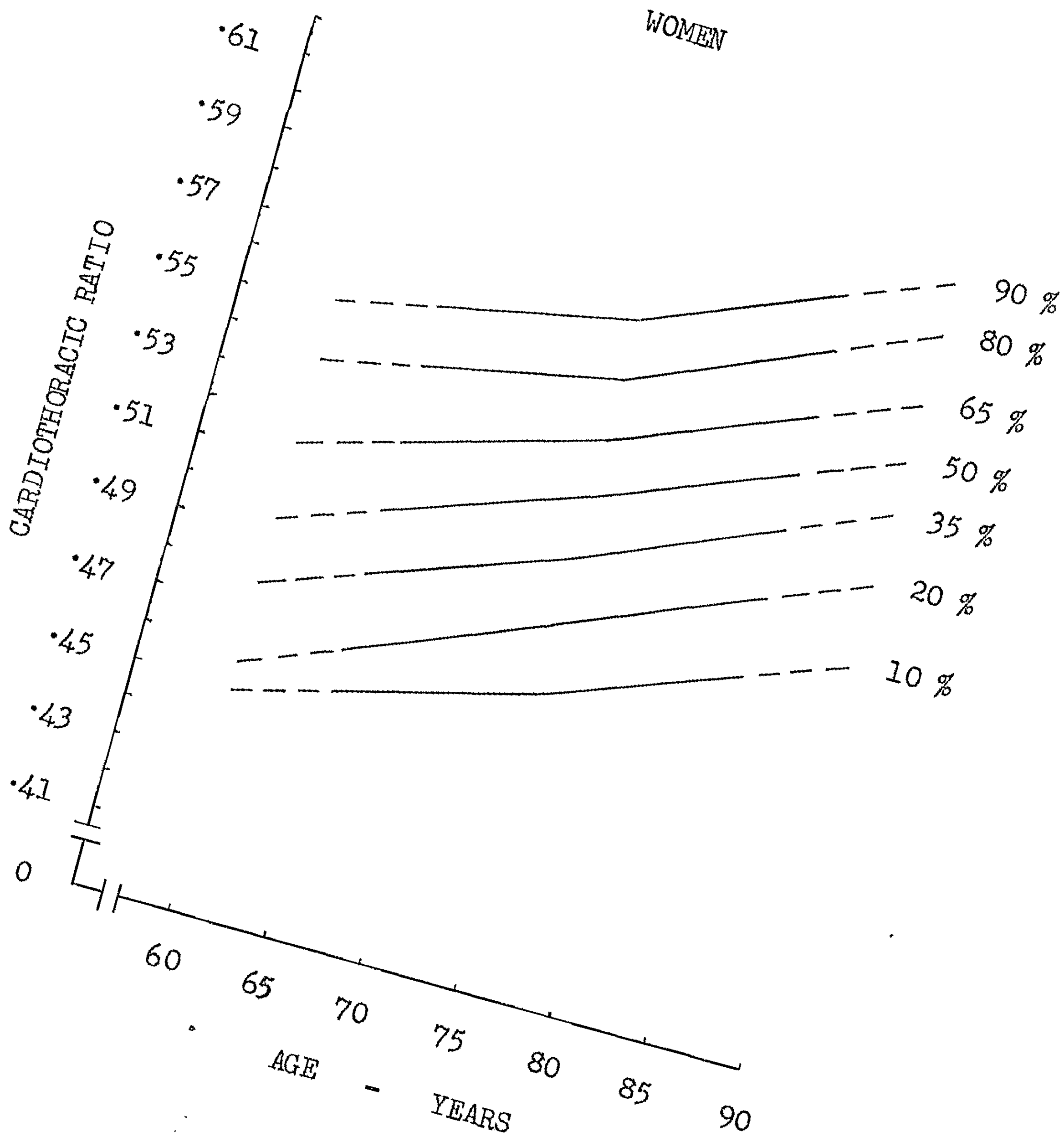


Figure 27. Selected percentile limits of cardiothoracic ratio for women.

Table 35.

Coefficients of correlation with reference to age and the variables used as estimates of heart size.

	MEN	WOMEN
Age - Maximum transverse diameter of heart	0·2788 **	0·0237
Age - Maximum transverse diameter of chest	- 0·1047	- 0·2392 **
Age - Cardiothoracic ratio	0·3111 **	0·3525 **
Age - Area of frontal cardiac silhouette	0·0867	- 0·0322
Age - Frontal area of chest	- 0·1891 **	- 0·2246 **
Age - Cardiothoracic area ratio	0·3253 **	0·2610 **

Partial correlation coefficients.

	MEN	WOMEN
Age - Maximum transverse diameter of heart: for constant kyphotic angle	0·3167 **	0·1200
Age - Area of frontal cardiac silhouette: for constant kyphotic angle	0·2635 **	0·0926

** Significant at the one per cent level.

THE TRANSVERSE DIAMETER OF THE HEART.

Many authors have regarded the heart diameter as a useful criterion of the heart size itself (Bedford and Treadgold, 1931; Bainton, 1932; Bakwin and Bakwin, 1935; Comeau and White, 1942) but, as far as I am able to ascertain, information relates to those of young and adult life and only inadequately to old age. In the first instance normal limits of the transverse heart diameter will be presented and discussed. Thereafter, the heart diameter will be assessed with reference to related variables.

RESULTS.

The frequency distributions of the 363 men and the 250 women by sex and ten year age groups with reference to the transverse diameter of the heart are shown in Table 36. There is a significant upward trend of the distributions with age for men, but not for women. Table 5 shows that the transverse diameter of the heart means for men increase with age from 12·3 cm. for the age group 60 - 64 to 13·7 cm. for the age group 85 - 89, while for women there is no such change 12·3 cm. being the mean values for the age groups 60 - 64 and 85 - 89. This increase in the means of the transverse diameter of the heart with age for men results in the averages for men becoming progressively greater than the corresponding averages for women. The absolute variation is similar for men and women and shows little change with age. The relative variability is slightly greater for men and shows no marked change with age.

Cumulative percentage frequencies were calculated from the frequency distributions shown in Table 36, and the cumulative percentage curves drawn from these data are shown in Figures 28 and 29 for men and women respectively. In addition, the 10th, 50th (median) and 90th percentiles are shown for each age group. From these curves are obtained directly the selected percentile values for the transverse diameter of the heart which are shown in Table 37. Thus the lower and upper limits, as represented by the 10th and 90th percentiles for the age groups 60 - 69, 70 - 79, and 80 - 89 are for men 11·12 cm. and 14·25 cm., 11·63 cm. and 14·20 cm., and 12·03 cm. and 14·72 cm. respectively. The corresponding figures for women, considered as one age group 60 - 89 years because there is no significant variation in the means with age, are 11·12 cm. and 13·29 cm. Selected percentile limits are also shown in Figures 30 and 31 for men and women respectively.

DISCUSSION.

The relative variability of the transverse diameter of the heart is about 7·0. This is exceedingly moderate and is comparable to that for the cardiothoracic ratio. If the narrowness of the scatter of the frequency distributions is accepted as a criterion of the suitability of a variable as a clinical index then the transverse diameter of the heart and cardiothoracic ratio are most effective criteria, and neither takes precedence over the other. However, if the belief that the transverse diameter of the chest is an unsatisfactory measurement (Ungerleider and Gubner, 1942) is true to even a minor extent, then the transverse diameter of the heart alone takes precedence over the cardiothoracic ratio.

The implications of the significant correlation between the transverse diameter of the heart and age observed for men, but not for women is discussed when considering the cardiothoracic ratio and the area of the cardiac silhouette. While correction for kyphosis enhances the correlation between the transverse diameter of the heart and age for men and women, the correlation for women does not attain a level of significance. It seems that the heart size increases significantly with age for men but not for women, and the reason for this sex difference is speculative. Do women possess better cardiovascular systems on the whole than men? Is the increase noted in heart size for men related to changes in the coronary arteries or intrinsically within the heart muscle which do not occur to the same degree in women? Only further research can provide the answer.

SUMMARY.

The value of the transverse diameter of the heart in clinical medicine has been assessed with reference to 363 men and 250 women aged 60 to 89 years, who were in good health.

The 10th and 90th percentile limits of the transverse diameter of the heart for the age groups 60 - 69, 70 - 79, and 80 - 89 for men are 11·12 cm. and 14·25 cm., 11·63 cm. and 14·20 cm., and 12·03 cm. and 14·72 cm. respectively. The corresponding figures for women taken as one group aged 60 - 89 years are 11·12 cm. and 13·29 cm.

It is observed that while there is a significant positive correlation between the transverse diameter of the heart and age for men, this is not the case for women. The reasons for this sex difference are speculative.

The transverse diameter of the heart has been considered thus far simply as a variable in terms of age and sex. The purpose now is to present the transverse diameter of the heart together with data relating to body weight, height, chest diameter, and arterial blood pressure. The object is to determine the nature and intensity of the relationships of the heart diameter and these other factors, and therefrom to assess the efficiency with which the heart diameter can be predicted from a knowledge of such variables in a healthy but elderly group of the population. The differences in these respects with change of age will also be indicated by contrasting the findings for adjacent decennial periods 60 to 69 and 70 to 79 years.

A paper which I prepared on this subject appeared in the British Heart Journal in 1960 (Volume 22. Page 391.). Because of the complex

Table 36.

The number of cases by sex and ten year age groups with reference to the transverse diameter of heart.

Transverse heart diameter cm.	Men 60 - 69 years	Men 70 - 79 years	Men 80 - 89 years	Women 60 - 69 years	Women 70 - 79 years	Women 80 - 89 years
9·6				1	1	
10·0	2			1		1
10·4	5	1	1	2	4	3
10·8	11	4		6	6	3
11·2	9	12	1	19	9	4
11·6	16	12	3	18	16	4
12·0	22	18	8	17	5	9
12·4	24	18	13	12	30	7
12·8	15	29	6	14	19	7
13·2	12	32	4	10	8	3
13·6	7	17	7	5		1
14·0	8	6	6	1	1	1
14·4	5	8	7			
14·8	2	3	3		1	1
15·2			1			
15·6	1	3				
16·0			1			
	139	163	61	106	100	44

Table 37.

Selected percentile values for the transverse diameter of heart from the cumulative percentage curves shown in Figure 28 for men by ten year age groups, and in Figure 29 for women with the age range 60 to 89 years taken as one group.

Percentiles	Men			Women
	60 - 69 years (cm.)	70 - 79 years (cm.)	80 - 89 years (cm.)	60 - 89 years (cm.)
90	14·25	14·20	14·72	13·29
80	13·42	13·70	14·29	13·00
65	12·84	13·33	13·75	12·67
50	12·49	13·03	13·28	12·29
35	12·13	12·65	12·85	11·89
20	11·65	12·11	12·40	11·47
10	11·12	11·63	12·03	11·12

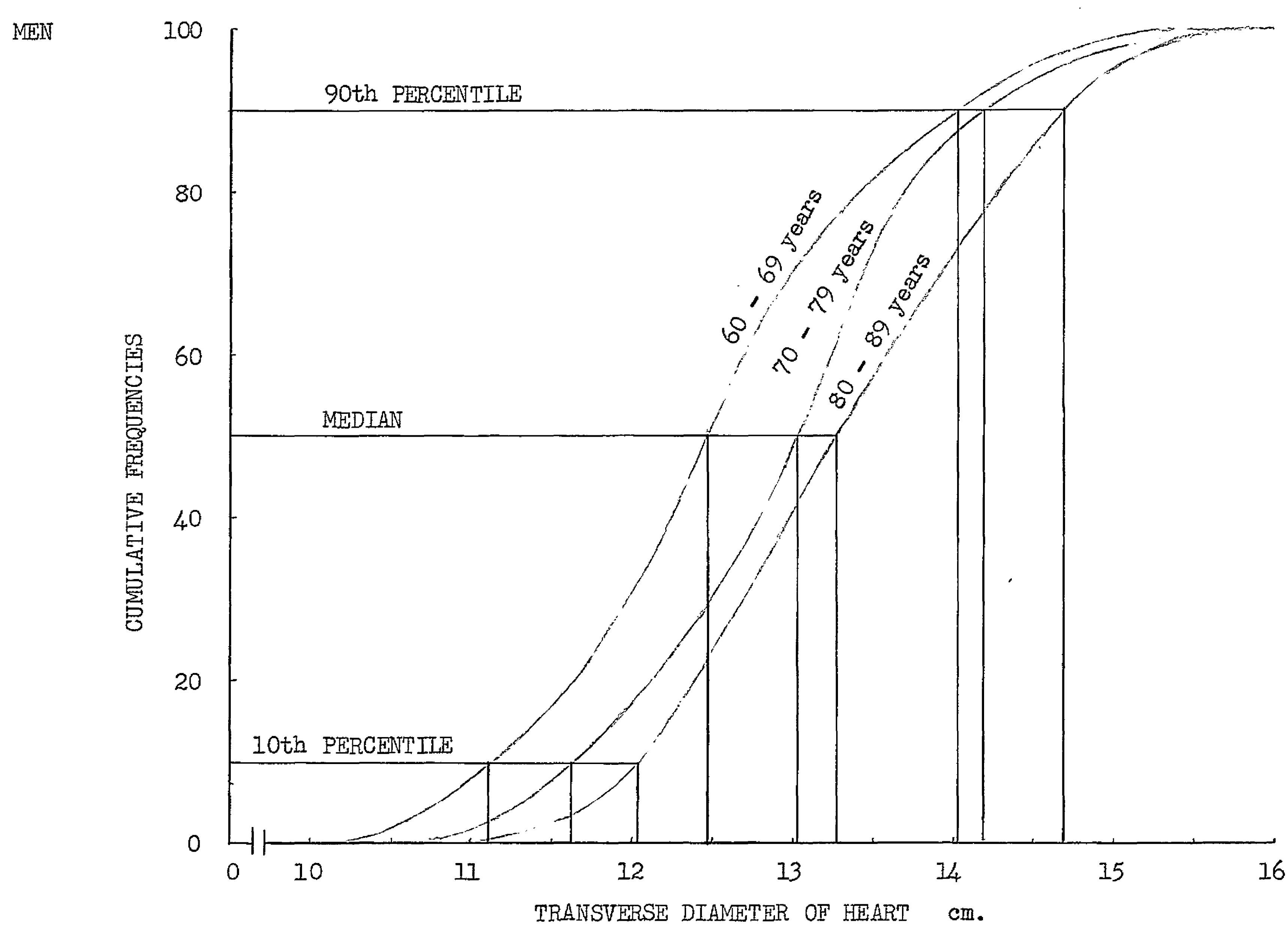


Figure 28. Cumulative frequency curves by ten year age groups of the transverse diameter of heart for men.

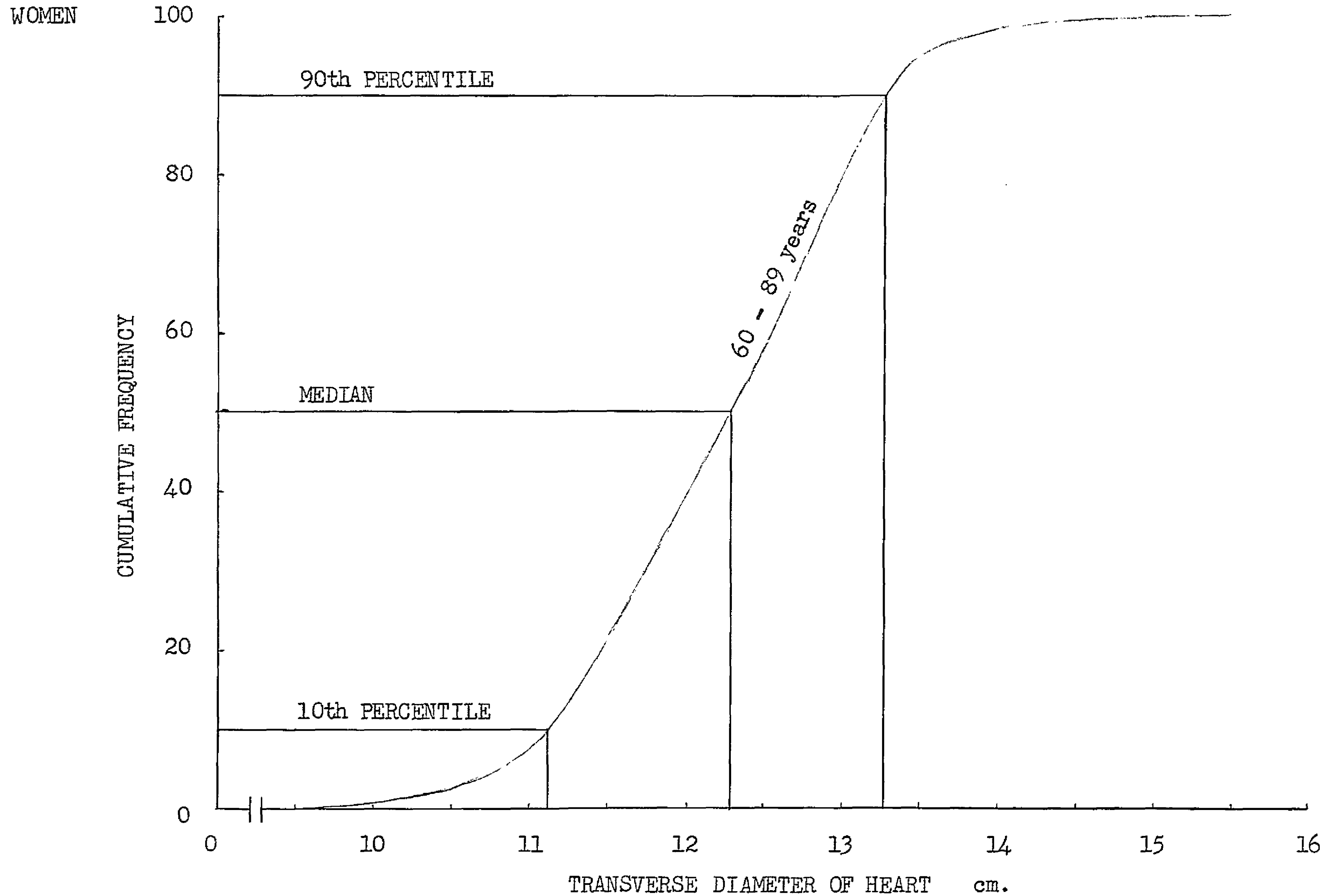


Figure 29. Cumulative frequency curve for the age range 60 to 89 years of the transverse diameter of heart for women.

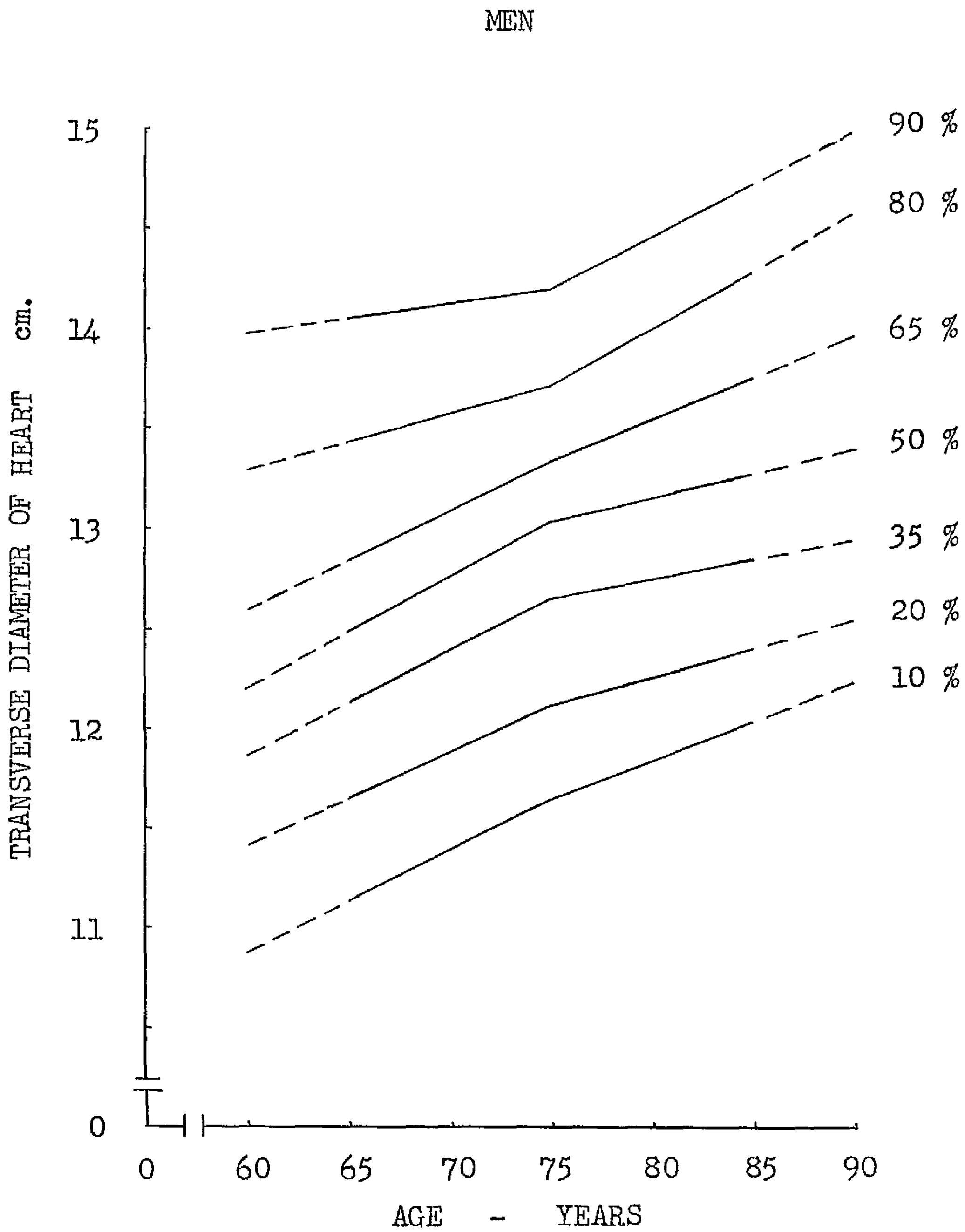


Figure 30. Selected percentile limits of transverse diameter of heart for men.

WOMEN

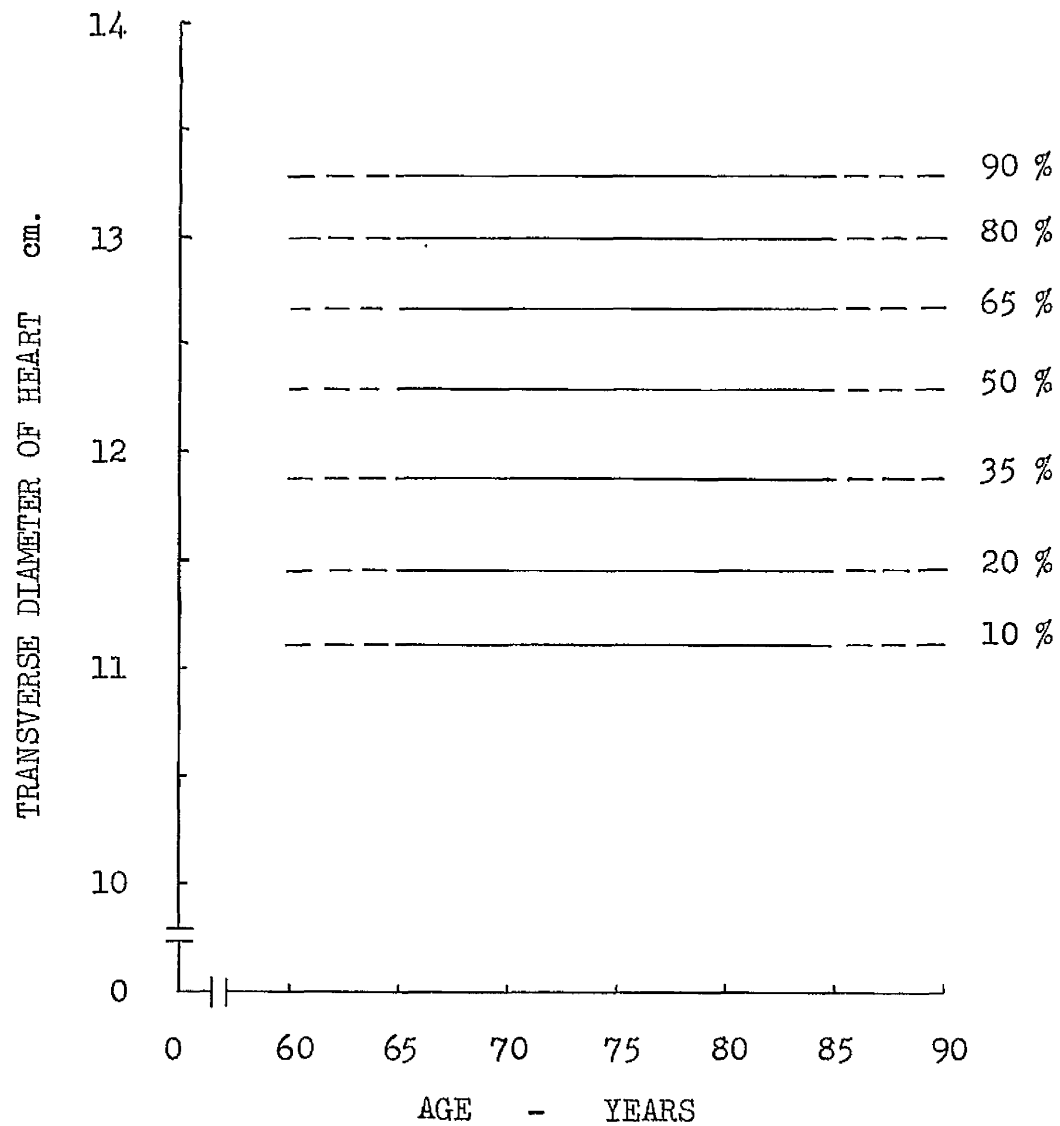


Figure 31. Selected percentile limits of transverse diameter of heart for women.

nature of the statistical work involved I present the findings recorded in this paper rather than recalculating the analysis on the basis of the number in this thesis.

The data are derived from the records of 111 men and 160 women, aged 60 to 69 years, and 123 men and 129 women, aged 70 to 79 years. All were considered to be in good health. Excluded from the series were those who had a haemoglobin under 11 g. Sahli, an apical systolic murmur greater than Grade 2 as described by Levine and Harvey (1949), or an asymmetrical chest. For the purpose of this statistical study the adipose who were otherwise in good health have been included. Subjects suffering from extreme degrees of adiposity usually excluded themselves because of co-existing disease or inability to measure the heart or chest diameters with accuracy.

RESULTS.

Because of the inclusion of the adipose in this analysis the means and other statistical indices may differ from those presented elsewhere in this thesis where the adipose are excluded.

Table 38 shows for each sex the means with their standard errors, the standard deviations, and the coefficients of variation of the several variables for two decennial age periods. The average heart diameters are alike for the sexes in the age group 60 to 69 years, but in the following decade the heart diameter of the men is on average 0·4 cm. greater than that of the women. The average values of the heart diameters of 12·6 cm. and 13·0 cm. in the men are greater than the

12·2 cm. recorded by Kerley (1950) for adult men, and the heart diameter means of the women are 2 cm. greater than the 10·7 cm. observed for adult women by Bainton (1932) from orthodiagrammatic studies. The diminution in the average body weight with age is rather more pronounced in women. Chest diameter decreases in both sexes with age, and the standard errors of these means suggest that the downward trend is significant in women but not in men. The average systolic and diastolic blood pressures of the women are greater than the corresponding values for the men in both age groups, while the increase in systolic blood pressure with age in both sexes is not observed for diastolic blood pressure. The men are taller on average than the women and for each sex the differences in the two age groups are negligible.

The absolute variation of heart diameter is equal in the sexes; shows no change with age; is less than that noted for other attributes such as body weight and blood pressure, and is comparable to the value of 1·09 noted by Hodges and Eyster (1926). The relative variability of heart diameter is alike for the sexes; shows no change with age; is less than that for weight and blood pressure, but greater than that for chest diameter and height.

The approximate relative variability of 8·8 for the heart diameter, which is analogous to the 7·7 observed for the cardiothoracic ratio, is moderate. Body weight and arterial blood pressure are more variable attributes, and the use of heart diameter as a clinical index cannot, therefore, be criticised on the grounds of its excessive variability in different subjects.

The coefficients of correlation for the four age-sex groups for each pair of variables were calculated and are shown in Table 39. The closest relationships between heart diameter and other variables are those involving weight and chest diameter. Arterial blood pressure though significantly correlated with heart diameter is of less importance, while between height and heart diameter the association, though positive in sign, is not significant statistically. These coefficients of correlation do not take into account the interrelationships that exist in varying degree between the variables themselves, and in consequence do not measure the strength of association between the heart diameter and each of the other variables when the influence of the remaining independent variables has been eliminated. This is measured by coefficients of partial correlation between heart diameter and each variable separately, one or more of the others being held constant. The third order coefficients of correlation shown in Table 40 indicate that when the three residual variables are held constant, (1) the significance of the correlations between the heart diameter and each variable is diminished, (2) weight and chest diameter remain the most important correlatives of heart diameter, and (3) the strength of association in each sex is less in the later than in the earlier decade, except in respect of the correlation between heart diameter and systolic or diastolic blood pressure in women, and between heart diameter and systolic blood pressure in men. Furthermore, heart diameter and height, which considered by themselves show a positive association, are when the remaining variables are held constant, if anything, negatively correlated but to a degree that is of doubtful significance.

In view of the decided association between these other attributes and heart diameter the high initial variability of this diameter (Table 38) can clearly be reduced when a knowledge of these other variables is available. The extent of this reduction when such knowledge is utilised is apparent on comparison of the partial standard deviations (Table 41) with the initial crude values (Table 38). They show that for constant weight, chest diameter, systolic blood pressure and height, the absolute variability of the heart diameter is reduced by 35 per cent and 37 per cent for men and women respectively in the earlier, and by 20 per cent and 25 per cent for men and women respectively in the later age group. There is no material difference in this respect if diastolic is substituted for systolic blood pressure in the assessment.

A further important point to determine is the relative strength of the association between the heart diameter and the various combinations of the independent variables. This is indicated by comparison of the coefficients of multiple correlation shown in Table 42. The salient feature is that for each sex and age group the coefficients of multiple correlation involving body weight and chest diameter are little less than the corresponding coefficients involving all four independent variables. Furthermore, virtually all the coefficients of multiple correlation show less strength of association in the older than in the younger age group.

Equations predicting heart diameter in terms of body weight and chest diameter are therefore quite as efficient as those using all four variables. The various equations are shown in Table 43. The predictive efficiency of these equations is approximately 34 per cent at 60 - 69 years and 20 per cent in the later age group.

The only other attempt of which I am aware to predict the heart diameter in terms of other variables is that of Hodges and Eyster (1926), who studied a group of young adult men aged approximately 15 to 45 years and related heart diameter to age, height and weight. The predictive efficiency of their equation was of the order of 19 per cent. In the old people of this series the value of the equations for prediction using these variables is not less satisfactory, and those predicting heart diameter from body weight and chest diameter are appreciably better for age group 60 to 69 years and equally so for ages 70 to 79 years. In addition, this study, unlike that of Hodges and Eyster (1926) which is based on orthodiagrammatic measurements, presents equations that refer to X-ray films, and in the evaluation of X-ray films consequently require no correction.

SUMMARY.

The transverse diameter of the heart in 523 healthy old people, aged 60 to 79 years, is examined and related to the other attributes body weight, transverse diameter of chest, arterial blood pressure and height.

In this series the average heart diameter differs little in older

men and women, and its relative variability of 8·9 is moderate. Body weight and arterial blood pressure are more variable attributes.

The transverse diameter of the heart is significantly related to each of the other variables mentioned, most appreciably with body weight and with the transverse diameter of the chest. When the other variables are held constant the predominating influence of body weight and the transverse diameter of the chest emerges.

Multiple regression equations are presented predicting the transverse diameter of the heart in terms of the two most important variables, in addition to the equations using all the independent variables. These indicate that in any accurate decision on cardiac enlargement it is essential to take into account body weight and chest diameter.

Table 38.

Means, standard deviations, and coefficients of variation of the several variables by sex and ten year age groups.

Age group	Number Men	Number Women	Variables	Mean ± S.E. Men	Mean ± S.E. Women	Standard deviation Men	Standard deviation Women	Coefficient of variation Men	Coefficient of variation Women
60 - 69	111	160	Transverse diameter of heart (cm.)	12·6 ± 0·12	12·7 ± 0·09	1·3	1·1	10·4	8·9
			Weight (lb.)	142·9 ± 2·16	147·3 ± 2·44	22·8	30·9	15·9	20·9
			Transverse diameter of chest (cm.)	28·5 ± 0·17	25·0 ± 0·14	1·8	1·8	6·4	7·3
			Systolic blood pressure (mm. Hg.)	156·8 ± 1·97	173·0 ± 2·28	20·8	28·9	13·3	16·7
			Diastolic blood pressure (mm. Hg.)	87·5 ± 0·81	90·8 ± 0·89	8·5	11·3	9·8	12·4
			Height (in.)	65·6 ± 0·24	60·5 ± 0·19	2·5	2·4	3·8	3·9
70 - 79	123	129	Transverse diameter of heart (cm.)	13·0 ± 0·10	12·6 ± 0·09	1·1	1·0	8·7	7·9
			Weight (lb.)	139·5 ± 1·89	139·4 ± 2·90	21·0	33·0	15·1	23·7
			Transverse diameter of chest (cm.)	28·2 ± 0·17	24·1 ± 0·14	1·9	1·6	6·6	6·7
			Systolic blood pressure (mm. Hg.)	166·0 ± 1·90	179·7 ± 2·54	21·1	28·8	12·7	16·0
			Diastolic blood pressure (mm. Hg.)	85·9 ± 0·79	90·5 ± 0·99	8·7	11·3	10·1	12·5
			Height (in.)	65·2 ± 0·22	60·5 ± 0·23	2·4	2·7	3·7	4·4

Table 39.

Partial correlations. Transverse diameter of heart. Zero order coefficients by sex and ten year age groups

Subscript	Zero order correlation coefficients							
	Men				Women			
	60 - 69 years		70 - 79 years		60 - 69 years		70 - 79 years	
	Coefficient	z:	Coefficient	z:	Coefficient	z:	Coefficient	z:
12	.6807	.830	.5525	.622	.7178	.903	.5213	.578
13	.6476	.771	.5655	.641	.6498	.775	.4655	.504
14	.2331	.237	.2225	.226	.4271	.456	.3363	.350
15	.3901	.412	.1698	.171	.3619	.381	.3554	.371
16	.1156	.116	.2548	.260	.0981	.098	.1411	.142
23	.6932	.854	.7022	.872	.5638	.638	.3689	.387
24	.1640	.165	.1470	.148	.4815	.525	.2135	.217
25	.2484	.254	.2064	.209	.4752	.517	.2974	.307
26	.4470	.481	.4065	.431	.2158	.219	.1901	.192
34	.0339	.034	.0574	.057	.1956	.198	- .0441	.044
35	.1810	.183	.1577	.159	.2021	.205	.0391	.039
36	.2937	.302	.4377	.469	.2490	.254	.2964	.306
46	.0183	.018	- .0315	.031	- .0063	.006	.1140	.114
56	.0443	.044	.0849	.085	.0726	.073	- .0130	.013

(This Table is continued overleaf)

* The subscripts are: 1 = Transverse diameter of heart

2 = Weight

3 = Transverse diameter of chest

4 = Systolic blood pressure

5 = Diastolic blood pressure

6 = Height

: The standard errors of z are as follows:

60 - 69 years.	Men	0·096
	Women	0·080
70 - 79 years	Men	0·091
	Women	0·089

Table 40.

Partial correlations. Transverse diameter of heart. Third order coefficients by sex and ten year age groups ※

Subscript	Third order correlation coefficients							
	Men				Women			
	60 - 69 years		70 - 79 years		60 - 69 years		70 - 79 years	
	Coefficient	z:	Coefficient	z:	Coefficient	z:	Coefficient	z:
12.346	.4629	.501	.2383	.243	.4762	.518	.3713	.390
12.356	.4632	.501	.2544	.260	.5094	.562	.3510	.367
13.246	.3649	.382	.3111	.322	.4626	.501	.4056	.430
13.256	.3535	.368	.2979	.307	.4512	.486	.3716	.390
14.236	.2096	.213	.1984	.201	.1826	.185	.3472	.363
15.236	.3183	.330	.0659	.066	.0781	.078	.2906	.299
16.234	- .2899	.298	- .0154	.015	- .1502	.151	- .0833	.083
16.235	- .2881	.296	- .0326	.033	- .1678	.169	- .0234	.023

※ The subscripts have the same meaning as those in Table 39.

: The standard errors of z are as follows: 60 - 69 years. Men 0·098 70 - 79 years. Men 0·092
Women 0·081 Women 0·090

Table 41.

Partial standard deviations for the transverse diameter of the heart by sex and ten year age groups with reference to all other variables.

	Partial standard deviations			
Subscript*	60 - 69 years		70 - 79 years	
	Men	Women	Men	Women
1 with 2346	0·85	0·69	0·88	0·75
1 with 2356	0·82	0·72	0.88	0·77

* The subscripts are:

1. Transverse diameter of heart
2. Weight
3. Transverse diameter of chest
4. Systolic blood pressure
5. Diastolic blood pressure
6. Height

Diastolic blood pressure is an alternative for systolic blood pressure.

Table 42.

Coefficients of multiple correlation by sex and ten year age groups.

Subscript*	Coefficients of multiple correlation			
	60 - 69 years		70 - 79 years	
	Men	Women	Men	Women
1.23	.7230	.7767	.6062	.5984
1.24	.6917	.7238	.5706	.5699
1.25	.7179	.7182	.5554	.5619
1.26	.7126	.7201	.5535	.5231
1.34	.6812	.7182	.5967	.5867
1.35	.7045	.6911	.5714	.5749
1.36	.6523	.6531	.5656	.4655
1.46	.2583	.4388	.3437	.3518
1.56	.4023	.3690	.2950	.3841
1.234	.7387	.7867	.6268	.6576
1.235	.7573	.7784	.6084	.6426
1.236	.7515	.7840	.6067	.5992
1.246	.7211	.7253	.5726	.5705
1.256	.7436	.7204	.5564	.5650
1.346	.6859	.7198	.5970	.5884
1.356	.7086	.6948	.5714	.5750
1.2346	.7638	.7921	.6269	.6606
1.2356	.7803	.7854	.6090	.6428

* The subscripts have the same meaning as those used in Table 39.

Table 43.

Prediction equations for the transverse diameter of heart by sex and ten year age groups. Diastolic blood pressure is an alternative for systolic blood pressure. *

Age group	Sex	Equations	Percentage efficiency of prediction
60 - 69	Men	$X_1 = 0{\cdot}02942\, x_2 + 0{\cdot}2540\, x_3 + 0{\cdot}008892\, x_4 - 0{\cdot}1143\, x_6 + 7{\cdot}2638$	36
	Men	$X_1 = 0{\cdot}02844\, x_2 + 0{\cdot}2359\, x_3 + 0{\cdot}03332\, x_5 - 0{\cdot}1102\, x_6 + 6{\cdot}1281$	37
	Women	$X_1 = 0{\cdot}01668\, x_2 + 0{\cdot}2449\, x_3 + 0{\cdot}005134\, x_4 - 0{\cdot}04624\, x_6 + 6{\cdot}0078$	39
	Women	$X_1 = 0{\cdot}01827\, x_2 + 0{\cdot}2407\, x_3 + 0{\cdot}005563\, x_5 - 0{\cdot}05221\, x_6 + 6{\cdot}6239$	38
70 - 79	Men	$X_1 = 0{\cdot}01487\, x_2 + 0{\cdot}2258\, x_3 + 0{\cdot}008655\, x_4 - 0{\cdot}006331\, x_6 + 3{\cdot}5422$	22
	Men	$X_1 = 0{\cdot}01624\, x_2 + 0{\cdot}2187\, x_3 + 0{\cdot}007097\, x_5 - 0{\cdot}01359\, x_6 + 4{\cdot}8514$	21
	Women	$X_1 = 0{\cdot}01017\, x_2 + 0{\cdot}2312\, x_3 + 0{\cdot}01010\, x_4 - 0{\cdot}02510\, x_6 + 5{\cdot}3174$	25
	Women	$X_1 = 0{\cdot}00993\, x_2 + 0{\cdot}2105\, x_3 + 0{\cdot}02141\, x_5 - 0{\cdot}007127\, x_6 + 4{\cdot}6426$	23
60 - 69	Men	$X_1 = 0{\cdot}02571\, x_2 + 0{\cdot}2433\, x_3 + 1{\cdot}9944$	31
	Women	$X_1 = 0{\cdot}01890\, x_2 + 0{\cdot}2245\, x_3 + 4{\cdot}2778$	37
70 - 79	Men	$X_1 = 0{\cdot}01656\, x_2 + 0{\cdot}2142\, x_3 + 4{\cdot}6581$	20
	Women	$X_1 = 0{\cdot}01232\, x_2 + 0{\cdot}1951\, x_3 + 6{\cdot}1876$	20

(This Table is continued overleaf)

* The subscripts are:

X_1 = Transverse diameter of heart (cm.)

x_2 = Weight (lb.)

x_3 = Transverse diameter of chest (cm.)

x_4 = Systolic blood pressure (mm.)

x_5 = Diastolic blood pressure (mm.)

x_6 = Height (in.)

THE FRONTAL CARDIAC SILHOUETTE.

Theoretically the area of the frontal cardiac silhouette as measured on a postero-anterior X-ray film is more accurate as an index of heart size than any of the diameters (White, 1945). This statement may be true when applied to the prime of life, but it requires qualification in older years. This matter will be investigated in detail, but for the present the cardiac silhouette is considered in its own right as though there were no related influencing attributes other than age.

RESULTS.

The frequency distributions of the 363 men and the 250 women by sex and ten year age groups with reference to the area of the cardiac silhouette are shown in Table 44. Men and women show no significant trend of the distributions with age. Table 14 shows that the cardiac silhouette means vary little with age for men and women. The predicted area of the cardiac silhouette for men is 120·7 sq. cm. at 60 years and 130·1 sq. cm. at 89 years, and the corresponding values for women at the same ages are 107·1 sq. cm. and 105·8 sq. cm. respectively. The cardiac silhouette means for men are greater than those for women at all ages. The absolute variation is slightly greater for men, and in both sexes increases with age. The relative variability is somewhat greater for men, and in both sexes increases slightly with age.

Cumulative percentage frequencies were calculated from the frequency distributions shown in Table 44, and the cumulative percentage curves drawn from these data are shown in Figures 32 and 33 for men and women respectively. In addition, the 10th, 50th (median) and 90th percentiles are shown for each age group. From these curves are obtained directly the selected percentile values for the area of the cardiac silhouette which are shown in Table 45. Thus the lower and upper limits, as represented by the 10th and 90th percentiles for the age range 60 to 89 years taken as one group are for men 109·4 sq. cm. and 141·2 sq. cm. respectively. The corresponding figures for the women are 94·2 sq. cm. and 120·2 sq. cm.

The partial correlation coefficients of age to the area of the cardiac silhouette with the influence of kyphosis eliminated for men and women are shown in Table 35. While the positive insignificant zero order correlation coefficient of age to the area of the cardiac silhouette is rendered highly significant and remains positive for men, the corresponding first order partial correlation coefficient for women remains insignificant though changed to a positive value.

Figures 34 and 35 show selected percentile limits of the area of the cardiac silhouette for men and women respectively.

DISCUSSION.

The finding that the area of the cardiac silhouette for men and women when estimated without reference to related variables does not increase significantly with age is surprising, and certainly upsets the preconceived ideas of the author. An immediate thought is that a real increase in the area of the cardiac silhouette is masked by kyphosis causing a backward displacement of the heart with its lower pole acting as a pivot. While the partial correlation coefficients calculated to eliminate the influence of kyphosis substantiates this theorising for men, it does not do so for women. Yet women exhibit greater average degrees of kyphosis by quinquennial age groups than men. This is a sex difference which appears illogical and I am at a loss to explain the phenomenon, particularly when adipose women are excluded from this study, that is, women 25 per cent or more over ideal weight as estimated from Anderson's nomogram (1948). It is reasonable to infer that for accurate prediction of the area of the cardiac silhouette it requires to be considered in terms of related variables, and this will be carried out subsequently. For comparison the influence of kyphosis on the maximum transverse diameter of the heart was similarly assessed. In both men and women the correlation between age and the transverse diameter of heart was enhanced, but the significance by sex remained unaltered, that is, the correlation was significant for men, but not for women. This finding is similar to that for the area of the cardiac silhouette.

The above statements, however, do not detract from the value of the percentile limits presented as indices of normal levels, when it is desired to compare the area of the cardiac silhouette in research work relating to the cardiovascular system. The relative variability of approximately 10·0, though greater than the relative variabilities of the cardiothoracic ratio and transverse diameter of heart, is moderate.

SUMMARY.

The value of the area of the cardiac silhouette in clinical medicine has been assessed with reference to 363 men and 250 women, aged 60 to 89 years, who were in good health.

The 10th and 90th percentile limits of the area of the cardiac silhouette for the age range 60 to 89 years considered as one group are for men 109·4 sq. cm. and 141·2 sq. cm. respectively. The corresponding values for women are 94·2 sq. cm. and 120·2 sq. cm.

Both sexes show no significant correlation between the area of the cardiac silhouette and age. The implications of this occurrence have been discussed with reference to kyphosis. When the effect of kyphosis is rendered void a highly significant correlation between the area of the cardiac silhouette and age arises, but this does not occur with women. No explanation of this phenomenon can be given.

Table 44.

The number of cases by sex and ten year age groups with reference to the area of the cardiac silhouette.

Frontal area of heart sq. cm.	Men 60 - 69 years	Men 70 - 79 years	Men 80 - 89 years	Women 60 - 69 years	Women 70 - 79 years	Women 80 - 89 years
77					1	
80						
83					2	
86				3	2	1
89				2	4	4
92		1		5	1	4
95	1	1		5	13	4
98	2	3		14	8	1
101	4	2	2	15	12	2
104	5	2		14	15	4
107	7	7	5	10	12	7
110	15	14	3	9	8	3
113	11	18	2	9	8	4
116	13	15	5	6	4	3
119	10	17	6	5	4	1
122	12	11	6	3	2	3
125	14	10	5	2		2
128	12	7	4	2		
131	11	13	7	1	2	1
134	7	12	5	1	2	
137		8	2			
140	2	9	4			
143	8	4				
146	3	4				
149	1		1			
152	1	1	1			
155		2	1			
158			1			
161						
164						
167		2	1			
	139	163	61	106	100	44

Table 45.

Selected percentile values for the area of the cardiac silhouette derived from the cumulative percentage curves shown in Figures 32 and 33, by sex for the age range 60 to 89 years.

Percentiles	Men 60 - 89 years (sq. cm.)	Women 60 - 89 years (sq. cm.)
90	141·2	120·2
80	135·1	114·8
65	128·8	110·0
50	123·3	105·9
35	118·0	102·3
20	112·5	98·1
10	109·4	94·2

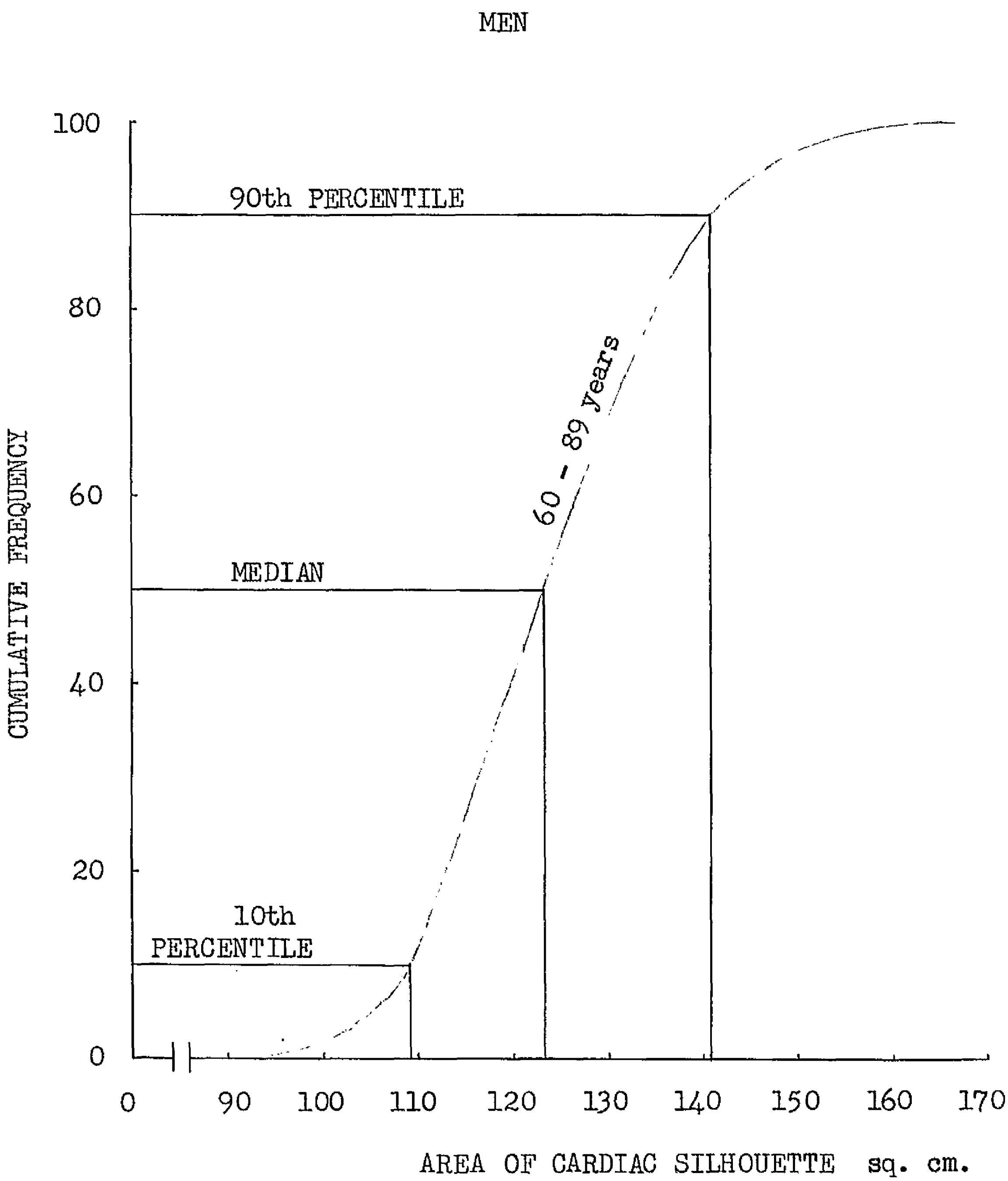


Figure 32. Cumulative frequency curve for the age range 60 to 89 years of the area of the cardiac silhouette for men.

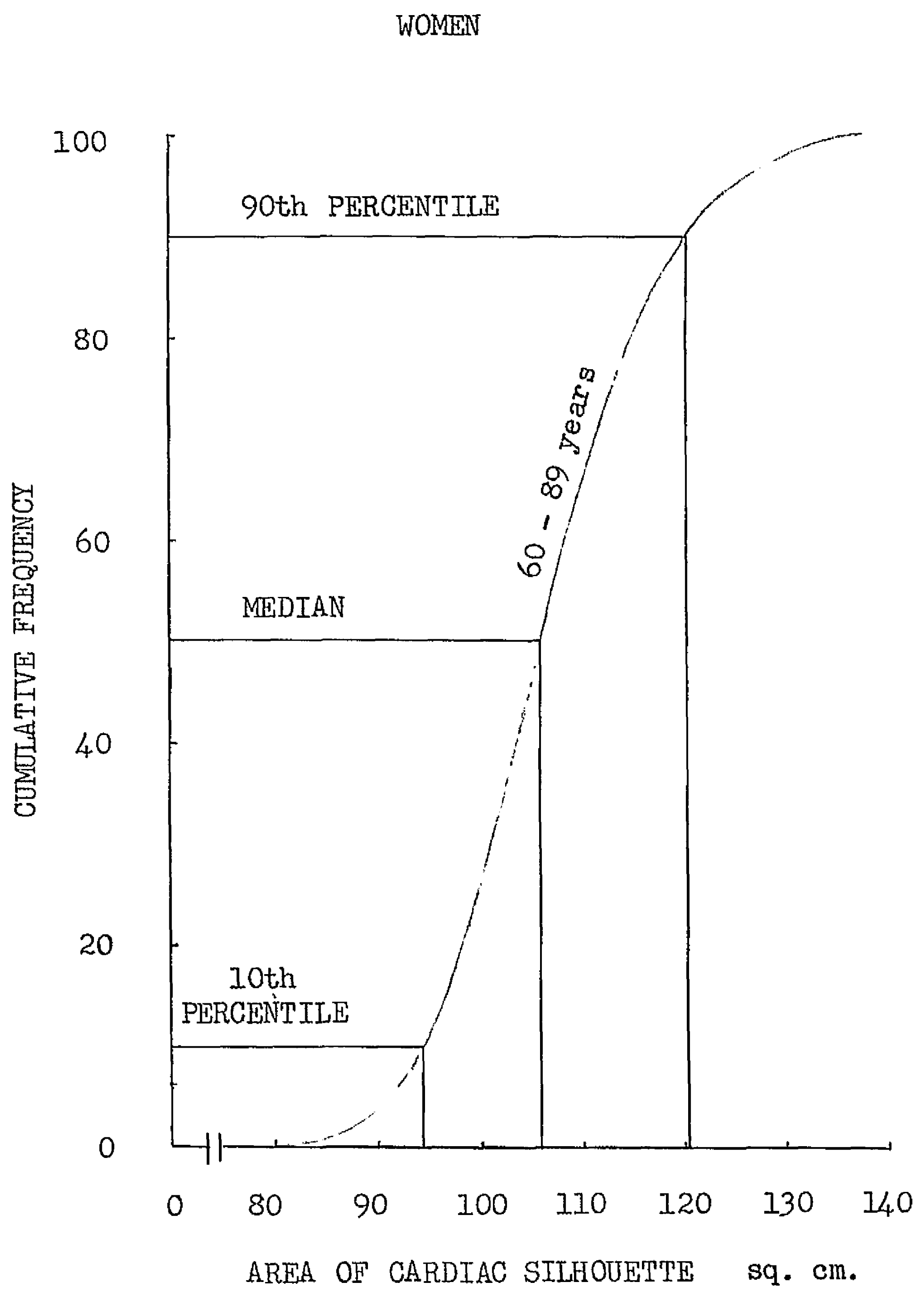


Figure 33. Cumulative frequency curve for the age range 60 to 89 years of the area of the cardiac silhouette for women.

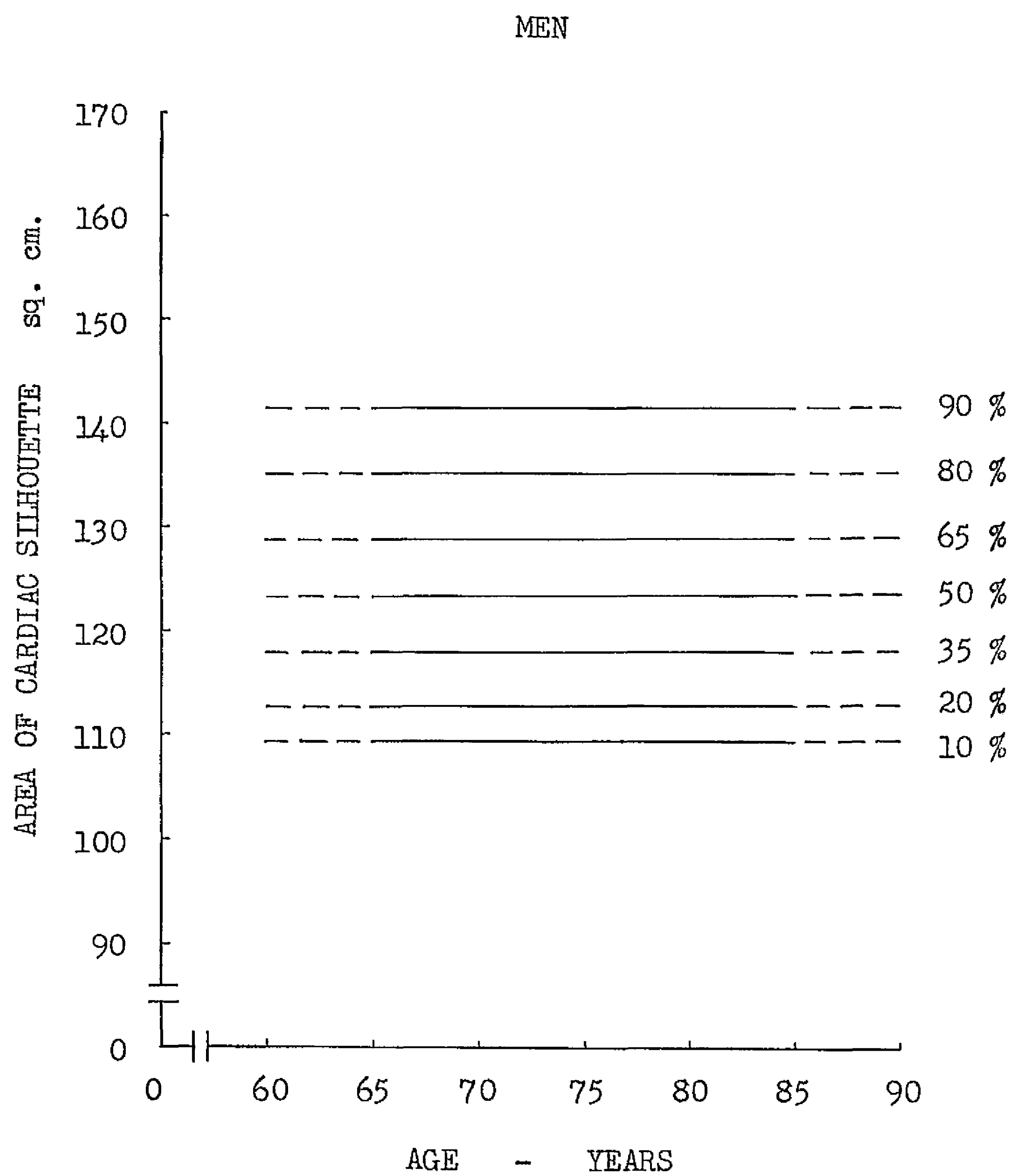


Figure 34. Selected percentile limits of area of cardiac silhouette for men.

WOMEN

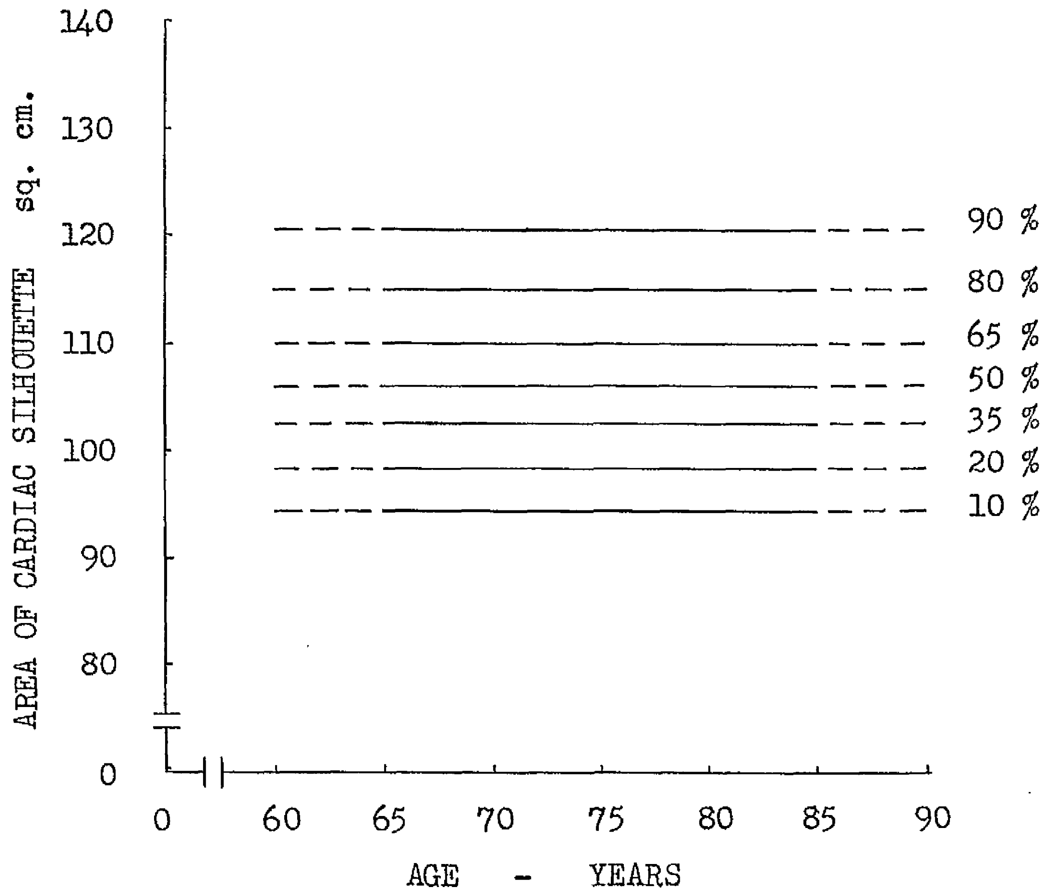


Figure 35. Selected percentile limits of area of cardiac silhouette for women.

THE AREA OF THE FRONTAL CARDIAC SILHOUETTE:
THE INFLUENCE OF RELATED VARIABLES.

In this study measurements of the area of the frontal cardiac silhouette are presented in persons aged 60 to 79 years, using X-ray films of the chest, together with data on their body weight, frontal area of the chest, kyphotic angle and systolic blood pressure. Diastolic blood pressure was no more effective than systolic blood pressure and is therefore omitted. As in the similar statistical analysis applied to the maximum transverse diameter of the heart the object is to determine the nature and intensity of the relationships of the cardiac silhouette and these other factors, and therefrom to assess the efficiency with which the cardiac silhouette can be predicted from a knowledge of such variables in a healthy but elderly group of the population. The differences in these respects with change of age will also be indicated by contrasting the findings for adjacent decennial periods 60 to 69 and 70 to 79 years.

The data are derived from the records of 139 men and 167 women, aged 60 to 69 years, and 163 men and 133 women, aged 70 to 79 years, who attended the Rutherglen Centre. All were considered to be in good health after a complete clinical examination which included ophthalmoscopic and rectal examinations. Excluded from the series were those who had a haemoglobin under 11 g. Sahli, an apical systolic murmur greater than Grade 2 as described by Levine and Harvey (1949), or an asymmetrical chest. For the purpose of this statistical study the adipose who were otherwise in good health have been included.

RESULTS.

Table 46 shows for each sex the means with their standard errors, the standard deviations, and the coefficients of variation of the several variables for two decennial periods. The average cardiac silhouette for men in the age group 60 to 69 years is 11·8 sq. cm. greater than that for women in the same age group. In the following decade the mean difference as between the sexes increases to 16·8 sq. cm. The diminution in the average body weight with age is more pronounced in women. The frontal area of the chest decreases in both sexes with age. The average kyphotic angle of the women is greater than the corresponding value for the men in both age groups, and in both sexes the kyphotic angle means increase with age. The average systolic blood pressure in women is greater than the corresponding mean for men in both age groups, and in both sexes the systolic blood pressure increases with age.

The absolute variability of the cardiac silhouette is equal for the sexes in the earlier and slightly greater for men in the later age group; a slight increase with age for men is not observed for women, and it is less than that of each of the other attributes. The relative variability of the cardiac silhouette is similar for the sexes; shows a slight increase with age for men but not for women, and is less than any of the relative variabilities of the other attributes.

The approximate relative variability of just under 11·0 for the cardiac silhouette is moderate, though somewhat greater than the values for the maximum transverse diameter of the heart and the cardiothoracic ratio. Body weight, frontal area of the chest, kyphotic angle and systolic blood pressure are more variable attributes. The use of the cardiac silhouette as a clinical index of heart size cannot, therefore, be criticised on the grounds of excessive variability in different subjects.

The zero order coefficients of correlation (Table 47) for the four age-sex groups for each pair of variables were calculated. The closest relationships between cardiac silhouette and other variables for men are those involving frontal area of chest and kyphotic angle. Weight and systolic blood pressure each show a non-significant association with the cardiac silhouette. Women, however, reveal highly significant associations between the cardiac silhouette and all the other independent variables, the strongest correlation being with the frontal area of the chest. For men and women the correlation between cardiac silhouette and kyphotic angle is negative and highly significant. These coefficients of correlation do not take into account the interrelationships that exist in varying degree between the variables themselves, and in consequence do not measure the strength of association between the cardiac silhouette and each of the other variables when the influence of the remaining independent variables has been eliminated. This is measured by coefficients of partial correlation between cardiac silhouette and each of the other variables taken separately, one or more of the others being held constant. The third order coefficients of correlation (Table 48) indicate that when the three residual variables are held constant, (1) the significance of the correlations between cardiac silhouette and each variable is diminished except for the association between cardiac silhouette and body weight for men and women in the age group 60 to 69 years, and cardiac silhouette and frontal area of chest for women only in the same age group, (2) in men frontal area of chest and kyphotic angle are the most important correlatives of cardiac silhouette for age group 60 - 69, while this only applies to the frontal area of the chest for age group 70 - 79. In women frontal area of the chest and body weight are the most important correlatives of cardiac silhouette in both decennial age periods, and (3) the strength of association in women is less in the later than in the earlierdecade, though only the correlation between cardiac silhouette and kyphotic angle is rendered non-significant in the later age period. In men the strength of association is less in the later than in the earlier decade for the independent variables body weight and kyphotic angle both becoming non-significant, is enhanced in the later decade for frontal area of chest, and remains non-significant for systolic blood pressure.

In view of the decided association between these other attributes and cardiac silhouette the high initial variability of this area (Table 46) can clearly be reduced when a knowledge of these other variables is available. The extent of this reduction when such a knowledge is utilised is apparent on comparison of the partial standard deviations (Table 49) with the initial crude values (Table 46). They show that for constant weight, frontal area of the chest, kyphotic angle and systolic blood pressure, the absolute variability of the cardiac silhouette is reduced by 37 per cent and 36 per cent for men and women respectively in the earlier, and by 31 per cent and 30 per cent for men and women respectively in the later age group.

With reference to the prediction equations (Table 51) the salient feature is that for men in both age groups the coefficients of multiple correlation involving frontal area of chest and kyphotic angle are little less than the corresponding coefficients involving all four independent variables. For women in both age groups the coefficients of multiple correlation involving body weight and chest area are little less than the corresponding coefficients involving all four independent variables (Table 50).

Equations predicting cardiac silhouette in terms of frontal area of chest and kyphotic angle for men, and body weight and frontal area of chest for women are therefore quite as efficient as those using all four variables. The various equations with their predictive efficiency are shown in Table 51.

Hodges and Eyster (1924) presented a prediction equation for the area of the frontal cardiac silhouette based on age, height and weight. This equation must lose its efficiency in old age because of the negative regression of weight on age especially for women, and the influence of kyphosis on the cardiac silhouette and height.

SUMMARY.

The area of the frontal cardiac silhouette in 602 healthy old people, aged 60 to 79 years, is examined and related to the other attributes body weight, frontal area of chest, kyphotic angle and systolic blood pressure.

In this series the average cardiac silhouette varies little with age in older men and women, and its relative variability of approximately 11.0 is moderate. The independent attributes are more variable.

The area of the frontal cardiac silhouette is related most appreciably with the frontal area of the chest and kyphotic angle for men, and with body weight and frontal area of the chest for women.

Multiple regression equations are presented predicting the cardiac silhouette in terms of all four independent variables and also in terms of the most important influencing variables. These indicate that in any accurate decision on heart size based on the area of the frontal cardiac silhouette it is essential to take account of at least the frontal area of the chest and kyphotic angle for men, and body weight and the frontal area of the chest for women.

Table 46.

Means, standard deviations and coefficients of variation of the several variables by sex and ten year age groups.

Age group	Number		Variables	Means ± S.E.		Standard deviations		Coefficients of variation	
	Men	Women		Men	Women	Men	Women	Men	Women
60 - 69	139	167	Area of cardiac silhouette (sq. cm.)	122·2 ± 1·03	110·4 ± 0·93	12·1	12·0	9·9	10·9
			Weight (lb.)	140·3 ± 1·87	147·8 ± 2·32	22·1	30·0	15·7	20·3
			Frontal area of chest (sq. cm.)	636·0 ± 6·47	476·3 ± 4·50	76·3	58·2	12·0	12·2
			Kyphotic angle (degrees)	42·6 ± 1·06	50·0 ± 1·04	12·5	13·5	29·3	27·0
			Systolic blood pressure (mm. Hg.)	154·8 ± 1·78	167·5 ± 2·19	21·0	28·3	13·6	16·9
70 - 79	163	133	Area of cardiac silhouette (sq. cm.)	124·2 ± 1·05	107·4 ± 1·01	13·4	11·7	10·8	10·9
			Weight (lb.)	138·3 ± 1·47	136·5 ± 2·35	18·8	27·1	13·6	19·8
			Frontal area of chest (sq. cm.)	618·6 ± 6·21	457·9 ± 5·11	79·3	58·9	12·8	12·9
			Kyphotic angle (degrees)	49·3 ± 1·22	55·8 ± 1·15	15·5	13·3	31·4	23·8
			Systolic blood pressure (mm. Hg.)	164·2 ± 1·70	181·3 ± 2·32	21·7	26·8	13·2	14·8

Table 47.

Partial correlations. Area of cardiac silhouette. Zero order coefficients by sex and ten year age groups.

Subscripts ‡	Zero order correlation coefficients			
	Men		Women	
	60 – 69 years	70 – 79 years	60 – 69 years	70 – 79 years
12	0·1539	0·1380	0·3943 **	0·4159 **
13	0·6497 **	0·7122 **	0·5810 **	0·5872 **
14	– 0·5887 **	– 0·4441 **	– 0·3163 **	– 0·3514 **
15	– 0·1719	– 0·0868	0·3424 **	0·2387 **
23	0·0355	0·0652	– 0·0972	0·1011
24	0·0728	– 0·0114	0·0150	– 0·0938
25	0·0555	0·0924	0·5267 **	0·2766 **
34	– 0·3464 **	– 0·5081 **	– 0·3486 **	– 0·4717 **
35	– 0·2349 **	– 0·1952 *	– 0·0789	– 0·0475
45	0·1597	0·0472	0·1155	0·0256

(This Table is continued overleaf)

* The subscripts are:

1. Area of cardiac silhouette.
2. Weight.
3. Frontal area of chest.
4. Kyphotic angle.
5. Systolic blood pressure.

The significance of the coefficients is assessed from Snedecor's Table 7.6.1.

Five per cent level of significance = *

One per cent level of significance = **

Table 48.

Partial correlations. Area of cardiac silhouette. Third order coefficients by sex and ten year age groups.

Subscript *	Third order correlation coefficients			
	Men		Women	
	60 - 69 years	70 - 79 years	60 - 69 years	70 - 79 years
12.345	0·2543 **	0·1291	0·4120 **	0·3842 **
13.245	0·5841 **	0·6263 **	0·6472 **	0·5539 **
14.235	- 0·5348 **	- 0·1371	- 0·2084 **	- 0·0830
15.234	0·0060	0·0543	0·2904 **	0·2351 **

* The subscripts have the same meaning as those in Table 47.

The significance of the coefficients is assessed from Snedecor's Table 7.6.1.

Five per cent level of significance - *

One per cent level of significance - **

Table 49.

Partial standard deviations for the area of the cardiac silhouette by sex and ten year age groups with reference to all other variables.

Subscript *	Partial standard deviations			
	60 - 69 years		70 - 79 years	
	Men	Women	Men	Women
1 with 2345	7·65	7·63	9·24	8·22

* The subscripts are:

1. Area of cardiac silhouette.
2. Weight.
3. Frontal area of chest.
4. Kyphotic angle.
5. Systolic blood pressure.

Table 50.

Coefficients of multiple correlation by sex and ten year age groups with reference to the variables used in the prediction equations.

Subscript *	Coefficients of multiple correlation			
	60 - 69 years		70 - 79 years	
	Men	Women	Men	Women
1.23		0·7367		0·6879
1.34	0·7565		0·7186	
1.2345	0·7747	0·7726	0·7257	0·7116

* The subscripts have the same meaning as those used in Table 47.

Table 51.

Prediction equations for the area of the frontal cardiac silhouette by sex and ten year age groups.

Age group	Sex	Equations	Percentage efficiency of prediction
60 - 69	Men	$X_1 = 0{\cdot}09176\ x_2 + 0{\cdot}07862\ x_3 - 0{\cdot}41505\ x_4 + 0{\cdot}00225\ x_5 + 76{\cdot}6772$	37
	Women	$X_1 = 0{\cdot}13573\ x_2 + 0{\cdot}11939\ x_3 - 0{\cdot}12936\ x_4 + 0{\cdot}09693\ x_5 + 23{\cdot}3518$	36
70 - 79	Men	$X_1 = 0{\cdot}06457\ x_2 + 0{\cdot}11145\ x_3 - 0{\cdot}09580\ x_4 + 0{\cdot}02378\ x_5 + 47{\cdot}1532$	31
	Women	$X_1 = 0{\cdot}13250\ x_2 + 0{\cdot}10601\ x_3 - 0{\cdot}05839\ x_4 + 0{\cdot}07744\ x_5 + 30{\cdot}0113$	30
60 - 69	Men	$X_1 = 0{\cdot}08032\ x_3 - 0{\cdot}39909\ x_4 + 88{\cdot}1330$	35
	Women	$X_1 = 0{\cdot}18239\ x_2 + 0{\cdot}12916\ x_3 + 21{\cdot}9646$	32
70 - 79	Men	$X_1 = 0{\cdot}11118\ x_3 - 0{\cdot}09583\ x_4 + 60{\cdot}1645$	30
	Women	$X_1 = 0{\cdot}15564\ x_2 + 0{\cdot}10949\ x_3 + 36{\cdot}0391$	27

(This Table is continued overleaf)

The subscripts are:

X_1 = Area of cardiac silhouette.

x_2 = Weight.

x_3 = Frontal area of chest.

x_4 = Kyphotic angle.

x_5 = Systolic blood pressure.

THE CARDIOTHORACIC AREA RATIO.

I am unaware of any information in the literature concerning the cardiothoracic area ratio. The area of the frontal cardiac silhouette and the maximum transverse diameter of the heart are accepted criteria of heart size. Theoretically the ratio of the area of the cardiac silhouette to the area of the chest taken in the same plane should be more effective as a measure of heart size than the ratio of two linear diameters. This is probably more true for those of young and adult life, but this does not render the provision of normal limits of the area ratio in older years less desirable. I have named this ratio of the areas the cardiothoracic area ratio as it parallels the classical cardiothoracic ratio.

RESULTS.

The frequency distributions of the 363 men and the 250 women by sex and ten year age groups with reference to the area ratio of heart to chest are shown in Table 52. Men and women show an upward trend of the distributions with age. Table 11 shows that the cardiothoracic area ratio means for men increase with age from 0·1921 for the age group 60 - 64 to 0·2250 for the age group 85 - 89, and that the corresponding means for women are 0·2226 and 0·2408. Thus the means for women are greater than those for men at all ages. The absolute variation is similar for the sexes and shows a slight increase with age. The relative variability is similar for the sexes within the age range 60 to 74 years. Over 74 years men show a somewhat greater relative variability than women.

Cumulative percentage frequencies were calculated from the frequency distributions shown in Table 52, and the cumulative percentage curves drawn from these data are shown in Figures 36 and 37 for men and women respectively. In addition, the 10th, 50th (median) and 90th percentiles are shown for each age group. From these curves are obtained directly the selected percentile values for the cardiothoracic area ratio which are shown in Table 53. Thus the lower and upper limits, as represented by the 10th and 90th percentiles for the age groups 60 - 69, 70 - 79, and 80 - 89 are for men 0·172 and 0·220, 0·181 and 0·230, and 0·183 and 0·242 respectively. The corresponding figures for the women are 0·200 and 0·254, 0·203 and 0·264, and 0·217 and 0·271.

In both sexes the significant increase in the cardiothoracic area ratio with age is due to a significant negative correlation between the area of the chest and age with no significant correlation between the area of the frontal cardiac silhouette and age.

DISCUSSION.

The relative variability of approximately 9·0 for the cardiothoracic area ratio is moderate, though slightly greater than the relative variability of about 7·0 for both the cardiothoracic ratio and the maxmimum transverse diameter of the heart.

The cardiothoracic area ratio increases significantly with age in both sexes. The reason for women is the same as applies to the cardiothoracic ratio, namely, a significant decrease in the skeletal attribute and no significant variation in heart size with age. In men the causes are different. While the cardiothoracic area ratio increases significantly with age due to a significant decrease in the frontal area of the chest associated with no significant change in heart size, the cardiothoracic ratio increases significantly with age because of a significant increase in the heart size and no material change in the dimensions of the maximum transverse diameter of chest. Since the cardiothoracic area ratio is not discussed in the literature no comparisons can be made with other surveys, and the normal limits presented still require to be related to those of younger years.

SUMMARY.

Normal limits for the cardiothoracic area ratio are presented with reference to 363 men and 250 women aged 60 to 89 years, who were in good health.

The 10th and 90th percentile limits of the cardiothoracic area ratio for the age groups 60 - 69, 70 - 79, and 80 - 89 for men are 0·172 and 0·220, 0·181 and 0·230, and 0·183 and 0·242 respectively. The corresponding figures for the women are 0·200 and 0·254, 0·203 and 0·264, and 0·217 and 0·271.

Both sexes show a significant positive correlation between the

cardiothoracic area ratio and age. In men and women this is due to a significant negative correlation between the frontal area of the chest and age, while the correlation between the area of the cardiac silhouette and age is not significant.

Table 52.

The number of cases by sex and ten year age groups with reference to the cardiothoracic area ratio.

Cardiothoracic area ratio	Men			Women		
	60 - 69 years	70 - 79 years	80 - 89 years	60 - 69 years	70 - 79 years	80 - 89 years
0·15	4	1				
0·16	5	2	2			
0·17	27	11	4			
0·18	32	27	5	2	3	
0·19	21	42	7	9	5	1
0·20	23	30	11	11	9	1
0·21	13	21	10	17	11	3
0·22	8	11	10	17	10	9
0·23	4	13	5	18	19	6
0·24	1	1	2	16	15	8
0·25	1	3	3	11	15	7
0·26		1	1	5	7	2
0·27					2	5
0·28			1		3	2
0·29					1	
	139	163	61	106	100	44

Table 53.

Selected percentile values for the cardiothoracic area ratio derived from the cumulative percentage curves shown in Figures 36 and 37, by sex and ten year age groups.

Percentiles	Men			Women		
	60 - 69 years	70 - 79 years	80 - 89 years	60 - 69 years	70 - 79 years	80 - 89 years
90	0·220	0·230	0·242	0·254	0·264	0·271
80	0·209	0·218	0·230	0·246	0·255	0·262
65	0·200	0·207	0·220	0·237	0·246	0·253
50	0·191	0·199	0·212	0·228	0·236	0·243
35	0·184	0·193	0·203	0·219	0·227	0·234
20	0·177	0·187	0·192	0·209	0·214	0·225
10	0·172	0·181	0·183	0·200	0·203	0·217

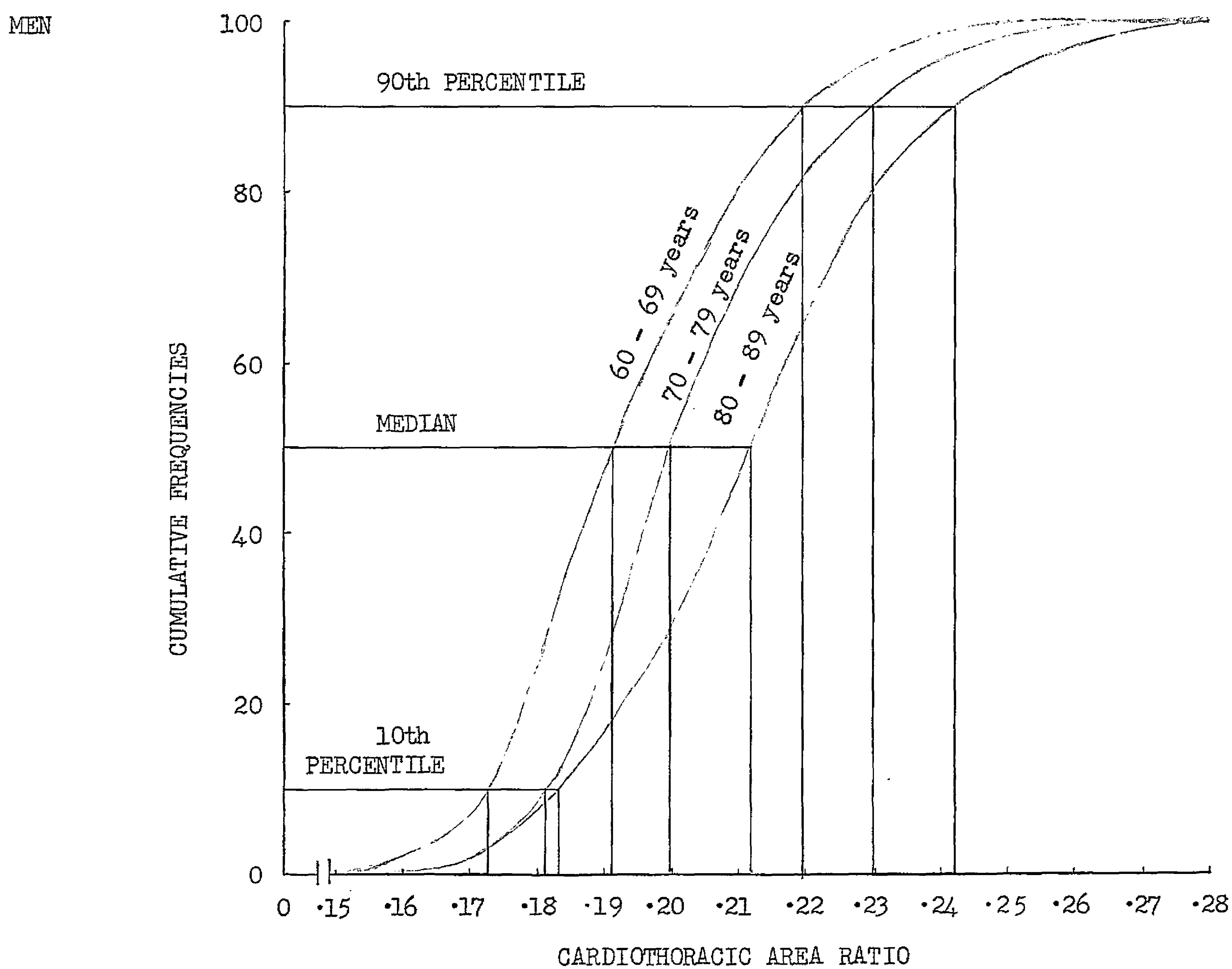


Figure 36. Cumulative frequency curves by ten year age groups of the cardiothoracic area ratio for men.

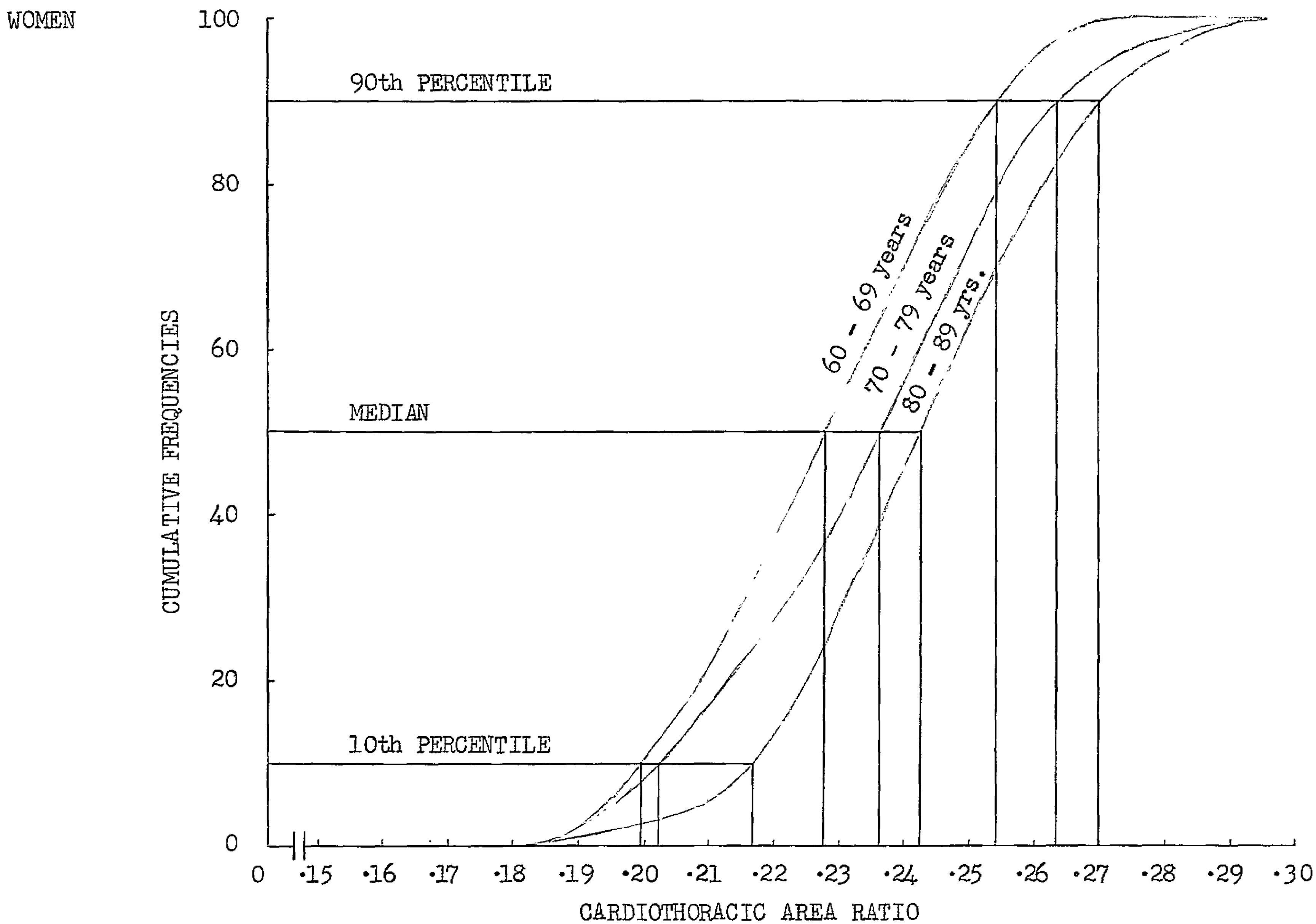


Figure 37. Cumulative frequency curves by ten year age groups of the cardiothoracic area ratio for women.

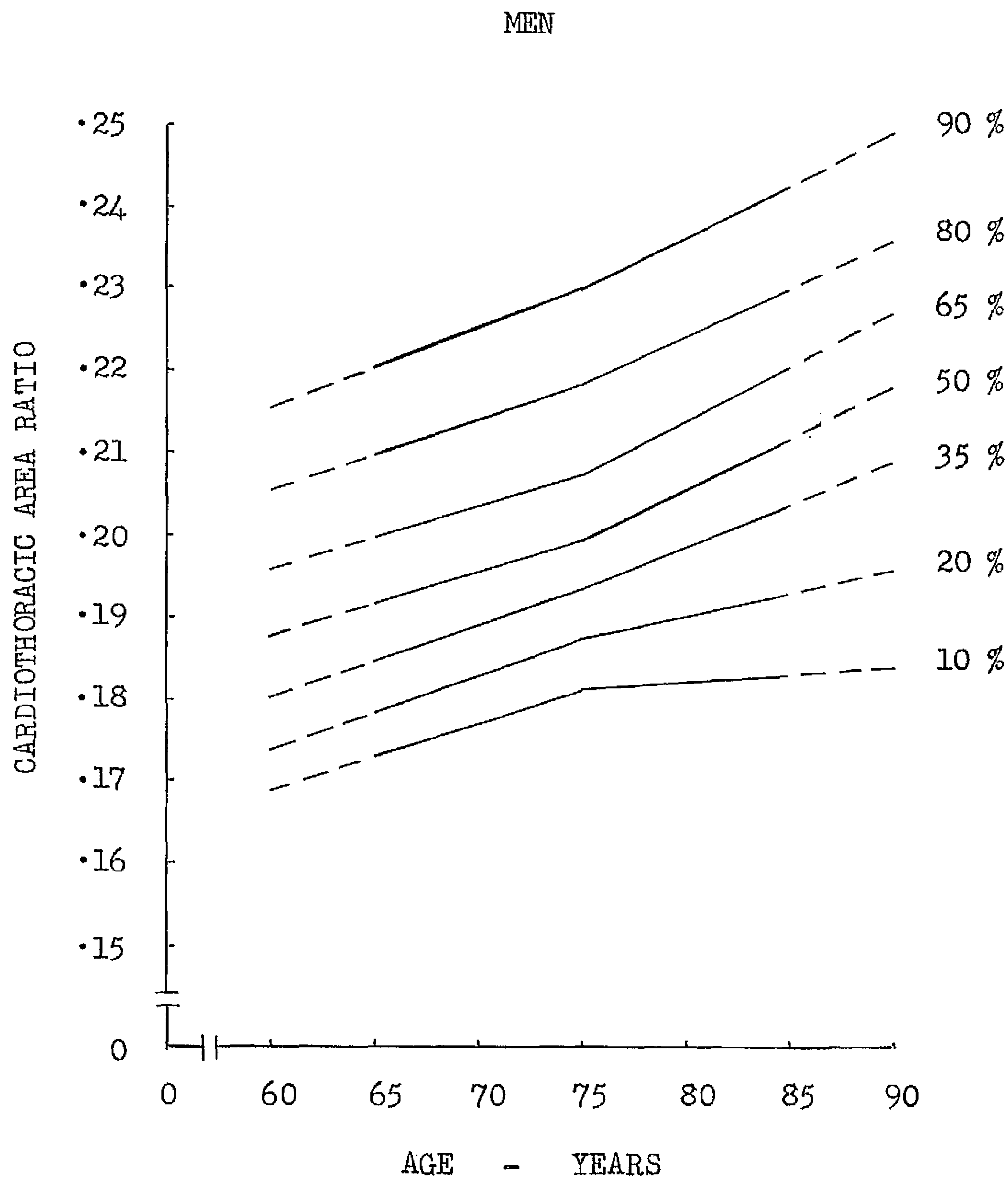


Figure 38. Selected percentile limits of cardiothoracic area ratio for men.

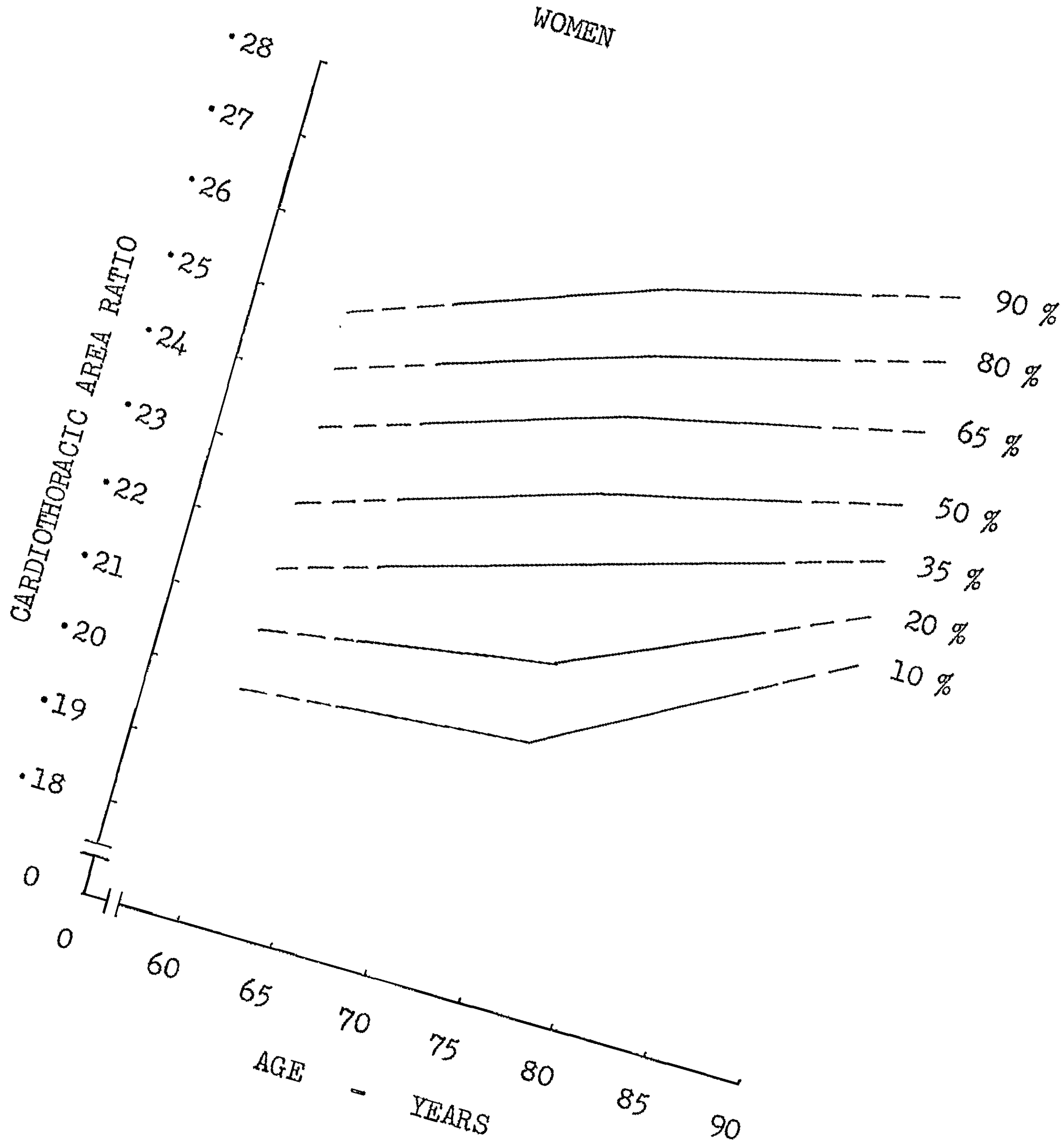


Figure 39. Selected percentile limits of cardiothoracic area ratio for women.

THE RELATIONSHIPS BETWEEN BODY WEIGHT, SYSTOLIC AND DIASTOLIC BLOOD PRESSURES OF HEALTHY OLDER PEOPLE AND ABNORMALITIES OBSERVED ON OPHTHALMOSCOPIC EXAMINATION, AND PALPATION OF RADIAL, DORSALIS PEDIS AND POSTERIOR TIBIAL ARTERIES.

Thus far data are presented for men and women regarded as physically healthy on the general principle of freedom from disease associated usually with symptoms. It must be recognised, however, that such a clinical method of selection is rather crude. The inadequate knowledge concerning the normal process of growing old renders an accurate definition of physical health impossible. Nevertheless, the ideal definition may be more nearly approached if, in addition to exclusion for the above reason, apparently physically healthy men and women with abnormalities of bodily attributes, which are not present in these attributes for all people, are also excluded. The purpose of this section of the thesis is to consider the possibility of forming from the initial group of healthy people already assessed at some length, a more select group by only retaining as physically healthy the men and women with normal ophthalmoscopic findings, normal radial arteries and normal pulsation in the dorsalis pedis and posterior tibial arteries. The following analysis is based on the 400 men and 293 women previously described as healthy and aged 60 to 89 years.

METHODS.

Men and women 25 per cent or more over ideal weight as estimated from Anderson's nomogram (Greene, 1948) are excluded from this analysis because of the difficulty in palpating the arteries in such adipose people.

Body weight and systolic and diastolic blood pressures are estimated as previously described (page 14.).

The three attributes ophthalmoscopic findings, state of radial arteries and presence or absence of pulsation in the dorsalis pedis and posterior tibial arteries form the following sub-groups: -

1. <u>Ophthalmoscopic examination</u>.

Two groups are derived from ophthalmoscopic examination, namely, normal and abnormal.

2. <u>Radial artery</u>.

Five sub-groups are formed according to the state of the radial arteries as palpated at the wrists, and these sub-groups are as follows: -

(a) Normal

(b) Slightly thickened and straight +

(c) Slightly thickened and tortuous ++

(d) Very thickened and straight +++

(e) Very thickened and very tortuous ++++

In the subsequent text the four abnormal radial artery groups may be described for brevity by the appropriate number of plus (+) signs. Furthermore, the radial artery may be considered simply as normal or abnormal for certain statistical purposes. The abnormal group then represents the sub-groups 2, 3, 4 and 5 combined.

3. <u>Palpation of the dorsalis pedis and posterior tibial arteries.</u>

Palpation of the dorsalis pedis and posterior tibial arteries provides two groups. In one group pulsation is normal in the dorsalis pedis and posterior tibial arteries, while in the other group pulsation is absent in one or more of the four arteries.

When these three attributes are considered solely as normal or abnormal the total number of permutations of groups of three is eight. These eight sub-groups are presented schematically in Table 61. These sub-groups present all possible combinations of abnormalities of attributes ranging from the first sub-group on the left of the Table with all three attributes normal to the last sub-group on the right of the Table with all three attributes abnormal.

When the radial artery is considered alone the total number of men and women in the series is used, but individuals with cataract, because of inability to carry out ophthalmoscopic assessment, are excluded from the combinations of attributes one to eight inclusive.

RESULTS.

Table 54 shows the 400 men and 293 women who form this series by the state of the radial artery and ten year age groups. For each decennial age period the percentage of women with normal radial arteries is far greater than the corresponding percentage for men, and there is a significant decrease in the proportion of normal radial arteries with age for both sexes. The abnormal radial artery groups + and ++ for men show little change with age. For women, however, the + radial artery group shows a marked increase in the eighth decade which is not sustained in the ninth, while the ++ radial artery group increases progressively with age. Both sexes show a marked consistent increase in the proportion of individuals in the +++ and ++++ radial artery groups with age.

Tables 55, 56 and 57 show for each ten year age group of men the significances of the differences between the normal radial artery group mean and the averages of the corresponding abnormal radial artery groups in terms of body weight, systolic and diastolic blood pressures respectively. In each decennial age period the abnormal radial artery groups in respect of body weight present averages which are less than their corresponding normal radial artery group average. The significances of the differences between the normal and abnormal radial artery groups means are real for the + and ++ groups in the seventh decade, for the +, ++ and +++ groups in the eighth decade, but not at all in the ninth decade. The downward mean trends are consistent for each ten year age group and it is probable that the small numbers in certain of the abnormal radial artery groups result in the absence of a significant difference between the means.

For systolic blood pressure in men the differences between the normal and abnormal radial artery groups means are significant only for the + and +++ groups at 70 to 79 years. A point of importance is that except for the ++++ radial artery group at 80 to 89 years, the systolic blood pressure means of the ++ and ++++ groups are consistently less than the means of the corresponding + and +++ groups. In respect of diastolic blood pressure the mean differences between the normal and abnormal radial artery groups are significant only for the +++ group at 70 to 79 years and the + group at 80 to 89 years. The mean differences between the ++, ++++ and +, +++ radial artery groups follow the trend observed for systolic blood pressure.

Tables 58, 59 and 60 refer to women and correspond to Tables 55, 56 and 57 for men. The number of women with abnormality of the radial arteries is small and consequently does not permit of satisfactory comparison by independent abnormal radial artery groups. For this reason, in each ten year age group the normal radial artery group is compared with the abnormal radial artery groups combined to form one group. It is then observed that all the abnormal radial artery groups exhibit averages for body weight which are less than the corresponding normal radial artery group means, and that the differences between the means while not significant at 60 to 69 years are highly significant for the two later decennial age periods. The trends of body weight means in terms of radial artery state are, therefore, similar for the sexes.

For systolic blood pressure in women the abnormal radial artery group average is significantly greater than the corresponding normal radial artery group average for each decennial age period. Diastolic blood pressure in women shows a similar significant mean difference for the age group 60 to 69 years only, though at all ages the normal radial artery group mean is less than the abnormal group mean.

The above results, however, take no account of other available clinical indices of vascular abnormality. Ophthalmoscopic findings and the presence or absence of pulsation in the dorsalis pedis and posterior tibial arteries are two other such criteria. Table 63 shows the body weight averages for men by the various combinations of the three attributes and five year age groups. Analyses of variance show that the weight means within each of the combinations of attributes do not vary significantly with age (Table 70). A comparison of the weight means of each of the combinations 2 to 8 with the weight mean of normal combination 1 shows that the weight averages of combinations 5b, 7 and 8 are significantly lower than the 145.05 lb. average for combination 1 by 16.97 lb., 11·17 lb. and 13·77 lb. respectively (Table 69.1a). Equivalent data for men are shown for systolic blood pressure in Tables 64, 70 and 69.1b and for diastolic blood pressure in Tables 65, 70 and 69.1c. The systolic blood pressure means within each of the combinations 1 to 8 do not vary significantly with age (Table 70). The systolic blood pressure averages of combinations 3, 4, 5a, 6, 7, and 8 are significantly higher than the systolic blood pressure average of 151·62 mm. for combination 1 by 8·85 mm., 17·11 mm., 6·55 mm., 17·24 mm., 10·46 mm. and 31·26 mm. respectively (Table 69.1b). Except for combination 3 in which the means vary significantly with age, the diastolic blood pressure means by age within each of the combinations of attributes do not vary significantly with age (Table 70). For diastolic blood pressure the average of combination 8 alone is significantly greater by 5·77 mm. than the 85·35 mm. average of combination 1 (Table 69.1c).

Table 66 shows the body weight means for women by the various combinations of the three attributes and five year age groups. Analysis of variance indicates that the weight means within combination 1 decline significantly with age (Table 71a). A comparison of the weight means of each of the abnormal combinations 2 to 8 with the weight mean of normal combination 1 shows that the weight averages of combinations 5 and 8 are significantly lower than the 128·16 lb. average for combination 1 by 10·36 lb.

and 19·16 lb. respectively (Table 69.2a). Equivalent data for women are shown for systolic blood pressure in Tables 67, 71b and 69.2b, and for diastolic blood pressure in Tables 68, 71c and 69.2c. The systolic blood pressure means within Combination 1 do not vary significantly with age (Table 71b). The systolic blood pressure averages of combinations 2, 3, 5, 6, 7, and 8 are significantly higher than the systolic blood pressure average of 157·22 mm. for combination 1 by 28·78 mm., 11·22 mm., 14·30 mm., 23·78 mm., 19·96 mm. and 32·78 mm. respectively (Table 69.2b). The diastolic blood pressure averages of combinations 2, 6 and 8 are significantly higher than the diastolic blood pressure average of 84·62 mm. for combination 1 by 4·83 mm., 8·38 mm. and 5·69 mm. respectively (Table 69.2c).

It is desirable to delineate which abnormal combinations when compared with normal combination 1 are loaded most heavily with significant differences between the means for the three variables body weight, systolic and diastolic blood pressures. The position is as follows: -

Men.

1. There is no significant difference between the means of combinations 1 and 2 for weight, systolic or diastolic blood pressures.
2. There is a significant difference between the means of combinations 1 and 3 for systolic blood pressure alone.

3. There is a significant difference between the means of combinations 1 and 4 for systolic blood pressure alone.

4. There is a significant difference between the means of combinations 1 and 5a for systolic blood pressure alone.

5. There is a significant difference between the means of combinations 1 and 5b for weight alone.

6. There is a significant difference between the means of combinations 1 and 6 for systolic blood pressure alone.

7. There is a significant difference between the means of combinations 1 and 7 for weight and systolic blood pressure, but not for diastolic blood pressure.

