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LONGER LIFE - BETTER LIFE?

STUDIES ON MORTALITY, MORBIDITY AND
QUALITY OF LIFE AMONG ELDERLY PEOPLE

Katarina Wilhelmson



Göteborg, 2003



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LONGER LIFE - BETTER LIFE? STUDIES ON MORTALITY, MORBIDITY AND QUALITY OF LIFE AMONG ELDERLY PEOPLE

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Katarina Wilhelmson
leg läkare

Fakultetsopponent

Professor Ann-Katrin Granérus
Geriatriska kliniken, Universitetssjukhuset i Linköping

Avhandlingen baseras på följande delarbeten:

- I Wilhelmson K, Allebeck P, Berg S, Steen B. Mortality in three different cohorts of 70-year olds: The impact of social factors and health. *Aging Clin Exp Res* 2002; 14: 143-151
- II Wilhelmson K, Allebeck P, Steen B. Improved health among 70-year olds: Comparison of health indicators in three different birth cohorts. *Aging Clin Exp Res* 2002; 14: 361-370
- III Wilhelmson K, Rubenowitz Lundin E, Andersson C, Sundh V, Waern M. Interviews or medical records, which type of data yields the best health status information. Submitted
- IV Wilhelmson K, Andersson A, Waern M, Allebeck P. Elderly people's perspective on quality of life. Submitted
- V Waern M, Rubenowitz E, Wilhelmson K. Predictors of suicide in the old elderly. In press, *Gerontology* 2003;49. S Karger AG

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Katarina Wilhelmson, Departments of Social Medicine and Geriatric Medicine, Göteborg University, Box 453, SE-405 30 Göteborg, Sweden

ABSTRACT

Background: Life expectancy has been increasing, but whether or not the added years are years with good health and quality of life have been vividly debated. Knowledge of the health conditions among elderly is of increasing importance.

Aim:

- To analyse differences in mortality and morbidity in three cohorts of 70-year olds with special regard to the impact of social factors.
- To compare health information from interviews and medical records.
- To investigate what elderly people consider being important for their quality of life.
- To determine predictors for suicide among the old elderly (75+).

Methods: Paper I and II: Random samples of 70-year old people born in 1901/02 (n=973), 1906/07 (n=1036) and 1911/12 (n=619). They were examined and interviewed regarding social background, social network and health. Death records were obtained up to and including 1998. Paper III-V: 85 elderly suicide cases (65 years of age and above) and 153 randomly selected control persons were interviewed in persons or by proxy, and their medical records were reviewed.

Results: The later born cohorts had lower mortality compared to the first-born cohort. Participants not living in an institution, non-smokers and those with one or more diseases were among those who had lower mortality in the later born cohorts. There were fewer 70-year olds not feeling healthy, fewer having many symptoms and there were indications of better physical functioning in the later born cohorts. Medical records gave better information concerning specific diseases, while interview data provided better measures of impairments. Elderly persons consider health, social relations, functional ability and activities to be important to the quality of life. Family discord, severe physical illness, loneliness and depression were risk factors for suicide in the old elderly.

Conclusions: Good years seem to have been added - although we live longer with diseases. More good years can be gained with improvements in life style behavior and with continued improvements in health services and medical treatment. It is important to recognize and treat depressions among elderly people, especially in the context of severe illness and impairment.

Key words: mortality, morbidity, social factors, quality of life, suicide, aged, epidemiology, cohort studies

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Katarina Wilhelmson

Göteborg, 2003

Departments of Social Medicine and Geriatric Medicine,
Institute of Community Medicine
Göteborg University, Göteborg
SWEDEN



03032003

Distribution
Katarina Wilhelmson

Göteborg University
Department of Social Medicine
P.O. Box 453
SE-405 30 Göteborg, Sweden

Katarina.wilhelmson@socmed.gu.se

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ORIGINAL PUBLICATIONS

The thesis is based on the following papers, which will be referred to in the text by their Roman numerals.

Paper I

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Paper III

Wilhelmson K, Rubenowitz Lundin E, Andersson C, Sundh V, Waern M. Interviews or medical records, which type of data yields the best health status information. (Submitted, *Methods of Information in Medicine*)

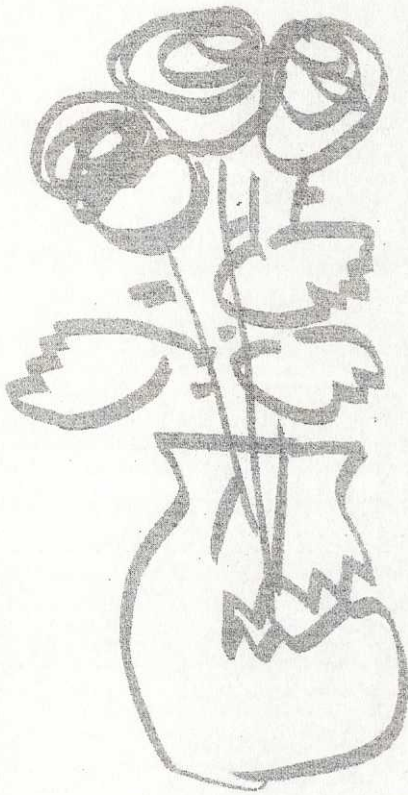
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Paper V

Waern M, Rubenowitz E, Wilhelmson K. Predictors of suicide in the old elderly. In press, *Gerontology* 2003;49. S Karger AG

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*och rosor i ett sprucket krus
är ändock alltid rosor*

Gustaf Fröding
Idealism och realism

Bild: Anders Wilhelmson

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TERMINOLOGY AND ABBREVIATIONS

ADL	Activities of daily living: personal care, tasks such as eating/drinking, personal hygiene, using the toilet, rising from a chair, getting in/out of bed, moving around indoors, dressing, walking outdoors.
CI	Confidence Interval
CIRS-G	Comprehensive Illness Rating Scale for Geriatrics
CPRS	Comprehensive Psychiatric Rating Scale
DALE	Disability adjusted life expectancy: The number of healthy years of life that can be expected on average in a given population.
Dependency	Need of help from others to maintain a normal life.
Disability	Inability to perform tasks in a normal manner.
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
GI	Gastro-intestinal
Functional limitations	Inability to perform specific physical or mental tasks used in daily life.
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
Impairment	The anatomical or physiological damage caused by disease or injury
Life Expectancy	The average number of years that a person can expect to live, usually based on contemporary death rates. May be calculated from birth, or from other ages.

Life span	The maximum number of years that a person has been known to live.
OR	Odds Ratio
Old old/old elderly	Aged 75 and over
Oldest old	Aged 80 and over
RA	The Augmented Rank-Order Agreement Coefficient
RP	Relative Position
RR	Relative Risk
SSRI	Selective Serotonin Reuptake Inhibitors
Young old	Aged 65 - 75
Younger/older cohort	used in paper I and II instead of earlier born/late born cohort, which is used in the thesis. Earlier born/late born are the terminology used in most of the recent studies, and is more appropriate, since the cohorts are the same age at the first examination but born in different years.
WHO	World Health Organization

INTRODUCTION

People born in the early years of the 20th century have experienced important changes in society. There has been a rapid development throughout the century, and several major events have occurred which have affected people's lives. The World War One and Two, the economic depression, urbanisation, great changes in the labour market, women entering the labour market, increased education, better living conditions, the introduction of television, and during the last decades the entrance of data and internet, are some of the most obvious changes. Society today depends on the technology to very great extent, while a hundred years ago most people depended on the capacity of their own bodies. The old of today had an upbringing very different from what we had, who are still in our working ages, and their circumstances as elderly differ in many aspects from that of their parents and grandparents at old age. This is important to be aware of when trying to assess the "lives" of people at older ages.

The health situation can be assessed and described in many ways. Historically, the first, and the easiest in the aspect of measure, was to compare the death rates. Mortality is undoubtedly a measure of health, and historically a better measure than it can be seen to be today. In the time when infectious diseases was the greatest threat to health status, and the mortality in infectious disease was high, mortality was a good measure of the health of a society. Due to the shift from infectious diseases to more chronic, non-fatal diseases, there was a need to use other measures. The International Classification of Diseases (ICD) began with comparing death causes in the late 1800's. In 1948 (ICD-6), WHO also included diseases, not merely death causes, to the classification. In the latest revision (ICD-10), there is now also the intention to compare and classify "related health problems". The importance of functional ability has led to another classification, the International Classification of Functioning, Disability and Health (ICF), since the health status can not merely be measured has diseases and diagnosis, and also taking into account contextual factors such as environment and personal factors. Kovács has examined different concepts of health, and has arrived at a definition of health as follows, "The healthier a physical or mental characteristic, process, reaction is, the more it makes it possible for the individual to adapt to reasonable social norms without pain and suffering, and the longer, and happier a life it will be able to ensure him in that society". He also stresses that it is impossible to define health and disease without paying attention to the notion of environment [1]. Fugelli and Ingstad found three characteristic qualities in lay perspective on health: wholeness: health is related to all aspects of life and society; pragmatism: health is experienced and evaluated according to what people find reasonable to expect, given their age, medical condition and social situation; and individualism: every human being is unique, and health and strategies for health must be individualised [2]. Quality of life has become

increasingly important as an outcome in medical research during later decades, and many quality of life instruments have been developed in order to compare the quality of life between individuals and between populations.