8. There is a significant difference between the means of combinations 1 and 8 for weight, systolic and diastolic blood pressures.

Women.

1. There is a significant difference between the means of combinations 1 and 2 for systolic and diastolic blood pressures.

2. There is a significant difference between the means of combinations 1 and 3 for systolic blood pressure alone.

3. There is no significant difference between the means of combinations 1 and 4 for weight, systolic or diastolic blood pressures.

4. There is a significant difference between the means of combinations 1 and 5 for weight and systolic blood pressure.

5. There is a significant difference between the means of combinations 1 and 6 for systolic and diastolic blood pressures.
6. There is a significant difference between the means of combinations 1 and 7 for systolic blood pressure alone.
7. There is a significant difference between the means of combinations 1 and 8 for weight, systolic and diastolic blood pressures.

Table 72 shows the means of weight, systolic and diastolic blood pressures with reference to the number of abnormal attributes. It is clear that with increase in the number of abnormal attributes there is on average a significant loss of weight and a significant increase in systolic and diastolic blood pressures. It is to be noted that the group with all attributes normal corresponds to combination 1, and that the group with all attributes abnormal corresponds to combination 8.

Tests for skewness and kurtosis were applied to the frequency distributions of combination 1 and of the abnormal combinations 2 to 8 combined for weight, systolic and diastolic blood pressures of men and women (Tables 73 and 74). For combination 1 the frequency distribution of diastolic blood pressure for women alone is significantly skewed and kurtotic. For the abnormal combinations combined the only departure from normality of the frequency distributions is the significant skewness for systolic blood pressure in women. Thus a significant departure from normality in respect of the frequency distributions is observed only in the isolated instance.

The linearity of the regression of a variable on age was usually assessed by simple inspection of the means plotted on a graph. Where doubt existed, however, concerning the linear character of a regression the significance of the deviations of the means from linearity was calculated by analysis of variance as shown in Table 75. All regressions were found to be linear.

DISCUSSION.

When the state of the radial artery is considered alone with reference to body weight and blood pressure it is observed that abnormal radial artery groups are associated on average with the men and women of lighter weight; that in women those who form the abnormal radial artery group in each decade show averages for systolic and diastolic blood pressures which are greater than the corresponding systolic and diastolic blood pressures averages for the normal radial artery group, and that in men there are complex mean differences in respect of systolic and diastolic blood pressures between the normal and abnormal radial artery groups and between the abnormal groups themselves for each decade. It is remarkable that the systolic and diastolic blood pressure averages for the radial artery groups ++ and ++++, apart from the ++++ group in the ninth decade, are lower than the corresponding averages for the + and +++ groups. This indicates that individuals with thickened and straight radial arteries have on average higher systolic and diastolic blood pressures than those who possess radial arteries which are thickened and tortuous. I am unable to explain this phenomenon.

When the three attributes ophthalmoscopic findings, state of radial artery and pulsation in the dorsalis pedis and posterior tibial arteries are considered the fundamental relationship between their various combinations of normality and abnormality and the variables body weight, systolic and diastolic blood pressures are, that as the number of abnormal attributes increase there is a significant decline in average body weight associated with a significant increase in average systolic and diastolic blood pressures. All the individuals in this series are regarded as physically healthy, though some are obviously more healthy than others, and it has been shown that the zero order coefficients of correlation for body weight and systolic or diastolic blood pressures are positive. Thus it would be expected that where a sub-group of individuals showed a significant decline in average weight a parallel appropriate decrease in average blood pressure should occur. This does not happen in the present study and the divergent trends shown by body weight and systolic or diastolic blood pressures are at variance with preconceived concepts. The reasons are speculative, and the findings indicate a profitable field for further research.

The three attributes when taken together clearly provide a more powerful criterion of abnormality of the vascular system in healthy older people than the use of one attribute alone.

The implications of the data presented are profound, and are particularly important when no comparable information exists in the literature. The findings indicate that the initial definition of physical health in this thesis, which was basically freedom from disease associated with symptoms, leaves much to be desired, though it is a practical concept for physicians. Further research, however, may be aided by stating the following hypothesis.

Within a group of older people regarded as physically healthy because of freedom from disease associated usually with symptoms there are sub-groups in varying degrees of physical health which range from positive to negative health. The sub-groups which exhibit negative health occupy an ill-defined zone between true health and overt disease.

In the present investigation combination 8 in which all three attributes are abnormal is certainly in a phase of negative health.

An extension of the hypothesis leads to the theory that with the passage of time a positive relationship will be found to exist between combinations 1 to 8 and morbidity and mortality with particular reference to the cardiovascular system. Proof of this statement lies in the continued observation of the cases which form the present study until there are no survivors. This is in the process of being carried out, but at the present time insufficient information is available for statistical analysis.

SUMMARY.

The relationship between the three attributes ophthalmoscopic findings, state of radial artery and pulsation in the dorsalis pedis and posterior tibial arteries and the variables body weight, systolic and diastolic blood pressures is presented and discussed for men and women aged 60 to 89 years.

With increase in the number of abnormal attributes there is a significant decrease in average body weight associated with a significant increase in blood pressure. The importance of this finding is noted and a hypothesis is presented that physical health in a healthy population should be regarded as a variable. With advancement in knowledge of the normal process of growing old the distribution of physical health may be more accurately defined.

In certain of the combinations there is a paucity of individuals and there is an age bias. Nevertheless, sufficient information is available to prove the important relationships between the variables weight, systolic and diastolic blood pressures and the abnormalities involving the three attributes under consideration in a group of healthy older people. A comparable statistical study of a much larger series would almost certainly provide more detailed information concerning trends in the intermediate individual combinations.

Table 54.

The number of men and women in the series by the state of the radial artery and ten year age groups.

State of radial artery	Sex	Number 60 - 69 years	Number 70 - 79 years	Number 80 - 89 years	Percentage 60 - 69 years	Percentage 70 - 79 years	Percentage 80 - 89 years
Normal	Men	72	65	16	47·7	35·5	24·3
Normal	Women	109	76	23	85·8	65·0	46·9
+	Men	61	69	27	40·4	37·7	40·9
+	Women	16	36	14	12·6	30·8	28·6
++	Men	14	26	8	9·3	14·2	12·1
++	Women	1	2	4	0·8	1·7	8·2
+++	Men	4	15	9	2·6	8·2	13·6
+++	Women	1	2	6	0·8	1·7	12·2
++++	Men		8	6		4·4	9·1
++++	Women		1	2		0·8	4·1

+ Slightly thickened and straight radial artery.
++ Slightly thickened and slightly tortuous radial artery.
+++ Very thickened and straight radial artery.
++++ Very thickened and very tortuous radial artery.

Table 55.

The means, mean differences, t values and probabilities for the weight of men by ten year age groups and the state of the radial artery.

Age group	State of radial artery	Number	Means lb.	Mean differences ± S.E. lb.	Significance of difference from average of normal radial artery. t	df	P
60 - 69	Normal	72	145·29	-	-	-	-
	+	61	137·70	- 7·59 ± 3·85	1·97	131	$<$ 0·05
	++	14	128·43	- 16·86 ± 6·15	2·74	84	$<$ 0·01
	+++	4	128·25	- 17·04 ± 11·16	1·53	74	$>$ 0·1
70 - 79	Normal	65	142·20	-	-	-	-
	+	69	140·88	- 1·32 ± 3·36	0·39	132	$>$ 0·6
	++	26	133·19	- 9·01 ± 4·11	2·19	89	$<$ 0·05
	+++	15	131·40	- 10·80 ± 4·98	2·17	78	$<$ 0·05
	++++	8	116·25	- 25·95 ± 6·68	3·88	71	$<$ 0·01
80 - 89	Normal	16	143·31	-	-	-	-
	+	27	142·70	- 0·61 ± 7·22	0·08	41	$>$ 0·9
	++	8	122·87	- 20·44 ± 11·29	1·81	22	$>$ 0·05
	+++	9	130·55	- 12·76 ± 9·23	1·38	23	$>$ 0·1
	++++	6	125·17	- 18·14 ± 11·44	1·59	20	$>$ 0·1

Table 56.

The means, mean differences, t values and probabilities for the systolic blood pressure of men by ten year age groups and the state of the radial artery.

Age group	State of radial artery	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal radial artery		
					t	df	P
60 - 69	Normal	72	151·72	-	-	-	-
	+	61	157·15	+ 5·43 ± 3·55	1·53	131	$>$ 0·1
	++	14	151·86	+ 0·14 ± 5·83	0·02	84	$>$ 0·9
	+++	4	164·00	+ 12·28 ± 9·82	1·25	74	$>$ 0·2
70 - 79	Normal	65	160·34	-	-	-	-
	+	69	167·56	+ 7·22 ± 3·44	2·10	132	$<$ 0·05
	++	26	163·08	+ 2·74 ± 4·75	0·58	89	$>$ 0·5
	+++	15	183·20	+ 22·86 ± 5·73	3·99	78	$<$ 0·01
	++++	8	153·75	- 6·59 ± 7·47	0·88	71	$>$ 0·3
80 - 89	Normal	16	172·87	-	-	-	-
	+	27	166·81	- 6·06 ± 6·86	0·88	41	$>$ 0·3
	++	8	162·25	- 10·62 ± 10·68	0·99	22	$>$ 0·3
	+++	9	170·22	- 2·65 ± 8·65	0·31	23	$>$ 0·7
	++++	6	178·67	+ 5·80 ± 10·80	0·54	20	$>$ 0·5

Table 57.

The means, mean differences, t values and probabilities for the diastolic blood pressure of men by ten year age groups and the state of the radial artery.

Age group	State of radial artery	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal radial artery		
					t	df	P
60 - 69	Normal	72	86·78	-	-	-	-
	+	61	85·05	- 1·73 ± 1·32	1·31	131	> 0·1
	++	14	84·28	- 2·50 ± 2·10	1·19	84	> 0·2
	+++	4	87·00	+ 0·22 ± 3·68	0·06	74	> 0·9
70 - 79	Normal	65	84·80	-	-	-	-
	+	69	87·39	+ 2·59 ± 1·48	1·75	132	> 0·05
	++	26	83·15	- 1·65 ± 1·90	0·87	89	> 0·3
	+++	15	89·60	+ 4·80 ± 2·33	2·06	78	< 0·05
	++++	8	83·00	- 1·80 ± 3·07	0·59	71	> 0·5
80 - 89	Normal	16	92·00	-	-	-	-
	+	27	85·33	- 6·67 ± 2·36	2·83	41	< 0·01
	++	8	86·75	- 5·25 ± 4·13	1·27	22	> 0·2
	+++	9	91·55	- 0·45 ± 3·45	0·13	23	> 0·8
	++++	6	86·33	- 5·67 ± 4·16	1·36	20	> 0·1

Table 58.

The means, mean differences, t values and probabilities for the weight of women by ten year age groups. In each decennial period the group of women with normal radial arteries is compared with the group which shows abnormal radial arteries.

Age group	State of radial artery	Number of women	Means lb.	Mean difference ± S.E. lb.	Significance of difference between means		
					t	df	P
60 - 69	Normal	109	130·83	-	-	-	-
	Abnormal	18	122·22	- 8·61 ± 4·75	1·81	125	> 0·05
70 - 79	Normal	76	128·91	-	-	-	-
	Abnormal	41	118·85	- 10·06 ± 3·31	3·04	115	< 0·01
80 - 89	Normal	23	125·96	-	-	-	-
	Abnormal	26	111·88	- 14·08 ± 5·71	2·46	47	< 0·02

Table 59.

The means, mean differences, t values and probabilities for the systolic blood pressure of women by ten year age groups. In each decennial age period the group of women with normal radial arteries is compared with the group which shows abnormal radial arteries.

Age group	State of radial artery	Number of women	Means mm.Hg.	Mean difference ± S.E. mm. Hg.	Significance of difference between means		
					t	df	P
60 - 69	Normal	109	158·49	-	-	-	-
	Abnormal	18	172.67	+ 14·18 ± 5·11	2·77	125	$<$ 0·01
70 - 79	Normal	76	168·18	-	-	-	-
	Abnormal	41	180·88	+ 12·70 ± 3·89	3·26	115	$<$ 0·01
80 - 89	Normal	23	174·52	-	-	-	-
	Abnormal	26	188.69	+ 14·17 ± 5·86	2·42	47	$<$ 0·02

Table 60.

The means, mean differences, t values and probabilities for the diastolic blood pressure of women by ten year age groups. In each decennial period the group of women with normal radial arteries is compared with the group which shows abnormal radial arteries.

Age group	State of radial artery	Number of women	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference between means		
					t	df	P
60 - 69	Normal	109	85·39	-	-	-	-
	Abnormal	18	89.67	+ 4·28 ± 1·98	2·16	125	$<$ 0·05
70 - 79	Normal	76	86·16	-	-	-	-
	Abnormal	41	87·90	+ 1·74 ± 1·68	1·04	115	$>$ 0·20
80 - 89	Normal	23	86·78	-	-	-	-
	Abnormal	26	90·92	+ 4·14 ± 2·79	1·48	47	$>$ 0·10

Table 61.

Schematic representation of the method by which the influence of the state of the radial artery as palpated at the wrist, the ophthalmoscopic findings, and the presence or absence of pulsation in the dorsalis pedis and posterior tibial arteries on weight, systolic and diastolic blood pressure is analysed.

Whole series

N.R.A.				Ab.R.A.			
N.R.A. N.O.		N.R.A. Ab.O		Ab.R.A. N.O.		Ab.R.A. Ab.O.	
N.R.A. N.O. N.P.	N.R.A. N.O. Ab.P.	N.R.A. Ab.O. N.P.	N.R.A. Ab.O. Ab.P.	Ab.R.A. N.O. N.P.	Ab.R.A. N.O. Ab.P.	Ab.R.A. Ab.O. N.P.	Ab.R.A. Ab.O. Ab.P.
1	2	3	4	5	6	7	8

N.R.A. - Normal radial artery.
N.O. - Normal ophthalmoscopic findings.
N.P. - Normal pulsation in dorsalis pedis and posterior tibial arteries.
Ab.R.A. - Abnormal radial artery.
Ab.O. - Abnormal ophthalmoscopic findings.
Ab.P. - Abnormal pulsation (partial or complete absence of pulsation) in dorsalis pedis and posterior tibial arteries.

Table 62.

The number of men and women in the series, excluding those with cataract, by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years. Combination 5 is divided into two sub-groups 5a and 5b. Sub-group 5a represents radial arteries which are thickened and straight, and 5b represents radial arteries which are thickened and tortuous.

Combinations of attributes	60 - 64 years		65 - 69 years		70 - 74 years		75 - 79 years		80 - 89 years	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
1	27	40	24	25	20	27	8	7	1	4
2		1	1		4	3	3	2	4	5
3	11	18	7	20	11	14	6	10	3	6
4		1	2		2	3	4	2	3	1
5a	17	4	19	5	19	6	13	5	4	2
5b	6		4	1	6		7	1	2	1
6			6	1	8	1	7	4	7	2
7	7	4	13	3	22	7	15	5	16	3
8	1		3			3	7	1	14	9

Table 63.

The means of the weight of men by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years.

Combinations of attributes	Number					Means				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	27	24	20	8	1	143·96	145·50	145·40	145·87	150·00
2		1	4	3	4		162·00	134·50	131·33	135·50
3	11	7	11	6	3	146·27	147·86	146·82	138·00	147·67
4		2	2	4	3		138·00	136·00	147·00	144·00
5 (a)	17	19	19	13	4	134·82	139·05	143·68	150·77	152·75
5 (b)	6	4	6	7	2	123·00	132·75	130·83	132·14	111·50
6		6	8	7	7		132·83	132·75	133·43	153·29
7	7	13	22	15	16	131·00	140·00	133·68	135·80	128·62
8	1	3		7	14	152·00	136·00		134·00	127·43

(continued overleaf)

Definitions of codings for combinations of attributes: -

1. Normal radial artery.
   Normal ophthalmoscopic findings.
   Normal pulsation of the dorsalis pedis and posterior tibial arteries.

2. Normal radial artery.
   Normal ophthalmoscopic findings.
   Pulsation absent in one or more of the dorsalis pedis and posterior tibial arteries.

3. Normal radial artery.
   Abnormal ophthalmoscopic findings.
   Normal pulsation of the dorsalis pedis and posterior tibial arteries.

4. Normal radial artery.
   Abnormal ophthalmoscopic findings.
   Pulsation absent in one or more of the dorsalis pedis and posterior tibial arteries.

5. Abnormal radial artery.
   Normal ophthalmoscopic findings.
   Normal pulsation of the dorsalis pedis and posterior tibial arteries.

   This group is subdivided into two sub-groups. 5 (a) in which the radial arteries show all degrees of thickening and are straight (+ and +++). 5 (b) in which the radial arteries show all degrees of thickening associated with tortuosity (++ and ++++).

6. Abnormal radial artery.
   Normal ophthalmoscopic findings.
   Pulsation absent in one or more of the dorsalis pedis and posterior tibial arteries.

7. Abnormal radial artery.
   Abnormal ophthalmoscopic findings.
   Normal pulsation of the dorsalis pedis and posterior tibial arteries.

8. Abnormal radial artery.
   Abnormal ophthalmoscopic findings.
   Pulsation absent in one or more of the dorsalis pedis and posterior tibial arteries.

Table 64.

The means of the systolic blood pressure of men by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years.

Combinations of attributes	Number of men by age groups					Means (mm. Hg.)				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	27	24	20	8	1	150·52	145·83	157·30	158·25	154·00
2		1	4	3	4		172.00	155·50	167·33	161·00
3	11	7	11	6	3	155·09	158·57	165·64	153·00	180·67
4		2	2	4	3		186·00	159·00	158.00	178·00
5 (a)	17	19	19	13	4	156·23	153·47	160·63	168·46	143·50
5 (b)	6	4	6	7	2	149·00	149·00	159·33	160·29	162.00
6		6	8	7	7		157·33	166·50	175·43	174·86
7	7	13	22	15	16	151·43	156·46	162·82	171·47	161·50
8	1	3		7	14	190·00	192·67		185·14	179·14

Table 65.

The means of the diastolic blood pressure of men by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years.

Combinations of attributes	Number of men by age groups					Means (mm. Hg.)				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	27	24	20	8	1	85·85	84·83	84·50	87·75	82·00
2		1	4	3	4		98·00	83·00	84·67	90·50
3	11	7	11	6	3	90·00	90·00	88·91	76·00	95·33
4		2	2	4	3		88·00	87·00	84·00	92·00
5 (a)	17	19	19	13	4	83·88	83·89	87·26	88·92	81·00
5 (b)	6	4	6	7	2	83·00	87·50	86·67	82·00	90·00
6		6	8	7	7		84·67	85·25	85·43	89·71
7	7	13	22	15	16	85·71	86·61	83·45	87·87	82·62
8	1	3		7	14	92·00	91·33		90·86	91·14

Table 66.

The means of the weight of women by the various combinations of attributes and by five year age groups for 60 to 79 years and a deccenial period for 80 to 89 years.

Combinations of attributes	Number of women by age groups					Means (lb.)				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	40	25	27	7	4	135·20	121·52	127·15	128·43	105·75
2	1		3	2	5	96·00		121·67	128·00	125·00
3	18	20	14	10	6	135·33	129·15	134·57	121·60	126·83
4	1		3	2	1	137·00		134·67	134·50	151·00
5	4	6	6	6	3	119·00	116·50	117·00	118·83	118·33
6		1	1	4	2		126·00	147·00	122·50	139·00
7	4	3	7	5	3	131·25	124·67	127·43	111·20	109·33
8			3	1	9			118·00	100·00	107·00

Table 67.

The means of the systolic blood pressure of women by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years.

Combinations of attributes	Number of women by age groups					Means (mm. Hg.)				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	40	25	27	7	4	154·10	158·96	161·85	157·43	146·00
2	1		3	2	5	170·00		190·67	179·00	189·20
3	18	20	14	10	6	157·78	165·00	180·14	176·40	171·33
4	1		3	2	1	162·00		163·33	162·00	182·00
5	4	6	6	6	3	177·50	167·33	164·00	175·33	179·33
6		1	1	4	2		186·00	150·00	199·50	157·00
7	4	3	7	5	3	162·00	186·67	179·43	178·40	180·67
8			3	1	9			180·00	168·00	195·78

Table 68.

The means of the diastolic blood pressure of women by the various combinations of attributes and by five year age groups for 60 to 79 years and a decennial period for 80 to 89 years.

Combinations of attributes	Number of women by age groups					Means (mm. Hg.)				
	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	80 - 89 years
1	40	25	27	7	4	85·50	85·28	83·48	85·71	77·50
2	1		3	2	5	98·00		87·33	90·00	88·80
3	18	20	14	10	6	84·11	85·00	91·43	87·80	89·00
4	1		3	2	1	90·00		91·33	71·00	94·00
5	4	6	6	6	3	87·00	87·67	85·67	87·67	87·33
6		1	1	4	2		92·00	86·00	95·00	93·00
7	4	3	7	5	3	88·00	98·67	87·43	80·40	84·00
8			3	1	9			84·67	78·00	93·55

Table 69.

The means, mean differences, t values and probabilities of the weight, systolic and diastolic blood pressure for the normal combinations of men and women (combination 1) and the corresponding abnormal combinations 2 to 8 taken individually. Combination 5 is divided into two sub-groups 5a and 5b for men. This sub-division is valueless for women as few form group 5b. Cataract cases are excluded from this analysis.

1. MEN. (a) Weight.

Combinations of attributes	Number	Means lb.	Mean differences ± S.E. lb.	Significance of difference from average of normal combination 1. t	df	P
1	80	145·05	-	-	-	-
2	12	136·33	- 8·72 ± 6·52	1·34	90	$>$ 0·1
3	38	145·53	+ 0·48 ± 4·14	0·12	116	$>$ 0·9
4	11	142·54	- 2·51 ± 6·32	0·40	89	$>$ 0·6
5a	72	142·15	- 2·90 ± 3·29	0·88	150	$>$ 0·3
5b	25	128·08	- 16·97 ± 4·53	3·75	103	$<$ 0·01
6	28	138·07	- 6·98 ± 4·40	1·59	106	$>$ 0·1
7	73	133·88	- 11·17 ± 3·34	3·34	151	$<$ 0·01
8	25	131·28	- 13·77 ± 4·60	2·99	103	$<$ 0·01

1. MEN.

(b) Systolic.

Combinations of attributes	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal combination 1.		
				t	df	P
1	80	151·62	–	–	–	–
2	12	161·67	+ 10·05 ± 6·13	1·64	90	$>$ 0·1
3	38	160·47	+ 8·85 ± 3·66	2·42	116	$<$ 0·02
4	11	168·73	+ 17·11 ± 6·60	2·59	89	$<$ 0·01
5a	72	158·17	+ 6·55 ± 3·20	2·05	150	$<$ 0·05
5b	25	155·68	+ 4·06 ± 4·49	0·90	103	$>$ 0·3
6	28	168·86	+ 17·24 ± 4·50	3·83	106	$<$ 0·01
7	73	162·08	+ 10·46 ± 3·48	3·01	151	$<$ 0·01
8	25	182·88	+ 31·26 ± 4·58	6·82	103	$<$ 0·01

1. MEN. (c) Diastolic.

Combinations of attributes	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal combination 1.		
				t	df	P
1	80	85·35	-	-	-	-
2	12	87·17	+ 1·82 ± 2·23	0·82	90	$>$ 0·4
3	38	87·89	+ 2·54 ± 1·44	1·76	116	$>$ 0·05
4	11	87·45	+ 2·10 ± 2·20	0·95	89	$>$ 0·3
5a	72	85·53	+ 0·18 ± 1·27	0·14	150	$>$ 0·8
5b	25	84·88	- 0·47 ± 1·56	0·30	103	$>$ 0·7
6	28	86·29	+ 0·94 ± 1·58	0·59	106	$>$ 0·5
7	73	84·96	- 0·39 ± 1·32	0·29	151	$>$ 0·7
8	25	91·12	+ 5·77 ± 1·73	3·33	103	$<$ 0·01

2. WOMEN.

(a) Weight.

Combinations of attributes	Number	Means lb.	Mean differences ± S.E. lb.	Significance of difference from average of normal combination 1. t	df	P
1	103	128·16	-	-	-	-
2	11	122·00	- 6·16 ± 5·73	1·07	112	> 0·2
3	68	130·59	+ 2·43 ± 2·83	0·86	169	> 0·3
4	7	137·29	+ 9·13 ± 7·01	1·30	108	> 0·1
5	25	117·80	- 10·36 ± 4·17	2·48	126	< 0·02
6	8	130·12	+ 1·96 ± 6·72	0·29	109	> 0·7
7	22	121·59	- 6·57 ± 4·43	1·48	123	> 0·1
8	13	109·00	- 19·16 ± 5·33	3·59	114	< 0·01

2. WOMEN.

(b) Systolic.

Combinations of attributes	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal combination 1. t	df	P
1	103	157·22	-	-	-	-
2	11	186.00	+ 28·78 ± 5·72	5·03	112	$<$ 0·01
3	68	168·44	+ 11·22 ± 3·06	3·67	169	$<$ 0·01
4	7	165·43	+ 8·21 ± 7·17	1·14	108	$>$ 0·2
5	25	171·52	+ 14·30 ± 4·22	3·39	126	$<$ 0·01
6	8	181·00	+ 23·78 ± 7·05	3·37	109	$<$ 0·01
7	22	177·18	+ 19·96 ± 4·53	4·41	123	$<$ 0·01
8	13	190·00	+ 32·78 ± 5·46	6·00	114	$<$ 0·01

2. WOMEN.

(c) Diastolic.

Combinations of attributes	Number	Means mm. Hg.	Mean differences ± S.E. mm. Hg.	Significance of difference from average of normal combination 1.		
				t	df	P
1	103	84.62	-	-	-	-
2	11	89.45	+ 4.83 ± 2.36	2.05	112	$<$ 0.05
3	68	86.85	+ 2.23 ± 1.22	1.83	169	$>$ 0.05
4	7	85.71	+ 1.09 ± 3.00	0.36	108	$>$ 0.7
5	25	87.04	+ 2.42 ± 1.70	1.42	126	$>$ 0.1
6	8	93.00	+ 8.38 ± 2.69	3.11	109	$<$ 0.01
7	22	87.00	+ 2.38 ± 1.88	1.27	123	$>$ 0.2
8	13	90.31	+ 5.69 ± 2.34	2.43	114	$<$ 0.02

Table 70.

Analysis of variance applied to each of the various combinations of attributes to assess the significance of the differences between the means within each combination of attributes for the weight, systolic and diastolic blood pressure of men. These combinations are represented by their code numbers.

WEIGHT.

1. Source of variation	Sum of squares	df	Mean square
Between groups	69	4	17·2
Within groups	33,071	75	440·9
Total	33,140	79	

$F = 0{\cdot}04$

For $v_1 = 75$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, the differences between the means of groups are not significant.

2. Source of variation	Sum of squares	df	Mean square
Between groups	750	3	250·0
Within groups	5,995	8	749·4
Total	6,745	11	

$F = 0{\cdot}33$

For $v_1 = 8$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·84. Therefore, the differences between the means of groups are not significant.

3. Source of variation	Sum of squares	df	Mean square
Between groups	416	4	104·0
Within groups	17,586	33	532·9
Total	18,002	37	

$F = 0{\cdot}19$

For $v_1 = 33$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, the differences between the means of groups are not significant.

4.

Source of variation	Sum of squares	df	Mean square
Between groups	213	3	71·0
Within groups	990	7	141·4
Total	1,203	10	

$F = 0{\cdot}50$

For $v_1 = 7$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·94. Therefore, the differences between the means of groups are not significant.

5 (a)

Source of variation	Sum of squares	df	Mean square
Between groups	2,556	4	639·0
Within groups	25,946	67	387·2
Total	28,502	71	

$F = 1{\cdot}65$

For $v_1 = 4$ and v_2 67, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

5(b)

Source of variation	Sum of squares	df	Mean square
Between groups	952	4	238·0
Within groups	6,226	20	311·3
Total	7,178	24	

$F = 0{\cdot}76$

For $v_1 = 20$ and $v_2=4$, the 5 per cent point of the variance-ratio is 5·91. Therefore, the differences between the means of groups are not significant.

6.

Source of variation	Sum of squares	df	Mean square
Between groups	2,161	3	720·3
Within groups	7,313	24	304·7
Total	9,474	27	

$F = 2{\cdot}36$

6. (continued)

For $v_1 = 3$ and $v_2 = 24$, the 5 per cent point of the variance-ratio is 3·01. Therefore, the differences between the means of groups are not significant.

7.

Source of variation	Sum of squares	df	Mean square
Between groups	683	4	170·7
Within groups	30,313	68	
Total	30,996	72	

$F = 0{\cdot}38$

For $v_1 = 68$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, the differences between the means of groups are not significant.

8.

Source of variation	Sum of squares	df	Mean square
Between groups	756	3	252·0
Within groups	7,634	21	363·5
Total	8,390	24	

$F = 0{\cdot}69$

For $v_1 = 21$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·74. Therefore, the differences between the means of groups are not significant.

SYSTOLIC BLOOD PRESSURE.

1.

Source of variation	Sum of squares	df	Mean square
Between groups	1,839	4	459·7
Within groups	28,376	75	378·3
Total	30,215	79	

$F = 1{\cdot}21$

For $v_1 = 4$ and $v_2 = 75$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

2.

Source of variation	Sum of squares	df	Mean square
Between groups	357	3	119·0
Within groups	4,682	8	585·2
Total	5,039	11	

$F = 0{\cdot}20$

For $v_1 = 8$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·84. Therefore, the differences between the means of groups are not significant.

3.

Source of variation	Sum of squares	df	Mean square
Between groups	2,196	4	549·0
Within groups	7,560	33	229·1
Total	9,756	37	

$F = 2{\cdot}40$

For $v_1 = 4$ and $v_2 = 33$, the 5 per cent point of the variance-ratio is 2·69. Therefore, the differences between the means of groups are not significant.

4.

Source of variation	Sum of squares	df	Mean square
Between groups	1,505	3	501.7
Within groups	5,722	7	817·4
Total	7,227	10	

$F = 0{\cdot}61$

For $v_1 = 7$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·94. Therefore, the differences between the means of groups are not significant.

5 (a)

Source of variation	Sum of squares	df	Mean square
Between groups	2,835	4	708.7
Within groups	25,231	67	376.6
Total	28,066	71	

$F = 1.88$

5 (a) continued.

For $v_1 = 4$ and $v_2 = 67$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

5 (b)

Source of variation	Sum of squares	df	Mean square
Between groups	756	4	189·0
Within groups	7,522	20	376·1
Total	8,278	24	

$F = 0 \cdot 50$

For $v_1 = 20$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·91. Therefore, the differences between the means of groups are not significant.

6.

Sourse of variation	Sum of squares	df	Mean square
Between groups	1,396	3	465·3
Within groups	12,848	24	535·3
Total	14,244	27	

$F = 0 \cdot 87$

For $v_1 = 24$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·64. Therefore, the differences between the means of groups are not significant.

7.

Source of variation	Sum of squares	df	Mean square
Between groups	2,543	4	635·7
Within groups	37,069	68	545·1
Total	39,612	72	

$F = 1 \cdot 17$

For $v_1 = 4$ and $v_2 = 68$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

8.

Source of variation	Sum of squares	df	Mean square
Between groups	569	3	189·7
Within groups	10,376	21	494·1
Total	10,945	24	

$F = 0{\cdot}38$

For $v_1 = 21$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·74. Therefore, the differences between the means of groups are not significant.

DIASTOLIC BLOOD PRESSURE.

1.

Source of variation	Sum of squares	df	Mean square
Between groups	86	4	21·5
Within groups	3,537	75	47·2
Total	3,623	79	

$F = 0{\cdot}45$

For $v_1 = 75$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, the differences between the means of groups are not significant.

2.

Source of variation	Sum of squares	df	Mean square
Between groups	250	3	83·3
Within groups	794	8	99·2
Total	1,044	11	

$F = 0{\cdot}84$

For $v_1 = 8$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·84. Therefore, the differences between the means of groups are not significant.

3.

Source of variation	Sum of squares	df	Mean square
Between groups	1,106	4	276·5
Within groups	1,558	33	47·2
Total	2,664	37	

$F = 5{\cdot}86$

For $v_1 = 4$ and $v_2 = 33$, the 1·0 per cent point of the variance-ratio is 4·02. Therefore, the differences between the means of groups are significant.

4.

Source of variation	Sum of squares	df	Mean square
Between groups	111	3	37·0
Within groups	442	7	63·1
Total	553	10	

$F = 0{\cdot}59$

For $v_1 = 7$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·94. Therefore, the differences between the means of groups are not significant.

5 (a)

Source of variation	Sum of squares	df	Mean square
Between groups	385	4	96·2
Within groups	5,091	67	76·0
Total	5,476	71	

$F = 1{\cdot}27$

For $v_1 = 4$ and $v_2 = 67$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

5 (b)

Source of variation	Sum of squares	df	Mean square
Between groups	179	4	44·7
Within groups	974	20	48·7
Total	1,153	24	

$F = 0{\cdot}92$

For $v_1 = 20$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·91. Therefore, the differences between the means of groups are not significant.

6.

Source of variation	Sum of squares	df	Mean square
Between groups	111	3	37·0
Within groups	1,775	24	73·9
Total	1,886	27	

$F = 0{\cdot}50$

For $v_1 = 24$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·64. Therefore, the differences between the means of groups are not significant.

7.

Source of variation	Sum of squares	df	Mean square
Between groups	302	4	75·5
Within groups	6,091	68	89·6
Total	6,393	72	

$F = 0{\cdot}84$

For $v_1 = 68$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, the differences between the means of groups are not significant.

8.

Source of variation	Sum of squares	df	Mean square
Between groups	1	3	0·3
Within groups	2,860	21	136·2
Total	2,861	24	

$F = 0{\cdot}002$

For $v_1 = 21$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8·74. Therefore, the differences between the means of groups are not significant.

Table 71.

Analyses of variance applied to combination 1 (normal radial artery, normal ophthalmoscopic findings and normal pulsation of the dorsalis pedis and posterior tibial arteries) to assess the significance of the differences between the means by age groups, for the weight, systolic and diastolic blood pressures of women.

(a) Weight.

Source of variation	Sum of squares	df	Mean square
Between groups	5,122	4	1280·5
Within groups	28,881	98	294·7
Total	34,003	102	

$F = 4{\cdot}34$

For $v_1 = 4$ and $v_2 = 98$, the 1·0 per cent point of the variance-ratio is 3·65. Therefore, the differences between the means of groups are most significant, and are most unlikely to have arisen by chance.

(b) Systolic.

Source of variation	Sum of squares	df	Mean square
Between groups	1,548	4	387·0
Within groups	34,054	98	347·0
Total	35,602	102	

$F = 1{\cdot}11$

For $v_1 = 4$ and $v_2 = 98$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

(c) Diastolic.

Source of variation	Sum of squares	df	Mean square
Between groups	288	4	72·0
Within groups	5,369	98	54·8
Total	5,657	102	

$F = 1{\cdot}31$

For $v_1 = 4$ and $v_2 = 98$, the 5 per cent point of the variance-ratio is 2·52. Therefore, the differences between the means of groups are not significant.

Table 72.

The means of weight, systolic and diastolic blood pressure with reference to combination 1 (three attributes normal), combinations 2, 3 and 5 combined (one attribute abnormal and two normal), combinations 4, 6 and 7 combined (two attributes abnormal and one normal), and combination 8 (three attributes abnormal), for men and women.

(a) Weight means. lb.

Number of attributes abnormal	Number		Means	
	Men	Women	Men	Women
0	80	103	145·05	128·16
1	147	104	140·16	126·60
2	112	37	135·78	126·40
3	25	13	131·28	109·00

(b) Systolic blood pressure. mm. Hg.

0	80	103	151·62	157·22
1	147	104	158·62	171·04
2	112	37	164·43	175·78
3	25	13	182·88	190·00

(c) Diastolic blood pressure. mm. Hg.

0	80	103	85·35	84·62
1	147	104	86·16	87·17
2	112	37	85·54	88·05
3	25	13	91·12	90·31

Table 73.

Tests of normality in the frequency distributions of combination 1 (normal attributes) of weight, systolic and diastolic blood pressure for men and women aged 60 years and more.

	MEN			WOMEN		
	Weight	Systolic	Diastolic	Weight	Systolic	Diastolic
S_2	669·0	293·9	227·5	702·1	345·7	350·6
S_3	648·2	246·2	42·9	− 49·0	58·1	393·1
S_4	15,854·4	2,932·9	1,559·5	12,005·3	2,820·4	3,620·0
k_2	8·4682	3·7209	2·8796	6·8823	3·3884	3·4372
k_3	8·4151	3·1950	0·5576	− 0·4899	0·5808	− 3·9292
k_4	− 7·0233	− 3·1047	− 4·5504	− 21·5496	− 6·1654	− 17·5357
$g_1 \pm$ S.E.	0·3415 ± 0·2689	0·4452 ± 0·2689	0·1141 ± 0·2689	− 0·0272 ± 0·2379	0·0931 ± 0·2379	− 0·6165 ± 0·2379
$g_2 \pm$ S.E.	− 0·0979 ± 0·5318	− 0·2242 ± 0·5318	− 0·5488 ± 0·5318	− 0·4549 ± 0·4716	− 0·5370 ± 0·4716	− 0·4842 ± 0·4716
t value for g_1	1·2700	1·6556	0·4243	0·1143	0·3913	2·5914
t value for g_2	0·1841	0·4216	1·0320	0·9646	1·1387	3·1471
degrees of freedom				∞		
P for g_1 and	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01	$<$ 0·01

Table 74.

Tests of normality in the frequency distributions of weight, systolic and diastolic blood pressure of men and women in the series aged 60 years and more, excluding those who form combination 1 (normal attributes).

	MEN			WOMEN		
	Weight	Systolic	Diastolic	Weight	Systolic	Diastolic
S_2	702·7	1,631·0	1,623·4	385·4	899·9	991·6
S_3	283·6	342·7	− 381·4	− 69·1	− 2,977·6	− 192·0
S_4	3,723·4	19,668·3	19,338·5	1,703·3	9,895·2	13,919·3
k_2	2·2028	5·1128	5·0890	2·0391	4·7614	5·2466
k_3	0·8952	1·0820	− 1·2031	− 0·3695	− 15·9220	− 1·0272
k_4	− 2·8978	− 16·3432	− 16·6574	− 3·3720	− 15·0608	− 7·8837
g_1 ± S.E.	0·2738 ± 0·1363	0·0936 ± 0·1363	− 0·1048 ± 0·1363	− 0·1269 ± 0·1763	− 1·5337 ± 0·1763	− 0·0854 ± 0·1763
g_2 ± S.E.	− 0·5972 ± 0·2718	− 0·6251 ± 0·2718	− 0·6448 ± 0·2718	− 0·8111 ± 0·3508	− 0·6664 ± 0·3508	− 0·2864 ± 0·3508
t value for g_1	2·0088	0·6867	0·7689	0·7198	8·6994	0·4844
t value for g_2	2·1972	2·2998	2·3723	2·3115	1·8997	0·8161
degrees of freedom			∞			
P for g_1 and $g_2 - g_1$	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01	$<$ 0·01	$>$ 0·01
g_2	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01	$>$ 0·01

Table 75.

Test of deviation from linear regression applied to selected groups of means where linearity is in doubt.

1. MEN. Systolic blood pressure. Combination 1.

Source of variation	df	Sum of squares	Mean square
Between age groups	4	1,839	
Linear regression	1	744	
Deviations from linear regression	3	1,095	365
Within groups (error)	75	28,215	378

$F = 0.97$

For $v_1 = 75$ and $v_2 = 3$, the 5 per cent point of the variance-ratio is 8.53. Therefore, no more than random sampling departure from linear regression is indicated.

2. MEN Systolic blood pressure. Combinations 2 to 8 combined.

Source of variation	df	Sum of squares	Mean square
Between age groups	5	8,551	
Linear regression	1	7,497	
Deviations from linear regression	4	1,054	263
Within groups (error)	314	149,296	475

$F = 0.55$

For $v_1 = 314$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5.63. Therefore, no more than random sampling departure from linear regression is indicated.

3. WOMEN. Weight. Combination 1.

Source of variation	df	Sum of squares	Mean square
Between age groups	4	5,122	
Linear regression	1	2,702	
Deviations from linear regression	3	2,420	807
Within groups (error)	98	28,881	295

$F = 2{\cdot}73$

For $v_1 = 3$ and $v_2 = 98$, the 5 per cent point of the variance-ratio is 2·76. Therefore, no more than random sampling departure from linear regression is indicated.

4. WOMEN. Weight. Combinations 2 to 8 combined.

Source of variation	df	Sum of squares	Mean square
Between age groups	5	4,572	
Linear regression	1	3,692	
Deviations from linear regression	4	880	220
Within groups (error)	184	67,244	365

$F = 0{\cdot}60$

For $v_1 = 184$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, no more than random sampling departure from linear regression is indicated.

5. WOMEN. Systolic blood pressure. Combination 1.

Source of variation	df	Sum of squares	Mean square
Between age groups	4	1,548	
Linear regression	1	65	
Deviations from linear regression	3	1,483	494
Within groups (error)	98	34,054	347

$F = 1.42$

For $v_1 = 3$ and $v_2 = 98$, the 5 per cent point of the variance-ratio is 2·76. Therefore, no more than random sampling departure from linear regression is indicated.

6. WOMEN. Systolic blood pressure. Combinations 2 to 8 combined.

Source of variation	df	Sum of squares	Mean square
Between age groups	5	12,380	
Linear regression	1	11,392	
Deviations from linear regression	4	988	247
Within groups (error)	184	75,753	412

$F = 0.60$

For $v_1 = 184$ and $v_2 = 4$, the 5 per cent point of the variance-ratio is 5·63. Therefore, no more than random sampling departure from linear regression is indicated.

The observations used in the present study are as follows: -

MEN.

60 - 64 years.

Radial artery normal			Radial artery normal			Radial artery +			Radial artery ++		
S.B.P.	D.B.P.	WT.	S.B.P.	D.B.P.	WT.	S.B.P.	D.B.P.	WT.	S.B.P.	D.B.P.	WT.
142	78	162	152	82	155	124	70	122	172	90	115
160	84	108	128	84	148	154	84	118	138	78	123
142	82	159	188	100	188	170	68	125	138	74	129
140	84	141	132	78	123	150	70	111	164	92	117
164	86	142	130	84	137	190	94	121	140	82	113
148	88	152	144	88	193	152	84	137	142	82	141
158	86	113	168	88	113 x	148	88	130	144	88	156 x
162	92	130	138	80	147 x	148	68	130			
162	82	144	138	78	140 x	164	94	163	Radial artery +++		
158	96	157	166	80	190 x	184	96	131			
148	92	128	162	98	161 x	182	94	149	178	96	134
172	88	133	168	96	154 x	122	78	160	158	94	146
138	74	153	128	92	121 x	142	86	126	152	84	119
142	92	169	148	100	166 x	182	84	119 x			
168	98	124	148	96	123 x	190	92	152 xxx	Radial artery ++++		
150	80	141	154	88	133 x	180	96	113 x			
150	84	143	188	94	161 x	112	68	150 x	No cases		
158	86	127				134	88	105 x			
128	80	128	Radial artery +			166	88	155 x			
162	92	159				142	88	119 x			
138	78	130	138	78	170						

x indicates abnormal ophthalmoscopic findings.
xx indicates absence of pulsation for one or more of the dorsalis pedis and posterior tibial arteries
xxx indicates that x and xx co-exist.

MEN.

65 - 69 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
126	84	163
156	96	158
198	98	165
126	76	108
138	86	133
132	80	126
166	94	139
138	78	132
184	92	133
174	86	201
170	84	157
124	86	181
122	80	120
140	82	150
112	76	129
140	74	152
196	98	113
138	84	114
126	90	140
122	80	162
142	82	115
148	84	171
130	76	144
152	90	186
156	88	153 *
174	92	139 *
154	88	144 *
142	86	150 *
158	94	105 *
172	86	160 *
154	96	184 *
172	98	162 **
180	80	128 ***
192	96	148 ***

Radial artery +

S.B.P.	D.B.P.	WT.
162	96	104
170	90	145
152	84	155
142	92	173
132	68	102
146	90	150
160	94	151
144	82	129
174	74	151
152	88	127
162	86	126
148	88	153
118	78	149
146	76	113
180	88	170
168	78	160
154	76	117
156	86	163
150	80	104
184	94	152 *
172	88	113 *
164	88	110 *
126	88	157 *
162	88	180 *
142	84	133 *
208	92	143 *
172	94	132 *
156	100	160 *
150	78	184 *
128	78	106 *
148	86	126 *
164	96	101 **
138	78	136 **
130	82	138 **
146	84	147 **
198	94	161 **
208	98	159 ***

Radial artery ++

S.B.P.	D.B.P.	WT.
142	88	160
144	78	112
128	86	125
182	98	134
122	68	124 *
164	82	133 ***
206	94	116 ***

Radial artery +++

168	74	114 **

Radial artery ++++

No cases

MEN.

70 - 74 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
176	90	161
170	90	145
206	98	104
134	72	132
144	88	151
168	82	146
128	72	148
168	98	136
162	84	116
138	80	166
168	88	170
140	88	134
150	80	147
168	86	131
142	84	170
130	72	152
154	78	164
168	88	166
184	88	127
148	84	142
160	72	137 *
162	98	158 *
184	92	198 *
140	82	151 *
190	88	151 *
180	96	159 *
172	86	170 *
156	92	119 *
148	86	124 *
168	92	137 *
162	94	111 *
142	84	130 *
138	74	112 **
144	80	131 **
198	94	165 **
180	96	139 ***
138	78	133 ***

Radial artery +

S.B.P.	D.B.P.	WT.
182	96	128
136	88	144
138	72	143
164	88	115
180	94	155
186	100	169
190	78	143
168	86	154
176	104	161
142	82	137
132	80	125
168	98	149
148	90	144
118	74	131
166	92	192
158	84	133
178	86	169
180	84	111 *
162	98	158 *
194	96	152 *
192	82	114 *
198	94	147 *
154	90	139 *
194	80	147 *
148	80	152 *
126	76	147 *
164	68	92 *
192	76	118 *
152	80	127 *
172	80	152 *
166	86	158 *
160	78	167 *
164	86	121 *
168	98	161 **
204	96	111 **
160	78	130 **
156	88	123 **

Radial artery ++

S.B.P.	D.B.P.	WT.
150	84	138
138	80	111
148	78	132
192	92	130
162	92	167
168	82	111 *
158	92	141 *
138	72	140 *
134	86	129 *
156	70	128 **
164	82	133 **
156	84	145 **

Radial artery +++

S.B.P.	D.B.P.	WT.
136	80	128
186	86	110
168	86	131 **

Radial artery ++++

S.B.P.	D.B.P.	WT.
166	94	107
158	98	107 *
108	72	111 *

MEN.

75 - 79 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
174	96	144
146	78	143
146	80	124
156	90	156
154	86	165
176	92	168
182	88	143
132	92	124
140	68	151 x
166	84	143 x
142	66	143 x
174	74	159 x
156	82	114 x
140	82	118 x
148	68	144 xx
180	98	120 xx
174	88	130 xx
146	84	145 xxx
208	90	162 xxx
144	80	132 xxx
134	82	149 xxx

Radial artery +

S.B.P.	D.B.P.	WT.
162	96	123
184	98	149
160	72	177
192	86	183
128	82	128
142	82	153
152	82	154
152	82	150
158	86	153
198	100	157
154	76	127 x
170	98	164 x
168	88	149 x
158	76	107 x
164	102	108 x
170	86	138 x
184	104	143 x

Radial artery +

S.B.P.	D.B.P.	WT.
162	96	175 x
170	88	124 xx
186	94	151 xx
198	96	159 xxx
206	106	156 xxx
172	86	137 xxx
146	84	101 xxx

Radial artery ++

S.B.P.	D.B.P.	WT.
148	78	146
152	90	142
154	84	161
186	70	118
136	82	127
192	76	125 x
176	82	119
148	76	144 xx
216	98	120 xxx
162	70	136 xxx

Radial artery +++

S.B.P.	D.B.P.	WT.
162	98	143
192	94	149
208	98	141
204	102	125 x
168	68	129 x
160	82	131 x
194	100	128 x
196	92	136 x
164	82	145 xx
216	94	131 xx
196	96	129 xxx

Radial artery ++++

S.B.P.	D.B.P.	WT.
170	88	112
128	72	121 x
172	90	114 xx
172	74	125 xx

MEN.

80 - 84 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
154	86	150
186	94	128 x
164	94	143 x
192	98	172 x
154	94	184 xx
194	96	110 xx
158	90	146 xx
192	100	131 xxx
194	88	156 xxx
148	88	145 xxx

Radial artery +

S.B.P.	D.B.P.	WT.
152	86	180
138	86	151
146	76	148
136	76	132
148	88	143 x
172	88	138 x
208	98	121 x
162	88	150 x
178	84	132 x

Radial artery +

S.B.P.	D.B.P.	WT.
142	78	175 x
186	94	109 x
172	72	117 x
210	98	150 xx
152	88	150 xx
168	74	112 xxx
170	90	148 xxx
172	88	101 xxx
172	78	167 xxx

Radial artery ++

S.B.P.	D.B.P.	WT.
138	86	102
136	74	97 x
190	84	179 xx
202	106	127 xxx
152	92	128 xxx

Radial artery +++

S.B.P.	D.B.P.	WT.
142	88	125 x
162	84	135 x
138	72	128 x

Radial artery +++

S.B.P.	D.B.P.	WT.
166	88	117 xxx
166	90	120 xxx
208	106	129 xxx
188	92	129 xxx

Radial artery ++++

S.B.P.	D.B.P.	WT.
186	94	121
192	86	130 x
184	88	117 x
122	66	132 x
208	104	105 xxx

MEN. 85 - 89 years

Radial artery normal

S.B.P.	D.B.P.	WT.
138	82	102 xx

Radial artery +

S.B.P.	D.B.P.	WT.
128	82	130 xx
156	84	136 xx
198	88	180 xx
156	78	132 xxx
170	86	151 xxx

Radial artery ++

S.B.P.	D.B.P.	WT.
140	74	109 x
210	106	118 xxx

Radial artery +++

S.B.P.	D.B.P.	WT.
190	104	148 xx

WOMEN.

60 – 64 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
130	72	150
158	84	119
174	94	163
162	94	150
142	74	144
138	88	132
132	88	115
138	90	155
134	76	119
152	82	167
176	74	140
164	90	127
148	86	150
160	88	150
196	94	159
126	70	136
118	80	139
122	88	151
150	86	111
140	84	100
158	80	120
144	86	112
162	94	146
140	76	121
156	82	140
170	64	117
180	88	137 x
148	72	143 x
162	82	128 x
132	90	113 x
186	92	133 x
164	94	162 x
144	88	130 x
154	84	148 x
178	92	134 x
156	90	117 x
140	78	105 x
186	92	131 x
170	84	134 x

Radial artery normal

S.B.P.	D.B.P.	WT.
128	68	145 x
148	82	148 x
168	88	146 x
132	68	134 x
164	82	148 x
170	98	96 xx
162	90	137 xxx

Radial artery +

S.B.P.	D.B.P.	WT.
158	72	127
198	94	106
174	94	133
180	88	110
140	88	100 x
140	78	155 x
170	90	138 x
198	96	132 x

Radial artery normal

S.B.P.	D.B.P.	WT.
168	92	136
152	80	135
146	92	132
194	90	132
152	84	128
168	82	106
168	98	137
124	74	146
176	94	130
154	86	126
152	94	124
154	92	156
172	94	139
196	98	148

WOMEN.

65 - 69 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
136	88	129
174	88	99
126	84	126
142	82	156
124	76	81
146	82	143
162	88	102
186	92	134
162	88	107
138	80	101
156	86	120
162	88	99
154	84	113
180	88	97
174	90	134
174	84	123
188	90	133
162	98	127
186	84	111
126	82	143
174	86	146
168	92	126
142	66	133
144	82	139
188	84	116
138	68	149 x
200	88	169 x
144	86	134 x
192	86	102 x
202	108	128 x
166	80	143 x
150	80	154 x
164	88	143 x
176	92	100 x
148	82	118 x
182	94	139 x
164	74	111 x
194	92	115 x
154	78	107 x

Radial artery normal

S.B.P.	D.B.P.	WT.
142	82	158 x
138	88	115 x
148	78	117 x
156	84	112 x
160	84	146 x
182	88	123 x

Radial artery +

132	80	72
188	88	144
174	86	109
178	86	115
188	98	156
158	92	96 x
214	108	144 x
186	92	126 xx

Radial artery ++

144	88	103

Radial artery +++

188	96	134 x

WOMEN.

70 - 74 years.

Radial artery normal			Radial artery normal			Radial artery +		
S.B.P.	D.B.P.	WT.	S.B.P.	D.B.P.	WT.	S.B.P.	D.B.P.	WT.
184	94	136	184	90	125 *	194	88	91
152	82	121	174	92	146 *	136	68	124
152	78	119	186	94	128 *	148	92	101
140	84	143	190	90	133 **	158	86	145
152	76	146	188	90	105 **	190	102	102
148	84	109	194	82	127 **	158	78	139
168	74	154	152	92	118 ***	182	80	151 *
188	84	128	158	86	146 ***	210	102	120 *
172	84	99	180	96	140 ***	182	82	120 *
154	92	169				196	96	98 *
160	72	141				170	96	145 *
158	88	129				156	84	125 *
140	88	108				160	72	133 *
154	88	153				150	86	147 **
156	74	105				208	78	106 ***
184	80	115				164	84	107 ***
148	84	118				168	92	141 ***
164	82	138						
188	94	138						
142	70	104						
140	78	121						
146	86	120						
170	90	116						
188	88	109						
148	82	124						
182	84	146						
192	94	124						
186	100	129 *						
210	96	130 *						
186	80	107 *						
190	88	160 *						
186	102	115 *						
162	82	151 *						
194	88	134 *						
166	100	138 *						
180	96	142 *						
138	80	136 *						
180	92	143 *						

WOMEN.

75 - 79 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
188	98	111
144	82	112
156	90	125
154	76	151
142	82	157
152	82	129
166	90	114
156	86	89 x
172	100	147 x
208	92	150 x
134	70	126 x
178	92	114 x
160	96	140 x
190	74	93 x
186	92	125 x
186	84	120 x
194	92	112 x
172	88	124 xx
186	92	132 xx
164	70	142 xxx
160	72	127 xxx

Radial artery +

S.B.P.	D.B.P.	WT.
186	98	118
186	86	86
148	84	137
180	88	143
162	76	130 x
210	94	133 x
186	68	87 x
176	86	115 x
216	90	123 xx
214	104	131 xx
190	96	144 xx
178	90	92 xx

Radial artery ++

158	78	91 x
168	78	100 xxx

Radial artery +++

192	86	103

Radial artery ++++

164	84	126

WOMEN.

80 - 84 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
152	86	111
138	66	97
142	74	96
198	90	149 x
158	82	134 x
172	86	130 x
184	88	140 x
198	90	118 xx
186	98	142 xx
184	92	145 xx
180	92	105 xx
198	72	115 xx
182	94	151 xxx

Radial artery +

S.B.P.	D.B.P.	WT.
162	74	116
198	96	137 x
188	78	109 x
160	92	126 xx
188	96	106 xxx
190	88	108 xxx
218	100	140 xxx

Radial artery ++

S.B.P.	D.B.P.	WT.
202	98	131

Radial artery +++

S.B.P.	D.B.P.	WT.
206	86	96 xxxx
202	68	107 xxxx
188	100	106 xxxx

Radial artery ++++

S.B.P.	D.B.P.	WT.
174	94	124 xxxx

WOMEN.

85 - 89 years.

Radial artery normal

S.B.P.	D.B.P.	WT.
152	84	119
180	94	124 x
136	94	84 x

Radial artery +

S.B.P.	D.B.P.	WT.
174	90	108
154	94	152 xx

Radial artery ++

No cases

Radial artery +++

S.B.P.	D.B.P.	WT.
156	78	82 x
204	108	86 xxx

Radial artery ++++

S.B.P.	D.B.P.	WT.
192	102	90 xxx

The information which follows immediately is based on the 400 healthy men, 293 healthy non-adipose women and 111 adipose women considered to be in good health.

FEET.

1. More men than women have feet which are in good condition. With age the proportion of such men declines from 34·8 per cent at 60 - 64 years to 10·9 per cent at 80 - 84 years and 0 per cent at 85 - 89 years, Women show no such trend with age. Feet with no defects are found in approximately 19 per cent of men, 9 per cent of non-adipose women and 8 per cent of adipose women (Table 76).

2. Corns are more prevalent in women than men, and in the adipose than the non-adipose women. Corns, which show a high incidence in all age groups, occur in about 70 per cent of men, 80 per cent of non-adipose women and 88 per cent of adipose women (Table 77).

3. Plantar callosities are more prevalent in women than men, and in the adipose than the non-adipose women. Such callosities are observed in about 54 per cent of men, 68 per cent of non-adipose women and 75 per cent of adipose women. There is a high incidence in all age groups for both sexes (Table 78).

4. Toe nails which require to be trimmed are more often encountered in women than men, and in the adipose than non-adipose women. This condition is noted in approximately 66 per cent of adipose women, 56 per cent of non-adipose women and 40 per cent of men. Furthermore, the proportions show an upward trend with age for men; a similar less marked trend for non-adipose women, and no trend for adipose women (Table 79).

5. Onychogryphosis occurs in about 22 per cent of men and non-adipose women and 28 per cent of adipose women (Table 80).

6. Bunions and hallux valgus are particularly associated with women, and their incidence particularly that of bunions declines with age in adipose women. Bunions are present in about 36 per cent of adipose women, 27 per cent of non-adipose women and 7 per cent of men. The corresponding percentages for hallux valgus are 41, 37 and 14 respectively (Tables 81 and 82).

8. Ingrowing toe nails are recorded in approximately 14 per cent of men, 12 per cent of non-adipose women and 9 per cent of adipose women. With adipose women only there is an indication of a probable decrease in incidence of this type of foot defect with age (Table 83).

9. Feet which required to be washed are encountered somewhat more frequently in men, but this is not a common condition. Dirty feet are observed in about 8 per cent of men, 3 per cent of non-adipose women and 2 per cent of adipose women (Table 84).

10. Flat feet are more frequently found in women than men, and in the adipose than the non-adipose women. There are no specific trends with age. Flat feet are noted in 15 per cent of adipose women, 6 per cent of non-adipose women and 2 per cent of men (Table 85).

11. Hammer toes and overlapping of toes are relatively uncommon. Hammer toes are found in about 4 per cent of men, 3 per cent of women who are non-adipose, and in 2 per cent of adipose women.

The corresponding percentages for overlapping of toes are 7, 5 and 4 respectively (Tables 86 and 87).

VARICOSE VEINS.

Varicose veins are significantly associated with women and especially with adipose women. The approximate proportions are 10 per cent of men, 24 per cent of non-adipose women and 49 per cent of adipose women. Adipose women alone present percentages which suggest an increase in incidence of varicose veins with age (Table 88).

RECTAL EXAMINATION.

Rectal examination revealed the presence of haemorrhoids in about 8 per cent of men, 7 per cent of non-adipose women and 11 per cent of adipose women (Table 91). Furthermore, tinea was diagnosed in 6 men and 2 women. Otherwise the rectal examinations were regarded as normal, though for completeness Table 90 records the incidence of haemorrhoidal tags. All the men were free from disease of the prostate.

HERNIA.

Herniae are observed in 13 per cent of men, but only in

1·7 per cent of non-adipose women and in none of the adipose women (Table 92). Thus herniae are significantly related to men. Of the 52 men with herniae 17, or 32 per cent, had no trusses and 9, or 17 per cent, had trusses which were faulty.

EPIGASTRIC PULSATION.

The absence of epigastric pulsation is significantly associated with adipose women. This absence of pulsation is recorded in 84·7 per cent of adipose women, 32·1 per cent of non-adipose women and in 11·5 per cent of men. Any influence which age may have on the absence of epigastric pulsation is to increase the incidence of absence with age (Table 93).

VIBRATION SENSE.

The absence of vibration sense at the ankle and knee increases in incidence with age in men and women. This incidence, which is comparable for men and non-adipose women, is considerably exceeded by that of the adipose women (Tables 94 and 95).

ABDOMINAL REFLEXES.

There is an increase in the incidence of absence of abdominal reflexes with age in men and non-adipose women, but this is much less noticable for adipose women. Furthermore, absence of abdominal reflexes is of significantly greater occurrence in women than men, and is more prevalent in the adipose than non-adipose women. Absence of abdominal reflexes is observed in 21 per cent of men, 58 per cent of non-adipose women and in approximately 68 per cent of adipose women (Table 96).

TENDON REFLEXES.

The purpose of presenting data which relate to tendon reflexes is to show that in older people in good health tendon reflexes may be absent or exaggerated, but that such events are relatively infrequent (Tables 97, 98, 99 and 100). Absent tendon reflexes occur for the ankle in 5·2 per cent of men, 1·4 per cent of non-adipose women and for the knee in 1·5 per cent of men. Otherwise the percentage occurrence is less than unity. Exaggerated reflexes are somewhat more frequent than absence of reflexes, and attain their highest values in respect of the knee where exaggeration of the reflex is found in 11·7 per cent of men, 9·9 per cent of non-adipose women, and 7·2 per cent of adipose women.

HEAD HAIR.

Very few people over 59 years show no greying of the hair of the head. Approximately 4 per cent of men and women are in this category, and none are over the age of 74 years. (Table 101).

Partial greying of the hair is present in about 17 per cent of men and 28 per cent of women, and the incidence of partial greying of the hair declines with age (Table 102).

Entirely grey hair occurs in about 36 per cent of men and women. In men and non-adipose women the proportion with grey hair does not decline until the ninth decade, while in adipose women there appears to be a fall in proportion with grey hair in the eighth decade (Table 103).

Completely white hair is more prevalent in men than women. About 43 per cent of men and 31 per cent of women have white hair, and in both sexes the proportion with white hair increases with age (Table 104).

BALDNESS.

About 23 per cent of men and 90 per cent of women show no evidence of baldness (Table 105). This significant association between baldness and men is further indicated by the existence of partial baldness in about 64 per cent of men, 10 per cent of non-adipose women and 6 per cent of adipose women (Table 106). Complete baldness of the crown of the head is entirely confined to men and is found in 12·7 per cent. While partial baldness in men shows a significant increase with age from 50·7 per cent at 60 - 64 years to 81·8 per cent at 85 - 89 years, complete baldness shows no such trend with age (Table 107). Partial baldness in women shows no specific variation in incidence with age.

DEAFNESS.

Deafness of such degree as to require the use of a hearing aid is present in 3·7 per cent of men and non-adipose women and in 5·4 per cent of adipose women. The incidence of deafness in both sexes increases with age (Table 108).

Of the 15 deaf men 7 possessed hearing aids and 3 did not use them. Of the 17 deaf women 10 possessed hearing aids and 2 did not use them. Hearing aids were recommended for those who had none.

Deafness due to wax in the ears is recorded for about 12 per cent of men and 8 per cent of women. Their ears were syringed. The wax was removed and their hearing was restored to normal (Table 109).

ARCUS SENILIS.

Arcus senilis is absent in 13 per cent of men, 25·6 per cent of non-adipose women and 37·8 per cent of adipose women. In men and women the proportion with no arcus senilis declines with age (Table 110). The adipose women have a greater proportion of their number free from arcus senilis than the non-adipose women by virtue of the excess numbers in the age range 60 - 69 years.

The sex difference persists for minimal arcus senilis (Table 111). Minimal arcus senilis is present in 21·7 per cent of men, 31·1 per cent of non-adipose women and 27·9 per cent of adipose women. Women show a change, however, with the adipose having a percentage less than the non-adipose.

A moderate degree of arcus senilis is more often noted in men than in women. Moderate arcus senilis occurs in 45·5 per cent of men, 33·8 per cent of non-adipose women and 26·1 per cent of adipose women (Table 112).

Gross arcus senilis is more commonly encountered in men than in women. It is observed in 19·7 per cent of men, 9·6 per cent of non-adipose women and 8·1 per cent of adipose women. In both sexes there is an increase in the incidence of gross arcus senilis with age (Table 113).

OPHTHALMOSCOPIC FINDINGS.

Table 114 shows that the findings on ophthalmoscopic examination are normal for 59·6 per cent of men, 57·2 per cent of non-adipose women and 43·0 per cent of adipose women. Thus the incidence of normal findings is comparable for men and non-adipose women; is much less for adipose women, and declines with age in both sexes.

Tables 115 to 124 show the numbers and percentages of men, non-adipose and adipose women with reference to the various abnormalities observed on ophthalmoscopic examination. Many of the Tables have few cases recorded in them and thus do not permit of satisfactory comparison. The most frequently noted abnormalities are silver wiring in 7·1 per cent of men, 7·0 per cent of non-adipose women and 19·0 per cent of adipose women; tortuosity of arteries in 11·5 per cent of men, 14·4 per cent of non-adipose women and 10·0 per cent of adipose women; thickened arteries in 3·0 per cent of men, 1·6 per cent of non-adipose women and 7·0 per cent of adipose women; thin arteries in 6·9 per cent of men, 9.7 per cent of non-adipose women and 6·0 per cent of adipose women, and thin and straight arteries in 1·9 per cent of men and non-adipose women, and in 7·0 per cent of adipose women. It is relevent to state that these abnormal ophthalmoscopic findings which are recorded in Tables 115 to 124 are combined to form one group in the statistical assessment of the relationship between body weight and arterial blood pressure on the one hand and abnormal ophthalmoscopic findings, the presence or absence of pulsation in the dorsalis pedis and posterior tibial arteries, and changes in the radial artery (page 242).

PURE HEART SOUNDS.

Pure heart sounds are found in 21·5 per cent of men, 13·3 per cent of non-adipose women and 9.0 per cent of adipose women. In both sexes there is a decline in the incidence of pure heart sounds with age (Table 125).

HEART MURMURS.

Grade I systolic cardiac murmurs are present in 25·2 per cent of men, 39·2 per cent of non-adipose women and 36·9 per cent of adipose women, while Grade II systolic cardiac murmurs are heard in 33·7 per cent of men, 47·4 per cent of non-adipose women and 54·0 per cent of adipose women. For both grades of systolic cardiac murmurs the incidence is greater in women than it is in men (Tables 126 and 127).

EXTRASYSTOLES.

Extrasystoles occur in 19·0 per cent of men, 11·9 per cent of non-adipose women and 8·1 per cent of adipose women. In both sexes there is an increase in incidence with age (Table 128).

DISCUSSION.

The data which relate to foot defects indicate the wide variety of disabilities and the relatively rare occurrence of men and particularly women with good feet. Furthermore, the incidence of foot defects underlines the need for a chiropody service for the elderly which is within their financial ability to pay.

It is shown that varicose veins are significantly associated with adiposity in women. While the positive correlation between body weight and arterial blood pressure is known, the influence of varicose veins alone on arterial blood pressure has been in doubt. Pickering et al. (1954) are of the opinion that the increase in blood pressure with age is greater in women with varicose veins than in women with no varicose veins. In addition, Anning (1954), in a study of leg ulcers, suggested that the opening up of arterio-venous shunts after deep venous thrombosis and their importance in the aetiology of varicose veins may prove to be of significance in relation to hypertension.

With my colleague Dr. Ferguson Anderson I have shown that the increase in the systolic and diastolic blood pressure means is related to the degree of associated adiposity, and it is not significantly influenced by the presence of varicose veins. Furthermore, it is probable that adiposity rather than arterio-venous shunts is the determining factor in the elevated blood pressures referred to by Anning (1954) (Anderson and Cowan, 1959).

The fact that 8 per cent of men, 7 per cent of non-adipose women and 11 per cent of adipose women were found to have haemorrhoids on routine rectal examination suggests that general practitioners might find the practice of rectal examination rewarding.

It is an indictment of the medical services responsible for the health of individuals in the community that of 52 men with herniae only 26, or 50 per cent, were adequately trussed. The fault lies not with the individuals who possess the herniae, but in the negative attitude of clinicians to the evolution of disease.

The absence of epigastric pulsation is apparently due to adiposity of the abdominal wall.

The data presented for the abdominal and tendon reflexes indicate that abdominal reflexes may be absent, and tendon reflexes may be absent, diminished or exaggerated, in healthy older people with no discernible disease of the central nervous system.

Already known information is given in precise terms under the heading of baldness, but a phenomenon of more than passing interest may exist in the finding that while partial baldness increases significantly with age in men, complete baldness of the crown of the head in men shows no such trend. This suggests a line of research based on the hypothesis that complete baldness in men is due to a cause different from that which produces partial baldness. Insufficient men with complete baldness exist in this series to permit of satisfactory statistical evaluation.

Of 32 deaf men and women who required hearing aids 20, or 62.5 per cent, either had no hearing aids or did not use the aids which they possessed. This high proportion seems to cast an adverse reflection on the community medical services.

The presence of arcus senilis is more frequent in men than in women, and in adipose than non-adipose women. I am at a loss to explain this occurrence. Particularly if it be true that arcus senilis represents deposition of cholesterol. For it has been shown by Keys (1949), who studied skin fold thickness, that fatter men tended to have higher cholesterol values, and by Hobson (1955) that in women the correlation between abdominal skin fold thickness and serum cholesterol level was significant. Hobson (1955), in addition, found no significant correlation between arcus senilis and the serum cholesterol level. Consequently the answer to the problem why men show the highest incidence of arcus senilis and adipose women the lowest remains a mystery.

I make no comments on the interpretation of the various ophthalmoscopic findings. The subject is one of much complexity, and numbers are lacking to allow of proper statistical analysis. It is relevant to note that in the entire series of men and women there is no instance in which exudates or haemorrhages were observed on ophthalmoscopic examination.

Pure heart sounds are more prevalent in men, and for this sex difference I can offer no explanation. Data are presented for Grade I and Grade II systolic cardiac murmurs only because a systolic cardiac murmur greater than Grade II was a criterion for exclusion from this healthy group of people.

Table 76.

The number and percentage of men and adipose and non-adipose women with no foot defects by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	24	6	2	34.8	8.6	5.3
65 - 69	19	2	1	23.2	3.5	2.9
70 - 74	15	7	5	14.8	9.9	20.0
75 - 79	14	5	1	17.1	10.9	7.7
80 - 84	6	4		10.9	10.8	
85 - 89		3			25.0	
Total	78	27	9	19.5	9.2	8.1

Table 77.

The number and percentage of men and adipose and non-adipose women with corns by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	42	55	35	60·9	78·6	92·1
65 - 69	55	53	32	67·1	93·0	91·4
70 - 74	74	54	20	73·3	76·1	80·0
75 - 79	62	34	11	75·6	73·9	84·6
80 - 84	38	29		69·1	78·4	
85 - 89	8	9		72·7	75·0	
Total	279	234	98	69·7	79·9	88·3

Table 78.

The number and percentage of men and adipose and non-adipose women with callosities by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	30	43	31	43·5	61·4	81·6
65 - 69	39	42	24	47·6	73·7	68·6
70 - 74	57	49	18	56·4	69·0	72·0
75 - 79	45	28	10	54·9	60·9	76·9
80 - 84	37	27		67·3	73·0	
85 - 89	9	9		81·8	75·0	
Total	217	198	83	54·2	67·6	74·8

Table 79.

The number and percentage of men and non-adipose and adipose women with toe nails requiring cutting by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	15	36	30	21.7	51.4	78.9
65 - 69	25	30	21	30.5	52.6	60.0
70 - 74	42	37	13	41.6	52.1	52.0
75 - 79	37	31	9	45.1	67.4	69.2
80 - 84	33	22		60.0	59.5	
85 - 89	10	8		90.9	66.7	
Total	162	164	73	40.5	55.9	65.8

Table 80

The number and percentage of men and adipose and non-adipose women with onychogryphosis by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	8	9	12	11·6	12·9	31·6
65 - 69	21	13	11	25·6	22·8	31·4
70 - 74	24	16	4	23·8	22·5	16·0
75 - 79	20	13	5	24·4	28·3	38·5
80 - 84	14	11		25·4	29·7	
85 - 89	2	4		18·2	33·3	
Total	89	66	32	22·2	22·5	28·8

Table 81.

The number and percentage of men and adipose and non-adipose women with bunions by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	1	15	15	1·4	26·3	42·9
65 - 69	4	19	18	4·9	33·3	51·4
70 - 74	11	22	6	10·9	31·0	24·0
75 - 79	8	13	1	9·8	28·3	7·7
80 - 84	4	8		7·3	21·6	
85 - 89		3			25·0	
Total	28	80	40	7·0	27·3	36·0

Table 82.

The number and percentage of men and adipose and non-adipose women with hallux valgus by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	4	23	17	5·8	32·9	44·7
65 - 69	10	20	18	12.2	35·1	51·4
70 - 74	20	27	7	19.8	38·0	28·0
75 - 79	15	21	4	18·3	45·6	30·8
80 - 84	6	12		10·9	32·4	
85 - 89		5			41·7	
Total	55	108	46	13·7	36·9	41·4

Table 83

The number and percentage of men and adipose and non-adipose women with ingrowing toe nails by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	7	6	5	10·1	8·6	13·2
65 - 69	6	8	4	7·3	14·0	11·4
70 - 74	19	7	1	18·8	9·9	4·0
75 - 79	13	5		15·8	10·9	
80 - 84	9	7		16·4	18·9	
85 - 89	3	1		27·3	8·3	
Total	57	34	10	14·2	11·6	9·0

Table 84.

The number and percentage of men and adipose and non-adipose women with dirty feet by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	5	1	4·3	7·1	2·6
65 - 69	5	3	1	6·1	5·3	2·9
70 - 74	9	1		8·9	1·4	
75 - 79	8			9·8		
80 - 84	7	1		12·7	2·7	
85 - 89	2			18·2		
Total	34	10	2	8·5	3·4	1·8

Table 85.

The number and percentage of men and adipose and non-adipose women with flat feet by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	1	3	7	1·4	4·3	18·4
65 - 69	1	2	4	1.2	3·5	11·4
70 - 74	4	6	4	4·0	8.4	16·0
75 - 79	1	2	2	1·2	4·3	15·4
80 - 84	1	4		1·8	10·8	
85 - 89		1			8·3	
Total	8	18	17	2·0	6·1	15·3

Table 86.

The number and percentage of men and adipose and non-adipose women with hammer toes by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	2	1	4·3	2·9	2·6
65 - 69	5	1		6·1	1·7	
70 - 74	5	1	1	4·9	1·4	4·0
75 - 79	2	5		2·4	10·9	
80 - 84	3			5·4		
85 - 89		1			8·3	
Total	18	10	2	4·5	3·4	1·8

Table 87.

The number and percentage of men and adipose and non-adipose women with overlapping toes by five year age groups
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	4	2	2	5·8	2·9	5·3
65 - 69	7	1	2	8·5	1·7	5·7
70 - 74	10	5		9·9	7·0	
75 - 79	4	1	1	4·9	2·2	7·7
80 - 84	4	4		7·3	10·8	
85 - 89		1			8·3	
Total	29	14	5	7·2	4·8	4·5

Table 88.

The number and percentage of men and adipose and non-adipose women with varicose veins by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	9	12	16	13.0	17.1	42.1
65 - 69	5	21	17	6.1	36.8	48.6
70 - 74	12	18	12	11.9	25.3	48.0
75 - 79	7	6	9	8.5	13.0	69.2
80 - 84	3	11		5.4	29.7	
85 - 89	2	2		18.2	16.7	
Total	38	70	54	9.5	23.9	48.6

Table 89.

The number and percentage of men and adipose and non-adipose women in whom rectal examination was normal by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	61	58	29	88·4	82·9	76·3
65 - 69	68	50	30	82·9	87·7	85·7
70 - 74	86	61	22	85·1	85·9	88·0
75 - 79	70	38	11	85·4	82·6	84·6
80 - 84	46	28		83·6	75·7	
85 - 89	9	11		81·8	91·7	
Total	340	246	92	85·0	84·0	82·9

Table 90.

The number and percentage of men and adipose and non-adipose women with haemorrhoidal tags by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	5	2	4·3	7·1	5·3
65 - 69	4	5	1	4·9	8·8	2·9
70 - 74	4	5	2	4·0	7·0	8·0
75 - 79	5	6	1	6·1	13·0	7·7
80 - 84	2	4		3·6	10·8	
85 - 89	1			9·1		
Total	19	25	6	4·7	8·5	5·4

Table 91.

The number and percentage of men and adipose and non-adipose women with haemorrhoids by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	6	6	4·3	8·6	15·8
65 - 69	8	2	4	9·8	3·5	11·4
70 - 74	9	5	1	8·9	7·0	4·0
75 - 79	6	2	1	7·3	4·3	7·7
80 - 84	7	4		12·7	10·8	
85 - 89	1	1		9·1	8·3	
Total	34	20	12	8·5	6·8	10·8

Table 92.

The number and percentage of men and adipose and non-adipose women with herniae by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	4			5·8		
65 - 69	8			9·8		
70 - 74	14	1		13·9	1·4	
75 - 79	13	2		15·8	4·3	
80 - 84	12	2		21·8	5·4	
85 - 89	1			9·1		
Total	52	5	0	13·0	1·7	0·0

Table 93.

The number and percentage of men and adipose and non-adipose women with absence of epigastric pulsation by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	7	24	29	10·1	34·3	76·3
65 - 69	8	10	31	9·8	17·5	88·6
70 - 74	9	27	22	8·9	38·0	88·0
75 - 79	12	14	12	14·6	30·4	92·3
80 - 84	8	15		14·5	40·5	
85 - 89	2	4		18·2	33·3	
Total	46	94	94	11·5	32·1	84·7

Table 94.

The number and percentage of men and adipose and non-adipose women with vibration sense absent at the knee by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	7	5	8	10·1	7·1	21·0
65 - 69	6	5	9	7·3	8·8	25·7
70 - 74	12	14	7	11·9	19·7	28·0
75 - 79	18	15	6	21·9	32·6	46·1
80 - 84	21	11		38·2	29·7	
85 - 89	4	4		36·4	33·3	
Total	68	54	30	17·0	18·4	27·0

Table 95.

The number and percentage of men and adipose and non-adipose women with vibration sense absent at the ankle by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	8	5	8	11·6	7·1	21·0
65 - 69	8	5	9	9·8	8·8	25·7
70 - 74	15	13	8	14·8	18·3	32·0
75 - 79	20	17	6	24·4	37·0	46·1
80 - 84	23	12		41·8	32·4	
85 - 89	5	4		45·4	33·3	
Total	79	56	31	19·7	19·1	27·9

Table 96.

The number and percentage of men and adipose and non-adipose women with absent abdominal reflexes by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	5	35	22	7·2	50·0	57·9
65 - 69	10	30	27	12·2	52·6	77·1
70 - 74	18	36	16	17·8	50·7	64·0
75 - 79	27	33	10	32·9	71·7	76·9
80 - 84	19	26		34·5	70·3	
85 - 89	5	10		45·4	83·3	
Total	84	170	75	21·0	58·0	67·6

Table 97.

The number and percentage of men and adipose and non-adipose women with tendon reflexes absent by five year age groups.
No adipose women over 79 years.

(a) Number.

Age group	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	1														
65 - 69	1					1	1								
70 - 74	4														
75 - 79	4	4			1	1						1			
80 - 84	9	2	1	1	1	1		1	1	1					
85 - 89	2					1									
Total	21	6	1	1	2	4	1	1	1	1		1			

Tendon reflexes absent.

(b) Percentage.

Age group	Percentage														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	1·4														
65 - 69	1·2					1·7	1·7								
70 - 74	4·0														
75 - 79	4·9	4·9			1·2	2·2						7·7			
80 - 84	16·4	3·6	1·8	1·8	1·8	2·7		2·7	2·7	2·7					
85 - 89	18·2					8·3									
Total	5·2	1·5	0·2	0·2	0·5	1·4	0·3	0·3	0·3	0·3		0·9			

A = ankle K = knee T = triceps B = biceps S = supinator

Table 98.

The number and percentage of men and adipose and non-adipose women with tendon reflexes diminished by five year age groups.
No adipose women over 79 years.

(a) Number.

Age group	Number														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	2	2	2	2	2	6	2				13	11	4	3	3
65 - 69	15	5	3	3	4	11	3	3	3	3	8	3	1	1	1
70 - 74	31	12	6	5	5	23	8	3	3	3	6	6	2	1	2
75 - 79	23	6	9	9	9	14	9	7	7	7	8	5	2	2	2
80 - 84	28	11	6	5	7	16	9	2	1	2					
85 - 89	7	2	2	2	2	4	3	1	1	1					
Total	106	38	28	26	29	74	34	16	15	16	35	25	9	7	8

Tendon reflexes diminished.

(b) Percentage.

Age group	Percentage														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	2·9	2·9	2·9	2·9	2·9	8·6	2·9				34·2	28·9	10·5	7·9	7·9
65 - 69	18·3	6·1	3·7	3·7	4·9	19·3	5·3	5·3	5·3	5·3	22·9	8·6	2·9	2·9	2·9
70 - 74	30·7	11·9	5·9	4·9	4·9	32·4	11·3	4·2	4·2	4·2	24·0	24·0	8·0	4·0	8·0
75 - 79	28·0	7·3	11·0	11·0	11·0	30·4	19·6	15·2	15·2	15·2	61·5	38·5	15·4	15·4	15·4
80 - 84	50·9	20·0	10·9	9·1	12·7	43·2	24·3	5·4	2·7	5·4					
85 - 89	63·6	18·2	18·2	18·2	18·2	33·3	25·0	8·3	8·3	8·3					
Total	26·5	9·5	7·0	6·5	7·2	25·2	11·6	5·5	5·1	5·5	31·5	22·5	8·1	6·3	7·2

A = ankle K = knee T = triceps B = biceps S = supinator

Table 99.

The number and percentage of men and adipose and non-adipose women with tendon reflexes present by five year age groups.
No adipose women over 79 years.

(a) Number.

Age group	Number														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	50	56	57	57	57	58	62	64	64	64	23	25	29	30	30
65 - 69	59	64	72	71	70	36	43	45	45	45	25	27	33	33	33
70 - 74	64	80	92	94	94	43	56	65	65	65	18	18	21	22	21
75 - 79	53	62	70	69	69	29	34	38	38	38	5	7	11	11	11
80 - 84	17	39	43	44	42	18	26	34	35	34					
85 - 89	2	8	7	7	7	6	8	9	9	9					
Total	245	309	341	342	339	190	229	255	256	255	71	77	94	96	95

Table 99.

(b) Percentage.

Age group	Percentage														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	72·5	81·2	82·6	82·6	82·6	82·9	88·6	91·4	91·4	91·4	60·5	65·8	76·3	78·9	78·9
65 - 69	71·9	78·0	87·8	86·6	85·4	63·2	75·4	78·9	78·9	78·9	71·4	77·1	94·3	94·3	94·3
70 - 74	63·4	79·2	91·1	93·1	93·1	60·6	78·9	91·5	91·5	91·5	72·0	72·0	84·0	88·0	84·0
75 - 79	64·6	75·6	85·4	84·1	84·1	63·0	73·9	82·6	82·6	82·6	38·5	53·8	84·6	84·6	84·6
80 - 84	30·9	70·9	78·2	80·0	76·4	48·6	70·3	91·9	94·6	91·9					
85 - 89	18·2	72·7	63·6	63·6	63·6	50·0	66·7	75·0	75·0	75·0					
Total	61·2	77·2	85·2	85·5	84·7	64·8	78·2	87·0	87·4	87·0	64·0	69·4	84·7	86·5	85·6

A = ankle K = knee T = triceps B = biceps S = supinator

Table 100.

The number and percentage of men and adipose and non-adipose women with tendon reflexes exaggerated by five year age groups.
No adipose women over 79 years.

(a) Number.

Age group	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	7	11	10	10	10	6	6	6	6	6	2	2	2	2	2
65 - 69	7	13	7	8	8	9	10	9	9	9	2	5	1	1	1
70 - 74	2	9	3	2	2	5	7	3	3	3	1	1	2	2	2
75 - 79	2	10	3	4	3	2	3	1	1	1					
80 - 84	1	3	5	5	5	2	2								
85 - 89		1	2	2	2	1	1	2	2	2					
Total	19	47	30	31	30	25	29	21	21	21	5	8	5	5	5

Tendon reflexes exaggerated.

(b) Percentage.

Age group	Percentage														
	Men					Women									
						Non-adipose					Adipose				
	A	K	T	B	S	A	K	T	B	S	A	K	T	B	S
60 - 64	10·1	15·9	14·5	14·5	14·5	8·6	8·6	8·6	8·6	8·6	5·3	5·3	5·3	5·3	5·3
65 - 69	8·5	15·8	8·5	9·8	9·8	15·8	17·5	15·8	15·8	15·8	5·7	14·3	2·9	2·9	2·9
70 - 74	2·0	8·9	3·0	2·0	2·0	7·0	9·9	4·2	4·2	4·2	4·0	4·0	8·0	8·0	8·0
75 - 79	2·4	12·2	3·7	4·9	3·7	4·3	6·5	2·2	2·2	2·2					
80 - 84	1·8	5·4	9·1	9·1	9·1	5·4	5·4								
85 - 89		9·1	18·2	18·2	18·2	8·3	8·3	16·7	16·7	16·7					
Total	4·7	11·7	7·5	7·7	7·5	8·5	9·9	5·2	5·2	5·2	4·5	7·2	4·5	4·5	4·5

A = ankle K = knee T = triceps B = biceps S = supinator

Table 101.

The number and percentage of men and adipose and non-adipose women with brown or fair hair (no greying) by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	10	7	4	14.5	10.0	10.5
65 - 69	5	2	1	6.1	3.5	2.9
70 - 74		1			1.4	
75 - 79						
80 - 84						
85 - 89						
Total	15	10	5	3.7	3.4	4.5

Table 102

The number and percentage of men and adipose and non-adipose women with partially greying hair by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	26	35	15	37·7	50·0	39·5
65 - 69	18	17	7	21·9	29·8	20·0
70 - 74	19	16	5	18·8	22·5	20·0
75 - 79	6	8	3	7·3	17·4	23·1
80 - 84	1	6		1·8	16·2	
85 - 89		3			25·0	
Total	70	85	30	17·5	29·0	27·0

Table 103.

The number and percentage of men and adipose and non-adipose women with grey hair by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	25	18	12	36·2	25·7	31·6
65 - 69	31	23	16	37·8	40·3	45·7
70 - 74	38	31	9	37·6	43·7	36·0
75 - 79	30	19	3	36·6	41·3	23·1
80 - 84	15	15		27·3	40·5	
85 - 89	2	2		18·2	16·7	
Total	141	108	40	35·2	36·9	36·0

Table 104.

The number and percentage of men and adipose and non-adipose women with white hair by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	8	10	7	11.6	14.3	18.4
65 - 69	28	15	11	34.1	26.3	31.4
70 - 74	44	23	11	43.6	32.4	44.0
75 - 79	46	19	7	56.1	41.3	53.8
80 - 84	39	16		70.9	43.2	
85 - 89	9	7		81.8	58.3	
Total	174	90	36	43.5	30.7	32.4

Table 105.

The number and percentage of men and adipose and non-adipose women showing no evidence of baldness by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	23	68	37	33·3	97·1	97·4
65 - 69	25	48	32	30·5	84·2	91·4
70 - 74	24	66	23	23·8	93·0	92·0
75 - 79	12	42	12	14·6	91·3	92·3
80 - 84	6	30		10·9	81·1	
85 - 89	1	11		9·1	91·7	
Total	91	265	104	22·7	90·4	93·7

Table 106.

The number and percentage of men and adipose and non-adipose women with partial baldness by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	35	2	1	50·7	2·9	2·6
65 - 69	50	9	3	61·0	15·8	8·6
70 - 74	65	5	2	64·3	7·0	8·0
75 - 79	57	4	1	69·5	8·7	7·7
80 - 84	42	7		76·4	18·9	
85 - 89	9	1		81·8	8·3	
Total	258	28	7	64·5	9·6	6·3

Table 107.

The number and percentage of men and adipose and non-adipose women with complete baldness by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	11			15.9		
65 - 69	7			8.5		
70 - 74	12			11.9		
75 - 79	13			15.8		
80 - 84	7			12.7		
85 - 89	1			9.1		
Total	51	0	0	12.7	0.0	0.0

Table 108.

The number and percentage of men and adipose and non-adipose women with deafness by five year age groups.
No adipose women over 79 years

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64			3			7·9
65 - 69		1			1·7	
70 - 74	3	1	3	3·0	1·4	12·0
75 - 79	6	4		7·3	8·7	
80 - 84	5	4		9·1	10·8	
85 - 89	1	1		9·1	8·3	
Total	15	11	6	3·7	3·7	5·4

Table 109.

The number and percentage of men and adipose and non-adipose women requiring ears syringed by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	5	6	2	7.2	8.6	5.3
65 - 69	8	5	1	9.8	8.8	2.9
70 - 74	13	8	2	12.9	11.3	8.0
75 - 79	12	4	2	14.6	8.7	15.4
80 - 84	9	3		16.4	8.1	
85 - 89	2			18.2		
Total	49	26	7	12.2	8.9	6.3

Table 110.

The number and percentage of men and adipose and non-adipose women with arcus senilis absent by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	15	27	21	21·7	38·6	55·3
65 - 69	14	19	13	17·1	33·3	37·1
70 - 74	11	20	7	10·9	28·2	28·0
75 - 79	8	4	1	9·7	8·7	7·7
80 - 84	3	5		5·4	13·5	
85 - 89	1			9·1		
Total	52	75	42	13·0	25·6	37·8

Table 111.

The number and percentage of men and adipose and non-adipose women with arcus senilis minimal by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	16	26	9	23·2	37·1	23·7
65 - 69	20	20	8	24·4	35·1	22·8
70 - 74	21	22	11	20·8	31·0	44·0
75 - 79	14	14	3	17·1	30·4	23·1
80 - 84	16	7		29·1	18·9	
85 - 89		2			16·7	
Total	87	91	31	21·7	31·1	27·9

Table 112.

The number and percentage of men and adipose and non-adipose women with arcus senilis moderate by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	28	15	7	40·6	21·4	18·4
65 - 69	37	15	10	45·1	26·3	28·6
70 - 74	46	23	6	45·5	32·4	24·0
75 - 79	42	19	6	51·2	41·3	46·1
80 - 84	22	19		40·0	51·3	
85 - 89	7	8		63·6	66·7	
Total	182	99	29	45·5	33·8	26·1

Table 113.

The number and percentage of men and adipose and non-adipose women with arcus senilis gross by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	10	2	1	14.5	2.9	2.6
65 - 69	11	3	4	13.4	5.3	11.4
70 - 74	23	6	1	22.8	8.4	4.0
75 - 79	18	9	3	21.9	19.6	23.1
80 - 84	14	6		25.4	16.2	
85 - 89	3	2		27.3	16.7	
Total	79	28	9	19.7	9.6	8.1

Table 114.

The number and percentage of men and adipose and non-adipose women with normal ophthalmoscopic findings, based on the total series less those with cataract. No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	50	45	19	72·5	66·2	52·8
65 - 69	54	32	12	68·3	58·2	37·5
70 - 74	57	37	9	62·0	57·8	39·1
75 - 79	38	19	3	54·3	51·3	33·3
80 - 84	13	11		28·9	44·0	
85 - 89	5	3		55·5	37·5	
Total	217	147	43	59·6	57·2	43·0

Table 115.

The number and percentage of men and adipose and non-adipose women with silver wiring on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

AGE group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	7	6	4·3	10·3	16·7
65 - 69		3	7		5·4	21·9
70 - 74	9	2	4	9·8	3·1	17·4
75 - 79	8	4	2	11·4	10·8	22·2
80 - 84	6	2		13·3	8.0	
85 - 89						
Total	26	18	19	7·1	7·0	19.0

Table 116.

The number and percentage of men and adipose and non-adipose women with silver wiring and nipping of veins on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	4	1		5·8	1·5	
65 - 69	1	3		1·3	5·4	
70 - 74	2	1	1	2·2	1·6	4·3
75 - 79						
80 - 84	1	1		2·2	4·0	
85 - 89						
Total	8	6	1	2·2	2·3	1·0

Table 117.

The number and percentage of men and adipose and non-adipose women with nipping of veins on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	1	2		1·4	2·9	
65 - 69	1	4	1	1·3	7·3	3·1
70 - 74	3	1		3·3	1·6	
75 - 79	1	1		1·4	2.7	
80 - 84						
85 - 89						
Total	6	8	1	1·6	3·1	1·0

Table 118.

The number and percentage of men and adipose and non-adipose women with tortuosity of arteries on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	7	10	3	10.1	14.7	8.3
65 - 69	12	10	4	15.2	18.2	12.5
70 - 74	9	9	3	9.8	14.1	13.0
75 - 79	7	4		10.0	10.8	
80 - 84	5	2		11.1	8.0	
85 - 89	2	2		22.2	25.0	
Total	42	37	10	11.5	14.4	10.0

Table 119.

The number and percentage of men and adipose and non-adipose women with tortuosity and silver wiring of arteries on ophthalmoscopic examination by five year age groups. No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64			1			2·8
65 - 69	2			2·5		
70 - 74						
75 - 79	1			1·4		
80 - 84	1			2.2		
85 - 89						
Total	4	0	1	1·1	0.0	1·0

Table 120.

The number and percentage of men and adipose and non-adipose women with tortuosity of arteries and nipping of veins on ophthalmoscopic examination by five year age groups. No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	3	1	2	4.3	1.5	5.5
65 - 69			1			3.1
70 - 74	1	2	1	1.1	3.1	4.3
75 - 79	1	2	2	1.4	5.4	22.2
80 - 84	2			4.4		
85 - 89						
Total	7	5	6	1.9	1.9	6.0

Table 121.

The number and percentage of men and adipose and non-adipose women with thickened arteries on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64			1			2.8
65 - 69	4	1	3	5.1	1.8	9.4
70 - 74	3	1	1	3.3	1.6	4.3
75 - 79	2		2	2.9		22.2
80 - 84	1	1		2.2	4.0	
85 - 89	1	1		11.1	12.5	
Total	11	4	7	3.0	1.6	7.0

Table 122.

The number and percentage of men and adipose and non-adipose women with thickening of arteries and nipping of veins on ophthalmoscopic examination by five year age groups. No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	1			1·4		
65 - 69	1			1·3		
70 - 74		2			3·1	
75 - 79						
80 - 84						
85 - 89						
Total	2	2	0	0·5	0·8	0·0

Table 123.

The number and percentage of men and adipose and non-adipose women with thin arteries on ophthalmoscopic examination by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64			2			5·5
65 - 69	4	1	1	5·1	1·8	3·1
70 - 74	8	7	2	8·7	10·9	8·7
75 - 79	10	7	1	14·3	18·9	11·1
80 - 84	3	8		6·7	32·0	
85 - 89		2			25·0	
Total	25	25	6	6·9	9·7	6·0

Table 124.

The number and percentage of men and adipose and non-adipose women with thin and straight arteries on ophthalmoscopic examination by five year age groups. No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64		2	3		2·9	8·3
65 - 69		1	3		1·8	9·4
70 - 74		2	1		3·1	4·3
75 - 79	2			2·9		
80 - 84	4			8.9		
85 - 89	1			11·1		
Total	7	5	7	1.9	1·9	7·0

Table 125.

The number and percentage of men and adipose and non-adipose women with pure heart sounds by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	18	14	3	26.1	20.0	7.9
65 - 69	21	6	5	25.6	10.5	14.3
70 - 74	24	10	1	23.8	14.1	4.0
75 - 79	13	4	1	15.8	8.7	7.7
80 - 84	7	4		12.7	10.8	
85 - 89	3	1		27.3	8.3	
Total	86	39	10	21.5	13.3	9.0

Table 126.

The number and percentage of men and adipose and non-adipose women with Grade I apical systolic murmurs by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	33	30	17	47.8	42.9	44.7
65 - 69	21	24	13	25.6	42.1	37.1
70 - 74	24	27	7	23.8	38.0	28.0
75 - 79	13	14	4	15.8	30.4	30.8
80 - 84	7	14		12.7	37.8	
85 - 89	3	6		27.3	50.0	
Total	101	115	41	25.2	39.2	36.9

Table 127.

The number and percentage of men and adipose and non-adipose women with Grade II apical systolic murmurs by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	18	26	18	26.1	37.1	47.4
65 - 69	25	27	17	30.5	47.4	48.6
70 - 74	38	34	17	37.6	47.9	68.0
75 - 79	31	28	8	37.8	60.9	61.5
80 - 84	21	19		38.2	51.3	
85 - 89	2	5		18.2	41.7	
Total	135	139	60	33.7	47.4	54.0

Table 128.

The number and percentage of men and adipose and non-adipose women with extrasystoles by five year age groups.
No adipose women over 79 years.

Age group	Number			Percentage		
	Men	Women		Men	Women	
		Non-adipose	Adipose		Non-adipose	Adipose
60 - 64	7	5	2	10·1	7·1	5·3
65 - 69	11	5	1	13·4	8·8	2·9
70 - 74	18	9	4	17·8	12·7	16·0
75 - 79	16	7	2	19·5	15·2	15·4
80 - 84	19	6		34·5	16·2	
85 - 89	5	3		45·4	25·0	
Total	76	35	9	19·0	11·9	8.1

SLEEP.

This study, which is concerned with the sleep behaviour of older people, is based on the 400 men and 293 non-adipose women aged 60 to 89 years considered to be in good physical health, and 111 adipose women aged 60 to 79 years who were otherwise well.

The following data which relate to the sleep behaviour of the elderly were gained entirely by questioning the men and women. It may be reasonably argued that the replies of the elderly people are liable to produce considerable error. It is submitted, however, that such errors as may arise are not of a magnitude sufficient to render specific trends void, and will not blur the existence of the sleep problems of the aged.

I have formed five grades of sleep which are defined as follows: -

1. Very good sleep.

(a) The individual falls asleep less than half an hour after going to bed. Exceptions to this rule are the people who retire to bed in the evening not to sleep, but to obtain physical relaxation, and those who have developed the habit of reading or knitting in bed prior to falling asleep.

(b) Sleep is continuous, except that it may be interrupted on one occasion for micturition.

(c) There are no nightmares.

(d) There is no mental activity which delays the onset of sleep.

(e) There is no experience of nocturnal leg cramps.

(f) There is no pain which interferes with sleep.

(g) Drugs are not required to induce sleep.

(h) The individual makes no complaint concerning the quality of sleep.

2. Good sleep.

Good sleep is similar to very good sleep with the following exceptions.

(a) Sleep may be interrupted on two occasions for micturition.

(b) There may be difficulty in falling asleep, but when sleep occurs it is of excellent quality.

(c) Nocturnal leg cramps may occur rarely.

3. Moderate sleep.

(a) Sleep may be interrupted on more than two occasions for micturition and / or

(b) nocturnal leg cramps though present do not exhibit a frequency greater than once each week, and / or

(c) difficulty in falling asleep is associated with breaks in sleep due to causes other than the need to micturate.

(d) The individual makes no complaint concerning the quality of sleep.

4. Bad sleep.

(a) There is nocturnal frequency of micturition and / or

(b) nocturnal leg cramps occur more often than once each week, and / or

(c) gross difficulty in falling asleep, and / or

(d) gross interruption of the sleep period, and / or

(e) drugs are required to induce sleep.

(f) The individual complains about the poor quality of sleep.

5. Very bad sleep.

This grade is confined to the grossest forms of sleep upset. Such upset is usually due to overt disease which produces pain or dyspnoea.

RESULTS.

The causes of sleep disturbance in men and non-adipose and adipose women regarded as healthy by five year age groups are shown in Tables 129a and 129b. Nocturnal micturition is a major cause of sleep interruption. There is a significant decline with age in the number of men and women who do not require to micturate during the hours of sleep. Men show a fall from 75·4 per cent at 60 - 64 years to 9·1 per cent at 85 - 89 years; non-adipose women a fall from 67.1 per cent at 60 - 64 years to 16.7 per cent at 85 - 89 years, while the corresponding figures for adipose women are 36·8 per cent and 15·4 per cent over the lesser age range 60 to 79 years.

There is little variation with age in the proportion of men and women who, while they may require to micturate once during the sleep period, do not require to do so every night.

With age there is an increase in the proportion of men who require to micturate on one occasion during each sleep period from 15·9 per cent at 60 - 64 years to a maximum of 36·6 per cent at 75 - 79 years. The non-adipose women show a similar increase at a higher level from 22·8 per cent at 60 - 64 years to a maximum of 42·3 per cent at 70 - 74 years. Beyond these age groups with maximum values the proportions remain high for both sexes. The adipose women are in a still less favourable position presenting an increase from 26·3 per cent at 60 - 64 years to 53·8 per cent at 75 - 79 years.

With age there is a significant increase in the proportion of men who must micturate on two occasions during the sleep period from 0 per cent at 60 - 64 years to 40·0 per cent at 80 - 84 years. The non-adipose women show a comparable increase with age from 1·5 per cent at 60 - 64 years to a maximum of 30·5 per cent at 75 - 79 years. In this category the adipose women have 21·0 per cent, 40·0 per cent and 36·0 per cent of their numbers in the age groups 60 - 64, 65 - 69 and 70 - 74 years respectively, and these values are far higher than the corresponding percentages for men and non-adipose women.

There are few people in this series who require to micturate on three occasions during their period of sleep.

Men show with age an increase in the proportion who experience nocturnal leg cramps of all grades of severity from 7·2 per cent at 60 - 64 years to a maximum of 23·2 per cent at 75 - 79 years. This is followed by a slight decline to 18·2 per cent in the ninth decade. The trend with age is similar for the non-adipose women, but within the age range 60 to 79 years the quinquennial female percentages are much higher than the corresponding male percentages. Their increase is from 14·3 per cent at 60 - 64 years to 32·6 per cent at 75 - 79 years. Adipose women have a significantly high incidence of nocturnal leg cramps in all four age groups, and their proportions are higher than the corresponding values for men and non-adipose women.

The occurrence of nightmares is entirely confined to women. Within the age range 60 to 79 years nightmares are experienced by 2·9 per cent of non-adipose women and 7·2 per cent of adipose women.

Delay in falling asleep on retiring to bed due to mental activity on the same subject every night is not common, but is more prevalent in women. Delay in sleep onset due to mental activity on subjects which vary from night to night is much more common. In men there is an increase in incidence from 11·6 per cent at 60 - 64 years to 25·6 per cent at 75 - 79 years followed by a decline. There is a similar trend for non-adipose women from 2·9 per cent at 60 - 64 years to a maximum of 34·8 per cent at 75 - 79 years which is followed by a decline. With adipose women the percentage values of 13·2, 22·9, 28·0 and 41·7 for the age groups 60 - 64, 65 - 69, 70 - 74 and 75 - 79 years are considerably higher than the corresponding percentages for men and non-adipose women.

The data presented indicate that there is a slight increase with age in delay in falling asleep due to unknown causes for men and non-adipose women, but not for adipose women.

Tables 130, 131, 132, 133, 134, 135 and 136 present the following data respectively for men, non-adipose women and adipose women by five year age groups.

1. The time of retiring to bed at night. Night workers are excluded.
2. The time of rising in the morning. Night workers are excluded.
3. The time taken to fall asleep. Night workers are excluded.
4. The longest period of undisturbed sleep.
5. The total hours of sleep during the night, and during the day for night workers.
6. The total hours of sleep during the 24 hours of the day.
7. Duration of sleep during the day. Night workers are excluded.

From these data are calculated the weighted means of time for the various attributes of sleep, and these means are shown in Table 137 for men, non-adipose and adipose women.

While the mean time of approximately 10·30 p.m. at which men retire to bed is a reasonable approximation for all age groups, there is a decided trend for women who as age advances tend to go to bed earlier. In the non-adipose women the average time of retiring to bed changes from 10·50 p.m. at 60 - 64 years to 9·20 p.m. at 85 - 89 years, and in adipose women the change is from 10·53 p.m. at 60 - 64 years to 10·19 p.m. at 75 - 79 years.