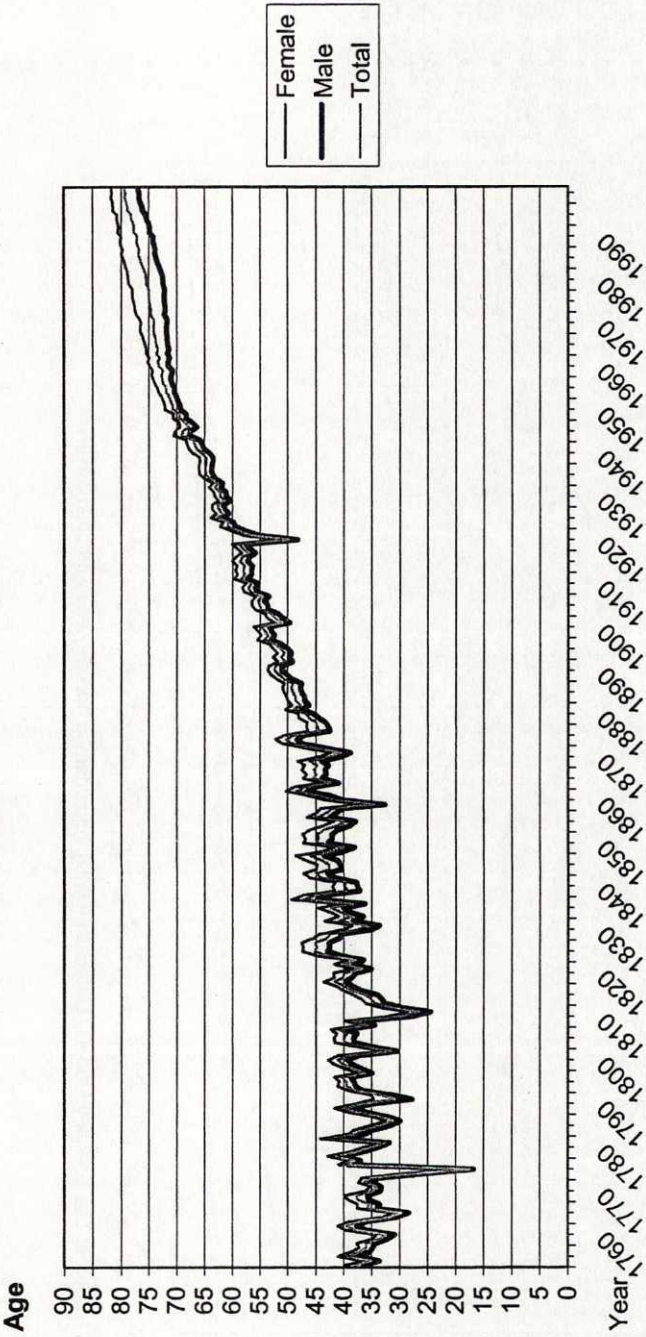
BACKGROUND

Historical data

The first collection of national population data began around 1750 in Sweden and Finland. Before that, not much is known about how long humans lived. It has been estimated that life expectancy at birth could have been around 20-30 years. The rise in life expectancy probably began before the industrialisation. The average life expectancy at birth in Sweden from 1751 to 1999 is shown in figure 1. By 1750, it was 38 years in Sweden. Then there was a slow and irregular increase for a century or more. After 1870, life expectancy rose quite rapidly in industrialised countries. By 1900, life expectancy had doubled, and by 2000 tripled (figure 1). Similar development has been observed in most industrial nations [3,4]. Life expectancy has increased substantially in the developed countries during the 20th century. For example, the life expectancy at birth was 48.3 for men and 51.1 for women in the US around 1900, and increased to 74.2 and 79.9, respectively, in year 2000 [5,6]. For Sweden, the corresponding figures were 52.8 for men and 55.3 for women in 1900, and 77.0 and 82.4 in year 2000. Developed countries are experiencing an aging population, due to increasing survival into old age and a decrease in number of births [3]. Now, the rise in life expectancy has slowed down, due to the fact that it now depends on the reduction of death rates at older ages. However, the reduction of death rates has not slowed down. The decline of mortality at older ages has accelerated since around 1970 [4]. Female death rates at older ages have fallen since 1950, with large absolute reductions at advanced ages. Men have experienced a similar pattern, though the progress in reducing male mortality has generally been slower than for females. In all ages, men have higher death rates than women [7]. Half of the female and a third of the male deaths are now occurring after age 80 in developed countries [8]. The decreasing death risks for the older age groups in Sweden, 1861-1999, are shown in figure 2.

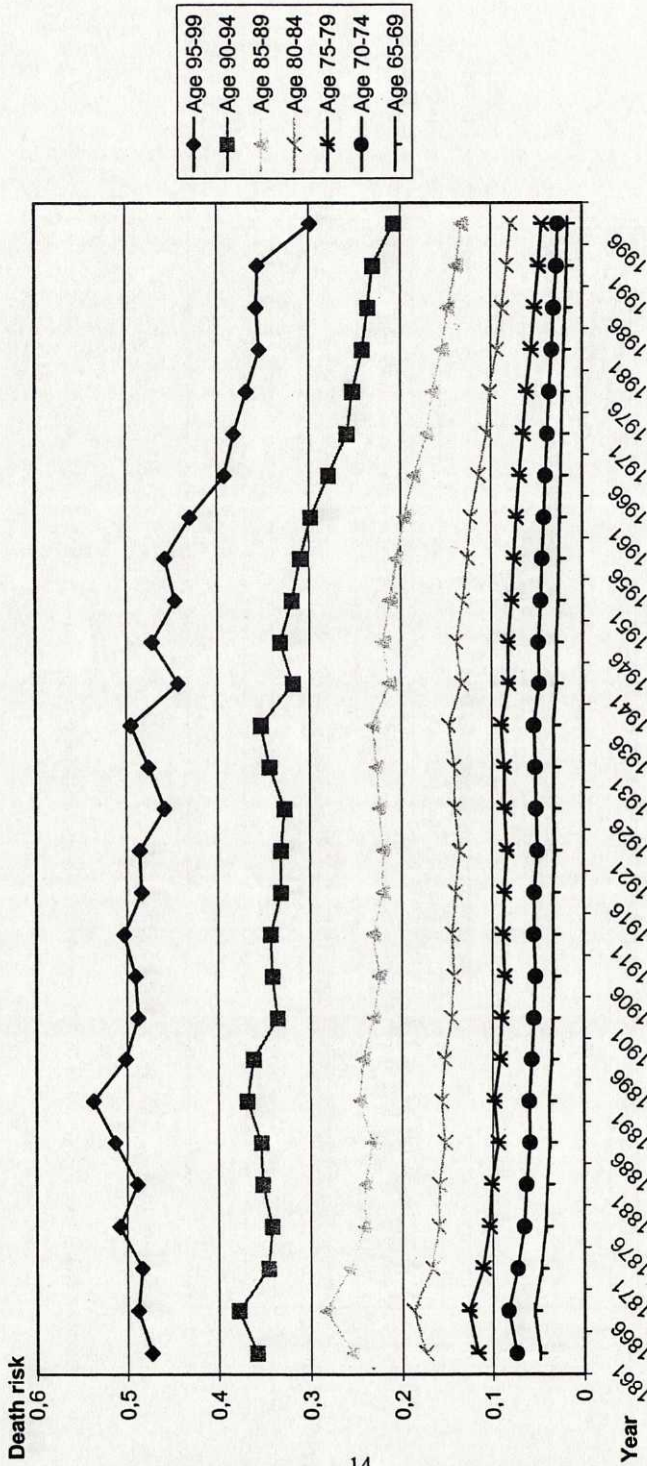
The average national gain in life expectancy at birth has been 66% for men and 71% for women from 1900 to 1990. For some nations, like Portugal and Spain, life expectancy has more than doubled during the same period. Japan and Singapore has now reached 80 years in life expectancy at birth. The relative difference between the developed countries in life expectancy has narrowed with time, and the female versus male difference has widened [5,6]. Now, women outlive men by between 5 – 9 years, compared to 2 – 3 years in 1900. The gap

Figure 1. Life expectancy at birth, Sweden, 1751 to 1999



Source: the Berkeley Mortality Database (BMD), <http://demog.berkeley.edu/wilmoth/mortality>

Figure 2. Death risks/year for different age-groups, 1861-1999, Sweden



Source: The Berkeley Mortality Database (BMD), <http://demog.berkeley.edu/wilmoth/mortality>

appears to have levelled off during recent years in several countries, among them Sweden and the US [5,9], as can be seen in figure 1 for Sweden. However, some very low mortality countries, like Japan and Switzerland are still experiencing an increase in the gender gap. The gender gap is usually smaller in developing countries [5,6].

There have been some exceptions from the life expectancy increase during the 20th century. The mortality decline slowed temporarily during the 1950s and '60s for many developed countries [3,10]. During the 1990s there were a stagnation and even reversal of earlier progress in parts of Africa, due to the AIDS epidemic, and in parts of the former Soviet bloc due to social disruptions and instability [4].

Sweden has one of the oldest populations in the world, and Sweden has historically led the world in longevity, although Japan now has passed Sweden as the country with the highest life expectancy at birth [11]. In 1995, Sweden was the demographically oldest of the world's nations, with 18% of the population aged 65 and over [12]. In year 2000, Italy and Japan had the demographically oldest populations measured as percent of population 65 years and over [13]. The maximum age at death in Sweden rose from about 101 years during the 1860s to about 108 years during the 1990s. The pace of increase accelerated after 1969, due to the faster decline in old-age mortality during recent decades [14], and the trends in death rates and in maximal ages at death show no sign of approaching a finite limit [3]. But for life expectancy to raise significantly during the 21st century it requires much larger mortality reductions at older ages [15].

Before the 1960s, infectious diseases were the major cause of death. It has now been replaced by cardiovascular disease as the major death cause for both men and women (in the developed countries as well as in many developing countries), although death rate due to cardiovascular disease has declined at older ages in many developed countries [6,10,16]. Cancer is usually the number two on the list of major death causes, with different changes over time for different types of cancer. Suicide rates are higher in ages over 75 than in younger ages, especially for men, and there is no clear trend in elderly suicide rates in the developed countries [6,10]. It has been predicted that suicide will become the tenth most common cause of death by year 2020 [17].

The shift in disease patterns can be referred to as the epidemiologic transition, which can be described in four stages. The first stage is "the age of pestilence and famine", probably lasting for about thousands of years during which it was a stagnation of death rates at extremely high levels. Death rates fluctuated due to epidemics. The major killers included influenza, pneumonia, diarrhoea, smallpox and tuberculosis. Infant and child mortality was high, and life

expectancy was around 20-40 years. The second stage was “the age of receding pandemics”, during which there were rapid improvements in sanitation and standards of living. There was a redistribution of death from the young to the old, and life expectancy increased to about 50 years. The third stage, “the age of degenerative and man-made diseases”, can be described as a plateau phase. The major causes of death were established as chronic degenerative diseases, such as heart, cancer and stroke, which tend to kill at old ages. The life expectancy reaches the seventh decades. We are now experiencing the fourth stage “the age of delayed degenerative diseases”, characterised by rapid mortality declines in advanced ages, due to a postponement of the ages at which degenerative diseases tend to kill. Rapidly declining death rates are seen mostly in advanced ages, for both sexes, due to the development of new drugs and treatments of degenerative diseases. Life expectancy will reach and perhaps go beyond the eight decades [18].

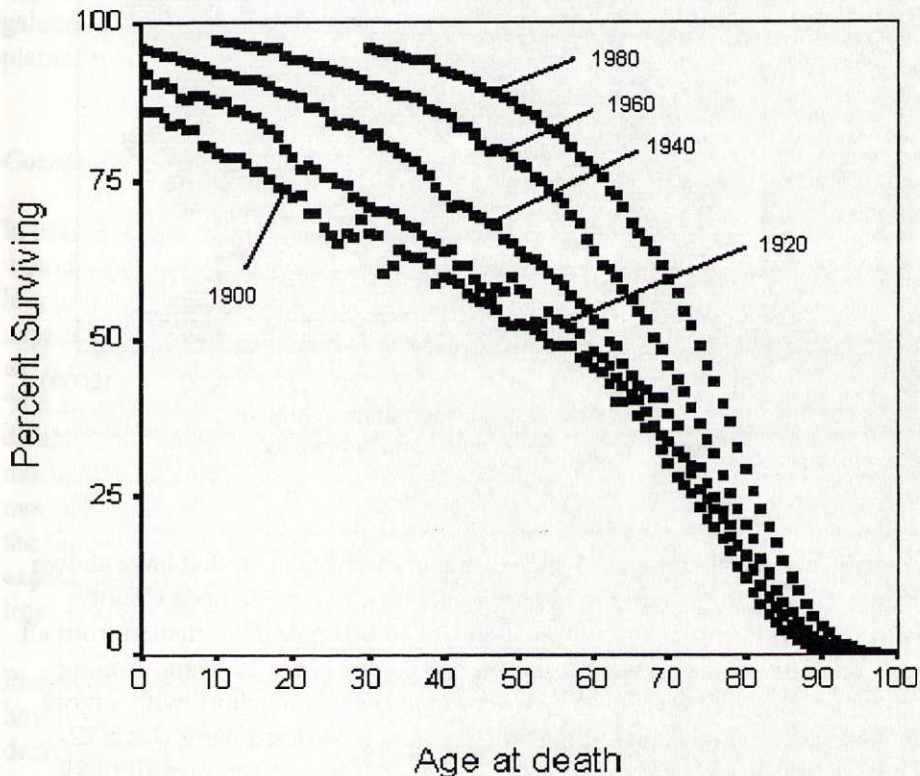
Compression of mortality

In 1900, the infant mortality was high and there was also a relatively high mortality through the middle years and a gradual increase at later ages. The mortality was mainly due to acute, often infectious diseases [5,19]. During the 20th century, there was a major decline in the prevalence in tuberculosis, acute rheumatic fever, smallpox, diphtheria, tetanus, poliomyelitis and pneumococcal pneumonia in the young. This was due to for example improved nutrition, better living conditions, water sterilization, personal hygiene, public health and also immunization, medical care and new treatments (such as antibiotics) [3,20]. There has been a shift in the distribution of causes of death from acute infectious diseases to more chronic degenerative diseases [11], the so-called epidemiological transition. Reductions in death rates among infants and children give much greater improvement in the average length of life than similar reductions at older ages [3]. Due to the decreased mortality at younger ages, the survival curve has become more and more rectangular [3,19], with now a very low infant mortality, low mortality in the middle years and more people dying at high ages, as shown in figure 3. Fries postulated in 1980 that more and more people would die at about the same age, “compression of mortality”. He also estimated that it would occur at about age 85. This has been debated ever since, and there are arguments both for [21,22] and against the hypothesis of compression of mortality [23,24].

With decreased mortality in younger ages and decreased fertility, many developed nations experience an aging population. In Sweden, those 65 years of age and older constituted 8,4% in 1900 compared to 17,5% in 1995, an increase by 359%, and those aged 80 and over constituted 1,1% in 1900 and 4,7% in 1995, an increase by 757%. In the same period, the total Swedish population