With age men and women tend to rise later in the morning. The average time of rising in the morning varies for men from 6·40 a.m. at 60 - 64 years to 8·11 a.m. at 85 - 89 years; for non-adipose women from 7·38 a.m. at 60 - 64 years to 8·15 a.m. at 85 - 89 years, and for adipose women from 7·49 a.m. at 60 - 64 years to 8·14 a.m. at 75 - 79 years.

Where there is difficulty in falling asleep on retiring to bed the mean time taken, which is similar for men and non-adipose women, increases with age from approximately 35 minutes at 60 - 64 years to 55 minutes at 85 - 89 years. The average time taken by adipose women to fall asleep increases with age from 49 minutes at 60 - 64 years to 53 minutes at 75 - 79 years where there is difficulty in falling asleep. For each quinquennial age period the means of the adipose women are greater than the corresponding means of the men and the non-adipose women.

The average longest periods of undisturbed sleep, which are similar for men and non-adipose women, decline with age. In men the decline is from an average of 7 hours 25 minutes at 60 - 64 years to 5 hours 32 minutes at 85 - 89 years. The corresponding periods of time for the non-adipose women are 7 hours 47 minutes and 6 hours 15 minutes. The means for adipose women also decline with age but, in addition, are much less than the corresponding averages for men and non-adipose women by 55 minutes and 1 hour 17 minutes at 60 - 64 years; 1 hour 37 minutes and 1 hour 31 minutes at 65 - 69 years; 1 hour 35 minutes and 1 hour 21 minutes at 70 - 74 years, and by 50 minutes and 37 minutes at 75 - 79 years respectively.

The average total hours of sleep during the normal sleep period increases with age, and the means are comparable for men, non-adipose and adipose women. The average increase is from 7 hours 53 minutes at 60 - 64 years to 8 hours 49 minutes at 85 - 89 years for men. The corresponding values for non-adipose women are 8 hours 30 minutes and 9 hours respectively. With adipose women the variation is from 8 hours 22 minutes at 60 - 64 years to 8 hours 37 minutes at 75 - 79 years.

The average total hours of sleep in the 24 hours of the day increases with age and,the mean trends are comparable for men, non-adipose and adipose women. The average increase is from 8 hours 2 minutes at 60 - 64 years to 8 hours 55 minutes at 85 - 89 years for men. The corresponding values for non-adipose women are 8 hours 34 minutes and 9 hours 20 minutes respectively. With adipose women the change is from 8 hours 33 minutes at 60 - 64 years to 9 hours 23 minutes at 75 - 79 years.

For the men whose normal sleep period is during the night, sleep in the day-time shows no evidence of a trend with age, and the average duration of their day-time sleep varies between three quarters of an hour and one hour. Non-adipose women, however, show a definite mean increase with age from 43 minutes at 60 - 64 years to 1 hour 30 minutes at 85 - 89 years. Adipose women show a mean trend similar to that of the non-adipose women, and with the adipose women the mean increase is from 45 minutes at 60 - 64 years to 1 hour 19 minutes at 75 - 79 years.

Table 138 shows the percentage of people with no difficulty in falling asleep on retiring to bed, excluding those who are on constant night work, by five year age groups. The data indicate that more men than women find no difficulty in falling asleep, and that non-adipose women are in a somewhat better position than those who are adipose.

Table 139 presents information relating to people who sleep during the day, excluding those on constant night work, with reference to whether sleep takes place in a chair or bed or on a couch. Approximately three-quarters of the men sleep in a chair and one-quarter in a bed or on a couch, while 40 per cent of non-adipose women sleep in a chair and 60 per cent in a bed or on a couch. The adipose women occupy an intermediate position between that of men and non-adipose women.

DISCUSSION.

I am unable to find in the literature information comparable to that which is presented. Consequently the discussion is confined to these data.

It is useful to place people into one of five grades according to the quality of their sleep. These grades are defined under the Methods section of this study.

There is a real deterioration in the quality of sleep of men and women with age. Of numerous specific causes in healthy older people there are three which are of considerable importance, namely, nocturnal micturition, nocturnal leg cramps and increased mental activity when the individual retires to bed.

The adverse effect of nocturnal micturition on the quality of sleep increases with age and afflicts women more than men especially adipose women. A similar pattern emerges for nocturnal leg cramps. They are more prevalent in women than in men, and occur particularly in adipose women. The same differences are observed for mental activity which may develop when people go to bed. Men are the least affected, while adipose women are much more liable to this form of mental disturbance than are non-adipose women.

In this series nightmares, which are entirely confined to women, are more common in those who are adipose.

The degree of difficulty in falling asleep is similar for men and non-adipose women, but is much greater for adipose women.

While age has no apparent influence on the average time at which men retire to bed, women tend to go to bed earlier with age.

The average longest durations of undisturbed sleep by quinquennial age periods are much less for the adipose women than they are for the men and non-adipose women.

The further results which are presented are largely factual and detail in precise terms certain factors the trends of which are already known vaguely in relation to age. For example, as age advances people rise later in the morning than they did when they were younger, and the average total hours of the normal sleep period, and of the total time of sleep in the 24 hours of the day, increase. There is no marked difference in these average times for men, non-adipose or adipose women.

Of those with the habit of sleeping during the day, most of the men do so in a chair, while the majority of women go to bed or lie on a couch.

SUMMARY.

The influences of age, sex and adiposity on sleep are considered with reference to 400 men and 293 non-adipose women within the age range 60 - 89 years who were regarded as healthy and 111 adipose women age 60 - 79 years otherwise regarded as well. It is shown that the quality of sleep in men and women

deteriorates with age and that this deterioration is particularly noticeable in adipose women. The quality of sleep in healthy older people is liable to be disturbed by numerous causes but there are three which are of particular importance. These salient causes of sleep upset are nocturnal micturition, nocturnal leg cramp and increased mental activity on retiring to bed. When the various attributes under consideration are assessed as a whole it is clear that the quality of sleep of adipose women is much less satisfactory than that of men and non-adipose women. In addition the quality of sleep of men is somewhat better than that of the non-adipose women.

Table 129.

The causes of sleep disturbance in men and adipose and non-adipose women regarded as healthy by five year age groups.
No adipose women over 79 years.

(a) Men and non-adipose women - Number.

Causes of sleep disturbance	60 - 64 years		65 - 69 years		70 - 74 years		75 - 79 years		80 - 84 years		85 - 89 years	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Nocturnal micturition - 0	52	47	39	36	43	28	26	6	10	8	1	2
0 or 1	6	6	9	2	17	5	2	8	4	4	1	2
1	11	16	27	16	29	30	30	18	17	15	4	4
2		1	7	3	12	8	23	14	22	10	4	3
3							1		2		1	1
Nocturnal leg cramps	5	10	7	10	11	16	19	15	10	7	2	2
Nightmares		3		1		2		1		3		
Anxiety over relatives	1	1		2		2		1		1		
Anxiety over death of spouse		1				1	1					
Noise from street		1										
Cause unknown	2		1	2	3	1	4	1	5	2		
Mental activity (non-specific)	8	2	17		18	9	21	16	12	3	1	

(a) Men and non-adipose women - Percentage.

Causes of sleep disturbance	60 - 64 years		65 - 69 years		70 - 74 years		75 - 79 years		80 - 84 years		85 - 89 years	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Nocturnal micturition - 0	75.4	67.1	47.6	63.2	42.6	39.4	31.7	13.0	18.2	21.6	9.1	16.7
0 or 1	8.7	8.6	11.0	3.5	16.8	7.0	2.4	17.4	7.3	10.8	9.1	16.7
1	15.9	22.8	32.9	28.0	28.7	42.3	36.6	39.1	30.9	40.5	36.4	33.3
2		1.5	8.5	5.3	11.9	11.3	28.1	30.5	40.0	27.1	36.4	25.0
3							1.2		3.6		9.1	8.3
Nocturnal leg cramps	7.2	14.3	8.5	17.5	10.9	22.5	23.2	32.6	18.2	18.9	18.2	16.7
Nightmares		4.3		1.7		2.8		2.2		8.1		
Anxiety over relatives	1.4	1.5		3.5		2.8		2.2		2.7		
Anxiety over death of spouse		1.5				1.4	1.2					
Noise from street		1.5										
Cause unknown	2.9		1.2	3.5	3.0	1.4	4.9	2.2	9.1	5.4		
Mental activity (non-specific)	11.6	2.9	20.7		17.8	12.7	25.6	34.8	21.8	8.1	9.1	

(b) Adipose women - Number.

Causes of sleep disturbance	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years
Nocturnal micturition - 0	14	5	7	2
0 or 1	5	5	3	
1	10	11	5	7
2	8	14	9	2
3	1		1	2
Nocturnal leg cramps	14	16	7	4
Nightmares	2	3	2	1
Anxiety over relatives		1		1
Noise from street				1
Cause unknown	2	1		
Mental activity (non-specific)	5	8	7	5

(b) Adipose women - Percentage.

Causes of sleep disturbance	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years
Nocturnal micturition - 0	36.8	14.3	28.0	15.5
0 or 1	13.2	14.3	12.0	
1	26.3	31.4	20.0	53.8
2	21.0	40.0	36.0	15.4
3	2.7		4.0	15.4
Nocturnal leg cramps	36.8	45.7	28.0	30.8
Nightmares	5.3	8.6	8.0	7.7
Anxiety over relatives		2.9		7.7
Noise from street				7.7
Cause unkmown	5.3	2.9		
Mental activity (non-specific)	13.2	22.9	28.0	41.7

Table 130.

The time at which men and adipose and non-adipose women regarded as healthy retire to bed by five year age groups. Individuals on constant night work are excluded, but their numbers are recorded in the Table. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	8 p.m.		9 p.m.		10 p.m.		11 p.m.		12 p.m.		1 a.m.		Constant night work
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
60 - 64			4	3	31	20	23	32	10	15			1
65 - 69			10	1	29	20	34	22	7	14	1		1
70 - 74			12	10	38	27	40	22	8	12	1		2
75 - 79			7	5	28	18	33	19	14	4			
80 - 84	4		3	9	23	13	18	11	5	4	1		1
85 - 89		3	1	4	4	3	4	1	2	1			
Total	4	3	37	32	153	101	152	107	46	50	3		5

(b) Adipose women

Age group	8 p.m.	9 p.m.	10 p.m.	11 p.m.	12 p.m.	1 a.m.
60 - 64			15	13	9	1
65 - 69		3	14	11	7	
70 - 74		4	7	9	5	
75 - 79	1	2	5	2	3	
Total	1	9	41	35	24	1

Table 131.

The time at which men and adipose and non-adipose women regarded as healthy rise from their beds in the morning by five year age groups. Individuals on constant night work are excluded, but their numbers are recorded in the Table. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	5 a.m.		6 a.m.		7 a.m.		8 a.m.		9 a.m.		10 a.m.		11 a.m.		12 a.m.		Night work
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
60- 64	6		27	10	21	16	12	33	2	11							1
65 - 69			9	4	24	13	31	31	17	8		1					1
70 - 74	5		8	3	25	17	36	33	19	18	4		2				2
75 - 79			7	2	14	5	30	21	21	16	7	2	2		1		
80 - 84			2	4	11	11	24	9	10	7	5	6	1		1		1
85 - 89					2	4	6	4	2	2	1	1		1			
Total	11		53	23	97	66	139	131	71	62	17	10	5	1	2		5

(b) Adipose women.

Age group	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.
60 - 64	4	9	17	7		1
65 - 69	3	8	19	5		
70 - 74	2	4	10	9		
75 - 79		4	5	2	1	1
Total	9	25	51	23	1	2

Table 132.

The time taken to fall asleep on retiring to bed by men and adipose and non-adipose women regarded as healthy by five year age groups. Individuals on constant night work are excluded, but their numbers are recorded in the Table. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	Less than $\frac{1}{2}$ hour		More than $\frac{1}{2}$ hour		More than one hour		More than $1\frac{1}{2}$ hours		More than 2 hours		Constant night work
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
60 - 64	62	53	5	15	1	2					1
65 - 69	58	37	12	11	11	8		1			1
70 - 74	66	39	23	18	9	14	1				2
75 - 79	42	22	23	15	14	9	3				
80 - 84	22	14	12	13	13	7	5	2	2	1	1
85 - 89	5	1	1	5	5	4		1		1	
Total	255	166	76	77	53	44	9	4	2	2	5

(b) Adipose women.

Age group	Less than $\frac{1}{2}$ hour	More than $\frac{1}{2}$ hour	More than one hour	More than $1\frac{1}{2}$ hour	More than 2 hours
60 - 64	22	7	8	1	
65 - 69	21	6	5	2	1
70 - 74	12	4	6	3	
75 - 79	4	4	4		1
Total	59	21	23	6	2

Table 133.

The longest period of undisturbed sleep during the night, and during the day where there is night work, for men and non-adipose and adipose women by five year age groups. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	Hours 3		4		5		6		7		8		9		10		11
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
60 - 64			2	2	7	7	3	4	17	7	30	25	8	21	2	4	
65 - 69		1	8	8	12	9	11	3	11	1	18	17	12	17	8	1	2
70 - 74	1		14	8	16	14	14	13	5	8	23	12	22	15	4	1	2
75 - 79	5	1	15	12	20	10	10	9	7	4	9	3	13	7	2		1
80 - 84	2		16	4	13	12	10	8	4	5	2	2	5	6	3		
85 - 89	1	1	1	2	6	2		2	2	1		1		3	1		
Total	9	3	56	36	74	54	48	39	46	26	82	60	60	69	20	6	5

(b) Adipose women.

Age group	Hours							
	3	4	5	6	7	8	9	10
60 - 64	2	7	6	3	2	12	5	1
65 - 69	4	10	4	8	3	2	2	2
70 - 74	3	11	2	2	2	1	3	1
75 - 79		6	3	1		3		
Total	9	34	15	14	7	18	10	4

Table 134.

The total hours of sleep during the night, and during the day where there is night work, for men and non-adipose and adipose women by five year age groups. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	Hours											
	6		7		8		9		10		11	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	3		18	6	35	30	10	27	3	7		
65 - 69	1	1	11	5	29	28	20	21	18	2	3	
70 - 74	1	1	8	5	36	26	43	29	10	7	3	3
75 - 79	1		11	3	22	14	36	19	10	9	2	1
80 - 84		1	8	4	11	11	21	16	11	4	4	1
85 - 89			2		1	3	5	7	3	1		1
Total	6	3	58	23	134	112	135	119	55	30	12	6

(b) Adipose women.

Age group	Hours			
	7	8	9	10
60 - 64	6	15	14	3
65 - 69	5	16	10	4
70 - 74	5	6	11	3
75 - 79	2	4	4	3
Total	18	41	39	13

Table 135.

The total hours of sleep during the 24 hours of the day for men and non-adipose and adipose women by five year age groups. There are no adipose women over 79 years.

(a) Men and non-adipose women.

Age group	Hours 6		7		8		9		10		11		12	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	2		14	5	38	27	10	31	5	7				
65 - 69	1	1	6	5	29	26	25	22	17	3	4			
70 - 74	1	1	8	5	29	22	45	26	14	14	4	3		
75 - 79	1		4	2	22	7	37	21	15	10	3	6		
80 - 84		1	6	2	10	8	21	20	11	4	5	1	2	1
85 - 89			1		2	2	5	6	3	2		2		
Total	5	3	39	19	130	92	143	126	65	40	16	12	2	1

(b) Adipose women.

Age group	Hours				
	7	8	9	10	11
60 - 64	4	14	15	5	
65 - 69	4	14	11	5	1
70 - 74	3	5	13	3	1
75 - 79		4	3	3	3
Total	11	37	42	16	5

Table 136.

The number and percentage of men and non-adipose and adipose women regarded as healthy in terms of duration of sleep during the day and of five year age groups. Individuals on constant night work are excluded. There are no adipose women over 79 years.

(a) Number of men and non-adipose women.

Age group	X		More than $\frac{1}{2}$ hour		More than one hour		More than $1\frac{1}{2}$ hours		More than 2 hours	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	52	61	6	5	6	4	3		1	
65 - 69	54	52	11	3	13	2	1		2	
70 - 74	73	54	14	6	10	7	1	3	1	1
75 - 79	54	25	10	7	12	12	5	2	1	
80 - 84	30	28	10	2	8	2	3	3	3	2
85 - 89	8	9	2	1	1					2
Total	271	229	53	24	50	27	13	8	8	5

X = Individuals who do not sleep during the day, or where they do so it is for less than half an hour.

(a) Percentage of men and non-adipose women.

Age group	X		More than $\frac{1}{2}$ hour		More than one hour		More than $1\frac{1}{2}$ hours		More than 2 hours	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	76.5	87.1	8.8	7.2	8.8	5.7	4.4		1.5	
65 - 69	66.7	91.2	13.6	5.3	16.0	3.5	1.2		2.5	
70 - 74	73.8	76.1	14.1	8.4	10.1	9.9	1.0	4.2	1.0	1.4
75 - 79	65.9	54.4	12.2	15.2	14.6	26.1	6.1	4.3	1.2	
80 - 84	55.5	75.7	18.5	5.4	14.8	5.4	5.6	8.1	5.6	5.4
85 - 89	72.7	75.0	18.2	8.3	9.1					16.7
Total	68.6	78.2	13.4	8.2	12.7	9.2	3.3	2.7	2.0	1.7

X = Individuals who do not sleep during the day, or where they do so it is for less than half an hour.

(b) Adipose women - Number.

Age group	X	More than $\frac{1}{2}$ hour	More than one hour	More than $1\frac{1}{2}$ hours	More than 2 hours
60 - 64	24	8	5	1	
65 - 69	23	7	3	2	
70 - 74	16	4	4		1
75 - 79	5	1	4		3
Total	68	20	16	3	4

X = Individuals who do not sleep during the day, or where they do so it is for less than half an hour.

(b) Percentage of adipose women.

Age group	X	More than $\frac{1}{2}$ hour	More than one hour	More than $1\frac{1}{2}$ hours	More than 2 hours
60 - 64	63.2	21.0	13.2	2.6	
65 - 69	65.7	20.0	8.6	5.7	
70 - 74	64.0	16.0	16.0		4.0
75 - 79	38.5	7.7	30.8		23.0
Total	61.3	18.0	14.4	2.7	3.6

X = Individuals who do not sleep during the day, or where they do so it is for less than half an hour.

Table 137.

The weighted means for the various attributes of sleep in terms of time for men and non-adipose and adipose women by five year age groups. There are no adipose women over 79 years. H = hours. M = minutes.

(a) Men and non-adipose women.

Means of the listed attributes are presented under the age groups	Sex	60 - 64 years		65 - 69 years		70 - 74 years		75 - 79 years		80 - 84 years		85 - 89 years	
		H	M	H	M	H	M	H	M	H	M	H	M
Time of retiring to bed (p.m.)	Men	10	37	10	31	10	28	10	40	10	22	10	38
	Women	10	50	10	52	10	31	10	29	10	16	9	20
Time of rising in the morning (A.M.)	Men	6	40	7	41	7	46	8	13	8	13	8	11
	Women	7	38	7	49	7	56	8	14	8	00	8	15
Time taken to fall asleep where there is difficulty in doing so - over half an hour	Men		35		44		40		45		57		55
	Women		34		45		43		41		48		55
Longest period of undisturbed sleep	Men	7	25	7	11	6	57	6	9	5	43	5	32
	Women	7	47	7	5	6	43	5	56	6	11	6	15
Total hours of sleep during the night	Men	7	53	8	38	8	37	8	36	8	51	8	49
	Women	8	30	8	19	8	46	8	48	8	34	9	00
Total hours of sleep in the 24 hours of a day	Men	8	2	8	46	8	50	8	51	9	5	8	55
	Women	8	34	8	20	8	47	9	14	8	50	9	20
Duration of sleep by day excluding men on constant night work	Men		58		53		47		57		59		40
	Women		43		42		58		53	1	17	1	30

(b) Adipose women.

Attributes	60 - 64 years		65 - 69 years		70 - 74 years		75 - 79 years	
	H	M	H	M	H	M	H	M
Time of retiring to bed (p.m.)	10	53	10	38	10	36	10	19
Time of rising in the morning (a.m.)	7	49	7	44	8	2	8	14
Time taken to fall asleep when there is difficulty in doing so - over half an hour		49		56		58		53
Longest period of undisturbed sleep	6	30	5	34	5	22	5	19
Total hours of sleep during the night	8	22	8	22	8	29	8	37
Total hours of sleep in the 24 hours of a day	8	33	8	34	8	46	9	23
Duration of day sleep		45		47		53	1	19

Table 138.

The percentage of men and non-adipose and adipose women with no difficulty in falling asleep on retiring to bed at night, that is, they take less than half an hour to fall asleep, by five year age groups. Individuals on constant night work are excluded. There are no adipose women over 79 years.

Age group	Percentage		
	Men	Women	
		Non-adipose	Adipose
60 - 64	91.2	75.7	57.9
65 - 69	71.6	64.9	60.0
70 - 74	66.7	54.9	48.0
75 - 79	51.2	47.8	30.8
80 - 84	40.7	37.8	
85 - 89	45.4	8.3	
Total	64.6	56.6	53.1

Table 139.

The number and percentage of men and non-adipose and adipose women who sleep during the day with reference to whether they sleep in a chair or on a bed or couch.

(a) Men and non-adipose women - Number.

Age group	Number					
	Chair		Bed		Couch	
	Men	Women	Men	Women	Men	Women
60 - 64	12	6	1	3	3	
65 - 69	22	4	2	1	3	
70 - 74	25	6	1	9		2
75 - 79	16	8	10	11	2	2
80 - 84	20	2	4	4		3
85 - 89	2		1	3		
Total	97	26	19	31	8	7

(a) Men and non-adipose women - Percentage.

Age group	Percentage					
	Chair		Bed		Couch	
	Men	Women	Men	Women	Men	Women
60 - 64	75.0	66.7	6.2	33.3	18.8	
65 - 69	81.5	80.0	7.4	20.0	11.1	
70 - 74	96.1	35.3	3.9	52.9		11.8
75 - 79	57.1	38.1	35.7	52.4	7.2	9.5
80 - 84	83.3	22.2	16.7	44.4		33.4
85 - 89	66.7		33.3	100.0		
Total	78.2	40.6	15.3	48.4	6.5	11.0

(b) Adipose women.

Age group	Number		
	Chair	Bed	Couch
60 - 64	10	4	
65 - 69	9	2	1
70 - 74	5	4	
75 - 79	3	5	
Total	27	15	1

(b) Adipose women - Percentage.

Age group	Percentage		
	Chair	Bed	Couch
60 - 64	71.4	28.6	
65 - 69	75.0	16.7	8.3
70 - 74	55.6	44.4	
75 - 79	37.5	62.5	
Total	62.8	34.9	2.3

BODY WEIGHT, ARTERIAL PRESSURE AND SLEEP.

I am unable to discover data in the literature which relate the quality of sleep to body weight and blood pressure. This study endeavours to clarify the association between these variables and the quality of sleep in a healthy but elderly group of 400 men and 293 women, non-adipose and within the age range 60 to 89 years, and 111 women adipose and within the age range 60 to 79 years.

Body weight, systolic and diastolic blood pressures are measured as described on page 14. The quality of sleep is as outlined on pages 376 to 378.

RESULTS.

Tables 140, 141 and 142 show the number of non-adipose men, non-adipose and adipose women respectively by the quality of sleep and quinquennial age periods. The non-adipose men and women reveal a radical deterioration in sleep quality with age. The X^2 is significant at the 0·01 level of probability for men and women. The adipose women, however, show no significant decline in sleep quality with age. This is due to an overall quality of sleep in the adipose which is significantly less satisfactory than the quality of sleep in the non-adipose.

Table 143 shows the influence of sex on the quality of sleep by decennial age periods. In the seventh and eighth decades the quality of sleep for women is significantly worse than that for men, but in the ninth decade it is comparable for the sexes. In women unsatisfactory sleep quality is significantly associated with adiposity (Table 144).

Tables 145, 146 and 147 present the means of body weight, systolic and diastolic blood pressures by sex, adiposity and non-adiposity, and quality of sleep for the age range 60 to 79 years. As the quality of sleep deteriorates there is a significant increase in the average weight of women, but not in the average weight of men. This significant trend observed in women is lost when women are considered in terms of adiposity and non-adiposity (Tables 148, 149, 150 and 151). When the women are assessed as one group the body weight increases from an average of 137·6 lb. for very good sleep to 148.8 lb. for bad sleep.

With deterioration in the quality of sleep there is a significant increase in average systolic blood pressure, but not in average diastolic blood pressure for men; a highly significant increase in average systolic blood pressure and an increase of lesser significance in average diastolic blood pressure for all women; a highly significant increase in average systolic blood pressure and an increase which is not significant for diastolic blood pressure in non-adipose women, and increases in the systolic and diastolic blood pressures means which do not attain a level of statistical significance in adipose women (Tables 152, 153, 154 and 155).

DISCUSSION.

It is an interesting phenomenon that the quality of sleep in adipose women is consistently unsatisfactory for all age groups, and is generally worse than that of the non-adipose men and women who exhibit significant progressive parallel deteriorations in the quality of sleep with age. This implies that in the non-adipose sleep deterioration with age is related to factors other than weight, while in the adipose sleep disturbance is intimately associated with excessive body weight. The quality of sleep attained by men is markedly better than that for women, and this is undoubtedly due in large measure to the adverse influence of adiposity.

The non-adipose men and women reveal increases in blood pressure averages with deterioration in quality of sleep which are significant for systolic but not for diastolic blood pressure. In the adipose women, however, there are no significant trends in blood pressure averages as sleep deteriorates, and they are consistently high in all categories of sleep. It is thus apparent that in the adipose high blood pressure levels in terms of sleep quality are the result of the co-existing adiposity, while in the non-adipose men and women the increases in blood pressure averages as the quality of sleep deteriorates are due to factors other than body weight.

Table 140.

The number of men in the series by quality of sleep and age.

Age group	Quality of sleep			
	Very good	Good	Moderate	Bad
60 - 64	56	11	2	
65 - 69	46	29	6	1
70 - 74	48	40	12	1
75 - 79	25	34	21	2
80 - 89	18	28	18	2
Total	193	142	59	6

By combining the data for moderate and bad degrees of sleep and considering the age range by decennial periods the $X^2 = 45{\cdot}11$ df = 4. $P < 0{\cdot}01$.

Table 141.

The number of non-adipose women in the series by quality of sleep and age.

Age group	Quality of sleep			
	Very good	Good	Moderate	Bad.
60 - 64	41	23	6	
65 - 69	29	17	11	
70 - 74	20	32	16	3
75 - 79	8	24	12	2
80 - 89	12	25	12	
Total	110	121	57	5

By combining the data for moderate and bad degrees of sleep the $X^2 = 34{\cdot}06$. df = 8. $P < 0{\cdot}01$.

Table 142.

The number of adipose women in the series by quality of sleep and age.

Age group	Quality of sleep			
	Very good	Good	Moderate	Bad
60 - 64	14	10	13	1
65 - 69	8	12	15	
70 - 74	4	8	8	5
75 - 79	3	5	3	2
Total	29	35	39	8

By combining the data for moderate and bad degrees of sleep and considering the age range by decennial periods the $X^2 = 1{\cdot}76$. $df = 2$. $P > 0{\cdot}2$.

Table 143.

The influence of sex on the quality of sleep by decennial age periods.

1. 60 - 69 years.

	Quality of sleep			
	Very good	Good	Moderate	Bad
Men	102	40	8	1
Women	92	62	45	1
Total	194	102	53	2

By combining the data for moderate and bad degrees of sleep the $X^2 = 23{\cdot}77$. df = 2. P $\lhd$ 0·01.

2. 70 - 79 years.

	Quality of sleep			
	Very good	Good	Moderate	Bad
Men	73	74	33	3
Women	35	69	39	12
Total	108	143	72	15

By combining the data for moderate and bad degrees of sleep the $X^2 = 13{\cdot}88$. df = 2. P $\lhd$ 0·01

3. 80 - 89 years.

	Quality of sleep			
	Very good	Good	Moderate	Bad
Men	18	28	18	2
Women	12	25	12	
Total	30	53	30	2

By combining the data for moderate and bad degrees of sleep the $X^2 = 0{\cdot}86$. df = 2. $P > 0{\cdot}5$.

Table 144.

The influence of adiposity on the quality of sleep experienced by women in the age range 60 to 79 years.

	Quality of sleep			
	Very good	Good	Moderate	Bad
Non-adipose women	98	96	45	5
Adipose women	29	35	39	8
Total	127	131	84	13

By combining the data for the moderate and bad degrees of sleep the $X^2 = 18{\cdot}80$. df = 2. $P < 0{\cdot}01$.

Table 145.

The means of weight by sex and quality of sleep for the age range 60 to 79 years. The means are also presented in terms of adiposity. The adipose group is composed of those women more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

Sex	Number by quality of sleep				Weight means (lb.)			
	Very good	Good	Moderate	Bad	Very good	Good	Moderate	Bad
Men	175	114	41	4	139·1	141·4	134·3	135·0
All women	127	131	84	13	137·6	142·0	149·1	148·8
Non-adipose women	98	96	45	5	127·5	128·7	125·5	126·4
Adipose women	29	35	39	8	171·7	178·5	176·2	162·7

Table 146.

The means of systolic blood pressure by sex and quality of sleep for the age range 60 to 79 years. The means are also presented in terms of adiposity. The adipose group is composed of those women more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

Sex	Number by quality of sleep				Means (mm. Hg.)			
	Very good	Good	Moderate	Bad	Very good	Good	Moderate	Bad
					Sys.	Sys.	Sys.	Sys.
Men	175	114	41	4	156·7	163·3	166·7	156·0
All women	127	131	84	13	164·6	175·6	185·6	200·0
Non-adipose women	98	96	45	5	156·8	168·6	171·9	186·0
Adipose women	29	35	39	8	191·0	194·7	201·3	208·7

Table 147.

The means of diastolic blood pressure by sex and quality of sleep for the age range 60 to 79 years. The means are also presented in terms of adiposity. The adipose group is composed of those women more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

Sex	Number by quality of sleep				Means (mm. Hg.)			
	Very good	Good	Moderate	Bad	Very good	Good	Moderate	Bad
					Dias.	Dias.	Dias.	Dias.
Men	175	114	41	4	85.1	86.3	87.9	83.0
All women	127	131	84	13	88.5	89.6	92.8	96.8
Non-adipose women	98	96	45	5	85.7	86.6	86.5	92.0
Adipose women	29	35	39	8	97.9	97.7	100.0	99.7

Table 148.

Analysis of variance applied to the weight means by quality of sleep of the men aged 60 to 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	1,473	3	491
Within groups	135,962	330	412
Total	137,435	333	

$F = 1.19$

For $v_1 = 3$ and $v_2 = 330$, the 5 per cent point of the variance-ratio is 2·60. Therefore, the differences between the means of groups are not significant.

Table 149.

Analysis of variance applied to the weight means by quality of sleep of all the women in the series aged 60 to 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	7,217	3	2,405·7
Within groups	298,615	351	850·7
Total	305,832	354	

$F = 2.83$

For $v_1 = 3$ and $v_2 = 351$, the 5 per cent point of the variance-ratio is 2,60. Therefore, the differences between the means of sleep groups are significant, and are unlikely to have arisen by chance.

Table 150

Analysis of variance applied to the weight means by quality of sleep of the non-adipose women aged 60 to 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	320	3	106·7
Within groups	82,772	240	344·9
Total	83,092	243	

$F = 0{\cdot}31$

The variance-ratio is less than unity. Therefore, the differences between the means of sleep groups are not significant.

Table 151.

Analysis of variance applied to the weight means by quality of sleep of the adipose women aged 60 to 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	1,986	3	662·0
Within groups	50,962	107	476·3
Total	52,948	110	

$F = 1{\cdot}39$

For $v_1 = 3$ and $v_2 = 107$, the 5 per cent point of the variance-ratio is 2·76. Therefore, the differences between the means of sleep groups are not significant.

Table 152.

Analyses of variance applied to the systolic and diastolic blood pressure means by quality of sleep of the men aged 60 to 79 years.

(a) Systolic.

Source of variation	Sum of squares	df	Mean square
Between groups	4,926	3	1,642·0
Within groups	151,786	330	459·9
Total	156,712	333	

$F = 3{\cdot}57$

For $v_1 = 3$ and $v_2 = 330$, the 5 per cent point of the variance-ratio is 2·60. Therefore, the differences between the means of sleep groups are significant, and are unlikely to have arisen by chance.

(b) Diastolic.

Source of variation	Sum of squares	df	Mean square
Between groups	231	3	77·0
Within groups	22,949	330	69·5
Total	23,180	333	

$F = 1{\cdot}11$

For $v_1 = 3$ and $v_2 = 330$, the 5 per cent point of the variance-ratio is 2·60. Therefore, the difference between the means of sleep groups are not significant.

Table 153.

Analyses of variance applied to the systolic and diastolic blood pressure means by quality of sleep of all women aged 60 to 79 years.

(a) Systolic.

Source of variation	Sum of squares	df	Mean square
Between groups	31,218	3	10,406·0
Within groups	309,776	351	882·5
Total	340,994	354	

$F = 11{\cdot}79$

For $v_1 = 3$ and $v_2 = 351$, the 0·1 per cent point of the variance-ratio is 5·42. Therefore, the differences between the means of sleep groups are highly significant, and are most unlikely to have arisen by chance.

(b) Diastolic.

Source of variation	Sum of squares	df	Mean square
Between groups	1,532	3	510·7
Within groups	41,209	351	117·4
Total	42,741	354	

$F = 4{\cdot}35$

For $v_1 = 3$ and $v_2 = 351$, the 1·0 per cent point of the variance-ratio is 3·78. Therefore, the differences between the means of sleep groups are significant, and are unlikely to have arisen by chance.

Table 154

Analyses of variance applied to the systolic and diastolic blood pressure means by quality of sleep of the non-adipose women aged 60 to 79 years.

(a) Systolic.

Source of variation	Sum of squares	df	Mean square
Between groups	12,187	3	4,062
Within groups	155,516	240	648
Total	167,703	243	

$F = 6{\cdot}27$

For $v_1 = 3$ and $v_2 = 240$, the 0·1 per cent point of the variance-ratio is 5·42. Therefore, the differences between the means of sleep groups are highly significant, and are most unlikely to have arisen by chance.

(b) Diastolic.

Source of variation	Sum of square	df	Mean square
Between groups	467	3	155·7
Within groups	16,434	240	68·5
Total	16,901	243	

$F = 2{\cdot}27$

For v_1 3 and $v_2 = 240$, the 5 per cent point of the variance-ratio is 2·60. Therefore, the differences between the means of sleep groups are not significant.

Table 155.

Analyses of variance applied to the systolic and diastolic blood pressure means by quality of sleep of the adipose women aged 60 - 79 years.

(a) Systolic.

Source of variation	Sum of squares	df	Mean square
Between groups	2,848	3	949·3
Within groups	90,913	107	849.6
Total	93,761	110	

$F = 1.12$

For $v_1 = 3$ and $v_2 = 107$, the 5 per cent point of the variance-ratio is 2·76. Therefore, the differences between the means of sleep groups are not significant.

(b) Diastolic.

Source of variation	Sum of squares	df	Mean square
Between groups	129	3	43·0
Within groups	14,333	107	133·9
Total	14,462	110	

$F = 0{\cdot}32$

The variance-ratio is less than unity. Therefore, the differences between the means of sleep groups are not significant.

The weight and blood pressure readings used in the study of the influence of sleep on these variables are as follows. Weight is presented to the nearest pound and blood pressure to the nearest even number. The horizontal inked lines separate the readings for the age group 60 to 69 years (above the lines) from those for the age group 70 to 79 years (below the lines). x indicates that a woman is adipose, that is, more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

MEN. 60 to 79 years.

Weight	Blood pressure Systolic	Blood pressure Diastolic	Weight	Blood pressure Systolic	Blood pressure Diastolic
1. Sleep - very good.			105	134	88
			149	182	94
140	138	78	160	122	78
137	152	84	161	188	94
128	148	92	155	166	88
133	172	88	119	142	88
130	148	88	162	142	78
130	148	68	170	138	78
113	180	96	108	160	84
161	162	98	122	124	70
115	172	90	159	142	82
154	168	96	118	154	84
153	138	74	125	170	68
123	148	96	119	152	84
123	138	78	111	150	70
169	142	92	141	140	84
163	164	94	121	190	94
124	168	98	142	164	86
129	138	74	113	168	88
143	150	84	147	138	80
117	164	92	152	148	88
127	158	86	113	158	86
128	128	80	130	162	92
159	162	92	126	142	86
131	184	96	148	128	84
130	138	78	188	188	100
113	140	82	146	158	94
150	112	68	123	132	78
141	142	82	193	144	88

Weight	Blood pressure		Weight	Blood pressure	
	Systolic	Diastolic		Systolic	Diastolic
113	146	76	157	170	84
133	164	82	139	174	92
104	176	82	163	156	86
161	198	94	134	182	98
160	156	100	111	138	80
160	168	78	198	184	92
150	142	86	132	148	78
152	140	74	151	190	88
113	196	98	107	166	94
105	158	94	170	168	88
112	144	78	134	140	88
140	126	90	125	132	80
162	122	80	165	198	94
184	150	78	131	168	86
148	192	96	170	172	86
106	128	78	129	134	86
171	148	84	127	152	80
117	154	76	149	168	98
144	130	76	119	156	92
101	164	96	124	148	86
128	180	80	152	130	72
163	126	84	166	168	88
104	162	96	144	148	90
136	138	78	131	118	74
158	156	96	192	166	92
153	156	88	128	136	80
165	198	98	167	162	92
145	170	90	111	108	72
108	126	76	133	158	84
155	152	84	142	148	84
133	138	86	161	176	90
113	172	88	137	160	72
126	132	80	104	206	98
173	142	92	135	204	104
110	164	88	144	136	88
150	146	90	131	168	86
139	166	94	132	134	72
132	138	78	143	138	72
129	144	82	112	138	74
133	184	92	161	168	98
201	174	86	114	192	82
157	126	88	151	144	88

Weight	Blood pressure Systolic	Blood pressure Diastolic
139	154	90
128	156	70
115	164	88
122	202	86
124	162	78
139	180	96
141	158	92
130	160	78
166	138	80
110	186	86
162	208	90
142	152	90
161	154	84
143	142	66
154	152	82
118	186	70
120	180	98
127	136	82
159	174	74
114	156	82
157	198	100
130	174	88
145	164	82
121	128	72
124	170	88
129	196	96
146	148	78
156	160	84
177	160	72
183	192	86
156	156	90
119	176	82
151	140	68
117	150	72
149	134	82

2. Sleep - good.

144	162	82
119	182	84
190	166	80
157	158	96

Weight	Blood pressure Systolic	Blood pressure Diastolic
134	178	96
121	128	92
166	148	100
141	150	80
155	152	82
156	140	88
137	130	84
181	124	86
126	162	86
153	148	88
144	154	88
180	162	88
120	122	80
149	118	78
133	142	84
160	142	88
162	172	98
170	180	88
143	208	92
147	146	84
133	182	88
129	112	76
160	172	86
114	138	84
125	128	86
116	206	94
115	142	82
152	184	94
151	174	74
177	142	78
127	152	88
159	208	98
186	152	90
126	148	86
184	154	96
104	150	80
143	190	78
152	148	80
145	156	84
140	138	72
147	126	76
127	172	96
92	164	68
154	168	86
118	192	76

Weight	Blood pressure Systolic	Diastolic
159	180	96
123	156	88
161	176	104
116	146	78
113	198	84
133	138	78
137	142	82
152	172	80
164	154	78
158	166	86
167	160	78
127	184	88
121	164	86
111	162	94
162	204	96
169	178	86
130	142	84
111	180	84
145	170	90
158	162	98
152	194	96
158	162	98
147	198	94
138	150	84
146	168	82
111	168	82
148	128	72
133	164	82
155	180	94
136	168	98
147	194	80
132	148	96
133	156	76
120	216	98
165	154	86
140	178	96
144	148	68
107	158	76
153	142	82
125	192	76
150	152	82
138	170	86
143	184	104
143	182	88
125	172	74
144	148	76
126	164	82
153	158	86
132	144	80
131	160	82
128	194	100
123	162	96
109	204	98
127	154	76
144	174	96
129	168	68
141	208	98
156	206	106
114	172	90
124	146	80
143	162	98
164	170	98
149	168	88
136	162	70
175	162	96

3. Sleep - moderate.

152	190	92
133	154	88
150	140	82
124	122	68
132	172	94
114	168	74
151	160	94
138	130	82
151	140	82
150	174	86
140	184	84
131	144	80
147	150	80
137	168	92
130	192	92
128	182	96
111	204	96
107	158	98
169	186	100
116	162	84
128	128	82
122	152	74

Weight	Blood pressure	
	Systolic	Diastolic
108	166	102
168	176	92
151	186	94
124	132	92
114	142	76
101	146	84
112	170	88
149	184	98
131	216	94
159	198	96
136	196	92
115	198	86
151	182	94
143	166	84
137	172	86
149	192	94
145	146	84
118	140	82

4. Sleep - bad.

102	132	68
170	142	84
143	146	78
125	204	102

WOMEN. 60 to 79 years

1. Sleep - very good.

143	148	72
128	162	82
113	132	90
100	140	88
150	130	72
119	158	84
163	174	94
127	158	72

Weight	Blood pressure	
	Systolic	Diastolic
122	162	88
162	164	94
150	162	94
144	142	74
134	178	92
140	176	74
127	164	90
96	170	98
150	148	86
105	140	78
139	118	80
151	122	88
145	128	68
148	148	82
111	150	86
120	158	80
112	144	86
146	162	94
134	132	68
137	162	90
117	170	64
133	174	94
131	186	92
128	152	84
106	168	82
138	170	90
137	168	98
146	124	74
126	154	86
132	146	98
124	152	94
134	170	84
148	196	98
103	144	88
134	144	86
102	192	86
109	174	86
129	136	88
154	150	80
134	188	96
143	164	88
100	176	92
118	148	82
126	186	92

Weight	Blood pressure Systolic	Blood pressure Diastolic	
81	124	76	
115	178	86	
107	154	78	
158	142	82	
107	162	88	
148	158	92	
101	138	80	
115	138	88	
97	180	88	
123	174	84	
133	188	90	
112	156	84	
127	162	98	
111	186	84	
126	168	92	
133	142	66	
139	144	82	
123	182	88	
178	158	100	*
162	192	108	*
153	166	104	*
166	162	100	*
196	198	84	*
166	182	98	*
175	238	112	*
194	232	112	*
174	260	120	*
183	212	106	*
159	142	76	*
165	162	90	*
149	188	96	*
160	180	86	*
153	196	94	*
182	168	106	*
178	198	92	*
161	202	106	*
169	222	112	*
182	214	102	*
165	160	82	*
146	198	96	*
129	186	100	
118	152	92	
91	194	88	
128	174	92	
115	186	102	

Weight	Blood pressure Systolic	Blood pressure Diastolic	
146	152	76	
134	194	88	
98	196	96	
99	172	84	
169	154	92	
108	140	88	
118	148	84	
145	158	86	
138	144	86	
133	160	72	
138	188	94	
104	142	70	
141	168	92	
121	140	78	
143	180	92	
118	186	98	
150	208	92	
126	134	70	
151	154	76	
124	172	88	
129	192	98	
127	160	72	
129	152	82	
169	222	98	*
160	140	82	*
251	174	94	*
175	212	98	*
186	192	104	*
154	166	80	*
168	204	100	*

2. Sleep - good.

137	180	88
133	186	92
132	136	88
106	198	94
115	132	82
130	144	88
155	138	90
148	154	84
119	134	76
117	156	90

Weight	Blood pressure Systolic	Blood pressure Diastolic	
150	160	88	
159	196	94	
136	126	70	
146	168	88	
100	140	84	
121	140	76	
140	156	82	
138	168	92	
135	152	80	
132	194	90	
130	176	94	
132	198	96	
156	154	92	
149	138	68	
169	200	88	
72	132	80	
128	202	108	
143	166	80	
99	174	88	
126	126	84	
156	142	82	
111	164	74	
134	186	92	
113	154	84	
158	158	78	
146	160	84	
143	126	82	
146	174	86	
156	188	98	
116	188	84	
278	214	120	*
223	162	94	*
206	168	86	*
164	200	104	*
168	208	100	*
222	192	120	*
149	160	84	*
156	166	92	*
166	172	98	*
180	180	88	*
155	182	98	*
187	162	86	*

Weight	Blood pressure Systolic	Blood pressure Diastolic	
155	194	90	*
177	210	104	*
215	194	106	*
170	210	102	*
211	260	110	*
189	254	126	*
169	210	110	*
153	176	96	*
182	234	108	*
167	192	90	*
151	182	80	
130	210	96	
107	186	80	
160	190	88	
136	184	94	
146	158	86	
119	152	78	
143	140	84	
109	148	84	
133	190	90	
151	162	82	
154	168	74	
128	188	84	
106	208	78	
124	136	68	
138	166	100	
101	148	92	
142	180	96	
141	160	72	
153	154	88	
144	164	90	
146	146	86	
141	174	80	
138	164	82	
105	188	90	
145	170	96	
125	156	84	
102	190	102	
107	164	84	
102	174	78	
120	146	86	
116	170	90	

Weight	Blood pressure Systolic	Blood pressure Diastolic	
120	210	108	
86	186	86	
123	216	90	
131	214	104	
144	190	96	
111	188	98	
147	172	100	
100	168	78	
92	178	90	
112	144	82	
122	170	76	
146	172	92	
107	212	104	
125	156	90	
104	216	98	
142	164	70	
157	142	82	
114	178	92	
126	160	84	
114	166	90	
127	208	94	
93	190	74	
99	124	74	
120	186	84	
155	180	98	*
149	200	98	*
228	148	98	*
180	154	70	*
152	198	88	*
208	156	78	*
146	212	84	*
165	254	120	*
159	196	98	*
146	164	86	*
163	210	88	*
185	230	104	*
168	214	98	*

3. Sleep - moderate.

Weight	Blood pressure Systolic	Blood pressure Diastolic	
155	140	78	
134	188	96	
167	152	82	
148	164	82	
139	172	94	
110	180	88	
96	158	92	
139	182	94	
115	194	92	
143	146	82	
102	162	88	
120	156	86	
144	214	108	
117	148	78	
99	162	88	
134	174	90	
173	188	96	*
189	224	116	*
194	206	100	*
168	172	90	*
206	210	102	*
196	208	108	*
153	246	102	*
167	162	82	*
164	152	92	*
159	158	92	*
174	212	98	*
179	192	108	*
174	148	82	*
183	168	96	*
171	182	94	*
178	186	96	*
162	248	114	*
170	210	106	*

Weight	Blood pressure Systolic	Diastolic	
180	188	92	*
195	198	96	*
188	208	110	*
174	222	118	*
165	214	112	*
166	178	104	*
204	220	110	*
157	172	84	*
171	170	68	*
164	186	106	*
120	210	102	
121	152	82	
120	182	82	
147	150	86	
129	158	88	
136	138	80	
105	156	74	
108	194	96	
115	184	80	
127	194	82	
140	180	96	
139	158	78	
109	188	88	
124	148	82	
128	186	94	
146	182	84	
91	158	78	
89	156	86	
129	182	78	
130	162	76	
137	148	84	
103	192	86	
132	186	92	
140	160	96	
133	210	94	
143	180	88	
87	186	68	
115	176	86	
161	174	88	*
208	254	108	*
164	260	98	*
168	208	104	*
183	182	100	*
161	194	78	*
185	186	102	*

Weight	Blood pressure Systolic	Diastolic	
152	236	108	*
175	250	118	*
219	236	114	*
172	244	108	*

4. Sleep – bad.

159	198	94	*
125	184	90	
146	174	92	
124	192	94	
125	186	92	
112	194	92	
153	214	96	*
159	202	92	*
168	208	96	*
180	198	108	*
146	248	122	*
164	170	94	*
173	232	96	*

BODY WEIGHT, ARTERIAL PRESSURE AND FAMILY SIZE.

Chesley, Annitto and Jarvis (1947) demonstrated that in susceptible women pregnancy may result in the development of hypertension when toxaemia occurs. In such women hypertension may persist following the birth of the infant. Barnes and Browne (1945), however, in a study of nulliparous and parous women found no significant difference between their average arterial pressures, and no variation in the average arterial pressures in respect of the number of previous pregnancies. Nevertheless, the influence of pregnancy on arterial pressure in subsequent years has rarely been investigated. The purpose of this analysis is to investigate the arterial pressure of older women in terms of family size, and the arterial pressure of men in relation to the number of their children. Weight is included in the study because of the important bearing it has on health.

Blood pressure is estimated as described on page 14. In the following text and in the Tables adipose indicates that the women are more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948).

This series is concerned with 151 men aged 60 to 69 years and 355 women aged 60 to 79 years. Of these numbers all the men and 244 of the women are non-adipose, while 111 women are adipose. The number of women in the ninth decade is presented.

RESULTS.

Table 156 shows the number of women in the series by parity and decennial age periods. Table 157 shows the number of women in terms of adiposity and quinquennial age periods. There is a significant decrease in the number of adipose women with age. The X^2 presents a probability less than 0·01. Table 158 shows the means of systolic and diastolic blood pressures by parity and the adjacent age periods 60 to 69 years and 70 to 79 years. In both age groups the systolic blood pressure means are high relative to the other averages. In married women with increase in parity there is an apparent decline in average systolic blood pressure followed by an increase in the women with four and more children. However, analyses of variance indicate that the variations of the means by parity are not significant. Similarly the means of diastolic blood pressure by parity for women do not vary significantly (Table 164). There is no change in the situation when non-adipose women are considered alone (Table 159).

In the women who are married the means of body weight by parity show an upward trend with increase in family size. This increase in average values is not significant for the age group 60 to 69 years, but is significant at the 5 per cent level of significance of the variance-ratio (Table 164) for the 70 to 79 years age group (Table 160).

Table 161 shows the body weight, systolic and diastolic blood pressures means for men by the parity of their wives and for men who are single in the age group 60 to 69 years. There is no significant variation in the means by the parity of the wives for any of the three variables (Table 165).

Tables 162 and 163 are presented for the age group 60 to 69 years to show that in single women and in those married with all degrees of family size the arterial pressure means are much higher in the adipose women than they are in the non-adipose women. Indeed, in most instances the differences between corresponding means are significant at the 0·01 level of probability.

DISCUSSION.

In this study there is no significant relationship between parity and arterial blood pressure. Thus the theory advanced by Miall and Oldham (1958) that parous women might have higher blood pressure than nulliparous women is not substantiated for the older age groups. My findings are more in harmony with those of Barnes and Browne (1945) who found no difference in arterial blood pressure as between nulliparous and parous women. The observation of Bøe, Humerfelt and Wedervang (1957) that average arterial pressure is lower in women who have had at least two children is not supported by the arterial pressure trends observed in this analysis.

Miall and Oldham (1958) note in the child bearing age 15 to 45 years a significant decrease in arterial pressure with increase in parity. This significance lessens in the elderly and thus conforms to the non-significant variations in the blood pressure means with parity in this study. One cause of this loss of significance with age may be a selective mortality involving the women with hypertension.

In this investigation the increase in average body weight in terms of parity for the adjacent decennial age periods 60 - 69 and 70 - 79 years is significant for the later decade. Apart from those who are single, older women who have had more than three children may possess on average somewhat greater weight and higher arterial pressure than those with a lesser number of children. When the adipose are excluded any slight difference in arterial prsssure is eliminated.

McKeown and Record (1957) consider that fertility and body weight are inversely correlated in women. This observation is at complete variance with the present data for older women which suggest that if any relationship exists between fertility and weight the association is weak and positive for the age group 60 to 69 years and significant and positive for the age group 70 to 79 years.

For all degrees of parity the arterial pressure means for the adipose are significantly greater than the corresponding means of the non-adipose women. This demonstrates the significant positive correlation between blood pressure and body weight, and that high levels of blood pressure are associated with adiposity.

Miall and Oldham (1958) discovered in men within the age range 15 to 50 years a marked fall in systolic pressure with increase in family size, though the trend was absent for diastolic blood pressure. The present study in respect of men in the age group 60 to 69 years shows no specific arterial pressure trends in terms of family size. This suggests that the significant findings observed by Miall and Oldham (1958) in younger men diminish with increase in age.

SUMMARY.

The relationship between body weight, arterial pressure and family size is assessed with reference to 151 men aged 60 to 69 years and 355 women aged 60 to 79 years.

The association between the variables and parity is characterised by a general lack of significance. This suggests that the significant trends between blood pressure and family size in the child bearing period for women, and in younger men observed by other workers weakens with age.

Table 156.

The number of women in the series by parity and ten year age groups.

Age group	Parity									
	0 (a)	0 (b)	1	2	3	4	5	6	7	8 and more
60 - 69	22	19	39	41	30	16	11	10	4	8
70 - 79	28	17	20	30	22	17	12	7	2	
80 - 89	9	7	8	9	5	6	3	1		1
Total	59	43	67	80	57	39	26	18	6	9

(a) Marital status - single. (b) Marital status - other than single.

Table 157.

The number of adipose and non-adipose women by five year age groups. The adipose women are those who are more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

Age group	Non-adipose women	Adipose women
60 - 64	70	38
65 - 69	57	35
70 - 74	71	25
75 - 79	46	13
80 - 84	37	0
85 - 89	12	0
Total	293	111

The decline in the number of adipose women with increase in age is highly significant.

$X^2 = 19{\cdot}8$

df = 3 (age groups 75 - 79, 80 - 84 and 85 - 89 are added together to give one age group 75 - 89 years)

$P < 0{\cdot}01$

Table 158.

The means of systolic and diastolic blood pressure for women by parity and adjacent decennial periods 60 to 69 and 70 to 79 years.

Number of women		Parity	Means (mm. Hg.)			
60 - 69 years	70 - 79 years		60 - 69 years		70 - 79 years	
			Systolic	Diastolic	Systolic	Diastolic
22	28	0 (a)	181·8	89·9	186·9	88·3
19	17	0 (b)	176·4	91·9	172·6	85·5
39	20	1	168·7	90·4	183·3	92·0
41	30	2	169·1	89·1	173·9	89·1
30	22	3	167·8	89·4	175·6	88·7
16	17	4	173·9	93·4	192·0	94·6
21	19	5 and 6	178·2	93·5	179·2	88·8
12	2	7 and more	176·3	93·5	170·0	79·0

(a) Marital status - single. (b) Marital status - other than single.

Table 159.

The means of systolic and diastolic blood pressure for non-adipose women by parity and adjacent decennial periods 60 to 69 and 70 to 79 years.

Number of women		Parity	Means (mm. Hg.)			
			60 - 69 years		70 - 79 years	
60 - 69 years	70 - 79 years		Systolic	Diastolic	Systolic	Diastolic
16	22	0 (a)	170·5	86·0	183·0	88·5
12	16	0 (b)	160·5	86·5	170·1	85·6
28	14	1	163·8	87·9	175·1	88·6
27	23	2	158·5	84·3	169·7	87·3
18	17	3	153·5	84·7	170·8	86·8
7	8	4	142·9	79·1	162·0	83·7
12	15	5 and 6	163·6	88·7	170·3	85·5
7	2	7 and more	162·3	87·1	170·0	79·0

(a) Marital status - single. (b) Marital status - other than single.

Table 160.

The weight means for women by parity and adjacent decennial periods 60 to 69 and 70 to 79 years.

Number of women		Parity	Means (lb.)	
60 - 69 years	70 - 79 years		60 - 69 years	70 - 79 years
22	28	0 (a)	142·2	125·9
19	17	0 (b)	138·0	128·8
39	20	1	141·5	144·7
41	30	2	143·4	134·7
30	22	3	150·8	140·3
16	17	4	152·0	154·0
21	19	5 and 6	151·1	138·6
12	2	7 and more	158·1	121·0

(a) Marital status - single. (b) Marital status - other than single.

Table 161.

The means of weight, systolic and diastolic blood pressure for men aged 60 to 69 years by parity of their wives. Single men are also included in the Table.

Number of men	Parity of wives	Weight (lb.)	Systolic (mm. Hg.)	Diastolic (mm. Hg.)
9	0 (a)	139·2	156·7	86·4
21	0 (b)	135·0	150·4	83·0
29	1	138·7	156·2	85·9
36	2	141·7	150·9	87·0
27	3	140·7	157·8	84·2
9	4	133·0	150·0	85·5
10	5	147·1	157·8	89·2
10	6 and more	149·3	156·7	88·0

(a) Marital status - single men.

(b) Marital status - other than single men.

Table 162.

The means, mean differences ± S.E., t values and probabilities of systolic blood pressure by parity for the non-adipose and adipose groups of women aged 60 to 69 years.

Parity	Means (mm. Hg.)		Mean differences ± S.E. (mm.Hg.)	t	df	P
	Non-adipose women	Adipose women				
0 (a)	170·5	212·0	+ 41·5 ± 8·24	5.04	20	$\lessdot$ 0·01
0 (b)	160·5	203·7	+ 43·2 ± 14·53	2·97	17	$\lessdot$ 0·01
1	163·8	181·3	+ 17·5 ± 8·44	2·07	37	$\lessdot$ 0·05
2	158·5	189·6	+ 31·1 ± 7·43	4·18	39	$\lessdot$ 0·01
3	153·5	189·2	+ 35·7 ± 7·72	4.61	28	$\lessdot$ 0·01
4	142·9	198·0	+ 55·1 ± 10·95	5·03	14	$\lessdot$ 0·01
5 and 6	163·7	197·5	+ 33·8 ± 11·19	3·03	19	$\lessdot$ 0·01
7 and more	162·3	196·0	+ 33·7 ± 11·52	2·93	10	$\lessdot$ 0.02

(a) Marital status - single. (b) Marital status - other than single.

Table 163.

The means, mean differences ± S.E., t values and probabilities of diastolic blood pressure by parity for the non-adipose and adipose groups of women aged 60 to 69 years.

Parity	Means (mm. Hg.) Non-adipose women	Means (mm. Hg.) Adipose women	Mean differences ± S.E. (mm.Hg.)	t	df	P
0 (a)	86.0	100.3	+ 14.3 ± 4.64	3.09	20	$<$ 0.01
0 (b)	86.5	101.1	+ 14.6 ± 4.27	3.43	17	$<$ 0.01
1	87.9	96.7	+ 8.8 ± 3.05	2.88	37	$<$ 0.01
2	84.3	98.4	+ 14.1 ± 2.99	4.72	39	$<$ 0.01
3	84.7	96.5	+ 11.8 ± 3.35	3.53	28	$<$ 0.01
4	79.1	104.4	+ 25.3 ± 3.80	6.65	14	$<$ 0.01
5 and 6	88.7	100.0	+ 11.3 ± 4.35	2.60	19	$<$ 0.02
7 and more	87.1	102.4	+ 15.3 ± 7.75	1.97	10	$>$ 0.05

(a) Marital status - single. (b) Marital status - other than single.

Table 164.

Analyses of variance applied to the weight, systolic and diastolic blood pressures means by parity, but excluding those who are single, for women aged 60 to 69 years and 70 to 79 years.

BODY WEIGHT. 60 - 69 years.

Source of variation	Sum of squares	df	Mean square
Between groups	5,832	6	972
Within groups	175,356	171	1,025
Total	181,188	177	

$F = 0{\cdot}95$

The variance-ratio is less than unity. Therefore, the differences between the means of groups are not significant and are most lihely to have arisne by chance.

70 - 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	10,548	5	2,109·6
Within groups	110,496	121	913·2
Total	121,044	126	

$F = 2{\cdot}31$

For $v_1 = 5$ and $v_2 = 121$, the 5 per cent point of the variance-ratio is 2·29. Therefore, the differennces between the means of groups are significant.

SYSTOLIC BLOOD PRESSURE. 60 - 69 years.

Source of variation	Sum of squares	df	Mean square
Between groups	2,713	6	452
Within groups	141,151	171	825
Total	143,864	177	

$F = 0.55$

The variance-ratio is less than unity. Therefore, the differences between the means of groups are not significant, and are most likely to have arisen by chance.

70 - 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	4,923	5	984.6
Within groups	92,939	121	768.1
Total	97,862	126	

$F = 1.28$

For $v_1 = 5$ and $v_2 = 121$, the 5 per cent point of the variance-ratio is 2.29. Therefore, the differences between the means of groups are not significant and are most likely to have arisen by chance.

DIASTOLIC BLOOD PRESSURE. 60 - 69 years.

Source of variation	Sum of squares	df	Mean square
Between groups	548	6	91
Within groups	22,254	171	130
Total	22,802	177	

F = 0·70

The variance-ratio is less than unity. Therefore, the differences between the means of groups are not significant and are most likely to have arisen by chance.

70 - 79 years.

Source of variation	Sum of squares	df	Mean square
Between groups	544	5	108.8
Within groups	13,176	121	108.9
Total	13,721	126	

F = 1·0

The variance-ratio is unity. Therefore, the differences between the means of groups are not significant and are most likely to have arisen by chance.

Table 165.

(a)

Analysis of variance applied to the weight means of men aged 60 to 69 years by the parity of their wives. Unmarried men are also included in this analysis.

Source of variation	Sum of squares	df	Mean square
Between groups	2,484	7	354.8
Within groups	69,917	143	488.9
Total	72,401	150	

F = 0.73

The variance-ratio is less than unity. Therefore, the differences between the means of groups are not significant.

(b)

Analysis of variance applied to the systolic blood pressure means of men aged 60 to 69 years by the parity of their wives. Unmarried men are included in this analysis.

Source of variation	Sum of squares	df	Mean square
Between groups	1,565	7	223.6
Within groups	61,672	143	431.3
	63,237	150	

F = 0·52

The variance-ratio is less than unity. Therefore, the differences between the means of groups are not significant.

(c)

Analysis of variance applied to the diastolic blood pressure means of men aged 60 to 69 years by the parity of their wives. Unmarried men are also included in this analysis.

Source of variation	Sum of squares	df	Mean square
Between groups	451	7	64.4
Within groups	8,446	143	59.1
Total	8,897	150	

$F = 1.09$

For $v_1 = 7$ and $v_2 = 143$, the 5 per cent point of the variance-ratio is 2.21. Therefore, the differences between the means of groups are not significant.

The weight and blood pressure readings used in the study of the influence of parity on these variables are as follows. Weight is presented to the nearest pound and blood pressure to the nearest even number. The horizontal inked lines separate the readings for the age group 60 to 69 years (above the lines) from those for the age group 70 to 79 years (below the lines). x indicates that a woman is adipose, that is, more than 24 per cent over ideal weight as estimated from Anderson's nomogram.

MEN. 60 to 69 years.

1. Marital status - single.

Weight	Blood pressure mm. Hg. Systolic	Diastolic
190	166	80
131	184	96
162	142	78
118	154	84
130	162	92
129	112	76
114	138	84
145	170	90
134	182	98

2. Marital status
- other than single

Weight	Blood pressure mm. Hg. Systolic	Diastolic
157	158	96
130	148	68
134	178	96
130	138	78
125	170	68
126	142	86
148	128	84
120	122	80
113	146	76
143	208	92
124	122	68
112	144	78
162	122	80
171	148	84
144	130	76
113	172	88
150	146	90
139	166	94
127	152	88
139	174	92

3. One child.

Weight	Blood pressure mm. Hg. Systolic	Diastolic
130	148	88
115	172	90
123	148	96
123	138	78
169	142	92
129	138	74
127	158	86
149	182	94
160	122	78
161	188	94
155	152	82
188	188	100
123	132	78
133	142	84
150	140	82
133	164	82
147	146	84
152	140	74
113	196	98
116	206	94
184	150	78
148	192	96
104	162	96
165	198	98
108	126	76
155	152	84

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic
129	144	82
157	126	88
104	150	80

4. Two children.

133	172	88
113	180	96
161	162	98
154	168	96
153	138	74
166	148	100
128	128	80
141	142	82
105	134	88
141	140	84
142	164	86
113	168	88
147	138	80
113	158	86
156	140	88
137	130	84
193	144	88
181	124	86
126	162	86
153	148	88
149	118	78
170	180	88
160	156	100
140	126	90
115	142	82
106	128	78
101	164	96
158	156	96
173	142	92
110	164	88
132	138	78
151	174	74
133	184	92
157	170	84
163	156	86
126	148	86

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic
102	132	68

5. Three children.

144	162	82
119	182	84
152	190	92
143	150	84
117	164	92
159	162	92
113	140	82
150	112	68
108	160	84
122	124	70
159	142	82
119	152	84
152	148	88
146	158	94
144	154	88
104	176	82
161	198	94
132	172	94
160	168	78
160	172	86
117	154	76
128	180	80
153	156	88
133	138	86
126	132	80
177	142	78
201	174	86

6. Four children.

137	152	84
121	128	92
141	150	80
155	166	88
160	142	88
114	168	74
105	158	94
128	148	92
136	138	78

Weight	Blood pressure mm. Hg. Systolic	Diastolic
7. Five children.		
163	164	94
124	168	98
133	154	88
119	142	88
111	150	70
121	190	94
180	162	88
150	142	86
186	152	90
184	154	96
8. Six children.		
140	138	78
162	172	98
9. Seven children.		
170	138	78
152	184	94
163	126	84
151	160	94
159	208	98
10. Eight children.		
125	128	86
11. Nine children.		
133	182	88

Weight	Blood pressure mm. Hg. Systolic	Diastolic	
12. Ten children.			
138	130	82	

WOMEN. 60 to 79 years.

1. Marital status - single.

Weight	Systolic	Diastolic	
137	180	88	
143	148	72	
163	174	94	
127	158	72	
133	186	92	
134	188	96	
106	198	94	
155	138	90	
134	178	92	
111	150	86	
117	170	64	
96	158	92	
143	146	82	
133	188	90	
111	186	84	
123	182	88	
196	198	84	*
194	232	112	*
159	198	94	*
170	210	102	*
174	212	98	*
169	222	112	*
107	186	80	
128	174	92	
120	182	82	
98	196	96	
105	156	74	
145	170	96	
143	180	92	

Weight	Blood pressure mm. Hg. Systolic	Diastolic	
124	192	94	
120	210	108	
118	186	98	
86	186	86	
123	216	90	
144	190	96	
100	168	78	
112	144	82	
122	170	76	
107	212	104	
104	216	98	
129	152	82	
126	160	84	
87	186	68	
112	194	92	
164	260	98	*
149	200	98	*
180	154	70	*
161	194	78	*
152	198	88	*
159	202	92	*

2. Marital status
   - other than single.

113	132	90	
115	132	82	
140	176	74	
105	140	78	
132	146	98	
72	132	80	
100	176	92	
126	186	92	
156	142	82	
139	182	94	
115	194	92	
116	188	84	
153	166	104	*
180	188	92	*
174	222	118	*
157	172	84	*
166	172	98	*
153	246	102	*
211	260	110	*

Weight	Blood pressure mm. Hg. Systolic	Diastolic	
120	210	102	
121	152	82	
154	168	74	
101	148	92	
99	172	84	
141	174	80	
125	156	84	
102	174	78	
104	142	70	
141	168	92	
146	174	92	
128	186	94	
147	172	100	
130	162	76	
151	154	76	
133	210	94	
146	212	84	*

3. One child.

152	130	72
132	136	88
117	156	90
159	196	94
139	118	80
146	162	94
136	168	92
106	168	82
137	168	98
146	124	74
126	154	86
124	152	94
139	172	94
148	196	98
149	138	68
102	192	86
143	166	80
99	174	88
118	148	82
115	178	86
134	186	92
144	214	108
115	138	88
113	154	84

Weight	Blood pressure mm. Hg. Systolic	Blood pressure mm. Hg. Diastolic	
97	180	88	
127	162	86	
126	168	92	
156	188	98	
178	158	100	*
166	182	98	*
195	198	96	*
166	178	104	*
156	166	92	*
149	188	96	*
187	162	86	*
159	158	92	*
169	210	110	*
165	160	82	*
182	234	108	*
136	184	94	
119	152	78	
143	140	84	
115	186	102	
133	190	90	
141	160	72	
127	194	82	
121	140	78	
131	214	104	
150	208	92	
92	178	90	
140	160	96	
114	166	90	
143	180	88	
160	140	82	*
228	148	98	*
146	248	122	*
219	236	114	*
163	210	88	*
173	232	96	*

4. Two children.

119	158	84
148	154	84
167	152	82
96	170	98
150	160	88

Weight	Blood pressure mm. Hg. Systolic	Blood pressure mm. Hg. Diastolic	
146	168	88	
120	158	80	
137	162	90	
121	140	76	
132	194	90	
128	152	84	
132	198	96	
156	154	92	
169	200	88	
129	136	88	
111	164	74	
107	154	78	
107	162	88	
148	158	92	
101	138	80	
117	148	78	
158	158	78	
112	156	84	
143	126	82	
146	174	86	
133	142	66	
139	144	82	
178	186	96	*
162	192	108	*
204	220	110	*
168	208	100	*
149	160	84	*
173	188	96	*
182	168	106	*
177	210	104	*
167	162	82	*
164	152	92	*
189	254	126	*
182	214	102	*
174	148	82	*
167	192	90	*
129	186	100	
162	190	88	
91	194	88	
109	148	84	
106	208	78	
147	150	86	
138	166	100	
169	154	92	
129	158	88	

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic	
108	194	96	
145	158	86	
105	188	90	
107	164	84	
139	158	78	
116	170	90	
109	188	88	
124	148	82	
146	182	84	
146	172	92	
157	142	82	
132	186	92	
99	124	74	
115	176	86	
155	180	98	*
165	254	120	*
161	174	88	*
146	164	86	*
154	166	80	*
168	204	100	*
164	170	94	*

5. Three children.

100	140	88	
144	142	74	
130	144	88	
127	164	90	
150	148	86	
151	122	88	
100	140	84	
134	132	68	
148	164	82	
130	176	94	
134	170	84	
103	144	88	
109	174	86	
154	150	80	
143	164	88	
158	142	82	
134	174	90	
123	174	84	
160	180	86	*

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic	
180	180	88	*
278	214	120	*
175	238	112	*
159	142	76	*
165	162	90	*
153	196	94	*
155	182	98	*
155	194	90	*
194	206	100	*
196	208	108	*
183	168	96	*
146	158	86	
142	180	96	
136	138	80	
144	164	90	
146	146	86	
102	190	102	
140	180	96	
138	188	94	
120	146	86	
125	184	90	
89	156	86	
129	182	78	
142	164	70	
129	192	98	
127	160	72	
93	190	74	
125	186	92	
169	222	98	*
183	182	100	*
208	156	78	*
168	208	96	*
186	192	104	*

6. Four children.

128	162	82
155	140	78
162	164	94
136	126	70
145	128	68
81	124	76
120	156	86

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic	
166	162	100	*
162	248	114	*
164	200	104	*
188	208	110	*
183	212	106	*
164	186	106	*
153	176	96	*
179	192	108	*
146	198	96	*
146	152	76	
134	194	88	
108	140	88	
133	160	72	
111	188	98	
126	134	70	
125	156	90	
124	172	88	
168	208	104	*
251	174	94	*
175	212	98	*
152	236	108	*
153	214	96	*
180	198	108	*
175	250	118	*
172	244	108	*
185	230	104	*

7. Five children.

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic	
119	134	76	
148	148	82	
112	144	86	
140	156	82	
133	174	94	
138	170	90	
110	180	88	
168	172	90	*
206	210	102	*
161	202	106	*
171	182	94	*
130	210	96	
128	188	84	
153	154	88	
118	148	84	
138	164	82	
138	144	86	
137	148	84	
114	178	92	
120	186	84	
208	254	108	*
159	196	98	*
168	214	98	*

8. Six children.

134	144	86	
128	202	108	
134	188	96	
102	162	88	
99	162	88	
223	162	94	*
206	168	86	*
174	260	120	*
189	224	116	*
178	198	92	*
151	162	82	
124	136	68	
115	184	80	
103	192	86	
127	208	94	
185	186	102	*
118	152	92	

9. Seven children.

135	152	80	
146	160	84	
171	170	68	*
215	194	106	*
151	182	80	
91	158	78	

Weight lb.	Blood pressure mm. Hg. Systolic	Diastolic	
10. Eight children.			
165	214	112	*
144	188	88	
11. Nine children.			
126	126	84	
122	162	88	
131	186	92	
170	210	106	*
222	192	120	*
12. Ten children.			
150	162	94	

THE TRANSVERSE DIAMETERS OF HEART AND OF CHEST AND THE CARDIOTHORACIC RATIO THROUGHOUT LIFE.

Throughout this thesis the study is concerned with older people in the age range 60 to 89 years. However, changes in bodily attributes may have their inception prior to 60 years. Consequently I propose taking a little licence with the subject of senescence by assessing the changes which occur in the size of an organ, an example of which is the heart, and in the dimensions of a skeletal attribute, an example of which is the width of the thorax, with age from infancy to 89 years.

This investigation was possible because within the premises of the local health authority there is a diagnostic chest clinic of the Western Regional Hospital Board. From the chest clinic's files of X-ray films I extracted for the years 1953 to 1959 inclusive the postero-anterior X-ray films of apparently healthy individuals. X-ray films were excluded from this series where there was disease, pregnancy, asymmetry of the chest, difficulty in the recording of accurate measurements, inadequacy of case notes and women over the age of 54 years who were more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948) though otherwise well. I measured the maximum transverse diameters of heart and of chest as described on pages 17 and 18. The data thus obtained were combined with the corresponding information derived from the Consultative Health Centre for older people. This provided observations for

3,339 males and 3,650 females within the age range infancy to 89 years.

The chest clinic's X-ray films used were derived from surveys of school children, contact groups, patients referred by general practitioners and found to have no disease, and those X-rayed after a disease such as pneumonia was completely cured.

As far as I am able to ascertain from the literature this is the first investigation which assesses the changes that occur with age in the transverse diameters of the heart and of chest and in the cardiothoracic ratio throughout life in one geographical area. In this way differences which might arise by comparing segmental age studies obtained from different populations is avoided, and the observer error as between various investigators is eliminated.

RESULTS.

Table 166 shows the number of males and females by yearly age groups to nineteen years and thereafter by five year age groups.

Table 167 (1 to 3) shows the means with their standard errors, Table 168 the standard deviations and Table 169 the coefficients of variation of the transverse diameter of the heart, the transverse diameter of the chest and of the cardiothoracic ratio respectively by yearly age groups to nineteen years and thereafter by five year age groups. The means of the transverse diameter of the heart, the transverse diameter of the chest and of the cardiothoracic ratio are also presented graphically in Figures 40, 41 and 42 respectively with the corresponding logarithmic equivalents in Figures 43, 44 and 45.

The logarithmic scale is used because for these attributes the relative change with age is of more interest than the actual amount of change.

Tables 170, 171 and 172 show the 95 per cent limits of the observations by sex and age for the transverse diameter of the heart, the transverse diameter of the chest and cardiothoracic ratio respectively.

Transverse diameter of heart.

The trend of the male heart diameter means indicates that the most rapid increase in heart size is from birth to three years; that this is followed by a slight lag in the fourth year and further rapid change up to 17 years with a stationary phase at 9 years. Continued much slower increase in the heart diameter occurs from an average of 11·87 cm. at 17 years to 12·17 cm. at 35 - 39 years. A slight decline to 11·94 cm. at 45 - 49 years gives way to a regular rise which attains a maximum of 13·13 cm. in the ninth decade. The respects in which the female heart diameter means differ from those of the male are that at all ages the averages of the women are less than the corresponding averages of the men; the stationary phase at 10 years is one year later than that observed for boys; the rapid increase in heart size in childhood ceases abruptly at 14 years and, since there is no comparable decline in the fifth decade to that noted for men, there is a fairly regular increase in the average heart diameter from 11·15 cm. at 35 - 39 years to a value of 12·39 cm. in the latter half of the ninth decade.

The absolute variability for the transverse diameter of the heart is similar for the sexes, and in adult life the absolute variability of approximately 1·00 is about twice that noted in the earliest years of life excluding infancy. For the pre-school child the absolute variability is greatest in infancy.

The relative variability for the transverse diameter of the heart is similar for the sexes; shows some increase during childhood, and in adults is generally between 8 and 9 per cent.

Transverse diameter of chest.

The changes in the chest diameter means with age are similar for boys and girls and, with less marked fluctuations in the relative rate of variation, resemble closely those for the heart diameter. The increase in the diameters of the heart and chest with age follows the general growth curve described by Nelson (1946). At 14 and 18 years of age for girls and boys respectively the rate of increase in chest width markedly slows down. Throughout the whole of life the maximum average value is reached by women at 35 - 39 years with a diameter of chest of 26·05 cm. and by men at 30 - 34 years with a diameter of chest of 29·39 cm. Subsequently the chest diameter diminishes with age in both sexes, but while this is negligible for men it is significant for women. At 85 - 89 years the chest diameter means are 23·00 cm. for women and 28·27 cm. for men.

The absolute variability for the transverse diameter of chest increases with age in childhood; shows no marked change in adult life; is comparable for the sexes, and is a little greater than the absolute variability for the transverse diameter of heart.

The relative variability for the transverse diameter of chest is similar for the sexes being approximately 5 to 6 per cent, and is less than the relative variability for the transverse diameter of heart.

Cardiothoracic ratio.

Except for ages 3 and 7 years the cardiothoracic ratio means of females are all greater than the corresponding means for males. Girls show a decline, which may be regarded as inherently non-linear, in mean values from 0·516 in infancy to 0·427 at 19 years. A phase of little change then exists until 40 - 44 years. From the average of 0·445 at 40 - 44 years there is a fairly regular increase in the averages to reach a maximum cardiothoracic ratio mean of 0·539 at 85 - 89 years.

The male cardiothoracic ratio means follow a similar course to that of the females up to the age group 35 - 39 years. The average values for males at infancy, 19 years and 35 - 39 years are 0·513, 0·416 and 0·416 respectively. As age advances further there is no comparable increase to that noted for women in the fifth decade. Indeed, the men show a slight decline in the late forties to an average of 0·412. In men an increase noted at 55 - 59 years with a mean of 0·424 continues thereafter to a maximum value of 0·465 at 85 - 89 years.

The absolute variability for the cardiothoracic ratio changes little with age; it is similar for the sexes, and is approximately 0·031.

The relative variability for the cardiothoracic ratio is about 7 to 8 per cent and is between that of the chest diameter and that of the heart diameter.

DISCUSSION.

In childhood and adolescence the means of the heart and chest diameters follow what I regard as a non-linear trend with age. This is in accord with the general growth curve described by Nelson (1946). Of these two variables the relative rate of change is most marked for the heart diameter. This indicates that it is wrong to project the linear regression on age of Hewitt (1958) for the transverse diameter of heart beyond his upper limit of five years, and it casts serious doubts on the concept of Ziskin (1925) that the increase in heart size up to 16 years is in the form of a linear regression on age.

There is lack of unanimity concerning which criterion is the most useful index of heart size, with the majority in favour of the transverse diameter of the heart (Hodges and Eyster, 1926; Bedford and Treadgold, 1931; Bainton, 1932; Bakwin and Bakwin, 1935; Comeau and White, 1942).

The slight diminution in the magnitude of the mean heart diameter in the fifth decade for men is of interest. This occurrence is at variance with the regular increase in heart diameter size with age of 1 mm. per decade predicted by Hodges and Eyster (1926). It is possible that the fall noted in the present series might be due to chance, but a study of the heart diameter means recorded by Tirman and Hamilton (1952) for men shows a similar slight decline. Their heart diameter means were 12·9 cm., 12·8 cm., 12·3 cm., 13·2 cm. and 13·8 cm. for the age groups 20 - 29, 30 - 39, 40 - 49, 50 - 59 and 60 - 75 years respectively. This variation in trend of means with age was not commented upon by Tirman and Hamilton (1952), but the similar decline in two independent investigations suggests that the fall may be a real entity and that the regression of the heart diameter means on age in adult men is not correctly represented by a linear function prior to 59 years. Ungerleider and Clark's (1939) opinion that no correction for age between 15 and 50 years, indeed, at any age, is necessary for the transverse heart diameter is misleading particularly in older years. Tirman and Hamilton (1952) observed the commencement of the upward trend in the heart diameter means in elderly men and postulated that it is possibly a phenomenon of advanced years. The present study shows that their assumption is correct, but that the increase in heart diameter size for men commences relatively early towards the end of the sixth decade and continues regularly thereafter. A significant sex difference is that the heart diameter means of women commence to increase in magnitude in the earlier part of the fifth decade. Kerley's (1950) mean heart diameter of 12·2 cm. for men agrees closely with the male heart diameter means in this study between the ages of 25 and 69 years, but over 69 years it is too small for men. The 10·7 cm. mean heart diameter for women suggested by Bainton (1932) from orthodiagrammatic studies is approximately 0·4 cm. lower than the female averages noted in this thesis between the ages of 20 and 39 years, while over 39 years the earlier relationship ceases to exist.

Danzer (1919), without stating the age or sex of his cases, recorded a range for the cardiothoracic ratio of 39 to 50 per cent with an average value of 45 per cent. Comeau and White (1942) are critical of this estimate of 50 per cent as an upper limit and, from an orthodiagrammatic study of 150 men aged 15 to 70 years with only four men over 59 years and 50 women aged 15 to 59 years, conclude that 55 per cent is a more valuable upper limit for the cardiothoracic ratio. The recommendations of these observers over simplifies the problem. Age is an important influencing variable and Table 172 shows that for men the 0·50 upper limit of Danzer (1919) for the cardiothoracic ratio is too low in childhood and over the age of 69 years, and somewhat high for the age range between childhood and 69 years where 0·48 is more appropriate. Apart from the pre-school age group the 0·55 of Comeau and White (1942) is excessively high. With women the 0·50 of Danzer (1919) applies between 14 and 39 years, but is inadequate to meet the higher cardiothoracic ratio values of children and of adult women over 39 years. The 0·55 of Comeau and White (1942) is too high between 8 and 59 years for women, and outwith this age range it is too low.

SUMMARY.

Normal standards for the transverse diameter of the heart, the transverse diameter of the chest and the cardiothoracic ratio are presented with reference to 3,339 males and 3,650 females aged from infancy to 89 years.

The salient features are that the increase in the heart and chest diameters and the variation in the cardiothoracic ratio with age prior to adult life seem to be basically non-linear; there is a slight diminution in the average heart diameter for men aged 45 - 49 years; from 55 - 59 years in men and 35 - 39 years in women there is a fairly regular increase in the average heart diameter throughout the remainder of life; from 30 - 34 years in men and 35 - 39 years in women there is a diminution in average chest diameter with age which is negligible for men and significant for women, while from 40 - 44 years in women and 55 - 59 years in men there is a progressive increase in the averages of the cardiothoracic ratio.

The relative variabilities of the transverse diameter of the heart, the transverse diameter of the chest and the cardiothoracic ratio are exceedingly moderate beimg approximately 8 to 9 per cent, 5·5 to 7 per cent and 7 to 8 per cent respectively.

The significant changes which occur in the transverse diameter of the heart and in the cardiothoracic ratio with age preclude the use of a constant value for either attribute as an upper limit of normality throughout adult life.

Table 166.

The number of males and females in the present investigation by yearly age groups to nineteen years and thereafter by five year age groups.

Age group years	Males	Females
Under 1	10	23
1	40	34
2	93	103
3	98	96
4	95	95
5	135	127
6	117	133
7	90	74
8	69	77
9	75	70
10	83	77
11	67	74
12	76	58
13	73	74
14	117	107
15	81	80
16	71	78
17	71	95
18	54	106
19	65	118
20 - 24	267	459
25 - 29	268	344
30 - 34	203	289
35 - 39	158	204
40 - 44	122	147
45 - 49	145	118
50 - 54	122	77
55 - 59	95	43
60 - 64	96	62
65 - 69	89	62
70 - 74	78	59
75 - 79	61	43
80 - 84	43	30
85 - 89	12	14
Total	3,339	3,650

Table 167.

The means ± S.E. of the transverse diameter of the heart, the transverse diameter of the chest and of the cardiothoracic ratio by sex and by yearly age groups to nineteen years and thereafter by five year age groups.

1. TRANSVERSE DIAMETER OF HEART.

Age group years	Means ± S.E. cm. Males	Females
Under 1	7.18 ± 0.08	7.18 ± 0.09
1	7.72 ± 0.08	7.61 ± 0.09
2	8.13 ± 0.05	7.95 ± 0.05
3	8.50 ± 0.05	8.18 ± 0.05
4	8.62 ± 0.05	8.31 ± 0.05
5	8.93 ± 0.05	8.68 ± 0.05
6	9.16 ± 0.05	8.84 ± 0.05
7	9.49 ± 0.06	9.11 ± 0.08
8	9.75 ± 0.07	9.37 ± 0.07
9	9.77 ± 0.08	9.55 ± 0.08
10	9.92 ± 0.08	9.58 ± 0.08
11	10.26 ± 0.09	9.84 ± 0.09
12	10.40 ± 0.10	10.08 ± 0.11
13	10.80 ± 0.10	10.50 ± 0.09
14	11.24 ± 0.10	10.81 ± 0.09
15	11.47 ± 0.11	10.85 ± 0.10
16	11.61 ± 0.13	10.89 ± 0.10
17	11.87 ± 0.11	10.87 ± 0.09
18	11.92 ± 0.14	10.88 ± 0.09
19	11.95 ± 0.13	10.92 ± 0.08
20 - 24	11.99 ± 0.06	11.09 ± 0.04
25 - 29	12.05 ± 0.06	11.12 ± 0.05
30 - 34	12.16 ± 0.07	11.09 ± 0.05
35 - 39	12.17 ± 0.08	11.15 ± 0.07
40 - 44	12.09 ± 0.08	11.41 ± 0.09
45 - 49	11.94 ± 0.09	11.44 ± 0.09
50 - 54	12.04 ± 0.09	11.65 ± 0.11
55 - 59	12.13 ± 0.11	11.72 ± 0.14
60 - 64	12.17 ± 0.11	12.10 ± 0.15
65 - 69	12.31 ± 0.12	11.84 ± 0.10
70 - 74	12.63 ± 0.12	12.35 ± 0.10
75 - 79	12.97 ± 0.14	12.03 ± 0.17
80 - 84	13.13 ± 0.17	12.28 ± 0.12
85 - 89	13.12 ± 0.33	12.39 ± 0.33

2. TRANSVERSE DIAMETER OF CHEST.

Age group years	Means ± S.E. cm. Males	Females
Under 1	14.00 ± 0.35	13.94 ± 0.22
1	15.38 ± 0.16	14.85 ± 0.18
2	16.40 ± 0.08	15.62 ± 0.09
3	17.05 ± 0.07	16.56 ± 0.08
4	17.55 ± 0.08	16.83 ± 0.08
5	18.29 ± 0.08	17.66 ± 0.09
6	18.97 ± 0.09	18.09 ± 0.10
7	20.02 ± 0.12	18.67 ± 0.14
8	20.87 ± 0.17	19.76 ± 0.13
9	21.72 ± 0.15	20.68 ± 0.18
10	22.62 ± 0.14	21.60 ± 0.15
11	23.13 ± 0.16	22.27 ± 0.15
12	23.91 ± 0.17	22.90 ± 0.18
13	25.26 ± 0.19	24.07 ± 0.19
14	26.38 ± 0.17	24.91 ± 0.15
15	27.16 ± 0.18	25.11 ± 0.15
16	27.75 ± 0.21	25.09 ± 0.17
17	28.39 ± 0.19	25.29 ± 0.14
18	28.65 ± 0.23	25.45 ± 0.13
19	28.77 ± 0.20	25.57 ± 0.14
20 - 24	29.35 ± 0.10	25.73 ± 0.07
25 - 29	29.29 ± 0.10	25.84 ± 0.07
30 - 34	29.39 ± 0.13	26.02 ± 0.09
35 - 39	29.30 ± 0.13	26.05 ± 0.10
40 - 44	28.97 ± 0.15	25.68 ± 0.12
45 - 49	28.97 ± 0.14	25.43 ± 0.13
50 - 54	29.05 ± 0.17	25.44 ± 0.16
55 - 59	28.64 ± 0.19	25.45 ± 0.22
60 - 64	28.53 ± 0.18	24.81 ± 0.24
65 - 69	28.28 ± 0.18	24.12 ± 0.21
70 - 74	28.13 ± 0.19	24.52 ± 0.21
75 - 79	28.37 ± 0.24	23.27 ± 0.20
80 - 84	28.30 ± 0.30	23.11 ± 0.30
85 - 89	28.27 ± 0.56	23.00 ± 0.43

3. CARDIOTHORACIC RATIO.

Age group years	Means ± S.E. ratio	
	Males	Females
Under 1	0·513 ± 0·010	0·516 ± 0·008
1	0.503 ± 0.005	0.514 ± 0.006
2	0.496 ± 0.003	0.499 ± 0.003
3	0.499 ± 0.003	0.495 ± 0.003
4	0.492 ± 0.003	0.494 ± 0.003
5	0.488 ± 0.002	0.492 ± 0.003
6	0.483 ± 0.002	0.489 ± 0.003
7	0.475 ± 0.003	0.487 ± 0.004
8	0.468 ± 0.004	0.475 ± 0.004
9	0.451 ± 0.004	0.464 ± 0.003
10	0.439 ± 0.003	0.444 ± 0.004
11	0.444 ± 0.003	0.442 ± 0.003
12	0.436 ± 0.004	0.441 ± 0.005
13	0.428 ± 0.004	0.437 ± 0.004
14	0.426 ± 0.003	0.434 ± 0.003
15	0.422 ± 0.003	0.432 ± 0.004
16	0.419 ± 0.004	0.434 ± 0.003
17	0.419 ± 0.004	0.430 ± 0.003
18	0.417 ± 0.004	0.428 ± 0.003
19	0.416 ± 0.004	0.427 ± 0.002
20 - 24	0.410 ± 0.002	0.428 ± 0.001
25 - 29	0.412 ± 0.002	0.431 ± 0.002
30 - 34	0.414 ± 0.002	0.427 ± 0.002
35 - 39	0.416 ± 0.002	0.428 ± 0.002
40 - 44	0.418 ± 0.003	0.445 ± 0.003
45 - 49	0.412 ± 0.003	0.446 ± 0.003
50 - 54	0.415 ± 0.003	0.458 ± 0.004
55 - 59	0.424 ± 0.003	0.461 ± 0.005
60 - 64	0.427 ± 0.004	0.488 ± 0.005
65 - 69	0.435 ± 0.003	0.492 ± 0.004
70 - 74	0.449 ± 0.004	0.505 ± 0.005
75 - 79	0.458 ± 0.005	0.517 ± 0.007
80 - 84	0.465 ± 0.006	0.533 ± 0.007
85 - 89	0.465 ± 0.011	0.539 ± 0.012

Table 168.

The standard deviations of the transverse diameter of the heart, the transverse diameter of the chest and of the cardiothoracic ratio by sex and by yearly age groups to nineteen years and then by five year age groups.

Age group years.	Heart diameter cm.		Chest diameter cm.		Cardiothoracic ratio	
	Males	Females	Males	Females	Males	Females
Under 1	0.73	0.58	1.10	1.05	0.033	0.039
1	0.51	0.50	1.00	1.06	0.030	0.038
2	0.48	0.52	0.80	0.94	0.030	0.027
3	0.50	0.51	0.69	0.81	0.027	0.031
4	0.53	0.52	0.79	0.77	0.027	0.029
5	0.57	0.61	0.96	1.06	0.029	0.034
6	0.56	0.57	1.03	1.13	0.027	0.030
7	0.61	0.67	1.17	1.21	0.032	0.035
8	0.60	0.61	1.43	1.13	0.030	0.031
9	0.73	0.71	1.33	1.49	0.035	0.024
10	0.77	0.73	1.31	1.33	0.031	0.032
11	0.75	0.80	1.33	1.32	0.028	0.030
12	0.85	0.81	1.47	1.37	0.037	0.035
13	0.82	0.82	1.64	1.63	0.032	0.032
14	1.05	0.89	1.86	1.58	0.033	0.031
15	1.02	0.90	1.61	1.33	0.031	0.033
16	1.09	0.87	1.74	1.50	0.035	0.029
17	0.96	0.92	1.59	1.36	0.031	0.032
18	1.01	0.95	1.70	1.37	0.031	0.033
19	1.06	0.85	1.60	1.55	0.031	0.026
20 - 24	1.02	0.95	1.64	1.43	0.032	0.031
25 - 29	0.98	1.01	1.64	1.31	0.032	0.035
30 - 34	1.05	0.93	1.85	1.51	0.031	0.034
35 - 39	1.03	1.00	1.60	1.49	0.031	0.032
40 - 44	0.91	1.05	1.62	1.49	0.030	0.037
45 - 49	1.12	0.96	1.67	1.40	0.033	0.030
50 - 54	1.01	0.93	1.86	1.42	0.029	0.033
55 - 59	1.06	0.92	1.81	1.44	0.032	0.036
60 - 64	1.08	1.20	1.80	1.87	0.036	0.040
65 - 69	1.11	0.80	1.69	1.69	0.030	0.035
70 - 74	1.06	0.81	1.70	1.61	0.032	0.039
75 - 79	1.12	1.11	1.90	1.31	0.039	0.044
80 - 84	1.14	0.65	1.95	1.67	0.037	0.041
85 - 89	1.16	1.23	1.93	1.62	0.032	0.043

Table 169.

The coefficients of variation of the transverse diameter of the heart, the transverse diameter of the chest and of the cardiothoracic ratio by sex and by yearly age groups to nineteen years and thereafter by five year age groups.

Age group years.	Heart diameter cm.		Chest diameter cm.		Cardiothoracic ratio	
	Males	Females	Males	Females	Males	Females
Under 1	10.2	8.0	7.8	7.5	6.4	7.5
1	6.6	6.6	6.5	7.1	6.0	7.4
2	5.9	6.5	4.9	5.9	6.0	5.4
3	5.9	6.3	4.1	4.9	5.4	6.2
4	6.1	6.2	4.5	4.6	5.5	5.8
5	6.3	7.1	5.2	6.0	5.9	6.9
6	6.1	6.4	5.4	6.2	5.6	6.1
7	6.4	7.3	5.8	6.5	6.7	7.3
8	6.2	6.5	6.8	5.7	6.4	6.6
9	7.5	7.5	6.1	7.2	7.7	5.1
10	7.7	7.7	5.8	6.2	7.0	7.1
11	7.3	8.1	5.7	5.9	6.4	6.7
12	8.2	8.0	6.2	6.0	8.4	7.9
13	7.6	7.8	6.5	6.8	7.5	7.2
14	9.4	8.2	7.0	6.3	7.8	7.1
15	8.8	8.3	5.9	5.3	7.3	7.6
16	9.4	8.0	6.3	6.0	8.4	6.7
17	8.1	8.5	5.6	5.4	7.4	7.5
18	8.5	8.7	5.9	5.4	7.5	7.7
19	8.9	7.8	5.6	6.1	7.4	6.1
20 - 24	8.5	8.6	5.6	5.6	7.7	7.3
25 - 29	8.1	9.1	5.6	5.1	7.7	8.0
30 - 34	8.6	8.4	6.3	5.8	7.6	7.9
35 - 39	8.4	9.0	5.5	5.7	7.4	7.5
40 - 44	7.5	9.2	5.6	5.8	7.1	8.5
45 - 49	9.4	8.4	5.8	5.4	8.1	6.8
50 - 54	8.4	8.0	6.4	5.6	6.9	7.3
55 - 59	8.7	7.8	6.3	5.6	7.4	7.7
60 - 64	8.9	9.9	6.3	7.5	8.3	8.3
65 - 69	9.0	6.8	6.0	7.0	7.0	7.1
70 - 74	8.4	6.5	6.1	6.5	7.1	7.8
75 - 79	8.6	9.2	6.7	5.6	8.6	8.4
80 - 84	8.7	5.3	6.9	7.2	8.0	7.7
85 - 89	8.8	9.9	6.9	7.0	6.9	8.1

Table 170.

THE TRANSVERSE DIAMETER OF THE HEART BY AGE AND SEX.
Showing 95 per cent (2 standard deviation) limits.

Age group years.	Males		Females	
	- 2 x S.D.	+ 2 x S.D.	- 2 x S.D.	+ 2 x S.D.
Under 1	5.7	8.6	6.0	8.3
1	6.7	8.7	6.6	8.6
2	7.2	9.1	6.9	9.0
3	7.5	9.5	7.2	9.2
4	7.6	9.7	7.3	9.4
5	7.8	10.1	7.5	9.9
6	8.0	10.3	7.7	10.0
7	8.3	10.7	7.8	10.4
8	8.5	10.9	8.1	10.6
9	8.3	11.2	8.1	11.0
10	8.4	11.5	8.1	11.0
11	8.8	11.8	8.2	11.4
12	8.7	12.1	8.5	11.7
13	9.2	12.4	8.9	12.1
14	9.1	13.3	9.0	12.6
15	9.4	13.5	9.0	12.6
16	9.4	13.8	9.1	12.6
17	9.9	13.8	9.0	12.7
18	9.9	13.9	9.0	12.8
19	9.8	14.1	9.2	12.6
20 - 24	9.9	14.0	9.2	13.0
25 - 29	10.1	14.0	9.1	13.1
30 - 34	10.1	14.3	9.2	12.9
35 - 39	10.1	14.2	9.1	13.1
40 - 44	10.3	13.9	9.3	13.5
45 - 49	9.7	14.2	9.5	13.4
50 - 54	10.0	14.1	9.8	13.5
55 - 59	10.0	14.2	9.9	13.6
60 - 64	10.0	14.3	9.7	14.5
65 - 69	10.1	14.5	10.2	13.4
70 - 74	10.5	14.7	10.7	14.0
75 - 79	10.7	15.2	9.8	14.2
80 - 84	10.8	15.4	11.0	13.6
85 - 89	10.8	15.4	9.9	14.8

Table 171.

THE TRANSVERSE DIAMETER OF CHEST BY AGE AND SEX.
Showing 95 per cent (2 standard deviation) limits.

Age group years.	Males		Females	
	- 2 x S.D.	+ 2 x S.D.	- 2 x S.D.	+ 2 x S.D.
Under 1	11.8	16.2	11.8	16.0
1	13.4	17.4	12.7	17.0
2	14.8	18.0	13.7	17.5
3	15.7	18.4	14.9	18.2
4	16.0	19.1	15.3	18.4
5	16.4	20.2	15.5	19.8
6	16.9	21.0	15.8	20.3
7	17.7	22.4	16.2	21.1
8	18.0	23.7	17.5	22.0
9	19.1	24.4	17.7	23.7
10	20.0	25.2	18.9	24.3
11	20.5	25.8	19.6	24.9
12	21.0	26.8	20.2	25.6
13	22.0	28.5	20.8	27.3
14	22.7	30.1	21.7	28.1
15	23.9	30.4	22.4	27.8
16	24.3	31.2	22.1	28.1
17	25.2	31.6	22.6	28.0
18	25.3	32.0	22.7	28.2
19	25.6	32.0	22.5	28.7
20 - 24	26.0	32.5	22.9	28.6
25 - 29	26.0	32.6	23.2	28.5
30 - 34	25.7	33.1	23.0	29.0
35 - 39	26.1	32.5	23.1	29.0
40 - 44	25.7	32.2	22.7	28.7
45 - 49	25.6	32.3	22.6	28.2
50 - 54	25.3	32.8	22.6	28.3
55 - 59	25.0	32.3	22.6	28.3
60 - 64	24.9	32.1	21.1	28.5
65 - 69	24.9	31.7	20.7	27.5
70 - 74	24.7	31.5	21.3	27.7
75 - 79	24.6	32.2	20.6	25.9
80 - 84	24.4	32.2	19.8	26.4
85 - 89	24.4	32.1	19.8	26.2

Table 172.

THE CARDIOTHORACIC RATIO BY SEX AND AGE.
Showing 95 per cent (2 standard deviation) limits.

Age group years.	− 2 x S.D.	+ 2 x S.D.	− 2 x S.D.	+ 2 x S.D.
Under 1	0.447	0.579	0.438	0.594
1	0.443	0.563	0.438	0.590
2	0.436	0.556	0.446	0.554
3	0.446	0.554	0.433	0.557
4	0.438	0.546	0.436	0.552
5	0.430	0.546	0.424	0.560
6	0.429	0.537	0.429	0.549
7	0.411	0.539	0.417	0.557
8	0.408	0.528	0.413	0.537
9	0.381	0.521	0.416	0.512
10	0.377	0.501	0.380	0.508
11	0.388	0.500	0.382	0.502
12	0.362	0.510	0.371	0.511
13	0.364	0.492	0.373	0.501
14	0.360	0.492	0.372	0.496
15	0.360	0.484	0.366	0.498
16	0.349	0.489	0.376	0.492
17	0.357	0.481	0.366	0.494
18	0.355	0.479	0.362	0.494
19	0.354	0.478	0.375	0.479
20 - 24	0.346	0.474	0.366	0.490
25 - 29	0.348	0.476	0.361	0.501
30 - 34	0.352	0.476	0.359	0.495
35 - 39	0.354	0.478	0.364	0.492
40 - 44	0.358	0.478	0.371	0.519
45 - 49	0.346	0.478	0.386	0.506
50 - 54	0.357	0.473	0.392	0.524
55 - 59	0.360	0.488	0.389	0.533
60 - 64	0.355	0.499	0.408	0.568
65 - 69	0.376	0.496	0.422	0.562
70 - 74	0.385	0.513	0.427	0.583
75 - 79	0.380	0.536	0.429	0.605
80 - 84	0.391	0.539	0.451	0.615
85 - 89	0.401	0.529	0.453	0.625

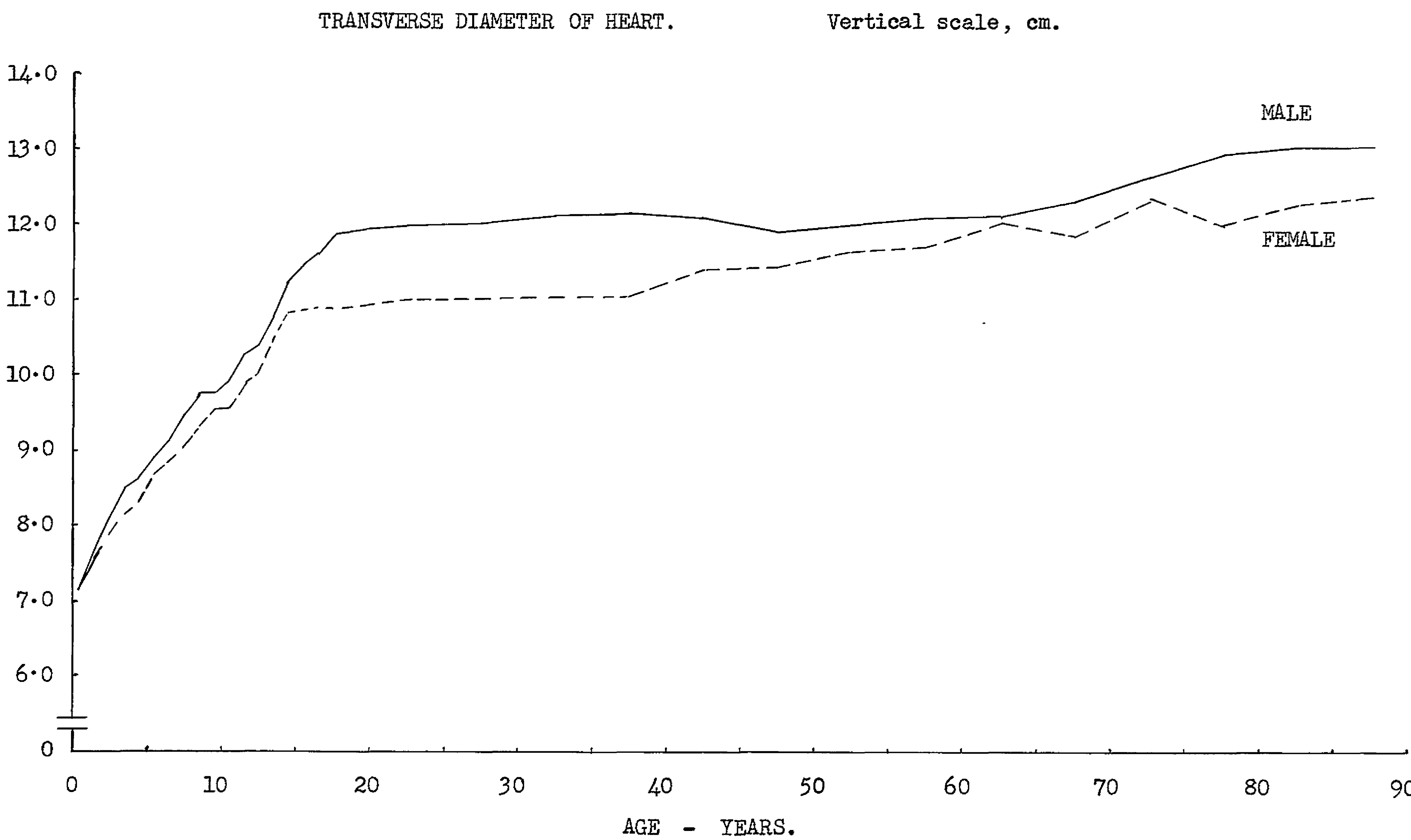

TRANSVERSE DIAMETER OF HEART.
Vertical scale, cm.
14·0
13·0
12·0
11·0
10·0
9·0
8·0
7·0
6·0
0
MALE
FEMALE
0
10
20
30
40
50
60
70
80
90
AGE - YEARS.

Figure 40.

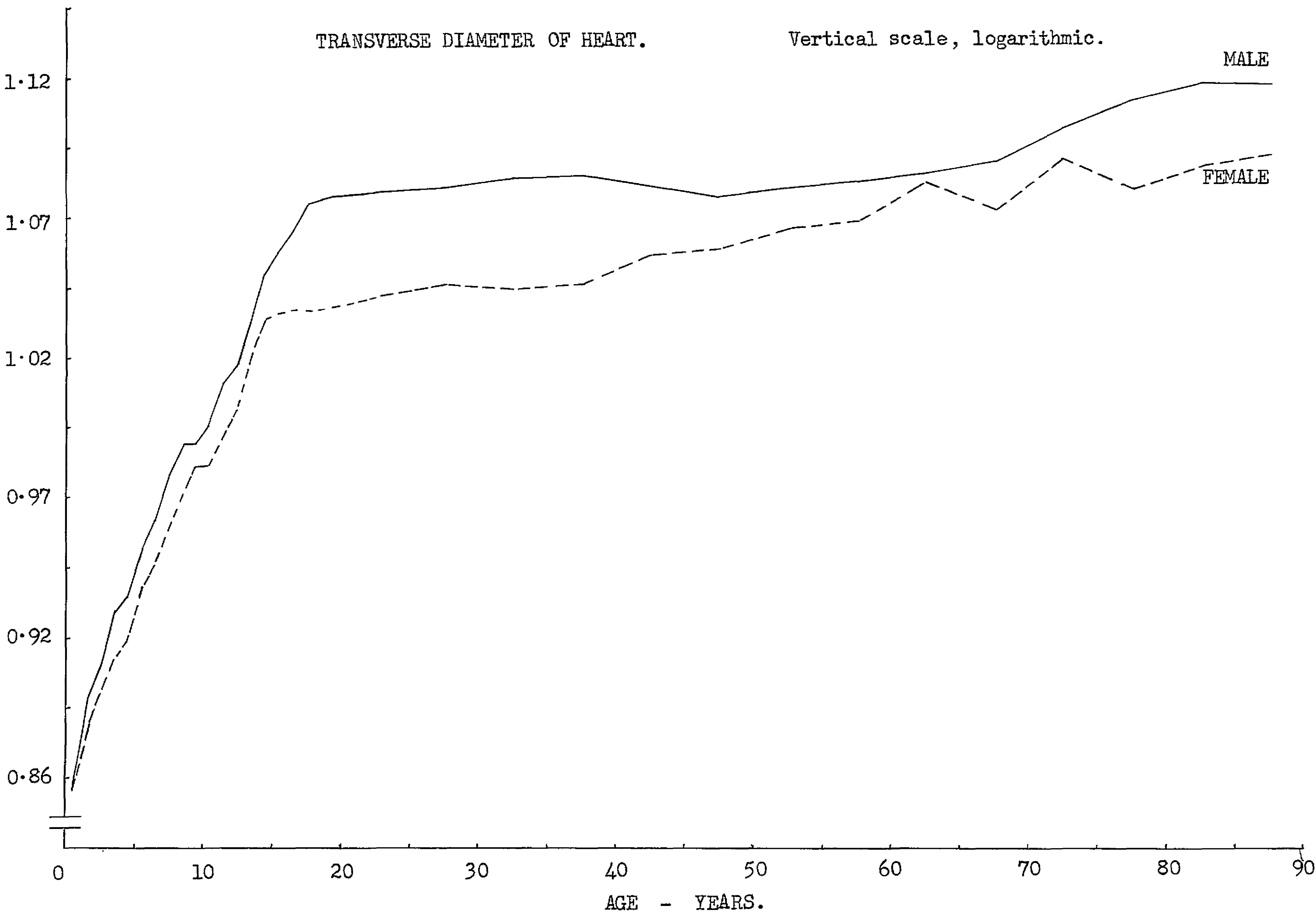

TRANSVERSE DIAMETER OF HEART.
Vertical scale, logarithmic.
MALE
FEMALE
1·12
1·07
1·02
0·97
0·92
0·86
0
10
20
30
40
50
60
70
80
90
AGE - YEARS.

Figure 41

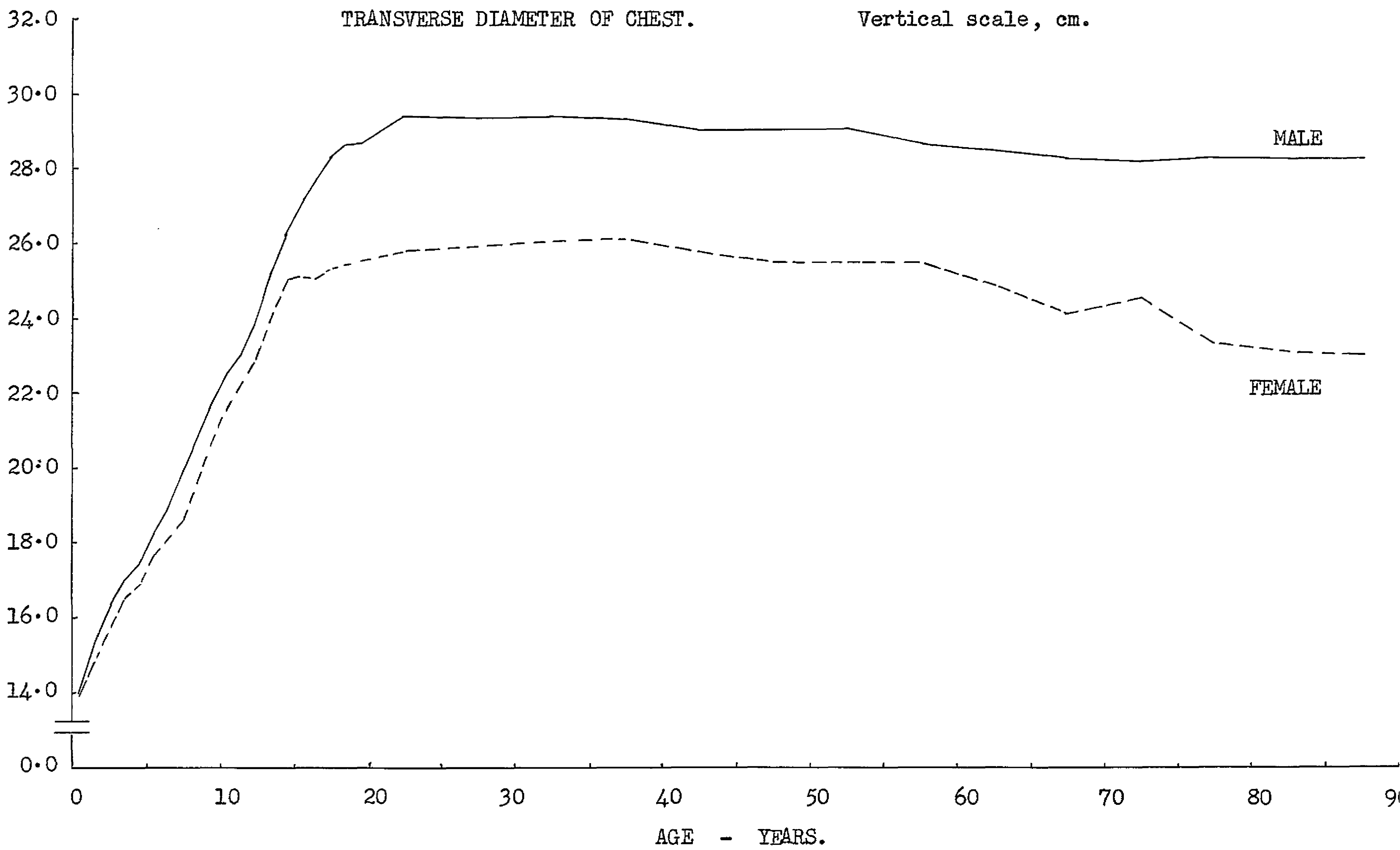

TRANSVERSE DIAMETER OF CHEST.
Vertical scale, cm.
MALE
FEMALE
32·0
30·0
28·0
26·0
24·0
22·0
20·0
18·0
16·0
14·0
0·0
0
10
20
30
40
50
60
70
80
AGE - YEARS.

Figure 42.

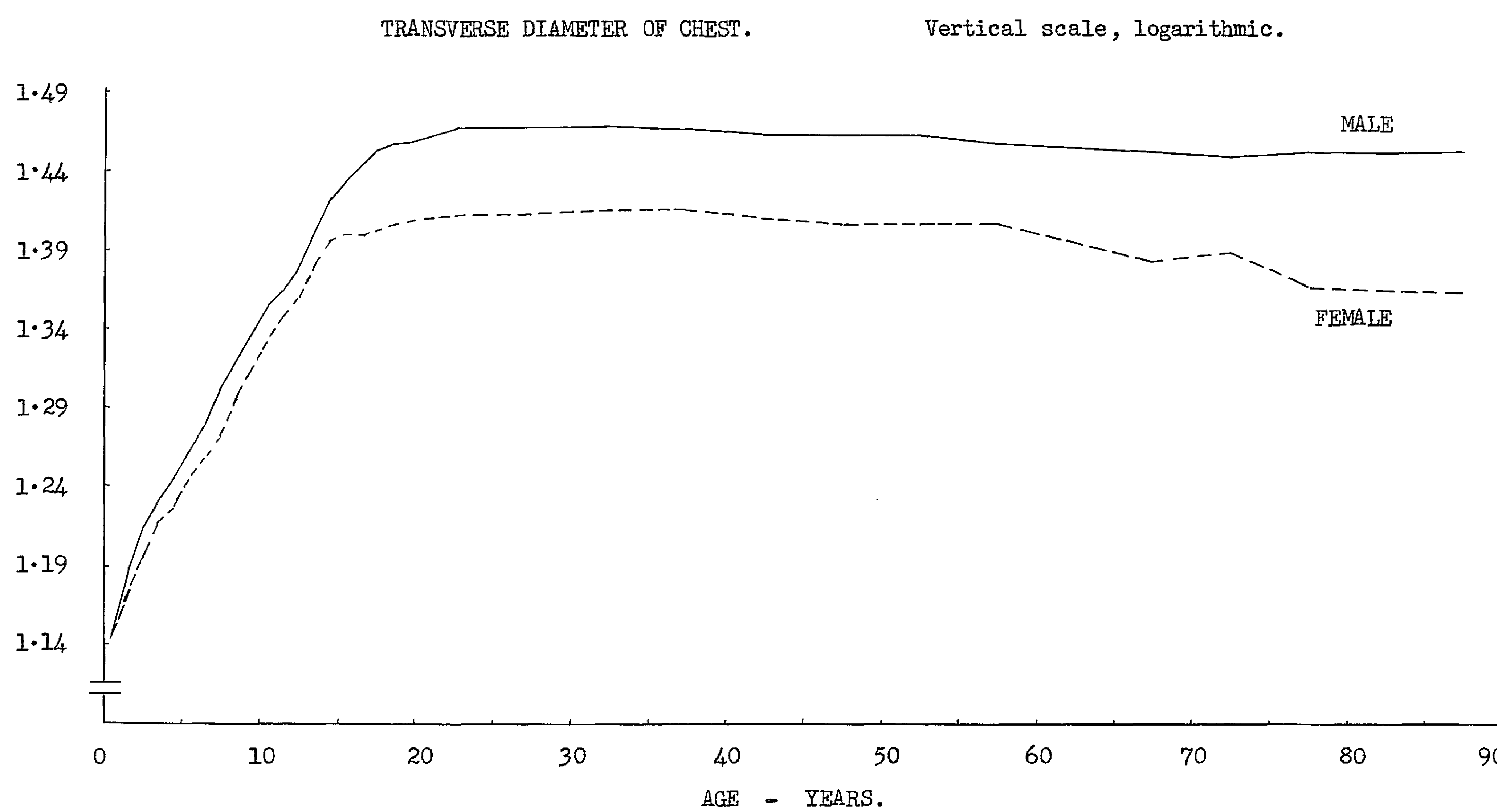

TRANSVERSE DIAMETER OF CHEST.
Vertical scale, logarithmic.
1·49
1·44
1·39
1·34
1·29
1·24
1·19
1·14
MALE
FEMALE
0
10
20
30
40
50
60
70
80
AGE - YEARS.

Figure 43.

CARDIOTHORACIC RATIO. Vertical scale, cardiothoracic ratio.

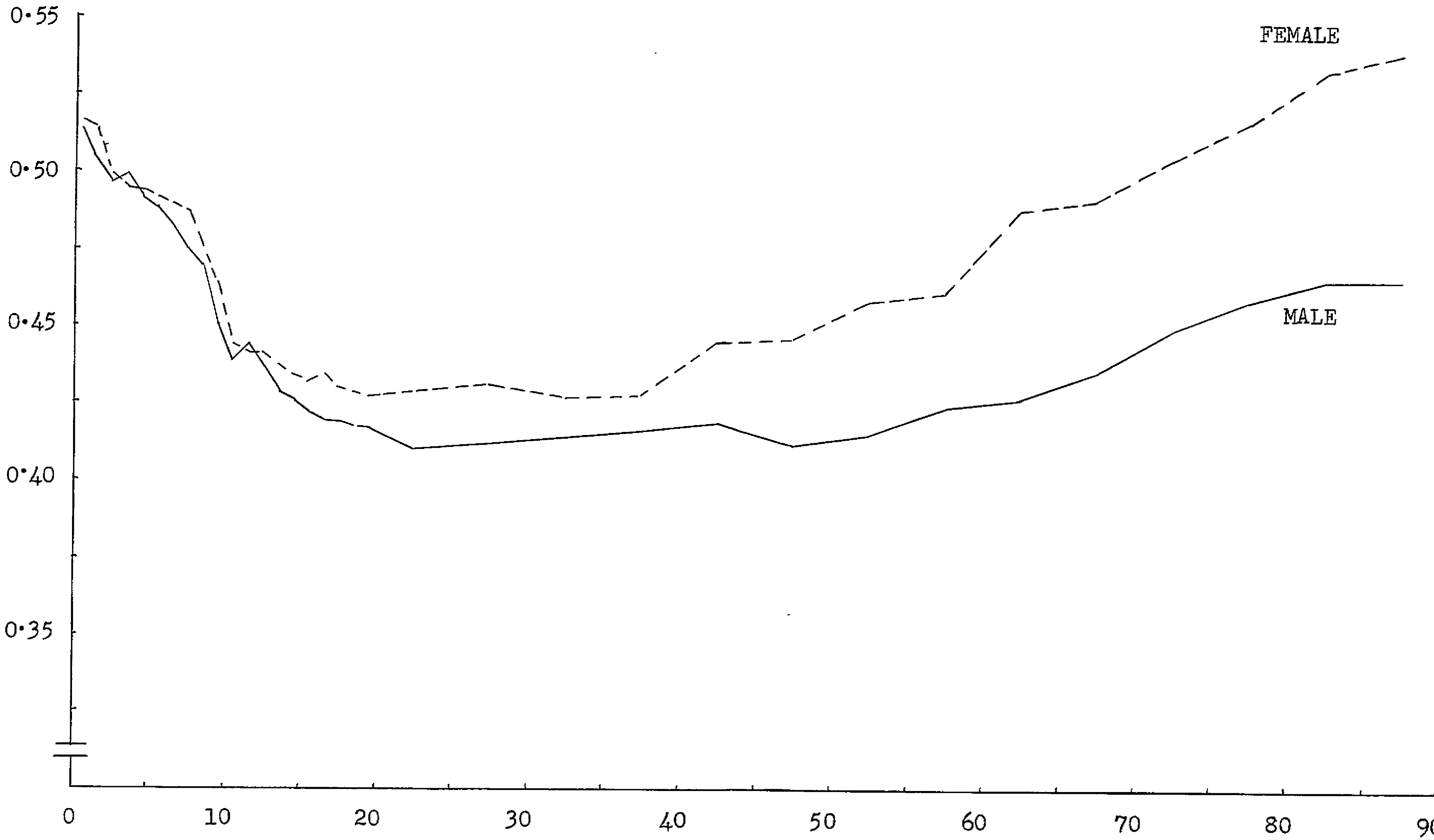


Figure 44.

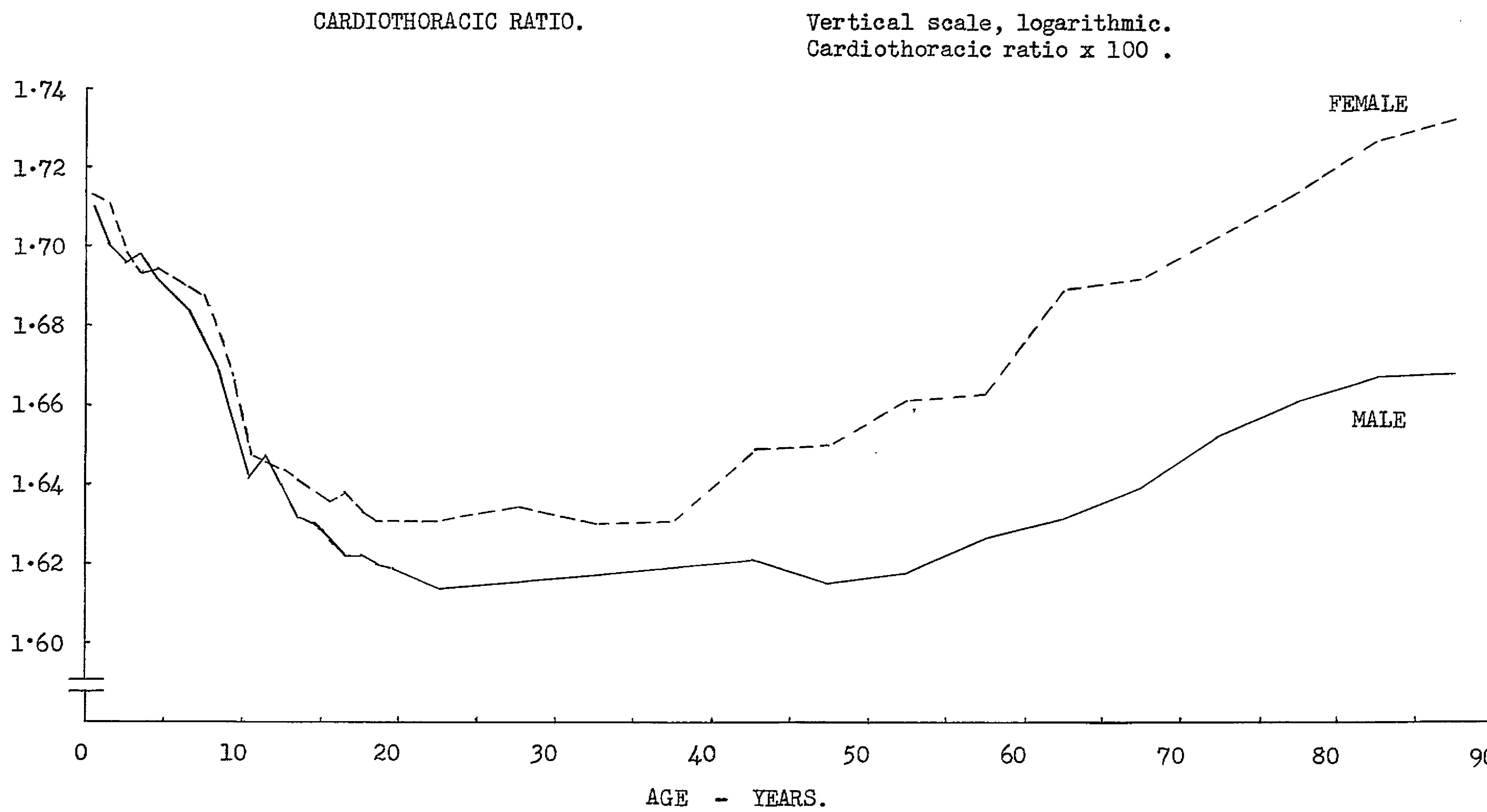

CARDIOTHORACIC RATIO.
Vertical scale, logarithmic.
Cardiothoracic ratio x 100 .
1·74
1·72
1·70
1·68
1·66
1·64
1·62
1·60
FEMALE
MALE
0
10
20
30
40
50
60
70
80
AGE - YEARS.

Figure 45.

The following are the observations for the transverse diameter of heart, the transverse diameter of chest and the cardiothoracic ratio used in the study of these variables throughout life.

Column 1 = Transverse diameter of heart

Column 2 = Transverse diameter of chest

Column 3 = Cardiothoracic ratio

MALES

1. Under one year.

1	2	3
12.2	6.5	.5328
13.5	6.9	.5111
13.1	6.2	.4733
14.2	7.7	.5422
12.5	6.2	.4960
15.4	7.7	.5000
14.0	8.0	.5714
15.1	8.1	.5364
14.6	6.6	.4521
15.4	7.9	.5130

2. One year.

1	2	3
15.4	7.2	.4708
15.3	7.8	.5098
13.9	7.5	.5396
15.1	8.0	.5298
16.8	7.9	.4702
15.4	7.9	.5130
16.1	7.8	.4845
15.8	8.3	.5253
16.3	7.8	.4785
16.2	7.8	.4815
17.2	8.3	.4826
14.8	7.0	.4730
15.9	8.4	.5283
15.3	7.6	.4967
15.2	7.9	.5197
14.5	6.9	.4759
15.0	7.7	.5133
15.5	7.8	.5032
16.9	7.9	.4674
15.5	7.5	.4839
14.5	6.9	.4759
12.9	6.9	.5349
15.7	8.0	.5095
15.7	7.3	.4650
16.3	7.8	.4785
16.0	8.3	.5187
15.5	8.3	.5355
16.9	8.3	.4911
16.0	7.6	.4750
14.9	7.7	.5168
15.4	6.9	.4480
16.2	9.0	.5555
13.3	7.7	.5789
16.1	7.7	.4814
16.1	8.6	.5342
13.0	7.3	.5615
13.8	6.5	.4710
14.9	7.9	.5302
15.5	7.5	.4839
14.4	7.6	.5278

3. 2 years.

1	2	3
17.0	8.6	.5059
16.8	8.5	.5059
18.1	8.7	.4807
16.9	8.6	.5089
16.5	8.3	.5030
15.8	7.9	.5000
18.1	8.3	.4586
16.2	7.8	.4815
16.8	8.4	.5000
14.4	7.5	.5208
16.1	8.7	.5404
16.8	8.3	.4940
16.9	8.4	.4970
17.6	8.7	.4943
16.2	7.7	.4753

MALES

1	2	3	1	2	3	1	2	3
17.4	8.0	.4598	16.9	8.2	.4852	4. 3 years.		
15.6	7.6	.4872	16.4	6.9	.4207			
15.5	8.5	.5484	17.3	7.6	.4393			
15.6	8.0	.5128	17.3	9.1	.5260	15.9	7.6	.4780
15.3	7.6	.4967	15.4	7.9	.5130	15.3	8.0	.5229
16.6	8.4	.5060	17.2	8.2	.4767	18.4	8.0	.4348
17.2	8.3	.4825	17.3	8.2	.4740	17.7	8.5	.4802
16.1	7.8	.4845	16.6	7.9	.4759	16.8	8.4	.5000
15.4	8.0	.5195	14.7	7.9	.5374	17.1	7.3	.4269
16.4	7.9	.4817	15.1	8.7	.5761	16.9	8.5	.5030
16.0	7.1	.4437	15.3	7.9	.5163	17.4	8.4	.4828
16.4	8.2	.5000	17.2	8.7	.5058	18.2	8.1	.4450
17.1	8.7	.5088	16.2	8.0	.4938	16.6	8.3	.5000
18.0	8.6	.4778	15.0	8.4	.5600	16.4	7.7	.4695
15.0	7.5	.5000	15.9	8.1	.5094	17.5	8.6	.4914
16.5	7.8	.4727	16.1	7.2	.4472	16.7	8.2	.4910
17.4	8.8	.5057	15.8	8.2	.5190	16.7	7.7	.4611
16.1	8.4	.5218	15.8	7.2	.4557	16.7	8.1	.4850
17.2	8.8	.5116	16.4	8.2	.5000	16.5	8.9	.5394
16.4	7.8	.4756	16.7	8.8	.5269	17.1	9.0	.5263
16.6	8.1	.4879	17.1	8.5	.4971	16.8	8.1	.4821
15.3	8.5	.5555	16.2	8.9	.5494	17.8	8.9	.5000
16.4	8.0	.4878	16.6	8.7	.5241	15.7	8.7	.5541
15.5	7.4	.4774	16.3	8.4	.5153	17.4	9.0	.5172
15.9	8.9	.5597	15.8	7.4	.4683	16.5	8.2	.4970
16.3	8.5	.5215	16.4	8.0	.4878	17.4	8.8	.5057
16.1	7.4	.4596	17.2	8.7	.5058	17.1	8.6	.5029
15.4	8.4	.5454	17.9	8.5	.4749	17.5	9.0	.5143
17.2	8.1	.4709	15.9	8.2	.5157	18.2	9.3	.5110
16.2	7.7	.4753	16.3	8.4	.5153	17.5	8.7	.4971
16.7	7.5	.4491	17.3	8.2	.4740	17.2	9.0	.5232
15.6	7.5	.4808	16.3	8.4	.5153	17.0	8.7	.5118
15.4	8.3	.5390	18.2	8.9	.4890	16.3	8.2	.5031
14.8	7.9	.5338	16.5	8.7	.5273	17.5	9.1	.5200
16.1	7.4	.4598	17.3	7.4	.4277	15.9	7.8	.4906
16.6	8.0	.4819	16.1	8.3	.5155	16.5	8.4	.5091
17.1	8.6	.5029	15.6	7.3	.4680	16.9	8.4	.4970
17.2	8.0	.4651				17.3	9.3	.5376
16.1	8.0	.4969				17.2	8.0	.4661
16.8	7.7	.4583				17.1	8.3	.4894
17.1	8.0	.4678				18.6	8.8	.4731

MALES

1	2	3	1	2	3			
16.1	8.7	.5404	18.5	8.5	.4595	16.1	8.2	.5093
16.7	7.9	.4730	17.0	9.5	.5588	19.4	9.3	.4794
16.4	7.7	.4695	16.7	8.7	.5210	16.4	8.3	.5061
17.7	9.0	.5085	16.4	7.9	.4817	18.2	8.9	.4890
16.9	8.1	.4793	17.5	9.0	.5143	16.0	8.3	.5187
16.5	8.3	.5030	17.5	8.1	.4628	17.8	8.1	.4551
18.0	7.5	.4167	17.4	8.6	.4942	16.5	8.3	.5030
17.2	8.5	.4942	18.4	9.4	.5109	17.5	8.0	.4571
16.7	8.3	.4970	17.3	8.8	.5087	17.6	8.9	.5057
17.2	9.1	.5291	15.9	8.4	.5283	18.0	8.8	.4889
17.3	8.4	.4855	18.0	9.5	.5278	17.5	8.2	.4686
16.5	8.9	.5394	16.6	7.9	.4759	17.9	9.4	.5251
16.6	8.3	.5000	15.9	8.4	.5283	17.8	9.1	.5112
17.1	9.2	.5380	16.3	8.7	.5337	18.5	8.3	.4486
17.0	7.9	.4647	17.4	8.2	.4713	17.8	8.5	.4775
16.0	7.8	.4875	16.3	7.7	.4724	17.3	8.7	.5029
17.1	8.6	.5029	18.4	9.1	.4946	18.0	9.0	.5000
17.1	8.0	.4678	17.4	8.6	.4942	18.9	9.3	.4921
17.7	8.9	.5028				16.9	8.3	.4911
16.7	9.0	.5389				17.3	8.4	.4855
17.2	8.6	.5000	5. 4 years.			17.1	7.7	.4503
16.5	8.9	.5394				17.5	8.8	.5029
17.3	8.8	.5087				16.7	8.6	.5150
17.8	8.9	.5000	16.6	8.1	.4879	17.5	8.6	.4914
16.3	8.6	.5276	17.4	9.4	.5402	17.3	8.3	.4798
17.3	8.8	.5087	18.5	9.1	.4919	16.1	8.4	.5217
19.0	8.9	.4684	17.6	9.3	.5284	18.8	8.8	.4681
16.5	7.5	.4545	19.3	8.8	.4560	16.7	8.3	.4970
17.1	8.5	.4971	16.8	7.9	.4702	17.7	8.2	.4633
17.1	7.9	.4620	17.7	8.3	.4689	17.7	8.7	.4915
17.3	9.2	.5318	17.7	9.0	.5084	18.0	8.6	.4778
17.1	9.0	.5263	16.7	7.6	.4551	17.2	8.6	.5000
16.3	8.8	.5399	17.7	8.2	.4633	17.2	9.5	.5523
17.1	8.3	.4854	17.0	8.5	.5000	19.4	8.9	.4588
16.0	7.7	.4812	17.6	8.0	.4545	17.3	8.0	.4624
16.8	8.0	.4762	18.4	9.6	.5217	17.9	9.1	.5084
16.4	8.0	.4878	17.5	9.1	.5200	16.0	7.2	.4500
16.9	8.9	.5266	17.5	8.2	.4686	17.3	8.5	.4913
18.0	9.2	.5111	17.4	9.3	.5345	18.4	8.9	.4837
18.0	9.2	.5111	16.7	8.5	.5090	17.8	9.3	.5225
17.0	8.4	.4941	18.2	8.6	.4725	16.7	8.5	.5090
17.5	9.0	.5143	17.8	9.0	.5056	18.5	8.3	.4486

MALES

1	2	3	1	2	3	1	2	3
18.9	8.2	.4339	6. 5 years.			16.8	8.3	.4415
18.2	8.7	.4780				17.1	8.7	.5088
17.2	8.5	.4942				19.1	9.9	.5183
17.8	7.4	.4157	19.8	8.9	.4495	20.5	10.1	.4975
17.9	8.9	.4972	17.8	8.4	.4719	18.6	8.7	.4628
18.4	9.1	.4946	19.5	9.2	.4718	17.5	8.4	.4800
18.1	8.5	.4696	20.1	9.5	.4726	17.6	8.1	.4602
17.7	8.4	.4746	18.0	8.1	.4500	19.2	8.7	.4531
16.1	9.0	.5590	19.3	8.9	.4611	19.2	9.2	.4792
17.8	8.8	.4944	18.3	8.9	.4863	19.8	8.6	.4343
17.4	9.5	.5460	16.8	8.5	.5059	18.4	8.9	.4837
17.7	9.0	.5085	16.6	8.2	.4940	18.9	8.8	.4656
17.1	8.5	.4971	19.7	9.5	.4822	18.6	8.9	.4785
18.7	9.5	.5080	17.8	8.1	.4551	17.3	8.7	.5029
18.2	9.2	.5055	17.8	8.9	.5000	17.2	8.8	.5116
17.0	8.1	.4765	18.0	9.5	.5278	18.9	9.2	.4868
18.5	8.4	.4540	18.8	9.9	.5266	18.6	9.0	.4839
18.8	8.7	.4628	17.9	8.7	.4860	19.0	8.5	.4474
17.5	8.3	.4743	18.1	8.4	.4641	19.8	10.4	.5252
17.1	8.7	.5088	17.5	8.9	.5086	18.7	8.7	.4652
16.9	8.5	.5029	20.2	10.5	.5198	17.9	8.5	.4749
18.1	9.0	.4972	18.3	8.7	.4754	17.9	8.8	.4916
17.9	8.9	.4972	16.4	7.7	.4695	18.9	9.6	.5079
16.2	9.0	.5555	18.5	9.4	.5081	19.4	9.2	.4742
17.5	8.7	.4971	19.0	10.1	.5316	18.2	9.4	.5165
18.3	8.7	.4754	20.0	8.1	.4050	17.7	8.9	.5028
18.3	9.2	.5027	16.8	8.3	.4940	18.5	8.8	.4757
17.7	8.8	.4972	18.6	9.1	.4892	17.5	8.8	.5029
16.3	8.8	.5399	19.1	9.2	.4817	19.3	9.1	.4715
17.4	8.1	.4655	19.0	10.0	.5263	17.8	8.1	.4551
16.2	8.0	.4938	18.3	8.6	.4699	17.5	8.4	.4800
16.3	8.5	.5215	18.3	8.8	.4809	19.0	9.0	.4737
18.0	8.5	.4722	18.8	9.3	.4947	16.4	8.6	.5244
16.2	8.4	.5185	17.4	8.5	.4885	17.9	8.8	.4916
			18.1	8.7	.4807	18.0	7.9	.4389
			15.9	8.2	.5157	18.0	9.5	.5278
			18.4	9.5	.5163	18.2	9.9	.5440
			17.8	8.6	.4831	18.5	9.6	.5189
			18.3	9.3	.5082	17.3	8.5	.4913
			18.8	9.1	.4840	18.7	9.0	.4813
			19.1	9.3	.4869	18.7	9.7	.5187
			19.9	8.1	.4070	18.0	8.7	.4833
			19.4	9.8	.5051	19.7	9.7	.4924

MALES

1	2	3
19.4	9.1	.4691
16.4	8.5	.5183
16.8	7.9	.4702
21.0	9.0	.4286
19.9	9.8	.4925
18.4	8.5	.4620
18.8	9.4	.5000
18.6	9.6	.5161
18.3	9.0	.4918
18.9	8.7	.4603
18.1	9.0	.4972
18.9	9.6	.5079
18.5	9.5	.5135
18.6	8.5	.3570
17.9	8.8	.4916
17.3	9.1	.5260
16.4	8.4	.5122
18.2	8.6	.4725
17.3	8.0	.4624
17.9	9.9	.5531
18.6	9.2	.4946
18.1	9.9	.5470
19.1	9.0	.4712
19.0	9.9	.5210
19.3	9.2	.4767
19.0	8.8	.4632
16.7	8.1	.4850
17.3	8.9	.5144
17.7	9.1	.5141
17.4	8.6	.4942
18.2	9.1	.5000
16.8	8.7	.5178
17.2	8.5	.4942
17.0	8.3	.4942
18.3	9.3	.5082
16.5	8.1	.4909
17.4	8.9	.5115
17.9	8.5	.4749
17.3	9.3	.5376
18.6	9.8	.5269
16.9	8.1	.4793
18.0	8.2	.4555

1	2	3
16.4	8.9	.4837
17.5	8.1	.4629
17.3	9.0	.5202
19.1	10.0	.5235
18.9	8.7	.4603
18.8	9.3	.4947
19.8	8.7	.4394
17.8	8.3	.4663
17.7	8.6	.4859
17.8	8.6	.4831

7. 6 years.

18.7	8.7	.4652
20.6	11.0	.5340
18.4	9.3	.5054
17.8	7.8	.4382
18.7	10.1	.5401
20.4	8.9	.4363
17.3	8.5	.4913
18.7	8.5	.4545
18.5	9.8	.5297
20.2	9.4	.4653
18.7	9.5	.5080
19.8	9.8	.4949
19.5	10.2	.5231
19.5	9.5	.4872
18.6	9.4	.5054
19.9	10.1	.5075
18.5	8.4	.4540
19.1	9.3	.4869
15.5	8.0	.5161
19.1	8.8	.4607
18.2	8.5	.4670
18.7	9.0	.4813
18.9	9.8	.5185
19.4	9.5	.4897
18.6	9.4	.5054
19.4	7.8	.4021
17.8	8.6	.4831

1	2	3
20.8	9.3	.4471
19.4	9.6	.4948
17.4	8.6	.4942
18.6	9.2	.4946
19.3	9.6	.4974
19.0	9.2	.4842
19.7	8.4	.4264
19.2	9.0	.4687
18.4	9.1	.4946
20.7	10.3	.4976
19.1	9.3	.4869
18.4	9.1	.4946
17.7	8.8	.4972
16.7	8.2	.4910
18.1	8.9	.4917
19.1	9.7	.5078
20.2	8.9	.4406
19.5	9.1	.4667
21.5	10.5	.4884
21.0	10.3	.4905
20.8	9.0	.4327
17.6	9.4	.5341
18.8	9.7	.5160
19.8	9.0	.4545
19.3	9.3	.4819
19.1	8.6	.4503
18.7	8.9	.4759
21.2	9.4	.4434
19.9	9.1	.4573
19.6	8.9	.4541
18.0	8.9	.4944
19.4	9.0	.4639
20.0	9.8	.4900
19.9	8.9	.4472
18.2	8.5	.4670
19.8	9.7	.4899
17.7	9.4	.5311
18.1	9.0	.4972
19.1	8.5	.4450
17.6	8.9	.5057
18.9	8.9	.4709
18.9	8.9	.4709

MALES

1	2	3	1	2	3	1	2	3
18.3	9.3	.5082	17.1	8.4	.4912	19.9	9.2	.4623
18.5	8.6	.4649	19.9	9.1	.4573	21.0	9.3	.4429
20.1	9.0	.4478	20.1	9.1	.4527	19.9	9.0	.4523
19.3	9.0	.4663	18.7	8.9	.4759	22.6	9.9	.4380
18.0	9.0	.5000	18.3	8.8	.4809	21.6	9.0	.4167
20.0	9.1	.4550	19.0	8.7	.4579	21.5	9.8	.4558
18.7	8.6	.4599				19.1	9.9	.5183
19.5	8.9	.4564				17.5	8.4	.4800
17.3	8.7	.5029	8. 7 years.			20.2	10.6	.5247
19.8	9.5	.4798				18.8	8.8	.4681
18.9	8.9	.4709				19.5	9.6	.4923
18.4	8.9	.4837	20.6	10.7	.5194	21.0	9.3	.4429
17.1	8.5	.4971	18.7	9.6	.5134	18.4	9.1	.4946
18.6	8.8	.4731	20.9	9.3	.4450	19.2	9.1	.4740
18.8	9.1	.4840	21.1	9.6	.4550	20.8	10.0	.4808
21.4	9.3	.4346	18.5	9.3	.5027	21.0	10.0	.4762
18.4	9.6	.5217	19.2	10.3	.5365	17.9	9.0	.5028
19.0	10.5	.5526	19.6	9.2	.4694	19.3	9.3	.4819
19.9	10.0	.5025	19.3	10.1	.5233	20.5	9.6	.4683
18.9	8.9	.4709	18.5	9.6	.5189	20.6	10.8	.5243
17.7	9.2	.5198	19.0	8.7	.4579	19.7	8.9	.4518
18.8	8.7	.4628	19.2	8.8	.4583	20.8	8.5	.4086
18.9	9.2	.4868	21.0	10.4	.4952	22.9	9.8	.4279
18.2	9.0	.4945	20.9	8.9	.4258	20.6	10.3	.5000
18.7	9.2	.4920	20.1	8.4	.4179	19.6	9.3	.4745
18.0	8.9	.4944	19.4	10.1	.5206	19.5	9.3	.4769
18.5	9.0	.4865	18.7	8.7	.4652	21.8	8.8	.4037
19.1	9.5	.4974	21.4	9.9	.4626	22.1	10.0	.4525
17.4	9.5	.5460	18.7	8.7	.4652	21.7	9.9	.4562
18.8	9.6	.5106	19.0	9.6	.5053	21.0	9.5	.4524
20.5	9.5	.4634	20.7	9.2	.4444	20.6	9.7	.4709
21.8	10.2	.4679	22.6	9.7	.4292	19.2	8.5	.4427
18.5	9.6	.5189	21.8	10.8	.4954	19.3	9.7	.5026
19.9	9.7	.4874	20.0	9.6	.4800	21.1	9.0	.4265
19.5	9.8	.5026	20.9	10.2	.4880	19.0	8.8	.4632
19.0	9.6	.5053	20.0	9.2	.4600	19.1	8.9	.4660
18.6	9.7	.5215	20.7	10.8	.5217	19.4	9.2	.4742
19.2	9.5	.4948	17.9	9.4	.5251	21.0	9.2	.4381
18.5	9.2	.4973	19.7	9.0	.4568	20.8	10.1	.4856
19.0	8.4	.4421	19.4	9.5	.4897	18.1	8.5	.4696
18.7	8.7	.4652	18.6	8.9	.4785	18.6	9.4	.5054
17.5	8.4	.4800	20.0	9.0	.4500	20.5	8.5	.4146

MALES

1	2	3
19.5	9.6	.4923
18.7	9.0	.4813
19.1	9.5	.4974
21.0	10.5	.5000
21.4	10.8	.5047
20.2	9.8	.4851
19.3	10.4	.5389
19.8	9.9	.5000
20.8	10.1	.4856
18.5	9.7	.5243
19.7	10.4	.5279
21.1	9.7	.4597
19.8	9.5	.4798
19.2	9.2	.4792
21.4	8.9	.4159
18.5	9.1	.4919
21.4	9.3	.4346

9. 8 years.

1	2	3
20.8	9.7	.4663
20.2	10.4	.5148
20.1	9.0	.4478
22.6	10.3	.4557
19.7	8.8	.4467
21.7	10.4	.4793
19.4	9.4	.4845
19.7	9.1	.4619
22.1	10.9	.4932
23.8	11.0	.4622
21.3	9.5	.4460
20.6	9.3	.4515
21.1	10.8	.5118
21.0	10.2	.4857
20.2	9.5	.4703
19.1	9.3	.4869
21.2	10.2	.4811
22.0	9.0	.4091
18.3	9.5	.5191
20.5	9.9	.4829
19.5	9.4	.4820
18.6	9.8	.5269
19.3	9.4	.4870
21.8	10.4	.4771
21.0	8.7	.4143
21.1	8.8	.4171
23.4	10.6	.4521
19.5	9.7	.4974
21.2	9.4	.4434
19.6	10.8	.5510
20.7	9.9	.4783
23.6	10.6	.4491
19.0	10.1	.5316
22.9	9.4	.4105
21.9	9.5	.4338
19.4	9.3	.4794
22.7	10.1	.4449
18.7	8.7	.4652
22.9	10.1	.4410
22.8	9.7	.4254
23.0	10.0	.4348
23.0	10.4	.4522
21.1	9.5	.4502
21.0	9.8	.4667
19.7	9.0	.4568
21.4	10.4	.4860
23.9	9.8	.4100
22.2	10.1	.4549
19.5	8.8	.4513
20.6	10.3	.5000
21.2	10.4	.4906
21.0	9.8	.4667
22.0	10.2	.4636
22.1	10.9	.4932
22.3	9.8	.4395
20.4	9.2	.4510
18.9	9.8	.5185
21.5	9.7	.4512
21.2	10.3	.4858
20.8	9.8	.4711
20.5	9.0	.4390
21.2	9.2	.4363
19.2	8.8	.4583
18.9	9.3	.4921
17.5	8.4	.4800
19.6	9.8	.5000
20.1	9.5	.4726
19.9	10.0	.5025
21.2	9.9	.4670

10. 9 years.

1	2	3
22.3	9.9	.4439
22.5	11.1	.4933
20.3	9.1	.4483
21.8	8.9	.4082
22.4	9.6	.4286
21.9	10.2	.4657
22.9	10.3	.4498
21.4	8.0	.3738
21.4	9.9	.4626
20.7	9.0	.4348
23.3	10.2	.4378
20.4	10.4	.5098
20.3	9.4	.4630
23.1	11.1	.4805
21.2	9.7	.4575
22.3	9.7	.4350
22.0	9.2	.4182
23.5	9.9	.4213
23.0	9.8	.4261
22.0	9.8	.4454
24.5	11.0	.4490
19.3	9.0	.4663
21.6	9.3	.4305
21.4	9.5	.4439
22.3	8.5	.3812
21.8	10.0	.4587
20.0	9.7	.4850
21.8	9.7	.4449
20.4	9.3	.4559
22.4	8.8	.3929
24.8	10.5	.4234
22.0	10.7	.4864
22.6	9.0	.3982

MALES

1	2	3	1	2	3	1	2	3
21.4	10.5	.4906	11. 10 years.			22.8	9.9	.4342
19.4	9.6	.4948				20.7	9.3	.4493
21.9	9.5	.4338				23.2	9.4	.4052
23.6	8.9	.3771	22.5	8.7	.3867	21.6	9.7	.4491
20.8	9.9	.4760	21.2	9.5	.4481	23.6	9.6	.4068
23.6	10.7	.4534	22.7	10.1	.4449	25.1	10.7	.4263
20.6	9.6	.4660	23.5	10.5	.4468	20.9	9.3	.4450
20.2	10.1	.5000	25.1	10.5	.4183	21.8	9.5	.4358
22.8	9.3	.4079	23.0	11.1	.4826	25.0	10.2	.4080
19.1	9.6	.5026	23.7	11.3	.4768	22.5	9.2	.4089
19.4	9.5	.4897	22.8	9.2	.4035	21.7	11.1	.5115
21.4	10.7	.5000	22.4	9.4	.4196	21.7	9.9	.4562
23.6	12.4	.5254	23.6	9.7	.4110	21.8	9.6	.4404
22.7	9.4	.4141	24.1	11.0	.4564	22.1	10.3	.4661
21.0	10.3	.4905	22.9	10.7	.4672	21.3	9.0	.4225
21.2	8.8	.4151	19.2	9.4	.4896	23.5	10.8	.4596
21.6	10.3	.4768	23.3	11.2	.4807	22.5	10.1	.4489
22.0	10.0	.4545	21.9	9.8	.4475	23.8	10.0	.4202
21.9	10.2	.4657	22.9	9.7	.4236	24.1	10.2	.4232
22.4	10.3	.4598	23.2	10.5	.4526	24.3	10.6	.4362
24.6	10.4	.4228	23.7	9.7	.4093	23.5	9.9	.4213
22.6	9.7	.4292	21.7	8.1	.3733	21.4	9.3	.4346
21.2	10.2	.4811	21.8	9.4	.4312	23.7	9.5	.4008
19.4	9.0	.4639	20.7	10.1	.4879	22.6	9.5	.4204
19.1	9.4	.4921	24.5	11.4	.4653	25.2	10.2	.4048
22.4	8.9	.3973	22.0	9.2	.4182	22.1	9.7	.4389
21.2	9.4	.4434	23.3	8.5	.3648	23.0	9.7	.4217
20.7	10.1	.4879	24.5	10.8	.4408	24.1	11.4	.4731
21.7	9.1	.4193	22.2	9.3	.4189	20.8	10.7	.5144
21.4	9.8	.4579	21.3	9.4	.4413	23.0	10.8	.4696
22.1	8.9	.4027	23.3	9.5	.4077	20.1	8.2	.4080
22.4	9.7	.4330	24.8	9.8	.3952	23.2	9.3	.4009
20.4	8.1	.3971	24.0	10.4	.4333	22.6	10.7	.4734
17.8	8.8	.4944	21.3	8.4	.3944	22.3	11.5	.5157
23.4	9.7	.4145	22.0	9.5	.4318	22.1	10.1	.4570
22.1	9.8	.4434	20.5	9.4	.4585	20.3	8.7	.4286
22.5	9.5	.4222	22.0	9.9	.4500	22.4	9.0	.4018
21.2	10.0	.4717	20.9	9.2	.4402	22.4	9.3	.4152
21.6	11.1	.5139	22.5	10.0	.4444	22.5	9.8	.4355
23.1	10.2	.4416	25.7	10.9	.4241	21.1	9.6	.4550
22.0	10.3	.4682	23.6	11.3	.4788	22.0	9.6	.4364
21.6	10.7	.4954	22.0	10.5	.4773	20.3	10.2	.5025

MALES

1	2	3
23.2	10.0	.4310
23.7	11.0	.4641

12. 11 years.

1	2	3
24.0	10.9	.4542
21.3	9.0	.4225
22.8	10.6	.4649
22.3	9.7	.4350
21.4	9.5	.4439
24.4	10.6	.4344
22.4	9.4	.4196
21.8	10.1	.4633
21.0	9.2	.4381
22.3	10.2	.4574
23.5	9.8	.4170
24.7	10.8	.4372
22.9	9.0	.3930
23.9	10.5	.4393
23.1	10.2	.4416
23.6	11.2	.4746
20.6	10.2	.4951
23.7	10.7	.4515
22.9	8.9	.3886
24.9	10.5	.4217
23.9	10.7	.4477
24.2	12.5	.5165
22.1	10.0	.4525
24.8	10.3	.4153
23.8	10.5	.4412
24.6	9.9	.4024
21.0	9.8	.4667
25.1	11.2	.4462
21.0	9.1	.4333
22.7	10.0	.4405
24.2	11.0	.4545
22.0	10.3	.4682
23.5	9.8	.4170
24.6	10.4	.4228
23.4	10.3	.4400

1	2	3
24.1	11.2	.4647
24.3	10.9	.4486
21.3	9.8	.4600
24.3	10.7	.4403
23.5	10.8	.4596
25.1	10.8	.4303
23.9	11.5	.4812
23.2	8.9	.3836
23.2	9.8	.4224
22.5	9.3	.4133
23.6	9.5	.4025
21.0	10.4	.4952
22.9	10.8	.4716
23.8	10.9	.4580
22.3	9.1	.4081
22.6	10.6	.4690
25.5	11.3	.4431
23.4	9.9	.4231
24.2	10.0	.4132
22.8	10.7	.4693
22.8	10.4	.4561
24.9	11.0	.4418
20.4	10.7	.5245
24.1	10.7	.4440
25.3	11.7	.4624
21.4	10.4	.4860
24.2	10.2	.4215
20.3	9.7	.4778
21.3	9.4	.4413
21.6	9.5	.4398
23.1	8.9	.3853
24.5	11.4	.4653

13. 12 years.

1	2	3
24.7	11.5	.4656
23.0	9.0	.3913
23.9	10.4	.4351
26.1	10.2	.3908
24.1	10.9	.4523

1	2	3
23.9	9.1	.3807
24.2	11.0	.4545
23.5	10.3	.4383
21.0	9.9	.4714
23.8	10.5	.4412
24.5	10.3	.4204
22.4	11.0	.4911
21.6	8.7	.4028
23.9	9.7	.4059
22.2	8.4	.3784
24.6	9.7	.3943
22.2	8.7	.3919
24.1	11.4	.4730
22.7	9.6	.4229
23.0	9.9	.4304
24.2	11.0	.4545
23.4	9.6	.4103
24.2	9.9	.4091
24.4	9.8	.4016
23.7	10.0	.4219
24.1	11.1	.4606
23.7	10.8	.4557
23.2	11.0	.4741
26.7	10.8	.4045
21.0	11.6	.5524
20.8	9.3	.4471
23.4	11.1	.4744
23.6	11.2	.4746
23.4	9.4	.4017
22.8	11.0	.4825
25.4	9.7	.3819
22.5	11.0	.4889
24.8	10.8	.4355
24.6	9.7	.3943
24.4	9.8	.4016
25.5	9.7	.3804
26.1	10.6	.4061
23.5	8.9	.3787
20.7	8.1	.3913
23.7	10.7	.4515
24.8	11.2	.4516
24.9	9.5	.3815

MALES

1	2	3
25.3	10.8	.4269
27.1	11.5	.4243
26.1	12.7	.4866
23.0	10.4	.4521
25.7	10.7	.4163
23.9	10.9	.4561
21.8	10.3	.4725
27.5	11.7	.4255
25.0	10.3	.4120
24.5	9.8	.4000
24.0	11.9	.4958
23.0	11.2	.4870
23.0	10.2	.4435
24.7	10.6	.4291
25.2	10.5	.4167
22.5	10.4	.4622
23.3	9.7	.4163
24.6	10.6	.4309
24.2	11.2	.4628
25.0	10.8	.4320
26.4	11.0	.4167
21.4	10.9	.5093
24.5	10.1	.4122
21.9	10.4	.4749
24.9	10.7	.4297
22.9	11.2	.4891
21.9	10.4	.4749
26.8	10.5	.3918
24.5	11.7	.4775

14. 13 years.

24.4	10.6	.4344
26.0	10.9	.4192
27.1	10.7	.3949
26.6	12.0	.4511
24.1	11.5	.4772
24.1	10.6	.4398
27.1	10.7	.3949
22.0	10.9	.4955

1	2	3
24.1	10.4	.4315
24.1	9.8	.4066
21.1	9.0	.4265
25.5	10.5	.4118
26.0	11.5	.4423
26.1	10.2	.3908
23.3	10.1	.4335
25.6	10.2	.3984
24.2	9.4	.3884
25.5	12.3	.4823
26.6	10.2	.3835
25.2	10.7	.4246
23.5	12.1	.5149
22.5	8.8	.3911
26.0	11.9	.4577
25.8	9.8	.3799
25.7	11.4	.4436
23.2	9.4	.4052
28.5	11.1	.3895
24.8	10.4	.4193
26.7	10.0	.3745
27.4	10.8	.3942
26.8	12.0	.4478
24.6	10.9	.4431
25.9	9.7	.3745
23.2	10.7	.4612
22.3	10.0	.4484
24.4	10.3	.4221
26.1	11.5	.4406
26.6	11.1	.4173
28.2	11.3	.4007
23.2	10.0	.4310
25.6	10.5	.4102
23.4	10.3	.4402
28.2	12.3	.4362
25.7	11.8	.4591
25.4	11.5	.4528
24.8	11.6	.4677
27.2	11.9	.4375
26.5	10.5	.3962
25.1	10.8	.4303
24.5	10.4	.4245

1	2	3
22.9	11.0	.4804
25.2	11.5	.4563
24.9	11.1	.4458
23.9	10.3	.4310
27.5	10.5	.3818
25.8	10.6	.4108
24.8	11.2	.4516
28.7	10.3	.3589
25.7	11.1	.4319
27.3	12.2	.4469
25.9	9.5	.3668
25.4	10.8	.4252
23.4	11.2	.4786
24.1	11.0	.4564
24.0	10.7	.4458
27.0	11.3	.4185
23.2	9.7	.4181
24.8	12.2	.4919
24.3	10.0	.4115
24.3	11.3	.4650
26.3	11.2	.4258
29.0	12.7	.4379
24.8	9.9	.3992

15. 14 years.

25.7	11.5	.4475
24.7	11.4	.4615
28.1	11.8	.4199
29.2	11.6	.3973
29.8	12.4	.4161
29.4	13.2	.4490
27.3	10.9	.3993
27.2	11.5	.4228
24.4	10.2	.4180
27.5	10.5	.3818
27.6	10.7	.3877
26.1	12.5	.4789
24.9	9.9	.3976
27.0	11.6	.4296

MALES

1	2	3
24.3	11.4	.4691
24.3	11.5	.4732
23.4	10.0	.4273
28.2	11.5	.4078
26.5	11.0	.4151
27.5	12.4	.4509
30.1	12.1	.4020
25.2	12.6	.5000
24.6	10.8	.4390
26.5	11.5	.4340
24.0	9.8	.4083
26.2	10.8	.4122
25.2	9.1	.3611
25.1	11.3	.4502
24.0	11.3	.4708
26.2	11.5	.4389
26.5	11.1	.4189
28.9	12.5	.4325
25.7	9.5	.3696
26.7	11.8	.4419
26.9	12.5	.4647
28.3	12.9	.4558
25.4	10.7	.4213
28.5	11.7	.4105
22.5	10.8	.4800
26.5	11.2	.4226
26.0	11.8	.4538
24.1	11.0	.4564
23.4	9.6	.4103
28.2	13.0	.4610
24.7	8.7	.3522
26.7	11.1	.4157
28.6	9.9	.3461
27.4	11.7	.4270
24.2	11.3	.4669
28.1	11.1	.3950
28.6	10.7	.3741
23.6	9.9	.4195
25.3	10.0	.3953
24.0	10.7	.4458
24.1	11.3	.4689
25.2	10.2	.4048

1	2	3
26.5	11.3	.4283
27.5	9.8	.3582
26.6	12.7	.4774
26.2	10.5	.4008
26.5	10.2	.3849
27.6	11.7	.4239
28.5	12.9	.4526
27.1	11.5	.4244
24.7	11.1	.4494
27.7	12.7	.4585
24.8	11.4	.4597
28.5	11.9	.4175
27.9	12.1	.4337
27.5	12.1	.4400
27.8	12.1	.4353
27.0	12.3	.4555
30.8	12.4	.4026
25.7	10.9	.4241
27.7	12.1	.4368
26.9	12.0	.4833
28.6	12.5	.4371
28.3	13.3	.4700
28.9	12.7	.4394
26.8	11.7	.4366
28.4	12.4	.4366
27.3	10.4	.3809
23.1	9.6	.4156
27.8	13.2	.4748
25.2	11.3	.4484
27.4	10.8	.3942
23.4	10.7	.4573
28.3	11.2	.3958
21.3	9.2	.4319
22.5	7.9	.3511
23.8	10.1	.4244
23.7	9.4	.3966
26.4	12.3	.4659
25.4	11.5	.4527
26.9	11.7	.4349
28.5	12.1	.4246
28.1	10.9	.3879
25.2	12.3	.4881

1	2	3
24.5	10.3	.4204
23.6	10.3	.4364
28.2	9.9	.3511
27.5	11.0	.4000
27.0	10.0	.3704
26.4	12.4	.4697
25.2	10.8	.4286
24.5	10.2	.4163
23.8	10.4	.4370
27.5	10.5	.3818
27.4	12.1	.4416
27.6	10.9	.3949
25.7	11.9	.4630
26.9	9.3	.3457
24.2	10.9	.4504
28.6	11.4	.3986
28.2	12.4	.4397
24.4	11.3	.4631
28.0	11.6	.4143

16. 15 years.

27.1	12.5	.4612
24.7	10.3	.4170
27.1	11.7	.4317
27.3	10.5	.3846
28.9	11.6	.4014
28.1	13.0	.4626
26.9	11.8	.4386
26.6	11.3	.4248
28.1	12.1	.4306
29.1	10.7	.3677
26.3	10.3	.3916
29.2	12.1	.4144
26.0	11.1	.4269
26.9	12.8	.4758
24.5	9.8	.4000
27.9	12.9	.4624
25.5	10.6	.4157
26.0	12.1	.4654

MALES

1	2	3	1	2	3	1	2	3
29.0	11.5	.3965	26.8	10.7	.3992	28.2	10.9	.3865
28.0	11.9	.4250	30.5	12.3	.4033	24.5	10.1	.4122
25.8	10.8	.4186	25.7	11.6	.4514	26.7	9.5	.3558
26.2	11.3	.4313	28.6	12.9	.4510	26.7	12.8	.4794
29.1	12.5	.4295	27.8	12.5	.4496	29.5	12.0	.4068
25.3	10.5	.4150	25.1	11.9	.4741	26.9	12.0	.4461
24.5	9.9	.4041	29.4	12.6	.4286	27.7	12.2	.4404
28.5	11.4	.4000	27.0	10.7	.3963	26.5	11.9	.4491
26.2	10.1	.3713	27.1	12.0	.4428	28.2	12.5	.4433
28.1	9.5	.3381	29.2	13.4	.4589	28.5	12.1	.4246
25.7	10.8	.4202	26.2	12.1	.4618	30.8	12.1	.3929
25.9	10.2	.3938	27.7	10.7	.3863	26.3	11.3	.4297
23.6	11.1	.4703	27.3	10.3	.3773	26.7	9.9	.3708
26.6	13.1	.4925	24.2	9.3	.3843	28.6	11.8	.4126
27.9	12.2	.4373	30.9	12.2	.3948	28.0	10.3	.3679
26.0	10.2	.3923	27.1	11.0	.4059	26.3	10.4	.3954
30.1	10.8	.3588	25.0	10.3	.4120	28.5	13.4	.4702
28.7	12.2	.4251				28.6	11.6	.4056
28.2	12.4	.4397				26.7	11.6	.4344
25.1	10.7	.4263	17. 16 years.			29.9	12.5	.4181
29.0	12.9	.4448				26.3	12.4	.4715
26.2	12.3	.4695				26.3	9.1	.3460
27.7	11.8	.4260	27.0	11.6	.4296	29.7	12.1	.4074
28.0	11.9	.4250	26.3	11.3	.4297	26.4	10.9	.4129
26.2	11.6	.4427	27.3	11.3	.4139	28.1	13.7	.4875
28.0	12.5	.4464	27.4	9.2	.3358	27.3	12.5	.4579
27.8	13.5	.4856	26.0	9.7	.3731	25.6	10.2	.3984
28.6	12.7	.4441	25.9	12.4	.4788	30.7	11.5	.3746
28.1	11.8	.4199	28.6	10.9	.3811	30.0	12.3	.4100
25.4	10.6	.4173	26.8	9.7	.3619	29.8	12.6	.4228
26.5	10.5	.3962	29.0	13.1	.4517	27.7	12.7	.4585
26.9	9.9	.3680	31.6	12.6	.3987	26.9	11.7	.4349
28.5	11.8	.4140	29.0	12.3	.4241	28.5	11.6	.4070
28.1	11.8	.4199	27.3	10.3	.3773	27.0	11.3	.4185
28.5	12.7	.4456	27.2	10.9	.4007	28.4	13.5	.4753
24.9	9.7	.3896	29.2	12.1	.4144	25.9	12.2	.4710
25.8	11.7	.4535	29.4	11.7	.3980	24.2	11.5	.4752
24.9	10.7	.4297	28.7	10.5	.3658	27.2	12.7	.4669
27.2	10.4	.3823	28.8	11.9	.4132	30.5	13.2	.4328
29.6	12.7	.4290	30.2	11.5	.3808	29.7	13.4	.4512
23.1	10.2	.4416	25.8	10.5	.4070	26.1	11.3	.4329
27.8	11.9	.4281	27.4	12.7	.4635	29.5	12.9	.4373
28.3	11.9	.4205	22.8	9.4	.4123	27.2	10.9	.4007

MALES

1	2	3
29.8	12.9	.4329
27.0	12.1	.4481
25.1	11.0	.4382
28.5	11.2	.3930
32.1	11.8	.3676
26.5	12.0	.4528
26.7	10.6	.3970

18. 17 years.

1	2	3
26.3	11.8	.4487
25.9	11.2	.4324
26.9	12.4	.4610
31.0	13.8	.4452
28.0	13.0	.4643
29.5	12.4	.4203
30.1	12.8	.4252
27.3	10.7	.3919
29.6	11.9	.4020
27.3	11.7	.4286
28.6	12.7	.4441
27.9	13.4	.4803
29.4	11.9	.4048
28.9	11.9	.4118
27.3	12.6	.4615
30.0	12.4	.4133
26.9	11.1	.4126
26.1	11.1	.4253
28.6	12.3	.4301
30.1	12.2	.4053
28.3	12.2	.4311
28.3	12.3	.4346
28.2	13.0	.4610
30.6	12.0	.3922
29.2	10.2	.3493
30.5	13.2	.4328
28.0	12.0	.4286
26.8	11.6	.4328
31.7	11.9	.3754
29.1	11.3	.3883
26.3	11.2	.4259
27.5	11.8	.4291
26.8	11.7	.4366
28.6	11.3	.3951
28.9	11.4	.3945
29.9	14.2	.4749
28.4	12.5	.4401
30.3	14.4	.4752
27.0	11.1	.4111
27.4	11.8	.4307
30.5	12.3	.4033
30.0	11.7	.3900
28.9	11.7	.4048
28.4	11.9	.4190
29.3	12.5	.4266
27.3	10.6	.3883
31.7	10.9	.3438
28.4	12.6	.4437
27.3	11.4	.4176
27.7	12.4	.4476
28.7	10.2	.3554
30.0	12.6	.4200
29.5	12.9	.4373
29.7	12.2	.4108
27.4	11.3	.4124
27.0	9.7	.3593
28.2	11.8	.4184
28.9	12.8	.4429
24.0	10.0	.4167
27.4	10.0	.3650
30.7	11.4	.3713
25.4	12.1	.4764
27.5	11.9	.4327
27.0	11.1	.4111
27.7	11.5	.4152
28.3	11.1	.3922
27.0	10.4	.3852
30.3	10.9	.3597
31.6	13.8	.4367
26.1	12.3	.4713
26.3	10.6	.4030

19. 18 years.

1	2	3
28.2	12.1	.4291
25.4	10.1	.3976
28.5	12.1	.4246
29.9	13.2	.4415
29.7	10.6	.3569
27.0	11.1	.4111
30.1	13.6	.4518
27.4	11.6	.4234
26.4	12.0	.4545
28.6	12.2	.4266
29.4	11.5	.3912
29.8	12.7	.4262
27.8	12.1	.4352
26.3	11.4	.4335
28.6	10.2	.3566
30.5	12.9	.4229
26.5	11.9	.4491
30.1	11.9	.3953
28.5	12.5	.4386
29.7	11.0	.3704
27.1	12.1	.4465
32.1	13.0	.4050
30.5	12.4	.4066
28.0	12.8	.4571
28.2	10.1	.3582
23.6	9.4	.3983
29.3	12.8	.4369
30.6	11.7	.3823
28.1	11.4	.4057
27.4	11.4	.4161
29.4	11.5	.3912
29.8	13.7	.4597
28.3	11.6	.4099
30.4	11.7	.3849
28.7	11.1	.3868
27.5	12.0	.4364
30.1	10.5	.3488
31.5	13.2	.4190
29.4	13.3	.4524
28.9	12.4	.4291

MALES

1	2	3
28.0	12.4	.4429
26.4	11.3	.4280
28.9	13.5	.4671
29.3	13.9	.4744
32.6	12.9	.3957
30.1	13.6	.4518
27.4	10.3	.3759
29.3	12.1	.4130
26.6	12.3	.4624
26.7	11.1	.4157
26.2	11.8	.4504
31.0	11.2	.3613
29.0	11.4	.3931
28.3	11.4	.4028

20. 19 years.

1	2	3
27.5	11.5	.4182
29.3	11.9	.4061
26.0	8.9	.3423
30.2	12.7	.4205
28.0	11.3	.4036
29.0	12.8	.4414
31.3	12.6	.4026
27.0	11.9	.4407
29.7	13.3	.4478
28.8	12.5	.4340
29.9	12.6	.4214
28.3	11.1	.3922
27.2	12.1	.4448
29.6	12.6	.4257
28.9	11.1	.3841
29.2	13.4	.4589
27.7	10.9	.3935
29.0	11.2	.3862
27.4	12.0	.4380
27.3	11.6	.4249
27.8	11.3	.4065
28,2	10.8	.3830
30.8	13.2	.4286
28.4	11.3	.3979
27.6	11.9	.4312
29.6	13.4	.4527
28.5	10.9	.3825
31.9	14.7	.4608
32.5	14.2	.4369
29.6	12.7	.4290
29.2	11.4	.3904
28.8	12.7	.4410
28.9	12.0	.4152
29.5	11.4	.3864
27.7	10.9	.3935
31.4	12.2	.3885
29.2	13.3	.4555
27.6	9.3	.3370
30.0	12.5	.4167
28.7	11.1	.3868
29.3	11.6	.3959
27.2	10.5	.3860
30.0	12.6	.4200
27.0	12.2	.4518
28.6	13.7	.4790
27.2	11.3	.4154
28.7	12.0	.4181
28.3	10.6	.3746
26.4	11.5	.4356
28.4	10.4	.3662
28.2	11.5	.4078
28.6	11.6	.4056
23.3	11.9	.5107
26.8	10.4	.3881
29.4	11.3	.3843
28.5	12.2	.4281
31.6	12.4	.3924
29.2	13.7	.4692
27.4	12.1	.4416
30.0	12.2	.4067
31.3	12.2	.3898
28.1	12.2	.4342
33.1	13.8	.4169
27.1	12.0	.4428
29.3	11.9	.4061

21. 20 years.

1	2	3
30.9	12.6	.4078
29.0	11.1	.3828
26.7	11.4	.4270
27.5	11.4	.4145
28.6	12.5	.4371
29.8	12.5	.4195
31.2	13.5	.4327
30.3	12.8	.4224
25.4	10.9	.4291
29.2	13.1	.4486
29.0	11.5	.3965
28.5	10.5	.3684
28.8	11.8	.4097
29.0	12.7	.4379
29.8	11.3	.3792
30.3	13.2	.4356
32.0	12.8	.4000
26.1	11.3	.4329
30.1	13.1	.4352
29.2	10.6	.3630
28.5	11.1	.3895
25.8	11.1	.4302
30.9	13.5	.4369
28.2	12.0	.4255
27.6	11.3	.4094
30.4	12.5	.4112
28.3	11.3	.3993
26.3	10.1	.3840
30.3	10.8	.3564
31.4	11.8	.3758
28.8	11.7	.4062
30.3	12.7	.4191
26.6	11.8	.4436
29.5	11.5	.3898
26.8	12.2	.4552
24.8	9.6	.3871
28.4	11.8	.4155
29.7	14.2	.4781
31.8	13.1	.4119

MALES

1	2	3
28.8	11.4	.3958
30.4	11.9	.3914
30.3	11.4	.3762
30.0	12.1	.4033
29.0	11.3	.3896
31.1	12.9	.4148
29.6	11.9	.4020
28.3	13.9	.4912
28.9	10.2	.3529
32.1	12.0	.3738
26.5	11.1	.4189
29.1	11.3	.3883
28.7	12.5	.4355
29.6	12.9	.4358
31.3	13.2	.4217
29.3	12.0	.4095
29.0	11.9	.4103
25.8	10.4	.4031
28.1	11.7	.4164
22.9	9.4	.4105
31.0	12.4	.4000

22. 21 years.

1	2	3
27.3	10.3	.3773
31.1	12.8	.4116
29.8	11.8	.3960
30.2	11.4	.3775
30.4	13.7	.4507
29.3	13.0	.4437
26.5	10.1	.3811
25.8	10.3	.3992
30.9	11.6	.3754
30.1	11.8	.3920
28.3	12.9	.4558
29.1	12.0	.4124
30.5	12.8	.4197
30.3	14.2	.4686
28.7	11.7	.4077
28.6	10.9	.3811
29.5	11.9	.4034

1	2	3
29.1	13.0	.4467
28.0	11.9	.4250
31.4	12.1	.3853
28.5	12.8	.4491
30.3	12.4	.4092
30.1	12.9	.4286
28.1	12.0	.4270
25.6	10.3	.4023
30.9	11.4	.3689
27.5	11.3	.4109
31.7	12.2	.3849
30.0	11.9	.3967
27.1	9.2	.3395
32.8	13.1	.3994
31.9	12.9	.4135
28.0	11.0	.3929
30.5	12.2	.4000
28.1	12.8	.4555
29.1	12.9	.4433
29.1	12.3	.4227
29.6	11.4	.3851
31.9	12.6	.3950
28.3	11.3	.3993
28.9	12.8	.4429
28.7	13.5	.4704
30.8	14.3	.4643
28.5	12.1	.4246
29.6	12.0	.4053
28.0	13.9	.4964
29.8	11.8	.3960
27.2	11.2	.4118
28.2	11.0	.3901
27.1	11.7	.4317
29.1	12.2	.4192
31.1	13.4	.4309
29.0	11.6	.4000
28.0	12.0	.4286
28.6	10.9	.3811
30.2	12.4	.4106
30.5	13.7	.4492

23. 22 years.

1	2	3
31.8	12.8	.4025
32.8	12.6	.3841
27.9	12.3	.4409
30.0	13.9	.4633
26.7	9.8	.3670
26.5	12.3	.4641
30.0	13.0	.4333
28.8	11.7	.4062
31.0	11.2	.3613
28.6	13.4	.4685
29.4	11.9	.4048
29.2	12.7	.4349
26.0	10.8	.4154
32.1	13.3	.4143
27.4	10.7	.3905
31.2	12.2	.3910
29.5	10.8	.3661
29.5	10.2	.3458
28.0	9.8	.3500
30.3	11.5	.3795
29.0	11.8	.4069
30.1	13.2	.4385
28.7	12.6	.4390
32.2	15.6	.4845
30.6	13.7	.4477
29.3	11.4	.3891
27.8	12.8	.4604
29.6	11.0	.3716
27.7	12.0	.4332
30.6	11.9	.3889
32.1	11.0	.3427
33.0	13.5	.4091
31.5	12.5	.3969
28.5	11.5	.4035
29.6	13.2	.4459
31.4	14.4	.4586
29.4	11.8	.4014
30.1	11.5	.3821
30.3	10.3	.3399
27.5	11.7	.4254

MALES

1	2	3
31.0	13.2	.4258
26.8	12.4	.4627
31.2	12.4	.3974
29.6	13.5	.4561
31.6	12.2	.3861
28.6	12.1	.4231
29.3	10.6	.3618
28.0	12.2	.4357
29.0	10.8	.3724
28.5	9.9	.3474
30.1	12.9	.4286
29.3	12.7	.4334

24. 23 years.

1	2	3
28.4	10.2	.3591
29.9	12.6	.4214
28.8	11.8	.4097
28.8	12.7	.4410
28.7	12.4	.4321
29.6	12.0	.4054
29.3	12.5	.4266
25.4	10.1	.3976
28.6	11.5	.4021
24.6	11.9	.4837
27.5	13.0	.4727
29.2	12.4	.4247
30.4	13.5	.4441
28.8	12.7	.4410
27.8	10.7	.3849
28.8	11.8	.4097
31.3	11.9	.3800
29.0	13.3	.4586
28.7	12.1	.4216
29.7	13.5	.4545
28.6	12.3	.4301
29.2	11.2	.3836
28.1	12.2	.4342
32.7	13.2	.4037
31.0	11.1	.3581
32.6	12.0	.3681
28.2	10.7	.3795
31.6	14.2	.4494
28.5	13.2	.4632
31.6	11.9	.3766
29.7	12.2	.4108
28.9	10.4	.3599
29.6	10.8	.3649
29.6	12.6	.4257
30.5	12.8	.4197
27.3	10.9	.3993
28.3	11.5	.4064
31.0	11.4	.3677
28.9	11.4	.3945
29.8	11.6	.3893
31.0	10.6	.3419
28.1	12.5	.4448
29.9	12.0	.4013
30.2	12.3	.4073
30.4	12.6	.4145
29.6	12.3	.4155
29.9	10.9	.3645
28.0	11.0	.3929
23.0	11.0	.4783
31.2	11.5	.3686
28.1	12.0	.4270

25. 24 years.

1	2	3
29.8	12.6	.4228
26.3	11.7	.4449
29.2	12.9	.4418
27.8	11.0	.3957
31.4	10.7	.3408
31.2	12.2	.3910
29.1	13.1	.4502
27.5	11.6	.4218
31.5	13.6	.4317
29.4	13.7	.4651
29.4	12.8	.4354
29.9	11.6	.3880
29.2	10.8	.3699
30.6	11.6	.3791
29.4	12.3	.4184
30.1	11.4	.3787
27.7	12.0	.4332
30.0	13.0	.4333
31.3	12.1	.3866
29.2	11.8	.4041
26.9	12.3	.4572
28.4	11.8	.4155
30.6	14.0	.4575
25.8	11.1	.4302
30.7	11.2	.3648
30.6	11.3	.3693
32.8	13.3	.4055
29.0	11.2	.3862
26.6	10.6	.3985
30.9	14.2	.4595
30.9	12.8	.4142
29.4	9.9	.3367
31.1	12.2	.3923
27.9	10.9	.3907
28.4	11.0	.3873
24.4	9.9	.4057
27.5	11.3	.4112
28.7	12.1	.4216
29.6	11.9	.4020
31.3	11.5	.3674
30.0	12.1	.4033
28.3	12.0	.4240
31.7	13.7	.4322
28.6	13.2	.4615
30.2	11.4	.3775
29.2	10.6	.3630
30.7	12.3	.4006

MALES

26. 25 years.

1	2	3
29.3	10.8	.3686
28.2	10.3	.3652
31.8	12.2	.3836
28.7	13.8	.4808
30.0	14.1	.4700
28.6	11.8	.4126
31.6	13.0	.4114
28.8	11.7	.4062
26.0	10.1	.3885
30.2	14.3	.4735
29.6	13.3	.4493
29.9	12.4	.4147
26.6	11.2	.4210
30.0	13.3	.4433
31.1	12.5	.4019
29.4	10.7	.3639
31.1	13.6	.4373
29.3	12.2	.4164
30.6	10.5	.3431
28.8	13.7	.4757
33.0	13.5	.4091
29.8	9.8	.3289
29.4	12.0	.4082
28.4	12.3	.4331
27.8	10.7	.3849
30.8	11.6	.3766
29.7	11.4	.3838
28.3	13.0	.4594
28.6	11.3	.3951
28.9	13.0	.4498
29.0	11.9	.4103
29.1	12.4	.4261
26.4	10.8	.4091
28.6	12.1	.4231
28.0	10.7	.3821
27.6	11.3	.4094
27.7	11.7	.4224
27.3	12.3	.4505
32.7	12.7	.3884
26.4	10.2	.3864
28.1	12.8	.4555
29.4	11.6	.3946
33.0	14.5	.4394
30.6	11.4	.3725
28.5	10.9	.3825
31.0	12.4	.4000
31.2	13.8	.4423
30.0	11.4	.3800
26.0	12.3	.4731
28.7	12.2	.4251
29.2	13.3	.4555
27.0	12.5	.4630
32.8	13.1	.3994
29.3	12.7	.4334
27.1	11.2	.4133
29.9	14.0	.4682
32.8	12.3	.3750
26.3	11.1	.4220

27. 26 years.

1	2	3
28.7	13.3	.4634
28.1	11.3	.4021
30.8	10.9	.3539
30.2	10.9	.3609
27.8	11.7	.4209
28.2	11.9	.4220
29.2	12.9	.4418
29.2	10.4	.3562
28.6	10.4	.3636
30.0	11.2	.3733
28.4	13.0	.4577
25.9	10.6	.4093
28.0	11.9	.4250
31.8	12.9	.4057
30.3	13.9	.4587
29.3	11.3	.3857
30.8	13.1	.4253
29.5	13.1	.4441
29.2	12.9	.4418
30.1	12.5	.4153
31.0	12.1	.3903
28.3	11.0	.3887
29.7	13.2	.4444
30.6	11.8	.3856
28.8	12.7	.4410
30.0	12.9	.4300
26.4	11.7	.4432
29.8	12.9	.4329
28.5	10.8	.3789
31.2	13.3	.4263
31.8	12.4	.3899
28.3	12.1	.4276
32.6	11.7	.3589
24.8	11.1	.4476
27.0	10.3	.3815
28.3	11.6	.4099
31.6	13.3	.4209
29.2	12.7	.4349
29.5	12.7	.4305
28.6	12.5	.4371
28.7	11.3	.3937
26.4	12.4	.4697
29.4	11.8	.4014
28.3	12.3	.4346
31.3	13.2	.4217
24.8	11.0	.4435
29.5	12.8	.4339

MALES

28. 27 years.

1	2	3
30.5	12.2	.4000
31.2	12.6	.4038
29.0	13.1	.4517
31.3	11.1	.3546
29.4	11.0	.3741
30.0	10.7	.3567
29.4	12.3	.4184
30.0	11.0	.3667
29.6	12.7	.4290
29.0	11.4	.3931
29.0	11.6	.4000
30.1	10.5	.3488
24.7	11.2	.4534
32.0	13.0	.4062
30.3	12.6	.4158
31.8	12.5	.3931
29.1	11.7	.4021
29.3	13.1	.4471
29.8	12.7	.4262
27.7	11.6	.4188
28.2	11.2	.3972
28.1	11.5	.4092
27.8	11.1	.3993
24.7	11.9	.4818
30.9	10.5	.3398
29.8	10.7	.3624
30.3	12.6	.4158
28.0	12.6	.4500
29.0	10.9	.3759
30.7	13.3	.4332
28.6	12.2	.4266
26.2	10.8	.4122
31.4	11.3	.3599
29.0	13.4	.4621
31.6	13.2	.4177
30.6	12.9	.4216
28.8	12.1	.4201
27.5	10.1	.3673
31.4	12.4	.3949
27.6	12.0	.4348
31.3	12.1	.3866
30.8	13.1	.4253
28.3	11.5	.4064
27.7	12.0	.4332
29.9	13.2	.4415
28.3	10.6	.3746
27.8	10.1	.3633
28.0	11.2	.4000
28.7	12.2	.4251
29.6	11.4	.3851
28.4	13.6	.4789
27.7	11.0	.3971
30.1	12.2	.4053
32.2	12.9	.4006
28.9	13.8	.4775
28.8	11.6	.4028
31.0	12.2	.3935
29.3	12.4	.4232

29. 28 years.

1	2	3
30.4	11.4	.3750
29.3	12.1	.4130
33.0	12.7	.3848
29.3	11.2	.3822
31.4	13.4	.4267
29.1	12.6	.4330
29.1	13.0	.4467
27.3	10.2	.3736
29.8	11.7	.3926
26.7	11.9	.4457
31.6	12.9	.4082
31.4	11.8	.3758
26.8	12.2	.4552
29.5	11.0	.3729
29.1	11.8	.4055
28.1	12.6	.4484
30.0	12.9	.4300
32.2	12.4	.3851
27.2	10.8	.3971
27.7	12.0	.4332
28.6	11.3	.3951
28.0	13.2	.4714
26.5	11.0	.4151
29.8	11.8	.3960
29.1	12.7	.4364
28.7	11.8	.4111
30.7	11.5	.3746
28.0	12.4	.4429
27.8	11.5	.4137
29.1	11.9	.4089
28.6	13.5	.4720
28.3	11.5	.4064
30.0	13.8	.4600
30.0	11.6	.3671
28.0	10.1	.3607
31.3	12.0	.3834
32.1	13.3	.4143
32.4	11.9	.3673
30.9	13.7	.4434

30. 29 years.

1	2	3
30.1	13.0	.4319
29.5	13.5	.4576
30.8	12.7	.4123
28.6	12.2	.4266
29.7	11.6	.3906
31.9	12.6	.3950
29.9	10.5	.3512
29.6	11.2	.3784
28.9	12.3	.4256
29.0	12.7	.4379
28.6	12.1	.4231
30.1	11.9	.3953
31.0	13.0	.4193

MALES

1	2	3
28.3	11.9	.4205
29.5	12.8	.4339
29.7	11.5	.3872
28.4	12.5	.4401
29.2	13.1	.4486
29.5	10.7	.3627
28.6	12.2	.4266
30.1	11.2	.3721
34.2	12.6	.3684
28.7	11.8	.4111
31.0	13.4	.4323
25.2	11.7	.4643
29.0	12.1	.4172
28.8	12.6	.4375
30.6	12.5	.4085
28.7	11.3	.3937
28.6	12.3	.4301
30.9	11.9	.3851
27.0	10.4	.3852
29.3	10.5	.3584
30.3	12.5	.4125
29.5	12.6	.4271
26.7	10.7	.4007
30.6	13.6	.4444
29.4	12.4	.4218
29.2	11.9	.4075
28.2	11.9	.4220
26.8	9.7	.3619
29.3	11.0	.3754
30.2	13.4	.4437
29.2	12.8	.4383
27.8	11.0	.3957

31. 30 years.

1	2	3
28.2	11.5	.4078
31.8	11.5	.3616
28.1	10.6	.3772
29.1	11.8	.4055
30.8	11.0	.3571
30.6	11.6	.3791
28.1	11.2	.3986
26.1	12.9	.4942
30.3	13.0	.4290
30.6	12.1	.3954
32.3	12.9	.3994
29.5	11.4	.3864
31.5	12.5	.3968
27.1	9.4	.3469
31.6	11.3	.3576
29.8	13.2	.4429
28.7	11.5	.4007
28.6	12.4	.4336
28.1	12.4	.4413
28.9	12.5	.4325
28.6	12.2	.4266
31.0	13.4	.4323
28.7	11.9	.4146
33.3	14.6	.4384
30.2	12.1	.4007
31.6	12.1	.3829
31.1	13.5	.4341
29.0	12.8	.4414
30.8	12.4	.4026
26.1	11.5	.4406
32.0	13.9	.4344
32.7	14.0	.4281
29.5	10.9	.3695
24.9	10.3	.4136
28.5	11.0	.3860
30.3	12.9	.4257
29.6	13.0	.4392
30.2	12.7	.4205
29.2	11.4	.3904
30.6	11.4	.3725
28.8	12.7	.4410
28.4	11.8	.4155
29.1	11.9	.4089
31.6	13.0	.4114
29.2	13.1	.4486
29.4	13.6	.4626
29.0	10.6	.3655
28.5	11.4	.4000
31.1	12.6	.4051

32. 31 years.

1	2	3
32.0	13.4	.4187
27.1	11.8	.4354
29.3	12.7	.4334
29.6	11.1	.3750
30.0	12.7	.4233
29.3	10.3	.3515
25.9	9.8	.3784
28.0	11.4	.4071
30.6	12.9	.4216
28.4	12.8	.4507
30.1	12.3	.4086
30.2	11.2	.3709
29.6	12.1	.4088
27.5	10.4	.3782
28.5	12.0	.4210
29.9	12.6	.4214
27.6	12.2	.4420
28.7	11.9	.4146
31.5	14.1	.4476
25.8	11.3	.4380
30.0	12.6	.4200
33.9	14.0	.4130
28.7	11.2	.3902
23.5	11.3	.4808
29.1	12.0	.4124
13.1	28.1	.4662
29.6	13.2	.4459
28.6	12.3	.4301
29.9	12.9	.4314
32.5	14.0	.4308
23.6	11.5	.4873
29.4	12.2	.4150
28.2	11.2	.3972
32.0	12.1	.3781
30.5	11.4	.3738

MALES

1	2	3
30.9	12.6	.4078

33. 32 years.

1	2	3
30.2	11.4	.3775
30.6	11.8	.3856
26.8	9.5	.3545
28.5	11.4	.4000
29.5	12.5	.4237
30.1	12.5	.4153
28.0	11.9	.4250
30.1	10.9	.3621
29.4	11.0	.3741
27.0	11.5	.4259
27.1	10.7	.3948
30.3	13.4	.4422
32.2	13.5	.4192
29.1	12.4	.4261
31.7	14.5	.4574
30.6	11.8	.3856
26.2	11.3	.4313
30.1	12.3	.4086
28.5	11.0	.3860
32.7	13.3	.4067
29.1	11.4	.3917
32.0	11.2	.3500
28.6	13.1	.4580
26.9	11.1	.4126
28.2	12.2	.4326
29.3	12.0	.4096
24.0	10.9	.4542
29.2	12.3	.4212
31.2	13.8	.4423
30.7	13.3	.4332
30.6	11.2	.3660
27.0	13.1	.4852
27.8	11.7	.4209
28.8	13.6	.4722
30.4	13.4	.4408
27.1	10.4	.3838

1	2	3
31.4	11.0	3503

34. 33 years.

1	2	3
27.9	10.7	.3835
31.2	11.8	.3782
26.1	10.7	.4100
28.7	10.9	.3798
33.3	13.5	.4054
27.6	10.2	.3696
33.1	14.0	.4230
27.7	12.7	.4585
29.1	11.4	.3917
29.0	11.9	.4103
31.9	12.2	.3824
30.1	11.4	.3787
28.8	12.8	.4444
29.6	12.5	.4223
31.2	11.5	.3686
31.5	13.8	.4381
30.5	12.6	.4131
28.2	13.3	.4716
30.6	12.0	.3922
29.3	12.0	.4096
30.7	12.4	.4039
31.4	12.6	.4013
24.4	10.3	.4221
29.6	12.3	.4155
28.3	13.3	.4700
30.6	10.3	.3366
29.7	13.9	.4680
29.2	11.9	.4075
28.5	11.7	.4105
30.1	13.1	.4352
31.8	12.2	.3836
28.3	11.9	.4205
33.5	14.0	.4179
26.2	12.3	.4695
29.8	11.4	.3825
30.8	12.8	.4156

1	2	3
29.4	11.4	.3877
31.2	13.1	.4199
32.3	13.2	.4061
28.5	11.8	.4140

35. 34 years.

1	2	3
30.1	12.4	.4119
32.6	13.1	.4018
26.5	11.6	.4377
28.0	11.6	.4143
32.1	12.8	.3987
29.7	12.9	.4343
28.1	12.4	.4413
30.4	12.4	.4079
26.3	9.9	.3764
30.2	13.1	.4338
29.3	12.2	.4164
31.1	10.9	.3505
29.5	12.6	.4271
28.0	11.4	.4071
27.4	11.0	.4015
30.2	14.1	.4669
29.9	10.8	.3612
28.1	10.7	.3808
27.4	13.3	.4854
29.1	12.0	.4124
30.3	14.1	.4653
30.4	12.8	.4210
28.4	11.8	.4155
30.2	13.3	.4404
28.0	11.9	.4250
29.7	14.4	.4848
28.6	13.1	.4580
29.2	13.5	.4623
28.3	12.1	.4276
28.1	11.7	.4164
28.7	11.7	.4077
31.1	13.5	.4341
28.6	11.2	.3916

MALES

1	2	3
28.7	12.5	.4355
29.0	9.7	.3345
28.8	12.0	.4167
27.7	11.6	.4188
28.3	12.3	.4346
28.8	12.4	.4305
32.9	14.1	.4286
27.2	12.6	.4632

36. 35 years.

29.3	11.6	.3959
29.9	13.5	.4515
29.3	12.1	.4130
29.5	12.4	.4203
28.6	12.4	.4336
30.4	11.9	.3914
26.6	10.5	.3947
29.9	9.2	.3077
26.9	10.4	.3866
27.8	11.8	.4245
31.5	12.9	.4095
28.4	11.9	.4190
30.1	12.5	.4153
31.0	11.6	.3742
27.1	12.1	.4465
28.3	12.5	.4417
29.5	12.7	.4305
30.4	10.9	.3585
28.6	12.8	.4475
31.4	11.9	.3790
29.1	12.2	.4192
30.8	12.9	.4188
29.8	12.5	.4195
28.6	12.7	.4441
28.3	13.1	.4629
28.1	12.6	.4484
28.1	11.2	.3986
26.1	10.3	.3946
27.8	10.8	.3885
32.0	13.9	.4344
30.7	12.1	.3941
28.0	11.4	.4071
33.2	14.4	.4337
29.6	13.0	.4392

37. 36 years.

29.4	10.9	.3707
28.1	12.7	.4520
27.0	10.3	.3815
28.4	12.6	.4437
28.8	13.3	.4618
31.0	12.0	.3871
29.4	12.3	.4184
30.1	13.1	.4352
31.9	13.9	.4357
24.9	11.8	.4739
31.1	12.7	.4084
31.9	13.4	.4201
24.5	10.2	.4163
31.0	12.5	.4032
27.4	11.8	.4307
30.2	11.4	.3775
29.8	13.1	.4396
28.2	10.4	.3687
28.2	12.0	.4255
30.5	13.5	.4426
29.7	12.1	.4074
30.7	12.9	.4202
31.5	12.5	.3968
28.3	10.8	.3716
29.5	14.3	.4847
27.1	11.0	.4059
29.7	13.4	.4512
28.8	13.3	.4618
30.0	13.0	.4333
30.5	12.5	.4098
30.8	13.8	.4480
28.0	11.7	.4179
30.1	13.7	.4551
31.5	13.3	.4222

38. 37 years.

28.0	11.6	.4143
29.3	11.7	.3993
28.0	8.8	.3143
26.8	10.7	.3992
28.7	10.9	.3798
31.2	11.9	.3814
30.7	12.8	.4169
29.8	12.5	.4195
29.2	12.8	.4384
30.1	12.8	.4252
28.4	10.9	.3838
27.7	11.4	.4115
28.3	13.6	.4806
28.2	11.1	.3936
31.1	11.4	.3666
29.9	10.9	.3645
29.4	13.2	.4490
30.5	12.3	.4032
29.9	11.9	.3980
30.3	12.4	.4092
28.2	11.4	.4042
27.2	11.7	.4301
27.4	12.1	.4416
29.8	13.6	.4564
28.4	13.5	.4753
28.1	12.0	.4270
27.5	11.1	.4036
31.0	13.3	.4290
28.6	11.6	.4056
29.7	11.3	.3805
29.3	11.8	.4027
31.1	12.7	.4084
32.0	12.4	.3875
28.1	12.9	.4591
27.2	10.3	.3787

MALES

39. 38 years.

1	2	3
28.2	12.2	.4326
29.2	11.9	.4075
32.6	13.2	.4049
31.2	13.0	.4167
30.2	13.6	.4503
28.8	12.4	.4305
29.2	11.6	.3973
28.2	12.9	.4574
30.0	12.8	.4267
29.5	11.8	.4000
28.8	13.4	.4653
29.1	11.5	.3952
31.9	13.9	.4357
27.3	11.4	.4176
32.1	13.3	.4143
29.5	12.8	.4339
30.1	10.8	.3588
30.3	13.5	.4455
31.1	12.0	.3858
28.6	11.6	.4056
28.0	12.6	.4500
31.2	13.2	.4231
29.7	11.8	.3973
28.3	9.8	.3463
29.3	12.8	.4369
31.3	13.7	.4521
31.0	11.5	.3710
27.9	12.1	.4337
31.8	13.2	.4151
32.2	12.8	.3975

40. 39 years.

1	2	3
29.7	12.8	.4310
27.9	12.8	.4588
27.6	12.4	.4493
28.6	11.6	.4056
29.3	10.0	.3413
29.6	11.5	.3885
30.8	12.9	.4188
28.1	11.6	.4128
29.6	11.8	.3986
28.4	12.9	.4542
26.7	12.1	.4532
31.0	12.8	.4129
29.6	10.9	.3682
29.0	11.7	.4034
27.7	12.9	.4657
32.0	12.8	.4000
27.0	10.9	.4037
30.7	11.2	.3648
24.5	10.8	.4408
30.3	12.9	.4257
29.5	12.8	.4339
28.3	13.1	.4629
30.6	12.2	.3987
30.9	12.6	.4078
25.4	10.4	.4094

41. 40 years.

1	2	3
29.5	11.9	.4034
28.4	11.2	.3944
29.0	10.7	.3690
30.7	12.5	.4072
28.0	11.4	.4071
25.2	11.2	.4444
27.2	11.2	.4118
28.2	9.9	.3511
28.8	11.7	.4062
31.2	13.1	.4199
33.6	14.0	.4167
31.6	12.0	.3797
26.6	11.9	.4474
28.5	12.3	.4316
30.7	12.4	.4039
29.7	12.9	.4343
32.2	10.3	.3199
30.4	12.7	.4178
28.5	13.6	.4772
27.3	11.3	.4139
25.6	11.0	.4297
28.9	12.9	.4464
29.2	14.5	.4966
29.2	12.7	.4349
28.3	13.0	.4594
29.9	10.5	.3512
28.2	10.3	.3692
32.5	13.6	.4185
31.8	12.2	.3836
30.0	12.4	.4133

42. 41 years.

1	2	3
28.7	11.6	.4042
31.2	13.0	.4167
29.5	13.5	.4576
29.4	11.9	.4048
27.0	10.9	.4037
29.0	12.2	.4207
29.4	11.4	.3877
28.5	11.6	.4070
29.5	13.0	.4407
28.6	12.0	.4196
29.0	12.3	.4241
26.3	9.7	.3688
29.2	12.2	.4178
27.4	11.8	.4307
26.9	11.9	.4424
29.1	12.4	.4261
32.3	12.9	.3994
26.3	12.8	.4867
29.9	13.0	.4348
27.1	11.7	.4317

MALES

43. 42 years.

1	2	3
30.3	11.4	.3762
30.7	12.0	.3909
25.8	12.0	.4651
25.9	11.6	.4479
27.9	9.8	.3512
32.8	12.9	.3933
29.6	13.4	.4527
28.0	12.9	.4607
28.3	12.1	.4276
29.4	11.9	.4048
28.3	12.1	.4276
28.2	11.7	.4149
28.1	12.0	.4270
28.6	13.2	.4615
28.3	12.6	.4452
27.6	12.8	.4638
30.5	12.2	.4000
31.4	11.8	.3758
29.2	11.3	.3870

44. 43 years.

1	2	3
26.8	12.0	.4478
31.7	12.7	.4006
29.8	12.5	.4195
27.7	12.2	.4404
29.3	12.5	.4266
28.3	12.0	.4240
30.5	13.4	.4393
27.6	11.8	.4275
28.9	12.8	.4429
28.4	10.6	.3732
29.9	13.2	.4415
25.4	11.4	.4488
28.4	13.1	.4613
27.7	10.7	.3862
28.4	12.5	.4401
28.6	12.0	.4196
27.7	12.3	.4440
28.2	12.5	.4433
27.5	10.5	.3818
30.1	11.8	.3920
30.4	13.9	.4572
29.1	11.5	.3952
28.3	10.7	.3781
24.7	11.2	.4534
28.7	12.2	.4251
27.9	12.3	.4409
29.8	13.4	.4497
28.5	11.3	.3965
27.7	11.5	.4152
29.3	10.9	.3720
28.0	12.5	.4464

45. 44 years.

1	2	3
28.7	11.5	.4007
27.8	11.2	.4029
28.8	12.4	.4305
31.2	13.6	.4359
27.4	11.8	.4307
29.7	12.5	.4209
32.5	14.1	.4338
29.2	12.5	.4281
30.1	12.5	.4153
30.3	11.4	.3762
28.0	11.7	.4179
28.4	11.8	.4155
29.3	12.8	.4369
28.5	12.0	.4210
29.7	12.5	.4209
30.5	11.4	.3738
29.8	12.2	.4094
28.3	11.4	.4028
30.7	12.3	.4006
29.6	11.1	.3750
30.3	13.1	.4323
29.7	12.0	.4040

46. 45 years.

1	2	3
30.1	14.5	.4817
28.3	11.2	.3958
29.0	12.7	.4379
28.1	11.3	.4021
29.8	12.9	.4329
29.6	11.9	.4020
32.0	12.2	.3812
28.2	13.2	.4681
30.0	11.7	.3900
32.6	12.5	.3834
28.7	11.2	.3902
27.4	12.7	.4635
27.2	11.6	.4265
29.3	10.3	.3515
28.8	12.7	.4410
29.7	14.1	.3737
28.2	10.9	.3865
31.3	13.7	.4377
28.3	12.1	.4276
28.7	13.1	.4564
27.9	11.3	.4050
28.7	11.8	.4111
28.3	11.5	.4064
25.3	10.9	.4301
30.1	12.4	.4120
27.8	13.2	.4748
27.5	11.6	.4218
30.0	10.8	.3600
31.5	13.4	.4254
27.4	10.2	.3723
29.7	13.4	.4512
30.3	11.3	.3729
32.9	13.3	.4043
29.8	12.6	.4228
31.7	12.1	.3817

MALES

47. 46 years.

1	2	3
29.4	12.9	.4388
27.6	11.3	.4094
30.3	11.9	.3927
29.8	9.9	.3322
29.6	13.6	.4595
29.8	12.4	.4161
31.0	12.8	.4129
25.5	10.3	.4039
29.4	12.0	.4082
28.3	10.7	.3781
29.6	9.9	.3345
27.8	11.2	.4028
26.9	11.3	.4201
29.8	13.2	.4429
29.1	12.1	.4158
28.1	11.8	.4199
27.9	12.8	.4588
28.9	11.0	.3806
29.2	11.3	.3870
27.5	10.0	.3636
29.2	10.1	.3459
28.2	12.9	.4574
26.2	11.5	.4389
29.3	12.4	.4232
29.0	11.8	.4069
29.9	12.9	.4314
27.7	11.5	.4152
30.8	13.3	.4318
25.7	9.2	.3580

48. 47 years.

1	2	3
29.3	12.2	.4164
28.5	11.1	.3895
28.4	11.6	.4084
27.6	11.2	.4058
25.8	10.7	.4147
29.1	11.2	.3849
28.5	12.2	.4281
30.8	11.6	.3766
29.2	11.1	.3801
26.2	12.3	.4695
28.7	9.5	.3310
30.1	12.4	.4120
29.8	12.4	.4161
29.0	11.2	.3862
27.2	11.4	.4191
31.7	12.4	.3912
28.7	13.2	.4599
31.3	12.7	.4057
30.7	12.3	.4006
27.4	11.4	.4161
30.8	12.0	.3896
29.0	11.7	.4034
30.9	12.8	.4142
31.3	13.2	.4217
29.8	13.1	.4396
28.9	12.8	.4429
28.8	12.1	.4201
29.8	13.1	.4396
31.3	13.4	.4281
28.8	12.5	.4340

49. 48 years.

1	2	3
28.5	9.8	.3439
31.1	12.8	.4116
25.8	11.9	.4612
28.9	13.1	.4533
28.1	12.5	.4448
28.8	10.4	.3611
28.6	11.0	.3846
26.7	12.7	.4756
27.4	9.9	.3613
30.4	12.3	.4046
29.6	12.0	.4054
29.5	13.4	.4542
26.7	11.9	.4457
30.4	13.4	.4408
25.2	11.2	.4444
26.6	12.1	.4549
28.1	10.9	.3879
28.5	11.9	.4175
28.0	10.2	.3643
31.9	13.2	.4138
28.4	12.7	.4472
28.3	10.8	.3816
30.0	13.6	.4533
26.0	9.4	.3615
30.4	11.0	.3618
33.6	14.2	.4226
31.4	11.5	.3662
29.1	11.2	.3849

50. 49 years.

1	2	3
26.3	10.4	.3954
28.7	12.4	.4321
27.0	11.9	.4407
28.9	12.5	.4325
13.5	30.5	.4369
27.0	11.8	.4370
29.1	13.5	.4639
26.3	10.0	.3802
27.8	9.8	.3525
29.6	12.6	.4257
26.8	10.8	.4030
33.0	14.2	.4303
29.5	13.7	.4644
32.2	13.2	.4099
30.2	11.5	.3808
28.2	12.3	.4362
28.0	13.0	.4643
27.2	10.6	.3897

MALES

1	2	3
27.1	11.4	.4207
30.8	12.7	.4123
29.0	12.3	.4241
31.1	11.1	.3569
27.4	10.6	.3869

51. 50 years.

1	2	3
24.1	10.3	.4274
29.9	11.4	.3813
27.7	11.5	.4152
31.6	13.4	.4240
29.3	12.4	.4232
27.4	12.8	.4671
29.5	12.1	.4102
29.6	11.5	.3885
26.9	12.1	.4498
30.3	10.7	.3531
31.2	13.0	.4167
28.2	9.8	.3475
27.1	10.8	.3985
26.9	11.5	.4275
29.1	12.4	.4261
30.0	11.9	.3967
27.2	11.7	.4301
28.6	13.6	.4755
29.1	11.5	.3952
31.6	12.9	.4082
30.8	14.0	.4545
30.3	13.7	.4521
28.0	11.6	.4143
29.1	9.4	.3230
29.2	12.0	.4110
26.9	10.1	.3755
30.5	11.8	.3869
34.2	12.9	.3772
26.7	11.6	.4344
30.7	12.4	.4039

52. 51 years.

1	2	3
29.8	11.0	.3691
29.4	12.5	.4252
25.2	10.7	.4246
29.5	11.7	.3966
28.0	11.8	.4214
26.4	11.5	.4356
29.2	11.2	.3836
27.3	10.7	.3919
30.4	13.0	.4276
28.2	12.8	.4539
31.3	13.6	.4345
28.5	12.2	.4281
30.7	12.4	.4039
30.7	12.8	.4169
31.2	13.2	.4231
27.2	10.3	.3787
29.2	13.6	.4657
28.2	11.4	.4042
29.1	12.5	.4295
28.7	12.8	.4460

53. 52 years.