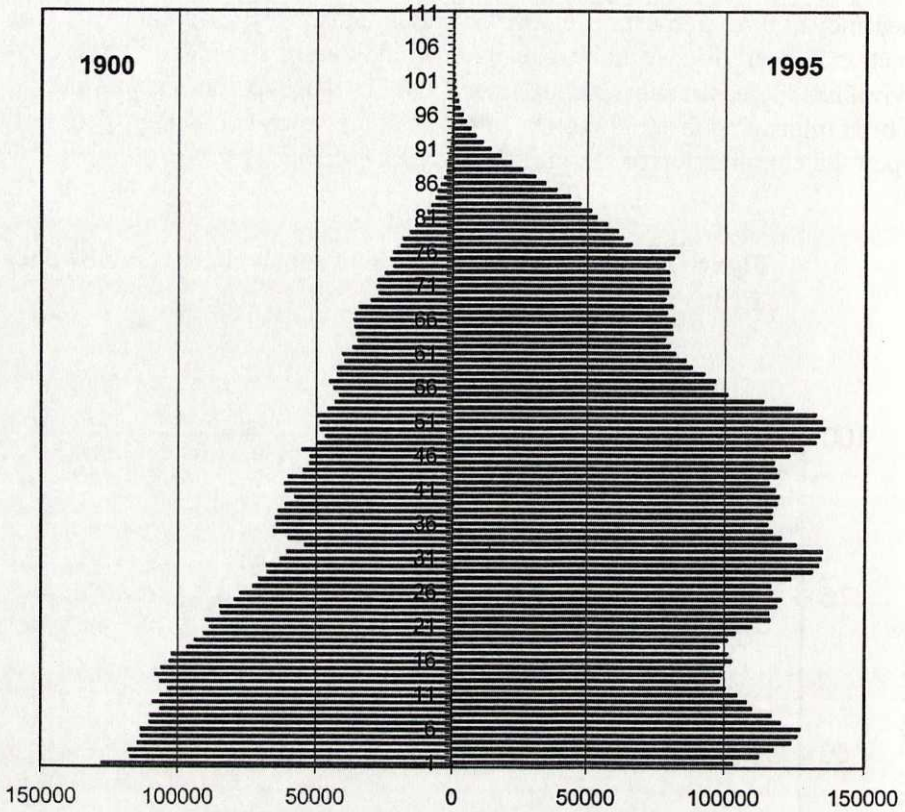
increased by 172% (Source: Berkeley Mortality Database) [25]. The population for Sweden 1900 and 1995 is shown in figure 4. It has been projected that the population aged 85 and over will increase by 350% between 2000 and 2050 in the US [26]. Life expectancy at age 65 is now increasing more rapidly than life expectancy at birth in most developed countries. This is primarily due to reduction in heart disease and stroke among middle-aged and older. Old-age survival has increased substantially since 1950 [7]. The fact that the mortality has been improving faster at the very old than at the younger old ages, does not support the compression of mortality hypothesis [5].

Figure 3. The rectangularisation of survival curves in Sweden during the 20th century



Source: The Berkeley Mortality Database (BMD), <http://demog.berkeley.edu.wilmoth/mortality>

Figure 4. Swedish population 1900 and 1995



Source: The Berkeley Mortality Database (BMD),
<http://demog.berkeley.edu/wilmoth/mortality>

There are a few population-based studies, mainly from the US, that have shown lower mortality among elderly in later born cohorts. In the Alameda County Study in California two cohorts from 1965 and 1974, randomly selected from all noninstitutionalized adults, were followed prospectively for 17 years. Among men, the mortality risk was 30-45% lower in the later born cohort, with a more pronounced reduced mortality in higher ages. Among women there was a 22-40% decline for those less than 80 years, and a 12% decline for ages 80 to 89 [27]. Three cohorts of women and men aged 50-59 years in 1950, 1960 and 1970 respectively have been followed for 20 years within the Framingham study. Cardiovascular mortality declined 59% among women and 53% among men between the cohorts. All-cause mortality declined 17% among women and 18% among men [28]. Also in Italy, there was a decline in both total mortality

and in cardiovascular mortality from 1982 to 1993, for people aged 75 or above [29].

Thus, data are indicating that we are living longer, and most demographers think that we will live even longer in the future [30]. It is, however, not known if the increased longevity is evenly distributed in groups with different social background and health conditions. Earlier studies have investigated predictors for life expectancy at older ages. Ljungquist found that health and physical activity had the greatest impact [31]. Self-rated health, as well as a number of social factors, such as marital status, occupation, socio-economic status and social network, is known to have impact on health and survival [31-37].

Whether or not the increased survival is more or less pronounced in groups with different social or health-related background is poorly known. There is thus need for knowledge about changes in mortality among elderly over time, differentiating according to social and other background factors. It would be important to know whether persons with good socio-economic conditions have gained more than those with poor conditions. More information is needed for planning of health care and prevention services.

Compression of morbidity

In his classical article from 1980, Fries also hypothesised that the morbidity would be postponed into later ages, and more so than the mortality, giving us less years with ill health, "compression of morbidity" [19]. Whether this is happening or not, have been debated ever since [38-45]. One alternative is that we are prolonging the time with ill health, due to morbidity not being postponed, "the expansion", "extension" or "prolongation of morbidity", or "pandemic of disabilities" [40,43,46]. An other scenario could be "postponement of morbidity", longer life but still the same amount of years with ill health, because mortality and morbidity is postponed to the same degree [41,47]. There is also the theory of "dynamic equilibrium", that postulates that although increasing life expectancy does lead to more disease and disability, they will gradually become less serious as each successive generation becomes healthier [44,46,48].

Previous studies that have compared the morbidity in different cohorts of elderly have come to somewhat contradictory results. There have been reports of decreasing prevalence of cardiovascular diseases, arthritis and emphysema, and increase in orthopedic disorders such as hip fractures and other osteoporotic fractures [49-51]. In the Framingham Study, a decrease was found in stroke severity in both sexes as well as a decrease in stroke incidence among women [52]. In the Manitoba Longitudinal Study on Aging there was an increase in number of reported health problems in later born cohorts [53]. Some studies have reported an increase in self-perceived health in later born cohorts [54-56],

while others have reported a decrease [53,57-59], and some could not find any difference in self-perceived health [60]. Improvements in social conditions such as housing, has been reported [61-63], and also better education in later born cohorts [62,63]. There have also been changes in life-style, such as smoking, and increase in educational level [56]. In the Gerontological and Geriatric Population Studies in Göteborg (H70), there was an increase in the prevalence of smoking among women and a decrease among men [63]. The Alameda County Study has also found improvements in some risk factors [27]. Concerning disability, there have been many recent reports of decrease in later born cohorts. Many of the studies are from the US, but there are also reports from other developed countries, including Sweden [50,64-75]. Studies with more recent data show the greatest declines in disability, and the rates of decline seem to have accelerated after 1994 [76]. However, Winblad et al found a decrease in disability only for women [77], Picavet and Hoeymans found that the prevalence of mobility disability dropped slightly for men between 1990 and 1998, but not for women [78].

According to World Health Report 2000 [79], Japan leads the world's estimated average healthy life expectancy (measured as DALE = disability adjusted life expectancy) with 74.5 years at birth 1999. Sweden was ranked on 4th place, with 73.0 DALE. The results from the Global Burden of Disease Study suggest that populations with higher mortality have higher prevalence of disability, and the proportion of the expected life span with disability declines as life expectancy rises [80]. Robine et al report increases in disability free life expectancy that exceeds the increase in life expectancy during the last decade, giving a compression of morbidity [81]. As Mathers et al conclude: higher life expectancy at birth is associated with a compression of morbidity, fewer expected years of good health are lost due to the non-fatal consequences of diseases and injury as mortality rates declines [79]. Heart disease, osteoarthritis, hip fracture, diabetes, intermittent claudication, stroke, chronic obstructive pulmonary disease, visual impairment, hearing impairment, depression and cognitive impairment are among chronic diseases that have been found to be strongly related to disability [45].

The reason for the decline in disability is probably multifactorial. Reasons discussed has been improved technology (e.g. improved surgery for example joint replacement and cataract and new pharmaceutical drugs), changes in socioeconomic status with fewer manual jobs and higher education, behavioral changes such as smoking and physical activity, use of assistive devices and reduces exposure to infectious diseases [67,76,82], but the reduction in disability is still largely unexplained [76]. One way to enhance the knowledge is to investigate if the reduction in disability varies between different subgroups regarding socioeconomic factors and health status.

Although it is known that socio-economic status influences the health status and disability [45,83-85], few studies has focused on trends in disparities for major demographic and socio-economic groups, and considerable gaps in our understanding of trends in disparities across major demographic groups remains [73]. For the planning of future health care and preventive services, it is important to know how the development is distributed in different subgroups concerning social background and health status. As Freedman et al argue “A thorough understanding of trends in disparities is critical not only for identifying groups that might benefit from various health-related interventions but also for projecting the future course of population-level health trends.” [73].

Validity of health status information

Many of these studies concerning compression of morbidity have used self-reported data (through questionnaires or interviews) to assess the health status [73]. Other data sources available are medical records data, register data (which in many cases is based on medical records data or self-reported data) and medical examinations. The validity of the results depends highly on the validity of the measurements of health status. Thus, it is important to know what type of information the different data sources provide, and the accuracy of that information.

Many studies use either self-reported data or medical records data to assess the prevalence of chronic illness and impairment. Analyses of agreement between these two data sources have shown that they do not always provide the same information [86,87]. There are both studies that conclude that self-reported information is inaccurate [88] as well as those that regard self-reported data as very reliable sources of information [89].