1	2	3
30.7	13.3	.4332
27.3	11.4	.4175
29.7	11.7	.3939
29.2	12.9	.4418
27.0	11.4	.4222
29.7	12.1	.4074
28.6	13.0	.4545
29.8	11.5	.3859
31.9	12.7	.3981
31.7	13.4	.4227
30.4	12.7	.4178
27.5	10.5	.3818
26.9	12.4	.4610
30.8	12.6	.4091
29.4	12.7	.4320
29.8	13.2	.4430
28.8	12.2	.4236
32.4	11.6	.3580
32.7	12.8	.3914
28.2	12.1	.4291
27.8	11.3	.4065
30.2	10.7	.3543
29.0	12.8	.4414
30.2	12.1	.4007
31.4	12.2	.3885
30.8	13.3	.4318

54. 53 years.

1	2	3
32.6	12.5	.3834
30.9	12.3	.3981
27.5	12.3	.4473
27.5	10.6	.3854
30.0	13.0	.4333
29.2	11.7	.4007
31.1	12.9	.4148
30.6	13.6	.4444
27.7	12.6	.4549
32.1	13.2	.4112
27.8	11.9	.4281
31.2	14.2	.4551
29.7	11.6	.3906
28.7	13.4	.4669
29.2	12.3	.4212
27.0	10.5	.3889
28.3	12.8	.4523
29.3	11.6	.3959
29.9	11.8	.3946
29.5	13.1	.4441
27.1	10.9	.4022
26.6	12.1	.4549
29.8	13.7	.4597
24.3	11.0	.4527

MALES

1	2	3
28.8	13.4	.4653
26.3	9.8	.3726
29.8	11.3	.3792
29.2	11.4	.3904

55. 54 years.

1	2	3
25.6	10.2	.3983
29.8	11.9	.3993
25.8	11.5	.4457
24.4	10.6	.4344
28.3	12.3	.4346
28.4	11.3	.3979
28.1	11.1	.3950
27.8	10.8	.3885
30.3	12.2	.4026
30.4	13.3	.4375
31.0	13.0	.4193
26.6	11.4	.4286
27.9	10.5	.3763
30.1	13.0	.4318
29.2	12.2	.4178
26.9	11.6	.4312
32.8	12.8	.3902
27.1	10.7	.3948

56. 55 years.

1	2	3
27.9	11.8	.4229
26.5	11.5	.4340
30.0	13.5	.4500
28.4	13.3	.4683
29.0	13.4	.4621
28.1	12.4	.4413
28.8	11.4	.3958
28.3	12.0	.4240
27.1	11.2	.4133
26.9	13.4	.4981

1	2	3
28.5	13.0	.4561
26.7	11.3	.4232
31.1	13.0	.4180
27.5	11.5	.4182
26.2	11.2	.4275
27.6	11.5	.4167
29.0	11.4	.3931
32.6	13.9	.4264
26.6	11.7	.4398
28.8	12.0	.4167
28.7	12.1	.4216

57. 56 years.

1	2	3
30.1	11.5	.3821
28.6	13.3	.4651
31.1	12.0	.3858
25.0	9.9	.3960
30.9	13.2	.4272
28.8	12.2	.4236
24.8	11.9	.4798
31.4	13.7	.4363
30.8	12.9	.4188
30.4	12.3	.4046
30.6	10.6	.3464
28.8	12.5	.4340
27.8	11.4	.4101
30.1	14.6	.4850
31.9	13.9	.4357
31.6	12.8	.4051
28.2	12.8	.4539
28.1	10.1	.3594

58. 57 years.

1	2	3
30.4	13.6	.4474
28.4	13.6	.4789
30.3	12.5	.4125

1	2	3
30.8	12.9	.4188
29.0	13.2	.4552
26.8	10.4	.3880
26.1	12.7	.4866
32.6	13.5	.4141
27.4	11.8	.4307
27.8	10.3	.3705
26.9	12.8	.4758
29.0	12.1	.4172
27.3	11.6	.4249
30.7	11.8	.3844
28.7	12.2	.4251
29.4	12.4	.4218
26.4	11.2	.4242
27.7	11.4	.4116
31.0	11.6	.3742
27.8	10.9	.3921
30.2	13.9	.4603
29.9	11.9	.3980

59. 58 years.

1	2	3
32.6	12.3	.3773
29.3	12.0	.4095
30.1	13.3	.4419
26.7	12.2	.4569
29.5	12.6	.4271
28.8	13.6	.4722
25.7	10.0	.3891
28.6	12.4	.4336
31.3	13.1	.4185
29.1	11.3	.3883
28.4	12.6	.4437
27.7	12.1	.4368
26.9	9.7	.3606
27.2	12.0	.4412
28.1	11.0	.3915
28.0	12.3	.4393
26.2	10.1	.3855
27.9	12.7	.4552

MALES

50. 59 years.

1	2	3
27.3	11.7	.4286
28.0	13.4	.4786
26.7	11.0	.4120
27.4	11.6	.4234
29.2	12.3	.4212
26.4	9.4	.3561
26.8	11.1	.4142
29.8	11.9	.3993
27.7	11.3	.4079
26.0	11.7	.4500
27.8	12.4	.4460
26.1	12.4	.4751
28.1	13.3	.4733
31.7	12.8	.4038

60 years and more.

The observations used for the males aged 60 years and more are largely those recorded on pages 111 to 119 with the exceptions that some of these observations are not used because this part of the thesis was completed before all the 400 healthy men were examined at the Rutherglen Centre, and some additional observations were derived from the records of the chest clinic.

FEMALES

1. Under one year.

1	2	3
13.3	7.2	.5413
14.9	7.3	.4899
14.1	8.0	.5674
12.4	6.6	.5323
13.6	6.1	.4485
14.2	6.8	.4789
13.7	7.0	.5109
14.9	7.2	.4832
12.8	7.5	.5859
16.6	8.1	.4879
12.2	6.0	.4918
13.1	7.1	.5420
12.8	6.6	.5156
13.8	8.2	.5942
12.9	7.3	.5659
15.3	7.1	.4640
14.7	6.9	.4694
15.5	8.2	.5290
14.1	7.2	.5106
14.5	7.7	.5310
14.1	7.0	.4964
13.2	7.2	.5454
14.0	6.8	.4857

2. One year.

1	2	3
14.5	8.6	.5931
14.7	7.2	.4898
13.7	7.3	.5328
16.0	7.6	.4750
15.6	7.3	.4679
14.6	7.1	.4863
17.7	8.9	.5028
14.5	7.0	.4827
16.5	8.3	.5030
15.2	8.0	.5263
14.8	7.5	.5067
15.5	8.0	.5161
15.0	7.4	.4933
14.1	7.9	.5603
13.9	7.1	.5108
15.5	6.9	.4452
13.8	8.0	.5797
13.8	7.2	.5217
13.1	7.9	.6030
15.1	7.3	.4834
13.9	7.1	.5108
14.1	7.1	.5035
12.9	7.4	.5736
14.5	7.4	.5103
12.8	7.5	.5859
14.7	6.7	.4558
15.8	7.7	.4873
16.2	7.7	.4753
15.3	7.8	.5098
14.8	7.5	.5068
15.6	8.4	.5385
16.2	8.2	.5062
14.8	7.7	.5203
15.8	8.0	.5063

3. 2 years.

1	2	3
17.2	8.7	.5058
16.1	7.9	.4907
16.7	8.1	.4850
14.9	6.7	.4497
14.9	7.5	.5033
14.7	7.9	.5374
14.5	7.3	.5034
15.8	7.7	.4873
16.6	7.8	.4699
17.1	8.9	.5205
16.3	8.0	.4908
14.9	7.6	.5101
16.7	8.5	.5090
15.6	7.6	.4872
15.3	7.5	.4902
16.6	7.7	.4638
14.9	7.9	.5302
16.1	7.0	.4348
15.6	8.5	.5449
14.9	7.7	.5168
16.2	8.0	.4938
16.2	7.9	.4876
15.7	7.4	.4713
15.6	7.9	.5064
17.7	8.5	.4802
15.5	8.3	.5355
13.4	7.5	.5597
18.3	7.9	.4317
15.9	7.9	.4968
14.9	7.8	.5235
15.2	8.3	.5460
15.9	8.2	.5157
14.9	8.1	.5436
16.3	8.0	.4908
16.0	7.8	.4875
15.5	7.8	.5032
17.8	8.8	.4944
16.3	8.8	.5399
16.5	8.1	.4909
15.5	7.4	.4774
15.8	8.5	.5380
16.0	8.0	.5000
16.7	7.8	.4671
14.1	6.5	.4610
16.5	8.4	.5091
16.2	8.0	.4938
16.3	7.6	.4662
15.8	8.3	.5253
15.7	7.5	.4777
16.6	7.8	.4699
16.4	7.7	.4695
16.0	8.7	.5437
15.6	7.1	.4551
17.1	8.1	.4737
17.0	8.1	.4765
15.8	8.1	.5127
15.4	7.6	.4935
16.9	7.3	.4591
17.5	8.1	.4628

FEMALES

1	2	3	1	2	3	1	2	3
17.3	7.6	.4393	15.4	7.3	.4740	16.8	8.8	.4681
15.3	7.4	.4837	15.0	7.9	.5267	15.3	7.5	.4902
17.1	9.0	.5263				15.8	8.3	.5253
15.1	7.7	.5099				16.3	7.9	.4847
18.0	8.9	.4944	4. 3 years.			17.0	8.6	.5059
16.2	8.0	.4938				17.1	8.4	.4912
15.1	7.8	.5165				16.8	8.4	.5000
15.3	7.0	.4575	15.8	7.8	.4937	17.7	8.8	.4972
15.9	7.7	.4843	17.5	8.1	.4629	16.3	8.1	.4969
15.3	6.9	.4510	15.4	7.4	.5109	16.4	7.8	.4756
15.1	8.1	.5364	15.8	8.5	.5380	15.3	7.8	.5098
15.1	7.3	.4834	15.7	7.9	.5032	18.3	8.4	.4590
15.9	8.1	.5094	16.2	8.5	.5247	16.6	8.5	.5120
16.8	8.6	.5119	15.7	7.6	.4841	15.6	7.9	.5064
17.0	8.9	.5235	16.0	7.7	.4812	17.1	8.4	.4912
16.4	7.9	.4817	17.2	8.4	.4884	17.0	8.6	.5059
16.7	7.9	.4730	17.6	8.6	.4886	17.1	8.9	.5205
13.9	7.5	.5396	17.6	7.7	.4375	16.8	9.0	.5357
15.9	7.7	.4843	15.8	8.4	.5316	16.9	8.2	.4852
18.0	9.6	.5333	16.4	7.4	.4512	18.1	8.8	.4862
15.0	7.3	.4867	17.6	9.0	.5114	17.1	6.8	.3977
16.9	8.6	.4089	16.2	8.7	.5370	17.6	8.5	.4829
18.4	9.2	.5000	15.4	8.1	.5260	16.4	8.6	.5244
15.9	8.4	.5283	17.2	8.4	.4884	15.6	8.0	.5128
15.3	7.8	.5098	15.9	8.5	.5346	16.4	8.1	.4939
16.6	8.1	.4879	15.3	7.5	.4902	16.5	8.8	.5333
14.9	7.7	.5168	16.5	8.7	.5273	15.6	8.0	.5128
14.8	7.5	.5067	15.6	8.2	.5256	16.6	8.5	.5120
17.9	8.4	.4693	16.8	8.5	.5051	17.3	8.3	.4797
15.5	7.7	.4968	16.7	7.7	.4611	16.2	8.1	.5000
15.3	8.3	.5425	16.6	7.8	.4699	17.5	8.3	.4743
17.3	8.5	.4913	16.4	8.6	.5244	16.7	8.4	.5030
15.6	7.9	.5064	17.4	9.0	.5172	16.0	7.3	.4562
15.4	8.2	.5325	14.6	7.0	.4794	17.1	7.7	.4503
15.8	7.9	.5000	16.9	8.1	.4793	17.0	7.6	.4471
15.1	7.5	.4967	17.5	8.1	.4628	15.5	7.8	.5032
15.7	8.1	.5159	16.1	7.6	.4720	17.6	8.3	.4716
15.5	8.2	.5290	17.6	8.2	.4659	15.0	7.9	.5267
15.7	8.3	.5287	16.9	8.0	.4734	17.6	8.3	.4716
15.4	8.2	.5325	18.1	8.9	.4917	17.4	8.8	.5057
15.4	8.0	.5195	16.4	8.2	.5000	18.2	9.0	.4945
16.4	8.0	.4878	16.1	7.8	.4845	16.7	8.5	.5090

FEMALES

1	2	3	1	2	3	1	2	3
16.5	7.8	.4727	17.8	9.5	.5337	16.3	7.5	.4600
16.9	8.3	.4911	17.3	8.0	.4624	15.9	8.0	.5031
16.2	8.6	.5309	17.4	8.0	.4598	15.6	7.8	.5000
16.7	7.4	.4431	16.4	8.2	.5000	16.1	8.4	.5217
16.3	8.0	.4908	17.4	8.5	.4885	17.1	8.0	.4678
17.8	8.2	.4607	16.9	8.6	.5089	15.8	8.2	.5190
16.0	7.4	.4625	16.4	8.2	.5000	17.3	8.4	.4855
16.2	7.7	.4753	18.7	9.0	.4813	17.9	8.2	.4581
16.4	7.7	.4695	16.3	8.2	.5030	16.8	8.5	.5059
15.7	7.8	.4968	17.7	9.1	.5141	17.7	8.0	.4520
15.7	8.4	.5350	17.2	9.0	.5232	16.8	8.8	.5238
16.3	8.8	.5399	15.5	7.7	.4968	16.4	7.5	.4573
18.0	8.4	.4667	16.5	8.3	.5030	16.5	8.1	.4909
17.1	8.4	.4941	17.7	7.8	.4407	16.7	8.8	.5269
17.3	9.0	.5202	17.4	8.0	.4598	16.1	8.3	.5155
16.3	8.5	.5215	16.4	7.9	.4817	17.2	8.1	.4709
15.9	9.2	.5786	17.0	8.2	.4823	17.4	7.9	.4540
15.2	7.1	.4671	18.2	9.7	.5330	17.8	8.7	.4888
14.9	9.1	.6107	16.1	7.2	.4472	17.2	8.2	.4767
16.6	7.2	.4337	16.0	8.1	.5062	18.5	9.0	.4865
16.5	7.4	.4485	17.1	8.2	.4795	16.3	8.6	.5307
			17.7	8.9	.5028	17.8	9.8	.5506
			17.1	8.3	.4854	16.2	7.7	.4753
5. 4 years.			16.0	8.4	.5250	16.5	8.6	.5212
			16.8	8.4	.5000	16.0	8.0	.5031
			16.4	7.6	.4634	16.3	8.6	.5276
16.7	8.4	.5030	17.5	8.7	.4971	16.8	8.7	.5179
16.0	8.2	.5125	17.9	8.7	.4860	17.5	8.8	.5029
18.1	8.0	.4420	16.2	8.3	.5123	17.4	7.8	.4483
18.0	8.4	.4667	17.0	8.2	.4823	15.6	8.9	.5705
16.8	7.9	.4702	16.4	8.7	.5305	16.2	8.6	.5309
15.7	8.2	.5223	17.7	8.7	.4915	15.6	7.1	.4551
16.5	8.4	.5091	17.9	8.4	.4693	16.4	7.2	.4390
15.9	7.8	.4906	17.0	7.7	.4529			
18.2	8.6	.4725	16.1	8.4	.5217			
17.0	8.1	.4765	15.6	8.1	.5192			
17.7	9.0	.5085	15.8	7.9	.5000			
16.4	7.4	.4512	15.6	8.6	.5513			
17.6	8.8	.5000	16.7	8.0	.4790			
16.3	8.6	.5276	17.7	7.7	.4350			
16.7	8.5	.5090	16.4	7.9	.4817			
16.5	8.5	.5151	17.7	8.7	.4915			

FEMALES

1	2	3	1	2	3	1	2	3
6. 5 years.								
17.8	9.6	.5393	18.7	9.2	.4920	17.9	9.6	.5363
17.4	9.4	.5402	18.1	8.8	.4862	17.6	9.0	.5114
16.7	8.0	.4790	17.8	9.5	.5337	18.6	8.5	.4570
16.6	9.6	.5783	16.4	8.0	.4878	17.3	8.8	.5087
18.4	10.1	.5489	16.2	8.7	.5370	19.7	9.3	.4721
16.2	7.6	.4691	15.3	8.6	.5621	19.5	9.1	.4667
18.7	9.0	.4813	17.3	9.4	.5433	16.7	7.6	.4551
19.9	9.4	.4723	16.9	8.5	.5029	17.5	8.4	.4800
16.3	7.9	.4847	18.5	9.1	.4919	17.0	8.0	.4706
17.2	9.1	.5291	17.7	9.4	.5311	19.0	8.3	.4368
18.0	8.6	.4778	17.1	8.1	.4737	18.4	10.1	.5489
18.1	8.7	.4807	18.5	7.8	.4216	18.0	8.3	.4611
16.9	9.0	.5325	17.4	7.8	.4483	18.5	7.4	.4000
18.1	8.7	.4807	16.0	7.8	.4875	16.5	8.8	.5333
16.6	9.0	.5422	16.9	8.5	.5030	17.3	9.0	.5202
17.1	8.2	.4795	17.7	8.2	.4633	18.2	9.1	.5000
17.4	7.9	.4540	18.0	7.6	.4222	18.1	8.3	.4586
18.2	8.7	.4780	17.2	8.8	.5116	18.2	9.2	.5055
20.3	9.4	.4630	17.3	8.6	.4971	17.7	8.3	.4689
19.1	9.1	.4764	18.1	8.5	.4696	15.4	7.7	.5000
20.4	9.5	.4657	16.1	8.7	.5404	16.2	8.8	.5432
17.3	8.8	.5087	17.3	8.1	.4682	18.3	9.2	.5027
18.5	7.4	.4000	17.8	8.5	.4775	15.4	7.9	.5130
17.6	8.9	.5057	17.4	8.6	.4942	16.4	7.9	.4817
17.6	9.5	.5398	17.3	9.0	.5202	16.5	7.9	.4788
18.6	9.8	.5269	17.2	8.3	.4825	18.3	8.2	.4481
20.2	9.7	.4802	17.6	7.9	.4489	17.6	8.6	.4886
17.5	8.8	.5028	17.1	8.5	.4971	17.2	8.5	.4942
18.1	9.6	.5304	17.6	8.7	.4943	17.3	8.3	.4798
17.1	8.8	.5146	20.1	9.1	.4527	17.1	8.6	.5029
17.8	9.4	.5281	16.8	8.8	.5238	16.4	8.5	.5183
18.5	9.6	.5190	17.7	8.8	.4972	16.3	7.7	.4724
16.1	7.8	.4845	17.9	8.3	.4637	18.1	9.0	.4972
18.6	9.8	.5269	17.2	9.2	.5348	18.1	8.9	.4917
16.5	8.5	.5151	17.8	8.5	.4775	19.9	9.2	.4623
16.6	6.4	.3855	17.2	8.1	.4709	18.5	8.9	.4811
18.8	8.5	.4521	16.6	8.4	.5060	17.4	9.5	.5460
17.2	8.7	.5058	19.9	8.9	.4472	16.7	8.5	.5090
17.1	8.7	.5088	17.6	8.8	.5000	19.0	9.3	.4895
20.1	8.8	.4378	17.5	8.6	.4914	17.6	8.6	.4886

FEMALES

1	2	3	1	2	3	1	2	3
15.8	8.5	.5380	17.7	8.8	.4972	19.7	9.3	.4721
16.8	8.5	.5059	17.8	8.9	.5000	20.1	9.3	.4627
18.0	9.0	.5000	15.8	8.7	.5506	17.9	8.4	.4693
18.3	8.4	.4590	18.0	9.1	.5055	20.4	9.1	.4461
19.6	9.1	.4643	17.8	9.4	.5281	17.7	8.1	.4576
18.7	9.1	.4866	21.8	9.8	.4495	17.6	7.2	.4091
16.3	8.7	.5337	18.9	8.2	.4868	16.1	8.2	.5093
			20.2	10.0	.4950	19.1	9.3	.4869
			18.6	9.1	.4892	18.4	9.8	.5326
7. 6 years.			16.9	7.8	.4615	18.6	9.4	.5054
			20.0	9.2	.4600	17.1	8.8	.5146
			17.3	9.7	.5607	17.7	9.4	.5311
18.3	8.9	.4863	18.0	9.0	.5000	18.3	8.9	.4863
17.9	8.9	.4972	16.9	8.4	.4970	18.4	8.6	.4674
17.7	9.4	.5311	19.5	8.9	.4564	17.2	9.2	.5348
19.2	8.1	.4219	19.5	8.4	.4308	16.7	8.6	.5150
18.0	8.7	.4833	19.8	9.6	.4848	16.2	7.7	.4753
18.6	9.3	.5000	18.1	9.0	.4972	18.5	8.9	.4811
18.3	8.2	.4481	17.8	8.5	.4775	18.2	8.4	.4615
18.5	8.5	.4595	18.6	9.4	.5054	17.9	8.7	.4860
19.3	9.0	.4663	17.6	9.5	.5398	18.0	8.2	.4555
17.4	8.7	.5000	16.6	8.8	.5301	18.0	9.3	.5167
17.5	8.3	.4743	18.7	8.9	.4759	16.9	8.7	.5148
18.9	9.6	.5079	18.7	9.1	.4866	19.0	8.8	.4632
19.8	9.8	.4949	16.9	8.2	.4852	17.8	8.8	.4944
19.0	8.9	.4684	17.0	8.6	.5059	17.1	8.1	.4737
18.0	8.3	.4611	17.3	8.4	.4855	17.7	9.1	.5141
16.9	9.4	.5562	18.5	9.3	.5027	16.2	8.6	.5309
18.5	9.7	.5243	19.5	9.1	.4667	17.3	9.7	.5607
18.0	9.3	.5167	18.1	9.3	.5138	17.4	8.7	.5000
16.5	8.4	.5091	18.2	8.3	.4560	19.2	8.8	.4583
20.0	8.8	.4400	18.9	8.5	.4591	16.2	8.4	.5185
18.0	9.6	.5333	17.5	8.5	.4857	18.8	10.0	.5319
18.0	8.5	.4722	18.7	8.8	.4706	18.1	9.4	.5193
16.5	8.1	.4909	18.4	9.5	.5163	19.4	9.1	.4691
18.4	9.6	.5217	17.2	8.0	.4651	17.5	8.8	.5029
19.2	9.0	.4687	17.8	8.3	.4663	17.4	8.7	.5000
17.1	8.7	.5088	16.7	7.9	.4730	18.2	8.8	.4835
15.8	7.5	.4747	19.3	10.1	.5233	16.7	8.4	.5030
18.0	8.9	.4944	18.2	9.3	.5110	18.4	8.8	.4783
17.5	9.0	.5143	18.1	8.3	.4586	20.4	9.5	.4657
17.7	8.5	.4802	18.3	8.5	.4645	19.0	9.7	.5105
17.8	8.9	.5000	22.1	10.2	.4615	17.7	9.1	.5141
18.2	8.3	.4560	18.2	9.1	.5000	19.5	9.5	.4872

FEMALES

1	2	3
17.8	8.8	.4944
16.3	9.2	.5644
16.3	7.3	.4478
15.3	8.1	.5294
18.1	8.5	.4696
18.9	8.5	.4497
18.0	8.3	.4611
17.4	7.6	.4368
17.5	8.4	.4800
19.5	8.6	.4410
19.2	9.1	.4740
16.8	8.6	.5119
17.6	8.8	.5000

8. 7 years.

1	2	3
20.7	9.9	.4782
18.8	9.4	.5000
17.4	9.5	.5460
18.5	9.6	.5189
19.1	8.7	.4555
19.0	8.5	.4474
17.3	9.2	.5318
18.3	9.8	.5355
17.9	9.2	.5140
17.0	8.7	.5117
18.6	10.3	.5538
19.2	9.0	.4687
17.6	8.2	.4659
18.8	8.9	.4690
19.6	9.6	.4898
20.3	9.3	.4581
17.0	7.9	.4647
18.2	9.4	.5165
18.3	9.1	.4973
19.4	9.8	.5051
20.1	10.3	.5124
18.0	9.1	.5055
16.9	8.7	.5148
18.3	8.1	.4426
18.3	9.3	.5082
19.3	9.6	.4975
18.4	9.2	.5000
18.7	9.1	.4866
18.6	8.8	.4731
17.1	8.6	.5029
17.7	7.7	.4350
17.3	8.3	.4798
18.2	7.9	.4341
19.7	8.6	.4365
17.7	8.4	.4746
16.9	7.9	.4674
18.0	9.3	.5167
17.1	8.2	.4795
20.8	8.6	.4135
18.4	8.9	.4837
16.2	8.7	.5370
20.2	9.2	.4554
18.6	9.2	.4946
19.7	9.4	.4772
21.2	8.5	.4009
16.1	8.1	.5031
19.5	10.0	.5128
20.2	9.4	.4653
21.0	10.2	.4857
16.6	7.5	.4518
18.2	9.6	.5275
18.2	8.8	.4835
19.6	9.5	.4847
18.3	9.1	.4973
18.6	10.2	.5484
18.4	9.4	.5109
21.1	10.1	.4787
20.2	10.5	.5198
19.2	10.0	.5208
19.1	9.1	.4764
19.9	9.9	.4975
19.6	10.4	.5306
19.5	8.8	.4513
17.3	9.2	.5318
18.4	9.2	.5000
17.8	8.5	.4775
17.8	8.6	.4831
18.2	9.4	.5165
19.7	9.7	.4924
17.0	9.0	.5294

9. 8 years.

1	2	3
21.7	9.3	.4286
19.0	9.7	.5105
20.4	9.8	.4803
19.8	9.4	.4747
20.1	9.4	.4677
18.2	8.0	.4396
18.3	9.3	.5081
19.2	8.6	.4479
17.2	9.0	.5232
19.7	9.7	.4924
19.9	9.2	.4623
21.2	9.2	.4340
20.9	9.5	.4545
20.7	9.2	.4444
18.7	7.8	.4171
20.1	9.4	.4677
20.7	10.2	.4927
18.5	9.8	.5297
17.8	9.7	.5449
18.6	9.5	.5107
21.7	9.4	.4332
20.0	10.4	.5200
21.3	7.8	.3661
18.7	8.6	.4599
20.3	9.4	.4630
20.4	9.6	.4706
21.0	10.1	.4809
19.7	9.4	.4772
20.6	10.3	.5000
20.1	9.3	.4627
22.0	10.5	.4773
18.2	9.2	.5055
19.2	9.2	.4792
20.7	10.4	.5024
19.1	8.5	.4450
20.5	9.2	.4488
21.1	10.0	.4739
17.7	9.0	.5085
18.7	9.3	.4973
19.5	9.8	.5026
19.0	9.3	.4895

FEMALES

1	2	3
19.4	9.2	.4742
18.8	9.3	.4947
18.5	8.2	.4432
20.3	10.2	.5025
17.6	8.9	.5057
21.5	8.7	.4046
18.2	9.0	.4945
19.8	10.1	.5101
19.9	8.8	.4422
18.7	8.3	.4438
19.6	9.2	.4694
20.2	10.0	.4950
20.1	10.3	.5124
20.8	9.6	.4615
18.9	9.8	.5185
21.0	10.2	.4857
21.2	9.7	.4575
20.7	9.8	.4734
19.9	9.1	.4573
20.7	9.6	.4638
21.9	8.9	.4064
18.8	9.2	.4894
18.6	9.3	.5000
20.0	10.2	.5100
19.8	8.9	.4495
20.2	9.5	.4703
21.7	9.9	.4562
17.9	8.7	.4860
19.3	9.6	.4974
19.2	9.1	.4740
18.6	8.9	.4785
20.1	9.3	.4627
20.0	10.2	.5100
18.4	8.6	.4674
21.1	10.3	.4881
19.9	8.8	.4422

10. 9 years.

1	2	3
21.4	9.7	.4533
19.8	9.6	.4848
22.7	8.0	.3524
20.4	9.8	.4804
21.6	9.3	.4305
20.8	10.4	.5000
20.5	9.8	.4780
22.6	10.1	.4469
21.0	9.9	.4714
20.0	9.8	.4900
22.1	10.6	.4796
21.5	9.8	.4558
23.6	10.0	.4237
20.3	9.0	.4433
20.9	9.3	.4450
20.2	9.1	.4505
20.0	10.5	.5250
22.2	10.1	.4549
18.1	9.4	.5193
21.5	9.3	.4326
18.2	10.2	.5604
19.3	9.4	.4870
21.0	9.7	.4619
21.0	9.5	.4524
20.7	9.4	.4541
21.1	8.5	.4028
21.0	9.2	.4381
21.7	8.9	.4101
23.5	11.0	.4681
20.8	9.0	.4327
22.1	10.7	.4842
20.8	9.7	.4663
21.8	10.5	.4816
21.2	9.1	.4292
18.5	8.8	.4757
18.8	8.5	.4521
20.4	10.1	.4951
25.5	9.5	.3725
18.8	8.7	.4628

1	2	3
20.2	10.3	.5099
20.1	9.9	.4925
19.3	9.5	.4922
21.1	9.4	.4455
21.8	9.7	.4449
19.5	9.9	.5077
16.8	8.6	.5119
22.5	9.4	.4178
21.6	9.9	.4583
20.2	9.3	.4604
21.3	9.2	.4319
19.5	8.2	.4205
22.9	10.9	.4760
22.2	9.3	.4189
21.3	9.4	.4413
18.8	9.4	.5000
20.8	8.7	.4183
19.8	8.5	.4293
20.8	8.2	.3942
20.4	9.4	.4608
23.1	9.9	.4286
18.4	8.7	.4728
17.9	9.0	.5028
19.3	9.3	.4819
18.7	9.6	.5134
21.4	8.3	.3878
20.6	9.8	.4757
21.2	10.1	.4764
19.6	11.1	.5663
19.2	11.1	.5781
20.2	10.7	.5297

11. 10 years.

22.1	10.1	.4570
19.5	9.2	.4718
22.3	10.1	.4529
21.6	9.6	.4444
20.8	8.4	.4038
20.2	9.7	.4802

FEMALES

1	2	3
20.0	8.6	.4300
21.3	9.4	.4413
21.3	9.8	.4601
21.9	9.3	.4247
23.3	10.2	.4378
23.2	9.8	.4224
21.2	9.8	.4623
21.6	9.3	.4305
23.3	9.4	.4034
20.1	10.6	.5274
23.1	10.4	.4502
22.5	11.6	.5155
21.1	9.7	.4597
23.5	10.1	.4298
21.5	10.1	.4698
22.6	9.5	.4203
24.2	10.8	.4463
20.9	8.8	.4210
19.9	8.8	.4422
18.5	8.8	.4757
24.0	10.6	.4417
19.8	7.9	.3990
21.4	9.4	.4392
19.4	8.9	.4588
20.5	8.8	.4293
20.5	9.8	.4780
26.1	9.7	.3716
22.5	9.9	.4400
22.4	10.9	.4866
20.5	9.7	.4732
22.3	11.1	.4978
22.3	9.2	.4126
22.0	9.8	.4454
22.5	9.4	.4178
21.4	8.6	.4019
21.1	9.4	.4455
21.0	9.6	.4571
20.0	9.4	.4700
25.5	9.7	.3804
22.3	10.1	.4529
20.6	8.9	.4320
20.0	8.2	.4100
22.5	8.6	.3822

1	2	3
21.2	9.4	.4434
22.0	9.2	.4182
21.0	9.3	.4429
21.1	9.9	.4692
21.9	8.7	.3973
23.0	9.8	.4261
21.2	9.9	.4670
22.3	9.2	.4126
20.5	9.1	.4439
20.4	9.0	.4412
19.8	8.7	.4394
20.6	10.1	.4903
22.2	10.8	.4865
21.2	8.6	.4057
20.4	9.1	.4461
20.2	9.4	.4653
22.0	10.9	.4955
22.3	9.6	.4305
23.1	9.9	.4286
20.3	9.9	.4877
21.8	8.6	.3945
20.9	10.8	.5167
21.3	9.5	.4460
21.9	9.8	.4475
23.5	11.3	.4808
21.5	8.8	.4093
21.7	9.2	.4240
21.9	10.0	.4566

12. 11 years.

24.0	10.0	.4167
22.9	9.9	.4323
24.0	11.0	.4583
22.6	10.0	.4425
23.3	10.4	.4463
22.6	9.3	.4115
21.9	9.6	.4383
23.5	10.3	.4383
22.5	9.8	.4355
20.5	9.8	.4780

1	2	3
21.5	8.9	.4139
23.2	11.8	.5086
22.0	9.7	.4409
23.9	10.1	.4226
21.4	9.4	.4392
19.8	9.9	.5000
21.4	8.7	.4065
22.9	10.8	.4716
22.3	9.9	.4439
20.7	9.6	.4638
24.9	10.0	.4016
22.2	10.5	.4730
22.8	9.4	.4123
23.8	10.2	.4286
22.6	10.9	.4823
23.9	9.3	.3891
22.7	9.6	.4229
22.6	9.9	.4380
20.6	9.2	.4466
24.3	11.1	.4568
21.0	10.6	.5048
20.3	8.3	.4089
22.0	9.2	.4182
21.0	9.8	.4667
21.8	9.1	.4174
23.3	9.1	.3906
22.6	9.8	.4336
20.9	8.9	.4258
22.3	10.5	.4708
21.7	10.6	.4885
21.5	9.2	.4279
22.2	9.3	.4189
22.1	9.4	.4253
21.9	10.9	.4977
23.2	10.3	.4440
20.9	8.9	.4258
21.3	9.4	.4413
21.1	9.2	.4360
21.5	10.7	.4977
21.3	10.0	.4695
21.7	9.7	.4470
22.6	9.6	.4248
23.3	11.4	.4893

FEMALES

1	2	3
22.7	9.1	.4009
19.7	8.9	.4518
23.3	9.5	.4077
21.5	9.2	.4279
26.7	11.1	.4157
21.2	8.8	.4151
21.0	10.1	.4809
21.1	9.0	.4265
23.8	10.7	.4496
25.8	12.9	.5000
22.3	10.5	.4708
19.9	9.1	.4573
22.5	9.7	.4311
21.3	10.2	.4789
21.9	10.1	.4612
21.5	9.8	.4558
24.6	9.9	.4024
23.3	9.4	.4034
23.0	10.0	.4348
21.5	8.3	.3860
21.0	9.2	.4381

13. 12 years.

1	2	3
20.8	10.5	.5048
24.3	9.6	.3951
23.0	9.2	.4000
23.0	8.9	.3870
23.0	9.8	.4261
22.3	9.8	.4395
24.0	9.2	.3833
22.2	9.2	.4144
19.0	8.5	.4474
22.4	10.8	.4821
22.5	9.4	.4178
24.2	11.3	.4669
22.0	9.3	.4227
24.5	11.5	.4694
22.8	9.6	.4210
24.3	11.2	.4609
23.4	8.9	.3803
24.2	10.7	.4421
22.7	10.2	.4493
22.8	10.9	.4781
23.5	9.4	.4000
23.2	9.6	.4138
24.7	11.5	.4656
22.1	10.0	.4525
23.2	10.8	.4655
24.1	10.3	.4274
23.1	9.8	.4242
23.2	9.1	.3922
23.2	10.5	.4526
23.8	9.1	.3823
23.8	9.8	.4118
23.0	9.9	.4304
24.6	10.6	.4309
24.7	10.2	.4129
23.0	11.5	.5000
22.2	10.4	.4685
20.2	9.4	.4653
21.3	9.4	.4413
25.0	11.0	.4400
24.8	10.8	.4355
23.5	9.8	.4170
23.5	9.5	.4042
21.7	11.2	.5161
21.1	9.7	.4597
22.0	10.7	.4864
22.9	10.7	.4672
21.1	9.6	.4550
19.2	8.0	.4167
22.5	11.2	.4978
24.6	10.3	.4187
22.9	10.4	.4541
23.9	10.6	.4435
25.8	10.7	.4147
21.6	9.2	.4259
20.8	10.9	.5240
21.7	11.1	.5115
22.7	9.7	.4273
22.4	9.6	.4286

14. 13 years.

1	2	3
27.0	12.3	.4555
24.0	10.1	.4208
22.6	10.4	.4602
24.8	10.9	.4395
24.8	11.6	.4677
21.8	9.5	.4358
22.9	10.9	.4760
24.1	9.1	.3776
26.5	10.6	.4000
25.1	11.9	.4741
23.1	10.8	.4675
24.5	9.3	.3796
19.5	9.2	.4718
23.6	10.7	.4534
23.3	11.1	.4764
24.7	8.6	.3482
26.8	12.1	.4515
22.8	10.3	.4517
24.3	10.2	.4197
25.8	11.0	.4264
26.7	9.9	.3708
24.9	11.1	.4458
23.6	10.0	.4237
24.4	9.7	.3975
26.3	10.7	.4068
26.1	11.0	.4215
24.3	9.3	.3827
21.4	10.0	.4673
26.4	10.6	.4015
23.1	10.1	.4372
21.0	8.9	.4238
22.7	11.1	.4890
25.8	11.9	.4612
20.8	9.7	.4663
23.1	10.0	.4329
25.0	11.1	.4440
26.0	10.1	.3885
22.7	10.6	.4670
25.3	10.4	.4111

FEMALES

1	2	3
23.7	10.1	.4262
21.4	9.6	.4486
23.5	9.8	.4170
24.1	10.3	.4598
24.6	11.1	.4512
21.8	9.9	.4541
23.8	10.9	.4580
26.7	10.2	.3820
24.9	11.4	.4578
21.5	9.7	.4512
24.9	11.3	.4538
22.5	10.1	.4489
24.8	11.3	.4556
25.2	12.1	.4802
22.2	10.7	.4820
23.5	10.4	.4425
24.3	10.8	.4444
24.7	11.0	.4453
24.1	10.6	.4398
25.6	11.1	.4336
24.1	9.4	.3900
23.2	9.3	.4009
24.0	9.8	.4083
25.1	10.2	.4064
24.5	11.8	.4816
25.7	12.0	.4669
24.7	10.6	.4291
24.7	10.2	.4129
21.1	10.5	.4976
27.0	10.8	.4000
25.8	11.2	.4341
22.6	9.6	.4248

15. 14 years.

1	2	3
23.1	12.0	.5195
24.2	11.1	.4587
22.1	10.4	.4706
25.6	10.1	.3945
26.1	11.3	.4329
26.9	11.5	.4275
25.6	11.3	.4414
23.6	11.4	.4830
21.8	9.8	.4495
22.9	10.1	.4410
23.7	9.6	.4051
25.4	9.3	.3661
23.7	10.1	.4262
26.7	11.3	.4232
26.4	11.2	.4242
24.5	10.0	.4082
24.6	11.6	.4715
22.4	9.7	.4330
24.2	11.2	.4628
21.9	9.8	.4475
26.0	11.7	.4500
23.2	10.5	.4526
28.2	11.7	.4149
27.5	11.3	.4109
26.3	12.5	.4753
24.4	11.6	.4754
24.6	10.9	.4431
25.2	10.7	.4246
22.4	9.4	.4196
25.1	10.6	.4223
28.4	11.3	.3979
27.2	12.4	.4559
26.4	11.4	.4318
20.3	10.3	.5074
23.6	9.2	.3898
27.2	10.8	.3971
25.6	10.6	.4141
25.2	10.4	.4127
24.2	10.6	.4380
23.0	8.4	.3652
23.7	9.7	.4093
23.8	10.1	.4244
26.6	11.2	.4210
24.5	11.5	.4694
24.9	10.4	.4177
26.6	12.5	.4699
26.4	12.1	.4583
26.5	11.8	.4453
24.8	11.7	.4718
24.0	12.6	.5250
25.9	11.6	.4479
22.2	9.7	.4369
24.2	9.8	.4050
25.1	10.2	.4064
22.1	11.2	.5068
24.1	9.6	.3983
26.5	11.5	.4340
26.0	10.6	.4077
25.5	10.6	.4157
24.2	9.9	.4091
25.8	10.8	.4186
25.3	10.4	.4111
24.0	11.5	.4792
24.5	10.9	.4449
25.0	11.1	.4440
26.8	12.5	.4664
26.7	11.4	.4270
24.7	11.3	.4575
26.7	11.4	.4270
24.0	12.2	.5083
25.6	12.3	.4805
26.3	11.7	.4449
26.4	11.7	.4432
25.3	10.8	.4269
23.5	10.6	.4511
25.0	10.7	.4280
25.2	12.0	.4762
26.5	11.4	.4302
26.6	10.7	.4023
25.5	11.2	.4392
26.2	10.8	.4122
24.0	10.2	.4250
23.6	10.8	.4576
26.0	11.6	.4461
24.3	11.4	.4691
24.5	10.2	.4263
26.5	11.3	.4264
26.3	11.7	.4449
25.7	10.3	.4008

FEMALES

1	2	3
28.7	10.8	.3763
24.5	9.4	.3837
27.2	11.7	.4301
26.1	11.9	.4559
22.4	8.9	.3973
25.3	10.8	.4269
26.7	10.9	.4082
25.6	10.6	.4141
22.6	9.8	.4336
24.7	10.0	.4049
24.2	10.1	.4174
24.1	10.2	.4232
23.5	9.6	.4085
22.6	9.1	.4026
22.9	9.0	.3930
23.6	10.5	.4449
23.2	10.5	.4526
24.1	10.8	.4481

16. 15 years.

1	2	3
26.1	12.3	.4713
26.7	11.7	.4382
26.4	12.0	.4545
22.7	8.7	.3833
26.5	11.2	.4226
25.3	9.7	.3834
23.5	11.6	.4936
25.2	12.6	.5000
22.8	10.6	.4649
24.7	10.6	.4291
23.0	10.8	.4696
26.8	12.1	.4515
24.5	9.1	.3714
24.2	9.3	.3843
25.2	11.8	.4682
22.9	10.2	.4454
23.1	10.8	.4675
26.8	12.3	.4589
25.2	11.8	.4682
24.8	9.9	.3992
25.1	9.9	.3944
25.6	11.4	.4453
24.9	9.3	.3735
24.3	10.2	.4197
25.1	11.2	.4462
24.9	10.3	.4136
23.3	11.5	.4936
27.0	11.2	.4148
24.3	11.2	.4609
26.0	10.3	.3961
24.2	11.1	.4587
25.6	9.4	.3672
24.4	10.5	.4303
27.1	12.0	.4428
26.1	10.3	.3946
26.3	10.7	.4068
22.9	9.3	.4061
24.9	10.2	.4096
24.5	11.3	.4612
25.7	10.5	.4086
23.0	10.3	.4478
26.8	10.9	.4067
24.0	9.8	.4083
26.9	11.8	.4387
23.7	11.7	.4937
25.0	11.4	.4560
26.1	10.6	.4061
24.7	11.2	.4534
26.3	11.6	.4411
25.9	11.2	.4324
24.9	10.8	.4337
25.8	11.4	.4419
25.3	12.6	.4980
25.4	11.0	.4331
27.2	11.4	.4191
24.5	11.9	.4857
25.3	10.9	.4308
24.8	10.5	.4234
24.9	11.3	.4538
24.1	10.3	.4274
25.0	10.7	.4280
27.3	11.4	.4176
24.4	10.5	.4303
26.0	9.9	.3808
26.0	12.0	.4615
27.6	12.1	.4384
25.4	11.9	.4685
24.7	10.9	.4413
27.2	10.8	.3971
25.5	11.2	.4392
22.5	9.3	.4133
26.9	9.4	.3494
23.5	9.8	.4170
24.3	9.9	.4074
26.2	12.3	.4695
25.8	9.5	.3682
23.6	10.8	.4576
22.5	9.9	.4422
26.3	11.5	.4373
25.2	10.9	.4325

17. 16 years.

1	2	3
23.9	11.3	.4728
28.1	11.6	.4128
25.5	11.4	.4471
26.7	12.3	.4607
24.1	11.4	.4730
25.2	10.6	.4206
24.5	11.8	.4816
22.2	9.9	.4459
23.1	10.9	.4719
23.6	10.7	.4534
24.3	9.9	.4074
25.0	10.8	.4320
24.4	10.9	.4467
25.6	10.8	.4219
26.2	10.7	.4084
23.4	11.2	.4786
22.6	10.3	.4557
28.8	12.6	.4375

FEMALES

1	2	3
25.0	10.8	.4320
23.5	10.5	.4468
23.7	10.8	.4557
23.2	10.3	.4440
24.0	10.1	.4208
23.9	11.6	.4853
25.8	10.8	.4186
25.4	10.2	.4016
27.2	12.9	.4743
26.0	11.2	.4308
27.7	11.2	.4043
24.5	10.9	.4449
26.4	10.8	.4091
25.7	11.6	.4514
27.9	11.8	.4229
27.7	11.7	.4224
24.2	11.4	.4711
26.2	10.1	.3855
24.3	10.2	.4197
24.2	10.2	.4215
25.5	10.8	.4235
23.5	9.9	.4213
27.9	11.0	.3943
25.9	11.1	.4286
24.8	10.6	.4274
21.8	7.3	.3349
27.0	10.8	.4000
25.5	10.9	.4274
23.0	9.8	.4261
24.6	10.2	.4146
24.9	10.9	.4377
27.5	12.1	.4400
27.2	11.4	.4191
22.6	10.0	.4425
24.8	9.2	.3710
24.1	9.2	.3817
26.5	12.5	.4717
25.1	10.2	.4064
24.4	11.4	.4672
23.7	9.7	.4093
25.7	11.5	.4475
25.3	11.9	.4704
24.5	10.6	.4326

1	2	3
26.3	12.6	.4791
25.8	11.1	.4302
25.8	9.5	.3682
24.8	10.7	.4314
26.5	12.0	.4528
23.1	10.8	.4675
26.9	10.9	.4052
24.8	11.8	.4758
24.9	11.0	.4418
24.2	11.6	.4793
24.1	10.8	.4481
26.5	11.2	.4226
23.5	9.8	.4170
24.7	11.3	.4575
26.6	10.9	.4098
23.6	10.4	.4407
25.3	11.7	.4624

18. 17 years.

26.4	11.6	.4394
27.2	8.9	.3272
27.4	12.3	.4489
26.5	11.8	.4453
24.0	10.1	.4208
25.3	10.9	.4308
21.5	10.1	.4698
25.3	11.5	.4545
25.3	9.6	.3794
24.2	9.9	.4091
25.0	10.2	.4080
26.0	9.7	.3731
27.2	11.0	.4044
23.6	9.3	.3941
26.2	11.6	.4427
27.1	11.8	.4354
25.1	11.1	.4422
24.6	11.6	.4715
24.2	11.1	.4587
25.8	12.1	.4690
23.6	8.8	.3729
25.0	10.1	.4040

1	2	3
24.3	10.1	.4156
26.9	10.2	.3792
24.8	11.1	.4476
25.6	10.8	.4219
26.1	12.3	.4713
25.0	10.2	.4080
25.4	10.2	.4016
23.3	10.2	.4378
24.1	11.6	.4813
24.1	9.7	.4025
26.1	13.1	.5019
26.4	11.5	.4356
24.9	10.8	.4337
26.5	10.9	.4113
24.2	10.6	.4380
24.4	10.8	.4426
24.0	9.9	.4125
27.8	11.7	.4209
25.0	10.7	.4280
25.9	10.4	.4015
26.3	9.7	.3688
27.8	11.2	.4029
24.1	10.5	.4357
22.0	8.7	.3954
23.8	10.7	.4496
27.3	11.8	.4322
27.2	12.1	.4448
26.0	10.9	.4192
26.8	10.1	.3769
25.2	11.8	.4682
28.3	12.6	.4452
23.3	11.6	.4978
26.0	11.6	.4461
24.6	10.1	.4106
23.2	11.2	.4828
24.7	10.0	.4049
24.2	11.2	.4628
26.4	12.3	.4659
22.9	10.3	.4498
25.8	10.7	.4147
25.2	11.3	.4484
26.0	10.3	.3961
26.8	11.9	.4440
24.6	9.8	.3984

FEMALES

1	2	3	1	2	3	1	2	3
25.0	9.7	.3880	26.7	11.1	.4157	25.8	12.7	.4922
23.4	9.5	.4060	25.8	8.3	.3217	24.4	10.6	.4344
27.4	10.9	.3978	25.8	12.0	.4651	26.3	11.8	.4487
24.1	11.0	.4564	27.5	11.9	.4327	25.6	10.7	.4180
26.5	9.7	.3660	25.8	11.6	.4496	25.7	11.6	.4514
26.3	11.8	.4487	24.5	11.3	.4612	25.8	11.0	.4264
26.5	11.9	.4491	26.7	12.5	.4682	26.6	10.8	.4060
23.8	11.1	.4664	25.3	9.7	.3834	24.9	11.1	.4458
25.2	12.3	.4881	26.7	10.8	.4045	24.8	11.2	.4516
25.2	11.1	.4405	24.2	10.2	.4215	22.5	10.3	.4578
26.0	11.3	.4346	25.3	9.4	.3715	22.9	12.2	.5327
25.3	10.9	.4308	27.3	11.6	.4249	26.1	11.3	.4329
23.8	9.2	.3865	25.6	10.0	.3906	23.2	8.7	.3750
25.7	11.3	.4397	25.9	10.1	.3900	26.4	11.3	.4280
27.5	11.9	.4327	26.1	10.2	.3908	25.9	10.8	.4170
25.3	11.4	.4506	26.3	10.5	.3992	25.1	10.3	.4104
25.3	11.7	.4624	28.0	11.5	.4107	24.6	10.6	.4309
22.5	10.9	.4844	24.9	10.5	.4217	24.5	10.2	.4163
27.0	10.5	.3889	28.6	12.3	.4301	25.4	10.1	.3976
25.1	10.5	.4183	24.0	11.5	.4792	24.9	11.5	.4618
23.3	9.9	.4249	25.9	11.0	.4247	23.6	10.0	.4237
23.9	9.5	.3975	25.3	11.7	.4624	25.7	11.3	.4397
26.2	12.1	.4618	27.1	11.5	.4243	26.7	10.2	.3820
26.1	12.5	.4789	23.7	10.2	.4304	26.6	11.5	.4323
25.7	11.3	.4397	26.2	11.9	.4542	26.3	10.8	.4106
25.5	10.7	.4196	25.1	10.2	.4064	26.1	11.1	.4253
25.2	11.0	.4365	26.5	12.1	.4566	21.9	9.6	.4384
25.7	11.7	.4552	25.1	12.8	.5100	24.6	11.3	.4593
24.6	11.1	.4512	24.6	11.4	.4634	26.5	10.8	.4075
			24.9	10.1	.4056	25.6	10.9	.4258
			26.4	11.2	.4242	25.2	10.3	.4087
19. 18 years.			24.3	11.6	.4774	25.8	10.8	.4186
			25.7	10.8	.4202	26.1	10.1	.3870
			25.8	10.0	.3876	26.1	11.6	.4444
22.5	8.6	.3822	26.0	11.1	.4269	25.5	10.5	.4118
24.7	10.6	.4291	27.5	10.7	.3891	25.1	11.7	.4661
28.5	11.2	.3930	26.1	10.6	.4061	26.5	11.1	.4189
28.0	12.6	.4500	26.5	11.8	.4453	26.2	12.2	.4656
25.8	10.3	.3992	26.2	10.8	.4122	28.6	9.5	.3322
25.3	11.4	.4506	26.3	11.3	.4297	25.9	12.0	.4633
24.4	10.4	.4262	23.9	10.1	.4226	26.5	12.1	.4566
25.9	9.8	.3784	24.1	9.6	.3983	24.8	11.8	.4758

FEMALES

1	2	3	1	2	3	1	2	3
24.2	10.0	.4132	27.3	11.6	.4249	23.6	11.1	.4703
20.5	10.3	.5024	26.3	10.7	.4068	26.5	12.4	.4679
25.7	11.3	.4397	24.0	9.6	.4000	24.9	10.4	.4177
23.3	10.4	.4463	23.4	10.9	.4658	22.8	10.0	.4386
25.3	10.8	.4269	24.2	11.0	.4545	27.2	11.3	.4154
26.8	11.9	.4440	25.6	10.9	.4258	25.5	9.6	.3765
23.6	10.3	.4364	24.1	10.6	.4398	25.8	10.6	.4108
22.8	11.1	.4868	26.2	10.7	.4084	26.4	11.8	.4470
24.8	9.8	.3951	26.4	11.7	.4432	25.5	11.7	.4588
24.9	10.7	.4297	24.0	10.5	.4375	26.1	9.5	.3640
23.3	9.3	.3991	23.8	10.5	.4412	27.3	11.8	.4322
24.5	10.3	.4204	26.3	11.0	.4182	23.5	9.9	.4213
26.6	12.1	.4549	25.6	10.6	.4141	22.7	10.3	.4537
25.0	11.1	.4440	26.6	10.1	.3797	26.9	11.6	.4312
			28.1	12.4	.4413	25.6	11.7	.4570
			26.0	11.6	.4461	26.4	10.0	.3788
20. 19 years.			28.0	12.6	.4500	27.3	10.2	.3736
			26.9	11.0	.4089	27.0	10.4	.3852
			28.0	12.3	.4393	27.0	11.0	.4074
26.3	11.9	.4525	25.5	12.4	.4863	22.9	9.8	.4279
27.9	12.2	.4372	25.1	11.4	.4542	24.6	10.3	.4187
25.1	9.6	.3825	24.0	11.1	.4625	23.4	9.6	.4103
27.2	11.8	.4338	26.2	11.5	.4389	23.6	11.0	.4661
27.2	12.6	.4632	26.3	11.2	.4258	26.5	10.5	.3962
25.6	11.6	.4531	24.6	9.6	.3902	24.5	10.9	.4449
23.9	10.4	.4351	26.4	11.8	.4470	27.3	11.1	.4066
23.3	9.8	.4206	26.2	10.9	.4160	24.2	9.8	.4050
26.5	11.3	.4264	24.8	9.4	.3790	26.1	11.3	.4329
28.0	11.2	.4000	25.3	12.0	.4743	29.1	11.0	.3780
25.5	10.8	.4235	26.6	12.4	.4662	26.0	11.2	.4308
24.5	10.2	.4163	27.4	11.4	.4161	25.8	10.9	.4225
23.5	9.6	.4085	23.1	10.1	.4372	26.5	12.3	.4641
27.6	13.2	.4783	25.8	10.3	.39[illegible]	25.3	10.7	.4229
26.2	10.7	.4084	25.9	11.1	.4286	23.6	10.6	.4491
25.6	10.6	.4141	22.5	9.9	.4400	26.1	10.8	.4138
25.6	10.8	.4219	25.0	11.3	.4520	26.9	11.4	.4238
25.4	11.6	.4567	23.7	9.9	.4177	28.5	12.8	.4491
25.7	11.1	.4319	29.3	12.0	.4096	27.5	12.0	.4364
26.5	11.1	.4189	25.2	11.6	.4603	26.1	10.0	.3831
27.0	12.0	.4444	24.3	10.0	.4115	25.2	11.3	.4464
26.4	10.9	.4129	25.3	11.1	.4387	23.2	10.3	.4440
25.3	11.8	.4664	27.1	10.3	.3801	26.6	11.1	.4173

FEMALES

1	2	3
22.0	9.7	.4409
24.5	9.1	.3714
21.6	9.8	.4537
27.7	10.8	.3899
23.7	10.4	.4388
24.5	10.4	.4245
25.7	11.5	.4475
25.2	10.8	.4286
24.4	10.1	.4139
24.5	10.4	.4245
23.4	9.6	.4103

21. 20 years.

1	2	3
24.5	9.8	.4000
26.1	9.7	.3716
23.6	9.4	.3983
25.1	10.6	.4223
26.8	10.0	.3731
26.8	12.0	.4478
24.2	10.2	.4215
27.4	12.0	.4380
25.0	8.9	.3560
25.0	11.0	.4400
25.0	10.1	.4040
27.0	11.9	.4407
23.8	10.7	.4496
25.6	12.5	.4883
25.8	11.0	.4398
29.3	13.4	.4573
25.5	10.6	.4157
27.8	11.4	.4101
25.7	12.2	.4747
28.8	13.3	.4618
26.1	12.6	.4828
23.8	10.1	.4244
23.8	10.8	.4538
27.8	11.6	.4173
27.7	12.8	.4621
25.6	11.0	.4297
26.9	11.4	.4238
24.7	10.7	.4332
24.8	10.7	.4314
23.5	10.2	.4341
23.7	10.4	.4388
26.4	11.8	.4470
26.3	11.7	.4449
24.9	9.4	.3775
22.6	11.5	.4510
26.3	10.9	.4144
24.8	10.5	.4234
25.0	11.5	.4600
24.1	10.4	.4315
28.3	12.4	.4382
25.6	10.4	.4062
25.3	11.2	.4427
22.1	8.7	.3937
25.8	10.9	.4225
25.2	10.6	.4206
24.3	11.0	.4527
26.8	11.5	.4291
25.9	11.7	.4517
24.1	11.2	.4647
24.7	12.1	.4899
26.3	11.0	.4182
27.2	11.5	.4228
26.2	10.6	.4046
26.1	11.6	.4444
27.5	10.5	.3818
24.8	10.7	.4314
25.3	10.4	.4111
27.0	12.6	.4666
24.8	10.6	.4275
25.7	12.0	.4669
25.9	11.4	.4401
24.6	10.5	.4268
24.7	11.3	.4575
24.4	12.2	.5000
24.5	9.5	.3877
24.5	10.3	.4204
24.9	11.6	.4659
27.0	12.7	.4704
27.6	12.5	.4529
24.9	10.2	.4096
25.5	9.9	.3882
24.7	11.4	.4615
25.7	10.8	.4202
24.9	12.7	.5100
24.7	10.9	.4413
28.0	10.4	.3714
23.6	9.4	.3983
26.4	11.5	.4356
26.2	11.4	.4351
25.4	10.6	.4292
28.5	11.8	.4140
24.6	11.5	.4675
25.3	11.4	.4506
25.4	12.6	.4961
25.5	10.4	.4078
24.6	11.9	.4837
22.2	9.2	.4144
26.1	10.8	.4138
27.3	11.5	.4212
21.5	9.4	.4372
24.2	9.8	.4050
25.8	10.1	.3915
26.1	12.0	.4598
26.8	11.6	.4328
25.8	11.4	.4419
26.4	10.2	.3864

22. 21 years.

1	2	3
26.0	12.1	.4654
27.3	11.0	.4029
23.5	10.7	.4553
28.1	11.1	.3950
26.0	10.7	.4115
26.6	11.3	.4434

FEMALES

1	2	3	1	2	3	1	2	3
24.4	10.3	.4221	24.2	11.3	.4669	27.6	12.1	.4384
25.1	12.5	.4980	25.3	11.1	.4387	28.1	12.6	.4484
25.5	10.9	.4274	25.2	11.1	.4405	26.6	10.3	.3872
26.3	11.6	.4411	23.7	10.3	.4346	25.4	10.7	.4213
26.0	11.6	.4461	26.1	12.0	.4598	25.1	10.9	.4343
26.7	11.1	.4157	23.3	10.2	.4378	25.8	11.8	.4574
24.9	10.4	.4177	22.8	10.7	.4693	24.8	11.2	.4516
28.6	11.4	.3986	23.2	8.7	.3750	23.3	10.5	.4506
27.3	12.0	.4396	26.6	10.1	.3797	26.2	10.9	.4160
25.7	11.9	.4630	23.8	9.3	.3908	26.1	10.7	.4100
24.7	10.4	.4210	25.8	10.3	.3992	28.2	12.7	.4503
22.5	10.2	.4533	25.5	10.9	.4274	25.9	10.1	.3900
26.0	12.3	.4731	26.3	11.9	.4525	28.2	11.5	.4078
26.0	11.0	.4231	24.2	9.5	.3926	25.7	11.0	.4280
25.6	12.7	.4961	24.3	10.6	.4362	26.8	10.2	.3806
23.7	9.3	.3924	26.4	10.8	.4091	26.2	10.5	.4008
27.6	11.6	.4203	24.6	11.2	.4553	24.5	12.1	.4939
25.9	10.4	.4015	24.3	10.4	.4280	23.8	9.0	.3781
25.0	10.5	.4200	23.2	9.9	.4267	27.5	10.5	.3818
26.6	10.7	.4023	24.9	10.3	.4136	23.8	10.4	.4370
27.0	12.2	.4518	26.6	11.2	.4210	25.7	11.3	.4397
26.3	11.6	.4411	23.8	10.8	.4538			
26.4	11.9	.4508	26.2	11.6	.4427			
25.1	11.6	.4621	24.7	11.9	.4818	23. 22 years.		
25.6	11.1	.4336	24.0	9.7	.4042			
26.2	9.7	.3702	23.9	10.6	.4435			
25.4	10.3	.4055	24.9	11.4	.4578	26.2	10.5	.4008
25.7	10.8	.4202	24.3	10.1	.4156	24.5	11.5	.4694
26.3	11.6	.4411	26.2	9.9	.3779	24.5	11.6	.4735
23.6	10.4	.4407	24.0	11.1	.4625	29.2	12.8	.4384
27.5	12.2	.4436	26.7	12.4	.4644	25.4	10.8	.4252
25.5	9.8	.3843	27.2	11.5	.4228	24.8	9.2	.3710
23.9	10.7	.4477	24.3	10.4	.4280	28.3	10.9	.3852
26.6	10.3	.3872	27.8	11.7	.4209	26.4	10.8	.4091
24.3	11.1	.4568	25.2	10.1	.4008	24.7	10.8	.4372
25.8	10.0	.3876	24.2	10.0	.4132	25.2	9.3	.3690
23.5	11.0	.4681	25.9	12.2	.4710	26.9	12.8	.4758
24.4	12.7	.5205	23.4	10.2	.4359	25.9	11.2	.4324
26.8	11.6	.4328	23.9	10.9	.4561	24.5	10.2	.4163
24.3	11.4	.4691	27.0	10.6	.3926	26.3	10.0	.3802
26.2	11.5	.4389	26.1	10.8	.4138	25.4	9.6	.3779
24.5	9.9	.4041	26.5	11.2	.4226	25.2	10.0	.3968

FEMALES

1	2	3	1	2	3	1	2	3
26.5	11.4	.4302	27.7	11.1	.4007	26.2	12.5	.4771
26.8	12.0	.4478	25.9	10.9	.4208	27.8	9.6	.3453
29.0	12.2	.4207	26.4	9.6	.3636	26.1	12.1	.4636
26.9	12.6	.4684	25.7	10.0	.3891	24.2	10.5	.4339
25.6	11.6	.4531	22.6	9.9	.4380	27.3	11.3	.4139
26.1	10.5	.4023	24.5	10.3	.4204	26.3	12.2	.4639
28.6	13.6	.4755	25.4	11.4	.4488	26.6	10.8	.4060
25.8	12.0	.4651	27.2	12.2	.4485	28.0	10.8	.3857
26.9	11.6	.4312	25.4	10.4	.4094	26.6	12.1	.4549
26.5	11.5	.4340	26.4	11.4	.4318	26.3	9.7	.3688
25.8	9.7	.3760	25.7	10.3	.4008	25.7	11.8	.4591
26.5	11.7	.4415	27.0	11.2	.4148	25.6	11.2	.4375
25.2	8.7	.3452	24.6	9.9	.4024	28.3	13.2	.4664
23.7	11.8	.4979	27.1	11.2	.4133	28.7	12.4	.4321
28.8	14.1	.4896	25.0	10.0	.4000	24.8	10.7	.4314
25.3	10.5	.4150	25.5	11.1	.4353	26.7	11.9	.4457
29.5	13.3	.4508	25.9	11.3	.4363	22.3	10.9	.4888
23.7	11.8	.4979	24.9	10.1	.4056	25.0	9.9	.3960
24.0	10.1	.4208	25.0	11.1	.4440	25.4	9.2	.3622
27.3	11.8	.4322	24.9	11.1	.4458	27.5	10.9	.3964
28.2	13.7	.4858	24.0	10.0	.4167	25.5	9.9	.3882
24.1	9.9	.4108	26.6	12.4	.4662	27.7	11.3	.4079
26.1	11.8	.4521	24.5	10.3	.4204	27.3	11.4	.4176
24.3	11.0	.4527	27.3	12.2	.4469	25.9	11.2	.4324
26.6	9.9	.3722	27.3	12.2	.4469	25.2	11.3	.4484
27.2	11.6	.4265	25.6	10.8	.4219	25.2	10.6	.4206
25.1	11.2	.4462	22.4	9.9	.4420	27.4	10.2	.3723
26.1	12.0	.4598	24.6	10.1	.4106	28.1	11.3	.4021
27.1	10.6	.3911	27.7	11.2	.4043	26.9	11.6	.4312
26.1	9.4	.3601	25.7	10.3	.4008	26.5	11.3	.4264
26.0	11.0	.4231	26.7	10.7	.4007	27.5	10.9	.3993
26.1	11.1	.4253	26.1	12.6	.4828	27.4	11.2	.4087
26.3	10.7	.4068				23.7	10.7	.4515
25.7	11.1	.4319				27.1	12.6	.4649
27.5	10.5	.3818	24. 23 years.			22.8	9.2	.4035
26.2	11.8	.4504				24.6	10.6	.4309
25.3	10.5	.4150				27.5	10.2	.3709
26.6	11.1	.4173	27.3	11.7	.4286	25.9	11.2	.4324
25.6	10.6	.4141	27.2	10.0	.3676	23.8	10.1	.4243
27.1	11.7	.4317	27.8	12.3	.4424	23.5	9.3	.3957
24.2	10.3	.4256	23.9	9.6	.4017	26.0	10.9	.4192
27.0	10.4	.3852	26.1	10.8	.4138	27.5	11.4	.4145

FEMALES

1	2	3
27.9	12.4	.4444
28.3	10.1	.3569
28.2	10.8	.3830
23.6	9.8	.4152
27.4	12.9	.4708
24.2	9.5	.3926
25.8	10.9	.4225
23.2	11.3	.4871
25.7	11.2	.4358
26.2	10.8	.4122
25.8	12.6	.4884
25.8	11.1	.4302
24.6	10.6	.4309
28.4	11.2	.3944
22.7	10.6	.4670
25.6	10.2	.3984
25.2	10.7	.4246
24.9	10.3	.4136
25.7	12.3	.4786
26.1	10.3	.3946
24.6	11.2	.4553
25.9	11.6	.4479
25.8	11.5	.4457
27.0	12.0	.4444
26.3	12.5	.4753
24.5	10.2	.4163
26.3	10.3	.3916
25.6	10.8	.4219
26.9	11.9	.4424
27.0	12.2	.4518
26.3	11.3	.4297
21.3	9.7	.4554
27.9	10.8	.3871
26.1	10.7	.4100
27.7	12.7	.4585
26.7	9.5	.3558
26.7	11.4	.4270

25. 24 years.

1	2	3
26.2	11.1	.4237
29.0	13.0	.4483
25.2	10.1	.4008
25.4	10.5	.4134
24.4	9.8	.4016
23.3	10.1	.4335
27.3	11.3	.4139
26.4	11.8	.4470
26.7	11.1	.4157
25.3	10.7	.4229
27.6	11.2	.4058
26.5	11.0	.4151
27.8	9.8	.3525
24.0	10.2	.4250
26.2	10.7	.4084
25.1	11.2	.4462
24.3	10.9	.4486
25.4	12.5	.4921
27.4	11.3	.4124
27.6	11.9	.4312
25.8	12.6	.4884
26.6	12.8	.4812
26.6	12.5	.4699
25.0	10.7	.4280
25.0	10.5	.4200
25.1	10.4	.4143
24.6	12.1	.4919
25.1	10.4	.4143
24.2	9.4	.3884
25.0	10.9	.4360
26.3	10.7	.4068
24.0	11.3	.4708
27.3	13.8	.5055
24.6	11.5	.4675
23.4	10.9	.4658
25.6	9.5	.3711
25.6	10.0	.3906
26.7	12.5	.4682
26.7	12.9	.4831
27.0	12.3	.4555

1	2	3
24.9	10.3	.4136
25.4	11.1	.4370
25.5	10.8	.4235
27.8	10.3	.3705
23.3	9.9	.4249
27.1	11.9	.4391
24.3	9.8	.4033
23.5	10.0	.4255
26.3	10.8	.4106
25.2	9.2	.3651
24.9	10.0	.4016
27.0	11.8	.4370
24.8	10.0	.4032
23.8	11.7	.4916
25.1	11.7	.4661
26.9	11.5	.4275
24.5	10.9	.4449
26.5	10.5	.3962
24.8	9.7	.3911
26.5	11.5	.4340
24.3	10.0	.4115
23.8	9.9	.4160
24.6	9.5	.3862
28.0	11.7	.4179
29.3	10.2	.3481
25.9	11.2	.4324
24.8	10.7	.4314
24.6	10.0	.4065
24.3	11.3	.4650
27.2	12.1	.4448
26.2	10.8	.4122
23.0	10.7	.4652
26.6	12.0	.4511
27.8	11.6	.4173
25.3	10.8	.4269
28.0	11.8	.4214

26. 25 years.

23.4	10.9	.4658
25.7	12.8	.4980

FEMALES

1	2	3	1	2	3	1	2	3
26.3	12.0	.4563	24.8	10.7	.4314	24.5	10.5	.4286
26.7	11.7	.4382	26.1	11.2	.4258	26.3	11.3	.4297
22.7	10.5	.4625	23.2	10.0	.4310	24.7	9.9	.4008
25.5	12.7	.4980	23.6	10.2	.4322	24.8	10.3	.4153
27.0	11.3	.4185	26.6	10.4	.3910	25.9	10.9	.4208
25.7	11.2	.4358	23.6	11.2	.4746	26.7	11.7	.4382
29.0	12.5	.4310	27.3	12.0	.4396	26.8	11.2	.4179
25.0	9.3	.3720	26.8	10.4	.3881	24.9	11.7	.4699
26.4	10.8	.4091	24.8	11.4	.4597	26.1	9.7	.3716
28.6	10.6	.3706	26.8	10.5	.3918	25.9	10.4	.4015
25.0	9.9	.3960	26.9	12.2	.4535	25.0	11.2	.4480
27.1	11.3	.4170	26.4	10.6	.4015	25.2	11.3	.4484
24.4	11.9	.4877	27.1	10.9	.4022	29.4	14.3	.4864
25.8	11.3	.4380	25.4	11.9	.4685	24.3	10.3	.4239
26.7	11.3	.4232	25.7	12.8	.4980	24.7	9.3	.3765
27.4	11.6	.4234	26.7	12.6	.4719	29.5	10.2	.3458
28.3	12.2	.4311	27.7	13.0	.4693	27.3	10.5	.3846
27.0	12.0	.4444	24.7	11.5	.4656	26.4	10.5	.3977
24.4	9.6	.3934	24.5	11.6	.4735	23.1	8.5	.3680
25.1	10.0	.3984	25.2	11.8	.4682	26.3	10.4	.3954
24.7	11.2	.4534	24.2	11.0	.4545	26.1	9.7	.3716
25.7	12.6	.4903	23.4	10.4	.4444	26.6	11.7	.4398
25.8	11.0	.4264	26.1	11.5	.4406	27.1	13.0	.4797
23.8	10.2	.4286	24.9	11.2	.4498	27.0	12.5	.4630
25.5	11.4	.4471				23.5	10.0	.4255
24.3	10.8	.4444				23.3	9.8	.4206
23.0	10.9	.4739	27. 26 years.			28.3	13.2	.4664
26.4	11.2	.4242				27.9	14.0	.5018
27.6	13.8	.5000				24.1	8.3	.3444
27.3	11.9	.4359	28.3	10.1	.3569	25.3	10.4	.4111
24.3	11.0	.4527	27.2	9.6	.3529	25.7	11.1	.4319
26.1	9.6	.3678	26.2	10.7	.4084	25.4	11.9	.4685
27.7	12.5	.4513	24.8	9.6	.3871	27.6	12.1	.4384
26.6	11.7	.4398	27.5	13.2	.4800	26.4	10.8	.4091
25.8	10.0	.3876	25.8	10.4	.4031	26.3	12.4	.4715
27.4	12.5	.4562	26.6	11.0	.4135	26.4	10.8	.4091
24.6	11.0	.4471	25.2	10.7	.4246	25.5	11.8	.4627
26.3	11.6	.4411	23.5	9.8	.4170	26.2	11.9	.4542
26.3	9.0	.3422	25.9	11.3	.4363	25.7	12.5	.4864
26.5	10.9	.4113	25.6	10.5	.4102	26.0	11.9	.4577
26.7	11.2	.4195	27.7	12.0	.4332	25.1	10.2	.4064

FEMALES

1	2	3
26.1	12.3	.4713
25.1	10.7	.4263
27.1	12.5	.4612
25.2	11.7	.4643
25.4	10.7	.4213
23.1	10.7	.4632
25.6	10.2	.3984
26.7	11.3	.4232
24.7	11.5	.4656
26.8	11.0	.4104
26.0	11.0	.4231
25.4	10.5	.4134
27.4	10.6	.3869
26.7	12.5	.4682
24.4	11.9	.4877
25.1	10.9	.4343
25.7	11.4	.4436
26.3	11.3	.4297
25.7	11.6	.4514
23.6	10.0	.4237
24.6	10.3	.4187
28.3	12.5	.4417
27.7	11.2	.4043
25.2	10.4	.4127
26.0	10.8	.4030
26.4	11.2	.4242
27.4	13.0	.4744
25.9	10.1	.3900
25.6	11.0	.4297
26.6	11.3	.4248
25.3	11.1	.4387
26.2	10.9	.4160
25.8	11.3	.4380

28. 27 years.

1	2	3
26.7	13.8	.5168
26.2	12.9	.4924
24.0	9.7	.4042
25.9	10.4	.4015

1	2	3
25.5	10.9	.4274
26.6	11.3	.4248
27.1	9.9	.3653
25.6	10.4	.4062
25.6	11.6	.4531
26.4	10.0	.3788
26.7	12.1	.4532
23.9	10.7	.4477
27.4	12.4	.4525
25.7	12.2	.4747
26.2	11.2	.4275
24.4	12.3	.5041
26.2	10.3	.3931
28.0	11.4	.4071
25.2	10.2	.4048
25.4	12.1	.4764
25.3	11.0	.4348
25.8	11.5	.4457
24.9	11.0	.4418
25.6	10.8	.4219
28.2	13.1	.4645
23.9	10.1	.4226
26.4	10.9	.4129
24.5	10.2	.4163
24.8	9.1	.3669
27.3	10.9	.3993
26.9	12.3	.4572
24.9	9.2	.3695
24.2	10.7	.4421
25.6	11.8	.4609
27.1	11.5	.4243
25.2	10.4	.4127
26.4	10.6	.4015
23.5	10.2	.4340
27.6	11.9	.4312
26.0	9.5	.3654
26.4	12.6	.4773
24.0	10.9	.4542
26.1	10.2	.3908
23.3	9.6	.4120
27.9	10.4	.3728
25.3	11.8	.4664

1	2	3
26.6	12.2	.4586
27.2	12.8	.4706
24.4	11.4	.4672
27.1	10.1	.3727
26.9	11.5	.4275
25.1	11.8	.4701
26.2	10.6	.4046
24.3	10.4	.4280
26.5	11.4	.4302
26.3	10.7	.4068
26.5	11.6	.4377
25.2	10.4	.4127
28.0	10.7	.3821
27.0	10.6	.3926
25.7	9.4	.3658
27.9	11.0	.3943
24.4	11.6	.4754
24.6	9.8	.3984
27.6	11.3	.4094
26.5	10.1	.3811
24.4	10.9	.4467
24.5	10.9	.4449
23.7	10.8	.4557
25.3	10.7	.4229

29. 28 years.

1	2	3
25.2	11.5	.4563
25.2	9.8	.3889
26.2	11.4	.4351
27.4	11.9	.4343
24.6	10.7	.4350
25.2	10.7	.4246
24.3	10.1	.4156
25.2	11.8	.4682
24.2	10.8	.4463
24.3	8.9	.3662
27.9	11.2	.4014
26.0	11.3	.4346
23.6	10.7	.4534

FEMALES

1	2	3
25.7	11.5	.4052
24.1	11.2	.4647
24.0	10.5	.4234
26.4	13.2	.5000
24.7	10.8	.4372
24.3	10.8	.4444
27.4	12.8	.4671
29.2	13.6	.4657
26.3	11.2	.4258
25.9	10.3	.3977
26.3	10.9	.4144
24.4	12.3	.5041
25.9	9.7	.3745
24.6	10.3	.4187
25.0	10.8	.4320
25.6	11.8	.4609
26.7	12.3	.4607
25.6	11.5	.4492
25.6	11.8	.4609
28.1	11.2	.3986
26.2	10.7	.4084
23.5	11.2	.4766
26.5	11.9	.4491
27.3	11.5	.4212
26.4	11.8	.4470
24.1	11.3	.4689
24.6	10.8	.4390
27.0	12.1	.4481
25.3	9.1	.3597
27.7	12.4	.4476
26.4	11.7	.4432
25.7	11.8	.4591
28.4	10.2	.3591
25.5	12.1	.4745
28.6	13.3	.4650
26.8	12.1	.4515
25.9	10.0	.3861
27.2	10.9	.4007
22.4	10.7	.4777
27.5	10.0	.3636
27.0	11.4	.4222
25.7	11.3	.4397

1	2	3
26.9	9.3	.3457
24.0	10.3	.4292
28.3	12.1	.4276
25.7	11.9	.4630

30. 29 years.

26.3	12.5	.4753
25.8	12.5	.4845
25.6	9.7	.3789
25.7	10.8	.4202
26.0	10.8	.4154
25.9	11.0	.4247
26.9	13.6	.5056
25.1	11.2	.4462
24.0	11.0	.4583
26.7	12.2	.4569
24.3	9.9	.4074
26.2	11.1	.4237
25.3	11.6	.4585
24.3	11.1	.4568
25.3	10.5	.4150
27.7	12.6	.4549
23.2	8.2	.3534
27.0	13.7	.5074
25.5	11.2	.4392
25.6	11.0	.4297
29.0	11.7	.4034
25.2	10.3	.4087
26.2	10.3	.3931
28.1	12.7	.4520
24.9	9.0	.3614
26.8	11.4	.4254
25.6	11.5	.4492
23.8	10.3	.4328
25.5	10.5	.4118
25.8	11.9	.4612
24.3	9.9	.4074
25.5	9.4	.3686
25.7	10.9	.4241

1	2	3
26.8	11.3	.4216
28.1	12.4	.4413
26.9	12.5	.4647
24.3	11.9	.4897
25.8	11.8	.4574
22.8	10.0	.4386
25.4	11.0	.4331
25.9	10.3	.3977
24.4	9.8	.4016
27.4	10.1	.3686
26.0	11.5	.4423
26.6	10.7	.4022
25.9	11.3	.4363
24.9	10.0	.4016
25.7	11.1	.4319
25.6	10.5	.4102
24.7	10.2	.4129
25.4	12.7	.5000
25.3	10.4	.4111
25.9	10.7	.4131
25.5	10.4	.4078
25.0	11.0	.4400
25.8	12.0	.4651
27.5	10.9	.3964
26.3	11.0	.4182
27.3	11.4	.4176
23.8	10.8	.4538
26.7	12.5	.4682

31. 30 years.

23.9	10.1	.4226
25.1	11.1	.4422
24.7	11.2	.4534
24.3	11.7	.4815
27.2	10.7	.3934
24.0	11.1	.4625
26.0	11.0	.4231
26.3	11.6	.4411
25.4	10.0	.3937

FEMALES

1	2	3
23.3	11.8	.5064
28.1	11.9	.4239
25.3	11.9	.4703
27.2	11.8	.4338
26.1	11.4	.4366
23.3	9.9	.4249
24.4	10.7	.4385
25.9	10.9	.4208
24.3	10.6	.4362
27.1	10.2	.3764
26.8	11.8	.4403
27.3	12.9	.4725
25.1	9.2	.3665
25.5	11.8	.4627
27.3	13.0	.4762
23.8	10.1	.4244
28.5	12.2	.4281
26.0	9.7	.3731
25.6	13.1	.5117
23.7	11.5	.4852
28.3	9.7	.3428
25.9	9.8	.3784
24.2	10.5	.4339
26.8	11.7	.4366
27.8	12.3	.4424
27.7	9.8	.3538
27.7	10.5	.3791
25.0	11.5	.4600
26.6	9.8	.3684
28.8	11.3	.3924
25.4	11.9	.4685
25.7	9.8	.3813
25.7	11.3	.4397
25.3	10.7	.4229
29.3	12.5	.4266
27.4	12.3	.4489
23.4	11.0	.4701
27.4	11.2	.4088
25.3	10.6	.4190
30.9	14.1	.4563
27.0	10.8	.4000
26.3	10.6	.4030
28.5	12.2	.4281
26.5	11.5	.4340
25.5	11.4	.4471
24.3	11.0	.4527
25.7	11.0	.4280
25.6	10.7	.4180
28.0	11.3	.4036
28.1	12.1	.4306
27.0	11.5	.4259
24.9	11.5	.4618
24.1	10.2	.4232
27.4	11.5	.4197
24.6	11.2	.4553
26.0	11.7	.4500
26.0	11.2	.4308

32. 31 years.

1	2	3
24.6	11.4	.4634
26.6	10.9	.4098
25.0	9.9	.3960
26.8	10.9	.4067
27.7	13.3	.4801
23.7	9.6	.4051
26.7	11.5	.4307
24.5	11.3	.4612
24.0	8.6	.3583
26.3	11.8	.4487
26.7	11.3	.4232
28.2	12.3	.4362
27.2	11.6	.4265
27.6	11.8	.4275
26.4	10.2	.3864
25.8	12.1	.4690
26.3	9.9	.3764
24.6	11.5	.4675
25.3	11.0	.4348
26.0	9.5	.3654
24.4	10.4	.4262
25.3	9.4	.3715
24.6	10.3	.4187
25.0	10.3	.4120
26.4	11.4	.4318
25.7	9.8	.3813
25.6	10.3	.4023
27.3	11.8	.4322
26.4	9.9	.3750
26.5	11.4	.4302
26.7	11.9	.4457
26.7	9.5	.3558
26.6	11.3	.4248
27.3	12.1	.4432
26.6	10.7	.4022
26.9	11.7	.4349
23.9	10.4	.4351
25.1	10.9	.4343
26.5	9.8	.3698
23.7	10.4	.4388
26.1	11.0	.4215
23.2	12.1	.5215
27.3	11.2	.4103
23.4	10.3	.4402
23.6	8.9	.3771
25.2	8.9	.3929
24.2	11.0	.4545
27.6	11.3	.4094
26.1	11.5	.4406
27.8	10.3	.3705
26.1	11.4	.4368

33. 32 years.

1	2	3
27.3	11.5	.4212
27.2	12.2	.4485
26.4	11.5	.4356
23.6	9.3	.3941
24.9	11.9	.4779
27.5	10.7	.3891
26.3	11.3	.4297
27.0	11.6	.4296
26.5	11.4	.4302

FEMALES

1	2	3
23.7	9.3	.3924
25.9	9.9	.3822
27.6	11.4	.4130
26.8	12.3	.4589
24.4	12.1	.4959
24.1	9.5	.3942
24.9	10.4	.4177
27.1	11.7	.4317
25.3	9.5	.3755
27.2	10.9	.4007
25.0	11.2	.4480
27.9	10.9	.3907
24.6	12.4	.5041
26.8	11.4	.4254
22.9	11.7	.5109
25.4	12.0	.4724
26.6	11.1	.4173
27.3	11.4	.4176
26.0	12.5	.4808
26.3	11.2	.4258
22.8	11.1	.4868
28.5	12.3	.4316
25.7	11.2	.4358
23.7	11.0	.4641
21.9	10.9	.4977
24.2	10.7	.4421
26.7	11.5	.4307
25.4	12.3	.4842
25.5	10.5	.4118
25.8	12.0	.4651
27.1	11.5	.4243
27.3	12.9	.4725
23.8	10.6	.4454
25.3	10.5	.4150
27.1	11.7	.4317
27.3	10.8	.3956
27.2	9.1	.3345
24.6	10.5	.4268
26.1	9.9	.3793
28.5	11.2	.3930
26.9	11.8	.4387
26.2	11.6	.4427
26.7	12.5	.4682

1	2	3
27.3	11.2	.4103
25.0	12.0	.4800
25.4	12.3	.4842
26.8	11.0	.4104
25.2	10.2	.4048
25.6	11.0	.4297
26.5	11.5	.4339
25.5	9.9	.3882
24.4	10.0	.4098
26.8	11.3	.4216
27.7	10.4	.3754
26.7	11.0	.4120
25.2	10.7	.4246
27.2	11.3	.4154
29.2	11.7	.4007
26.2	9.4	.3588
26.5	10.8	.4075
24.1	9.7	.4025
25.9	10.4	.4015
24.0	10.3	.4292
29.2	11.1	.3801
25.9	9.9	.3822

34. 33 years.

29.6	11.3	.3817
25.6	11.3	.4414
25.5	10.2	.4000
26.1	11.9	.4559
26.4	12.9	.4886
25.7	10.3	.4008
27.5	9.2	.3345
29.2	12.7	.4349
28.4	11.7	.4120
27.7	12.4	.4476
23.3	11.0	.4721
27.0	12.0	.4444
26.1	12.8	.4904
23.7	9.7	.4093
25.4	10.4	.4094
26.1	9.4	.3601

1	2	3
26.8	10.9	.4067
26.3	9.7	.3688
24.8	10.8	.4355
28.0	12.1	.4321
26.3	10.4	.3954
25.2	10.2	.4048
24.2	9.3	.3843
26.5	10.6	.4000
27.3	12.2	.4469
26.4	11.4	.4318
25.2	11.5	.4563
27.4	13.3	.4854
26.8	11.9	.4440
27.3	11.2	.4103
27.7	11.0	.3971
25.2	10.5	.4167
26.2	13.6	.5191
23.6	10.0	.4237
26.1	10.4	.3985
26.3	9.8	.3726
23.3	10.4	.4463
28.0	12.6	.4500
24.6	11.9	.4837
27.1	11.5	.4243
26.8	11.5	.4291
25.5	11.5	.4510
26.1	10.8	.4138
29.3	12.4	.4232
26.4	11.8	.4470
28.0	12.2	.4357

35. 34 years.

24.2	10.4	.4298
25.1	10.8	.4303
24.5	10.5	.4286
23.4	10.9	.4658
25.3	11.2	.4427
25.8	10.9	.4225
28.3	12.9	.4558
25.3	11.2	.4427

FEMALES

1	2	3
28.2	13.1	.4645
28.6	12.2	.4266
25.2	10.7	.4246
25.2	10.6	.4206
28.8	12.1	.4201
24.3	10.3	.4239
29.1	12.8	.4399
25.7	11.1	.4319
26.6	10.7	.4022
25.2	10.4	.4127
24.0	9.7	.4042
26.0	10.5	.4038
25.0	10.7	.4280
26.4	12.3	.4659
25.6	11.3	.4414
25.2	10.5	.4167
27.5	11.8	.4291
22.3	11.5	.5157
29.5	12.0	.4068
27.2	11.2	.4118
24.5	9.6	.3918
27.2	11.0	.4044
23.1	9.7	.4199
24.7	11.2	.4534
22.9	11.0	.4803
25.7	10.9	.4241
28.7	12.2	.4251
24.5	10.2	.4163
27.6	10.3	.3732
25.2	10.6	.4206
26.8	11.6	.4328
24.3	11.4	.4691
27.7	11.6	.4188
27.0	10.7	.3963
25.0	9.9	.3960
26.5	11.3	.4264
26.2	11.1	.4257
27.7	11.8	.4260
26.1	12.0	.4598
25.1	10.9	.4343
24.5	11.6	.4735
27.3	11.2	.4103

1	2	3
24.9	10.3	.4136
25.6	10.8	.4219

36. 35 years.

1	2	3
26.7	10.4	.3895
24.0	11.5	.4792
27.0	13.0	.4815
27.7	12.3	.4440
24.6	10.4	.4228
25.0	11.2	.4480
24.4	10.5	.4303
26.0	10.6	.4077
25.2	9.8	.3889
26.4	10.6	.4015
25.9	11.6	.4479
23.7	10.8	.4557
25.3	11.4	.4506
26.1	12.1	.4636
23.7	11.1	.4683
26.8	10.1	.3769
25.6	10.9	.4258
26.6	10.3	.3872
26.1	10.7	.4100
25.5	10.3	.4039
25.0	11.4	.4560
24.5	11.0	.4490
26.9	11.3	.4201
25.2	9.9	.3929
24.5	11.2	.4571
26.7	13.2	.4944
25.3	11.1	.4387
25.6	10.8	.4219
25.2	10.3	.4087
26.6	11.6	.4361
26.0	11.7	.4500
26.6	11.9	.4474
26.3	12.2	.4639
26.5	11.3	.4264
27.5	10.7	.3891

1	2	3
27.1	9.6	.3542
25.6	11.9	.4648
26.1	10.3	.3946
27.5	12.4	.4509
26.6	11.7	.4398
27.3	11.2	.4103
26.5	11.3	.4264
25.1	10.0	.3984

37. 36 years.

1	2	3
26.1	11.0	.4215
24.7	10.5	.4251
27.0	11.0	.4074
24.8	9.7	.3911
24.2	10.7	.4421
26.9	11.8	.4387
27.3	11.4	.4176
25.2	10.1	.4008
27.2	10.6	.3897
24.6	10.8	.4390
25.0	9.0	.3600
25.3	11.9	.4703
26.3	10.8	.4106
28.9	13.4	.4637
24.2	11.5	.4752
28.6	12.9	.4510
25.0	10.0	.4000
26.5	11.3	.4264
27.2	12.0	.4412
25.7	11.0	.4280
26.7	10.9	.4082
25.1	11.5	.4582
24.7	9.9	.4008
27.7	11.7	.4224
23.5	10.3	.4383
27.4	11.5	.4197
24.7	9.9	.4008
24.1	11.4	.4730
28.3	11.4	.4028

FEMALES

1	2	3
28.4	12.5	.4401
28.2	11.8	.4184
26.5	11.2	.4226
25.9	10.5	.4054
25.6	11.5	.4492

38. 37 years.

29.4	12.7	.4320
26.0	11.7	.4500
27.5	11.6	.4218
25.0	8.9	.3560
25.6	10.6	.4141
24.8	10.2	.4113
26.6	11.7	.4398
25.2	10.1	.4008
24.7	10.4	.4210
25.5	9.1	.3569
29.4	12.0	.4082
26.7	11.1	.4157
28.5	11.4	.4000
28.4	12.4	.4366
26.4	11.3	.4280
25.0	10.5	.4200
27.5	11.5	.4182
30.2	12.5	.4139
26.9	13.5	.5019
26.5	9.5	.3585
28.7	13.7	.4773
26.0	12.3	.4731
27.2	9.8	.3603
24.6	11.4	.4634
28.6	10.9	.3811
27.9	11.1	.3978
27.1	11.8	.4354
26.7	11.3	.4232
23.5	9.6	.4085
26.5	11.3	.4264
24.0	10.1	.4208
25.5	12.8	.5020

1	2	3
24.2	11.6	.4793
27.1	12.5	.4612
25.3	10.9	.4308
25.8	11.6	.4496
27.1	11.0	.4059
26.7	12.2	.4569
26.5	12.1	.4566
24.8	11.1	.4476
27.2	11.6	.4265
26.3	10.6	.4030
26.2	10.1	.3855
24.5	10.6	.4326
24.6	9.9	.4024
23.5	9.2	.3915
26.4	11.7	.4432
25.2	11.5	.4563
27.0	10.5	.3889
26.5	11.4	.4302
24.6	10.7	.4350

39. 38 years.

26.7	9.9	.3708
26.1	9.6	.3678
23.9	11.7	.4895
26.4	11.8	.4470
26.8	11.2	.4179
25.3	10.4	.4111
23.8	10.4	.4370
26.9	9.4	.3494
25.2	10.3	.4087
28.0	11.6	.4143
28.3	12.2	.4311
27.0	11.7	.4333
27.3	11.4	.4176
26.7	11.6	.4345
24.8	10.7	.4314
27.3	11.8	.4322
25.2	9.8	.3889
26.5	13.0	.4906

1	2	3
27.6	10.1	.3659
25.7	10.4	.4047
23.1	10.9	.4719
24.3	8.8	.3621
24.6	11.4	.4634
28.9	13.7	.4740
25.2	10.8	.4286
26.4	12.6	.4773
29.7	12.1	.4074
28.4	12.2	.4296
24.6	11.4	.4634
28.3	12.8	.4523
26.0	10.6	.4077
27.0	12.1	.4481
26.7	12.8	.4794
29.0	11.4	.3931
27.0	10.4	.3852
25.3	11.5	.4545
26.1	11.3	.4329
24.7	10.8	.4372
25.5	11.2	.4392

40. 39 years.

23.6	9.4	.3983
25.5	11.2	.4392
23.6	10.4	.4407
28.9	12.1	.4187
25.3	10.6	.4190
27.5	12.7	.4618
26.7	11.4	.4270
24.9	10.4	.4177
22.5	9.5	.4222
27.0	10.9	.4037
25.1	11.3	.4502
25.7	11.2	.4358
25.5	12.4	.4863
26.7	13.7	.5131
21.9	10.4	.4749
26.3	11.7	.4449

FEMALES

1	2	3
21.8	8.4	.3853
22.5	9.5	.4222
25.7	11.0	.4280
26.7	12.9	.4831
27.9	12.0	.4301
27.5	11.1	.4036
26.4	10.4	.3939
28.4	13.4	.4718
25.2	10.2	.4048
22.9	10.4	.4541
25.3	12.3	.4862
26.7	10.6	.3970
25.0	12.3	.4920
25.9	11.1	.4286
23.9	11.1	.4644
27.3	11.0	.4029
26.8	11.7	.4366
26.0	11.3	.4346
26.7	10.0	.3745
24.0	10.4	.4333
27.6	11.5	.4167

41. 40 years.

1	2	3
26.0	12.1	.4654
24.6	12.2	.4959
25.3	11.8	.4664
25.2	10.3	.4087
25.5	9.7	.3804
24.0	12.8	.5333
24.8	9.3	.3750
27.4	13.6	.4963
22.7	11.7	.5154
26.6	11.9	.4474
25.9	11.2	.4324
26.7	11.4	.4270
25.6	11.7	.4570
27.8	12.2	.4388
28.5	12.9	.4526
25.2	10.4	.4127
26.7	9.9	.3708
24.8	11.4	.4597
27.2	11.7	.4301
28.9	12.9	.4464
24.2	11.2	.4628
25.7	12.7	.4942
25.6	10.8	.4219
28.7	11.5	.4007
25.6	11.3	.4414
23.4	11.4	.4872
23.7	10.3	.4346
23.0	10.6	.4609

42. 41 years.

1	2	3
26.6	11.2	.4210
25.1	11.3	.4502
25.2	12.8	.5079
23.9	10.3	.4310
26.0	10.2	.3923
26.1	9.7	.3716
25.2	11.4	.4524
24.3	12.4	.5103
25.6	12.7	.4961
26.4	12.3	.4659
25.8	11.4	.4419
24.0	8.6	.3583
27.0	12.8	.4741
25.6	9.5	.3711
27.4	13.0	.4744
23.7	11.2	.4726
24.2	10.9	.4504
25.8	10.6	.4108
23.6	10.0	.4237
27.6	12.1	.4384
28.1	12.0	.4270
28.3	12.8	.4523
28.3	11.0	.3887
26.1	12.2	.4674
25.9	10.1	.3900

43. 42 years.

1	2	3
27.1	10.8	.3985
27.6	12.5	.4529
25.4	10.1	.3976
26.0	10.9	.4192
25.8	11.9	.4612
26.1	12.8	.4904
24.7	10.9	.4413
25.7	8.7	.3385
24.1	11.3	.4689
29.1	12.5	.4295
25.9	9.8	.3784
28.6	12.6	.4406
26.8	13.2	.4925
24.5	10.6	.4326
22.7	9.8	.4317
26.8	10.2	.3806
26.8	12.6	.4701
27.1	10.6	.3911
27.5	11.8	.4291
27.7	11.3	.4079
26.8	11.7	.4366
23.5	11.1	.4723
26.4	11.8	.4470
26.3	11.8	.4487
27.5	14.1	.5127
23.2	9.7	.4181
24.6	11.2	.4553
25.9	13.1	.5058
23.1	11.1	.4805
26.0	12.4	.4769
24.9	10.0	.4016
24.4	10.9	.4467
23.4	12.1	.5171
24.6	10.1	.4106

FEMALES

44. 43 years.

1	2	3
24.7	11.6	.4696
27.2	10.8	.3971
25.9	12.4	.4788
27.2	11.4	.4191
24.4	11.2	.4590
24.8	11.1	.4476
25.9	10.9	.4208
26.5	11.9	.4491
26.9	10.9	.4052
25.6	11.6	.4531
27.6	12.2	.4420
26.6	12.5	.4699
26.3	12.3	.4677
27.2	11.5	.4228
23.8	11.7	.4916
23.7	11.9	.5021
27.2	11.8	.4338
24.6	11.3	.4593
24.8	11.0	.4435
24.4	10.5	.4303
26.8	13.3	.4963
25.5	11.4	.4471
24.4	10.9	.4467
27.6	13.2	.4783
23.0	9.9	.4304
23.8	10.4	.4370
25.4	11.8	.4646
25.7	10.7	.4163
24.1	12.2	.5062
28.0	12.5	.4464
24.4	10.6	.4344
27.0	11.5	.4259
24.1	11.6	.4813
27.8	13.3	.4784
25.1	11.9	.4741
23.5	12.4	.5277
26.9	10.8	.4015
25.3	11.0	.4348
23.6	8.7	.3686
27.4	12.6	.4598
24.5	11.5	.4694
26.5	10.1	.3811
27.0	12.9	.4778
26.2	11.7	.4466
26.4	12.1	.4583
25.9	12.1	.4672
26.5	12.2	.4604
26.9	9.8	.3643
23.8	11.0	.4622

45. 44 years.

1	2	3
26.1	10.1	.3870
26.3	12.8	.4867
27.3	13.1	.4798
24.5	10.8	.4408
25.7	11.4	.4436
26.3	11.3	.4297
26.0	11.0	.4269
23.6	10.9	.4619
24.0	10.9	.4542
23.9	10.5	.4393
22.1	11.2	.5068

46. 45 years.

1	2	3
27.0	12.4	.4593
26.4	10.9	.4129
22.2	9.2	.4144
26.4	10.0	.3788
24.5	11.0	.4490
27.5	11.4	.4145
23.4	10.8	.4615
25.9	12.7	.4903
27.3	11.9	.4359
26.2	12.3	.4695
26.2	12.8	.4885
25.3	11.4	.4506
25.4	12.3	.4842
24.2	10.1	.4173
25.6	10.4	.4062
26.5	9.6	.3623
28.2	12.6	.4468
27.2	12.7	.4669
26.1	12.1	.4636
26.2	11.9	.4542
28.2	14.1	.5000
25.5	10.8	.4235
23.7	10.7	.4515
25.1	10.0	.3984
24.2	10.9	.4504
24.4	10.8	.4426
25.1	11.1	.4422
26.4	10.6	.4015
27.3	12.8	.4689
26.5	11.9	.4491
24.9	11.6	.4659
27.4	11.9	.4343
25.1	12.3	.4900
24.0	10.2	.4250

47. 46 years.

1	2	3
23.5	11.0	.4681
24.6	12.2	.4959
24.7	12.1	.4899
24.7	12.3	.4980
26.8	11.1	.4142
21.4	9.8	.4579
25.4	12.4	.4882
26.3	11.7	.4449
27.8	11.8	.4245
26.1	10.8	.4138
27.0	11.8	.4370
26.1	11.3	.4329
25.2	12.5	.4960
26.2	11.2	.4275

FEMALES

1	2	3
27.6	12.8	.4638
26.3	10.6	.4030
26.0	12.1	.4654
26.4	11.7	.4432
24.3	11.6	.4774
26.5	12.4	.4679
26.9	11.0	.4089
27.2	12.4	.4559
26.7	12.3	.4607
25.6	11.0	.4297
25.3	12.2	.4822
23.6	10.2	.4322

48. 47 years.

1	2	3
25.3	11.2	.4427
26.1	12.0	.4598
26.0	11.8	.4538
25.6	12.4	.4844
23.9	11.2	.4686
24.5	10.6	.4326
23.5	10.6	.4511
27.1	11.6	.4280
23.0	10.0	.4348
26.5	13.0	.4906
26.3	11.8	.4487
25.3	11.7	.4624
25.5	10.1	.3961
27.8	12.9	.4640
29.1	12.2	.4192
23.9	10.0	.4184
24.8	10.0	.4032
26.8	12.4	.4627
24.6	11.6	.4715

49. 48 years.

1	2	3
23.6	12.0	.5085
27.9	11.6	.4158
25.9	12.2	.4710
27.7	12.6	.4549
24.5	11.4	.4653
27.0	11.8	.4370
25.4	10.6	.4173
24.0	9.7	.4042
24.8	11.2	.4516
24.9	11.3	.4538
24.1	11.4	.4730
25.8	12.0	.4651
28.0	12.7	.4536
23.6	12.0	.5085
25.2	10.8	.4269
24.6	13.1	.5325
26.1	12.3	.4713
25.1	12.2	.4860
27.0	10.2	.3778
26.3	10.2	.3878

50. 49 years.

1	2	3
26.3	11.9	.4525
24.4	10.7	.4385
24.2	11.3	.4669
27.9	12.8	.4588
27.1	12.1	.4465
25.5	10.2	.4000
24.0	9.4	.3917
24.5	10.0	.4082
27.1	11.0	.4059
25.2	10.8	.4286
25.6	12.4	.4844
22.6	10.0	.4425
26.3	11.7	.4449
27.3	11.9	.4359
26.2	10.9	.4160
26.8	11.9	.4440
25.2	10.2	.4048
24.6	12.2	.4959
25.4	10.2	.4016

51. 50 years.

1	2	3
26.2	11.5	.4389
27.0	12.1	.4481
24.2	12.5	.5165
25.3	10.0	.3953
27.4	12.1	.4416
26.7	13.0	.4869
25.4	10.9	.4291
27.4	13.1	.4781
24.6	12.6	.5122
24.8	11.2	.4516
25.3	11.2	.4427
25.3	11.0	.4348
25.4	12.1	.4764
24.9	11.8	.4739
23.8	11.5	.4832
27.1	13.1	.4834
27.6	11.9	.4312
25.4	10.8	.4252
24.2	11.2	.4628

52. 51 years.

1	2	3
27.4	12.0	.4380
26.5	12.6	.4755
24.9	11.3	.4538
25.3	10.8	.4269
26.0	12.5	.4808
24.7	10.7	.4332

FEMALES

1	2	3
27.2	13.4	.4926
26.3	10.5	.3992
23.5	9.9	.4213
23.6	9.6	.4068
26.0	11.6	.4461
24.8	10.9	.4395
26.4	10.7	.4053
26.9	10.8	.4015

53. 52 years.

1	2	3
26.3	12.7	.4829
24.6	11.7	.4756
25.3	13.1	.5178
24.0	10.6	.4417
28.6	12.3	.4301
27.4	11.4	.4161
24.6	10.7	.4350
25.6	11.7	.4570
24.5	11.1	.4531
22.8	10.9	.4781
24.4	12.3	.5041
26.6	12.0	.4511
26.8	11.7	.4366
24.5	11.2	.4571
25.6	11.9	.4648
24.3	13.1	.5391
24.8	12.8	.5161
25.0	11.2	.4480
26.5	12.0	.4528
26.7	12.0	.4494

54. 53 years.

1	2	3
24.6	11.4	.4634
23.3	11.2	.4807
24.0	11.0	.4583
23.7	11.1	.4683

1	2	3
27.2	12.1	.4448
26.1	13.3	.5096
25.6	10.1	.3945
22.0	11.3	.5136
22.1	10.2	.4615
24.3	10.9	.4485
25.9	12.8	.4942
25.3	11.6	.4585

55. 54 years.

1	2	3
24.3	10.6	.4362
25.7	10.4	.4047
24.1	11.9	.4938
26.4	12.8	.4848
24.8	13.6	.5484
26.0	11.7	.4500
28.5	12.0	.4210
22.5	10.0	.4444
25.7	11.7	.4552
24.7	12.5	.5061
27.6	12.8	.4638
27.8	12.9	.4640

56. 55 years.

1	2	3
25.3	11.8	.4664
25.9	11.4	.4401
24.0	10.8	.4500
26.3	11.1	.4220
25.8	12.2	.4729
27.3	11.8	.4322
24.7	11.4	.4615
27.6	12.3	.4456

57. 56 years.

1	2	3
24.9	12.1	.4859
25.2	11.6	.4603
22.5	12.9	.5733
27.8	13.1	.4712
27.6	11.5	.4167
23.9	11.6	.4853
23.7	10.8	.4557

58. 57 years.

1	2	3
24.4	12.1	.4959
24.1	11.7	.4855
27.5	13.1	.4764
24.4	12.1	.4959
25.1	9.9	.3944
23.7	10.6	.4473
26.0	11.2	.4308
27.5	12.2	.4436
25.4	11.1	.4370
28.1	13.6	.4840
24.2	10.3	.4256
22.7	11.1	.4890
26.2	10.8	.4122

59. 58 years.

1	2	3
23.4	12.1	.5171
25.1	12.8	.5100
26.4	12.9	.4886
26.7	11.3	.4232

FEMALES

1	2	3

60. 59 years.

24.6	11.2	.4553
26.1	12.5	.4789
23.8	10.9	.4580
26.3	10.3	.3916
26.7	12.2	.4569
25.5	11.5	.4510
23.5	10.1	.4298
25.8	12.9	.5000
25.3	12.6	.4980
27.0	13.5	.5000
26.2	10.8	.4122

60 years and more.

The observations used for the females aged 60 years and more are largely those recorded on pages 120 to 126 with the exceptions that some of these observations are not used because this part of the thesis was completed before all the 293 non-adipose healthy women were assessed at the Rutherglen Centre, and some additional observations were derived from the records of the chest clinic.

PART II

The second part of this thesis is concerned primarily with sociological data. The individuals who form this series do not represent a random sample of the population and, therefore, any comparisons made with other surveys must be carried out with discretion. The main effort of the Consultative Health Centre was to assess healthy older people, though individuals with obvious disease were never turned away. As a result a group of healthy people and a smaller group of diseased people were obtained. I propose to contrast the sociological data in terms of the presence or absence of disease by sex. In addition, since I consider that adiposity is a most adverse factor in relation to the maintenance of health I will contrast also the healthy people and the diseased people in terms of the presence or absence of adiposity. This latter sub-division by adiposity applies only to women, because there were no adipose healthy men over 24 per cent ideal weight as estimated from Anderson's nomogram (Greene, 1948) and there were only a small number of diseased adipose men. Finally information is presented concerning factors such as dental hygiene and symptoms such as vertigo and tinnitus.

MARITAL STATUS.

Tables 173 to 177 show the number and percentage of men and women by marital status, the presence or absence of health, and the presence or absence of adiposity for women by quinquennial age groups. In general, there is a greater proportion of married men than married women and of widowed women than widowed men in corresponding age groups. Furthermore, the proportion of single women is greater than the proportion of single men. Within each of the groups under consideration there is a small proportion of men and women who are divorced or separated and the proportions vary between 0·9 per cent and 3·0 per cent.

There are 236 married, 132 widowed and 25 single men who are healthy, and the corresponding numbers for the women who are healthy and non-adipose are 105, 136 and 47 respectively. The differences between the expected and observed values are significant ($X^2 = 41{\cdot}87$. df = 2. $P < 0{\cdot}01$). There are more married men, widows and single women, and less married women, widowers and single men than expected. A similar trend is observed when men and non-adipose women with disease are contrasted. For these two groups there are 165 married men and 44 married women, 60 widowers and 68 widows, and 22 single men and 31 single women ($X^2 = 47{\cdot}66$. df = 2. $P < 0{\cdot}01$). Within the age range 60 to 79 years there are 55 married, 43 widowed and 12 single adipose women, and 97 married, 105 widowed and 38 single women who are non-adipose. No significant differences exist between these two groups ($X^2 = 3{\cdot}23$. df = 2. $P > 0{\cdot}10$).

The higher proportions recorded of married men, widowed women and single women are not fortuitous, and these trends are paralleled by the findings of Strom (1956) in his investigation of the living conditions of old people in Norway. He found that of 587 men 336, or 57·1 per cent, were married, 200, or 34·2 per cent, were widowed or divorced, and 51, or 8·7 per cent, were single, and that of 802 women 213, or 26·5 per cent, were married, 418, or 52·1 per cent, were widowed or divorced, and 171, or 21·4 per cent, were single. These marital status differences between the sexes have an important influence on the occurrence of a greater incidence of emotional disturbance in women than in men.

In the seventh decade there are 116 married, 22 widowed and 9 single men who are healthy, and 96 married, 21 widowed and 15 single men who have disease. The differences between the expected and observed values are not significant ($X^2 = 2{\cdot}55$. df = 2. $P > 0{\cdot}20$). In the eighth decade the corresponding numbers are 102, 68 and 11 for the healthy men, and 65, 27 and 7 for the diseased men respectively. Again no significant differences exist between the two groups for marital status ($X^2 = 3{\cdot}01$. df = 2. $P > 0{\cdot}20$). Thus for men there is no evidence that disease is particularly related to any specific marital status group. The position is different for women. In the seventh decade there are 68 married, 40 widowed and 16 single women who are non-adipose and healthy, and 26 married, 28 widowed and 21 single women who are non-adipose with disease.

The differences between the expected and observed values ($X^2 = 10\cdot00$. df = 2. $P < 0\cdot01$) are significant. There are less married and more widowed and single non-adipose women with disease than expected. It is tempting to imagine that widowed and single women are more prone to disease than married women. Further research is necessary to clarify this matter, especially when significance is absent in the following decade ($X^2 = 0\cdot34$. df = 2. $P > 0\cdot80$).

SOCIAL CLASS.

Tables 178 to 181 show the number and percentage of men and women with reference to social class, the presence or absence of health, and the presence or absence of adiposity in women by quinquennial age groups. Approximately 60 per cent of all individuals are in social class III. In the following study social classes I and II are combined, and social classes IV and V are combined.

Of the 400 healthy men 56 are in social classes I and II, 263 in class III and 81 in social classes IV and V. The corresponding numbers for the 293 non-adipose women who are healthy are 46, 203 and 44 respectively. There are no significant differences between the expected and observed values ($X^2 = 3.24$. df = 2. $P > 0.10$). A similar absence of significance is observed between the 250 diseased men with 48 in social classes I and II, 149 in social class III, and 53 in social classes IV and V, and the 145 non-adipose diseased women with the corresponding figures 25, 95 and 25 ($X^2 = 1{\cdot}41$. df = 2. P $\triangleright$ 0·30). Thus the social class distribution of the men is similar to that of the non-adipose women in health and disease.

Within the age range 60 to 79 years there are 111 healthy adipose women of whom 9 are in social classes I and II, 75 in social class III, and 27 in social classes IV and V. The corresponding numbers for the healthy non-adipose women within the same age range are 37, 170 and 37 respectively. The differences between the expected and observed values are significant ($X^2 = 6{\cdot}49$. df = 2. P $\triangleright$ 0·02). There are more adipose women in social classes IV and V, and less in social classes I and II than expected, while the number in class III is much as expected. A similar trend which does not attain a level of significance is noted when diseased women are similarly assessed with reference to the presence or absence of adiposity. The non-adipose diseased women have 23 in social classes I and II, 88 in social class III, and 24 in social classes IV and V, and the corresponding numbers for the diseased adipose women are 5, 18 and 10 respectively ($X^2 = 3{\cdot}06$. df = 2. P $\triangleright$ 0·20). Thus adiposity appears to be more frequently encountered among women who form the semi-skilled and unskilled occupational groups.

No significant differences exist between the expected and observed values when the healthy and diseased men are contrasted by social class. At 60 - 69 years there are in social classes I and II, class III, and social classes IV and V 25, 88 and 38 healthy men and 23, 70 and 29 diseased men respectively ($X^2 = 0{\cdot}24$. df = 2. $P > 0{\cdot}80$). At 70 – 79 years in these same social class groups there are 27, 119 and 37 healthy men and 16, 56 and 17 diseased men respectively ($X^2 = 0{\cdot}46$. df = 2. $P > 0{\cdot}70$). The healthy and diseased men may therefore be combined to study trends by age. Social class groups I and II combined, social class III, and social class groups IV and V combined contain in the seventh decade 50, 166 and 69 men; in the eighth decade 46, 181 and 56 men, and in the ninth decade 8, 65 and 9 men respectively. The differences between the expected and observed values are significant ($X^2 = 12{\cdot}40$. df = 4. $P > 0{\cdot}01$). In the seventh decade there are more men in social classes I and II, and IV and V, but less in class III than expected. In the eighth decade the observed and expected numbers correspond closely, while in the ninth decade there are less in social classes I and II, and IV and V, and more in class III than expected. The suggestion here is that social class III is the most favoured for longevity. Similarly the non-adipose healthy and diseased women may be combined. These women, however, in contrast to the men show no significant variations by social class with age ($X^2 = 2{\cdot}87$. df = 4. $P > 0{\cdot}50$).

HOUSING.

Tables 182 and 183 show the distribution of men, non-adipose and adipose women in health and disease with reference to the type of house within which they reside. The proportions of individuals in the various types of houses do not differ significantly by sex, the presence or absence of adiposity in women, or the presence or absence of health. About 45 per cent of all people live in tenements; 20 per cent in semi-detached houses; 20 per cent in houses constructed four to the block; 10 per cent in terrace houses and the small remainder in detached houses. None of the chi-square tests which were calculated attained a level of significance, and of these tests the following is an example. Of the 400 healthy men 167 live in tenements; 17 in detached houses; 77 in semi-detached houses; 52 in terrace houses and 87 in four to the block houses. The corresponding numbers for the 293 healthy non-adipose women are 141, 13, 57, 24 and 58, and for the 111 adipose women otherwise well are 55, 4, 21, 9 and 22 respectively ($X^2 = 7{\cdot}00$. df = 8. $P > 0{\cdot}50$).

Tenancy.

Of the 400 healthy men 337 are the tenants of the houses within which they reside and 63 are not the tenants. The corresponding numbers for the 250 men with disease are 217 and 33 respectively. The difference between the expected and observed values of these who are tenants is not significant when the healthy and diseased men are contrasted ($X^2 = 0{\cdot}78$. df = 1. $P > 0{\cdot}30$). The same lack of significance is observed for women. Of the 404 healthy women 188 are the tenants of the houses within which they reside and 216 are not the tenants. The corresponding numbers for the 178 women with disease are 97 and 81 respectively ($X^2 = 3{\cdot}11$. df = 1. $P > 0{\cdot}05$).

Unsuitable houses.

It was not possible to assess the standard of housing in detail but the number of houses with an outside lavatory, no bath and / or no piped hot water supply were recorded. Houses with an outside lavatory, no bath and / or no piped hot water supply were occupied by 117, or 29·2 per cent, of the 400 healthy men; 75, or 30·0 per cent, of the 250 men with disease; 133, or 32·9 per cent, of the 404 healthy women, and 63, or 35·4 per cent, of the 178 women with disease. Thus the incidence of men and women living under such adverse housing conditions is similar for the healthy and diseased groups.

The data so far presented are characterised by the lack of significant contrasts. It may be surmised that radical variations in basic housing conditions are not significant factors in the production of disease in old people.

Ownership of house.

Of the 804 men and women who are healthy 344, or 42·8 per cent, live in houses rented from a private owner; 246, or 30·6 per cent, live in houses of the local authority, and 214, or 26·6 per cent, live in owner occupied houses. The proportions are comparable for the 428 diseased men and women of whom 190, or 44·4 per cent, live in houses rented from a private owner; 139, or 32·5 per cent, in houses of the local authority, and 99, or 23·1 per cent, in owner occupied houses. Thus the incidence of disease is not influenced by the form of ownership of the house. If the form of ownership of the house is any indication of the affluence of the family then the non-significant findings when the healthy and diseased people are compared are of interest.

Level of house in relation to ground level.

Tables 184 and 185 show the distribution of men, non-adipose and adipose women in health and disease in terms of the level of their homes in relation to the ground. The proportions do not vary materially with age and the numbers by five year age groups are not presented.

Of the 400 healthy men 116 live at ground level; 91 are in houses with a ground floor and one storey; 139 are at one storey; 41 are at two storeys, and 12 are at three storeys and one is at four storeys. The corresponding figures for the 293 healthy non-adipose women are 86, 61, 93, 39, 14 and 0, and for the 111 adipose women otherwise well are 26, 25, 39, 14, 7 and 0. There are no significant differences between the expected and observed values when these three groups are compared ($X^2 = 5{\cdot}62$. df = 8. $P > 0{\cdot}50$). Thus neither sex nor weight in the case of women, when people are healthy, alters the proportions who live at the various levels with reference to the ground.

The levels of the houses of the 250 diseased men, which correspond to those noted above for healthy men, are 85, 49, 61, 38, 15 and 2. The differences between the expected and observed values are significant ($X^2 = 14{\cdot}65$. df = 4. $P < 0{\cdot}01$). The diseased men have more of their numbers living at ground level and two storeys or more up and less at one storey than expected. It is reasonable to suppose that the increase in the numbers of diseased men at ground level is due to migration downwards because of the difficulty in negotiating stairs. I am at a loss as to why the ground floor increase is only at the expense of one storey houses.

The levels of the houses of the 145 non-adipose diseased women, which correspond to those noted above for non-adipose healthy women, are 40, 33, 39, 23, 9 and 1. The differences between the expected and observed values are not significant ($X^2 = 2{\cdot}24$. df = 4. $P > 0{\cdot}50$).

Thus, in general, the occurrence of disease has no marked effect in causing older people who reside upstairs to migrate to ground level. This does not imply that re-housing at ground level was not necessary to alleviate the physical distress experienced by those who had difficulty with stairs. I have the authority to arrange for re-housing at ground level in local authority accomodation when disability exists. Unfortunately the numbers requiring such houses far exceed the supply, and transfer within privately owned property is even less satisfactory. There is a need for greater flexibility in the exchange of houses, and it may be that local authorities should have powers to enforce exchanges in houses which they regard as desirable for the benefit of the community. The extent to which affection for a house keeps the individual in that house though it is unsuitable is a matter of speculation.

Difficulty with stairs.

Tables 186 to 189 show the number and percentage of men, non-adipose and adipose women in health and disease in terms of difficulty with stairs by quinquennial age groups.

The 400 healthy men and 293 healthy non-adipose women show a similar decline with age in the numbers who experience no difficulty with stairs. The decline is from 100 per cent with no difficulty at 60 - 64 years to 45·4 per cent for healthy men and 58·3 per cent for healthy non-adipose women at 85 - 89 years. The comparable decline with age in the numbers who experience no difficulty with stairs is much less satisfactory for the 250 diseased men and 145 non-adipose diseased women. For both sexes with disease the decline commences at 60 - 64 years with only 77 per cent having no difficulty with stairs. At each quinquennial age period the proportion of adipose women otherwise well who find no difficulty with stairs is less than the corresponding proportion for the healthy non-adipose women. When the diseased adipose women are contrasted with the adipose women otherwise well in terms of difficulty with stairs, the diseased adipose women are in a less favourable position. It is hardly necessary to present statistical proof of the significant variations, but the following are selected examples

Of the 400 healthy men 21 find difficulty with stairs and 379 do not have this handicap. The corresponding figures for the 293 healthy non-adipose women are 17 and 276. There is no significant difference between the expected and observed values ($X^2 = 0{\cdot}09$. df = 1. $P > 0{\cdot}70$). Corresponding to the figures 17 and 276 for the 293 healthy non-adipose women are the figures 44 and 67 for the 111 adipose women otherwise well. Here the difference between the expected and observed values is significant ($X^2 = 71{\cdot}60$. df = 1. $P < 0{\cdot}01$). Far more adipose than expected have difficulty with stairs. Furthermore, corresponding to the figures 44 and 67 for the 111 adipose women otherwise well are the figures 23 and 10 for the 33 diseased adipose women. The difference between the expected and observed values is significant ($X^2 = 9{\cdot}37$. df = 1. $P < 0{\cdot}01$). More diseased adipose women than expected have difficulty with stairs.

Sheldon (1948) in a study of difficulty with stairs observed that of 457 subjects 176, or 38.5 per cent, had difficulty while 281, or 61·5 per cent, had no trouble. In the present series of 1232 men and women 216, or 17·5 per cent, have difficulty with stairs, and this proportion is much less than that noted by Sheldon (1948). The difference is doubtless due to the more selective accumulation of cases in the present investigation which has concentrated on the healthier men and women in the community. This is further emphasised by the fact that Sheldon (1948) had 29 subjects who found it impossible to manage stairs at all, while in the present study no such people are recorded. Sheldon (1948) noted that women are relatively more affected than men. Only 26·5 per cent of the male sample were concerned, against 41 per cent of the female sample. This preponderance of women who have difficulty with stairs is confirmed by the present study. Of the 650 men 83, or 12·8 per cent, and of the 582 women 133, or 22·8 per cent, have difficulty with stairs. However, without stating his criterion of obesity Sheldon (1948) stated that difficulty with stairs was due to obesity in three instances. The situation is very different in the present study. Of 438 non-adipose women 66, or 15·1 per cent, and of 144 adipose women 67, or 46·7 per cent, have difficulty with stairs. Thus adiposity has a significant adverse influence on the ability to climb stairs, and the proportion of non-adipose women who have difficulty with stairs approximates to the corresponding proportion of men.

The most frequent cause of difficulty in ascent of stairs is dyspnoea, and this was also observed by Sheldon (1948). Difficulty in descent of stairs was due mainly to involvement of lower limbs by disease such as osteoarthritis.

Number of rooms.

Tables 190 to 193 show the number and percentage of men, non-adipose and adipose women in health and disease by the number of rooms and quinquennial age periods. The healthy men, healthy non-adipose women and adipose women otherwise well are similar in that the proportions living in 1, 2, 3, 4 and 5 roomed houses are approximately 10, 27, 33, 20 and 10 per cent respectively. In addition, any variations in the proportions when the diseased men, diseased non-adipose and diseased adipose women are considered are not of sufficient degree to produce chi-square values which are significant. An example is as follows. Of the 400 healthy men there are living in 1, 2, 3, 4 and 5 roomed houses 35, 104, 137, 82 and 42 men respectively. The corresponding numbers for the 250 diseased men are 12, 69, 74, 68 and 27. There are no significant differences between the expected and observed values ($X^2 = 7{\cdot}52$. df = 4. $P \rhd 0{\cdot}10$).

All electric power supply.

Tables 194 and 195 show the number and percentage of men, non-adipose and adipose women in health and disease with reference to an all electric power supply in their houses. The proportions of the various groups with an all electric power supply do not differ materially. Of the 650 men 81 are in all electric houses while 569 are in houses with gas and electricity. The corresponding numbers for the 582 women are 57 and 525. The difference between the expected and observed values is not significant ($X^2 = 2\cdot20$. df = 1. $P > 0\cdot10$). The sexes may therefore be combined, in which case 138, or 11·2 per cent, of the 1232 men and women have an all electric power supply in their houses.

Of the 1232 men and women 183, or 14·8 per cent, stated that their sense of smell had so deteriorated that they were unable to smell gas, and that if they were to use gas appliances the only way they could tell whether the gas was on or off was by looking at the gas tap. Subsequent to examination one of the men in this series died through accidental gas poisoning, and the number of known near misses is 9. The following is an example. An old lady decided late at night to warm some milk in a pan over a gas ring. She turned the gas tap on, struck a match and as she thought lit the gas, but the gas was not ignited. She sat down to read until the milk heated. After some time she realised the milk was not being heated, and on looking at the gas ring noticed there was no light. She turned off the gas tap, but as she lived on the ground floor alone she was afraid to open the windows. She abandoned the heating of the milk, went through to an adjacent room and shut the communicating door, under the impression that the gas which she could not smell would not come into the other room. She went to bed and fell asleep. In the morning she was sick and dizzy. When fresh air was admitted to the house she made an uneventful recovery. This old woman of 81 years was lucky. The outcome might easily have been more tragic.

CHILDREN.

Tables 196 and 197 show the number of children by their sex, marital status and location in relation to the parental home, of the men and women in health or with disease who possess children by five year age groups.

Childless men and women.

Of the 650 men in the series 134, or 20·6 per cent, have no children, and of the 582 women 161, or 27·7 per cent, are childless. The proportion of childless women is significantly greater than the proportion of childless men ($X^2 = 8{\cdot}34$. df = 1. $P < 0{\cdot}01$).

The 516 men with children account for 788 sons and 763 daughters, while the 421 women with children possess 655 sons and 613 daughters.

Of the 400 healthy men 317 have children and 83 are childless, and the corresponding numbers for the 250 diseased men are 199 and 51. The proportions childless do not differ significantly ($X^2 = 0{\cdot}00$. df = 1. $P > 0{\cdot}99$). Of the 404 healthy women 302 have children and 102 are childless, and the corresponding numbers for the 178 diseased women are 119 and 59. The difference between the expected and observed values is significant ($X^2 = 3{\cdot}89$. df = 1. $P < 0{\cdot}05$). There are more women with disease childless than expected. This significance is not due to loading of single women in the diseased group. Of the 404 healthy women 59 are single, and of the 178 diseased women 33 are single. The difference between the proportions is not significant ($X^2 = 1.46$. df = 1. $P > 0.20$). These findings indicate that women, and particularly women with disease, are at a much greater disadvantage than men when there is need of filial assistance in old age. It may be that to be childless is a more important factor for women than it is for men as a contributory cause of emotional disturbance, though it is not possible to be precise in this matter.

Location of children.

The children may be grouped according to whether they live with their parents, live near the parental homes so that visits to parents may be carried out easily and frequently, or live far from the parental homes so that visits to the parents are impossible or are infrequent and costly. These groups may form sub-groups in terms of the locations of the sons and daughters of healthy and diseased men and women. There are eight possible permutations which are as follows: -

	In home	Near	Far	Total
1. Healthy men - sons	101	308	92	501
2. Diseased men - sons	47	182	58	287
3. Healthy men - daughters	117	277	71	465
4. Diseased men - daughters	70	179	49	298
5. Healthy women - sons	79	284	92	455
6. Diseased women- sons	28	130	42	200
7. Healthy women - daughters	104	267	62	433
8. Diseased women- daughters	50	98	32	180
Total	596	1,725	498	2,819

When these eight sub-groups are contrasted highly significant differences between the expected and observed values are noted ($X^2 = 32{\cdot}08$. df = 14. $P < 0{\cdot}01$). It is desirable to proceed further to find where the significant differences lie. The contrast of the four sub-groups 5, 6, 7 and 8 which refer to women reveals significant differences between the expected and observed values ($X^2 = 20{\cdot}99$. df = 6. $P < 0{\cdot}01$). Furthermore, there are no significant differences between sub-groups 5 and 6 ($X^2 = 1{\cdot}15$. df = 2. $P > 0{\cdot}50$), or between sub-groups 7 and 8 ($X^2 = 2{\cdot}83$. df = 2. $P > 0{\cdot}20$). Thus for women significant differences are not found for sons or daughters when each sex is considered in terms of the health or disease of parents. Significant differences are present when sub-groups 5 and 6 combined are compared with sub-groups 7 and 8 combined ($X^2 = 17{\cdot}15$. df = 2. $P < 0{\cdot}01$). Consequently with women the significant differences in the location of children are not related to the presence or absence of health, but are associated with the sex of the children. More daughters live with their parents and less daughters are near and far from the parental homes than expected. The converse situation exists for sons. Following the above statistical procedure for men the contrast of sub-groups 1, 2, 3 and 4 shows that the differences between the sub-groups just fail to be significant ($X^2 = 10{\cdot}73$. df = 6. $P > 0{\cdot}05$), though the trends are similar to those noted for the sub-groups 5, 6, 7 and 8 of women. The sons of all men may be compared with the sons of all women, that is, sub-groups 1 and 2 combined compared with sub-groups 5 and 6 combined. The differences are not significant ($X^2 = 1{\cdot}66$. df = 2. $P > 0{\cdot}30$). Similarly with daughters there are no significant differences between sub-groups 3 and 4 combined and sub-groups 7 and 8 combined ($X^2 = 0{\cdot}08$. df 2. $P > 0{\cdot}95$). It is now permissible to compare the location of all sons with the location of all daughters irrespective of whether the parents are men or women and are in health or have disease. The differences between sub-groups 1, 2, 5 and 6 combined and sub-groups 3, 4, 7 and 8 combined are highly significant ($X^2 = 24{\cdot}70$. df = 2. $P < 0{\cdot}01$). There are more daughters in the same homes as their parents, and less daughters near and far from the parental homes than expected, while the converse situation is the case for sons. The purpose of this statistical exercise was to test the theory that disease in an old person might induce the individual to live with children in order to obtain adequate care and attention more frequently than if the old person was healthy. There is no evidence of this occurring and the theory must be rejected. Grossly incapacitated old people are not represented in this study and the matter so far as they are concerned remains open. The greater proportion of daughters as compared with sons who live in the same homes as their parents may be due in part to daughters being more reluctant than sons to leave the parental homes as the parents grow older; the daughters may have a greater sense of filial devotion, while daughters who are married are more likely to become widowed at an earlier age than sons and almost all widowed daughters in this study came to live again with their parents.

Marital status of the children who live with their parents.

Of the 2,819 children in this series 1,443 are sons and 1,376 are daughters. Living in the same homes as their parents are 41, or 3·4 per cent, of 1,189 married sons and 96, or 8·7 per cent, of 1,099 married daughters; 203, or 83·5 per cent, of 243 single sons and 206, or 88·8 per cent, of 232 single daughters; all 6 widowed sons and 22, or 78·6 per cent, of 28 widowed daughters; all 5 sons and 17 daughters who are divorced or separated from their spouses. Thus few married children live in the same homes as their parents, while as a complete contrast almost all widowed, divorced and separated children live with their parents. In addition, only a minority of single children live apart from their parents.

Clearly the great migration from the parental home is carried out by children who marry. It is an interesting observation that it is a personal tragedy for the son or daughter who is untimely widowed or whose marriage is a failure. The same cannot necessarily be said for the parents of these children for whom it may be something of a blessing. These elderly parents regain into their households children whom they had regarded as gone forever. The significant value of the care and attention which such children can give to their parents is obvious, and but for misfortune this would largely have been directed to the childrens own families outwith the parental homes.

<u>The relationship between parental age and the proportion of children who live in the same homes as their parents.</u>

The 650 men in this series possess 788 sons, and the proportions of these sons who live in the same homes as their parents by five year age groups are as follows: -

60 - 64 years: 57, or 41·3 per cent, of 138 sons.
65 - 69 years: 24, or 13·6 per cent, of 176 sons.
70 - 74 years: 33, or 18·2 per cent, of 181 sons.
75 - 79 years: 22, or 12·9 per cent, of 170 sons.
80 - 84 years: 12, or 11·5 per cent, of 104 sons.
85 - 89 years: 0, or 0·0 per cent, of 19 sons.

The corresponding percentage values for the daughters of these 650 men are 34·2, 19·1, 24·2, 21·4, 27·0 and 46·1.

The comparable data for the sons of the 582 women in this series are as follows: -

60 - 64 years: 47, or 24·0 per cent, of 196 sons.
65 - 69 years: 30, or 18·9 per cent, of 159 sons.
70 - 74 years: 21, or 13·1 per cent, of 160 sons.
75 - 79 years: 5, or 5·6 per cent, of 89 sons.
80 - 84 years: 2, or 4·6 per cent, of 43 sons.
85 - 89 years: 2, or 25·0 per cent, of 8 sons.

The corresponding data for the daughters of these 582 women give the percentage values 26·9, 25·6, 14·8, 32·0, 35·4 and 28·6 respectively.

Thus the proportion of sons who live in the same homes as their parents declines with increase in the age of parents, while this decline is not observed with daughters.

Tables 198 and 199 show an extension of the preceeding results relating to the location of the children. The marked variation in the ways in which children of families may be located in relation to the parental home is evident.

Children who are neglectful of their parents.

Tables 200 and 201 show the number and percentage of children who are or who are not neglectful of their parents by the marital status of the children and by decennial age periods for the parents. This study of neglect of the parents by children according to the marital status of the latter indicates that in the healthy group of men and women, while 94 married sons are neglectful and 684 married sons are not neglectful, there are only 48 married daughters neglectful with 670 married daughters not neglectful. The differences between the expected and observed values of neglect on the part of married sons and married daughters are significant ($X^2 = 12{\cdot}72$. df = 1. $P < 0{\cdot}01$). More married sons and less married daughters than expected neglect their parents. The same significant differences are recorded for the diseased group of 250 men and 178 women. Here 34 married sons and 15 married daughters are neglectful of their parents, while 377 married sons and 366 married daughters are not neglectful of their parents ($X = 6.44$. df = 1. $P < 0.02$). There are more married sons and less married daughters than expected who neglect their parents with disease.

The incidence of neglectful children is based on the statements of the parents. It was not found possible to question the children regarded as neglectful. While the significantly greater proportion of married sons compared with married daughters who are neglectful of their parents possibly represents a real difference in the degree of filial devotion as between the sexes, the data may over emphasise to an undetermined extent the lack of parental interest shown by sons. A married son has to work to earn an income and is immediately at a disadvantage compared with a married daughter who may visit her parents while her husband is at work. Consequently the antagonism of a daughter-in-law towards her husband's parents can more effectively bar him from his parents, than the antagonism of a son-in-law towards his wife's parents.

Neglect of parents by single children is uncommon and does not, because of the smallness of numbers, lend itself to statistical analysis. However, single sons and daughters show a similar high degree of filial devotion. For the 1232 men and women in this series 7 single sons and 3 single daughters are neglectful of their parents, while 236 single sons and 229 single daughters are not neglectful of their parents. Thus old people who possess unmarried children are fortunate, and are most unlikely to be neglected by such children.

When the parental neglect by married children is considered with reference to the health of their parents it is noted that the healthy group of 804 men and women have 94 neglectful married sons and 684 married sons who are not neglectful, while the corresponding figures for the 428 men and women with disease are 34 and 377. The difference between the proportions of neglectful married sons by health and disease of parents is significant ($X^2 = 4{\cdot}10$. df = 1. $P < 0{\cdot}05$). The healthy group of 804 men and women with 48 neglectful married daughters and 670 married daughters who are not neglectful may be contrasted with the 428 men and women with disease who have the corresponding figures of 15 and 366. Here the difference is not significant ($X^2 = 3{\cdot}44$. df = 1. $P > 0{\cdot}05$). Nevertheless, the married sons and daughters show the same trends. There are less married sons and daughters neglectful of parents with disease, and more neglectful of parents who are healthy than expected. These findings suggest that when aged parents become ill married children do rally to their assistance, and that this is more marked in the case of married sons. The significance is greater for married sons than married daughters probably because when parents are healthy married daughters show a greater sense of filial responsibility and there is less scope for significant change when parents become ill.

The data are only of sufficient magnitude to permit of reasonable study by age for married sons and daughters, and only for the healthy group of men and women. The 804 healthy men and women have 20, 43 and 31 neglectful married sons in the seventh, eighth and ninth decades respectively. The corresponding figures for married sons who are not neglectful are 289, 294 and 101. There are significant differences between the expected and observed values ($X^2 = 25{\cdot}27$. df = 2. $P < 0{\cdot}01$). In addition, the healthy group of men and women have 17, 17 and 14 neglectful married daughters in the seventh, eighth and ninth decades respectively, and the corresponding figures for the married daughters who are not neglectful are 288, 303 and 79. Again there are significant differences between the expected and observed values ($X^2 = 12{\cdot}08$. df = 2. $P < 0{\cdot}01$). The married sons are less neglectful in the seventh decade, a little more neglectful in the eighth decade, and much more neglectful in the ninth decade than expected. The married daughters are less neglectful in the seventh and eighth decades and more neglectful in the ninth decade than expected.

The significant increase in the proportion of neglectful married children with increase in the age of parents is highly relevant. When parents are in the higher age ranges the position is attained that their children may be entering the age range of the elderly themselves. Such elderly children are beginning to look to their own children for aid rather than contemplating what assistance they require to give to their parents. Thus with the increase in longevity in modern society the question arises what is the moral responsibility of children not only to their parents but also to their grand parents. If it be admitted that children have a responsibility for the care of their grand parents then such children have a most onorous task.

DOMESTIC STRUCTURE.

Tables 202 and 203 show in some detail the domestic structures within the homes in which the patients reside in terms of their health and disease respectively. From these Tables is derived the following data which present in more concise form the more common types of domestic structure. The comparison by health and disease is to assess the theory that disease might be associated with certain forms of domestic structure.

Married men and women - healthy group.

	Number		Percentage	
	Men	Women	Men	Women
Self and spouse	133	94	56·4	58·7
Self, spouse and unmarried daughter	24	19	10·2	11·9
Self, spouse and unmarried son	32	22	13·6	13·7
Self, spouse, unmarried daughter and unmarried son	13	10	5·5	6·2
Self, spouse, and sons or daughters widowed, separated or divorced	6	5	2·5	3·1
Self, spouse, married daughter and son-in-law	7	7	3·0	4·4
Self, spouse, married son and daughter-in-law	4	2	1·7	1·2
Other	17	1	7·1	0·8
Total	236	160	100·0	100·0

Married men and women - group with disease.

	Number		Percentage	
	Men	Women	Men	Women
Self and spouse	101	35	61·2	61·4
Self, spouse and unmarried daughter	21	7	12·7	12·3
Self, spouse and unmarried son	13	2	7·9	3·5
Self, spouse, unmarried daughter and unmarried son	12	2	7·3	3·5
Self, spouse, and sons or daughters widowed, separated or divorced	6	1	3·6	1·7
Self, spouse, married daughter and son-in-law	5	5	3·0	8·8
Self, spouse, married son and daughter-in-law	1	2	0·6	3·5
Other	6	3	3·7	5·3
Total	165	57	100·0	100·0

Widowed, divorced or separated men and women - healthy group.

Living alone	39	80	28.1	43·2
Self and unmarried daughter	15	18	10·8	9·7
Self and unmarried son	6	13	4·3	7·0
Self and unmarried daughter and unmarried son	4	6	2·9	3·2
Self and sons or daughters widowed, separated or divorced	9	12	6·5	6·5
Self, married daughter and son-in-law	25	19	18.0	10·3
Self, married son and daughter-in-law	13	5	9.3	2.7

	Number		Percentage	
	Men	Women	Men	Women
Self and unmarried or widowed sister	5	11	3.6	5.9
Living as a lodger	6	2	4.3	1.1
Other	17	19	12.2	10.4
Total	139	185	100.0	100.0

Widowed, divorced or separated men and women - group with disease.

Living alone	15	39	23.8	44.3
Self and unmarried daughter	7	9	11.1	10.2
Self and unmarried son	2	7	3.2	7.9
Self and unmarried daughter and unmarried son	0	3	0.0	3.4
Self and sons or daughters widowed, separated or divorced	2	3	3.2	3.4
Self, married daughter and son-in-law	13	10	20.6	11.4
Self, married son and daughter-in-law	8	4	12.7	4.5
Self and unmarried or widowed sister	3	2	4.8	2.3
Living as a lodger	4	1	6.3	1.1
Other	9	18	14.3	11.5
Total	63	88	100.0	100.0

Single men and women - healthy group.

Living alone	2	23	8.0	39.0
Self and unmarried or widowed sister	8	20	32.0	33.9
Self and unmarried or widowed brother	1	4	4.0	6.8

	Number		Percentage	
	Men	Women	Men	Women
Living as a lodger	9	1	36.0	1.7
Other	5	11	20.0	18.6
Total	25	59	100.0	100.0

Single men and women - group with disease.

Living alone	4	18	18.2	54.5
Self and unmarried or widowed sister	8	13	36.4	39.4
Self and unmarried or widowed brother	1	0	4.5	0.0
Living as a lodger	3	0	13.6	0.0
Other	6	2	27.3	6.1
Total	22	33	100.0	100.0

About 60 per cent of those who are married live in their homes with no other relatives than their spouses. The next most common finding is that a married couple has an unmarried daughter and / or son in the household. The remaining types of domestic structure for married people form only a small proportion of the total. The proportions presented for the married men and women are comparable by health and disease and by sex.

The widowed, divorced and separated group of men and women have percentage values which are similar by health and disease, but differ in certain aspects by sex. In this group more of the women than men live alone. Where men or women live with married children in the home the preference is to be with a married daughter rather than a married son, and this is an occurrence which was noted also by Sheldon (1948). The preference for an aged parent to live with a married daughter rather than a married son is according to Nimkoff (1961) due to the feeling of the parent that it is safer to be dependent on a daughter than on a son. Since the woman usually sets the tone of the home and has the major responsibility for its management, it is more satisfactory to be dependent on a daughter than on a daughter-in-law.

Of the 937 men and women who possess children 441, or 47.1 per cent, have at least one child living with them. This is a markedly higher proportion than the 36 per cent recorded by Shanas (1960) in her study of family responsibility and the health of older people. She further observed that despite the much discussed mobility of individuals almost 90 per cent of her old people who possessed children had at least one child in or near the parental home. This high proportion is similar to the finding in the present study. Furthermore, while the neglect of parents by children in this series is of a proportion which cannot be ignored, such neglect is often buffered by the filial devotion of other children in a family. Thus the number of old people with children who are neglected by all their children is small. This reflects the statement of Shanas (1960) that children assume the obligations which are traditionally associated with the relationships of aged parents and adult children.

There is ample evidence in this study that the family ties between older people and their children are strong, and this lends support to the observations of Adams (1957), Brown (1960), Shanas (1960), Streib (1958) and Townsend (1957). It might seem that childless old people, therefore, are at a significant disadvantage when in need of family assistance. The disparity, however, is not as great as might be expected. Childless old people who require aid derive assistance from relatives other than children, and such help is often given by sisters. Serious difficulty arises when there are no relatives or only distant relatives, and the individual lives alone. Such isolated old people require particular assistance from local health authorities, voluntary effort and others.

The single men and women in this study present percentage values which are similar by health and disease. Although more of the diseased men and women live alone than those who are healthy, the difference in proportions is not significant (($X^2 = 2{\cdot}07$. df = 1. $P > 0{\cdot}10$) for women). Where a single person lives with another relative it is usually with an unmarried or widowed sister. More men than women live as lodgers.

EMOTIONAL DISTURBANCE.

Anxieties and depressions of significant degree were observed among the people studied, and in the following text they will be described by the term emotional disturbance. Tables 204 and 205 present the causes and incidence of emotional disturbance for men and women by health and disease and decennial age periods.

Emotional disturbance is found in 271, or 22·0 per cent, of the 1232 men and women in this series, or in 131, or 20·1 per cent, of 650 men and 140, or 24·0 per cent, of 582 women, or in 53, or 13·2 per cent, of 400 healthy men; 78, or 31·3 per cent, of 250 diseased men; 72, or 17·8 per cent, of 404 healthy women, and 68, or 38·4 per cent, of 178 women with disease. There are no significant differences between the proportions with emotional disturbance for the following contrasted groups: -

(a) All men compared with all women - $X^2 = 2{\cdot}73$. df = 1. $P > 0{\cdot}05$.

(b) Healthy men compared with healthy women - $X^2 = 3{\cdot}21$. df = 1. $P > 0{\cdot}05$.

(c) Diseased men compared with diseased women - $X^2 = 2{\cdot}28$. df = 1. $P > 0{\cdot}10$.

Though none of these comparisons provide statistically significant chi-square values a feature common to all is that there are more women and less men with emotional disturbance than expected. This consistency suggests that emotional disturbance may be really more prevalent in women than in men in a series such as this.

Sheldon (1948) recorded anxiety and preoccupation in 74 people formed by 14, or 9.5 per cent, of 147 men and 60, or 17.6 per cent, of 340 women. Sheldon's (1948) proportion of men is comparable to that observed for my 400 healthy men ($X^2 = 1{\cdot}39$. df = 1. $P > 0{\cdot}20$), but obviously is significantly less than the 31·3 per cent of the 250 diseased men with emotional disturbance. Similarly his 60, or 17·6 per cent, of 340 women is comparable to the 17·8 per cent of 404 healthy women with emotional disturbance, but is significantly less than the 38·4 per cent recorded for the 178 diseased women. This is a peculiar situation because Sheldon (1948) included in his series people with disease of more gravity than exist in my study. Prior to this statistical comparison I would have guessed that Sheldon's (1948) incidence of mental upset might have consequently been greater than that noted in my series. Either the elderly people of Wolverhampton are subject to less emotional disturbance than their counterparts in Rutherglen, or Sheldon (1948) is less critical in his assessment of deviation from mental normality. A complicated situation is only rendered more confusing when the survey of Hobson and Pemberton (1955) is assessed. Hobson and Pemberton (1955) found abnormal degrees of anxiety or depression in 50, or 26·6 per cent, of 188 men studied. This proportion is comparable to the 131, or 20.1 per cent, of 650 men in my series with emotional disturbance ($X^2 = 3.58$. df = 1. $P > 0.05$). Hobson and Pemberton (1955), however, found abnormal degrees of anxiety or depression in

155, or 55·6 per cent, of 279 women, and this proportion must be derived from a population completely different from that of Rutherglen. In the present study 140, or 24·0 per cent, of 582 women were emotionally disturbed. The differences between the two populations are extremely significant ($X^2 = 83{\cdot}0$. df = 1. $P < 0{\cdot}01$). Thus the overall incidence of emotional disturbance in the present investigation lies between that of Sheldon (1948) and of Hobson and Pemberton (1955). In addition, the present study indicates clearly a strong association between emotional disturbance and the occurrence of disease. The divergent observations noted in the three surveys possibly imply an urgent need for uniformity in the assessment of emotional disturbance.

Age and emotional disturbance.

The incidence of emotional disturbance among healthy people in the seventh, eighth and ninth decades is 14, or 9·3 per cent, of 151 men; 22, or 12·0 per cent, of 183 men, and 17, or 25·8 per cent, of 66 men respectively, while for women the incidence is 33, or 16·5 per cent, of 200; 25, or 16·1 per cent, of 155, and 14, or 28·6 per cent, of 49 respectively. Healthy men show a highly significant increase in the incidence of emotional disturbance with age ($X^2 = 9{\cdot}49$. df = 2. $P < 0{\cdot}01$). There are less healthy men in the seventh decade, slightly less in the eighth decade, and more in the ninth decade with emotional disturbance than expected. Healthy women show a similar age trend, but the differences by decennial age periods are not significant ($X^2 = 4.45$. df = 2. $P > 0.10$).

The incidence of emotional disturbance in men with disease is 43, or 32·1 per cent, of 134 in the seventh decade; 30, or 30·0 per cent, of 100 in the eighth decade, and 5, or 33·3 per cent, of 15 in the age group 80 to 84 years. The corresponding data for women with disease are 41, or 42.3 per cent, of 97; 25, or 35·2 per cent, of 71, and 2, or 22·2 per cent, of 9 respectively. Thus there is no variation in the incidence of emotional disturbance with age for men with disease, while there is a marked decline in the incidence of emotional disturbance with age for women with disease.

The incidence of emotional disturbance for the 650 healthy and diseased men is 57, or 20·0 per cent, of 285 in the seventh decade; 52, or 18·4 per cent, of 283 in the eight decade, and 22, or 26·8 per cent, of 82 in the ninth decade. The proportion of men with emotional disturbance does not vary significantly with age ($X^2 = 2{\cdot}84$. df = 2. $P > 0{\cdot}20$), and this is in agreement with the finding of Hobson and Pemberton (1955) that the incidence of anxiety and depression does not vary significantly with age in men. However, to assess the influence of age on the incidence of emotional disturbance in men without reference to the presence or absence of disease results in the loss of valuable information. The absence of significant variation with age in the incidence of emotional disturbance in the diseased group of men masks the significant increase with age in the incidence of emotional disturbance in the healthy group of men when both groups are combined.

The incidence of emotional disturbance for the 582 healthy and diseased women is 74, or 24·9 per cent, of 297 in the seventh decade; 50, or 22·1 per cent, of 226 in the eighth decade, and 16, or 27·1 per cent, of 59 in the ninth decade. The proportion of women with emotional disturbance does not vary significantly with age ($X^2 = 0{\cdot}89$. df = 2. $P > 0{\cdot}50$). This non-significant trend does not conform to that of Hobson and Pemberton (1955) who found that in women over the age of 75 years anxiety and depression become considerably less frequent. In the present study it is relevant to note that the non-significant increase with age in the incidence of emotional disturbance in women who are healthy masks the significant decline with age in the incidence of emotional disturbance in women with disease when both groups are combined.

The primary causes of emotional disturbance are as follows: -

<u>Adverse home environment</u>.

In the group of 271 men and women emotionally disturbed the primary cause is an adverse home environment for 66, or 24·3 per cent.

In the seventh, eighth and ninth decades emotional disturbance due to an adverse home environment is observed for the 400 healthy men in 2, or 1.3 per cent, of 151; 6, or 3.3 per cent, of 183, and 10, or 15.1 per cent, of 66 respectively, and for the 404 healthy women in 10, or 5.0 per cent, of 200; 10, or 6.4 per cent, of 155, and 4, or 8.2 per cent, of 49 respectively. In the seventh and eighth decades and the age group 80 to 84 years emotional disturbance due to an adverse home environment is observed for the 250 diseased men in 1, or 0·7 per cent, of 134; 5, or 5·0 per cent, of 100, and 2, or 13·3 per cent, of 15 respectively. The corresponding data for the 178 diseased women are 5, or 5·1 per cent, of 97; 10, or 14·1 per cent, of 71, and 1, or 11.1 per cent, of 9. Thus for both sexes in health and disease the incidence of emotional disturbance due to an adverse home environment tends to increase with age.

Of the 400 healthy men and 250 diseased men 18 and 8 are emotionally disturbed because of an adverse home environment respectively. The proportions of the healthy and diseased groups of men with emotional disturbance due to an adverse home environment are comparable ($X^2 = 0{\cdot}68$. df = 1. $P > 0{\cdot}30$). Similarly of the 404 healthy women and 178 diseased women 24 and 16 are emotionally disturbed because of adverse home circumstances respectively, and the proportions do not differ significantly ($X^2 = 1{\cdot}82$. df = 1. $P > 0{\cdot}10$). Thus the healthy and diseased people may be combined and contrasted by sex. Then 26 of the 650 men and 40 of the 582 women are emotionally disturbed because of an adverse home environment, and the proportions differ significantly by sex ($X^2 = 4{\cdot}97$. df = 1. $P > 0{\cdot}02$). More women and less men than expected are emotionally disturbed because of an adverse home environment. An important factor in this sex difference is the greater incidence of women who live alone and are very lonely. Of the 26 men and 40 women emotionally disturbed because of an adverse home environment 16, or 61.5 per cent, and 33, or 82.5 per cent, respectively live alone. The 16 men and 32 of the 33 women who live alone also complain of marked loneliness.

Men and women may be very lonely though they do not live alone. Usually this is due to the other occupants of the homes being at work during the day. This form of loneliness was found in 9, or 21·4 per cent, of the 42 healthy men and women who lived in an adverse home environment causing emotional disturbance, while no case was noted in the corresponding group of 24 men and women with disease.

Tables 204 and 205 indicate that emotional disturbance due primarily to adverse home conditions may in certain instances be further aggravated by secondary factors such as financial insecurity, neglectful children, personal ill-health, restriction of activities or unemployment.

Bereavement.

For 60, or 22·1 per cent, of the 271 men and women emotionally disturbed the cause is primarily bereavement, and this proportion is comparable to the 11, or 14.9 per cent, of 74 men and women noted by Sheldon (1948) ($X^2 = 1{\cdot}86$. df = 1. $P > 0{\cdot}10$).

Emotional disturbance due to bereavement requires to be considered from two aspects. The emotional disturbance associated with the death of any relative to which all individuals are exposed, and the emotional disturbance associated with the death of the spouse to which only the widowed are vulnerable.

1. Death of any relative.

In the seventh, eighth and ninth decades emotional disturbance due to bereavement exists in 1·3 per cent, 2·7 per cent and 1·5 per cent of healthy men, and in 5·5 per cent, 3·9 per cent and 6·1 per cent of healthy women respectively. In the seventh and eighth decades and age group 80 to 84 years emotional disturbance caused by bereavement is found in 6·0 per cent, 7·0 per cent and 6·7 per cent of diseased men, and in 8·2 per cent, 9·9 per cent and 11·1 per cent of diseased women respectively. For either sex in health or disease age has no significant influence on the proportion of individuals emotionally disturbed by bereavement.

Eight, or 2·0 per cent, of 400 healthy men; 16, or 6·4 per cent, of 250 diseased men; 20, or 4·9 per cent, of 404 healthy women, and 16, or 9·0 per cent, of 178 diseased women are emotionally disturbed because of bereavement. The difference between the proportions emotionally disturbed by bereavement in terms of health and disease is significant for men ($X^2 = 8{\cdot}46$. df = 1. $P < 0{\cdot}01$), but does not quite attain a level of significance for women ($X^2 = 3{\cdot}49$. df = 1. $P > 0{\cdot}05$). However, the trends for both sexes are similar. More diseased and less healthy individuals than expected are emotionally disturbed by bereavement. The difference between the proportion of healthy men and the proportion of healthy women emotionally disturbed by bereavement is significant (X^2 5·15. df = 1. $P > 0{\cdot}02$), but when men and women with disease are contrasted there is no significant difference between the two proportions ($X^2 = 1{\cdot}01$. df = 1. $P > 0{\cdot}30$). The trends are the same in health and disease. Thus particularly in health, women are more likely than men to be emotionally disturbed by bereavement.

2. Death of spouse.

Of 146 widowed men and women in the seventh decade 25, or 17·1 per cent, are emotionally disturbed by the death of the spouse, and the corresponding data for widowed men and women in the eighth and ninth decades are 22, or 10.1 per cent, of 218 and 4, or 4.3 per cent, of 92 respectively. Thus widowed men and women show a marked decline with age in the incidence of emotional disturbance due to the death of the spouse. This decline in incidence is doubtless related to a positive correlation which exists for widowed old people between age and the time interval between the death of the spouse and the medico-social assessment. It is apparent that the power of the death of a spouse to produce emotional disturbance in the survivor weakens with the passing of time.

Of 132 widowed healthy men and 60 widowed diseased men 6 and 16 respectively are emotionally disturbed by the deaths of their spouses. The difference between the proportions by health and disease is significant ($X^2 = 19{\cdot}75$. df = 1. $P < 0{\cdot}01$). Of 179 widowed healthy women and 85 widowed diseased women 15 and 14 respectively are emotionally disturbed by the deaths of their spouses. The difference between the proportions by health and disease is significant, though the significance is less strong than that noted for men ($X^2 = 3{\cdot}92$. df = 1. $P < 0{\cdot}05$). For these men and women there are more diseased and less healthy individuals than expected who are emotionally disturbed by the deaths of their spouses. There is no evidence that the average time interval between the death of the spouse and time of examination differs significantly between the widowed healthy and diseased people. Thus disease may render those who are widowed more prone to emotional disturbance because of their bereavement than would be the case were they healthy.

The difference between the proportions of widowed healthy men and women emotionally disturbed by bereavement is not significant ($X^2 = 1{\cdot}75$. df = 1. $P > 0{\cdot}10$), and the difference between the proportions of widowed diseased men and women emotionally disturbed by bereavement also lacks significance ($X^2 = 2{\cdot}24$. df = 1. $P > 0{\cdot}10$). Thus while disease has a significant role to play in the cause of emotional disturbance due to bereavement, the incidence is not materially influenced by sex.

Age has no influence on the incidence of emotional disturbance caused by the death of any relative, but there is a significant decline when the death of a spouse alone is considered. I have suggested an explanation for this decline. The age trend for the deaths of any relatives may lack significance because unlike the death of a spouse, though an individual's age may increase this does not protect from deaths continuing sporadically among all relatives.

Frequently emotional disturbance due to bereavement is not a simple association and Tables 204 and 205 show that secondary adverse factors may be present such as living alone, loneliness, neglectful children, dependency on children, personal ill-health, financial insecurity and compulsory retirement.

Personal ill-health.

Personal ill-health accounts for 62, or 22·9 per cent, of the 271 men and women emotionally disturbed. Personal ill-health as a cause of emotional disturbance is entirely related to the men and women with disease, and is recorded in 36, or 14·5 per cent, of the 250 diseased men, and in 26, or 14·7 per cent, of the 178 diseased women.

In the seventh and eighth decades and the age group 80 to 84 years emotional disturbance due to personal ill-health is observed in 27, or 20·1 per cent, of 134; 8, or 8·0 per cent, of 100, and 1, or 6.7 per cent, of 15 diseased men respectively. The corresponding data for diseased women are 22, or 22·7 per cent, of 97; 4, or 5.6 per cent, of 71, and 0, or 0.0 per cent, of 9. Both sexes show a significant decline with age in the incidence of emotional disturbance due to personal ill-health.

Personal ill-health is the sole cause of emotional disturbance in 13, or 36.1 per cent, of the 36 men, and this proportion is similar to the 6, or 23.1 per cent, of the 26 women ($X^2 = 1.24$. df = 1. $P > 0{\cdot}20$). For the other 43 men and women emotionally disturbed by personal ill-health there are subsidiary adverse influences such as restriction of activities, living alone, loneliness, financial insecurity, compulsory retirement, inability to work because of ill-health, ill-health of a relative, neglectful children and dependency on a relative.

Personal ill-health, one of the most serious causes of emotional disturbance in the aged, is within the individual, and the mind cannot deal with this inner danger as readily as with an external realistic threat. Anxiety predominates though there are instances where anxiety, hypochondriasis and possibly depression co-exist in subtle combination. The task of the physician in the present study was rendered more difficult as few possessed inner resources of such strength as to warrant the assumption that the patients could with mental tranquillity face a future rendered precarious and unpredictable by disease. The physician requires to proceed warily. He must initially carry out a careful clinical examination for two reasons. To inform himself of the precise physical state of the patient, and to instil into the mind of the individual that there is someone who is really interested in his difficulties. By this means the mind of the patient is rendered more receptive to subsequent instruction, whether it be simple reassurance, guidance on an altered mode of life in terms of physical incapacity, or other means of enhancing mental health. Only in the isolated case is a single consultation of much value. Repetative instruction over a series of visits, modified as circumstances may alter, is essential to achieve any degree of success. The practice of making a speedy diagnosis without proper examination of an adequately undressed patient has no place in the medical care of the aged. If the illness is associated with anxiety the patient's mind is merely further disturbed by the possible realisation that the physician is unlikely to be conversant with the true character of the disease. This mental insecurity may easily advance into a panic state with the mind feeling overwhelmed and completely helpless.

Ill-health of a relative.

Of the 271 emotionally disturbed people ill-health of a relative is the cause in 30, or 11·1 per cent.

Emotional disturbance due primarily to the ill-health of a relative is found in 9, or 2.2 per cent, of 400 healthy men; 9, or 2.2 per cent, of 404 healthy women; 6, or 2.4 per cent, of 250 diseased men, and in 6, or 3.4 per cent, of 178 diseased women. Thus the incidence of emotional disturbance due to the ill-health of a relative does not vary materially by sex or the presence or absence of health.

In 22, or 73.3 per cent, of these 30 men and women the ill-health of a relative is the sole cause of the emotional disturbance. For the other 8 men and women subsidiary causes of the emotional disturbance are restriction of activities, living alone, financial insecurity, neglectful children, death of a relative and loneliness.

Neglectful children.

Of the 271 emotionally disturbed people 26, or 9.6 per cent, are in this mental state because of neglectful children.

Tables 204 and 205 present the numbers of neglectful children as proportions of total age group. It is more informative to calculate the percentages of neglectful children in terms only of the men and women who possess children, and these values are as follows. In the seventh, eighth and ninth decades the numbers of healthy men with neglectful children are 3, or 2.5 per cent, of 121; 4, or 2.7 per cent, of 146, and 3, or 6.0 per cent, of 50 respectively, while the corresponding numbers of healthy women with neglectful children are 3, or 1.9 per cent, of 159; 3, or 2.7 per cent, of 110, and 4, or 12.1 per cent, of 33. There is but the slightest of indications that the incidence of neglectful children might increase with parental age. There are only 6 diseased men and women with neglectful children and the number is too small to indicate any age trend.

For the people who possess children the incidence of neglectful children is 10, or 3.1 per cent, of 317 healthy men; 10, or 3.3 per cent, of 302 healthy women; 3, or 1.5 per cent, of 198 diseased men, and 3, or 2.5 per cent, of 119 diseased women. Thus the incidence of neglectful children is small and is comparable by sex and by the presence or absence of health.

Of these 26 men and women with neglectful children neglect by children is the sole cause of emotional disturbance for 11, or 42.3

per cent. Of the remaining 15 men and women with secondary causes of emotional disturbance 6 live alone and 8 are very lonely.

Inadequate finance.

Of the 271 emotionally disturbed men and women 8, or 2.9 per cent, are in this mental state because of inadequate finance.

Inadequate finance as a primary cause of emotional disturbance is relatively uncommon, and is recorded in 3, or 0.7 per cent, of the 400 healthy men, and in 5, or 1.2 per cent, of the 404 healthy women, but is not observed in the groups of diseased men and women. However, inadequate finance is more often a subsidiary cause of emotional disturbance. This is also found by Sheldon (1948) who states that economic anxieties rarely exist in vacuo. It is other factors with their economic colouring which appear to be responsible, rather than the simple struggle to make both ends meet.

Miscellaneous group.

A change of home to a different area; a drunken spouse; the fear of rejection by God; a daughter's unhappy marriage; the fear of being sacked; actual unemployment and the heaviness of work are the causes of emotional disturbance for the remaining 5 men and 4 women who are healthy. Compulsory retirement; the unfounded fear of disease; a drunken spouse; deterioration of vision and the fear of dying are the causes of emotional disturbance in the remaining 9 men and one woman who have disease.

Comment.

Ninety per cent of the 271 emotionally disturbed men and women were in this mental state because of an adverse home environment, bereavement, personal ill-health, neglectful children or the ill-health of a relative. Furthermore, among the secondary adverse influences are such occurrences as financial insecurity, restriction of activity, dependency on children and compulsory retirement, while in certain instances a primary cause may be a subsidiary to another primary agent. In my opinion the services generally directed to the aged by local health authorities are inadequate to counter effectively the above internal and external environmental stresses. I am no less certain that these adverse influences on the minds of aged men and women are amenable to considerable control, and their effects significantly ameliorated through the provision by local health authorities of skilled clinical and mental care. Obviously a local health authority cannot meet such a complex commitment, which involves physical, mental and social well-being, on its own. A local health authority requires to act as integrator of action by its own officials, the physicians of the hospital service and general practitioners. The Standing Advisory Committee on Local Authority Services (1961), following their assessment of the mental health services of local health authorities, considered that the prevention of mental ill-health in elderly people would best be attained through the local health authority provision of a comprehensive service to keep old people active and alert. The Rutherglen Consultative Health Centre for older people is an example of such an envisaged comprehensive service.

Emotional disturbance and marital status.

Tables 206 and 207 show the incidence of emotional disturbance for men and women by health and disease and decennial age periods in terms of marital status.

When healthy men and women are contrasted emotional disturbance is minimal and comparable for healthy married men and women, and is present in 20, or 8.5 per cent, of 236 healthy married men and 8, or 5.0 per cent, of 160 healthy married women. Emotional disturbance is more prevalent in healthy widowed men and women. Of 132 healthy widowed men 26, or 19.7 per cent, and of 179 healthy widowed women 51, or 28.5 per cent, are emotionally disturbed. The incidence of emotional disturbance in healthy single men and women may be regarded as similar to the incidence of emotional disturbance for those who are widowed, with 5, or 20.0 per cent, of 25 healthy single men and 12, or 20.3 per cent, of 59 healthy single women being emotionally disturbed. The 7 men and 6 women healthy and divorced or separated have an incidence of emotional disturbance comparable to that for the widowed and single people. Healthy married people have the company, sympathy and encouragement of their spouses, and are thus more protected mentally against the effects of adverse occurrences than are the other marital status groups. A married person is only rarely compelled to live alone and experience loneliness. It is, therefore, no surprise that for the marital status groups the incidence of emotional disturbance is least for married people.

The diseased men and women show marked differences compared with those who are healthy. The diseased men and women have a similar incidence of emotional disturbance. It is found in 43, or 26·1 per cent, of 165 diseased married men, and in 16, or 28·1 per cent, of 57 diseased married women; in 29, or 48·3 per cent, of 60 diseased widowed men, and in 39, or 45·9 per cent, of 85 diseased widowed women; in 5, or 22·7 per cent, of 22 diseased single men, and in 11, or 33·3 per cent, of 33 diseased single women. Three men and 3 women with disease are divorced or separated, but the numbers are small and do not permit of reasonable comparison. Thus where marital status is complicated by the presence of disease the incidence of emotional disturbance tends to become higher than it is for healthy marital status groups. This is largely due to personal ill-health acting as a cause of emotional disturbance, and this adverse factor can only exist in the diseased marital status groups.

There is no indication of a real variation with age in the incidence of emotional disturbance by marital status for healthy men and women. On the other hand, diseased married men show a decline with age in the incidence of emotional disturbance from 27, or 28.1 per cent, of 96 at 60 - 69 years to nil of 4 at 80 years and more, while the diseased married women decline from 14, or 38.9 per cent, of 36 at 60 - 69 years to nil of 2 at 80 years and more. In addition, the diseased widowed men decline from 13, or 61.9 per cent, of 21 at 60 - 69 years to 5, or 41.7 per cent, of 12 at 80 years and more, while the diseased widowed women decline from 19, or 51.4 per cent, of 37 at 60 - 69 years to 1, or 14.3 per cent, of 7 at 80 years and more. It seems that personal ill-health as a cause of emotional disturbance becomes less prevalent with age.

Emotional disturbance and social class.

Tables 208 and 209 show the incidence of emotional disturbance by social class for men and women in health and disease by decennial age periods.

A comparison of social classes I and II combined, social class III, and social classes IV and V combined shows that there are 6, or 10.7 per cent, of 56; 36, or 13.7 per cent, of 263, and 11, or 13.6 per cent, of 81 healthy men emotionally disturbed; that there are 14, or 25.5 per cent, of 55; 39, or 14.0 per cent, of 278, and 19, or 26.8 per cent, of 71 healthy women emotionally disturbed; that there are 11, or 22.9 per cent, of 48; 45, or 30.2 per cent, of 149, and 22, or 41.5 per cent, of 53 diseased men emotionally disturbed, and that there are 11, or 36.7 per cent, of 30; 39, or 34.5 per cent, of 113, and 18, or 51.4 per cent, of 35 diseased women emotionally disturbed respectively.

The above data indicate that in social classes I and II combined the proportions of healthy and diseased men who are emotionally disturbed are comparable ($X^2 = 2.89$. df = 1. $P > 0.05$). However, significant differences exist between the incidences of emotional disturbance for healthy and diseased men in social class III ($X^2 = 16.41$. df = 1. $P < 0{\cdot}01$), and in social classes IV and V combined ($X^2 = 16.46$. df = 1. $P < 0{\cdot}01$). Women present similar findings. In social classes I and II combined the proportions of healthy and diseased women who are emotionally disturbed are comparable ($X^2 = 1.20$. df = 1. $P > 0{\cdot}20$), but the proportions differ significantly in social class III ($X^2 = 21.23$. df = 1. $P < 0{\cdot}01$) and in social classes IV and V combined ($X^2 = 6.32$. df = 1. $P > 0{\cdot}01$). The trends between health and disease by social class are consistent for men and women. There are more diseased and less healthy individuals emotionally disturbed than expected, particularly in social class III and social classes IV and V combined. It is probable that disease is less likely to be associated with emotional disturbance in men and women in social classes I and II than it is in other social classes.

In social class III healthy men and women show no significant difference between the proportions emotionally disturbed ($X^2 = 0.02$. df = 1. $P > 0{\cdot}80$), while significant differences exist between the incidences of emotional disturbance for healthy men and women in social classes I and II combined ($X^2 = 4.10$. df = 1. $P > 0{\cdot}02$) and in social classes IV and V combined ($X^2 = 4.17$. df = 1. $P > 0{\cdot}02$). When the diseased men and women are contrasted no significant differences in the incidences of emotional disturbance are observed for social classes I and II combined ($X^2 = 1.66$. df = 1. $P > 0{\cdot}10$), social class III ($X^2 = 0.56$. df = 1. $P > 0{\cdot}30$) or social classes

IV and V combined ($X^2 = 0{\cdot}84$. df = 1. $P > 0{\cdot}30$). However, though differences between incidences of emotional disturbance may lack significance in certain instances the trends are consistent by social class. More women and less men than expected are emotionally disturbed. It is reasonable to assume, therefore, that the greater proportion of women than men emotionally disturbed is not markedly biased against any particular social class.

The number of individuals with emotional disturbance does not vary significantly between social classes I and II combined, social class III and social classes IV and V combined for healthy men ($X^2 = 0{\cdot}34$. df = 2. $P > 0{\cdot}80$), diseased men ($X^2 = 4.28$. df = 2. $P > 0{\cdot}10$) or for diseased women ($X^2 = 3.25$. df = 2. $P > 0{\cdot}10$), but significant differences exist for healthy women ($X^2 = 8.74$. df = 2. $P > 0{\cdot}01$), with less emotionally disturbed women in social class III than expected. However, I find it difficult to believe that alone of the four groups studied healthy women should present significant findings. It may be that the observed significance is of chance occurrence. If this assumption is correct there is no relation between the incidence of emotional disturbance and social class, and this statement agrees with that of Hobson and Pemberton (1955).

The percentage values for emotional disturbance in men and women in health or with disease by decennial age periods indicate that there is no uniform variation with age in terms of social class.

Emotional disturbance with reference to the existence or non-existence of children.

Of 516 men who possess children 101, or 19.6 per cent, and of 134 men who are childless 30, or 22.4 per cent, are emotionally disturbed. Although the proportion of childless men emotionally disturbed is slightly greater than the corresponding proportion for men with children, the difference between the proportions is not significant.

Of 421 women with children 92, or 21.8 per cent, and of 161 women with no children 48, or 29.8 per cent, are emotionally disturbed. The difference between the proportions is significant ($X^2 = 4.06$. df = 1. $P < 0.05$). There are more childless women emotionally disturbed than expected.

While there seems to be a relationship between the incidence of emotional disturbance and the absence of children, the strength of the association is weak.

Emotional disturbance with reference to the location of children.

Of 516 men who possess children 40 with children in the home, 55 with children near the parental home, and 6 with all children far from the parental home are emotionally disturbed, and the corresponding numbers for those not emotionally disturbed are 216, 178 and 21 respectively. The comparison of the numbers emotionally disturbed and not emotionally disturbed by location of children shows that the differences between the expected and observed values are not significant ($X^2 = 5.05$. df = 2. $P > 0.05$). Nevertheless, there are less men with children in the home than expected who are emotionally disturbed.

Of the 421 women who possess children 40 with children in the home, 45 with children near the parental home, and 7 with all their children far from the parental home are emotionally disturbed, and the corresponding numbers for those not emotionally disturbed are 161, 157 and 11 respectively. The differences between the expected and observed values are not significant ($X^2 = 3.61$. df = 2. $P > 0{\cdot}10$). As with men, however, there are less with children in the home than expected who are emotionally disturbed.

Since the trend is similar for men and women it is apparent that the location of children has some bearing on the incidence of emotional disturbance in aged parents. When the data for men and women are combined the differences are found to be significant ($X^2 = 6.17$. df = 2. $P < 0{\cdot}05$). Thus the presence of children in the parental home is likely to enhance to some extent the mental health of elderly parents.

Emotional disturbance and neglectful children.

Tables 210 and 211 show the number of men and women in health and disease who possess children by the presence or absence of emotional disturbance and the presence or absence of neglectful children.

The trends are comparable for sex and for health and disease. Thus the numbers may be combined. There are 25 men and women, who are either healthy or have disease, emotionally disturbed with all their children neglectful, and 5 men and women who are not emotionally disturbed with all their children neglectful. The corresponding figures for the intermediate group with some of the children neglectful are 22 and 41, and for the group of men and women with all children not neglectful are 187 and 657 respectively. These sub-groups represent a total of 937 men and women who possess children. Highly significant differences exist with far more men and women emotionally disturbed in the group with all children neglectful, more in the group with some children neglectful and much less in the group with all children not neglectful of their parents than expected ($X^2 = 61{\cdot}35$. df = 2. $P < 0{\cdot}01$).

It has already been shown that the existence of neglectful children may act as a primary or secondary cause of emotional disturbance, but it is only with the presentation of these further data that the strong association between mental health of aged parents and filial devotion is grasped by the observer. The relationship is proven beyond all reasonable doubt.

Of 937 men and women who possess children 93, or 9.9 per cent, state that some or all of their children are neglectful. This is a proportion which may not be discarded lightly, particularly in view of the relationship between emotional disturbance and the existence of neglectful children. Complacency is out of the question. Children neglect their parents to an appreciable extent. Where children live far from the parental homes communications to their parents may gradually diminish and ultimately cease. The children are then lost. Parents seldom forget wayward children, and, though in such families other children may take the load of parental care, the old people may grieve for the lost children yet live in good social surroundings. Neglect by children who live near their parents suggests lack of family unity, filial apathy or selfishness. Neglect by children who live with their parents is a serious social problem, but fortunately it is encountered rarely. In such cases antagonism and hostility are linked with neglect and, as the old people are unable to protect themselves, the parents become outcasts within the homes. Here is a rewarding field of endeavour for those who would enhance the mental health of the aged. Physicians, clergymen and others could not wish for a more complex social situation to test their initiative.

Emotional disturbance and the duration of time widowed.

Tables 212 and 213 show the incidence of emotional disturbance for men and women in health and disease in terms of the duration of time widowed.

Of the 132 healthy widowed men 32 are widowed less than 5 years and 100 are widowed 5 years and more. Of the 32 widowed less than 5 years 11, or 34.4 per cent, are emotionally disturbed, while of the 100 widowed 5 years and more 14, or 14.0 per cent, are emotionally disturbed. The proportions differ significantly

($X^2 = 6.44$. df = 1. $P \rhd 0{\cdot}01$) with more men widowed less than 5 years being emotionally disturbed than expected.

Of the 179 healthy widowed women 29 are widowed less than 5 years and 150 are widowed 5 years and more. Of the 29 widowed less than 5 years 12, or 41.4 per cent, are emotionally disturbed, while of the 150 widowed 5 years and more 36, or 24.0 per cent, are emotionally disturbed. Thus as with healthy widowed men the proportion of healthy women widowed less than 5 years who are emotionally disturbed is more than expected, but the difference between the proportions for women does not quite attain a level of significance ($X^2 = 3.69$. df = 1. $P \rhd 0{\cdot}05$).

Of the 60 diseased widowed men 22 are widowed less than 5 years and 38 are widowed 5 years and more. Of the 22 widowed less than 5 years 16, or 72.7 per cent, are emotionally disturbed, while of the 38 widowed 5 years and more 13, or 34.2 per cent, are emotionally disturbed. The proportions differ significantly ($X^2 = 8.38$. df = 1. $P \lhd 0{\cdot}01$) with more diseased men widowed less than 5 years being emotionally disturbed than expected.

Of the 85 diseased widowed women 19 are widowed less than 5 years and 66 are widowed 5 years and more. Of the 19 widowed less than 5 years 14, or 73.7 per cent, are emotionally disturbed, while of the 66 widowed 5 years and more 24, or 36.4 per cent, are emotionally disturbed. The proportions differ significantly ($X^2 = 8.29$. df = 1. $P \lhd 0{\cdot}01$) with more diseased women widowed less than 5 years being emotionally disturbed than expected.

The deduction from the above figures of the numbers emotionally disturbed primarily by personal ill-health does not alter the significant findings. Thus personal ill-health has no bias in the production of the significant findings.

In the under 5 years widowed period the proportion of diseased men emotionally disturbed is greater than the proportion of healthy men, and the position is similar for women.

There is a consistent trend in all combinations tested irrespective of whether significance is present or absent. Men and women widowed less than 5 years are more likely to be emotionally disturbed than expected. In general the same observation applies with some loss in the strength of significance when the period less than 10 years widowed is taken as the criterion of contrast.

These findings suggest that when patients are assessed particular attention requires to be given to the health of the minds of those who are more recently widowed.

Emotional disturbance and living alone.

The significant role of living alone in the production of emotional disturbance has been indicated earlier. Table 214 presents in concise form the data which relate emotional disturbance to living alone. There is ample confirmation that men and women who live alone whether in health or disease have a significantly greater incidence of emotional disturbance than those who do not live alone.

HOUSEWORK.

Tables 215 and 216 show who does the housework for men and women in health and disease by decennial age periods. Few men are obliged to do housework unaided, and the incidence varies little from 6, or 4.0 per cent, of 151 healthy men at 60 - 69 years to 5, or 7.6 per cent, of 66 healthy men at 80 - 89 years. A far greater proportion of healthy women are unassisted in their housework, though the proportions present a marked decline with age. The incidence falls radically from 129, or 64.5 per cent, of 200 healthy women at 60 - 69 years to 13, or 26.5 per cent, of 49 healthy women at 80 - 89 years.

These findings reflect custom. The vast majority of men do not take part in housework because it is regarded primarily as the duty of women. The decline with age in the proportion of healthy women who carry out their housework unaided is the result of failing physical powers with age, and the help which husbands may give for the first time in their lives following retirement. These comments also apply to diseased men and women, with the further point that the weakness associated frequently with disease overshadows the simple decline in physical powers with age of the healthy people.

The diseased men and women reveal a similar pattern to that of the healthy men and women. Of the diseased men 2, or 1.5 per cent, of 134 at 60 - 69 years; 3, or 3.0 per cent, of 100 at 70 - 79 years and 2, or 12.5 per cent, of 16 at 80 years and more do their own housework. The corresponding data for diseased women are 42, or 43.3 per cent, of 97; 28, or 39.4 per cent, of 71, and 3, or 30.0 per cent, of 10 respectively.

Where the housework is carried out by others there is a real sex contrast. Most of the healthy men and very few of the healthy women are found in this category. The housework is done by others for 117, or 77.5 per cent, of 151 healthy men at 60 - 69 years; 115, or 62.8 per cent, of 183 healthy men at 70 - 79 years and 36, or 54.5 per cent, of 66 healthy men at 80 - 89 years. This is a most significant decline with age ($X^2 = 13.51$. df = 2. $P < 0.01$), and more healthy men in the seventh decade and less healthy men in the eighth and ninth decades have their housework done by others than expected. Of the 404 healthy women only 6 who are all in the ninth decade have their housework done by others.

The decline in the proportions with age of men who have their housework done by others is related to the increase in the number of men who are widowed with age, and to the increase in the number of men with age who voluntarily assist their spouses with the housework. The diseased men and women show the same sex difference as that shown by healthy men and women for housework done by others, but the proportions are greater for diseased as compared with healthy people because disease precludes a larger number from undertaking their own housework.

Housework is done by others for 109, or 81.3 per cent, of 134 diseased men at 60 - 69 years; 78, or 78.0 per cent, of 100 diseased men at 70 - 79 years and 12, or 75.0 per cent, of 16 diseased men at 80 years and more. Nine, or 9.3 per cent, of 97 diseased women at 60 - 69 years; 7, or 9.9 per cent, of 71 diseased women at 70 - 79 years, and 1, or 10.0 per cent, of 10 diseased women at 80 years and more have their housework done by others.

The third and final group is where housework is done by self and others. This is observed for 28, or 18.5 per cent, of 151 healthy men; 58, or 31.7 per cent, of 183, and 25, or 37.9 per cent, of 66 healthy men in the seventh, eighth and ninth decades respectively. The corresponding data for the healthy women are 71, or 35.5 per cent, of 200; 92, or 59.4 per cent, of 155, and 30, or 61.3 per cent, of 49 respectively. The proportions of healthy men and women who have their housework done by self and others vary significantly with age. For the healthy men $X^2 = 11.18$. df = 2. $P < 0{\cdot}01$, and for healthy women $X^2 = 23.98$. df = 2. $P < 0{\cdot}01$. In the seventh decade there are less healthy men and women, while in the eighth and ninth decades there are more healthy men and women than expected who have their housework carried out by self and others. The causes for the various trends where housework is done by self or done by others apply equally to this group where the housework is performed by self and others. Furthermore, influencing the incidences in all three groups is the potential aid available from children who happen to live in the parental homes.

The proportion of diseased men who have their housework done by self and others is comparable with that of healthy men at 60 - 69 years, but in the eighth and ninth decades the diseased men do not show any increase in proportions and to this extent differ from the healthy men. This absence of increase in proportions of diseased men assisting in the housework with age may be due to disease preventing such men participating in this household task. Diseased women show the same increase in the proportions who share housework with age as do the healthy women, and the proportions are roughly comparable by decennial age periods.

Inspection of Tables 215 and 216 indicates that a wide range of relatives are involved in assisting elderly men and women with their housework. Domestics may be employed, but otherwise aid drawn from outwith the family circle is uncommon.

THE WASHING OF CLOTHES.

Tables 217 and 218 show the means by which clothes are washed for men and women in health and disease by decennial age periods. The general trends and sex differences for the washing of clothes reflect those recorded for housework. There are, however, certain divergences which are as follows.

The number of healthy men who have their clothes washed by others is significantly greater in each decennial age period than the corresponding number who have their housework done by others. In each age group the number of healthy men who have their clothes washed by self and others is less than the number who have their housework done by self and others. The means by which the diseased men have their clothes washed are comparable to those described for healthy men.

A study of healthy women shows that in each decennial age period less do their own washing of clothes unassisted than do their own housework unaided. In each age group more healthy women have their clothes washed by self and others than have their housework done by self and others. The means by which the diseased women have their clothes washed are comparable to those described for healthy women.

SHOPPING.

Tables 219 and 220 show the means by which men and women in health and disease obtain their shopping. The influence of age is assessed by quinquennial age periods.

Fifty-four, or 13.5 per cent, of 400 healthy men and 312, or 77.2 per cent, of 404 healthy women do their own shopping. This highly significant sex difference is observed for all age groups.

Shopping is carried out by others for 327, or 81.7 per cent, of the 400 healthy men and for 15, or 3.7 per cent, of the 404 healthy women. This highly significant sex difference is observed for all age groups.

Shopping is performed by self and others for 77, or 19.1 per cent, of the 404 healthy women and for 19, or 4.8 per cent, of the 400 healthy men. This sex difference is noted for all age groups.

Twelve, or 4.8 per cent, of 250 diseased men, and 110, or 61.8 per cent, of 178 diseased women shop unassisted. Thus, while the sex difference is maintained, less diseased men than healthy men and less diseased women than healthy women do their own shopping, and this is observed for all age groups.

Shopping is carried out by others for 224, or 89.6 per cent, of the 250 diseased men and for 29, or 16.3 per cent, of the 178 diseased women. Thus diseased men and women are more likely to have others shop for them than are healthy men and

women.

Shopping by self and others is comparable for the diseased and healthy men and the diseased and healthy women.

Tables 221 and 222 show the means by which men and women in health and disease have their food cooked by quinquennial age periods. The proportions of men in health and disease who either cook for themselves, or are assisted by others or have their cooking done entirely by others are comparable to the data presented for shopping. While women show similar comparisons for shopping and cooking the strength of association is less than that for men. Of 404 healthy women 312 do their own shopping and 338 healthy women do their own cooking. Thus more healthy women cook unaided than shop unassisted, and the difference is significant ($X^2 = 5.32$. df = 1. $P < 0{\cdot}05$). The same observation is noted for diseased women. Of the 178 diseased women 110 do their own shopping and 130 do their own cooking ($X^2 = 5.10$. df = 1. $P < 0{\cdot}05$).

The regularity with which meals are taken is similar for men and women in health and disease. Of the 650 men in the series 29, or 4.5 per cent, take their meals irregularly, and of the 582 women 34, or 5.8 per cent, take their meals irregularly.

THE ROLE OF CHILDREN IN THE MAINTENANCE OF THE FINANCIAL STABILITY OF THEIR PARENTS.

Tables 223 to 226 show the number of men and women in health and disease in terms of retirement and work, financial stability and financial aid from children by decennial age periods. These Tables are presented with the headings "retired from work" and "at work". These two titles are self explanatory for men, but for women "at work" means a woman and / or her husband are at work, while "retired from work" means that a married woman has a retired husband and is not working herself; that a widowed woman is not working, and that a single woman is retired.

Healthy men.

An individual with an adequate income and / or capital does not require financial assistance. Nevertheless, 6, or 8·1 per cent, of 74 such healthy men retired from work and 7, or 5·9 per cent, of 118 such healthy men at work receive money regularly from their children. The totals 74 and 118 indicate the number of men who possess children. There are, in addition, 36 healthy men retired from work and 22 at work who are childless. There is no discernible parental age trend in this provision of money by the children.

The individuals who form the following groups are basically in an unstable financial state.

There are 31 healthy men with incomes which are inadequate and with capitals which are diminishing. All are retired from work and are within the age range 70 to 89 years. Seven are childless, and of the other 24 who possess children 14, or 58·3 per cent, receive money regularly from their children. None of the men in this group are in financial difficulty. The percentage values suggest that with age more children are likely to give financial support to healthy men with income inadequate and diminishing capital.

There are 60 healthy men with income inadequate and meagre or no capital. Fifty-seven are retired from work and 3 are at work. Of the 57 who are retired from work one is childless and he receives financial assistance from a brother. The other 56 retired from work and the 3 at work are given financial aid by their children. These 60 healthy men are not in financial difficulty, but would be so if they did not obtain money from relatives.

Fifty-six healthy men retired from work and 3 at work are in financial difficulty. Seventeen of those retired are childless. Of the 39 with children and retired from work 16, or 41·0 per cent, receive financial assistance from their children. The children of the 3 men at work give no financial aid. Where children give no financial aid to parents in this group, the usual reason is that the children cannot afford to do so. In only the isolated instance is the child neglectful of the parent and selfish. When children give financial aid to their parents and financial difficulty persists, the children almost invariably have personal commitments which do not permit of adequate liberality.

Healthy women.

The group with an adequate income and / or capital is composed of 126 healthy women under the heading "retired from work" and 90 "at work". Of the 126 healthy women 54 are childless and of the 72 with children 11, or 15.3 per cent, receive financial assistance from their children. Of the 90 healthy women 16 are childless and of the 74 with children 4, or 5.4 per cent, receive money from their children. With increase in parental age there may be an increase in the proportion of children who give financial assistance to healthy women with an adequate income and / or capital. While the numbers are small in this series the proportion of children who give money to such parents increases from 12.9 per cent at 60 - 69 years to 22.2 per cent at 80 - 89 years.

There are 31 healthy women with incomes which are inadequate and with capitals which are diminishing. All are within the group "retired from work". Ten are childless, and of the other 21 who possess children 13, or 61.9 per cent, receive money regularly from their children. None of the 31 healthy women who form this group are in financial difficulty. The incidence of support provided financially by children shows no specific trend with parental age.

There are 89 healthy women with income inadequate and meagre or no capital. All are within the group "retired from work", and the 87 who possess children receive adequate financial aid from these children.

Sixty-six healthy women noted under the heading "retired from work" and two "at work" are in financial difficulty. Nineteen of the retired group and one of those at work are childless. Of the 47 with children in the retired group 14, or 29.8 per cent, receive financial aid from their children. The one woman with children in the "at work" group receives no such aid.

The data for the diseased men and women follow basically the trends described above for the healthy men and women. There are, however, certain divergences of interest.

Of the 193 retired healthy men and 125 retired diseased men with children 92 and 48 respectively receive financial aid from their children. The proportions of healthy and diseased men retired from work who are given financial assistance by their children do not differ significantly ($X^2 = 2.62$. df = 1. $P > 0{\cdot}10$). Of the 227 healthy women and 87 diseased women "retired from work" and with children 125 and 64 respectively receive financial aid from their children. The proportions of these healthy and diseased women "retired from work" who are given financial assistance by their children differ significantly ($X^2 = 8.93$. df = 1. $P < 0{\cdot}01$). More diseased women and less healthy women than expected are given financial assistance by their children.

Relatively few men and women under the heading "at work" receive money from their children. When combined these men and women total 305 of whom 199 are healthy and 106 have disease. The respective numbers given financial aid by their children are 14 and 5. There is no significant difference between the proportions receiving money from their children ($X^2 = 0.64$. df = 1. $P > 0.30$).

A salient feature in this study of men and women who possess children is that the financial aid given by children to their parents is directed to those who are retired from work whether they are in health or have disease. Of 619 healthy men and women with children 420 are retired from work and 199 are at work. The respective numbers given financial aid by their children are 217 and 14. The difference between the proportions is highly significant ($X^2 = 115.15$. df = 1. $P < 0{\cdot}01$). The same highly significant difference between the proportions is observed for the 318 diseased men and women with children ($X^2 = 70.28$. df = 1. $P < 0{\cdot}01$).

Of the 193 healthy men and 227 healthy women with children and who are retired from work 92 and 125 respectively receive financial assistance from their children. There is no significant difference between the proportions receiving financial aid from their children ($X^2 = 2.26$. df = 1. $P > 0{\cdot}10$). On the other hand, of the 125 diseased men and 87 diseased women with children and retired from work 48 and 64 receive financial aid from their children. The difference between the proportions of diseased men and diseased women receiving financial aid from their children is highly significant ($X^2 = 35.34$. df = 1. $P < 0{\cdot}01$). More of the diseased women and less of the diseased men receive financial assistance from their children than expected.

A comparison of the 937 men and women with children and the 295 men and women who are childless shows no marked difference by age or social class. Of the 937 men and women with children 141, or 15.0 per cent, and of the 295 men and women who are childless 62, or 21.0 per cent, are in financial difficulty. The proportion of childless in financial difficulty is significantly greater than the proportion of those who have children ($X^2 = 5.81$. df = 1. $P \triangleright 0.01$). If for theoretical reasons it is assumed that the 937 men and women with children had no recipients of financial aid from their children then a completely different situation would present itself. The 937 men and women with children would have 369, or 39.4 per cent, in financial difficulty. The childless would then appear as the more secure financial group. I am unable to find for the childless an equivalent to the continuous financial assistance given to parents by so many children. I cannot believe that the childless are more Spartan in their existence than those with children, and consequently require less money to live. It is tempting to suggest that those who are childless are better placed to prepare financially for their old age than those who have children. The ability of parents to accumulate capital may be markedly restricted because of the additional expenditure required to rear a family. If this theorising be even partly correct there is immediately a strong moral obligation on children to protect their aged parents from financial insecurity. The data indicate that many children willingly accept this obligation.

INTERESTS AND HOBBIES.

Table 227 shows the number and percentage of men and women in health and disease with reference to their interests and hobbies.

Religion.

Of the 400 healthy men and 250 diseased men 221 and 163 respectively possess religious awareness. The difference between the expected and observed values is highly significant ($X^2 = 6.29$. df = 1. $P < 0{\cdot}02$). More diseased and less healthy men than expected have an interest in religion. Of the 404 healthy women and 178 diseased women 336 and 149 respectively possess religious awareness. Thus far more women than men are interested in religion, and the proportions of healthy and diseased women with religious awareness are comparable at over 80 per cent.

Television.

Of the 400 healthy men and 250 diseased men 183 and 147 respectively like television. The difference between the expected and observed values is highly significant ($X^2 = 10.50$. df = 1. $P < 0{\cdot}01$). There are more diseased and less healthy men than expected who like television. Of the 404 healthy women and 178 diseased women 167 and 68 respectively like television, and these proportions are comparable for healthy and diseased women. More men than women are interested in television.

Community life.

Of the 400 healthy men and 250 diseased men 92 and 45 respectively take part in community life. The difference between the expected and observed values is not significant ($X^2 = 2.31$. df = 1. $P \trianglerighteq 0{\cdot}10$). Of the 404 healthy women and 178 diseased women 240 and 77 respectively take part in community life. The difference between the expected and observed values is highly significant ($X^2 = 13.05$. df = 1. $P \trianglelefteq 0{\cdot}01$). More healthy and less diseased women take part in community life than expected. Compared with men a significantly greater proportion of women are interested in community life.

Reading books.

Of the 400 healthy men and 250 diseased men 157 and 119 respectively read books. The difference between the expected and observed values is significant ($X^2 = 4.35$. df = 1. $P \trianglerighteq 0{\cdot}02$). More diseased and less healthy men read books than expected. Of the 404 healthy women and 178 diseased women 86 and 36 respectively read books, and the difference between these proportions is not significant. Compared with women a significantly greater proportion of men are interested in books.

Wireless.

Of the 400 healthy men and 250 diseased men 84 and 66 respectively like the wireless. These proportions are comparable. Of the 404 healthy women and 178 diseased women 113 and 64 respectively are interested in the wireless, and the difference between the expected and observed values is significant ($X^2 = 3.75$. df = 1. $P \mp 0{\cdot}05$). More diseased and less healthy women than expected like the wireless, and a greater proportion of women than men are interested in the wireless.

Walks.

Of the 400 healthy men and 250 diseased men 207 and 102 respectively like walks. The difference between the expected and observed values is highly significant ($X^2 = 21.26$. df = 1. $P < 0{\cdot}01$). More healthy and less diseased men than expected are interested in walks. Of the 404 healthy women and 178 diseased women 39 and 9 respectively are interested in walks, and the difference between the proportions is not significant ($X^2 = 3.48$. df = 1. $P > 0{\cdot}05$), though the trend is the same as for men. A significantly greater proportion of men as compared with women are interested in walks.

Cards.

Of the 400 healthy men and 250 diseased men 116 and 70 respectively are interested in card games, and the difference between the proportions is not significant. Of the 404 healthy women and 178 diseased women 31 and 23 respectively play card games, and the difference between the expected and observed values is significant ($X^2 = 4.06$. df = 1. $P > 0{\cdot}02$). More diseased and less healthy women than expected are interested in cards. A significantly greater proportion of men as compared with women play card games.

Cinema or theatre.

In health and disease the proportions of men and women who are interested in the cinema or theatre are comparable. Almost one-fifth of all individuals like the cinema or theatre.

Gardening.

The proportions clearly indicate that gardening is an activity interest of far more healthy men and women than diseased men and women, and that a much greater proportion of men than women are interested in gardening.

Music.

Of the 400 healthy men and 250 diseased men 49 and 38 respectively are interested in music. The difference between the proportions is not significant ($X^2 = 1.13$. df = 1. $P > 0{\cdot}20$). Of the 404 healthy women and 178 diseased women 80 and 43 respectively are interested in music. The difference between the proportions is not significant ($X^2 = 1.41$. df = 1. $P > 0{\cdot}20$). Of the 650 men and 582 women 87 and 123 respectively like music. The difference between the expected and observed values is highly significant ($X^2 = 13.04$. df = 1. $P < 0{\cdot}01$). More women and less men than expected are interested in music..

Playing or watching bowls.

The playing or watching of bowls is an interest of 93, or 23 per cent, of 400 healthy men; 27, or 11 per cent, of 250 diseased men; 54, or 13 per cent, of 404 healthy women, and of 8, or 4 per cent, of 178 diseased women. Thus more healthy men than diseased men, more healthy women than diseased women, and more men than women are interested in the playing or watching of bowls.

Football.

An interest in football is observed for men but not for women. Of the 400 healthy men and 250 diseased men 135 and 54 respectively are interested in football. The difference between the expected and observed values is highly significant ($X^2 = 11.02$. df = 1. $P < 0{\cdot}01$). There are more healthy and less diseased men than expected interested in football.

Dominoes, draughts.

An interest in dominoes or draughts is noted for men but not for women. Of the 400 healthy men and 250 diseased men 44 and 26 respectively play dominoes or draughts. The proportions by health and disease do not differ significantly.

Knitting, embroidery, etc.

An interest in knitting, embroidery, etc. is observed for women but not for men. Of the 404 healthy women and 178 diseased women 63 and 26 respectively are interested in knitting, enbroidery, etc. The proportions by health and disease do not differ significantly.

Golf.

Golf is played by 20, or 5 per cent, of the 400 healthy men; 3, or 1 per cent, of the 250 diseased men; 7, or 2 per cent, of the 404 healthy women, but by none of the diseased women.

Politics.

An interest in politics is shown by 11, or 3 per cent, of the 400 healthy men; 8, or 3 per cent, of the 250 diseased men; 3, or 0.7 per cent, of the 404 healthy women, and by 1, or 0.6 per cent, of the 178 diseased women. Thus a negligible proportion of the men and women are interested in politics.

Rarer interests are photography, painting in oils or water colours and line drawing, the study of antiques and works of art, woodwork, watch-repairing, first-aid work, fishing, wood-carving, cross-word puzzles, ornithology, car or bus runs and dancing.

WORK AND RETIREMENT.

This study of the influences of work and retirement on the health of older men is based on the 650 men aged 60 to 89 years. Of these 650 men 127 are in the age group 60 to 64 years. Thus there are 523 men aged 65 years and more. Of these 523 men 157 had retired voluntarily; 94 had retired because of ill-health; 147 were compulsorily retired by their employers, and 125 were employed at the time of examination.

Reasons for voluntary retirement.

Within the age range 65 to 89 years 157 men stated that they retired voluntarily. An uncritical acceptance of such statements gives a wrong impression of the proportion of men who retire in a really voluntary manner. I define voluntary retirement as the relinquishment of employment by an individual entirely on his own initiative and free from any form of duress. This criterion of voluntary retirement is fulfilled by 76, or 48.4 per cent, of the 157 men who stated that they retired voluntarily. The other 81 men who retired in a so-called voluntary way did so for three fundamental reasons which were maladjustment between work and worker, the compelling demand of adverse home circumstances, and the acceptance of the misguided advice of relatives, with the acceptance of advice being subsequently regretted.

The detailed reasons for the retirement of the 157 men who considered they had retired voluntarily are as follows: -

Reason for retirement	Number	Percentage
Purely voluntary	76	48.4
Work heavy and beyond the physical capacity of the individual	54	34.4
The mental strain of the work	7	4.5
Advised by relative to retire - advice subsequently regretted	6	3.8
Retired to nurse invalid relative in the home	4	2.5
The working environment was too cold	3	1.9
The working environment - fumes	1	0.6
Retired because wife died	1	0.6
Retired because employer died and could not work with any other employer	1	0.6
Retired to give wife company in the home	1	0.6
Tired serving the public	1	0.6
The distance to work was too far	2	1.3

Thus approximately 40 per cent of the 157 men who retired voluntarily did so because of an adverse working environment. Some would have continued longer in employment had the working conditions been congenial. It is obvious that much could be done for such men in terms of job analysis and placement. When men struggle in varying degree to meet the unchanging demands of work though their physical and possibly their mental resources are declining with age, there is the implication that either the industrial social system is significantly apathetic concerning the needs of the older worker or there is no answer to the problem. The fact that retirement may be due to social complexities which originate outwith the working environment indicates that pre-retirement guidance by experienced and sympathetic advisers is desirable.

Retirement through ill-health or accident.

Within the age range 65 to 89 years 94 men retired because of ill-health or accident. At the time of their retirement 31 men had disease of the cardiovascular system, 17 had disease of the respiratory system, while 14 had experienced accidents. It is not possible to give the precise number who were subsequently fit for work through the remission of their disease. It is, however, certain that some would have worked once more if they had found suitable employment. Of the 14 accidents 11 were of industrial origin and 3 occurred outwith the working environment. These accidents resulted in injuries to the hands, lower limbs, chest, eyes or head.

Over the age of 64 years there are 398 men retired and of this number 49 retired within the age range 49 to 64 years, 223 within the age group 65 - 69 years, and 126 at over 69 years. Ill-health or accident caused the retirement of 38, or 77.5 per cent, of the 49 men who retired before the age of 65 years; 43, or 19.3 per cent, of the 223 men who retired at 65 - 69 years, and 13, or 10.3 per cent, of the 126 men who retired over the age of 69 years. Thus ill-health or accident as a cause of retirement diminishes significantly with age. Ill-health is the principle reason for retirement before the age of 65 years. This finding supports the belief of MacPhail and Ferguson (1955) that disability becomes increasingly important as a cause of unemployment in older age-groups.

Compulsory retirement.

Compulsory retirement at a fixed age limit or by being paid off at any age ended the working lives of 147 men.

Of the 523 men over the age of 64 years 41, or 7·8 per cent, considered compulsory retirement was a good thing provided the event was associated with a pension; 460, or 88·0 per cent, believed it was harmful to the health of older men, and 22, or 4·2 per cent, had no opinion. Clearly older men are of the opinion that compulsory retirement is a social evil.

Change of occupation.

I present no data on this aspect of the subject. The matter was considered by myself and Dr. Ferguson Anderson in a paper published in 1956. We were of the opinion that basic research is necessary to clarify the most appropriate means by which mobility of labour in older years might be obtained. The object being to maintain the individual's health in the most satisfactory state possible and at the same time benefit society. In this context the observation of

Welford (1953) is important. He suggested that older men can be successfully placed in work which requires care and accuracy rather than speed.

Men aged 60 to 64 years.

Within the age group 60 to 64 years there are 127 men. Of these 127 men 8 had retired because of ill-health, while one had done so voluntarily. One hundred and eighteen were in employment.

Of the 127 men aged 60 to 64 years 15, or 11.8 per cent, considered compulsory retirement was a good thing; 87, or 68.5 per cent, believed it was harmful to the health of older men, while 25, or 19.7 per cent, had no opinion. These proportions differ significantly from those observed for the men 65 years and more ($X^2 = 40.21$. df = 2. $P < 0{\cdot}01$). Under 65 years there are more who consider compulsory retirement good, less who consider compulsory retirement bad, and more with no opinion than expected. Over 64 years there are somewhat less who consider compulsory retirement good, more who regard compulsory retirement as bad, and less with no opinion than expected. It is obvious that the practical experience of retirement alters radically the opinion of men concerning the nature of compulsory retirement.

Of the 118 men aged 60 to 64 years and in employment 21, or 17.8 per cent, had given serious consideration to the methods by which they might counter the problems of retirement. The other 97 men either contemplated working on as long as possible or had attempted to dismiss an unpleasant subject from their minds.

At a Civil Defence Study Course I had the privilege of listening to an address by Professor T. Fergusom Rodger on the "Psychology of Disaster". The Professor indicated that a community reasonably informed of the nature and potential of a possible catastrophe would be more able mentally to meet the situation should it occur than a community not so enlightened. It seems to me that there is a parallel here in the consideration of retirement. For many men enforced retirement may be regarded theoretically as virtually a disaster. It is reasonable to assume that such a social catastrophe will have less adverse efects on the minds of men who have taken part in pre-retirement counselling programmes.

Health of workers.

At the time of examination 243 men over 59 years of age were in employment. Of these 243 men 77, or 42.5 per cent, of 181 in the seventh decade; 17, or 29.8 per cent, of 57 in the eighth decade, and 3, or 60.0 per cent, of 5 in the ninth decade had disease. The diseases were as follows: -

	Number
Hypertension with symptoms	24
Chronic bronchitis	24
Previous coronary thrombosis	11
Valvular heart disease	8
Iron deficiency anaemia	6

	Number
Malignant disease	4
Duodenal ulcer	4
Intermittent claudication	4
Angina pectoris	3
Pulmonary tuberculosis	3
Silicosis	2
Diabetes mellitus	2
Complete heart block	1
Thrombosis of popliteal artery	1
Total	97

It is evident that the fact that an older man is in employment does not imply that he is thereby in good health.

Social adjustment.

I attempted to classify the social adjustment of the 650 men under consideration by following the concept outlined by Havighurst (1956). Accordingly the men are grouped by interaction with persons, the range and variety of activity and interests, and the quality and variety of intellectual and emotional activity. Each group forms three sub-groups in terms of high, medium and low ratings. I can do no better than quote the criteria laid down by Havighurst (1956).

1. Interaction with persons.

(a) High rating.

"A considerable number and variety of interactions with persons in various social roles. Interaction with people in most of the role-areas, including work, leisure, citizen.

In addition, take account of the complexity of relations with persons. For instance, if the relation varies from one of authority to one of equality to one of dependence, this means greater complexity. On the other hand, if the relation is a stereotyped one, no matter what the role-area, this means lesser complexity. For example, the man who must always be the organiser, in all the groups in which he moves, is rated down, as against a man who is the organiser of one group, but a supporter of the leadership in another group, and something of a critic of the status quo in another group."

(b) Medium.

"Interacts with an average number of persons in such areas as parent, spouse, church, work, clubs, friends. The interaction shows some, but not much variety of quality."

(c) Low.

"Has little or no interaction with persons. If there is an average amount of interaction, the quality of it is stereotyped."

2. Range and variety of activities and interests.

(a) High.

"A considerable number of activities and interests, both present and past, in a number of role-areas. For a high score, the areas of leisure, citizenship, work, and home-making should be well-developed. Contrast in activity makes for a high score. For example, a person who hunts big game, attends the symphony, and is a leader in the World Federalists gets a higher rating than one who is active in a variety of sports. For a high rating, the activity must have a variety of aspects to it."

"For a high rating, there should be a variety of activities in the past, such as travel, higher education, variety of work experience with a number of people".

(b) Medium.

"Has an average number of activities and interests. May be limited to two or three role-areas, such as leisure but not clubs, friends but not citizenship. Average amount of variety of experience in the past. Tends to operate pretty much on the same level in various activities."

(c) Low.

"Very few interests or activities. Experience in the past limited to one or two jobs, little education, no travel, early marriage. If there are a number of activities or interests, score may be reduced by stereotyped behaviour in these activities."

3. Imaginative complexity.

(a) High.

"Enjoys a variety of activities which do not involve face-to-face relations with people or physical activity. For example, reading, listening to music, collections of various kinds, writing, inventing. Variety makes for a higher rating. For instance, liking a variety of music, or reading in several areas. Evidence of emotional discrimination makes for a high rating - such as marked enjoyment of some kinds of literature with distaste for other kinds.

Has plans for the future - such as a plan for retirement, or a series of projects laid out for the next few years, or plans for travel and holiday."

(b) Medium.

"Does at least several things by himself, such as reading, writing, listening to music. Speaks with enjoyment of at least one imaginative activity or interest. Has given thought to plans for the future if only for the coming vacation."

(c) Low.

"Little or no sign of intellectual activity or interest. Conversation shows little or no signs of reflection about his life. Tends to respond entirely to outer stimulation. Would not know what to do if his day was not organised for him by the demands of job, family, and institution."

The above criteria of Havighurst (1956) are progressively more difficult to apply as age advances. Consequently I have doubtless committed errors in the rating placements. There is a need for special rating criteria which take account of advancing years in the aged. Nevertheless, the rating values which are presented are of interest. The 650 men have the following rating values for interaction with persons, range and variety of activities and interests, and imaginative complexity. High ratings are noted in 38, or 5.8 per cent; 53, or 8.1 per cent, and 28, or 4.3 per cent, respectively. Medium ratings are observed in 397, or 61.1 per cent; 363, or 55.9 per cent, and 333, or 51.2 per cent, respectively. Low ratings are recorded in 215, or 33.1 per cent; 234, or 36.0 per cent, and 289, or 44.5 per cent, respectively. There are significant differences between the expected and observed values when the numbers are contrasted by groups and ratings ($X^2 = 25.59$. df = 4. $P < 0.01$). The number of men with high ratings is as expected for interaction with persons, more than expected for the range and variety of activities and interests, and less than expected for imaginative complexity. The number of men with medium ratings is more than expected for interaction with persons, as expected for the range and variety of activities and interests, and less than expected for imaginative complexity. The number of men with low ratings is less than expected for interaction with persons, less than expected for the range and variety of activities and interests, and more than expected for imaginative complexity. The salient features are the large proportion of men with low ratings, particularly for imaginative complexity, and the paucity of high ratings. The data indicate that there is considerable scope for improvement in the way the men in this series lead their lives. This is another pointer to the necessity for the adequate provision of pre- and post-retirement services for the aged.