When self-reported data and medical records are compared, data from medical records are often seen as the gold standard [86,90-92]. However, as Kvale et al discuss: “The most confounding problem in charts is that absence of information does not mean absence of a condition, symptom, or function” [93]. Many symptoms and impairments are not recorded in medical records, either because patients do not mention them to the physician or because the physician does not consider them relevant to what the patient is seeking for [93,94]. Physicians’ notes are known to have very little functional status documentation [95]. Self-reported data, however, provide information on symptoms and impairments that the person has never sought medical care for. On the other hand, there are many interviewed respondents who fail to report diagnoses found in medical records [96]. This could be due to recall bias, unawareness or misunderstanding of the diagnosis or unwillingness to report it. Another reason could be that the person does not have any symptoms of the disease and therefore does not find it worth

reporting. Medical records as data source on health status do only include people who have had contacts with medical care [92], and consequently medical records contains no information about those who has not had any contact with health care.

Agreement between self-reported data and medical records is known to vary by different diseases [87,97,98]. Earlier studies have shown that agreement is better for well-defined diagnoses, that are easy to explain and that require regular follow-up and treatment [89,94].

Neither medical records nor self-reported data can be regarded as “the gold standard”, since both lack information. Using both data sources ought to give a better picture and the opportunity to estimate which data source contributes most to the combined information.

Health and quality of life

Health is not easy to define, and there are many definitions. The word “health” comes from “Hal” in old English, meaning hale, whole, sound in wind and limb. The World Health Organization’s, WHO’s, definition is very broad “a state of complete physical, mental and social well being and not merely the absence of disease and infirmity” [99].

Health in old age cannot meaningfully be defined as the absence of disease [100]. For most of us, growing old does eventually involve living with chronic diseases, health problems and decreasing capacity. Older people may modify their criteria of perceived health so that deterioration of physical health loses its significance for perceived health [101]. For those with chronic disease, the goal of health care cannot always be freedom from disease. Instead, the goal can be to help persons to live as good a life as possible despite illness and impairments [102,103], that is, to maintain a good quality of life. Thus, health is not merely evaluated from diseases and impairments. It is also necessary to capture the individual and the individual’s social and material context. In such, it is close to the concept of quality of life.

Quality of life was first mentioned in 1920, but did not come into use until after the Second World War [104]. Social scientists started to use it in the 1970s [102]. In 1977, it became a key word in the Medical Subjects Headings. Since then, there has been an exponential rise in research in which quality of life is mentioned [104]. Now, a Medline search with quality of life as MeSH Major Topic yields over 12 000 hits. One out of many definitions is the definition by the WHOQOL Group: “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to

their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment" [105]. They state that the most important potential application of quality of life assessment is perhaps in sensitising health care professionals to look beyond diseases, disability and symptoms [106]. There is, however, no consensus definition of quality of life [107,108].

Many quality of life instruments have been developed during the last decades [104,109]. The impact of health status on the quality of life is often emphasized and many quality of life instruments measure general health status rather than quality of life [110-112]. Some use the term health-related quality of life [111,112] to emphasize that they measure the quality of life as influenced by health status, but the two terms are sometimes confounded [113,114]. There are many dimensions of quality of life besides health status and many quality of life instruments include different dimensions or domains such as physical functioning, emotional functioning, cognitive functioning, social functioning, life satisfaction, health perceptions, economic status, recreation, sexual functioning and energy and vitality [115]. Studies on quality of life in elderly have shown that functional capacity, perceived health, good housing conditions, an active life style and good social relationships are some of the factors that explain life satisfaction and subjective quality of life [102].

Health and socioeconomic conditions are factors that enhance quality of life, but good health and a good socio-economic situation do not guarantee a good quality of life [102]. The influence of health status on the quality of life is not easily understood. Functional status and symptoms may well have an impact on quality of life, but they are not synonymous with quality of life [116] and assumptions about the overall quality of life of individual patients should not be based on measures of their health status alone [117]. As Albrecht et al point out, there are many people who rate their quality of life as good or even very good despite poor health status – the "disability paradox" [118]. Strawbridge et al have shown that many elderly people with chronic conditions rate themselves as aging successfully [119].

Quality of life measurements have been criticized, since there is no clear definition of what quality of life is and how to operationalise it [116]. Gill and Feinstein found that only 11 out of 75 articles measuring quality of life, actually defined quality of life [113]. They conclude that quality of life can only suitably be measured by determining the opinions of patients and by supplementing (or replacing) the instruments developed by "experts" [113].

In order to help social and health services to assist persons to improve quality of life, there is a need to know what people themselves consider being important to

the quality of life. Few studies have asked individuals to define what they consider to be important for their quality of life [110]. In a Swedish study by Nilsson et al, they asked 87 healthy elderly persons "What does quality of life mean to you?". They found that the emphasis was on health and independence, contentment, and a peaceful life, personal integrity in terms of a moral and caring attitude [120]. In a study by Bowling, a random sample of 2000 adult members of the British population were asked about the most important things in their lives [121]. They were most likely to mention relationships with family or relatives, followed by their own health. Similar results were reported by Farquhar, who found that social contacts appeared to be as valued components of a good quality of life in the elderly (aged 65 and over) as health status [122]. Information of what elderly people consider constituting quality of life is still scarce. To be able to assess the quality of life of elderly people, it is vital to know what the individuals themselves consider to be important for their quality of life. One way to enhance the knowledge is to ask elderly persons themselves, what they consider to be quality of life, and to explore the importance of gender, age and health status on what is considered to be important to quality of life.

Suicide and elderly people

To choose to end your own life implies that you cannot see any hope for the future and that death is seen better than life. Thus, suicide can be seen as the extreme of bad quality of life. The suicide rates are highest among old persons in almost all industrialised countries [123,124]. Old age is often accompanied with deterioration in health status and physical function, as well as losses of social roles and relations, due to the own ill health and also to close friends growing older, which might explain the high suicide rates among elderly people. Most countries are experiencing a growing proportion of elderly, and suicidologists predict a dramatic increase in both rate and the total number of late-life suicides over the next three decades [125]. Suicide is predicted to be the tenth most common cause of death by year 2002 [17].

It is not known if there is any significant alteration in prevalence of suicidal ideation of over the life course [126]. In a population-based study of 85-years olds in Göteborg, Sweden, 15.9% of the subjects reported suicidal feelings last month [127], which is in accordance with another Swedish study reporting 13.3% of elderly having suicidal thoughts the last two weeks [128]. However, suicidal feelings are much less frequent among mentally healthy. In the study in Göteborg, only 4.0% of the mentally healthy 85-years old had thought that life was not worth living during the last month, 4.0% had had death wishes, 0.9% had thought of taking their own life and none had seriously considered suicide. Among subjects with mental disorders had 29% thought that life was not worth living, 27.5% had had death wishes, 9.2% had thought about taking their lives

and 1.7% had seriously considered suicide. The frequency of suicidal feelings was significantly higher among subjects with all types of mental disorders, especially depressive disorders [127]. Suicidal thoughts among elderly have also been found to be associated with increased disability in daily living, institutionalisation, visual problems and the use of psychotropic drugs [128]. Although the suicide rates are high at old ages, it is known that older adults have the lowest rates of attempted suicide across the life span [123], and elderly people who attempt suicide have a high mortality both from completed suicide and death from other causes [129].

A number of recent studies have characterised persons who commit suicide in later life [130-136]. They all found that most elderly persons who commit suicide suffer from depression. Suicide appears to be more strongly associated with depression in the elderly than in the younger age groups [137]. Other risk factors are other mental disorders, personality disorder and personality trait accentuation, physical illness, functional limitations, limited social network and family discord [131-136,138-143].

There is some evidence that the prevalence of depression may increase after the age of 75 –80. Reasons for this include social isolation, institution, bereavement, impaired activities of daily living and declining physical health [144], and it has been shown that the presence of multiple chronic medical conditions increases the likelihood of depressive symptoms [145]. The majority of suicide victims with serious physical illness also suffers from psychiatric illness, particularly affective disorders [125]. Conwell et al state that physical illness and functional impairment increase the risk of suicide in late life, but their influence appears to be mediated by depression [138].

All these studies investigating risk factors for suicide in later life include also the young elderly, some even in their early fifties. There is a lack of controlled studies that specifically address risk factors for suicide in the old elderly, despite the disproportionate suicide mortality in this age group. Increased knowledge about the risk factors enhances our possibilities to prevent suicides and improve the quality of life of those in risk of committing suicide.

AIMS OF THE THESIS

Overall aim

The overall aim of the thesis was to analyse aspects of mortality, morbidity and quality of life among elderly people

Specific aims

The specific aims of the thesis were

- to analyse differences in mortality in three different cohorts of 70-year-olds, and to examine whether the development of mortality differed in subgroups according to social background, social network, self-assessed health and number of diseases at age 70.
- to analyse differences in morbidity – measured as self-assessed health, number of symptoms, number of diseases and physical function – in three different cohorts of 70-year olds, with special regard to the impact of social factors on the development of morbidity
- to compare data from interviews and medical records regarding diseases, symptoms and impairments among elderly, and to analyse the agreement between a consensus from both data sources and data from interviews and medical records, respectively.
- to investigate what elderly people consider to be important for their quality of life, and to explore the impact of gender, social factors and health status on individuals' perspective of quality of life.
- to determine predictors of suicide in persons aged 75 and above.