DISCUSSION.

The modern industrial society may be regarded as being in part artificial, detrimental to the mental health of individuals through its complexity, and liable to be harmful to physical health. Older man is rendered mentally insecure by external forces over which he has little or no control. The mind of man through childhood, adolescence and maturity is coerced by society to accept the working habits decreed by custom. The same mind in older years is exposed to the threat of its habituated functioning being suddenly gillotined by a remorseless society. A society which does not appear to comprehend the mental trauma and shock which may be associated with retirement. My thoughts on the subject are paralleled by those of Anderson (1959). He notes that the individual is expected to become a producer and live in a work-oriented and money-oriented environment, and to remain a responsible citizen until approximately 65 years. Then he is suddenly released from the work- and money-oriented demands of adult life to which he has become habituated, and is expected on his own initiative to develop other activity patterns. Society renders his problems of adjustment more difficult by removing many of the primary and secondary motivations that have carried him along.

It is a harsh, negative and barren philosophy which postulates that, since society cannot provide work for all men throughout their effective working lives, older men must retire to provide jobs for those who are young. Those who believe in this concept are either ruthless or facile, and blur the issue with emotion by reminding us that the young have their children to rear. No matter what retirement policy is supported by society I am sure the growth and health of children will remain unaffected. The unbiased observer clearly detects an inherent antagonism on the part of society against the older worker and even old people. The problems of the aged in industrial societies may be more easily understood from a minority group aspect. My contentions are supported by Barron (1953) if his essay is valid. He suggests that the aged meet many of the criteria of a minority as defined in sociologic theory of majority-minority group interaction. In the out-group they are looked upon as a threat to the power structure. The aged are subject to prejudiced attitudes. Stereotypes and rationalisations for discrimination by younger adults assume the same properties as they do in ethnic intergroup relations. In addition, legislation is enacted in behalf of the aged which parallels that for the protection of ethnic groups.

Society will require to decide which is the more ethical practice when, particularly in times of trade recession, there are less jobs than the number of men who seek work. Should the number of working men to available jobs be equated by forced retirement of older workers or should the unemployment be spread evenly over all age ranges? Is it reasonable to load the incidence of emotional disturbance associated with unemployment on the older workers? Is it right that unemployment should masquerade as retirement? The difficulties of older workers are related to the misconceived beliefs of society concerning their needs and the effects on the mind and body of the aging process. This is substantiated by Tuckman and Lorge (1953) who are of the opinion that chronologic age as a criterion of aging must be abandoned and more adequate objective criteria developed if the erroneous notions and stereotypes about old people and the older worker are to be broken down. Furthermore, Breslow (1954) finds that the well-known deterioration of socio--economic status in the later decades of life contributes to the burden of chronic illness, and Lipman (1961) is certain that retirement of the male represents a major crisis in mental adjustment. Like divorce, or the advent of children, it demands a new set of role conceptions. Retirement means that the role of wage earner is withdrawn. The retired worker is isolated from the occupational system and this is often a shock with grave effects upon his entire life pattern.

While I have laboured the principle of the right of the older worker to employment, it would be false to assume that voluntary retirement for all men would necessarily be in their best interests. A part of industrial work is unnatural, onerous, devoid of recompense apart from money, and can be injurious to physical and mental health. Murrell (1959) notes among other things that some of the ill-health suffered by the elderly could be traced back to bad machine design.

Thus where working conditions are detrimental to health premature retirement is perhaps desirable. Since it is difficult for older men to find new employment, their retirement may require to be compulsory. It is preferable that the process of relinquishing employment should be gradual through transference to a less demanding position in another work situation.

The phenomenon of retirement cannot be discussed critically unless the variety of meanings which work has for man is understood. From the eighteenth century philosophers and social theorists have tended to view work with favour and to consider it more positively. Work has been allied to progress, while Adam Smith regarded it as the salient influence in the success or failure of civilisation. Kant wholly approved of work, while other German thinkers raised work to the status of almost a privilege. Fourier, the French social theorist, envisaged men in the ideal society running with eagerness and happiness to work. Retirement is the negation of such concepts and is the equivalent of a penal sentence. Havighurst and Shanas (1953) define the meaning of work for contemporary man as a way of earning a living, a duty and a right, and less clearly and universally, a privilege.

Dependent upon its character the variety of meanings assigned to work by individuals may vary radically from the vocation with its mental rewards and stimulation through the nuances of feeling and emotion to the intellectual poverty of mundane occupations. Friedmann and Havighurst (1954) found that, in general, the meaning of work as a source of self-respect, of interesting purposeful activity, and of a service to others increases with the skill and educational level of the occupation . The evolution of modern industrial processes has produced many jobs which are mentally unrewarding and from which the worker derives little apart from money. The superficial observer might well be excused if he assumes that men in such occupations must yearn for retirement. Unfortunately this is not the case for reasons which are complex. Man may be considered as a creature of habit. Consequently it is hard to break the inclination to work even when financial security is assured. This is particularly so when inner resources are inadequate to counter change. Further reasons against contented retirement may exist when work is vocational in character. In this context men tend to become engrossed in work which is of interest and is mentally satisfying to the neglect of leisure pursuits. Thus men in all occupational classes are exposed to the frustration of retirement, and they may feel acutely the emptiness and uselessness of their existence. One of the most critical phases in the life of man is the period of months or years immediately following retirement during which, by a process of trial and error, adjustment to an altered way of takes place. For some men this adjustment is unstable and is liable to disintegrate under the stress of adverse environmental occurrences.

The modern economic system does not guarantee to provide employment for all who desire to work. It is, therefore, a common occurrence to see frustrated unemployed older workers seeking work and those who, having given up the struggle, are unhappily resigned to retirement. Even for those fortunate enough to find work there are further complications such as loss of occupational status. Such adverse situations are damaging to self-esteem and to the pocket, and represent a misuse of skilled experience on the part of society. Untimely retirement does nothing to remedy the waste of potential real income and wealth which results from the under-employment of productive resources.

I have laboured the need to maintain older men in employment because so many are adversely affected mentally by retirement and possess inadequate financial resources. This, however, does not mean that I consider work to an indefinite old age as desirable. Continued work into advanced old age is fundamentally a negation of social advancement. I have merely indicated that until all members of society are educated to lead successful lives; are free from financial anxiety, and desire to retire at a reasonable age to pursue leisure interests, it is hazardous to their health to cast them poor, ignorant and bewildered into the mental vacuum of retirement. The enhancement of the mental health of the older worker may be dependent upon the solution of profound problems through geriatric psychotherapy. Thus it can be argued that pre- and post-retirement programmes are incomplete and can never achieve complete success unless means exist for the provision where necessary of such expert aid. The difficulties of retirement may be associated with one or other of the causes of emotional disturbance listed earlier in this thesis, or with the individual in the throes of the major task of old age envisaged by Grotjahn (1955). He states that the task of integrating one's life as it has been lived and the final acceptance of one's own death are problems of existence. To deal with them is the great task of old age. They are essentially different from the tasks of infancy, childhood, adolescence and maturity. Thus the reader may well speculate on the degree of turmoil or even the panic state which may exist in the minds of some older workers. As in other branches of gerontology unresolved issues pervade geriatric psychoanalytic thinking. Rechtschaffen (1959) states some of them briefly. There are questions regarding intellectual efficiency, capacity for insight, motivation for and resistance to change, opportunity for libidinal gratification, and the choice of goals. Obviously the ideal mental state for the older worker is in the nebulous future. Meanwhile there is a need for an employment office for older workers, as suggested by Macintosh(1951), where jobs would be properly advertised with appropriate wages and the candidates interviewed and tested.

The ability to retire and lead a successful life with the mind functioning at its optimum is related to memory, learning and adequate finance. Little is known of the precise association between brain and memory, but it may be assumed that memory of acquired skills, events and sensations depends upon the repeated activation of neuronal pathways in which the essential knowledge is retained, and that nerve cells possess the fundamental tendency to repeat patterns of activity. Whatever the actual brain memory mechanism may be it is evident that if we wish older men to retire in reasonable harmony with their environment, their neuronal pathways require to be habituated to pursuits external to work. In this way brain elements responsive to the working habits of a life time when arbitrarily sterilised of their activity would be more adequately compensated by others. Memory and learning are closely related and it is probable that a successful life in old age depends on education of the mind throughout childhood, adolescence and maturity. In particular adult education may with advantage stress a balanced mode of life.

The ideal society described by Fourier, the French social theorist, is a fascinating concept. I imagine that in such a society the mind, the body and interaction with persons would be nurtured to their optimal state and when the time came, apart from the accidental intervention of death, work would be discarded easily as an aging irrelevancy. The existence of a community thus richly endowed mentally would significantly simplify pre- and post-retirement programmes. Alas it is necessary to be practical and to deal with the foibles of the world as we find them. The endeavours of the Glasgow Council for Preparation for and Occupational Activities on Retirement merit attention. This voluntary organisation aims to interest industry and commerce in the special needs and problems of the older worker. It tries to stimulate staff recreational and welfare schemes to include interests and activities attractive to the older worker which will continue in retirement. It carries out a comprehensive educational programme through courses arranged in "Day-Release" classes, and actively conducts pre-retirement counselling. Courses are arranged for personnel and welfare officers on the problems of retirement, and research is undertaken. Such services as this are of value to the older worker. Mack (1958) in an evaluation of a retirement planning programme found positive evidence of its usefulness. The scheme which she studied aimed to provide information about age and retirement; to encourage constructive thinking about, and planning for, retirement, and to stimulate action on plans. She found that the programme reduced the fear of retirement and enhanced positive attitudes towards retirement, that it encouraged constructive planning for this event and it effected disirable behaviour in retirement preparation. The guidance was most effective in relation to financial planning, health and nutrition, retirement living, and the meaning of work and retirement.

I feel that pre- and post-retirement guidance require to be modified to suit the different mental attitudes of at least some of the occupational classes. This point is also noted by Burgess, Corey, Pineo and Thornbury (1958) who investigated occupational differences in attitudes towards aging and retirement. They believe that retirement planning programmes should be differently designed for at least upper level occupational groups and manual workers.

The complexity of retirement schemes is reflected in the statement of Friedmann and Havighurst (1954) that retirement should offer an activity routine, opportunity for personal contacts, status derived from performance of a culturally defined role, perhaps opportunity to serve others, as well as intrinsic satisfaction in the activity itself.

FLATULENCE.

Tables 228 to 231 show the incidence of flatulence for men, non-adipose and adipose women in health and disease by quinquennial age groups. Age has little influence on the incidence of flatulence for men and women in health or disease. There may be an increase in the proportions with flatulence by age for diseased non-adipose women, but the trend is not statistically significant. Similarly, with the small numbers available it is hazardous to interpret the fall in incidence observed for healthy adipose women.

Of the 400 healthy men and 293 healthy non-adipose women 8 and 18 respectively have flatulence. The difference between the proportions of healthy men and healthy non-adipose women with flatulence is significant ($X^2 = 8.00$. df = 1. $P < 0{\cdot}01$). There are more healthy non-adipose women and less healthy men than expected with flatulence.

Of the 293 healthy non-adipose women and 111 healthy adipose women 18 and 22 respectively have flatulence. The difference between the proportions of healthy non-adipose and adipose women with flatulence is significant ($X^2 = 16.84$. df = 1. $P < 0{\cdot}01$). There are more healthy adipose and less healthy non-adipose women than expected with flatulence.

Of the 400 healthy men and 250 diseased men 8 and 58 respectively have flatulence. The difference between the proportions of healthy men and diseased men with flatulence is significant ($X^2 = 75.65$. df = 1. $P < 0{\cdot}01$). There are more diseased men and less healthy men than expected with flatulence. Similarly, of the 293 healthy non-adipose women and 145 diseased non-adipose women 18 and 46 respectively have flatulence, and the difference between the proportions is significant ($X^2 = 50.84$. df = 1. $P < 0{\cdot}01$).

Of the 111 healthy adipose women and 33 diseased adipose women 22 and 11 respectively have flatulence. The difference between the proportions with flatulence is not significant ($X^2 = 2.55$. df = 1. $P > 0.10$). Thus the adipose in health or with disease are comparable in the incidence of flatulence and may be combined for contrast with the diseased non-adipose women. The difference between the proportions with flatulence is not significant (X^2 2.85. df = 1. $P > 0{\cdot}05$).

Flatulence is present in all groups assessed, but is of greater prevalence in women than men; in disease than health for men and non-adipose women; in adipose women than healthy non-adipose women, and is comparable for adipose women and diseased non-adipose women. A variety of drugs are taken for flatulence, but where the individual carries out self medication the drug of choice is sodium bicarbonate.

Of the 1232 men and women in this series 163, or 13.2 per cent, have flatulence, and this proportion is less than the 18.8 per cent recorded by Sheldon (1948). This is probably due to the bias of healthy individuals in the present series. It is rather surprising that the difference between the proportions is not greater.

TINNITUS.

Tables 232 to 235 show the incidence of tinnitus for men and women in health and disease by quinquennial age groups.

Eighteen, or 4.5 per cent, of 400 healthy men; 13, or 4.4 per cent, of 293 healthy non-adipose women; and 6, or 5.4 per cent, of 111 healthy adipose women experience tinnitus. Fifty-five, or 22.0 per cent, of 250 diseased men; 32, or 22.1 per cent, of 145 diseased non-adipose women, and 9, or 27.3 per cent, of 33 diseased adipose women have tinnitus. Thus in health tinnitus is comparable in incidence for men and women, but is significantly higher in men and women with disease than it is in those who are healthy. The incidence of tinnitus shows no significant variation with age for men or women in health or disease.

Of the 1232 people in the present series 133, or 10.8 per cent, have tinnitus. This proportion is less than the 17.8 per cent of Sheldon (1948) and the 38 per cent of Hobson and Pemberton (1955). The favourable proportion in this study is doubtless due to the predominance of healthy subjects compared with the other surveys. While this may explain the difference from Sheldon (1948) it does not wholly explain the difference from Hobson and Pemberton (1955). This is because if the diseased men and women in the present study are considered alone the bias on disease should reasonably be expected to produce a higher or at least a comparable proportion to that of Hobson and Pemberton (1955), but this does not occur. Of the 250 diseased men and 178 diseased women in the present series 55, or 22.0

per cent, and 41, or 23.0 per cent, respectively have tinnitus, and these proportions fall far short of the 38 per cent of Hobson and Pemberton (1955). I am at a loss to explain this difference.

VERTIGO.

Tables 236 and 237 show the incidence of postural vertigo in healthy men and healthy non-adipose and adipose women by five year age groups. Tables 238 and 239 show the incidence of vertigo from all causes for the diseased men and diseased non-adipose and adipose women by five year age groups.

The incidence of postural vertigo increases with age for healthy men and healthy non-adipose women, but the increase is less definite for healthy adipose women. Vertigo due to any cause in the diseased men and diseased non-adipose women increases with age, while there is no specific age trend for diseased adipose women.

Postural vertigo is observed in 15, or 3.7 per cent, of 400 healthy men; 13, or 4.4 per cent, of 293 healthy non-adipose women, and 2, or 1.8 per cent, of 111 healthy adipose women. The incidence of postural vertigo in the diseased groups of men and women is a matter of speculation because it is overshadowed by other causes of vertigo. However, vertigo is found in 81, or 32.4 per cent, of 250 diseased men; 65, or 44.8 per cent, of 145 diseased non-adipose women, and 15, or 45.5 per cent, of 33 diseased adipose women.

Of the 650 men and 582 women in this series 96, or 14.8 per cent, and 95, or 16.3 per cent, respectively have vertigo. These proportions are markedly less than the 38.7 per cent for men and 57.2 per cent for women recorded by Sheldon (1948) and the 29 per cent for men and 38 per cent for women noted by Strom (1956). The 13.1 per cent for men observed by Hobson and Pemberton (1955) is comparable to the 14.8 per cent for men in the present study, but their 30.3 per cent for women is far greater than my 16.3 per cent for women. These differences from other surveys probably reflect the bias on health in the present investigation. However, the diseased people considered alone in this study should present proportions with vertigo higher than those observed in general surveys. Of the 250 diseased men 81, or 32.4 per cent, and of the 178 diseased women 80, or 44.9 per cent, have vertigo. These proportions are higher than those presented by Strom (1956) and Hobson and Pemberton (1955), but are still less than the corresponding proportions of Sheldon (1948). This suggests that the incidence of vertigo recorded by Sheldon (1948) may for some unknown reason over-emphasise the incidence of vertigo in the community.

TOBACCO.

Tables 240 and 241 show the number and percentage of men and women in health and disease who smoke tobacco by quinquennial age groups. Of the 400 healthy men 327, or 81.7 per cent, smoke tobacco; 26, or 6.5 per cent, have never smoked tobacco, and 47, or 11.8 per cent, have given up the habit of smoking. Of the 250 diseased men 226, or 90.4 per cent, smoke tobacco; 12, or 4.8 per cent, have never smoked tobacco, and 12, or 4.8 per cent, have given up the habit of smoking. When the healthy and diseased men are contrasted the differences between the expected and observed values are most unlikely to be due to chance ($X^2 = 10.29$. df = 1. $P < 0{\cdot}01$). Less healthy men smoke tobacco and more have never smoked or have stopped smoking than expected.

Of the 404 healthy women 25, or 6.2 per cent, smoke tobacco and 379, or 93.8 per cent, have never smoked. Of the 178 diseased women 3, or 1.7 per cent, smoke tobacco and 175, or 98.3 per cent, have never smoked. The trend is different from that noted for men. A greater proportion of healthy women smoke tobacco compared with diseased women.

In health men and women show no apparent significant variation with age in the proportions who smoke tobacco. There is a slight decrease with age in the proportions of diseased men who smoke tobacco.

ALCOHOLIC DRINK.

Tables 242 and 243 show the incidence of alcoholic drinking by men and women in health and disease by quinquennial age groups. The consumption of alcoholic drinks shows no marked variation with age except in one instance. Of the 178 diseased women 142 are in the age range 60 - 74 years and 36 are aged 75 years and more. Of the 142 women 33 take alcoholic drink and of the 36 women 16 take alcoholic drink. The difference between the expected and observed values is unlikely to be due to chance ($X^2 = 6.50$. df = 1. $P > 0.01$). Less of the diseased women in the younger age group and more in the older age group than expected take alcoholic drink.

Of the 400 healthy men and 250 diseased men 289 and 186 respectively take alcoholic drink. The variation in proportions is not significant ($X^2 = 0.36$. df = 1. $P > 0.50$). Of the 404 healthy women and 178 diseased women 46 and 49 take alcoholic drink. The difference between the expected and observed values is unlikely to be due to chance ($X^2 = 23.72$. df = 1. $P < 0.01$). Less healthy women and more diseased women than expected take alcoholic drink.

CONSTIPATION.

Tables 244 to 247 show the incidence of constipation for men, non-adipose and adipose women in health and disease by quinquennial age groups. The proportions of healthy men and healthy non-adipose women increase significantly with age. Of the 400 healthy men there are 151 in the age group 60 - 69 years and 249 aged 70 years and more. Of the 151 and 249 healthy men 27 and 84 respectively have constipation. The difference between the expected and observed values is significant ($X^2 = 11.76$. df = 1. $P < 0{\cdot}01$). There are less healthy men in the younger age group and more in the older age group than expected with constipation. Similarly, of the 293 healthy non-adipose women 127 are in the age group 60 - 69 years and 166 aged 70 years and more. Of the 127 and 166 healthy non-adipose women 51 and 86 respectively have constipation. The difference between the expected and observed values is significant ($X^2 = 3.94$. df = 1. $P > 0{\cdot}02$). There are less healthy non-adipose women in the younger age group and more in the older age group than expected with constipation. While the healthy adipose women, diseased men and diseased non-adipose women show no real increase in the incidence of constipation with age, the diseased adipose women present a marked increase in the incidence of constipation with age.

Constipation is encountered much more frequently in women than in men. Constipation is present in 137, or 46.8 per cent, of 293 healthy non-adipose women, and in 50, or 45.0 per cent, of 111 healthy adipose women, but only in 111, or 27.7 per cent, of 400 healthy men. Similarly, constipation occurs in 55, or 37.9 per cent, of 145 diseased non-adipose women, and in 14, or 42.4 per cent, of 33 diseased adipose women, but only in 51, or 20.4 per cent, of 250 diseased men.

SMELL.

Tables 248 to 251 show the incidence of deterioration in the sense of smell for men, non-adipose and adipose women in health and disease by quinquennial age groups. There is a general increase in the deterioration of the sense of smell with age for men, non-adipose and adipose women in health and disease. Neither sex nor the occurrence of disease influence the total proportions of individuals with a poor sense of smell. Deterioration in the sense of smell is observed in 71, or 17.8 per cent, of 400 healthy men; 54, or 18.4 per cent, of 293 healthy non-adipose women, and in 19, or 17.1 per cent, of 111 healthy adipose women. It is similarly noted in 45, or 18.0 per cent, of 250 diseased men; 17, or 11.7 per cent, of 145 diseased non-adipose women, and in 6, or 18.2 per cent, of 33 diseased adipose women.

ACCIDENTS.

Tables 252 to 255 show the incidence of accidents for men, non-adipose and adipose women in health and disease by quinquennial age groups. There is an increase in the incidence of accidents with age for healthy men, healthy non-adipose women, diseased non-adipose women and possibly for diseased adipose women. In this assessment of accidents only those which occurred in the three years period prior to the interview are considered.

Accidents are recorded for 24, or 6.0 per cent, of 400 healthy men; 37, or 12.6 per cent, of 293 healthy non-adipose women, and 22, or

19.8 per cent, of 111 healthy adipose women. Accidents are also noted for 19, or 7.6 per cent, of 250 diseased men; 12, or 8.3 per cent, of 145 diseased non-adipose women, and 6, or 18.2 per cent, of 33 diseased adipose women. Thus women are more prone to accidents than men, and this sex difference has been noted by Sheldon (1948), Hobson and Pemberton (1955) and Strom (1956).

Of the 400 healthy men and 293 healthy non-adipose women 24 and 37 respectively have experienced accidents. The difference between the expected and observed values is highly significant ($X^2 = 9.23$. df = 1. $P < 0{\cdot}01$). More women than men who are healthy have had accidents. While there is no significant difference in the proportions of diseased men and diseased non-adipose women who have had accidents ($X^2 = 0.05$. df = 1. $P > 0{\cdot}80$), there is significance when the diseased men are contrasted with the diseased adipose women, Of the 250 diseased men and 33 diseased adipose women 19 and 6 respectively have had accidents. The difference between the expected and observed values is significant ($X^2 = 4.10$. df = 1. $P > 0{\cdot}02$). More diseased adipose women and less diseased men than expected have had accidents.

In the present study the number of accidents recorded are those which occurred in the three year period prior to the date of examination. In this three year period accidents involved 43, or 6.6 per cent, of the 650 men and 77, or 13.2 per cent, of the 582 women. These proportions compare favourably with the findings of Strom (1956) for one calander year. He found 3.7 per cent of men and 5.2 per cent of women had been involved in accident during the year prior to their assessment.

An important finding in the present study is that the group most exposed to accidents appears to be adipose women, and this is irrespective of whether the adipose women are in health or suffer from disease.

I do not propose to embark on a discussion of the causes of accidents because this has been comprehensively considered by Sheldon (1948) and others. However, if there is any surprise in the present study it is the fact that the incidence of accidents is so low. The analysis earlier in this thesis of the housing conditions cannot possibly give a clear picture of the adverse environment within which so many old people existed. Many of the tenement homes lacked basic facilities, with the serious hazard of outside toilets. Poor lighting and dark corners, uneven floor boards, badly designed furniture, worn stairs, dangerous fire-places and badly fitting windows are but some of the defects encountered. Thus the local health authorities and home safety committees have considerable scope for their activities by attempting to reduce the home hazards of the aged.

TEETH.

Tables 256 to 259 show the dental findings for men and women in health or with disease by quinquennial age groups.

Upper and lower dentures are worn by 304, or 76.0 per cent, of 400 healthy men; 242, or 82.6 per cent, of 293 healthy non-adipose women; 89, or 80.2 per cent, of 111 healthy adipose women; 183, or 73.2 per cent, of 250 diseased men; 116, or 80.0 per cent, of 145 diseased non-adipose women, and 23, or 69.7 per cent, of 33 diseased adipose women.

Of the 650 men 565, or 86.9 per cent, and of the 582 women 564, or 96.9 per cent, wear dentures. Of the 565 men the dentures were full upper and lower for 487, or 86.2 per cent, and of the 564 women the dentures were full upper and lower for 470, or 83.3 per cent. The proportions of men and women in this investigation who wear dentures are much higher than the respective percentages of 62 and 86.8 for men and women recorded by Hobson and Pemberton (1955). Sheldon (1948) found 40 per cent of men and 67 per cent of women wore dentures. These differences between the surveys suggest that even since 1955 when Hobson and Pemberton (1955) published their work, a still greater proportion of old people in the community have taken advantage of the Health Service. Hobson and Pemberton (1955) found that 92 per cent of the dentures worn were full upper and lower, while Sheldon (1948) put the percentage at 94 per cent. The proportions of men and women in the present study wearing full upper and lower dentures are somewhat lower than that recorded in the survey of Sheldon (1948) or in the survey of Hobson and Pemberton (1955). In the present study the proportion of individuals wearing upper and lower dentures would have been greater if the lower dentures had fitted reasonably accurately. The quite common statement that the lower denture wobbled in the mouth and did not fit properly must indicate that dentists find some difficulty in making satisfactory lower dentures. It seems a waste of public money that a lower dental plate should be made only to be discarded, apart from the fact that dental hygiene must be less satisfactory when only an upper dental plate is worn.

Of the 650 men 8, or 1.2 per cent, possessed adequate natural dentition. This proportion is less than the 3.5 per cent noted by Hobson and Pemberton (1955). Of the 582 women 3, or 0.5 per cent, possessed adequate natural dentition. This is the same percentage value as found for women by Hobson and Pemberton (1955). Furthermore, Sheldon (1948) observed that 3.2 per cent of his sample had complete or almost complete dentition.

It was considered that about 25 per cent of men and 20 per cent of women might have derived some benefit from dental attention. Some men and women possess neither their own teeth nor dentures; others have a few remaining teeth which require treatment, while some wear upper dentures only with no lower teeth.

Those who wear dentures for cosmetic reasons only and remove the dentures when they eat food are a special problem.

Table 173.

The number of men and non-adipose women regarded as healthy by marital status and five year age groups.

Age group	Married		Widowers	Widows	Single		Divorced or separated	
	Men	Women			Men	Women	Men	Women
60 - 64	58	44	5	12	5	11	1	3
65 - 69	58	24	17	28	4	5	3	
70 - 74	58	24	37	38	5	8	1	1
75 - 79	44	5	31	27	6	14	1	
80 - 84	17	6	32	24	5	7	1	
85 - 89	1	2	10	7		2		1
Total	236	105	132	136	25	47	7	5

Table 174.

The percentage of men and non-adipose women regarded as healthy by marital status and five year age groups.

Age group	Married		Widowers	Widows	Single		Divorced or separated	
	Men	Women			Men	Women	Men	Women
60 - 64	84.1	62.9	7.2	17.1	7.2	15.7	1.5	4.3
65 - 69	70.7	42.1	20.7	49.1	4.9	8.8	3.7	
70 - 74	57.4	33.8	36.6	53.5	5.0	11.3	1.0	1.4
75 - 79	53.7	10.9	37.8	58.7	7.3	30.4	1.2	
80 - 84	30.9	16.2	58.2	64.9	9.1	18.9	1.8	
85 - 89	9.1	16.7	90.9	58.3		16.7		8.3
Total	59.0	35.8	33.0	46.4	6.3	16.1	1.7	1.7

Table 175.

The number and percentage of adipose women regarded as otherwise well by marital status and five year age groups.

Age group	Number				Percentage			
	Married	Widows	Single	Divorced or separated	Married	Widows	Single	Divorced or separated
60 - 64	22	12	3	1	57.9	31.6	7.9	2.6
65 - 69	18	14	3		51.4	40.0	8.6	
70 - 74	12	7	6		48.0	28.0	24.0	
75 - 79	3	10			23.1	76.9		
Total	55	43	12	1	49.6	38.7	10.8	0.9

Table 176.

The number and percentage of men and non-adipose women with disease by marital status and five year age groups.

(a) Number.

Age group	Married		Widowers	Widows	Single		Divorced or separated	
	Men	Women			Men	Women	Men	Women
60 - 64	43	16	6	11	7	9	2	
65 - 69	53	10	15	17	8	12		1
70 - 74	39	11	15	20	5	7		1
75 - 79	26	5	12	13	2	2	1	
80 - 84	4	2	11	6		1		
85 - 89			1	1				
Total	165	44	60	68	22	31	3	2

(b) Percentage.

Age group	Married		Widowers	Widows	Single		Divorced or separated	
	Men	Women			Men	Women	Men	Women
60 - 64	74.1	44.4	10.3	30.6	12.1	25.0	3.5	
65 - 69	69.8	25.0	19.7	42.5	10.5	30.0		2.5
70 - 74	66.1	28.2	25.4	51.3	8.5	17.9		2.6
75 - 79	63.4	25.0	29.3	65.0	4.9	10.0	2.4	
80 - 84	26.7	22.2	73.3	66.7		11.1		
85 - 89			100.0 *	100.0 *				
Total	66.0	30.3	24.0	46.9	8.8	21.4	1.2	1.4

* Groups too small to make percentages valid.

Table 177.

The number and percentage of adipose women with disease by marital status and five year age groups.

Age group	Number				Percentage			
	Married	Widows	Single	Divorced or separated	Married	Widows	Single	Divorced or separated
60 - 64	2	6	1		22.2	66.7	11.1	
65 - 69	8	3		1	66.7	25.0		8.3
70 - 74	2	4			33.3	66.7		
75 - 79	1	4	1		16.7	66.7	16.7	
Total	13	17	2	1	39.4	51.5	6.1	3.0

Table 178.

The number and percentage of men and non-adipose women by social class and five year age groups.
(healthy men and women)

(a) Number.

Age group	Social class I		II		III		IV		V	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	6	2	5	7	40	48	3	3	15	10
65 - 69	8	4	6	7	48	36	3	3	17	7
70 - 74	6	3	10	3	63	54	2	1	20	10
75 - 79	4	2	7	9	56	32	2	1	13	2
80 - 84	1	2	2	5	47	26		1	5	3
85 - 89		1	1	1	9	7		1	1	2
Total	25	14	31	32	263	203	10	10	71	34

(b) Percentage.

Age group	Social class I		Social class II		Social class III		Social class IV		Social class V	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	8.7	2.8	7.3	10.0	58.0	68.6	4.3	4.3	21.7	14.3
65 - 69	9.8	7.0	7.3	12.3	58.5	63.2	3.7	5.2	20.7	12.3
70 - 74	5.9	4.2	9.9	4.2	62.4	76.1	2.0	1.4	19.8	14.1
75 - 79	4.9	4.3	8.5	19.6	68.3	69.6	2.4	2.2	15.9	4.3
80 - 84	1.8	5.4	3.6	13.5	85.5	70.3		2.7	9.1	8.1
85 - 89		8.3	9.1	8.3	81.8	58.4		8.3	9.1	16.7
Total	6.2	4.8	7.7	10.9	65.8	69.3	2.5	3.4	17.8	11.6

Table 179.

The number and percentage of adipose women by social class and five year age groups.
(healthy women)

Age group	Number					Percentage				
	Social class					Social class				
	I	II	III	IV	V	I	II	III	IV	V
60 - 64		2	22	3	11		5.3	57.9	7.9	28.9
65 - 69	2	2	25	2	4	5.7	5.7	71.5	5.7	11.4
70 - 74	1	1	17	2	4	4.0	4.0	68.0	8.0	16.0
75 - 79	1		11		1	7.7		84.6		7.7
Total	4	5	75	7	20	3.6	4.5	67.6	6.3	18.0

Table 180.

The number and percentage of men and non-adipose women with disease by social class and five year age groups.

(a) Number.

Age group	Social class I		II		III		IV		V	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	8	1	9	3	28	25	5	2	8	5
65 - 69	3	1	5	8	50	23	3	2	15	6
70 - 74	6	3	6	4	36	26	1	2	10	4
75 - 79	2		5	3	26	14		1	8	2
80 - 84	1		3	1	8	7	1		2	1
85 - 89				1	1					
Total	20	5	28	20	149	95	10	7	43	18

(b) Percentage.

Age group	Social class I Men	I Women	II Men	II Women	III Men	III Women	LV Men	LV Women	V Men	V Women
60 - 64	13.8	2.8	15.5	8.3	48.3	69.4	8.6	5.6	13.8	13.9
65 - 69	3.9	2.5	6.6	20.0	65.8	57.5	3.9	5.0	19.8	15.0
70 - 74	10.2	7.7	10.2	10.3	61.0	66.7	1.7	5.1	16.9	10.2
75 - 79	4.9		12.2	15.0	63.4	70.0		5.0	19.5	10.2
80 - 84	6.7		20.0	11.1	53.3	77.8	6.7		13.3	11.1
85 - 89				100.0 *	100.0 *					
Total	8.0	3.5	11.2	13.8	59.6	65.5	4.0	4.8	17.2	12.4

* groups too small to make percentages valid.

Table 181.

The number and percentage of adipose women with disease by social class and five year age groups.

Age group	Number					Percentage				
	Social class					Social class				
	I	II	III	IV	V	I	II	III	IV	V
60 - 64		2	5		2		22.2	55.6		22.2
65 - 69		1	6		5		8.3	50.0		41.7
70 - 74			4	1	1			66.7	16.7	16.7
75 - 79		2	3		1		33.3	50.0		16.7
Total		5	18	1	9		15.2	54.5	3.0	27.3

Table 182.

The number and percentage of men, non-adipose and adipose women who are healthy in terms of the type of house within which they reside. The proportions do not vary significantly with age. Consequently sub-divisions by quinquennial age groups are omitted.

	Number					Percentage				
	Tenement 1	Detached house 2	Semi-detached house 3	Terrace 4	4 houses in block 5	1	2	3	4	5
Men	167	17	77	52	87	41.7	4.2	19.3	13.0	21.8
Non-adipose women	141	13	57	24	58	48.1	4.4	19.5	8.2	19.8
Adipose women	55	4	21	9	22	49.6	3.6	18.9	8.1	19.8
Total	363	34	155	85	167	45.1	4.2	19.3	10.6	20.8

Table 183.

The number and percentage of men, non-adipose and adipose women with disease in terms of the type of house within which they reside.

	Number					Percentage				
	Tenement	Detached house	Semi-detached house	Terrace	4 houses in block	1	2	3	4	5
	1	2	3	4	5					
Men	112	8	54	23	53	44.8	3.2	21.6	9.2	21.2
Non-adipose women	72	2	29	17	25	49.7	1.4	20.0	11.7	17.2
Adipose women	19		4	4	6	57.6		12.1	12.1	18.2
Total	203	10	87	44	84	47.4	2.4	20.3	10.3	19.6

Table 184.

The number and percentage of men, non-adipose and adipose women who are healthy in terms of the level of their homes in relation to ground level.

	Number						Percentage					
	1	2	3	4	5	6						
	Ground level	Ground level and 1 storey	1 storey	2 storeys	3 storeys	4 storeys	1	2	3	4	5	6
Men	116	91	139	41	12	1	29.0	22.8	34.8	10.2	3.0	0.25
Non-adipose women	86	61	93	39	14		29.4	20.8	31.7	13.3	4.8	
Adipose women	26	25	39	14	7		23.4	22.5	35.2	12.6	6.3	
Total	228	177	271	94	33	1	28.4	22.0	33.7	11.7	4.1	0.13

Table 185.

The number and percentage of men, non-adipose and adipose women with disease in terms of the level of their homes in relation to ground level.

	Number						Percentage					
	1	2	3	4	5	6						
	Ground level	Ground level and 1 storey	1 storey	2 storeys	3 storeys	4 storeys	1	2	3	4	5	6
Men	85	49	61	38	15	2	34.0	19.6	24.4	15.2	6.0	0.8
Non-adipose women	40	33	39	23	9	1	27.6	22.8	26.9	15.9	6.2	0.6
Adipose women	11	3	11	7	1	0	33.3	9.1	33.3	21.2	3.0	0.0
Total	136	85	111	68	25	3	31.8	19.9	25.9	15.9	5.8	0.7

Table 186.

The number and percentage of men and non-adipose women in terms of difficulty in negotiating stairs by five year age groups.
(healthy men and women)

(a) Number.

Age group	Ascending		Descending		Ascending and descending		No difficulty	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64							69	70
65 - 69							82	57
70 - 74		3			1		100	68
75 - 79	2	4	1		3	1	76	41
80 - 84	5	1		1	3	2	47	33
85 - 89	1	1	1	2	4	2	5	7
Total	8	9	2	3	11	5	379	276

(b) Percentage.

Age group	Ascending		Descending		Ascending and descending		No difficulty	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64							100·0	100·0
65 - 69							100·0	100·0
70 - 74		4.2			1.0		99.0	95.8
75 - 79	2.4	8.7	1.2		3.7	2.3	92.7	89.0
80 - 84	9.1	2.7		2.7	5.4	5.4	85.5	89.2
85 - 89	9.1	8.3	9.1	16.7	36.4	16.7	45.4	58.3
Total	2.0	3.1	0.5	1.0	2.7	1.7	94.8	94.2

Table 187.

The number and percentage of adipose women who are healthy in terms of difficulty in negotiating stairs by five year age groups.

	Number				Percentage			
Age group	Ascending	Descending	Ascending and descending	No difficulty	Ascending	Descending	Ascending and descending	No difficulty
60 - 64	10		1	27	26.3		2.6	71.1
65 - 69	9		7	19	25.7		20.0	54.3
70 - 74	8	2		15	32.0	8.0		60.0
75 - 79	5	2		6	38.5	15.4		46.1
Total	32	4	8	67	28.8	3.6	7.2	60.4

Table 188.

The number and percentage of men and non-adipose women with disease in terms of difficulty in negotiating stairs by five year age groups.

(a) Number.

Age group	Ascending		Descending		Ascending and descending		No difficulty	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	12	7			2	1	44	28
65 - 69	16	15	3		2	2	55	23
70 - 74	5	7	1	1	1	2	52	29
75 - 79	9	5	1	1	5	2	26	12
80 - 84	3	4			2	2	10	3
85 - 89							1	1
Total	45	38	5	2	12	9	188	96

(b) Percentage.

Age group	Ascending		Descending		Ascending and descending		No difficulty	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	20.7	19.4			3.4	2.8	75.9	77.8
65 - 69	21.1	37.5	3.9		2.6	5.0	72.4	57.5
70 - 74	8.5	17.9	1.7	2.6	1.7	5.1	88.1	74.4
75 - 79	22.0	25.0	2.4	5.0	12.2	10.0	63.4	60.0
80 - 84	20.0	44.5			13.3	22.2	66.7	33.3
85 - 89							100.0 *	100.0 *
Total	18.0	26.2	2.0	1.4	4.8	6.2	75.2	66.2

* Groups too small to make percentages valid.

Table 189.

The number and percentage of adipose women with disease in terms of difficulty in negotiating stairs by five year age groups.

Age group	Ascending	Descending	Ascending and descending	No difficulty	Ascending	Descending	Ascending and descending	No difficulty
60 - 64	4		1	4	44.4		11.1	44.4
65 - 69	4		4	4	33.3		33.3	33.3
70 - 74	3		1	2	50.0		16.7	33.3
75 - 79	3	1	2		50.0	16.7	33.3	
Total	14	1	8	10	42.4	3.0	24.3	30.3

Table 190.

The number and percentage of men and non-adipose women who are healthy by the number of rooms in their homes and five year age groups.

(a) Number.

Age group	1 room		2 rooms		3 rooms		4 rooms		5 and more rooms	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	4	6	13	15	27	27	15	16	10	6
65 - 69	3	6	26	15	32	22	12	9	9	5
70 - 74	9	7	23	21	33	27	31	10	5	6
75 - 79	12	5	19	13	28	7	14	14	9	7
80 - 84	7	5	19	10	15	9	6	9	8	4
85 - 89		2	4	5	2	3	4	2	1	
Total	35	31	104	79	137	95	82	60	42	28

(b) The numbers of men and non-adipose women are expressed as percentages of the totals in each respective five year age group.

Age group	1 room		2 rooms		3 rooms		4 rooms		5 and more rooms	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	5.8	8.6	18.9	21.3	39.1	38.6	21.7	22.9	14.5	8.6
65 - 69	3.7	10.5	31.7	26.3	39.0	38.6	14.6	15.8	11.0	8.8
70 - 74	8.9	9.9	22.8	29.6	32.7	38.0	30.7	14.1	4.9	8.4
75 - 79	14.6	10.9	23.2	28.3	34.1	15.2	17.1	30.4	11.0	15.2
80 - 84	12.7	13.5	34.5	27.0	27.3	24.4	10.9	24.3	14.6	10.8
85 - 89		16.7	36.4	41.6	18.2	25.0	36.4	16.7	9.0	
Total	8.7	10.6	26.0	27.0	34.3	32.4	20.5	20.5	10.5	9.5

Table 191.

The number and percentage of adipose women who are healthy by the number of rooms in their homes and five year age groups.

Age group	Number					Percentage				
	1 room	2 rooms	3 rooms	4 rooms	5 and more rooms	1 room	2 rooms	3 rooms	4 rooms	5 rooms and more
60 - 64		9	19	9	1		23.7	50.0	23.7	2.6
65 - 69	5	12	11	4	3	14.3	34.3	31.4	11.4	8.6
70 - 74	4	7	5	5	4	16.0	28.0	20.0	20.0	16.0
75 - 79	2	5	3	2	1	15.4	38.5	23.1	15.4	7.6
Total	11	33	38	20	9	9.9	29.7	34.2	18.0	8.2

Table 192.

The number and percentage of men and non-adipose women with disease by the number of rooms in their homes and five year age groups.

(a) Number.

Age group	1 room		2 rooms		3 rooms		4 rooms		5 and more rooms	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	2	6	15	10	17	9	15	10	9	1
65 - 69	4	1	22	10	27	13	15	10	8	6
70 - 74	3	3	18	15	14	7	19	10	5	4
75 - 79	2	1	10	6	12	5	14	8	3	
80 - 84	1	6	4	1	3		5	1	2	1
85 - 89					1					1
Total	12	17	69	42	74	34	68	39	27	13

(b) Percentage.

Age group	1 room		2 rooms		3 rooms		4 rooms		5 and more rooms	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	3.4	16.7	25.9	27.8	29.3	25.0	25.9	27.8	15.5	2.7
65 - 69	5.3	2.5	28.9	25.0	35.5	32.5	19.7	25.0	10.5	15.0
70 - 74	5.1	7.7	30.5	38.5	23.7	17.9	32.2	25.6	8.5	10.3
75 - 79	4.9	5.0	24.4	30.0	29.3	25.0	34.1	40.0	7.3	
80 - 84	6.7	66.7	26.7	11.1	20.0		33.3	11.1	13.3	11.1
85 - 89					100.0 *					100.0 *
Total	4.8	11.7	27.6	29.0	29.6	23.4	27.2	26.9	10.8	9.0

* Groups too small to make percentages valid.

Table 193.

The number and percentage of adipose women with disease by the number of rooms in their homes and five year age groups.

Age group	Number					Percentage				
	1 room	2 rooms	3 rooms	4 rooms	5 and more rooms	1 room	2 rooms	3 rooms	4 rooms	5 and more rooms
60 - 64	1	5	2		1	11.1	55.6	22.2		11.1
65 - 69	1	3	7	1		8.3	25.0	58.4	8.3	
70 - 74	2	2	1	1		33.3	33.3	16.7	16.7	
75 - 79	1	1	2	2		16.7	16.7	33.3	33.3	
Total	5	11	12	4	1	15.2	33.3	36.4	12.1	3.0

Table 194.

The number and percentage of men, non-adipose and adipose women who are healthy with an all electric power supply in their homes.

	Number		Percentage	
	All electric	Gas and electricity	All electric	Gas and electricity
Men	47	353	11.7	88.3
Non-adipose women	29	264	9.9	90.1
Adipose women	13	98	11.7	88.3
Total	89	715	11.1	88.9

Table 195.

The number and percentage of men, non-adipose and adipose women with disease who possess an all electric power supply in their homes.

	Number		Percentage	
	All electric	Gas and electricity	All electric	Gas and electricity
Men	34	216	13.6	86.4
Non-adipose women	13	132	9.0	91.0
Adipose women	2	31	6.1	93.9

Table 196.

The number of children by their sex, marital status and location in relation to the parental home, of the men and women by five year age groups.
(317 men and 302 women)
(healthy men and women)

(a) Children possessed by the men.

Age group of parent	Location of children	Marital status of children											
		Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
60 - 64	In home		3	35	21						1	35	25
	Near	39	34	1	2							40	36
	Far	6	6	2								8	6
65 - 69	In home	1	5	13	13						1	14	19
	Near	61	67									61	67
	Far	9	14	5	1							14	15
70 - 74	In home	8	7	18	12		2				1	26	22
	Near	73	57	1								74	57
	Far	16	18	1								17	18
75 - 79	In home	5	9	11	12	1	2	1	2			18	25
	Near	74	78		1		1					74	80
	Far	23	12		1		1					23	14

(continued overleaf)

Table 196 continued.

Age group of parent	Location of children	Marital status of children											
		Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
80 - 84	In home	4	6	3	10	1	3		1		1	8	21
	Near	45	31									45	31
	Far	25	16	2	1							27	17
85 - 89	In home		4				1						5
	Near	14	6									14	6
	Far	2		1	1							3	1
Total	In home	18	34	80	68	2	8	1	3		4	101	117
	Near	306	273	2	3		1					308	277
	Far	81	66	11	4		1					92	71
Total irrespective		405	373	93	75	2	10	1	3	0	4	501	465

(b) Children possessed by the women.

Age group of parent	Location of children	Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons.	Dgts.
60 - 64	In home	1	4	38	22	1			1			40	27
	Near	89	69		1							89	70
	Far	16	18	3	4							19	22
65 - 69	In home	2	3	15	18		1					17	22
	Near	73	71		1		1					73	73
	Far	12	11	3								15	11
70 - 74	In home	3	5	11	8	2	1		2			16	16
	Near	52	70									52	70
	Far	30	15	1	1							31	16
75 - 79	In home		8	2	12		2				1	2	23
	Near	36	30									36	30
	Far	17	11									17	11
80 - 84	In home		4	1	7	1	3					2	14
	Near	28	19	3	1							31	20
	Far	7	1									7	1
85 - 89	In home	1	1	1			1					2	2
	Near	3	4									3	4
	Far	3	1									3	1

(continued overleaf)

Table 196 b continued.

Age group of parent	Location of children	Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
Total	In home	7	25	68	67	4	8		3		1	79	104
	Near	281	263	3	3		1					284	267
	Far	85	57	7	5							92	62
Total irrespective of location of children		373	345	78	75	4	9		3		1	455	433

Table 197.

The number of children by their sex, marital status and location in relation to the parental home, of the men and women with disease by five year age groups.

(a) Children possessed by the men.

Age group of parent	Location of children	Married Sons	Married Dgts.	Single Sons	Single Dgts.	Widowed Sons	Widowed Dgts.	Divorced Sons	Divorced Dgts.	Separated Sons	Separated Dgts.	Total Sons	Total Dgts.
60 - 64	In home		2	22	12							22	14
	Near	22	28									22	28
	Far	10	5	1								11	5
65 - 69	In home	3	5	6	10		1			1	1	10	17
	Near	61	55	1	2							62	57
	Far	14	9	1	4							15	13
70 - 74	In home	2	6	4	8		2	1	1			7	17
	Near	46	33									46	34
	Far	10	11	1	2							11	13
75 - 79	In home	2	5	2	8		1				1	4	15
	Near	36	40	1								37	40
	Far	13	11	1	2							14	13
80 - 84	In home	2	1	2	5							4	6
	Near	13	20									13	20
	Far	7	5									7	5

(continued overleaf)

Table 197 continued.

Age group of parent	Location of children	Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
85 - 89	In home		1										1
	Near	2										2	
	Far												
Total	In home	9	20	36	43		4	1	1	1	2	47	70
	Near	180	176	2	2		1					182	179
	Far	54	41	4	8							58	49
Total irrespective of location of children		243	237	42	53		5	1	1	1	2	287	298

(b) Children possessed by the women.

Age group of parent	Location of children	Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
60 - 64	In home		3	7	12							7	15
	Near	26	15	2								28	15
	Far	8	6	5	1							13	7
65 - 69	In home	1	4	11	11		1	1	1		1	13	18
	Near	30	27									30	27
	Far	11	5									11	5
70 - 74	In home	5	3		2				1			5	6
	Near	46	29	1								47	29
	Far	7	10	2			2					9	12
75 - 79	In home	1	5	1	2		1	1				3	8
	Near	22	20									22	20
	Far	8	5	1								9	5
80 - 84	In home		2		1								3
	Near	3	7									3	7
	Far		3										3
85 - 89	In home												
	Near												
	Far												

(continued overleaf)

Table 197 b continued.

Age group of parent	Location of children	Married		Single		Widowed		Divorced		Separated		Total	
		Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.	Sons	Dgts.
Total	In home	7	17	19	28		2	2	2		1	28	50
	Near	127	98	3								130	98
	Far	34	29	8	1		2					42	32
Total irrespective of location of children		168	144	30	29		4	2	2		1	200	180

Table 198.

The number and percentage of men and women with reference to the location of their children by five year age groups. The number and percentage of men and women with no children is also presented. (healthy men and women)

1. MEN. (a) Number.

Age group of parent	The location of the children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	9	20	0	3	17	6	2	12	69
65 - 69	9	9	8	1	26	8	3	18	82
70 - 74	7	18	12	3	26	9	4	22	101
75 - 79	7	17	9	1	19	11	3	15	82
80 - 84	2	7	11	4	9	5	3	14	55
85 - 89	0	3	2	0	3	1	0	2	11
Total	34	74	42	12	100	40	15	83	400

1. MEN.

(b) Percentage age group.

Age group of parent	The location of children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Tôtal
60 - 64	13.0	29.0	0.0	4.4	24.6	8.7	2.9	17.4	100·0
65 - 69	11.0	11.0	9.7	1.2	31.7	9.8	3.7	21.9	100·0
70 - 74	6.9	17.8	11.9	3.0	25.7	8.9	4.0	21.8	100·0
75 - 79	8.5	20.7	11.0	1.2	23.2	13.4	3.7	18.3	100·0
80 - 84	3.6	12.7	20.0	7.3	16.4	9.1	5.4	25.5	100·0
85 - 89	0.0	27.3	18.2	0.0	27.3	9.0	0.0	18.2	100·0
Total	8.5	18.5	10.5	3.0	25.0	10.0	3.7	20.8	100·0

2. WOMEN. (a) Number.

Age group of parent	The location of the children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	8	19	15	1	30	6	5	24	108
65 - 69	4	16	8	4	33	7	3	17	92
70 - 74	4	17	4	1	23	16	4	27	96
75 - 79	6	4	8	2	13	6	2	18	59
80 - 84	3	7	3	1	10	2	1	10	37
85 - 89	1	0	3	0	1	1	0	6	12
Total	26	63	41	9	110	38	15	102	404

2. WOMEN.

(b) Percentage age group

Age group of parent	The location of the children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	7.4	17.6	13.9	0.9	27.8	5.6	4.6	22.2	100.0
65 - 69	4.3	17.4	8.7	4.3	35.9	7.6	3.3	18.5	100.0
70 - 74	4.2	17.7	4.2	1.0	23.9	16.7	4.2	28.1	100.0
75 - 79	10.2	6.8	13.5	3.4	22.0	10.2	3.4	30.5	100.0
80 - 84	8.1	18.9	8.1	2.7	27.0	5.4	2.7	27.0	100.0
85 - 89	8.3	0.0	25.0	0.0	8.3	8.3	0.0	50.0	100.0
Total	6.4	15.6	10.2	2.2	27.2	9.4	3.7	25.3	100.0

Table 199.

The number and percentage of men and women with disease with reference to the location of their children by five year age groups. The number and percentage of individuals with no children are also presented.

1. MEN.

(a) Number.

Age group of parent	Location of children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	8	11	3	1	12	5	3	15	58
65 - 69	4	13	4	2	23	8	6	16	76
70 - 74	4	10	4	3	15	8	1	14	59
75 - 79	5	8	5	0	9	6	2	6	41
80 - 84	1	5	2	0	3	4	0	0	15
85 - 89	0	1	0	0	0	0	0	0	1
Total	22	48	18	6	62	31	12	51	250

1. MEN. (b) Percentage.

Age group of parent	Location of children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	13.8	19.0	5.2	1.7	20.7	8.6	5.2	25.8	100.0
65 - 69	5.3	17.1	5.3	2.6	30.3	10.5	7.9	21.0	100.0
70 - 74	6.8	16.9	6.8	5.1	25.4	13.6	1.7	23.7	100.0
75 - 79	12.2	19.5	12.2	0.0	22.0	14.6	4.9	14.6	100.0
80 - 84	6.7	33.3	13.3	0.0	20.0	26.7	0.0	0.0	100.0
85 - 89	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Total	8.8	19.2	7.2	2.4	24.8	12.4	4.8	20.4	100.0

2. WOMEN. (a) Number.

Age group of parent	The location of the children: In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	3	7	3	2	7	3	2	18	45
65 - 69	4	14	1	4	7	5	0	17	52
70 - 74	1	7	1	2	9	9	1	15	45
75 - 79	3	4	2	1	6	4	0	6	26
80 - 84	1	0	1	1	4	0	0	2	9
85 - 89	0	0	0	0	0	0	0	1	1
Total	12	32	8	10	33	21	3	59	178

2. WOMEN. (b) Percentage.

Age group of parent	The location of the children								
	In home	In home and near	In home, near and far	In home and far	Near	Near and far	Far	No children	Total
60 - 64	6.7	15.6	6.7	4.4	15.6	6.7	4.4	40.0	100.0
65 - 69	7.7	26.9	1.9	7.7	13.5	9.6	0.0	32.7	100.0
70 - 74	2.2	15.6	2.2	4.4	20.0	20.0	2.2	33.3	100.0
75 - 79	11.5	15.4	7.7	3.8	23.1	15.4	0.0	23.1	100.0
80 - 84	11.1	0.0	11.1	11.1	44.4	0.0	0.0	22.2	100.0 *
85 - 89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0 *

* Groups too small to make percentages valid.

Table 200.

The number of married and unmarried children in respect of their interest in the well-being of their parents by ten year age groups of the parents. The individual numbers are also expressed as percentages of the respective total numbers for each marital status group of the children in each ten year age group of the parents. For example, there are 309 married sons in the age group 60 - 69 years of whom 20, or 6.5 per cent, neglect their parents and 289, or 93.5 per cent, do not neglect their parents. No widowed, divorced or separated children neglected their parents and they are omitted, therefore, from this Table.

(healthy men and women)

(a) Number.

Age group of parent	Neglectful children				Children not neglectful			
	Married sons	Married dgts.	Single sons	Single dgts.	Married sons	Married dgts.	Single sons	Single dgts.
60 - 69	20	17			289	288	115	83
70 - 79	43	17	2		294	303	43	47
80 - 89	31	14	2	2	101	79	9	18
Total	94	48	4	2	684	670	167	148

(b) Percentage.

Age group of parent	Neglectful children				Children not neglectful			
	Married sons	Married dgts.	Single sons	Single dgts.	Married sons	Married dgts.	Single sons	Single dgts.
60 - 69	6.5	5.6	0.0	0.0	93.5	94.4	100.0	100.0
70 - 79	12.8	5.3	4.4	0.0	87.2	94.7	95.6	100.0
80 - 89	23.5	15.0	18.2	10.0	76.5	85.0	81.8	90.0
Total	12.1	6.7	2.3	1.3	87.9	93.3	97.7	98.7

Table 201.

The number of married and unmarried children in respect of their interest in the well-being of their parents with disease by ten year age groups of the parents. The individual numbers are also expressed as percentages of the respective total numbers for each marital status group of the children in each ten year age group of the parents. No widowed, divorced or separated children neglected their parents and they are omitted, therefore, from this Table.

(a) Number.

Age group of parent	Neglectful children				Children not neglectful			
	Married sons	Married dgts.	Single sons	Single dgts.	Married sons	Married dgts.	Single sons	Single dgts.
60 - 69	8	4	2	0	178	160	54	52
70 - 79	23	10	1	1	175	168	13	23
80 and more	3	1	0	0	24	38	2	6
Total	34	15	3	1	377	366	69	81

(b) Percentage.

Age group of parent	Neglectful children				Children not neglectful			
	Married sons	Married dgts.	Single sons	Single dgts.	Married sons	Married dgts.	Single sons	Single dgts.
60 - 69	4.3	2.4	3.6	0.0	95.7	97.6	96.4	100.0
70 - 79	11.6	5.6	7.1	4.2	88.4	94.4	92.9	95.8
80 and more	11.1	2.6	0.0	0.0	88.9	97.4	100.0	100.0
Total	8.3	3.9	4.2	1.2	91.7	96.1	95.8	98.8

Table 202.

The number of men and women with reference to their domestic structure.
(healthy men and women)

Domestic structure	Men	Women	Total
1. Married subjects. Living with:			
- Spouse	133	94	227
- Spouse and unmarried daughter	24	19	43
- Spouse and unmarried son	32	22	54
- Spouse, unmarried daughter and unmarried son	13	10	23
- Spouse, widowed daughter with no children	2	1	3
- Spouse, widowed daughter with children	2	0	2
- Spouse, widowed son with children	1	1	2
- Spouse, divorced daughter with children	1	3	4
- Spouse, unmarried daughter and divorced son with no children	1	0	1
- Spouse, unmarried son and separated daughter with children	1	0	1
- Spouse, unmarried son and unmarried sister	0	1	1
- Spouse, unmarried son, unmarried daughter and separated daughter with children	1	0	1
- Spouse, married daughter, son-in-law with no children	3	3	6
- Spouse, married daughter, son-in-law with children	4	4	8
- Spouse, married son, daughter-in-law with no children	1	0	1
- Spouse, married son, daughter-in-law with children	3	2	5

Table 202 continued.

Domestic structure	Men	Women	Total
- Spouse, unmarried son, married daughter, son-in-law with children	1	0	1
- Spouse and unmarried brother	2	0	2
- Spouse and unmarried sister	1	0	1
- Spouse and unmarried grand-children	3	0	3
- Spouse and unmarried sister-in-law	2	0	2
- Spouse, nephew, his wife and children	1	0	1
- Alone. Spouse in hospital, where she subsequently died	4	0	4
Total	236	160	396
2. Widowed, divorced or separated subjects.			
Living alone	39	80	119
Living with:			
- Unmarried daughter	15	18	33
- Unmarried son	6	13	19
- Unmarried daughter and unmarried son	4	6	10
- Widowed daughter with no children	1	3	4
- Widowed daughter with children	3	4	7
- Widowed son with no children	1	3	4
- Widowed son with children	0	1	1
- Unmarried daughter and widowed son with no children	1	0	1
- Divorced daughter with children	2	0	2
- Separated daughter with children	2	1	3

Table 202 continued.

Domestic structure	Men	Women	Total
- Unmarried son and widowed daughter with no children	1	0	1
- Married daughter, son -in-law with no children	3	6	9
- Married daughter, son-in-law with children	22	13	35
- Married son, daughter-in-law with no children	3	0	3
- Married son, daughter-in-law with children	10	5	15
- Unmarried daughter, married daughter, son-in-law with children	0	1	1
- Unmarried son, married daughter, son-in-law with children	1	0	1
- Unmarried son, married son, daughter-in-law with children	1	0	1
- Unmarried or widowed sister with no children	5	10	15
- Widowed sister with children	0	1	1
- Unmarried daughter, unmarried sister, married son, daughter-in-law with children	0	1	1
- Unmarried brother	1	0	1
- Sister-in-law and her spouse	1	0	1
- Widowed sister-in-law	3	1	4
- Widowed brother-in-law	0	2	2
- Widowed sister-in-law and her widowed daughter	0	1	1
- Unmarried son, unmarried sister and unmarried brother	1	1	2
- Unmarried grand-children	1	1	2
- Unmarried niece	1	3	4
- Widowed niece with her children	1	0	1
- Married niece, her spouse and children	0	1	1

Table 202 continued.

Domestic structure	Men	Women	Total
- Nephew, his spouse and children	1	0	1
- Living as a lodger	6	2	8
- Has lodgers	2	5	7
- Living as a housekeeper	0	1	1
- Has a housekeeper	1	1	2
Total	139	185	324
3. Unmarried subjects.			
Living alone	2	23	25
Living with:			
- Unmarried or widowed sister with no children	5	19	24
- Unmarried sister and unmarried brother	3	1	4
- Unmarried or widowed brother with no children	1	4	5
- Widowed brother and unmarried nephew	0	1	1
- Married niece, her spouse with no children	1	0	1
- Unmarried cousin	1	0	1
- Unmarried niece	0	1	1
- Widowed aunt with no children	1	0	1
- Married sister, her spouse and their children	1	0	1
- Married sister, her spouse with no children	0	1	1
- Widowed brother-in-law with no children	0	1	1
- Divorced sister and her unmarried son	0	1	1
- Widowed sister-in-law with no children	0	1	1
- Living as a lodger	9	1	10

Table 202 continued.

Domestic structure	Men	Women	Total
- Has lodgers	0	1	1
- Living as a housekeeper	0	3	3
- Has a housekeeper	1	1	2
Total	25	59	84

Table 203.

The number of men and women with disease with reference to their domestic structure.

Domestic structure	Men	Women	Total
1. Married subjects. Living with:			
- Spouse	101	35	136
- Spouse and unmarried daughter	21	7	28
- Spouse and unmarried son	13	2	15
- Spouse, unmarried daughter and unmarried son	12	2	14
- Spouse and unmarried grand-daughter	1	0	1
- Spouse, widowed daughter and her children	2	0	2
- Spouse, divorced daughter with children	1	0	1
- Spouse, separated daughter with children	1	1	2
- Spouse, separated daughter and separated son with their children	1	0	1
- Spouse, divorced son with no children	1	0	1
- Spouse, unmarried son and widowed daughter with no children	0	1	1
- Spouse, unmarried daughter and divorced son with no children	0	1	1
- Spouse, married daughter, son-in-law with no children	1	1	2
- Spouse, married daughter, son-in-law with children	4	3	7
- Spouse, married son, daughter-in-law with no children	0	1	1
- Spouse, married son, daughter-in-law with children	1	1	2

Table 203 continued.

Domestic structure	Men	Women	Total
- Spouse, unmarried daughter, widowed brother-in-law and his children	1	0	1
- Spouse, unmarried son and lodger	1	0	1
- Spouse and unmarried brother	1	0	1
- Spouse and unmarried sister	2	0	2
- Spouse and lodger	0	1	1
Total	165	57	222
2. Widowed, divorced or separated subjects.			
Living alone	15	39	54
Living with:			
- Unmarried daughter	7	9	16
- Unmarried son	2	7	9
- Unmarried daughter and unmarried son	0	3	3
- Widowed daughter with children	2	1	3
- Divorced daughter with no children	0	2	2
- Married daughter, son-in-law with no children	2	0	2
- Married daughter, son-in-law with children	11	10	21
- Married daughter, son-in-law with children and divorced son with no children	0	1	1
- Married son, daughter-in-law with children	8	4	12
- Married son, daughter-in-law with children and widowed sister with no children	0	1	1

Table 203 continued.

Domestic structure	Men	Women	Total
- Unmarried daughter, married daughter, son-in-law with children	1	0	1
- Unmarried daughter and widowed aunt	0	1	1
- Unmarried son, married daughter, son-in-law with children	2	1	3
- Unmarried son, unmarried daughter and unmarried brother	0	1	1
- Unmarried or widowed sister with no children	3	2	5
- Unmarried son and unmarried sister	1	0	1
- Unmarried grand-children	0	2	2
- Unmarried niece	1	0	1
- Unmarried cousin	1	1	2
- Widowed niece with no children	1	0	1
- Living as a lodger	4	1	5
- Has lodgers	0	2	2
- Has a housekeeper	2	0	2
Total	63	88	151
3. Unmarried subjects.			
Living alone	4	18	22
Living with:			
- Unmarried or widowed sister with no children	8	13	21
- Unmarried sister, married sister and brother-in-law with no children	0	1	1

Table 203 continued.

Domestic structure	Men	Women	Total
- Unmarried brother	1	0	1
- Unmarried nephew	1	0	1
- Married niece, her spouse with children	2	0	2
- Unmarried niece	1	0	1
- Widowed aunt, married brother and his spouse with no children	1	0	1
- Married sister, her spouse with no children	0	1	1
- Widowed sister-in-law with children	1	0	1
- Living as a lodger	3	0	3
Total	22	33	55

Table 204.

The causes and incidence of emotional disturbance by sex and ten year age groups, with reference to the 400 men and 404 women in the series.
(healthy men and women)

Causes of emotional disturbance	Age group - years. 60 - 69		70 - 79		80 - 89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Adverse home environment.								
Very lonely (not alone in home)		1	1	1	4	1	5	3
Very lonely; inadequate finance (not alone in home)					1		1	
Hostile relative in the home	1		1	2			2	2
Alone in home; very lonely	1	6	2	4	3	2	6	12
Alone in home; very lonely; inadequate finance		2	1	1		1	1	4
Alone in home; very lonely; neglectful children		1	1	1	1		2	2
Alone in home; very lonely; inadequate finance; neglectful children					1		1	
Alone in home; very lonely; inadequate finance; unemployment				1				1

Table 204 continued.

Causes of emotional disturbance	Age group - years. 60 - 69		70 - 79		80 - 89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Total for adverse home environment	2	10	6	10	10	4	18	24
Percentage age group	1.3	5.0	3.3	6.4	15.1	8.2	4.5	5.9
Bereavement.								
Death of - spouse	2	4	1	1			3	5
- spouse; neglectful children			1			2	1	2
- spouse; alone in home		1	1	1			1	2
- spouse; alone in home; very lonely		2	1	2			1	4
- spouse; alone in home; very lonely; inadequate finance		1						1
- spouse and sister; alone in home		1						1
- son					1		1	
- daughter; alone in home; inadequate finance				1				1

Table 204 continued.

Causes of emotional disturbance	Age group- years. 60 - 69		70 - 79		80 - 89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
- sister			1				1	
- sister; alone in home; very lonely				1				1
- sister; alone in home; very lonely; inadequate finance		1						1
- brother; alone in home; very lonely		1						1
- niece; alone in home; very lonely						1		1
Total for bereavement	2	11	5	6	1	3	8	20
Percentage age group	1.3	5.5	2.7	3.9	1.5	6.1	2.0	5.0
<u>Neglectful children</u>.								
Neglectful children -	2	2			2		4	2
- alone in home		1						1
- alone in home; very lonely			1	1		3	1	4

Table 204 continued.

Causes of emotional disturbance	60 - 69		70 - 79		80 - 89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
- very lonely (not alone in home)					1	1	1	1
- death of son				1				1
- suicide of daughter-in-law				1				1
- inadequate finance			3				3	
- unemployment	1						1	
Total for neglectful children	3	3	4	3	3	4	10	10
Percentage age group	2.0	1.5	2.2	1.9	4.5	8.2	2.5	2.5
<u>Ill-health of a relative.</u>								
Ill-health of - spouse	1	2	2		1		4	2
- spouse; inadequate finance		1	1				1	1
- spouse; very lonely	1		1				2	
- spouse; death of son; neglectful children			1				1	

Table 204 continued.

Causes of emotional disturbance	Age group - years. 60 - 69 Men	60 - 69 Women	70 - 79 Men	70 - 79 Women	80 - 89 Men	80 - 89 Women	Total Men	Total Women
- spouse; neglectful children		1						1
- son			1			1	1	1
- daughter				1		1		2
- sister				1		1		2
Total for ill-health of a relative	2	4	6	2	1	3	9	9
Percentage age group	1.3	2.0	3.3	1.3	1.5	6.1	2.2	2.2
<u>Inadequate finance</u>.								
Inadequate finance -	1	2		1			1	3
- dependence on children		1		1	2		2	2
Total for inadequate finance	1	3		2	2		3	5
Percentage age group	0.7	1.5		1.3	3.0		0.7	1.2

Table 204 continued.

Causes of emotional disturbance	Age group- years. 60 - 69		70 - 79		80 - 89		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
<u>Change of home to different area</u>		1	1	1			1	2
Percentage age group		0.2	0.5	0.6			0.2	0.5
<u>Miscellaneous group</u>.								
Drunken spouse		1						1
Fear of rejection by God				1				1
Daughter's unhappy marriage	1						1	
Fear of losing job	1						1	
Unemployment	1						1	
Heaviness of work	1						1	
Grand total	14	33	22	25	17	14	53	72
Percentage age group	9.3	16.5	12.0	16.1	25.8	28.6	13.2	17.8

Table 205.

The causes and incidence of emotional disturbance for the 250 men and 178 women with disease. The age range 60 to 79 years is represented by two decennial age periods. No cases occur over 84 years with emotional disturbance. Thus a quinquennial age period includes all individuals with emotional disturbance over the age of 79 years.

Causes of emotional disturbance	Age group - years.							
	60 - 69		70 - 79		80 - 84		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Adverse home environment.								
Hostile relative in the home		1	2	1			2	2
Alone in home; very lonely			1	2	1		2	2
Alone in home; inadequate finance				1				1
Alone in home; very lonely; inadequate finance	1	2	1	1		1	2	4
Alone in home; very lonely; personal ill-health		2		3				5
Alone in home; very lonely; restricted activities				1				1
Alone in home; very lonely; inadequate finance; personal ill-health			1				1	
Alone in home; very lonely; inadequate finance; restricted activities					1		1	

Table 205 continued.

Causes of emotional disturbance	Age group - years. 60 - 69		70 - 79		80 - 84		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Alone in home; very lonely; inadequate finance; personal ill-health; neglectful children				1				1
Total for adverse home environment	1	5	5	10	2	1	8	16
Percentage age group	0.7	5.1	5.0	14.1	13.3	11.1	3.2	9.0
<u>Bereavement</u>.								
Death of - spouse	4	1	1	2	1		6	3
- spouse; alone in home		1	1	1			1	2
- spouse; alone in home; very lonely	2		2	2			4	2
- spouse; alone in home; dependency on children				1				1
- spouse; alone in home; personal ill-health				1				1
- spouse; alone in home; compulsory retirement	1						1	

Table 205 continued.

Causes of emotional disturbance	Age group - years. 60 - 69		70 - 79		80 - 84		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
- spouse; alone in home; very lonely; inadequate finance						1		1
- spouse; alone in home; very lonely; personal ill-health		1						1
- spouse; alone in home; very lonely; inadequate finance; fear of ill-health		1						1
- spouse; compulsory retirement	1						1	
- spouse; personal ill-health		1	2				2	1
- spouse; inadequate finance; dependency on children			1				1	
- spouse; personal ill-health; restricted activities		1						1
- sister; alone in home		1						1
- cousin; alone in home; personal ill-health		1						1
Total for bereavement	8	8	7	7	1	1	16	16
Percentage age group	6.0	8.2	7.0	9.9	6.7	11.1	6.4	9.0

Table 205 continued.

Causes of emotional disturbance	Age group - years. 60 - 69		70 - 79		80 - 84		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
<u>Personal ill-health</u>.								
Personal ill-health -	11	5	2	1			13	6
- restricted activities	3	9	3	1			6	10
- alone in home		3			1		1	3
- inadequate finance		1						1
- compulsory retirement	1						1	
- and thus unable to work	7						7	
- and thus unable to work; alone in home			1				1	
- and thus unable to work; inadequate finance	4		2				6	
- restricted activities; dependency on daughter-in-law		1						1
- restricted activities; dependency on daughter	1	3					1	3
- restricted activities; ill-health of sister				1				1

Table 205 continued.

	Age group -years.							
	60 - 69		70 - 79		80 - 84		Total	
Causes of emotional disturbance	Men	Women	Men	Women	Men	Women	Men	Women
- restricted activities; neglectful children; inadequate finance; alone in home				1				1
Total for personal ill-health	27	22	8	4	1	0	36	26
Percentage age group	20.1	22.7	8.0	5.6	6.7	0.0	14.5	14.7
<u>Neglectful children</u>.								
Neglectful children -	1		1	2	1		3	2
- very lonely (not alone in home)		1						1
Total for neglectful children	1	1	1	2	1	0	3	3
Percentage age group	0.7	1.0	1.0	2.8	6.7	0.0	12	1.7
<u>Ill-health of a relative</u>.								
Ill-health of - spouse	2	1	2				4	1
- spouse; misses children who are all away from the parental home		1						1
- spouse; being retired from work; inadequate finance			1				1	

Table 205 continued.

	Age group - years.							
	60 - 69		70 - 79		80 - 84		Total	
Causes of emotional disturbance	Men	Women	Men	Women	Men	Women	Men	Women
- daughter			1	1			1	1
- sister		1		1				2
- aunt		1						1
Total for ill-health of a relative	2	4	4	2	0	0	6	6
Percentage age group	1.5	4.1	4.0	2.8	0.0	0.0	2.4	3.4
<u>Miscellaneous group</u>.								
Unfounded fear of disease	1		1				2	
Drunken spouse		1						1
Deterioration of vision	1						1	
Fear of dying			1				1	
Compulsory retirement	2		3				5	
Grand total	43	41	30	25	5	2	78	68
Percentage age group	32.1	42.3	30.0	35.2	33.3	22.2	31.3	38.4

Table 206.

The number of men and women with reference to marital status and the presence or absence of emotional disturbance by ten year age groups. For each marital status group the numbers emotionally disturbed and not emotionally disturbed are calculated as percentages of their summation for each decade.
(healthy men and women)

Marital status		Emotional disturbance	MEN				WOMEN			
			60 - 69 years	70 - 79 years	80 - 89 years	Total	60 - 69 years	70 - 79 years	80 - 89 years	Total
Married	Number	Absent	106	94	16	216	102	43	7	152
		Present	10	8	2	20	6	1	1	8
	Percentage	Absent	91.4	92.2	88.9	91.5	94.4	97.7	87.5	95.0
		Present	8.6	7.8	11.1	8.5	5.6	2.3	12.5	5.0
Widowed	Number	Absent	19	56	31	106	43	62	23	128
		Present	3	12	11	26	23	20	8	51
	Percentage	Absent	86.4	82.3	73.8	80.3	65.1	75.6	74.2	71.5
		Present	13.6	17.7	26.2	19.7	34.9	24.4	25.8	28.5

Table 206 continued.

Marital status		Emotional disturbance	MEN 60 - 69 years	MEN 70 - 79 years	MEN 80 - 89 years	MEN Total	WOMEN 60 - 69 years	WOMEN 70 - 79 years	WOMEN 80 - 89 years	WOMEN Total	
Single	Number	Absent	9	10	1	20	18	24	5	47	
		Present	0	1	4	5	4	4	4	12	
	Percentage	Absent	100.0	90.9	20.0	80.0	81.8	85.7	55.5	79.7	
		Present	0.0	9.1	80.0	20.0	18.2	14.3	44.5	20.3	
Divorced or Separated	Number	Absent	3	1	1	5	4	1	0	5	
		Present	1	1	0	2	0	0	1	1	
	Percentage	Absent	75.0	50.0	100.0	71.4	100.0	100.0	0.0	83.3	*
		Present	25.0	50.0	0.0	28.6	0.0	0.0	100.0	16.7	

* groups too small to make percentages valid.

Table 207.

The number of men and women with disease with reference to marital status and the presence or absence of emotional disturbance by ten year age groups. For each marital status group the numbers emotionally disturbed and not emotionally disturbed are calculated as percentages of their summation for each decade.

Marital status		Emotional disturbance	MEN				WOMEN			
			60 - 69 years	70 - 79 years	80 + years	Total	60 - 69 years	70 - 79 years	80 + years	Total
Married	Number	Absent	69	49	4	122	22	17	2	41
		Present	27	16	0	43	14	2	0	16
	Percentage	Absent	71.9	75.4	100.0	73.9	61.1	89.5	100.0	71.9
		Present	28.1	24.6	0.0	26.1	38.9	10.5	0.0	28.1
Widowed	Number	Absent	8	16	7	31	18	22	6	46
		Present	13	11	5	29	19	19	1	39
	Percentage	Absent	38.1	59.3	58.3	51.7	48.6	53.7	85.7	54.1
		Present	61.9	40.7	41.7	48.3	51.4	46.3	14.3	45.9

Table 207 continued.

Marital status		Emotional disturbance	MEN				WOMEN			
			60 - 69 years	70 - 79 years	80 + years	Total	60 - 69 years	70 - 79 years	80 + years	Total
Single	Number	Absent	12	5	0	17	15	7	0	22
		Present	3	2	0	5	7	3	1	11
	Percentage	Absent	80.0	71.4	0.0	77.3	68.2	70.0	0.0	66.7
		Present	20.0	28.6	0.0	22.7	31.8	30.0	100.0	33.3
Divorced or separated	Number	Absent	2	0	0	2	1	0	0	1
		Present	0	1	0	1	1	1	0	2
	Percentage	Absent	100.0	0.0	0.0	66.7	50.0	0.0	0.0	33.3
		Present	0.0	100.0	0.0	33.3	50.0	100.0	0.0	66.7

* Certain of the above groups are too small to make percentages valid.

Table 208.

The number of men and women with reference to social class and the presence or absence of emotional disturbance by ten year age groups. For each social class grouping the numbers emotionally disturbed and not emotionally disturbed are calculated as percentages of their summation for each decade (healthy men and women).

Social class		Emotional disturbance	MEN				WOMEN			
			60 - 69 years	70 - 79 years	80 - 89 years	Total	60 - 69 years	70 - 79 years	80 - 89 years	Total
I and II	Number	Absent	24	22	4	50	22	13	6	41
		Present	1	5	0	6	4	7	3	14
	Percentage	Absent	96.0	81.5	100.0	89.3	84.6	65.0	66.7	74.5
		Present	4.0	18.5	0.0	10.7	15.4	35.0	33.3	25.5
III	Number	Absent	80	106	41	227	112	101	26	239
		Present	8	13	15	36	19	13	7	39
	Percentage	Absent	90.9	89.1	73.2	86.3	85.5	88.6	78.8	86.0
		Present	9.1	10.9	26.8	13.7	14.5	11.4	21.2	14.0
Iv and V	Number	Absent	33	33	4	70	33	16	3	52
		Present	5	4	2	11	10	5	4	19
	Percentage	Absent	86.8	89.2	66.7	86.4	76.7	76.2	42.9	73.2
		Present	13.2	10.8	33.3	13.6	23.3	23.8	57.1	26.8

Table 209.

The number of men and women with disease with reference to social class and the presence or absence of emotional disturbance by ten year age groups. For each social class gro uping the numbers emotionally disturbed and not emotionally disturbed are calculated as percentages of their summation for each decade.

Social class		Emotional disturbance	MEN 60 - 69 years	MEN 70 - 79 years	MEN 80 + years	MEN Total	WOMEN 60 - 69 years	WOMEN 70 - 79 years	WOMEN 80 + years	WOMEN Total
I and II	Number	Absent	20	14	3	37	11	7	1	19
		Present	5	5	1	11	5	5	1	11
	Percentage	Absent	80.0	73.7	75.0	77.1	68.7	58.3	50.0	63.3
		Present	20.0	26.3	25.0	22.9	31.3	41.7	50.0	36.7
III	Number	Absent	53	45	6	104	35	33	6	74
		Present	25	17	3	45	24	14	1	39
	Percentage	Absent	67.9	72.6	66.7	69.8	59.3	70.2	85.7	65.5
		Present	32.1	27.4	33.3	30.2	40.7	29.8	14.3	34.5
IV and V	Number	Absent	18	11	2	31	10	6	1	17
		Present	13	8	1	22	12	6	0	18
	Percentage	Absent	58.1	57.9	66.7	58.5	45.4	50.0	100.0	48.6
		Present	41.9	42.1	33.3	41.5	54.6	50.0	0.0	51.4

Table 210.

The number of men and women who are healthy who possess children by the presence or absence of emotional disturbance and the presence or absence of neglectful children.

Emotional disturbance	All the children in the family neglectful		Some of the children in the family neglectful		None of the children in the family neglectful		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Present	13	7	5	10	35	55	53	72
Absent	3	1	15	17	246	212	264	230
Total	16	8	20	27	281	267	317	302

Table 211.

The number of men and women with disease who possess children by the presence or absence of emotional disturbance and the presence or absence of neglectful children.

Emotional disturbance	All the children in the family neglectful		Some of the children in the family neglectful		None of the children in the family neglectful		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Present	3	2	2	5	59	38	64	45
Absent	1	0	6	3	128	71	135	74
Total	4	2	8	8	187	109	199	119

Table 212.

The number of widowed men and women by ten year age groups and the presence or absence of emotional disturbance in relation to the duration of being widowed which is presented in five year periods. For each quibquennial period the total number of those emotionally disturbed and the total number of those who are not emotionally disturbed are each expressed as a percentage of the sum of both totals. For example, at 0 - 4 years the total of men not emotionally disturbed is 21 and the total of men who are emotionally disturbed is 11. These two numbers when added give the figure 32. Twenty-one is 65.6 per cent of 32 and 11 is 34.4 per cent of 32.
(healthy men and women)

Duration of being widowed in years	Emotional disturbance	MEN					WOMEN				
		60-69 years	70-79 years	80-89 years	Total	Percentage	60-69 years	70-79 years	80-89 years	Total	Percentage
Less than 5	Absent	3	12	6	21	65.6	8	7	2	17	58.6
	Present	3	4	4	11	34.4	5	5	2	12	41.4
5 - 9	Absent	9	17	5	31	86.1	18	17	5	40	70.2
	Present	0	5	0	5	13.9	10	5	2	17	29.8
10 - 14	Absent	5	12	5	22	84.6	2	13	5	20	76.9
	Present	0	1	3	4	15.4	1	3	2	6	23.1
15 - 19	Absent	2	5	4	11	84.6	7	13	5	25	86.2
	Present	0	2	0	2	15.4	3	1	0	4	13.8

Table 212 continued.

Duration of being widowed in years	Emotional disturbance	MEN 60-69 years	MEN 70-79 years	MEN 80-89 years	MEN Total	MEN Percentage	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80-89 years	WOMEN Total	WOMEN Percentage
20 - 24	Absent		6	2	8	80.0	1	6	2	9	69.2
	Present			2	2	20.0		3	1	4	30.8
25 - 29	Absent		1	4	5	100.0	3	5	1	9	90.0
	Present					0.0	1			1	10.0
30 - 34	Absent		1	5	6	85.7	4			4	66.7
	Present			1	1	14.3	1	1		2	33.3
35 - 39	Absent		1	1	2	100.0	1	2		3	75.0
	Present					0.0	1			1	25.0
40 - 44	Absent		1		1	100.0		1	3	4	80.0
	Present					0.0			1	1	20.0
Total		22	68	42	132		66	82	31	179	

Table 213.

The number of widowed men and women with disease by ten year age groups and the presence or absence of emotional disturbance in relation to the duration of being widowed which is presented in five year periods. For each quinquennial period the total number of those emotionally disturbed and the total number of those who are not emotionally disturbed are each expressed as a percentage of the sum of both totals.

Duration of being widowed in years	Emotional disturbance	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	MEN Percentage	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total	WOMEN Percentage
Less than 5	Absent	0	4	2	6	27.3	4	1	0	5	26.3
	Present	8	5	3	16	72.7	6	8	0	14	73.7
5 - 9	Absent	3	4	1	8	53.3	2	3	3	8	53.3
	Present	3	4		7	46.7	4	3		7	46.7
10 - 14	Absent		4	1	5	83.3	6	5		11	78.6
	Present			1	1	16.7	1	2		3	21.4
15 - 19	Absent		2	1	3	60.0	1	5	1	7	77.8
	Present	1	1		2	40.0		1	1	2	22.2

(continued overleaf)

Table 213 continued.

Duration of being widowed in years	Emotional disturbance	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	MEN Percentage	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total	WOMEN Percentage
20 - 24	Absent			1	1	50.0	1	4		5	62.5
	Present		1		1	50.0	1	2		3	37.5
25 - 29	Absent	1			1	50.0	1	1		2	50.0
	Present	1			1	50.0	1	1		2	50.0
30 -34	Absent	2			2	66.7	3	1	1	5	45.4
	Present			1	1	33.3	5	1		6	54.6
35 - 39	Absent	1	2	1	4	100.0		3		3	75.0
	Present					0.0	1			1	25.0
40 - 44	Absent	1			1	100.0			1	1	100.0
	Present					0.0					0.0
Total		21	27	12	60		37	41	7	85	

* Certain of the above groups are too small to make percentages valid.

Table 214.

The number of men and women by health and disease with reference to the presence or absence of emotional disturbance and the state of living alone or otherwise. For those who live alone and also for those who do not live alone the number of those emotionally disturbed and the number of those who are not emotionally disturbed are each expressed as a percentage of the sum of both totals for each group.

Domestic situation		Emotional disturbance	Healthy men	Healthy women	Diseased men	Diseased women
Living alone	Number	Absent	28	63	5	28
		Present	17	40	14	29
	Percentage	Absent	62.2	61.2	26.3	49.1
		Present	37.8	38.8	73.7	50.9
Not Living alone	Number	Absent	319	269	167	82
		Present	36	32	64	39
	Percentage	Absent	89.9	89.3	72.3	67.8
		Present	10.1	10.7	27.7	32.2

Table 215.

The number of men and women in terms of who does the housework by ten year age groups. The percentage age group values are shown for selected combinations.
(healthy men and women)

Housework done by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
1. Self	6	10	5	21	129	63	13	205
Percentage age group	4.0	5.5	7.6	5.2	64.5	40.6	26.5	50.7
2. Others.								
Spouse	78	45	2	125	0	0	0	0
Percentage age gro up	51.7	24.6	3.0	31.2	-	-	-	-
Daughter	5	20	21	46	0	0	3	3
Percentage age group	3.3	10.9	31.8	11.5	-	-	6.1	0.7
Spouse and daughter	16	20	1	37	0	0	0	0
Percentage age group	10.6	10.9	1.5	9.2	-	-	-	-

Table 215 continued.

Housework done by:	MEN				WOMEN			
	Age groups							
	60 - 69 years	70 - 79 years	80 - 89 years	Total	60 - 69 years	70 - 79 years	80 - 89 years	Total
Sister	5	6	1	12	0	0	0	0
Percentage age group	3.3	3.3	1.5	3.0	-	-	-	-
Daughter-in-law	1	9	3	13	0	0	1	1
Percentage age group	0.7	4.9	4.5	3.2	-	-	2.0	0.2
Landlady	1	1	3	5	0	0	0	0
Domestic	2	8	2	12	0	0	0	0
Spouse and domestic	4	1	1	6	0	0	0	0
Spouse and daughter-in-law	1	1	0	2	0	0	0	0
Aunt	1	0	0	1	0	0	0	0
Sister-in-law	1	2	0	3	0	0	0	0
Sister and domestic	1	0	0	1	0	0	1	1
Niece	1	1	0	2	0	0	0	0
Housekeeper	0	1	1	2	0	0	0	0

Table 215 continued.

Housework done by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Grand-daughter	0	0	1	1	0	0	0	0
Niece and domestic	0	0	0	0	0	0	1	1
Total of group 2	117	115	36	268	0	0	6	6
Percentage age group	77.5	62.8	54.5	67.0	-	-	12.2	1.5
3. Self and others.								
Self and spouse	13	23	9	45	2	4	1	7
Percentage age group	8.6	12.6	13.6	11.2	1.0	2.6	2.0	1.7
Self and daughter	9	13	5	27	43	45	18	106
Percentage age group	6.0	7.1	7.6	6.7	21.5	29.0	36.7	26.2
Self and sister	1	0	1	2	11	13	3	27
Percentage age gro up	0.7	-	1.5	0.5	5.5	8.4	6.1	6.7

Table 215 continued.

Housework done by:	MEN 60-69 years	MEN 70-79 years	MEN 80-89 years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80-89 years	WOMEN Total
	Age groups							
Self and domestic	1	9	2	12	8	13	2	23
Percentage age group	0.7	4.9	3.0	3.0	4.0	8.4	4.1	5.7
Self, spouse and daughter	1	6	1	8	2	3	1	6
Percentage age group	0.7	3.3	1.5	2.0	1.0	1.9	2.0	1.5
Self and daughter-in-law	2	3	0	5	3	3	0	6
Percentage age group	1.3	1.6	-	1.2	1.5	1.9	-	1.5
Self and niece	0	1	0	1	0	7	1	8
Self and sister-in-law	1	0	0	1	1	2	1	4
Self and nephew's spouse	0	1	0	1	0	0	0	0
Self, spouse and domestic	0	1	1	2	0	0	0	0
Self and lodger	0	0	1	1	0	0	0	0
Self and neighbour	0	0	0	0	0	1	0	1

Table 215 continued.

Housework done by:	MEN 60-69 years	MEN 70-79 years	MEN 80-89 years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80-89 years	WOMEN Total
Self and cousin	0	1	1	2	0	0	0	0
Self and brother	0	0	2	2	1	0	0	1
Self and son	0	0	1	1	0	0	0	0
Self, daughter-in-law and neighbour	0	0	1	1	0	0	0	0
Self, daughter-in-law and grand-daughter	0	0	0	0	0	1	0	1
Self, daughter and niece	0	0	0	0	0	0	1	1
Self, sister and domestic	0	0	0	0	0	0	1	1
Self and landlady	0	0	0	0	0	0	1	1
Total of group 3	28	58	25	111	71	92	30	193
Percentage age group	18.5	31.7	37.9	27.8	35.5	59.4	61.3	47.8

Table 216.

The number of men and women with disease in terms of who does the housework by ten year age groups. The percentage group values by age are shown for selected combinations.

Housework done by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
1. Self	2	3	2	7	42	28	3	73
Percentage age group	1.5	3.0	12.5	2.8	43.3	39.4	30.0	41.0
2. Others.								
Spouse	57	36	2	95	0	0	0	0
Percentage age group	42.5	36.0	12.5	38.0	0.0	0.0	0.0	0.0
Daughter	6	12	5	23	6	5	0	11
Percentage age group	4.5	12.0	31.2	9.2	6.2	7.0	0.0	6.2
Spouse and daughter	21	17	2	40	1	0	0	1
Percentage age group	15.7	17.0	12.5	16.0	1.0	0.0	0.0	0.6

Table 216 continued.

Housework done by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Sister	8	2	0	10	2	0	0	2
Percentage age group	6.0	2.0	0.0	4.0	2.1	0.0	0.0	1.1
Daughter-in-law	2	4	2	8	0	0	0	0
Percentage age group	1.5	4.0	12.5	3.2	0.0	0.0	0.0	0.0
Landlady	3	0	0	3	0	0	0	0
Landlady and daughter-in-law	1	0	0	1	0	0	0	0
Spouse, daughter and domestic	1	0	0	1	0	0	0	0
Domestic	0	0	0	0	0	1	0	1
Spouse and domestic	2	1	0	3	0	0	0	0
Spouse and daughter-in-law	1	0	0	1	0	0	0	0
Sister and daughter-in-law	0	0	0	0	0	1	0	1
Sister-in-law and her daughter	0	1	0	1	0	0	0	0

Table 216 continued.

Housework done by:	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total
Daughter and domestic	0	2	1	3	0	0	0	0
Sister and domestic	1	0	0	1	0	0	1	1
Sister and niece	1	0	0	1	0	0	0	0
Niece	3	3	0	6	0	0	0	0
Housekeeper	1	0	0	1	0	0	0	0
Nephew and domestic	1	0	0	1	0	0	0	0
Total of group 2	109	78	12	199	9	7	1	17
Percentage age group	81.3	78.0	75.0	79.6	9.3	9.9	10.0	9.6
3. <u>Self and others.</u>								
Self and spouse	11	9	0	20	2	3	1	6
Percentage age group	8.2	9.0	0.0	8.0	2.1	4.2	10.0	3.4
Self and daughter	2	3	1	6	22	13	2	37
Percentage age group	1.5	3.0	6.2	2.4	22.7	18.3	20.0	20.8

Table 216 continued.

Housework done by:	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total
Self, daughter and son	0	0	0	0	2	0	0	2
Self and sister	1	0	0	1	10	2	0	12
Percentage age group	0.7	0.0	0.0	0.4	10.3	2.8	0.0	6.7
Self and domestic	2	1	0	3	4	4	0	8
Percentage age group	1.5	1.0	0.0	1.2	4.1	5.6	0.0	4.5
Self and son	0	0	1	1	1	0	0	1
Self, spouse and daughter	3	0	0	3	1	2	2	5
Self and daughter-in-law	2	0	0	2	2	4	0	6
Self and niece	0	0	0	0	0	0	1	1
Self and nephew's spouse	0	0	0	0	1	1	0	2
Self and aunt	1	0	0	1	0	0	0	0

Table 216 continued.

	MEN				WOMEN			
	Age groups							
Housework done by:	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Self and neighbour	1	0	0	1	0	1	0	1
Self and housekeeper	0	1	0	1	0	0	0	0
Self, daughter and domestic	0	0	0	0	0	1	0	1
Self and cousin	0	0	0	0	1	1	0	2
Self and brother	0	1	0	1	0	0	0	0
Self, daughter and daughter-in-law	0	1	0	1	0	0	0	0
Self, daughter-in-law and domestic	0	0	0	0	0	1	0	1
Self, sister and domestic	0	0	0	0	0	1	0	1
Self and grand-daughter	0	1	0	1	0	2	0	2
Self and landlady	0	2	0	2	0	0	0	0
Total for group 3	23	19	2	44	46	36	6	88
Percentage age group	17.2	19.0	12.5	17.6	47.4	50.7	60.0	49.4

Table 217.

The number of men and women in terms of who washes the clothes by ten year age groups.
(healthy men and women)

Clothes washed by:	MEN 60-69 years	MEN 70-79 years	MEN 80-89 years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80-89 years	WOMEN Total
1. <u>Self</u>	6	13	8	27	101	44	8	153
Percentage age group	4.0	7.1	12.1	6.7	50.5	28.4	16.3	37.9
2. <u>Others</u>.								
Spouse	64	52	9	125	0	0	0	0
Daughter	10	27	20	57	0	5	4	9
Spouse and laundry	30	21	3	54	0	0	0	0
Spouse and daughter	15	14	0	29	0	0	0	0
Daughter and laundry	5	5	3	13	0	1	1	2
Daughter-in-law	0	7	1	8	0	0	1	1
Spouse, daughter and laundry	3	4	1	8	0	0	0	0
Sister	5	2	1	8	0	0	0	0
Daughter-in-law and laundry	0	4	2	6	0	0	0	0

Table 217 continued.

Clothes washed by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Sister and laundry	2	2	1	5	0	0	0	0
Niece	1	2	0	3	0	1	0	1
Laundry	1	0	2	3	0	0	1	1
Spouse and domestic	1	1	1	3	0	0	0	0
Sister-in-law and laundry	0	2	0	2	0	0	0	0
Landlady	0	1	1	2	0	0	0	0
Housekeeper	0	1	1	2	0	0	0	0
Sister and domestic	0	0	0	0	0	0	1	1
Neighbour	0	1	0	1	0	0	0	0
Spouse and daughter-in-law	0	1	0	1	0	0	0	0
Laundry and domestic	0	1	0	1	0	0	0	0
Grand-daughter	0	0	1	1	0	0	0	0

Table 217 continued.

Clothes washed by:	MEN 60-69 years	MEN 70-79 years	MEN 80-89 years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80-89 years	WOMEN Total
Total of group 2	137	148	47	332	0	7	8	15
Percentage age group	90.7	80.9	71.2	83.0	0.0	4.5	16.3	3.7
3. Self and others.								
Self and laundry	2	9	4	15	39	30	9	78
Self and daughter	4	6	3	13	36	34	5	75
Self, daughter and laundry	0	1	0	1	7	13	8	28
Self and sister	0	0	0	0	7	6	1	14
Self, sister and laundry	0	1	0	1	4	6	0	10
Self and daughter-in-law	1	0	0	1	2	5	1	8
Self and niece	0	0	0	0	0	3	3	6
Self, niece and laundry	0	0	0	0	0	4	1	5
Self and spouse	0	2	1	3	1	0	0	1
Self and neighbour	0	0	0	0	1	2	1	4

Table 217 continued.

Clothes washed by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Self, sister and domestic	0	0	2	2	0	0	2	2
Self, sister-in-law and laundry	1	0	1	2	0	1	0	1
Self and domestic	0	2	0	2	1	0	0	1
Self and sister-in-law	0	1	0	1	0	0	0	0
Self, daughter-in-law and laundry	0	0	0	0	1	0	0	1
Self, daughter and niece	0	0	0	0	0	0	1	1
Self, niece and domestic	0	0	0	0	0	0	1	1
Total of group 3	8	22	11	41	99	104	33	236
Percentage age group	5.3	12.0	16.7	10.3	49.5	67.1	67.4	58.4

Table 218.

The number of men and women with disease in terms of who washes the clothes by ten year age groups.

Clothes washed by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
1. Self	1	1	0	2	31	16	0	47
Percentage age group	0.7	1.0	0.0	0.8	32.0	22.5	0.0	26.4
2. Others.								
Spouse	47	35	0	82	0	0	0	0
Daughter	6	12	4	22	7	4	1	12
Spouse and laundry	27	11	1	39	0	0	0	0
Spouse and daughter	15	13	0	28	0	0	0	0
Spouse, daughter and laundry	4	2	3	9	0	0	0	0
Daughter and laundry	2	7	3	12	4	3	1	8
Daughter-in-law	3	4	2	9	0	0	0	0
Spouse and domestic	1	0	0	1	0	0	0	0
Sister	4	2	0	6	2	1	0	3

Table 218 continued.

Clothes washed by:	MEN				WOMEN			
	Age groups							
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Daughter-in-law and laundry	0	1	0	1	0	0	0	0
Sister and laundry	6	0	0	6	1	0	1	2
Niece	3	2	0	5	0	0	0	0
Laundry	1	0	0	1	0	0	0	0
Sister-in-law and laundry	0	1	0	1	0	0	0	0
Landlady	2	1	0	3	0	0	0	0
Landlady and laundry	1	1	0	2	0	0	0	0
Housekeeper	1	0	0	1	0	0	0	0
Housekeeper and laundry	0	1	0	1	0	0	0	0
Neighbour	0	0	0	0	0	1	0	1
Aunt and laundry	1	0	0	1	0	0	0	0
Grand-daughter	0	0	0	0	0	1	0	1
Total of group 2	124	93	13	230	14	10	3	27
Percentage age group	92.5	93.0	81.2	92.0	14.4	14.1	30.0	15.2

Table 218 continued.

Clothes washed by:	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total
3. Self and others.								
Self and laundry	4	2	1	7	18	13	3	34
Self and daughter	2	2	0	4	11	12	3	26
Self, daughter and laundry	1	0	0	1	12	3	0	15
Self and sister	1	0	0	1	6	4	0	10
Self, sister and laundry	0	0	0	0	2	0	0	2
Self, son and laundry	0	0	1	1	0	0	0	0
Self and daughter-in-law	0	0	0	0	0	3	0	3
Self, niece and laundry	0	0	0	0	0	0	1	1
Self, spouse and daughter	0	0	0	0	1	0	0	1
Self and neighbour	0	0	1	1	0	3	0	3
Self and domestic	0	1	0	1	1	4	0	5
Self and brother	0	1	0	1	0	0	0	0

Table 218 continued.

Clothes washed by:	MEN 60-69 years	MEN 70-79 years	MEN 80 + years	MEN Total	WOMEN 60-69 years	WOMEN 70-79 years	WOMEN 80 + years	WOMEN Total
Self, daughter-in-law and laundry	0	0	0	0	1	1	0	2
Self, neighbour and laundry	1	0	0	1	0	0	0	0
Self, grand-daughter and laundry	0	0	0	0	0	1	0	1
Self and nephew's spouse	0	0	0	0	0	1	0	1
Total of group 3	9	6	3	18	52	45	7	104
Percentage age group	6.8	6.0	18.8	7.2	53.6	63.4	70.0	58.4

Table 219.

The number and percentage of men and women in terms of whether shopping is carried out by self or others and by five year age groups.
(healthy men and women)

	Number						Percentage					
Age group	Shopping by self		Shopping by others		Shopping by self and others		Shopping by self		Shopping by others		Shopping by self and others	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	5	97	63		1	11	7.2	89.8	91.3		1.5	10.2
65 - 69	7	81	73		2	11	8.5	88.0	89.0		2.5	12.0
70 - 74	15	74	80	1	6	21	14.8	77.1	79.2	1.0	6.0	21.9
75 - 79	14	35	64	5	4	19	17.1	59.3	78.0	8.5	4.9	32.2
80 - 84	11	20	38	4	6	13	20.0	54.0	69.1	10.8	10.9	35.2
85 - 89	2	5	9	5		2	18.2	41.7	81.8	41.7		16.6
Total	54	312	327	15	19	77	13.5	77.2	81.7	3.7	4.8	19.1

Table 220.

The number and percentage of men and women with disease in terms of whether shopping is carried out by self or others and by five year age groups.

Age group	Number						Percentage						
	Shopping by self		Shopping by others		Shopping by self and others		Shopping by self		Shopping by others		Shopping by self and others		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	0	31	55	6	3	8	0.0	68.9	94.8	13.3	5.2	17.8	
65 - 69	6	34	69	5	1	13	7.9	65.4	90.8	9.6	1.3	25.0	
70 - 74	2	29	53	9	4	7	3.4	64.4	89.8	20.0	6.8	15.6	
75 - 79	2	13	36	6	3	7	4.9	50.0	87.8	23.1	7.3	26.9	
80 - 84	2	3	10	2	3	4	13.3	33.3	66.7	22.2	20.0	44.5	
85 - 89	0	0	1	1	0	0	0.0	0.0	100.0	100.0	0.0	0.0	*
Total	12	110	224	29	14	39	4.8	61.8	89.6	16.3	5.6	21.9	

* Groups too small to make percentages valid.

Table 221.

The number and percentage of men and women in terms of whether the cooking of food is carried out by self or others and by five year age groups.
(healthy men and women)

	Number						Percentage					
Age group	Cooking by self		Cooking by others		By self and others		Cooking by self		Cooking by others		By self and others	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	5	100	63		1	8	7.2	92.6	91.3		1.5	7.4
65 - 69	7	81	72		3	11	8.5	88.0	87.8		3.7	12.0
70 - 74	15	84	81		5	12	14.8	87.5	80.2		5.0	12.5
75 - 79	13	40	65	1	4	18	15.8	67.8	79.3	1.7	4.9	30.5
80 - 84	11	26	38	1	6	10	20.0	70.3	69.1	2.7	10.9	27.0
85 - 89	2	7	9	3		2	18.2	58.3	81.8	25.0		16.7
Total	53	338	328	5	19	61	13.2	83.7	82.0	1.2	4.8	15.1

Table 222.

The number and percentage of men and women with disease in terms of whether the cooking of food is carried out by self or others and by five year age groups.

Age group	Number						Percentage						
	Cooking by self		Cooking by others		By self and others		Cooking by self		Cooking by others		By self and others		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	0	37	55	0	3	8	0.0	82.2	94.8	0.0	5.2	17.8	
65 - 69	6	37	69	3	1	12	7.9	71.1	90.8	5.8	1.3	23.1	
70 - 74	1	35	53	3	5	7	1.7	77.8	89.8	6.7	8.5	15.5	
75 - 79	1	18	37	4	3	4	2.4	69.2	90.2	15.4	7.4	15.4	
80 - 84	2	3	10	2	3	4	13.3	33.3	66.7	22.2	20.0	44.5	*
85 - 89	0	0	1	1	0	0	0.0	0.0	100.0	100.0	0.0	0.0	
Total	10	130	225	13	15	35	4.0	73.0	90.0	7.3	6.0	19.7	

* groups too small to make percentages valid.

Table 223.

The number of healthy men in terms of retirement and work, financial stability and financial aid from children by ten year age groups.

(a) Adequate income and / or capital.

	RETIRED FROM WORK				AT WORK			
	60 - 69 years	70 - 79 years	80 - 89 years	Total	60 - 69 years	70 - 79 years	80 - 89 years	Total
Children give financial assistance	2	2	2	6	5	2	0	7
Children give no financial assistance	18	40	10	68	80	30	1	111
No children exist	10	17	9	36	16	5	1	22
Total	30	59	21	110	101	37	2	140
Percentage of children who give financial assistance to their parents	10.0	4.8	16.7	8.1	5.9	6.2	0.0	5.9
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	6.7	3.4	9.5	5.4	4.9	5.4	0.0	5.0

(b) Income inadequate and diminishing capital.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	0	7	7	14	0	0	0	0
Children give no financial assistance	0	7	3	10	0	0	0	0
No children exist	0	5	2	7	0	0	0	0
Total	0	19	12	31	0	0	0	0
Percentage of children who give financial assistance to their parents	-	50.0	70.0	58.3	-	-	-	-
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	-	36.8	58.3	45.2	-	-	-	-

(c) Income inadequate and meagre or no capital.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	6	33	17	56	1	2	0	3
Children give no financial assistance	0	0	0	0	0	0	0	0
No children exist	0	1	0	1	0	0	0	0
Total	6	34	17	57	1	2	0	3
Percentage of children who give financial assistance to their parents	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	100.0	97.1	100.0	98.2	100.0	100.0	-	100.0

(d) In financial difficulty.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	1	11	4	16	0	0	0	0
Children give no financial assistance	6	11	6	23	2	1	0	3
No children exist	4	9	4	17	0	0	0	0
Total	11	31	14	56	2	1	0	3
Percentage of children who give financial assistance to their parents	14.3	50.0	40.0	41.0	0.0	0.0	-	0.0
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	9.1	35.5	28.6	28.6	0.0	0.0	-	0.0

Table 224.

The number of healthy women in terms of retirement and work in respect of spouse and / or self, financial stability and financial aid from children by ten year age groups.

(a) Adequate income and / or capital.

	RETIRED FROM WORK				AT WORK			
	60 - 69 years	70 - 79 years	80 - 89 years	Total	60 - 69 years	70- 79 years	80 - 89 years	Total
Children give financial assistance	4	5	2	11	4	0	0	4
Children give no financial assistance	27	27	7	61	62	8	0	70
No children exist	18	25	11	54	12	4	0	16
Total	49	57	20	126	78	12	0	90
Percentage of children who give financial assistance to their parents	12.9	15.6	22.2	15.3	6.1	0.0	-	5.4
Percentage women, irrespective of the non-existence of children, who receive financial assistance from children	8.2	8.8	10.0	8.7	5.1	0.0	-	4.4

(b) Income inadequate and diminishing capital.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	5	3	5	13	0	0	0	0
Children give no financial assistance	2	5	1	8	0	0	0	0
No children exist	2	6	2	10	0	0	0	0
Total	9	14	8	31	0	0	0	0
Percentage of children who give financial assistance to their parents	71.4	37.5	83.3	61.9	-	-	-	-
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	55.5	21.4	62.5	41.9	-	-	-	-

(c) Income inadequate and meagre or no capital.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	34	42	11	87	0	0	0	0
Children give no financial assistance	0	0	0	0	0	0	0	0
No children exist	1	1	0	2	0	0	0	0
Total	35	43	11	89	0	0	0	0
Percentage of children who give financial assistance to their parents	100.0	100.0	100.0	100.0	-	-	-	-
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	97.1	97.7	100.0	97.7	-	-	-	-

(d) In financial difficulty.

	Retired from work				At work			
	60-69 years	70-79 years	80-89 years	Total	60-69 years	70-79 years	80-89 years	Total
Children give financial assistance	4	8	2	14	0	0	0	0
Children give no financial assistance	16	12	5	33	1	0	0	1
No children exist	8	8	3	19	0	1	0	1
Total	28	28	10	66	1	1	0	2
Percentage of children who give financial assistance to their parents	20.0	40.0	28.6	29.8	0.0	-	-	0.0
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	14.3	28.6	20.0	21.2	0.0	-	-	0.0

Table 225.

The number of men with disease in terms of retirement and work, financial stability and financial aid from children by ten year age groups.

(a) Adequate income and / or capital.

	RETIRED FROM WORK				AT WORK			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	1	0	0	1	2	0	0	2
Children give no financial assistance	21	25	3	49	55	12	3	70
No children exist	7	9	0	16	18	5	0	23
Total	29	34	3	66	75	17	3	95
Percentage of children who give financial assistance to their parents	4.5	0.0	0.0	2.0	3.5	0.0	0.0	2.8
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	3.4	0.0	0.0	1.5	2.7	0.0	0.0	2.1

(b) Income inadequate and diminishing capital.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	2	2	0	4	0	0	0	0
Children give no financial assistance	0	2	0	2	0	0	0	0
No children exist	1	0	0	1	0	0	0	0
Total	3	4	0	7	0	0	0	0
Percentage of children who give financial assistance to their parents	100.0	50.0	-	66.7	-	-	-	-
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	66.7	50.0	-	57.1	-	-	-	-

(c) Income inadequate and meagre or no capital.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	6	22	7	35	1	0	0	1
Children give no financial assistance	0	0	0	0	0	0	0	0
No children exist	0	0	0	0	0	0	0	0
Total	6	22	7	35	1	0	0	1
Percentage of children who give financial assistance to their parents	100.0	100.0	100.0	100.0	100.0	-	-	100.0
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	100.0	100.0	100.0	100.0	100.0	-	-	100.0

(d) In financial difficulty.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	3	4	1	8	0	0	0	0
Children give no financial assistance	11	13	2	26	1	0	0	1
No children exist	5	6	0	11	0	0	0	0
Total	19	23	3	45	1	0	0	1
Percentage of children who give financial assistance to their parents	21.4	23.5	33.3	23.5	0.0	-	-	0.0
Percentage of men, irrespective of the non-existence of children, who receive financial assistance from children	15.8	17.4	33.3	17.8	0.0	-	-	0.0

Table 226.

The number of women with disease in terms of retirement and work of spouse and / or self, financial stability and financial aid from children by ten year age groups.

(a) Adequate income and / or capital.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	2	0	0	2	0	0	0	0
Children give no financial assistance	5	8	1	14	23	6	0	29
No children exist	18	13	1	32	13	0	0	13
Total	25	21	2	48	36	6	0	42
Percentage of children who give financial assistance to their parents	28.6	0.0	0.0	12.5	0.0	0.0	-	0.0
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	8.0	0.0	0.0	4.2	0.0	0.0	-	0.0

(b) Income inadequate and diminishing capital.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	1	7	1	9	0	0	0	0
Children give no financial assistance	1	1	1	3	0	0	0	0
No children exist	0	0	0	0	0	0	0	0
Total	2	8	2	12	0	0	0	0
Percentage of children who give financial assistance to their parents	50.0	87.5	50.0	75.0	-	-	-	-
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	50.0	87.5	50.0	75.0	-	-	-	-

(c) Income inadequate and meagre or no capital.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	23	18	3	44	1	1	0	2
Children give no financial assistance	0	0	0	0	0	0	0	0
No children exist	0	0	0	0	0	0	0	0
Total	23	18	3	44	1	1	0	2
Percentage of children who give financial assistance to their parents	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0

(d) In financial difficulty.

	Retired from work				At work			
	60-69 years	70-79 years	80 + years	Total	60-69 years	70-79 years	80 + years	Total
Children give financial assistance	3	5	1	9	0	0	0	0
Children give no financial assistance	2	4	0	6	1	0	0	1
No children exist	4	8	2	14	0	0	0	0
Total	9	17	3	29	1	0	0	1
Percentage of children who give financial assistance to their parents	60.0	55.5	100.0	60.0	0.0	-	-	0.0
Percentage of women, irrespective of the non-existence of children, who receive financial assistance from children	33.3	29.4	33.3	31.0	0.0	-	-	0.0

Table 227.

The number and percentage of men and women in health and disease with reference to their interests and hobbies.

(a) Number.

Interest or hobby	Men		Women	
	Health (400)	Disease (250)	Health (404)	Disease (178)
Religion	221	163	336	149
Television	183	147	167	68
Community life	92	45	240	77
Reading books	157	119	86	36
Wireless	84	66	113	64
Walks	207	102	39	9
Cards	116	70	31	23
Cinema or theatre	69	51	75	31
Gardening	154	32	72	4
Music	49	38	80	43
Playing or watching bowls	93	27	54	8
Football	135	54	0	0
Dominoes, draughts	44	26	0	0
Knitting, embroidery, etc.	0	0	63	26
Golf	20	3	7	0
Politics	11	8	3	1

(b) Percentage.

Interest or hobby	Men		Women	
	Health	Disease	Health	Disease
Religion	55	65	83	84
Television	46	59	41	38
Community life	23	18	59	43
Reading books	39	48	21	20
Wireless	21	26	28	36
Walks	52	41	10	5
Cards	29	28	8	13
Cinema or theatre	17	20	19	17
Gardening	38	13	18	2
Music	12	15	20	24
Playing or watching bowls	23	11	13	4
Football	34	22	-	-
Dominoes, draughts	11	10	-	-
Knitting, embroidery, etc.	-	-	16	15
Golf	5	1	2	-
Politics	3	3	0.7	0.6

Table 228.

The number and percentage of men and non-adipose women who experience flatulence by five year age groups.
(healthy men and women)

Age group	Flatulence present		Flatulence absent		Flatulence present		Flatulence absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	2	3	67	67	2.9	4.3	97.1	95.7
65 - 69		2	82	55	0.0	3.5	100.0	96.5
70 - 74	1	5	100	66	1.0	7.0	99.0	93.0
75 - 79	3	4	79	42	3.7	8.7	96.3	91.3
80 - 84	2	3	53	34	3.6	8.1	96.4	91.9
85 - 89		1	11	11	0.0	8.3	100.0	91.7
Total	8	18	392	275	2.0	6.1	98.0	93.9

Table 229.

The number and percentage of healthy adipose women who experience flatulence by five year age groups.

	Number		Percentage	
Age group	Flatulence present	Flatulence absent	Flatulence present	Flatulence absent
60 - 64	9	29	23.7	76.3
65 - 69	8	27	22.9	77.1
70 - 74	4	21	16.0	84.0
75 - 79	1	12	7.7	92.3
Total	22	89	19.8	80.2

Table 230

The number and percentage of men and non-adipose women with disease who experience flatulence by five year age groups.

Age group	Number				Percentage				
	Flatulence present		Flatulence absent		Flatulence present		Flatulence absent		
	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	9	8	49	28	15.5	22.2	84.5	77.8	
65 - 69	22	13	54	27	28.9	32.5	71.1	67.5	
70 - 74	14	13	45	26	23.7	33.3	76.3	66.7	
75 - 79	10	6	31	14	24.4	30.0	75.6	70.0	
80 - 84	2	6	13	3	13.3	66.7	86.7	33.3	
85 - 89	1	0	0	1	100.0	0.0	0.0	100.0	*
Total	58	46	192	99	23.2	31.7	76.8	68.3	

* groups are too small to make percentages valid.

Table 231.

The number and percentage of adipose women with disease who experience flatulence by five year age groups.

Age group	Number		Percentage	
	Flatulence present	Flatulence absent	Flatulence present	Flatulence absent
60 - 64	4	5	44.5	55.5
65 - 69	3	9	25.0	75.0
70 - 74	1	5	16.7	83.3
75 - 79	3	3	50.0	50.0
Total	11	22	33.3	66.7

Table 232.

The number and percentage of men and non-adipose women who experience tinnitus by five year age groups.
(healthy men and women)

Age group	Number				Percentage			
	Tinnitus present		Tinnitus absent		Tinnitus present		Tinnitus absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	2	2	67	68	2.9	2.9	97.1	97.1
65 - 69	5	1	77	56	6.1	1.7	93.9	98.3
70 - 74	3	2	98	69	3.0	2.8	97.0	97.2
75 - 79	6	3	76	43	7.3	6.5	92.7	93.5
80 - 84	1	3	54	34	1.8	8.1	98.2	91.9
85 - 89	1	2	10	10	9.1	16.7	90.9	83.3
Total	18	13	382	280	4.5	4.4	95.5	95.6

Table 233.

The number and percentage of healthy adipose women who experience tinnitus by five year age groups.

	Number		Percentage	
Age group	Tinnitus present	Tinnitus absent	Tinnitus present	Tinnitus absent
60 - 64	3	35	7.9	92.1
65 - 69	1	34	2.9	97.1
70 - 74	1	24	4.0	96.0
75 - 79	1	12	7.7	92.3
Total	6	105	5.4	94.6

Table 234.

The number and percentage of men and non-adipose women with disease who experience tinnitus by five year age groups.

Age group	Number				Percentage				
	Tinnitus present		Tinnitus absent		Tinnitus present		Tinnitus absent		
	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	11	10	47	26	19.0	27.8	81.0	72.2	
65 - 69	14	8	62	32	18.4	20.0	81.6	80.0	
70 - 74	16	7	43	32	27.1	17.9	72.9	82.1	
75 - 79	10	4	31	16	24.4	20.0	75.6	80.0	
80 - 84	3	3	12	6	20.0	33.3	80.0	66.7	
85 - 89	1	0	0	1	100.0	0.0	0.0	100.0	*
Total	55	32	195	113	22.0	22.1	78.0	77.9	

* groups too small to make percentages valid.

Table 235.

The number and percentage of adipose women with disease who experience tinnitus by five year age groups.

Age group	Number		Percentage	
	Tinnitus present	Tinnitus absent	Tinnitus present	Tinnitus absent
60 - 64	1	8	11.1	88.9
65 - 69	5	7	41.7	58.3
70 - 74	1	5	16.7	83.3
75 - 79	2	4	33.3	66.7
Total	9	24	27.3	72.7

Table 236.

The number and percentage of men and non-adipose women who experience postural vertigo by five year age groups.
(healthy men and women)

Age group	Number: Postural vertigo present		Number: Postural vertigo absent		Percentage: Postural vertigo present		Percentage: Postural vertigo absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64			69	70	0.0	0.0	100.0	100.0
65 - 69			82	57	0.0	0.0	100.0	100.0
70 - 74	2	2	99	69	2.0	2.8	98.0	97.2
75 - 79	4	3	78	43	4.9	6.5	95.1	93.5
80 - 84	4	6	51	31	7.3	16.2	92.7	83.8
85 - 89	5	2	6	10	45.4	16.7	54.6	83.3
Total	15	13	385	280	3.7	4.4	96.3	95.6

Table 237.

The number and percentage of healthy adipose women who experience postural vertigo by five year age groups.

Age group	Number		Percentage	
	Postural vertigo present	Postural vertigo absent	Postural vertigo present	Postural vertigo absent
60 - 64		38	0.0	100.0
65 - 69	1	34	2.9	97.1
70 - 74	1	24	4.0	96.0
75 - 79		13	0.0	100.0
Total	2	109	1.8	98.2

Table 238.

The number and percentage of men and non-adipose women with disease who experience vertigo, which may be other than postural, by five year age groups.

Age group	Number				Percentage			
	Vertigo present		Vertigo absent		Vertigo present		Vertigo absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	13	14	45	22	22.4	38.9	77.6	61.1
65 - 69	24	20	52	20	31.6	50.0	68.4	50.0
70 - 74	21	12	38	27	35.6	30.8	64.4	69.2
75 - 79	15	13	26	7	36.6	65.0	63.4	35.0
80 - 84	7	6	8	3	46.7	66.7	53.3	33.3
85 - 89	1	0	0	1	100.0	0.0	0.0	100.0 *
Total	81	65	169	80	32.4	44.8	67.6	55.2

* groups too small to make percentages valid.

Table 239.

The number and percentage of adipose women with disease who experience vertigo, which may be other than postural, by five year age groups.

Age group	Number		Percentage	
	Vertigo present	Vertigo absent	Vertigo present	Vertigo absent
60 - 64	3	6	33.3	66.7
65 - 69	7	5	58.3	41.7
70 - 74	2	4	33.3	66.7
75 - 79	3	3	50.0	50.0
Total	15	18	45.5	54.5

Table 240.

The number and percentage of men and women who are healthy with reference to the smoking of tobacco by five year age group s.

Age group	Number						Percentage					
	Smokes tobacco		Never smoked tobacco		Smoked in the past		Smokes tobacco		Never smoked tobacco		Smoked in the past	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	55	11	8	97	6	0	79.7	10.2	11.6	89.8	8.7	0.0
65 - 69	64	6	6	86	12	0	78.0	6.5	7.3	93.5	14.7	0.0
70 - 74	88	4	5	92	8	0	87.1	4.2	4.9	95.8	8.0	0.0
75 - 79	68	1	2	58	12	0	82.9	1.7	2.4	98.3	14.7	0.0
80 - 84	45	2	4	35	6	0	81.8	5.4	7.3	94.6	10.9	0.0
85 - 89	7	1	1	11	3	0	63.6	8.3	9.1	91.7	27.3	0.0
Total	327	25	26	379	47	0	81.7	6.2	6.5	93.8	11.8	0.0

Table 241.

The number and percentage of men and women with disease who smoke tobacco by five year age groups.

Age group	Number						Percentage						
	Smokes tobacco		Never smoked tobacco		Smoked in the past		Smokes tobacco		Never smoked tobacco		Smoked in the past		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	55	1	3	44	0	0	94.8	2.2	5.2	97.8	0.0	0.0	
65 - 69	69	2	4	50	3	0	90.8	3.8	5.3	96.2	3.9	0.0	
70 - 74	53	0	4	45	2	0	89.8	0.0	6.8	100.0	3.4	0.0	
75 - 79	35	0	1	26	5	0	85.4	0.0	2.4	100.0	12.2	0.0	
80 - 84	13	0	0	9	2	0	86.7	0.0	0.0	100.0	13.3	0.0	
85 - 89	1	0	0	1	0	0	100.0	0.0	0.0	100.0	0.0	0.0	*
Total	226	3	12	175	12	0	90.4	1.7	4.8	98.3	4.8	0.0	

* groups too small to make percentages valid.

Table 242.

The number and percentage of men and women with reference to the taking of alcoholic drink by five year age groups.
(healthy men and women)

Age group	Number				Percentage			
	Does not take alcoholic drink		Takes alcoholic drink		Does not take alcoholic drink		Takes alcoholic drink	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	15	95	54	13	21.7	88.0	78.3	12.0
65 - 69	34	86	48	6	41.5	93.5	58.5	6.5
70 - 74	24	82	77	14	23.8	85.4	76.2	14.6
75 - 79	18	53	64	6	21.9	89.8	78.1	10.2
80 - 84	19	32	36	5	34.5	86.5	65.5	13.5
85 - 89	1	10	10	2	9.1	83.3	90.9	16.7
Total	111	358	289	46	27.7	88.6	72.3	11.4

Table 243.

The number and percentage of men and women with disease with reference to the taking of alcoholic drink by five year age groups.

Age group	Number				Percentage			
	Does not take alcoholic drink		Takes alcoholic drink		Does not take alcoholic drink		Takes alcoholic drink	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	11	33	47	12	19.0	73.3	81.0	26.7
65 - 69	19	41	57	11	25.0	78.8	75.0	21.2
70 - 74	18	35	41	10	30.5	77.8	69.5	22.2
75 - 79	12	15	29	11	29.3	57.7	70.7	42.3
80 - 84	4	4	11	5	26.7	44.4	73.3	55.6
85 - 89	0	1	1	0	0.0	100.0	100.0	0.0 *
Total	64	129	186	49	25.6	72.5	74.4	27.5

* groups too small to make percentages valid.

Table 244.

The number and percentage of men and non-adipose women in terms of the presence or absence of constipation by five year age groups.
(healthy men and women)

Age group	Number				Percentage			
	Constipation present		Constipation absent		Constipation present		Constipation absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	9	27	60	43	13.0	38.6	87.0	61.4
65 - 69	18	24	64	33	21.9	42.1	78.1	57.9
70 - 74	25	31	76	40	24.7	43.7	75.3	56.3
75 - 79	26	25	56	21	31.7	54.3	68.3	45.7
80 - 84	26	22	29	15	47.3	59.5	52.7	40.5
85 - 89	7	8	4	4	63.6	66.7	36.4	33.3
Total	111	137	289	156	27.7	46.8	72.3	53.2

Table 245.

The number and percentage of healthy adipose women in terms of the presence or absence of constipation by five year age groups.

Age group	Number		Percentage	
	Constipation present	Constipation absent	Constipation present	Constipation absent
60 - 64	23	15	60.5	39.5
65 - 69	10	25	28.6	71.4
70 - 74	12	13	48.0	52.0
75 - 79	5	8	38.5	61.5
Total	50	61	45.0	55.0

Table 246.

The number and percentage of men and non-adipose women with disease in terms of the presence or absence of constipation by five year age groups.

Age group	Number				Percentage			
	Constipation present		Constipation absent		Constipation present		Constipation absent	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64.	3	15	55	21	5.2	41.7	94.8	58.3
65 - 69	21	14	55	26	27.6	35.0	72.4	65.0
70 - 74	13	17	46	22	22.0	43.6	78.0	56.4
75 - 79	10	7	31	13	24.4	35.0	75.6	65.0
80 - 84	4	2	11	7	26.7	22.2	73.3	77.8
85 - 89	0	0	1	1	0.0	0.0	100.0	100.0 ¤
Total	51	55	199	90	20.4	37.9	79.6	62.1

¤ groups too small to make percentages valid.

Table 247.

The number and percentage of adipose women with disease in terms of the presence or absence of constipation by five year age groups.

Age group	Number		Percentage	
	Constipation present	Constipation absent	Constipation present	Constipation absent
60 - 64	1	8	11.1	88.9
65 - 69	5	7	41.7	58.3
70 - 74	3	3	50.0	50.0
75 - 79	5	1	83.3	16.7
Total	14	19	42.4	57.6

Table 248.

The number and percentage of men and non-adipose women with reference to changes in the sense of smell by five year age groups.
(healthy men and women)

Age group	Number				Percentage			
	No change in sense of smell		Deterioration in sense of smell		No change in sense of smell		Deterioration in sense of smell	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	60	61	9	9	87.0	87.1	13.0	12.9
65 - 69	71	49	11	8	86.6	86.0	13.4	14.0
70 - 74	87	57	14	14	86.1	80.3	13.9	19.7
75 - 79	68	37	14	9	82.9	80.4	17.1	19.6
80 - 84	38	29	17	8	69.1	78.4	30.9	21.6
85 - 89	5	6	6	6	45.4	50.0	54.6	50.0
Total	329	239	71	54	82.2	81.6	17.8	18.4

Table 249.

The number and percentage of healthy adipose women with reference to changes in the sense of smell by five year age groups.

Age group	Number		Percentage	
	No change in sense of smell	Deterioration in sense of smell	No change in sense of smell	Deterioration in sense of smell
60 - 64	33	5	86.8	13.2
65 - 69	28	7	80.0	20.0
70 - 74	21	4	84.0	16.0
75 - 79	10	3	76.9	23.1
Total	92	19	82.9	17.1

Table 250.

The number and percentage of men and non-adipose women with disease with reference to changes in the sense of smell by five year age groups.

Age group	Number				Percentage				
	No change in sense of smell		Deterioration in sense of smell		No change in sense of smell		Deterioration in sense of smell		
	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	58	33	0	3	100.0	91.7	0.0	8.3	
65 - 69	63	37	13	3	82.9	92.5	17.1	7.5	
70 - 74	49	34	10	5	83.1	87.2	16.9	12.8	
75 - 79	25	17	16	3	61.0	85.0	39.0	15.0	
80 - 84	10	7	5	2	66.7	77.8	33.3	22.2	
85 - 89	0	0	1	1	0.0	0.0	100.0	100.0	*
Total	205	128	45	17	82.0	88.3	18.0	11.7	

* groups too small to make percentages valid.

Table 251.

The number and percentage of adipose women with disease with reference to changes in the sense of smell by five year age groups.

Age group	Number		Percentage	
	No change in sense of smell	Deterioration in sense of smell	No change in sense of smell	Deterioration in sense of smell
60 - 64	8	1	88.9	11.1
65 - 69	10	2	83.3	16.7
70 - 74	4	2	66.7	33.3
75 - 79	5	1	83.3	16.7
Total	27	6	81.8	18.2

Table 252.

The number and percentage of men and non-adipose women in terms of the occurrence of accidents by five year age groups.
(healthy men and women)

Age group	Number				Percentage			
	Accident recorded		No accident recorded		Accident recorded		No Accident recorded	
	Men	Women	Men	Women	Men	Women	Men	Women
60 - 64	1	4	68	66	1.4	5.7	98.6	94.3
65 - 69	4	6	78	51	4.9	10.5	95.1	89.5
70 - 74	8	8	93	63	7.9	11.3	92.1	88.7
75 - 79	5	10	77	36	6.1	21.7	93.9	78.3
80 - 84	6	8	49	29	10.9	21.6	89.1	78.4
85 - 89	0	1	11	11	0.0	8.3	100.0	91.7
Total	24	37	376	256	6.0	12.6	94.0	87.4

Table 253.

The number and percentage of healthy adipose women in terms of the occurrence of accidents by five year age groups.

Age group	Number		Percentage	
	Accident recorded	No accident recorded	Accident recorded	No accident recorded
60 - 64	7	31	18.4	81.6
65 - 69	9	26	25.7	74.3
70 - 74	4	21	16.0	84.0
75 - 79	2	11	15.4	84.6
Total	22	89	19.8	80.2

Table 254.

The number and percentage of men and non-adipose women with disease in terms of the occurrence of accidents by five year age groups.

Age group	Number				Percentage				
	Accident recorded		No accident recorded		Accident recorded		No accident recorded		
	Men	Women	Men	Women	Men	Women	Men	Women	
60 - 64	4	2	54	34	6.9	5.5	93.1	94.5	
65 - 69	8	3	68	37	10.5	7.5	89.5	92.5	
70 - 74	3	3	56	36	5.1	7.7	94.9	92.3	
75 - 79	3	2	38	18	7.3	10.0	92.7	90.0	
80 - 84	1	2	14	7	6.7	22.2	93.3	77.8	
85 - 89	0	0	1	1	0.0	0.0	100.0	100.0	*
Total	19	12	231	133	7.6	8.3	92.4	91.7	

* groups too small to make percentages valid.

Table 255.

The number and percentage of adipose women with disease in terms of the occurrence of accidents by five year age groups.

Age group	Number		Percentage	
	Accident recorded	No accident recorded	Accident recorded	No accident recorded
60 - 64	1	8	11.1	88.9
65 - 69	2	10	16.7	83.3
70 - 74	2	4	33.3	66.7
75 - 79	1	5	16.7	83.3
Total	6	27	18.2	81.8

Table 256.

The number of men and non-adipose women by the state of their teeth and five year age groups.
(healthy men and women)

State of teeth	Sex	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85-89 years	Total Number	Total Percentage
Own teeth - good condition	Men	3			3			6	1.5
	Women	1						1	0.34
- require treatment	Men	3	2	3	3	4	1	16	4.0
Dentures - upper and lower	Men	52	69	82	55	39	7	304	76.0
	Women	56	49	59	38	31	9	242	82.6
Dentures and own teeth	Men	2	2	2				6	1.5
	Women	3				1		4	1.4
Dentures - upper only	Men	7	5	5	8	1		26	6.5
	Women	8	7	8	5	3		31	10.6
Neither	Men	1	4	6	9	11	3	34	8.5
	Women	1	1	3	1	1	2	9	3.1
Dentures - cosmetic use only	Men	1		3	4			8	2.0
	Women	1		1	2	1	1	6	2.0

Table 257.

The number of healthy adipose women by the state of their teeth and five year age groups.

State of teeth	60-64 years	65-69 years	70-74 years	75-79 years	Total	
					Number	Percentage
Dentures - upper and lower	31	28	20	10	89	80.2
Dentures and own teeth	1		1		2	1.8
Dentures - upper only	4	6	4	2	16	14.4
Neither	1	1		1	3	2.7
Dentures- cosmetic use only	1				1	0.9

Table 258.

The number of men and non-adipose women with disease by the state of their teeth and five year age groups.

State of teeth	Sex	60-64 years	65-69 years	70-74 years	75-79 years	80 + years	Total Number	Total Percentage
Own teeth - good condition	Men		1	1			2	0.8
	Women	1	1				2	1.4
- require treatment	Men		3	1	1		5	2.0
	Women							0.0
Dentures - upper and lower	Men	39	56	47	30	11	183	73.2
	Women	32	29	32	15	8	116	80.0
Dentures and own teeth	Men	3	1	2	1		7	2.8
	Women	1					1	0.7
Dentures - upper only	Men	8	7	2	1	3	21	8.4
	Women	2	7	7	4	2	22	15.2
Neither	Men	5	3	5	7	2	22	8.8
	Women		1		1		2	1.4
Dentures - cosmetic use only	Men	2	5	1	1		9	3.6
	Women		2				2	1.4
Dentures for shaving only	Men	1					1	0.4

Table 259.

The number of adipose women with disease by the state of their teeth and five year age groups.

State of teeth	60 - 64 years	65 - 69 years	70 - 74 years	75 - 79 years	Total Number	Total Percentage
Dentures - upper and lower	6	6	6	5	23	69.7
Dentures - upper only	2	3	0	1	6	18.2
Neither	0	1	0	0	1	3.0
Dentures - cosmetic use only	1	2	0	0	3	9.1

PART III

A BRIEF ASSESSMENT OF THE DISEASED GROUP OF MEN AND WOMEN IN THIS SERIES.

No attempt will be made to deal comprehensively with the clinical aspects of disease in older people since the numbers in this thesis are inadequate for the purpose, and the primary object was to study the physiological aspects of senescence. However, I wish to consider a few aspects of disease with particular reference to the cardiovascular system.

Of the 250 men with disease 128, or 51.2 per cent, had normal hearts; 36, or 14.4 per cent, had coronary artery occlusion; 59, or 23.6 per cent, had nonvalvular heart disease other than coronary artery occlusion, and 27, or 10.8 per cent, had in all probability valvular heart disease. Of the 178 women with disease 80, or 44.9 per cent, had normal hearts; 15, or 8.4 per cent, had coronary artery occlusion; 48, or 27.0 per cent, had nonvalvular heart disease other than coronary artery occlusion, and 35, or 19.7 per cent, had in all probability valvular heart disease. Thus normal hearts were more frequently met in men than in women; coronary artery occlusion was more prevalent in men, while valvular heart disease, and nonvalvular heart disease other than coronary artery occlusion were more often noted in women.

It is obvious that heart disease must form a major part of the work of the geriatric clinician. For this reason all the diseases recorded in the 250 men and 178 women are presented in Table 260 in a form which stresses the importance of heart disease in the aged patients. This Table further indicates another fundamental problem in geriatric medicine which is the frequent occurrence of multiple pathology in the individual patient. For this reason alone the task of the geriatric physician is rendered more difficult and complex than that of his colleague who prefers to practice medicine in relation to those who are in the prime of life when disease is more likely to be a single uncomplicated entity. Furthermore, the geriatric physician is significantly hampered in his treatment of disease by the lack of knowledge concerning the normality of bodily attributes in old age. It is manifestly wrong to project into old age physiological data derived from adults who are not old. Such information requires to be regarded as valueless in defining the boundary between health and disease in old age until proved otherwise through research on old people.

Monroe (1951) found the diagnoses per case in patients with disease, but free from heart disease to be 1.4 for men and 1.1 for women. This is similar to the 1.5 for men and 1.6 for women noted in the present study. However, for coronary artery occlusion, other nonvalvular heart disease and valvular heart disease Monroe (1951) recorded the diagnoses per case for both sexes combined as 2.51, 2.47 and 2.42 respectively. These values are greater than the corresponding 1.4, 1.9 and 1.6 of the present series. This difference between the two studies may be related to the fact that Monroe(1951) was analysing a hospital population, while I am considering an ambulant group of old people only a minority of whom required to be admitted to hospital.

Throughout this thesis I have consistently drawn attention to the significant influence of adiposity upon the well-being of the individual. In the case of the 250 diseased men 18, or 7.0 per cent, were more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948). These 18 adipose men had diseases which formed three groups, namely, cardiovascular disease, cerebral thrombosis and chronic bronchitis with or without emphysema. Of the 178 diseased women 33, or 18.5 per cent, were more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948) and they suffered from the same diseases which are noted for men. In addition, the adipose women also had individuals with diabetes mellitus, anaemia or paralysis agitans. Osteoarthritis and fibrositis might also be associated with these other diseases in women with adiposity.

Figure 46 shows the transverse diameter of the heart in men with coronary artery occlusion with reference to the normal percentile limits of the transverse diameter of the heart in men. Figure 47 presents the same information using the cardiothoracic ratio as a criterion of heart size. They both give similar findings. Coronary artery occlusion is clearly strongly associated with cardiac enlargement. With the transverse diameter of the heart and the cardiothoracic ratio there are only 5 and 6 men respectively below the sixty-fifth percentile. Figures 48 and 49 show the transverse diameter of the heart and the cardiothoracic ratio respectively in women with coronary artery occlusion. The association between coronary artery occlusion and cardiac enlargement is again apparent.

Figure 50 shows the transverse diameter of the heart in men with nonvalvular heart disease other than coronary artery occlusion with reference to the normal percentile limits of the transverse diameter of the heart in men. (·) indicates uncomplicated nonvalvular heart disease other than coronary artery occlusion, except that hypertension and albuminuria may be present. (o) indicates nonvalvular heart disease other than coronary artery occlusion associated with chronic bronchitis with or without emphysema. (x) indicates nonvalvular heart disease other than coronary artery occlusion associated with diseases other than chronic bronchitis with or without emphysema. Figure 51 provides the same information using the cardiothoracic ratio instead of the transverse diameter of the heart as a criterion of heart size.

Figure 50 suggests that nonvalvular heart disease other than coronary artery occlusion in men whether uncomplicated, associated with chronic bronchitis or with other diseases results in cardiac enlargement. The transverse diameter of the heart criterion of heart size raises the possibility that this type of nonvalvular heart disease with chronic bronchitis while leading to cardiac enlargement does so to a lesser extent than when the nonvalvular heart disease is uncomplicated or associated with diseases other than chronic bronchitis. This observation is less apparent when the cardiothoracic ratio is used as a criterion of heart size

(Figure 51). A larger series of cases is desirable to clarify the problem.

Figure 52 shows the transverse diameter of the heart in women with nonvalvular heart disease other than coronary artery occlusion with reference to the normal percentile limits of the transverse diameter of the heart in women. (o) indicates uncomplicated nonvalvular heart disease other than coronary artery occlusion in women who are not more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948). The nonvalvular heart disease may be associated with hypertension and albuminuria. (x) indicates nonvalvular heart disease other than coronary artery occlusion in women who are more than 24 per cent over ideal weight as estimated from Anderson's nomogram (Greene, 1948). The nonvalvular heart disease and adiposity may be associated with other diseases. (•) indicates nonvalvular heart disease other than coronary artery occlusion in women who are not more than 24 per cent over ideal weight associated with other diseases. Figure 53 provides the same information using the cardiothoracic ratio instead of the transverse diameter of the heart as a criterion of heart size.

Figures 52 and 53 show that cardiac enlargement in women with nonvalvular heart disease other than coronary artery occlusion is most evident when there is also adiposity; that uncomplicated nonvalvular heart disease in non-adipose women is in an intermediate position, and that cardiac enlargement in women with nonvalvular heart disease other than coronary artery occlusion is least when other disease is also present in the non-adipose.

Figure 54 shows the transverse diameter of the heart in men with rheumatic heart disease (•), calcification of mitral annulus fibrosus (o), or a systolic apical murmur greater than Grade II either associated with hypertension with symptoms (x) or of undetermined origin (□), with reference to the normal percentile limits of the transverse diameter of the heart in men. Figure 56 shows the corresponding data for women. Figures 55 and 57 present the same information for men and women respectively using the cardiothoracic ratio instead of the transverse diameter of the heart as a criterion of heart size. It is evident that for the groups considered the heart disease in both men and women is associated with considerable cardiac enlargement.

Figure 58 shows the transverse diameter of the heart in men with chronic bronchitis with reference to the normal percentile limits of the transverse diameter of the heart in men. (x) indicates uncomplicated chronic bronchitis with or without emphysema. (o) indicates chronic bronchitis with or without emphysema associated with other diseases, but without evidence of heart disease. (•) indicates chronic bronchitis with or without emphysema associated with nonvalvular heart disease other than coronary artery occlusion. (□) indicates calcific valve disease without chronic bronchitis. This group is included as a contrast to the chronic bronchitic groups. Figure 59 provides the same information using the cardiothoracic ratio instead of the transverse diameter of the heart as a criterion of heart size.

The percentile rankings of these four groups are such that the uncomplicated chronic bronchitic group occupies the lowest position, and the highest position is taken by the group with calcific valve disease. The remaining two chronic bronchitic groups are in an intermediate position. Apart from recording the incidence of marked emphysema in Table 260 I have not attempted to diagnose the more marginal instances of emphysema because of the clinical and radiological difficulties inherent in this enterprise. However, marked cases of emphysema with chronic bronchitis were more prevalent in the lower part of the percentile range. It is obvious that the heart size in a group of chronic bronchitic patients lacks consistency, and this is in part related to the variety of diseases which may co-exist.

Table 260.

The diseases found in the 250 men and 178 women who form the diseased group with and without heart disease.

Disease	No heart disease		Coronary artery occlusion		Other nonvalvular heart disease		Heart disease - probably valvular *	
	Men	Women	Men	Women	Men	Women	Men	Women
Chronic bronchitis	44	12			13	1	2	
Hypertension with symptoms (no apparent heart disease)	33	39						
Cerebral vascular accident	11	8	3		4	6	1	
Iron deficiency anaemia	11	11			1	7		3
Emphysema	20	3			4		2	
Psychoneurosis	5	3	7	4	1	3	2	4
Malignant disease	15	4			3	2	1	
Arthritis	2	9	1	2	3	4	1	2
Intermittent claudication	11	2	1		2	1	1	
Diabetes mellitus	1	7			3	1	1	2
Accident	7	2			2	1	2	
Peptic ulcer	5	4			1		1	

* indicates rheumatic heart disease; calcification of mitral annulus fibrosus; systolic apical murmur greater than Grade II.

Disease	No heart disease		Coronary artery occlusion		Other nonvalvular heart disease		Heart disease - probably valvular	
	Men	Women	Men	Women	Men	Women	Men	Women
Rupture (truss required)	4				3	1	1	1
Haemorrhoids (requiring treatment)	2	3			1	2	1	1
Pernicious anaemia	2	4				1	1	
Pulmonary tuberculosis	6				1		1	
Uterine prolapse		2				3		2
Paralysis agitans	2	3			1		1	
Nocturnal leg cramps (severe)	2		1		1	3		
Nephritis						3		1
Cholecystitis		2				1		1
Pyelitis		2				2		
Sinusitis	3	1						
Paget's disease	2					1		
Psychosis	1	1			1			
Pneumoconiosis	3							-
Pneumonia			1				1	

Disease	No heart disease		Coronary artery occlusion		Other nonvalvular heart disease		Heart disease - probably valvular *	
	Men	Women	Men	Women	Men	Women	Men	Women
Syphilis	1				1			
Osteoporosis						1		1
Salivary gland calculus				1				
Obstructing prostate							1	
Spondylitis	1							
Rheumatoid arthritis		1						
Asthma		1						
Angioneurotic oedema		1						
Myxoedema						1		
Thrombosis of artery	1							
Cystitis					1			
Hiatus hernia					1			
Rodent ulcer	1							
Epilepsy						1		
Number of cases	128	80	36	15	59	48	27	35
Diagnoses per case	1.5	1.6	1.4	1.5	1.8	2.0	1.8	1.5

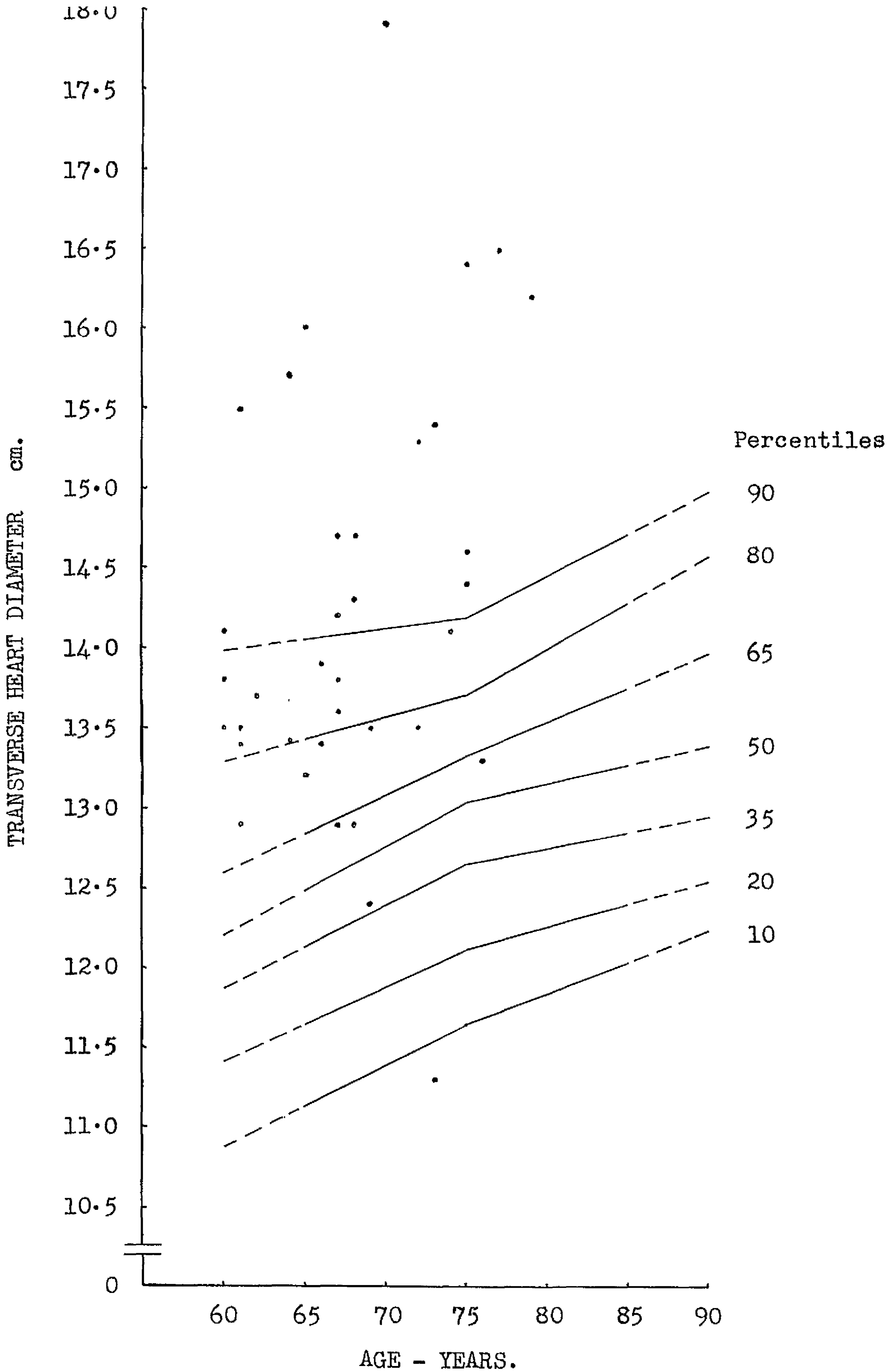


Figure 46 . The transverse diameter of the heart in men with coronary artery occlusion with reference to the normal percentile limits of the transverse diameter of the heart.

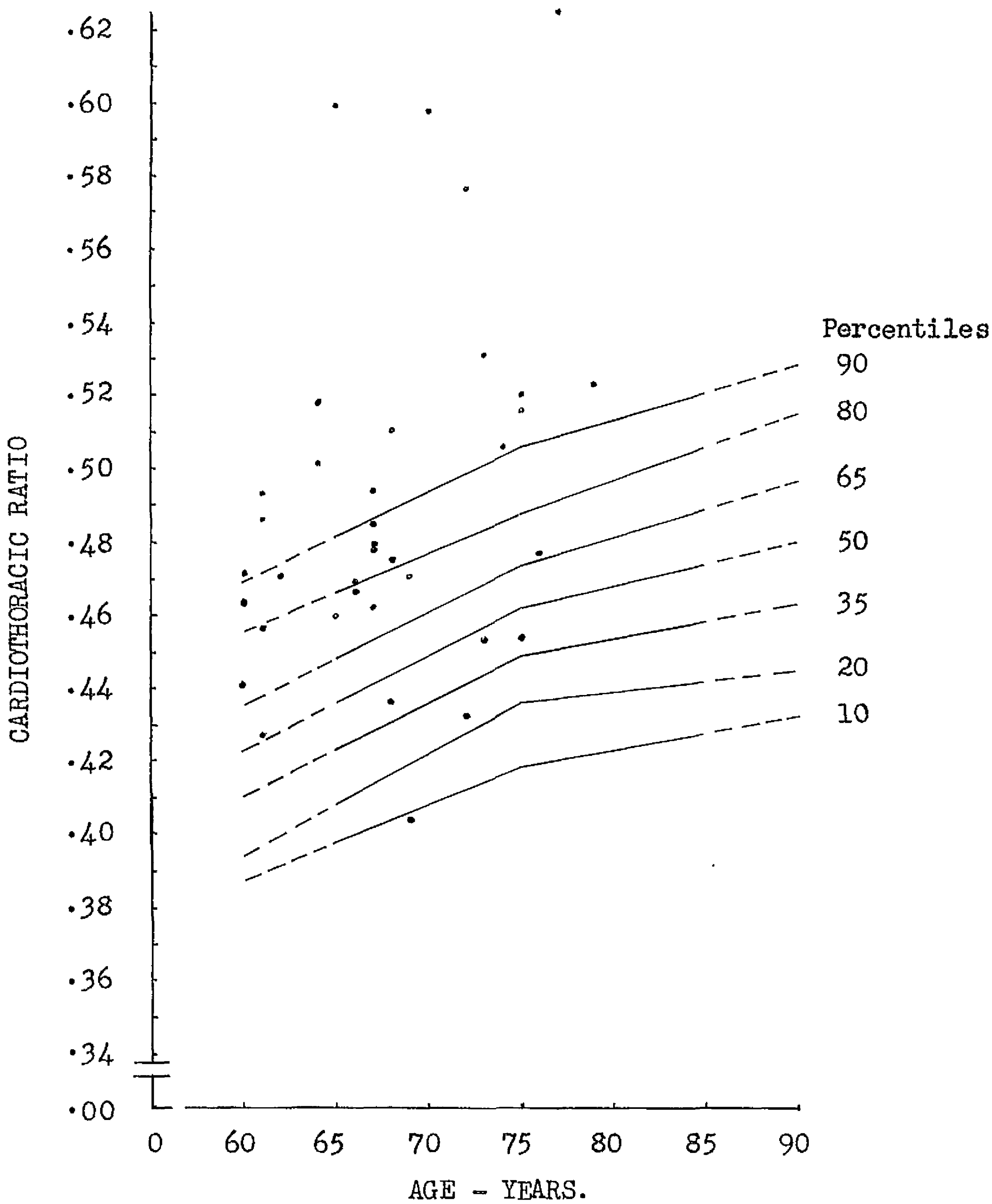


Figure 47. The cardiothoracic ratio in men with coronary artery occlusion (·) with reference to the normal percentile limits of the cardiothoracic ratio.

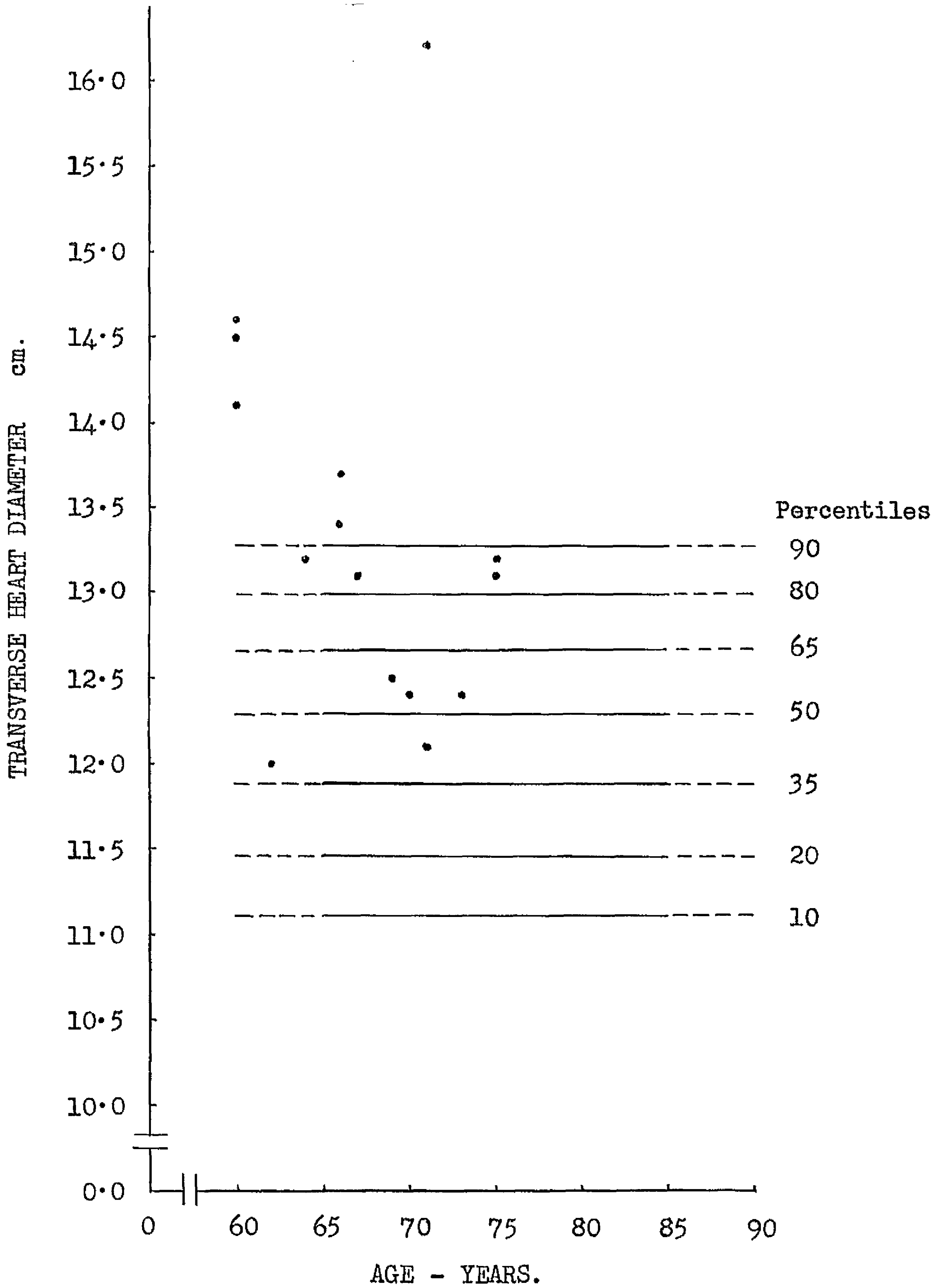


Figure 48 . The transverse diameter of the heart in women with coronary artery occlusion (.) with reference to the normal percentile limits of the transverse diameter of the heart.

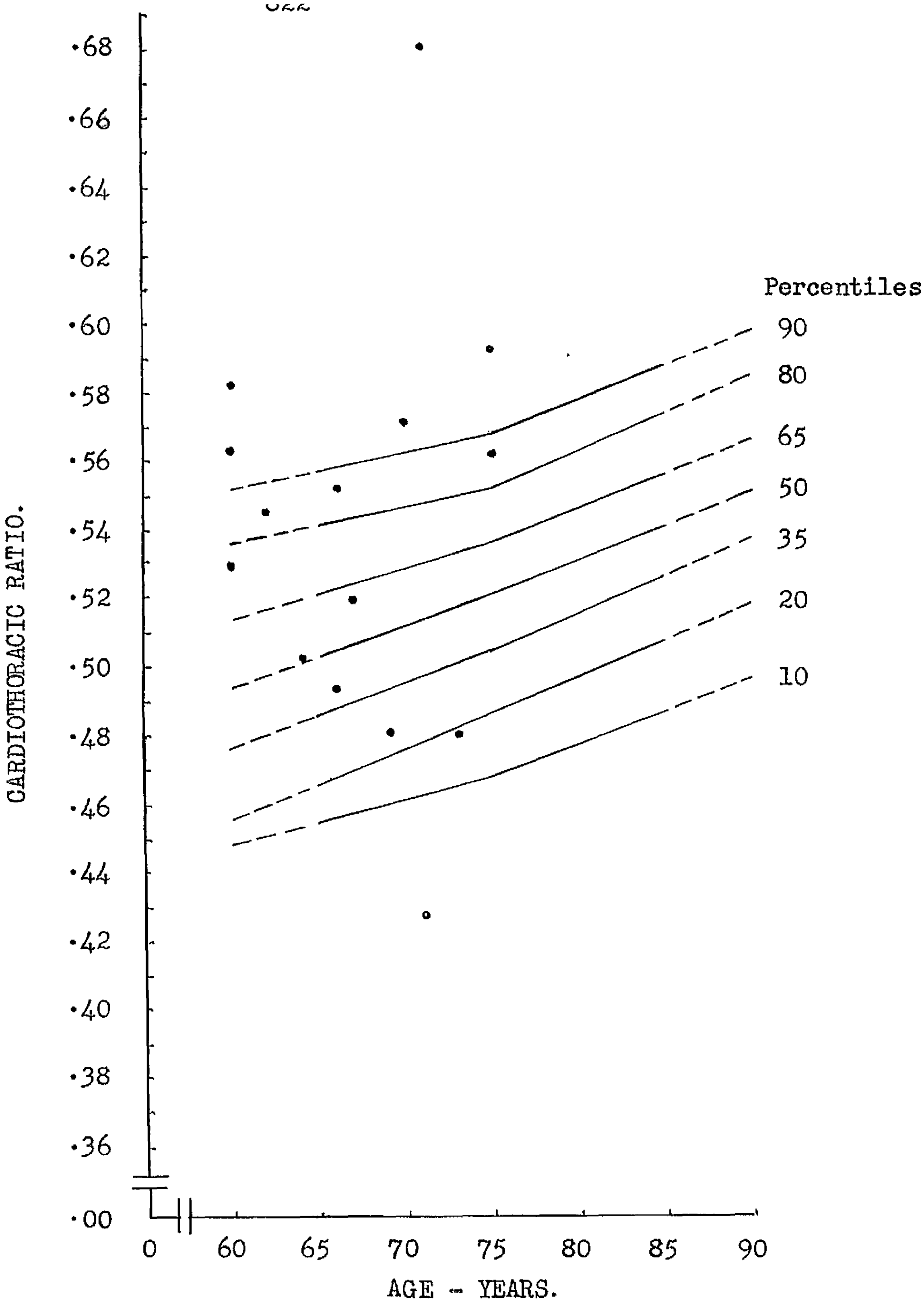
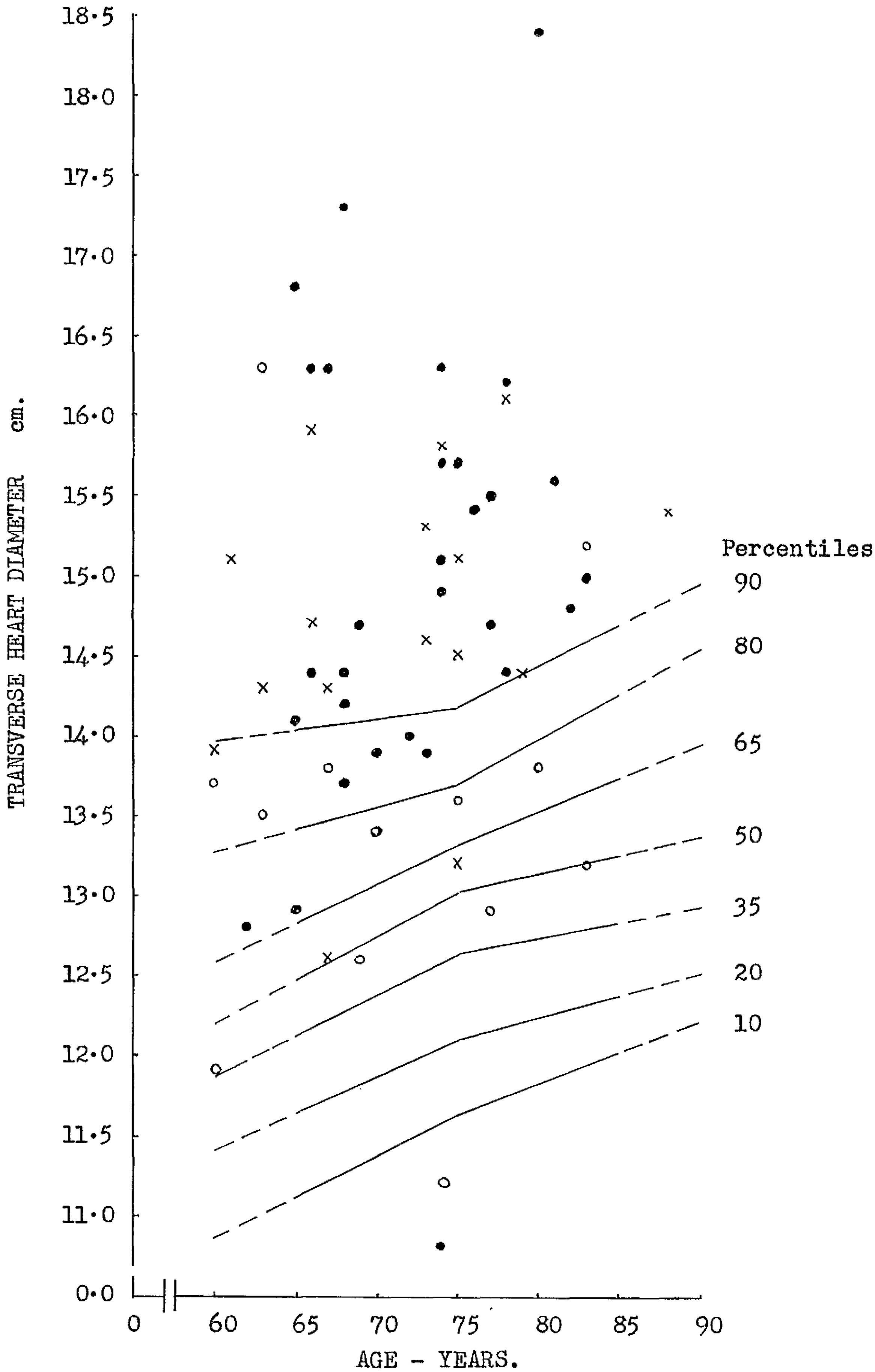


Figure 49. The cardiothoracic ratio in women with coronary artery occlusion (·) with reference to the normal percentile limits of the cardiothoracic ratio.


18·5
18·0
17·5
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16·0
15·5
15·0
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13·0
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12·0
11·5
11·0
0·0
TRANSVERSE HEART DIAMETER cm.
0
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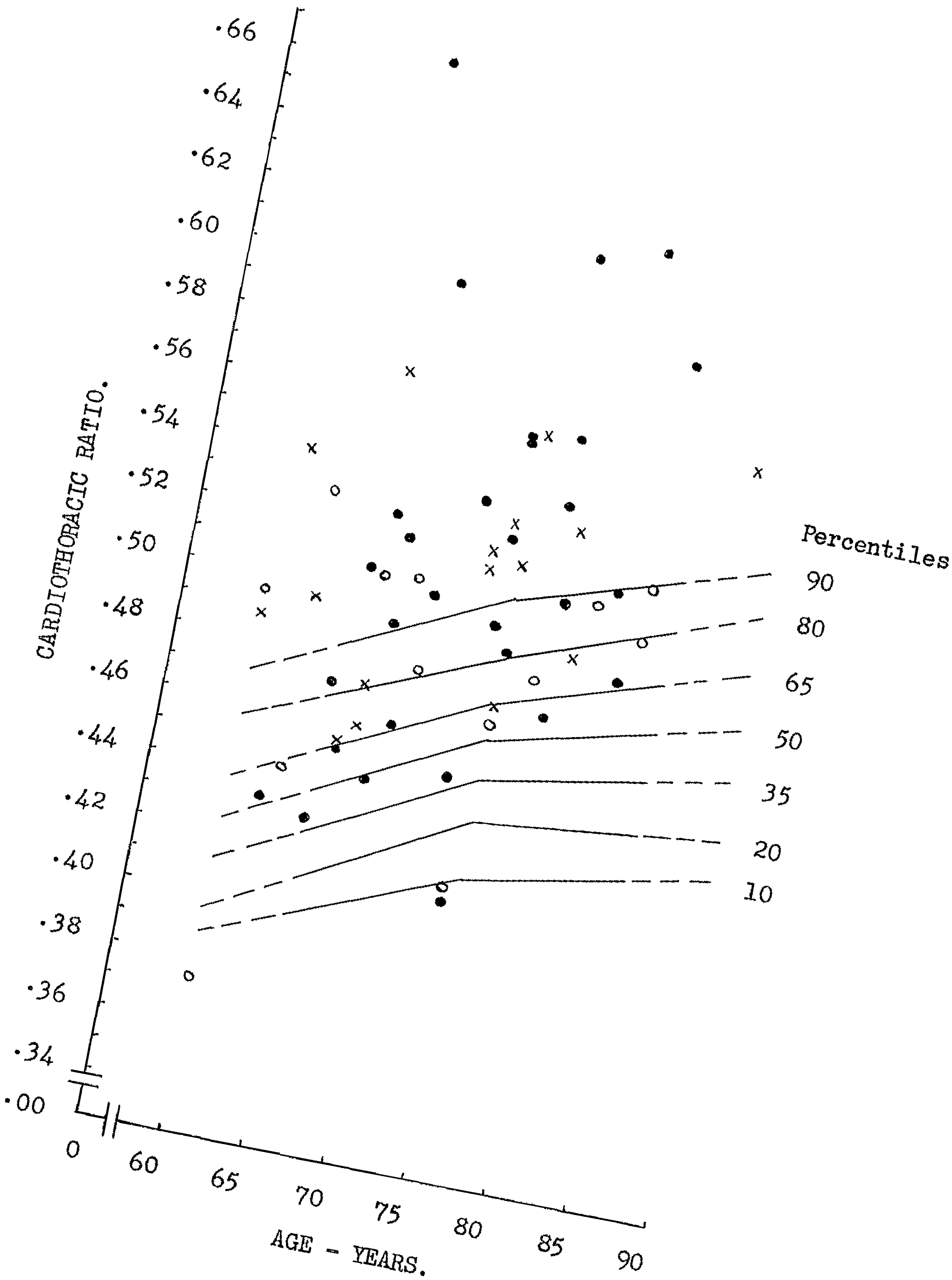
65
70
75
80
85
90
AGE - YEARS.
Percentiles
90
80
65
50
35
20
10

Figure 50.


CARDIOTHORACIC RATIO.
·66
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AGE - YEARS.
Percentiles
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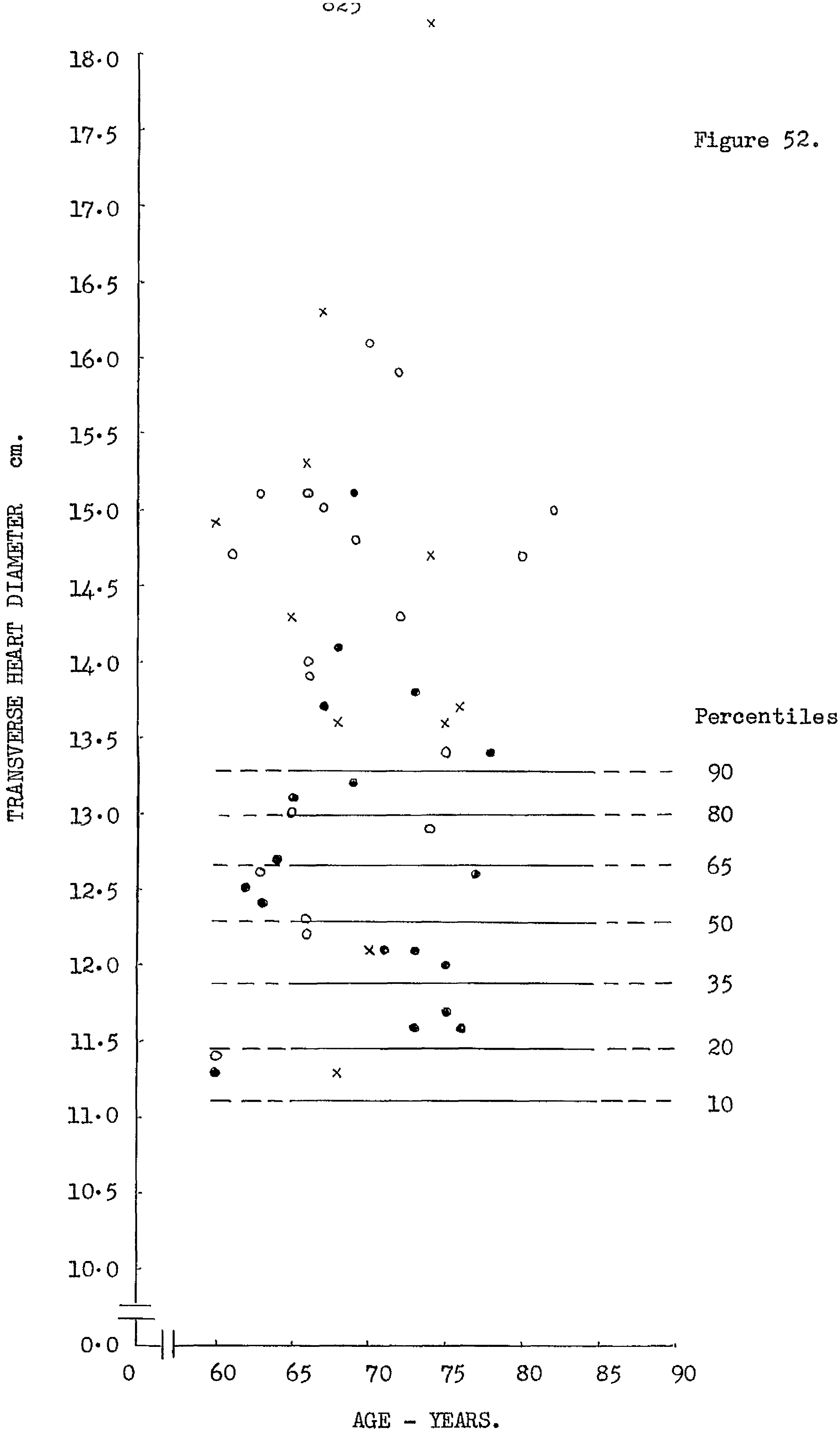
10

Figure 51.

Figure 52.


18·0
17·5
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0·0
TRANSVERSE HEART DIAMETER cm.
Percentiles
90
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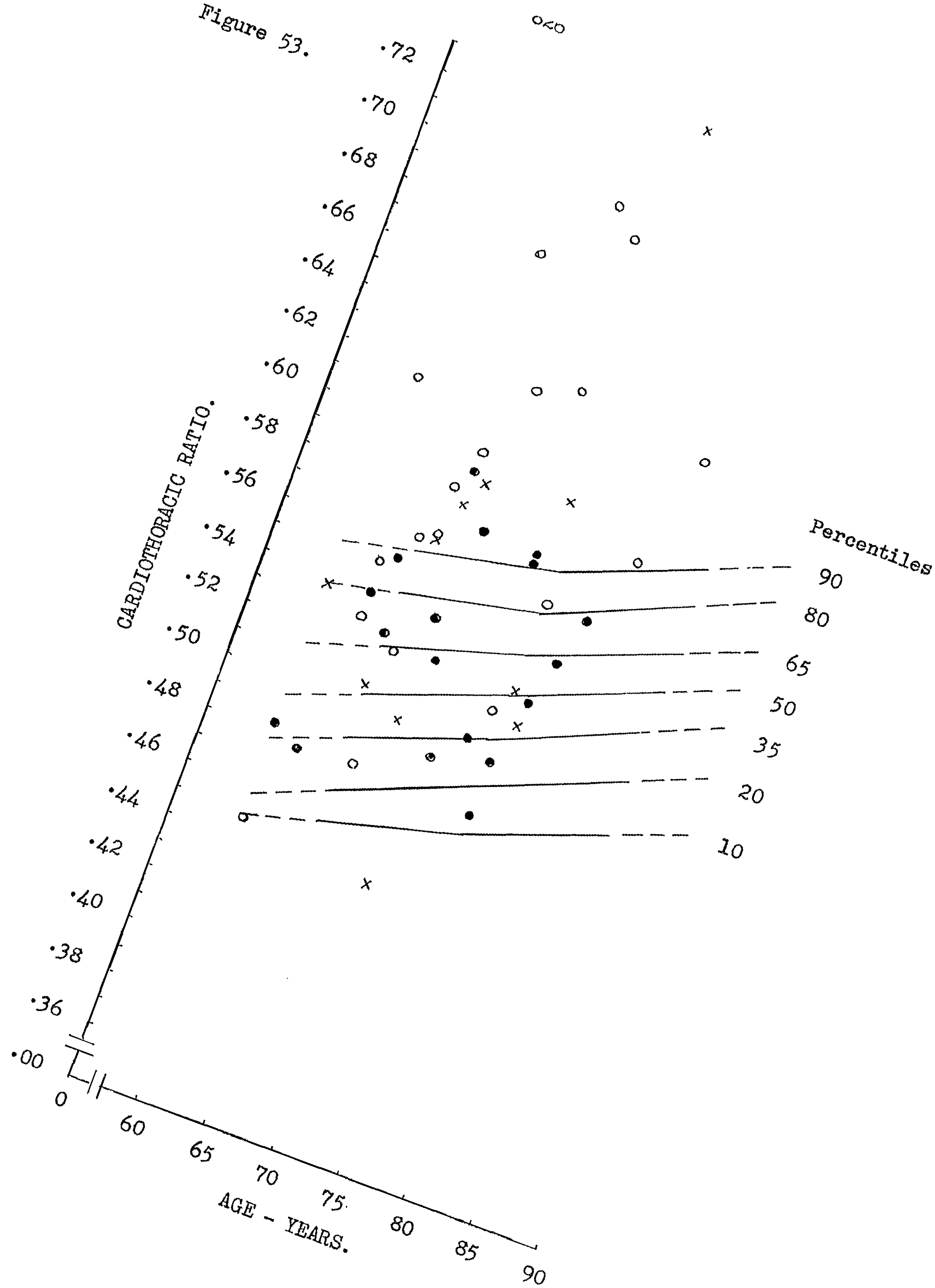
65
70
75
80
85
90
AGE - YEARS.

Figure 53.



CARDIOTHORACIC RATIO.
·72
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90
AGE - YEARS.
Percentiles
90
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10

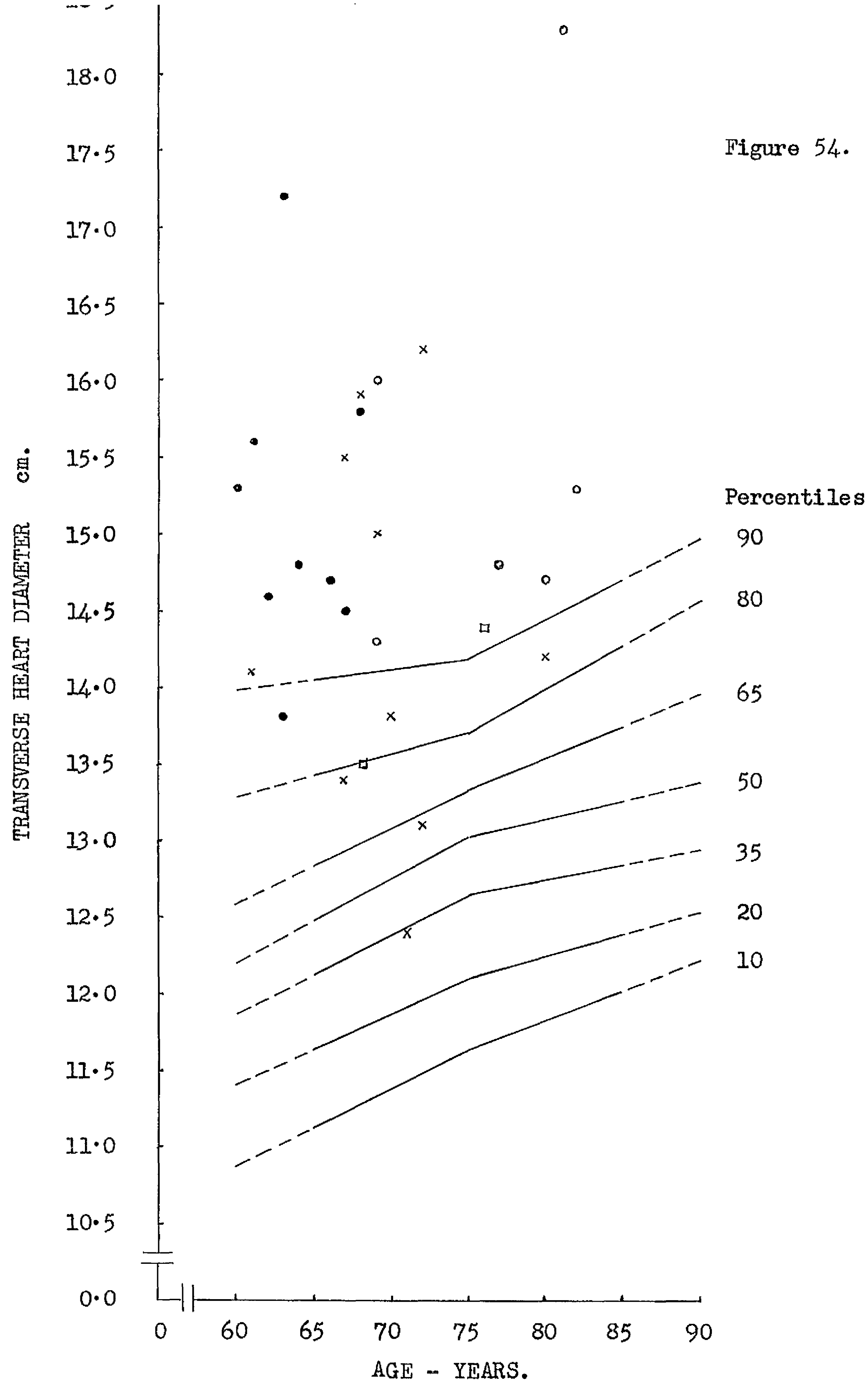
Figure 54.
Percentiles
90
80
65
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35
20
10
TRANSVERSE HEART DIAMETER cm.
18·0
17·5
17·0
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13·5
13·0
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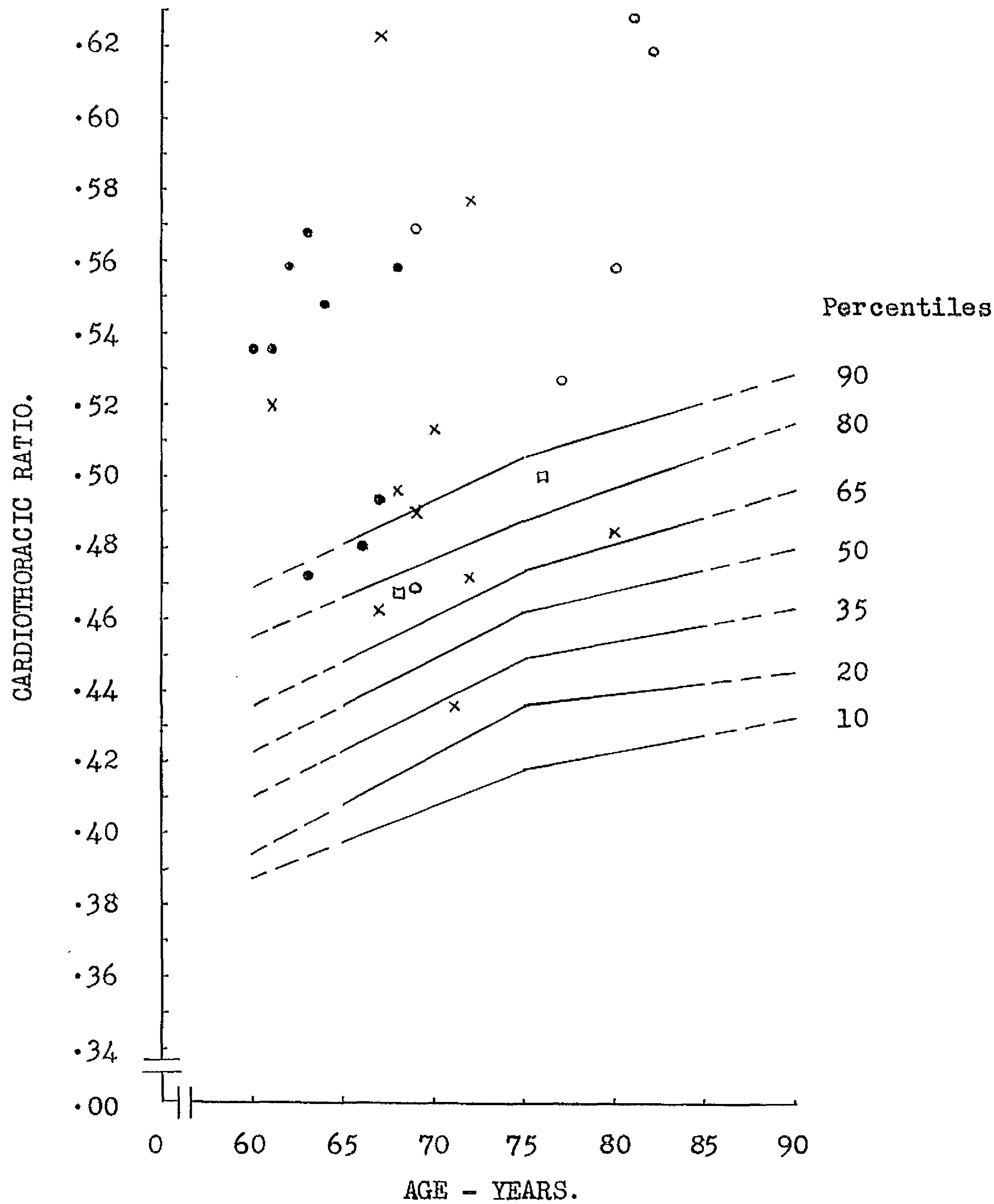
AGE – YEARS.



CARDIOTHORACIC RATIO.
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85
90
AGE - YEARS.
Percentiles
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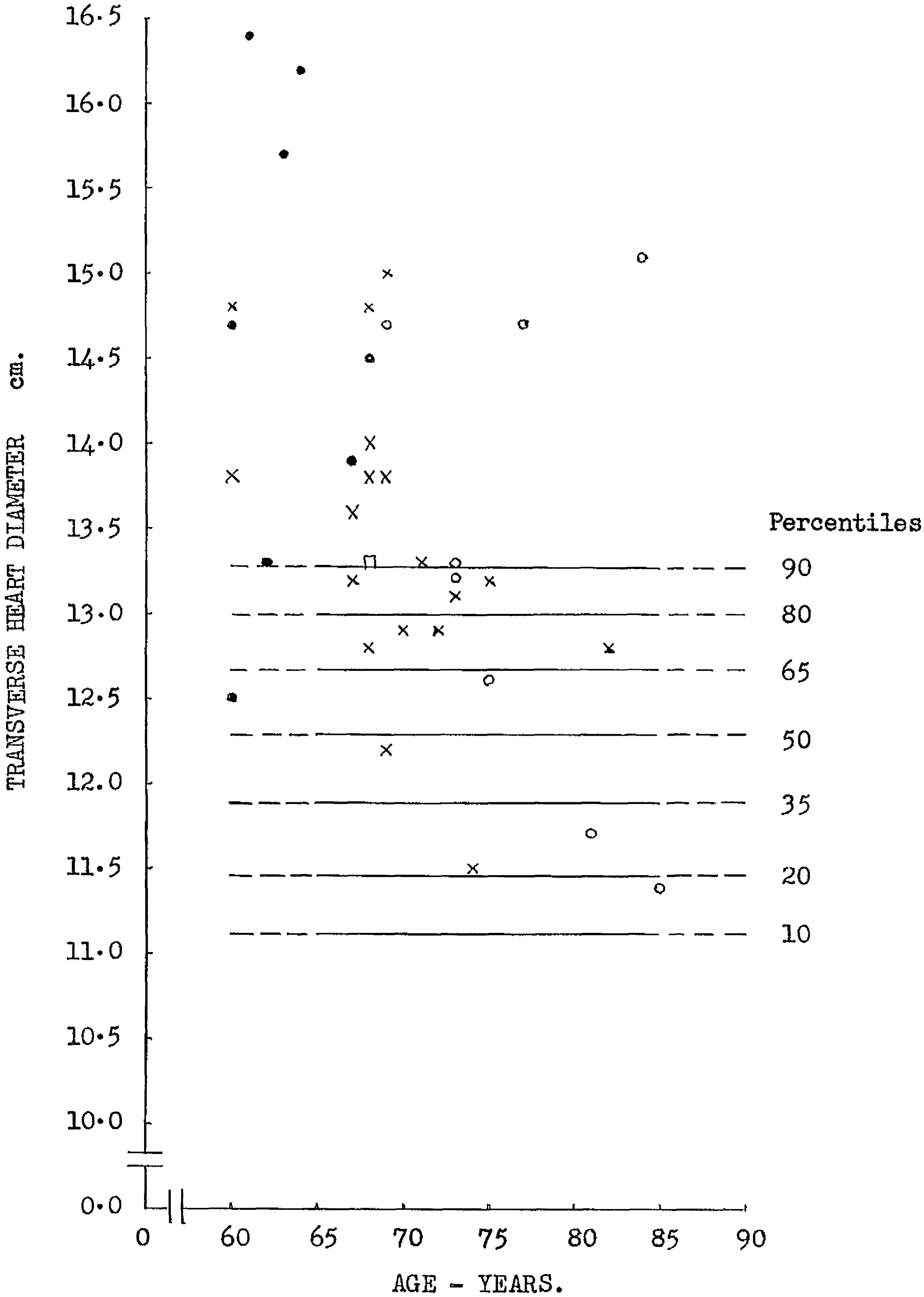
50
35
20
10

Figure 55.


16·5
16·0
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TRANSVERSE HEART DIAMETER cm.
Percentiles
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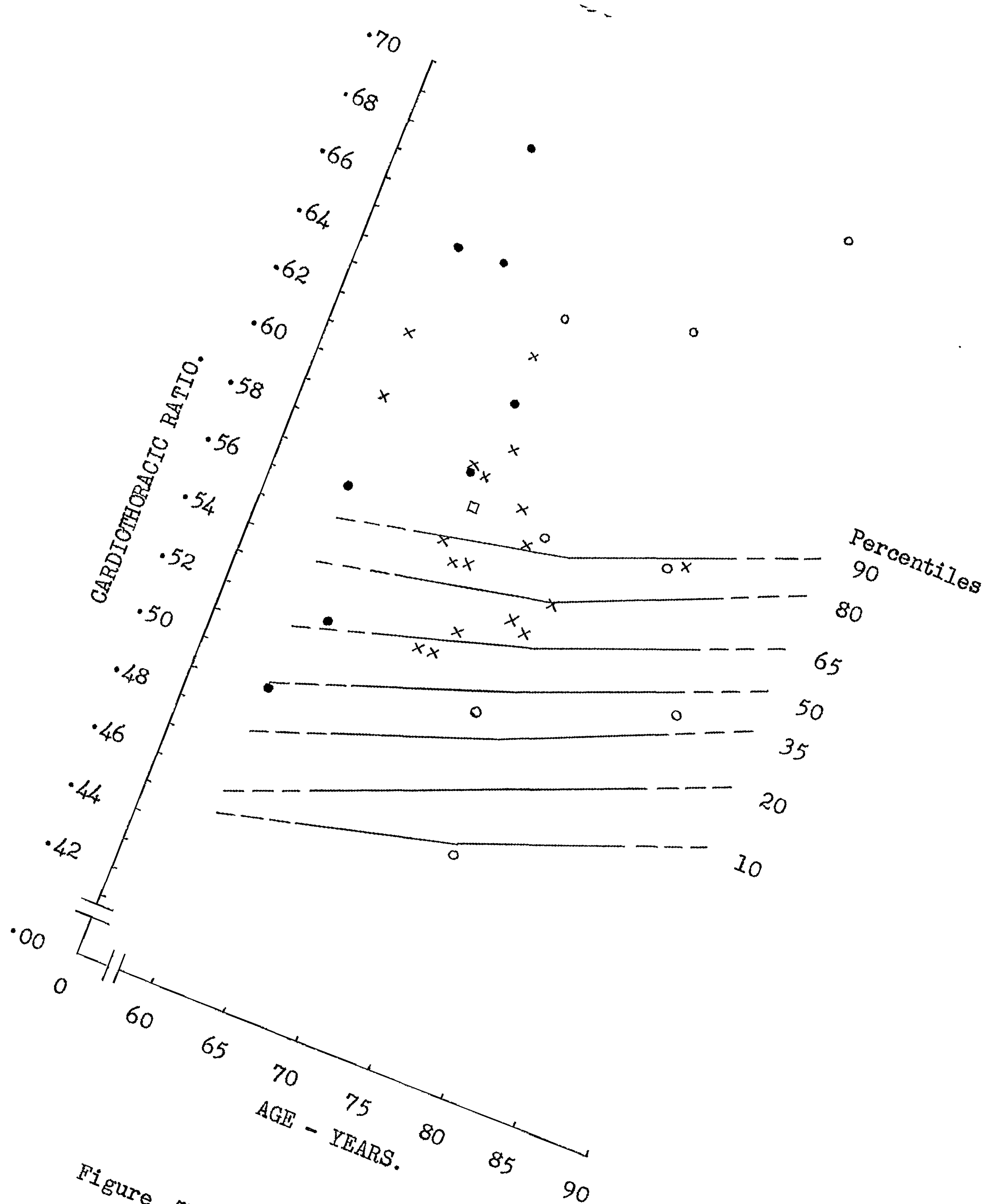
85
90
AGE – YEARS.

Figure 56.


CARDIOTHORACIC RATIO.
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AGE - YEARS.
Percentiles
90
80
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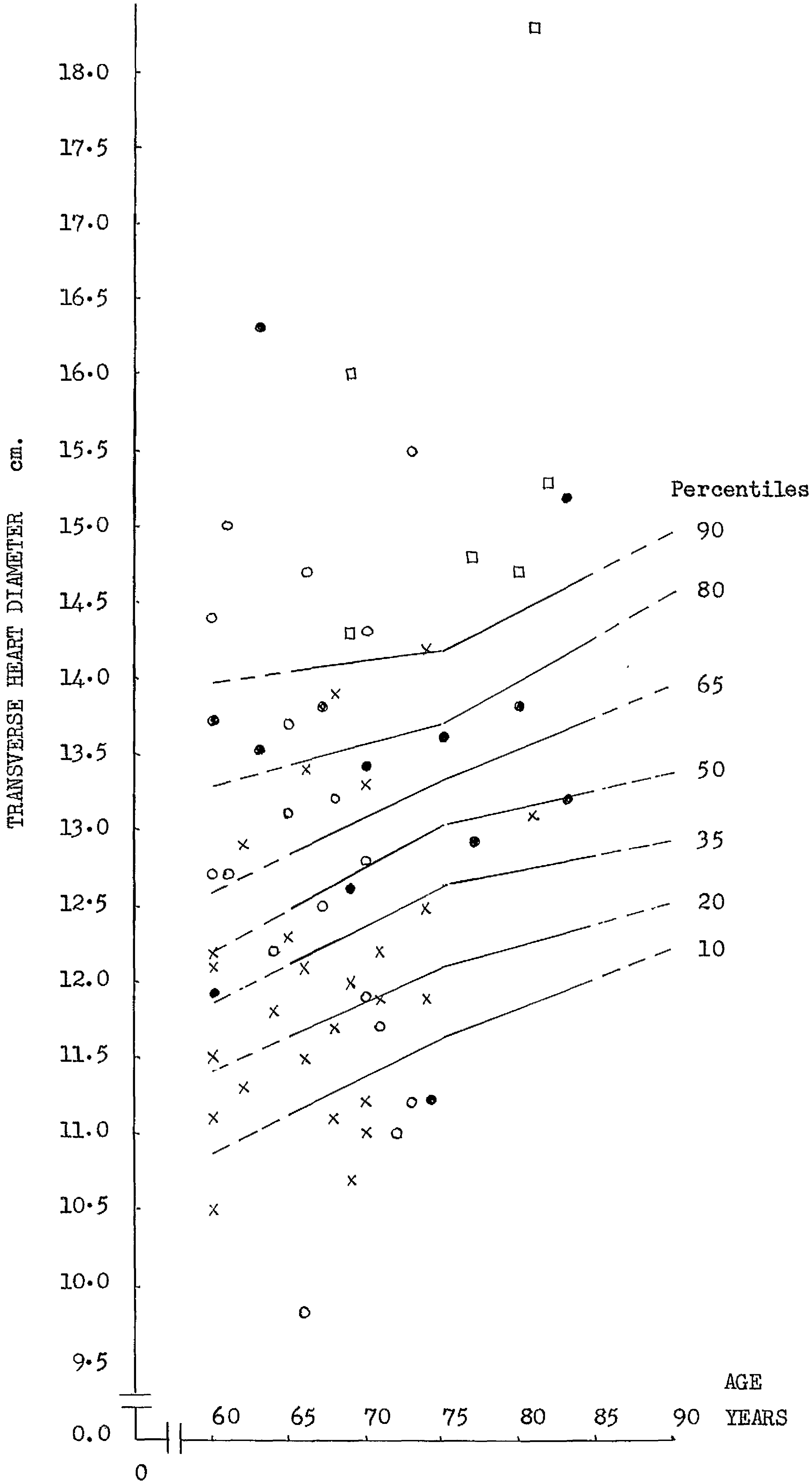
35
20
10

Figure 57.

Figure 58.


TRANSVERSE HEART DIAMETER cm.
18.0
17.5
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Percentiles
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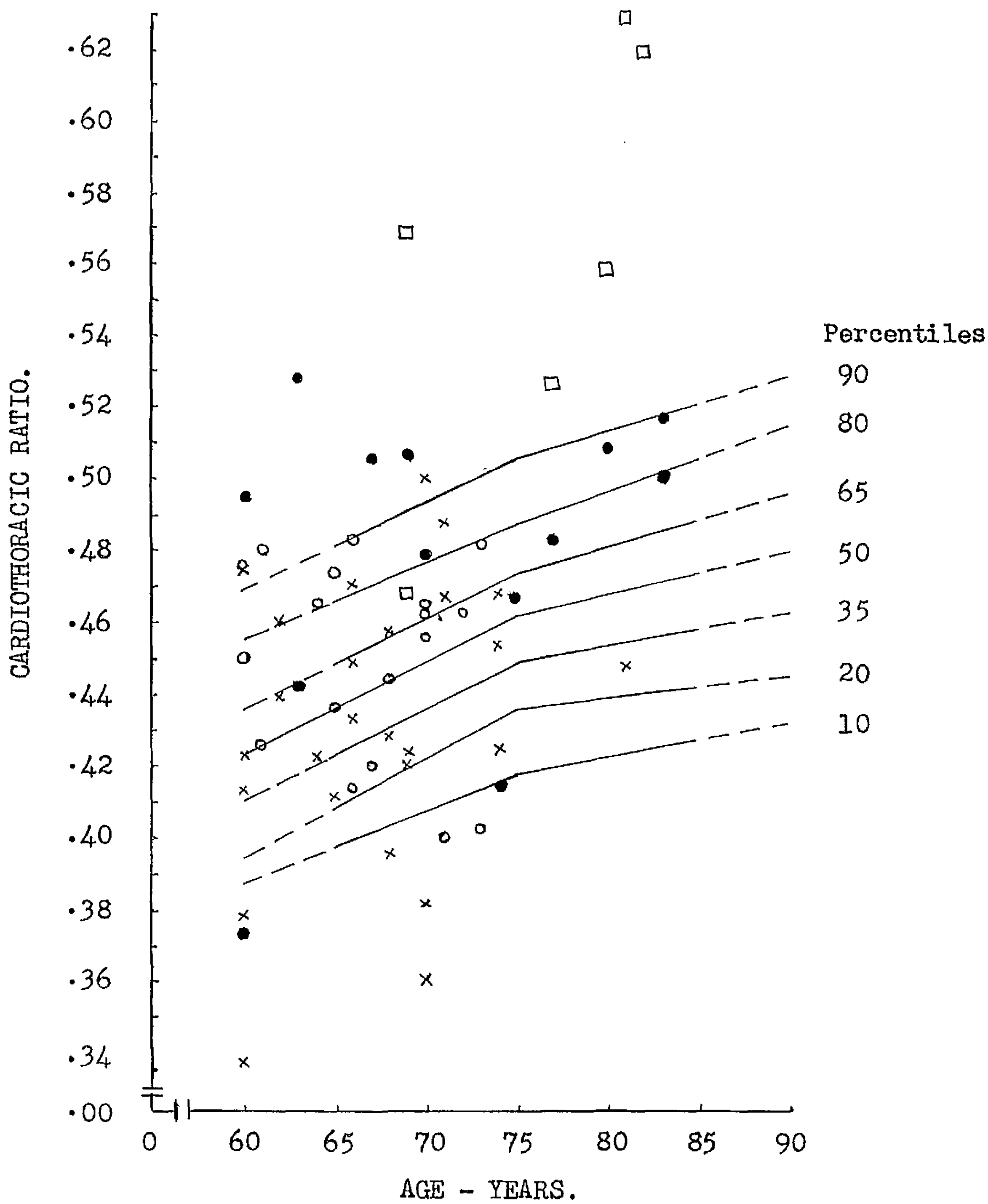
60 65 70 75 80 85 90
AGE
YEARS


CARDIOTHORACIC RATIO.
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Percentiles
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75
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85
90
AGE - YEARS.

Figure 59.

The data relating to coronary artery occlusion are as follows: -

MEN.

Age	Chest diameter - transverse cm.	Heart diameter - transverse cm.	Cardiothoracic ratio
60	29.1	13.5	.4639
60	32.0	14.1	.4406
60	29.3	13.8	.4710
61	31.4	15.5	.4936
61	29.3	13.4	.4573
61	27.8	13.5	.4856
61	30.3	12.9	.4257
62	29.1	13.7	.4708
64	26.7	13.4	.5019
64	30.3	15.7	.5181
65	28.7	13.2	.4599
65	26.7	16.0	.5992
66	28.6	13.4	.4685
66	29.8	13.9	.4664
67	31.8	14.7	.4623
67	27.9	13.8	.4946
67	28.4	13.6	.4789
67	26.6	12.9	.4850
67	29.7	14.2	.4781
68	30.1	14.3	.4751
68	28.8	14.7	.5104
68	29.5	12.9	.4373
69	30.7	12.4	.4039
69	28.7	13.5	.4704
70	29.9	17.9	.5987
72	31.2	13.5	.4327
72	26.6	15.3	.5752
73	24.9	11.3	.4538
73	29.0	15.4	.5310
74	27.9	14.1	.5054
75	28.3	14.6	.5159
75	31.7	14.4	.4543
75	31.5	16.4	.5206
76	27.9	13.3	.4767
77	26.4	16.5	.6250
79	30.9	16.2	.5243

WOMEN.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	25.1	14.6	.5817
60	25.0	14.1	.5640
60	27.4	14.5	.5292
62	22.0	12.0	.5454
64	26.3	13.2	.5019
66	24.8	13.7	.5524
66	27.1	13.4	.4945
67	25.2	13.1	.5198
69	26.0	12.5	.4808
70	21.7	12.4	.5714
71	28.3	12.1	.4276
71	23.8	16.2	.6807
73	25.8	12.4	.4806
75	23.5	13.2	.5617
75	22.3	13.2	.5919

The data relating to nonvalvular heart disease other than coronary artery occlusion are as follows: -

MEN.

(·) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
62	29.7	12.8	.4310
65	30.0	14.1	.4700
65	25.3	16.8	.6640
65	30.2	12.9	.4271
66	32.2	16.3	.5062
66	32.0	14.4	.4500
67	31.1	16.3	.5241
68	28.9	14.2	.4913
68	30.9	13.7	.4434
68	28.9	17.3	.5986
68	27.8	14.4	.5180
69	31.9	14.7	.4608
70	27.7	13.9	.5018
72	26.2	14.0	.5343
73	31.0	13.9	.4484
74	26.3	10.8	.4106
74	26.8	14.9	.5560
74	29.4	16.3	.5544
74	31.6	15.7	.4968
74	28.8	15.1	.5243
75	32.1	15.7	.4891
76	25.1	15.4	.6135
77	28.9	15.5	.5363
77	26.3	14.7	.5589
78	30.5	14.4	.4721
78	31.9	16.2	.5078
80	29.7	18.4	.6195
81	30.3	15.6	.5148
82	30.4	14.8	.4868
83	25.6	15.0	.5859

(o) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	31.9	11.9	.3730
60	27.7	13.7	.4948
63	30.6	13.5	.4412
63	30.9	16.3	.5275

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
67	27.3	13.8	.5055
69	24.9	12.6	.5060
70	28.0	13.4	.4786
74	26.9	11.2	.4164
75	29.2	13.6	.4657
77	26.7	12.9	.4831
80	27.1	13.8	.5092
83	29.4	15.2	.5170
83	26.3	13.2	.5019

(x) group.

60	28.6	13.9	.4860
61	28.0	15.1	.5393
63	28.9	14.3	.4948
66	32.6	14.7	.4509
66	28.0	15.9	.5679
67	30.4	14.3	.4704
67	27.5	12.6	.4582
73	29.8	15.3	.5134
73	28.1	14.6	.5196
74	29.9	15.8	.5284
75	28.1	14.5	.5160
75	27.9	13.2	.4731
75	27.1	15.1	.5572
78	30.4	16.1	.5296
79	29.3	14.4	.4915
88	27.6	15.4	.5580

WOMEN.

(o) group.

60	25.4	11.4	.4488
61	23.9	14.7	.6151
63	27.5	15.1	.5491
63	23.8	12.6	.5294
65	23.1	13.0	.5628
66	23.4	12.2	.5214
66	24.6	13.9	.5650
66	24.0	14.0	.5833
66	22.5	15.1	.6711
66	25.7	12.3	.4786
67	25.1	15.0	.5976
69	23.7	14.8	.6245

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
70	23.1	16.1	.6970
72	23.1	15.9	.6883
72	22.7	14.3	.6299
74	25.1	12.9	.5139
75	24.1	13.4	.5560
80	25.3	14.7	.5810
82	24.1	15.0	.6244

(x) group.

60	27.8	14.9	.5360
65	28.2	14.3	.5071
66	27.1	15.3	.5646
67	28.2	16.3	.5780
68	22.7	11.3	.4978
68	23.1	13.6	.5887
70	27.5	12.1	.4400
74	24.8	14.7	.5927
74	24.8	18.2	.7339
75	26.0	13.6	.5231
76	26.8	13.7	.5112

(·) group.

60	23.4	11.3	.4829
62	26.2	12.5	.4771
63	23.0	12.4	.5391
64	23.0	12.7	.5522
65	24.9	13.1	.5261
67	23.2	13.7	.5905
68	26.3	14.1	.5361
69	25.2	13.2	.5238
69	26.4	15.1	.5720
71	24.7	12.1	.4899
73	24.3	13.8	.5679
73	21.2	12.1	.5707
73	23.1	11.6	.5022
75	25.2	12.0	.4762
75	23.6	11.7	.4958
76	22.3	11.6	.5202
77	23.5	12.6	.5362
78	24.1	13.4	.5560

The data relating to probable valvular heart disease are as follows: -

MEN.

(·) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	28.6	15.3	.5350
61	29.1	15.6	.5361
62	26.1	14.6	.5594
63	30.3	17.2	.5677
63	29.2	13.8	.4726
64	27.0	14.8	.5481
66	30.6	14.7	.4804
67	29.4	14.5	.4932
68	28.3	15.8	.5583

(o) group.

69	28.1	16.0	.5694
69	30.5	14.3	.4688
77	28.1	14.8	.5267
80	26.3	14.7	.5589
81	29.1	18.3	.6289
82	24.7	15.3	.6194

(x) group.

61	27.1	14.1	.5203
67	24.9	15.5	.6225
67	29.0	13.4	.4621
68	32.1	15.9	.4953
69	30.6	15.0	.4902
70	26.9	13.8	.5130
71	28.5	12.4	.4351
72	28.1	16.2	.5765
72	27.8	13.1	.4712
80	29.3	14.2	.4846

(□) group.

68	28.9	13.5	.4671
76	28.8	14.4	.5000

WOMEN.

(·) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	25.4	12.5	.4921
60	26.1	14.7	.5632
61	25.3	16.4	.6482
62	25.6	13.3	.5195
63	22.9	15.7	.6856
64	25.0	16.2	.6480
67	23.8	13.9	.5840
68	23.9	14.5	.6067

(o) group.

69	23.0	14.7	.6391
73	25.9	13.2	.5096
73	23.3	13.3	.5708
75	27.1	12.6	.4649
77	22.6	14.7	.6504
81	20.3	11.7	.5763
84	21.7	15.1	.6958
85	21.4	11.4	.5327

(x) group.

60	24.9	14.8	.5944
60	22.4	13.8	.6161
67	22.6	13.2	.5841
67	24.4	13.6	.5574
68	22.1	13.8	.6244
68	24.5	12.8	.5224
68	26.8	14.8	.5522
68	24.1	14.0	.5809
69	23.3	12.2	.5236
69	25.3	15.0	.5929
69	24.9	13.8	.5542
70	24.3	12.9	.5309
71	23.1	13.3	.5758
72	22.8	12.9	.5658
73	24.2	13.1	.5413
74	21.3	11.5	.5399
75	23.9	13.2	.5523
82	22.1	12.8	.5792

(□) group.

68	23.3	13.3	.5708

The data relating to chronic bronchitis are as follows: -

MEN.

(x) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	29.3	11.1	.3788
60	25.7	12.2	.4747
60	31.1	10.5	.3376
60	28.6	12.1	.4231
60	27.8	11.5	.4137
62	25.7	11.3	.4397
62	28.0	12.9	.4607
64	27.9	11.8	.4229
65	29.9	12.3	.4113
66	28.5	13.4	.4701
66	27.9	12.1	.4337
66	25.6	11.5	.4492
68	25.9	11.1	.4286
68	29.6	11.7	.3953
68	30.4	13.9	.4572
69	25.5	10.7	.4196
69	28.3	12.0	.4240
70	26.6	13.3	.5000
70	31.1	11.2	.3601
70	28.8	11.0	.3819
71	24.4	11.9	.4877
71	26.1	12.2	.4674
74	30.4	14.2	.4671
74	29.4	12.5	.4251
74	26.2	11.9	.4542
81	29.2	13.1	.4480

(o) group.

Age	Transverse chest diameter cm.	Transverse heart diameter cm.	Cardiothoracic ratio
60	30.3	14.4	.4752
60	28.3	12.7	.4488
61	31.2	15.0	.4808
61	29.8	12.7	.4262
64	26.2	12.2	.4656
65	30.1	13.1	.4352
65	28.9	13.7	.4740
66	23.7	9.8	.4135
66	30.4	.	.
67	29.8	12.5	.4195
68	29.7	13.2	.4444
70	27.7	12.8	.4621

Age	Transverse chest diameter	Transverse heart diameter	Cardiothoracic ratio
70	26.1	11.9	.4559
70	30.7	14.3	.4658
71	29.3	11.7	.3993
72	23.8	11.0	.4622
73	32.2	15.5	.4814
73	27.8	11.2	.4029

(·) group.

The data for this group are already recorded under nonvalvular heart disease other than coronary artery occlusion.

(□) group.

The data for this group are already recorded under probable valvular heart disease - group (o).

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