METHODS

Design of paper I-II

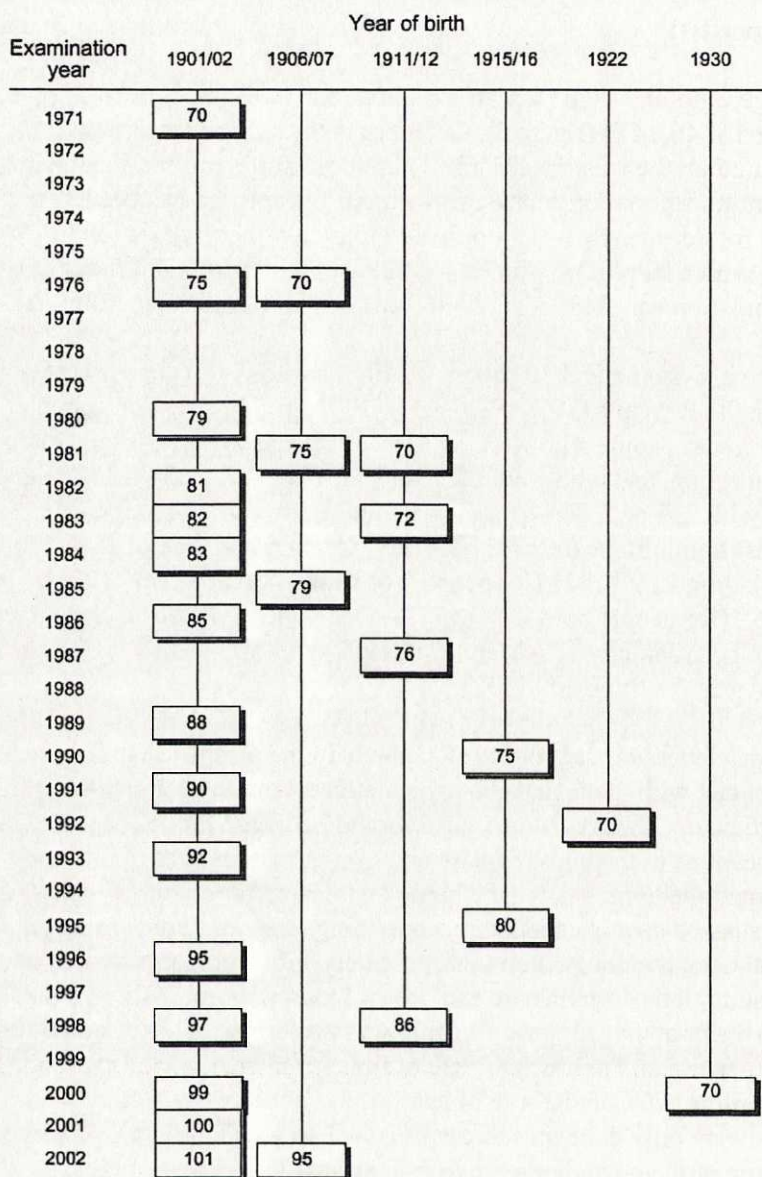
In 1971, the gerontological and geriatric population studies in Göteborg, Sweden – H70 – started [146,147] (figure 5). Göteborg is the second largest city in Sweden, situated on the western coast and has about half a million inhabitants. It is an important transportation centre for Northern Europe and has been characterized for decades by its harbour and industries. The population in 1901 was 132 111, with a surplus of women (72 328 women and 60 783 men). In 1971, the population was 448 792 (227 360 women and 221 432 men) [146].

A representative, systematic 3/10 sample of 70-year olds in Göteborg was obtained from the Revenue Office Register in 1971, giving a random sample. The population was people who were registered for census purposes in Göteborg on the date sampling, and who were born July 1st, 1901 – June 30th, 1902 on dates ending with 2, 5 or 8. The sampling was performed in four steps on different dates (to minimize the time between sampling and date of investigation): August 9th 1971 (for people born July 1st – Sept. 30th 1901), September 28th (for people born October 1st – December 31st 1901), December 6th (for people born January 1st – March 31st 1902) and March 10th 1902 (for people born April 1st – June 30th 1902).

An introductory letter was sent out to all persons in the sample. Within a week, a nurse took contact with them, and set up a date for a home visit to those who agreed to participate. Two registered nurses, who had been trained together in asking the questions in the questionnaire and evaluating answers of different types, performed the home visits. The home visit lasted for about 1,5 hours. The interview was based on a questionnaire, containing questions concerning e.g. basic personal data, dwelling conditions, economy, education, profession, need for care, consumption of health care and drugs. Later, an examination at the Out-patient Department at the Geriatric Hospital was performed. This examination included e.g. general and ophthalmologic examination, hearing ability, blood and urine sampling, ECG and X-ray of heart, lungs and breasts. Some examinations were only done on subsamples, such as psychological, psychiatric, dental, somatometric and audiometric examinations. The general medical examination included, besides the somatic examination, a questionnaire containing maximally 157 questions.

1148 persons were included in 1971/72. Of these, 973 (449 men, 524 women) had a full examination, giving a participation rate of 86.4% for men and 83.4% for women. In 1976/1977 a new cohort of 1281 70-year-old persons was invited. 83.6% of the men and 78.7% of the women participated (474 men, 562 women)

Figure 5. The gerontological and geriatric studies in Göteborg, Sweden, H70



(table 1). The non-participants did not significantly differ from the responders regarding sex, marital status and income [146].

Table 1. Number of 70-year olds invited and participating in the three cohorts

Cohort	All invited			Participants			Participation rate %		
	Men	Women	All	Men	Women	All	Men	Women	All
1	520	628	1148	449	524	973	86.4	83.4	84.8
2	567	714	1281	474	562	1036	83.6	78.7	80.9
3	365	441	806	302	317	619	82.7	71.9	76.8

From the third cohort (the IVEG study) [148], selected in 1981/82, we used two out of three subsamples, the intervention sample and the medical control sample, including 400 and 406 persons respectively. 82.7% of the men and 71.9% of the women participated (302 men, 317 women). The third subsample was a control group, not examined at age 70, for which only register-based data were available. Methods for data collection and instruments used were the same in the IVEG study as in the other cohorts. The intervention took place after the baseline study at age 70. Previous studies have shown that this cohort (the intervention sample and the medical control sample) is fully comparable to the earlier cohorts [147-150]. Separate analyses of mortality in the two samples of the IVEG study did not show any difference in mortality rate. Follow-up studies have shown that the intervention did not have any substantial effect on the variables used in this study [149,150]. Variables used in paper I and II are shown in table 2 and 3. Table 4 shows the variables in paper I as hazard ratios for 10-year follow-up mortality for the three cohorts together.

Statistical analyses

The survival in paper I was assessed using the Cox proportional-hazards model [151]. This makes it possible to compare the three cohorts despite different lengths of follow-up. Comparisons were made between the three cohorts and are presented as survival curves, and as relative risk estimates (RR) with 95% confidence intervals (CI). Time unit was survived days and the first-born cohort (cohort 1) was used as the reference group (RR=1). Sex has been controlled for when men and women were analysed together. In order to assess interaction between predictor variables and cohort effect, we modelled predictors and cohorts in the Cox regression models including interactions terms. Analyses on overall mortality were performed for all persons selected to the samples as well

as those who participated in the interview and clinical examination (participants).

In paper II, odds ratios (OR) for different health outcomes in the three cohorts were calculated with logistic regression. Also here the first-born cohort (cohort 1) was the reference group (OR=1). Analyses were performed on all participants in the three cohorts, as well as in subgroups based on marital status, level of education, type of dwelling, smoking habits and social network. The results are presented with 95% confidence intervals. Sex was controlled for when men and women were analysed together. In addition, significance test for trend was performed with Mantel Haenszel linear association chi-square.

Table 2. Variables in paper I and paper II measuring social background and social network

		Paper I	Paper II
Social background	Marital status	Never married	Never married
		Married/cohabitant	Married/cohabitant
		Divorced	Divorced
		Widow/widower	Widow/widower
	Type of dwelling	Non institution Institution ¹	Non institution Institution ¹
	Level of education	Elementary school > Elementary school	Elementary school > Elementary school
	Smoking habits	Never smoked Ex-smoker Current smoker	Never smoked Ex-smoker Current smoker
Social network	Contact with children	Sufficient	
		Too little	
	Contact with neighbours	Sufficient	
		Too little	
	Contact with children/neighbours or friends		Too little
Feeling lonely	Never/seldom Sometimes/often		
Number of activities ²	0		
	1-2		
	3-6		

¹Including old peoples home, nursing home and hospital.

²Comprising reading more than one newspaper, reading a weekly paper every week, having a weekend cottage, traveling, attending church and driving a car.

Table 3. Variables measuring health in paper I and paper II

Self-assessed health	Do you feel healthy	Yes/No	No
	Do you generally feel tired	Yes/No	
Number of symptoms			0
			>5
Medically defined health	Number of chronic diseases	0	0
		1 ¹	>4 ²
		2-6 ¹	
Functional impairment	Ability to walk/mobility impairment	Able to walk >10 meters without aid Yes/No	Not able to walk without assistive devices, personal aid or not able at all
	Impaired hearing		Not able to hear conversation from five meters
	Ability to rise from chair		Not able to rise from a chair without assistive devices, personal aid or not able at all
	Nursing needs/need of care ³	Yes/No	Yes

¹Including diabetes, chronic bronchitis, asthma, angina pectoris, myocardial infarction, diseases of the prostate, chronic rheumatic arthritis, cancer, fractures and stroke.

²Including diabetes, hypertension, goitre, chronic bronchitis, asthma, lung tuberculosis, rheumatic fever, angina pectoris, myocardial infarction, other heart disease, icterus, gall stones, gastric ulcer, appendicitis, kidney stones, urinary tract infections, diseases of the prostate, disorders of the female reproductive organs, chronic rheumatic arthritis, lumbago/slipped disc/sciatica, cancer, anaemia, stroke, TIA and surgery for inguinal hernia.

³Having at least one of the following problems: urin/feces incontinence, needing help with walking, eating, dressing, going to the toilet, personal hygiene or being disturbing.

Table 4. Predictors of mortality, hazard ratio for 10-year follow-up, for the whole sample (the three cohorts together). Shown as hazard ratio and 95% confidence intervals.

		<u>Men</u>	<u>Women</u>
		Hazard ratio (CI)	Hazard ratio (CI)
Marital status	Married/cohabitant	1	1
	Unmarried	1.31 (0.98 – 1.75)	1.23 (0.90 – 1.68)
	Divorced	2.43 (1.86 – 3.17)	0.94 (0.60 – 1.47)
	Widower/widow	1.20 (0.92 – 1.58)	1.14 (0.90 – 1.44)
Type of dwelling	Non-institution	1	1
	Institution ¹	2.77 (1.94 – 3.96)	3.84 (2.47 – 5.97)
Level of education	Elementary school	1	1
	> Elementary school	0.95 (0.78 – 1.17)	1.19 (0.88 – 1.60)
Smoking habits	Never smoked	1	1
	Ex-smoker	1.15 (0.92 – 1.45)	1.09 (0.75 – 1.60)
	Current smoker	1.36 (1.09 – 1.70)	1.60 (1.22 – 2.11)
Contact with children	Not relevant	1.28 (1.05 – 1.55)	1.05 (0.82 – 1.33)
	Sufficient	1	1
	Too little	1.37 (1.07 – 1.75)	0.91 (0.66 – 1.26)
Contact with neighbours	Not relevant	3.10 (2.05 – 4.68)	4.24 (2.71 – 6.62)
	Sufficient	1	1
	Too little	1.70 (1.28 – 2.26)	1.18 (0.85 – 1.64)
Feeling lonely	Never/seldom	1	1
	Sometimes/often	1.59 (1.24 – 2.04)	1.27 (0.97 – 1.66)
Activity index ²	0	2.34 (1.82 – 3.02)	2.27 (1.53 – 3.36)
	1-2	1.48 (1.24 – 1.78)	1.28 (1.02 – 1.61)
	3-6	1	1
Feeling healthy	Yes	1	1
	No	1.67 (1.41 – 1.99)	1.66 (1.34 – 2.05)
Feeling tired	No	1	1
	Yes	1.88 (1.55 – 2.27)	1.69 (1.35 – 2.11)

¹ including old peoples home, nursing home and hospital

² comprising reading more than one newspaper, reading a weekly paper every week, having a weekend cottage, travelling, attending church and driving a car

Table 4 continued

		<u>Men</u>	<u>Women</u>
		Hazard ratio (CI)	Hazard ratio (CI)
Number of diseases ³	0	1	1
	1	1.09 (0.88-1.35)	1.36 (1.06-1.76)
	2-6	1.64 (1.33-2.02)	2.59 (1.98-3.38)
Mobility impairment ⁴	No	1	1
	Yes	2.54 (1.85 – 3.50)	3.24 (2.34 – 4.50)
Need of care ⁵	No	1	1
	Yes	2.74 (1.98 – 3.82)	4.05 (2.90 – 5.66)

³ including diabetes, chronic bronchitis, asthma, angina pectoris, myocardial infarction, diseases of the prostate, chronic rheumatic arthritis, cancer, fractures and stroke

⁴ comprising urin/feces incontinence, ability to walk, eat, dress, go to the toilet, personal hygiene and if the person is disturbing

⁵ if the person is able to walk without help, needs a wheelchair or is bedridden

Design of paper III-V

The study [126,136] was conducted in western Sweden, and included the counties of Göteborg-Bohuslän and Älvsborg (65+ population 210 703 at the start of the study). The area includes several industrial cities, surrounded by farmland and forests.

Suicide cases (paper V)

Study cases were included from consecutive cases of suicide in elderly (65+) Scandinavian-born persons who underwent necropsy at the Göteborg Institute of Forensic Medicine from January 1994 to May 1996, and were classified as certain suicide (International Classification of Diseases (ICD 9) (E950-959) or undetermined cause of death (E980-989) by the forensic examiner. The forensic data and the police reports were reviewed by two psychiatrists (the first author of study V and a senior suicidologist), who then estimated the certainty of suicide. Cases that were rated as "certain suicide" (n=83) and "almost certain suicide" (n=17) were included, giving a total of 100 potential study cases.

Potential informants for 98 of the 100 suicides were identified. They were contacted by telephone and informed about the study. Informants of 85

individuals agreed to participate in an interview. 71 of the 85 study cases were certain suicides and fourteen were cases with undetermined cause of death, in which circumstances strongly suggested suicide.

Cases with informant interview (85/100) did not differ significantly from those without an interview in terms of sex ratio (males/females 1.18 vs. 1.14), mean age (75 vs. 73 years), proportion with a positive post-mortem screening for antidepressants or lithium (38% vs. 49%).

The old elderly subgroup (age 75 or above) included 20 men and 18 women (median age 81.5, range 75-97), and the young elderly subgroup included 26 men and 21 women (median age 70, range 65-74).

Population controls (paper III-V)

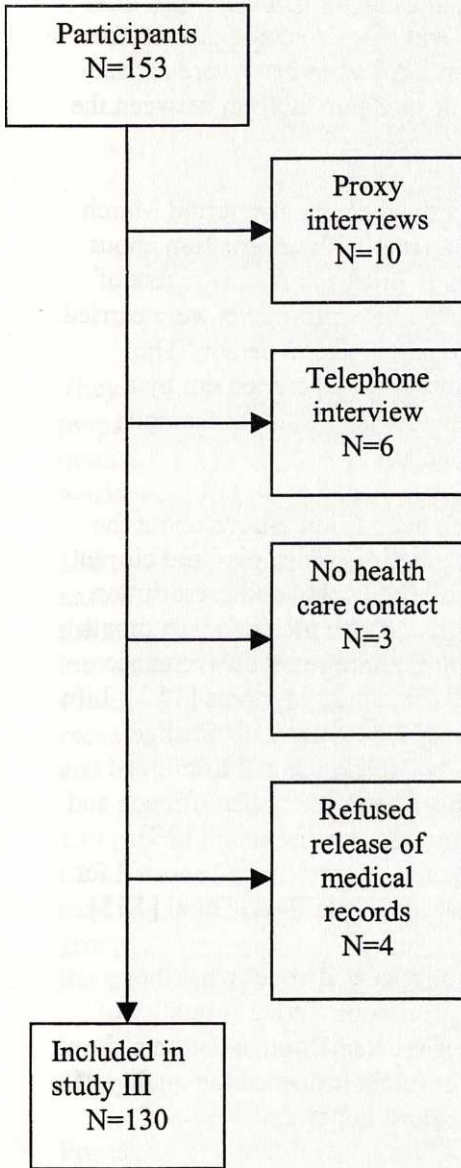
Two control persons were randomly chosen from the roster of the regional tax authorities for each case. The controls were selected from the same area, with the same sex and birth year (+/- 2 years) as the suicide case. If a control person declined to participate, another was invited to take part in the study (a maximum of eight persons were invited per case). A total of 240 potential control persons were invited to take part in the study. Six persons could not be traced. 60 declined participation due to lack of interest, 13 due to poor health and eight persons reported that they chose not to participate for social reasons. 10 control persons could not participate actively due to dementia, and interviews for these were instead carried out with a close informant. In all, 153 (64%) of the potential comparison subjects accepted participation. The interviews were carried out face-to-face, except for 6 control persons who only agreed to be interviewed over the telephone. Due to a lag time between the suicides and the interviews with the controls, the controls were somewhat older than the suicide cases.

Paper III included those who were interviewed face-to-face and who consented to the access to their medical records. Thus, the 10 proxy interviews were excluded, as was the 6 telephone interviews. Of the remaining 137, three persons had no relevant contact with health care, and four refused to release their medical records (two with and two without severe illness). These were not included, giving a total of 130 participants (75 men, 56 women) (figure 6). The median age was 76 years for both men (range 67-98) and women (range 67-99).

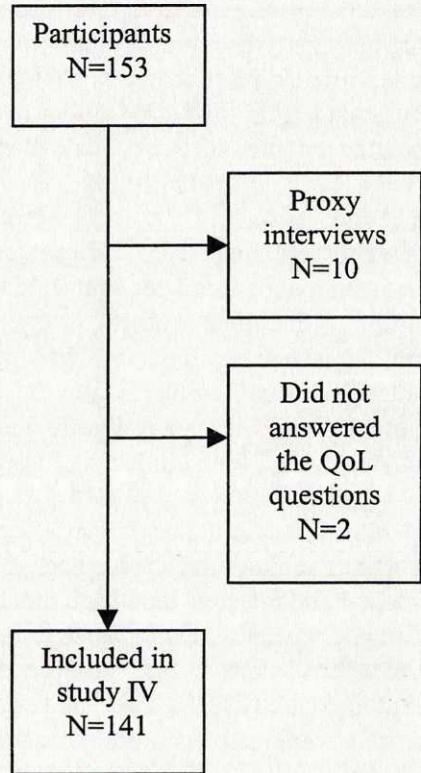
Paper IV included those interviewed face-to-face (n=137) and by telephone (n=6). Of the 137 who were interviewed face-to-face two were unable to answer the quality of life questions (due to language problems or inability to concentrate on the questions), giving a total number of 141 included in study IV (79 men, 62

Figure 6. The control group used in paper III and IV

Paper III



Paper IV



women) (figure 6). The median age was 76 for both men (range 67-98) and women (range 67-99).

The interviews

A letter including detailed information about the study and time and place for the interview were sent out to informants of suicide victims who had agreed to an interview. The interview took usually place in the informant's home. In a few cases the informant preferred to be interviewed at his or her place of work or at the university hospital. Primary informants for eight cases declined face-to-face interview but participated in a telephone interview. All interviews were carried out by a psychiatrist (first author of paper V). The medium duration between the suicide and the interview was 7 months.

The interviews with the control group were performed during the period March 1998 to September 1999. The subjects received a letter with information about the study, and were later contacted by telephone. In order to reduce the risk of dropouts due to poor health, proxy interviews with close informants were carried out for 10 demented persons who were unable to participate in person. The interview usually took place in the subject's home, and was carried out by a geriatrician (KW), a psychiatric nurse or a psychiatric occupational therapist (CA), all with long clinical and interview experience.

A semi-structured questionnaire was used, which included questions about the subjects socio-demographic background, social life, life events, past and current mental and physical health, suicidal behaviour, use of alcohol and prescription drugs, and contacts with in- and outpatient services. It also included past month psychiatric signs and symptoms derived from the Comprehensive Psychiatric Rating Scale (CPRS) [152] and questions about dementia symptoms [153]. Life events were rated according to a revised version of the Recent Life Change Questionnaire [154], merged into 13 categories by Heikkinen and Lönnqvist [141]. One question on imprisonment was replaced by any criminal offence and three questions on job problems were replaced by one on retirement [139]. Somatic illness was a self-report item in this instrument (informant-reported for the suicide cases). Suicidal feelings were rated according to Paykel et al [155].

The participants in the control group were also interviewed about what they considered to be quality of life, asked as an open question "What is quality of life for you?". Then, they were asked to choose three items from a list on a show card: "I am going to mention different things that might influence the quality of life. Please choose the three things you consider most important:

- Physical health
- Mental health
- Cognitive function
- Having no pain
- To be able to do activities of daily living, such as cleaning, shopping, cooking
- To be able to manage personal hygiene, dressing etc
- To have contact with friends and relatives
- To be able to read
- To be able to hear well
- Participation in societies
- Not feeling lonely
- Not feeling tired
- Energy to do what you want to
- To be able to feel engaged
- To feel needed
- To be able to remain living in your home
- Not to worry about your economy
- Other things”

They were not asked to order them by priority. The list on the show card was prepared specifically for this study. It included a number of items often used in quality of life instruments [110,115], but was adapted based on experience of working with elderly people and processed after discussion in the research team.

138 persons answered the open-ended question, 77 men and 61 women. The answers were recorded by the interviewer. They were then categorized by two of the authors (KW, CA) after reading all answers. Each response was fragmented into statements that were classified in different categories, but each response could only contribute to the same category once. The categorization was reevaluated until the different categories were in accordance with the statements and all statements were categorized.

139 persons gave three responses as requested to the show card list, 77 men and 62 women. Two men, age 84 and 90, could not choose any item from the show card (one of them said that all were equally important). The single items were grouped into broader domains. If a respondent selected more than one item from the same domain, the answer was included only once.

Medical Record Review

For the suicide cases, records from psychiatric and primary care facilities in the individual’s health care district were reviewed. Records from other specialists

and private psychiatrists were scrutinised when such contacts were recorded in the police report or primary care notes or when the interview person provided information concerning such contacts. The psychiatrist who had made the interview made this review. The controls were asked about previous health care contacts. Medical records were requested on the basis of this information, after the subjects had given their informed consent. A physician (ER) who was blind to interview data reviewed these records. Records from other clinics were requested whenever such contact was indicated in the review. Three control persons had no relevant contact with health care and four refused to release their medical records (two with and two without severe illness). For these seven controls, the illness ratings were based solely on self-report.

Assessment of psychiatric illness

The psychiatrist who made the interviews of the suicide informants and the record review of the suicide cases, made retrospective Axis I diagnoses according to the diagnostic algorithms of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) [156] for both the suicide and the control group. Cases with symptoms constellations that did not fit the DSM-IV algorithms were given "best estimate" diagnoses after discussion with a senior psychiatrist. For the suicide cases, a symptom was rated as present during the last month of life if acknowledged by any source. The interview and the case records provided the basis for assessment of past month mental symptoms for the control persons. A conservative approach was used to the assignment of major depression, that is, somatic symptoms that could be attributed to concomitant physical illness were not counted as symptoms of depression. A non-demented person who experienced a first depressive episode in connection with stroke or other neurological disorder was considered to have depression due to a medical condition. A person fulfilling at least two but less than five of the A criteria for major depression was considered to have minor depression, which is in accordance with DSM-IV research criteria. Further details of the diagnostic procedure have been reported previously [136].

Assessment of physical illness

Illness burden ratings were made according to the Cumulative Illness Rating Scale for Geriatrics (CIRS-G) [157]. This rating scale is a modification of the Cumulative Illness Rating Scale (CIRS) [158] revised to reflect problems common in the elderly with an emphasis on morbidity using specific examples. It provides operationalized ratings of disability in 13 somatic organ systems plus psychiatric disorders: heart, vascular, haematopoietic, respiratory, eyes/ears/nose/throat/larynx, upper GI (gastrointestinal), lower GI, liver, renal, genito-

urinary, musculoskeletal/integument, neurological, endocrine/metabolic/breast and psychiatric illness. The scale ranges from 0 to 4. A rating of 0 indicates no problem; 1- current mild problem or past significant problem; 2 - moderate disability or morbidity/ requires "first line" therapy; 3 – severe/constant significant disability/ "uncontrollable" chronic problems; 4 – extremely severe/ immediate treatment required/end organ failure/severe impairment in function. Smoking status and body mass index were not included in the present study. CIRS and CIRS-G have been shown to have good interrater reliability and face validity and to have a broad applicability to research in geriatrics [157,159,160]. We used the manual of guidelines for scoring the CIRS-G from May 1991 by Miller (in English). The interview included questions covering the 14 organ-systems from the CIRS-G.

For paper III, the illness burden for the control persons was rated in three ways:

1. Ratings based on interview data. The interviewers made these ratings at the time of the interview.
2. Ratings based on data from medical records review.
3. Consensus ratings based on information from both interviews and record reviews, used as golden standard in study III.

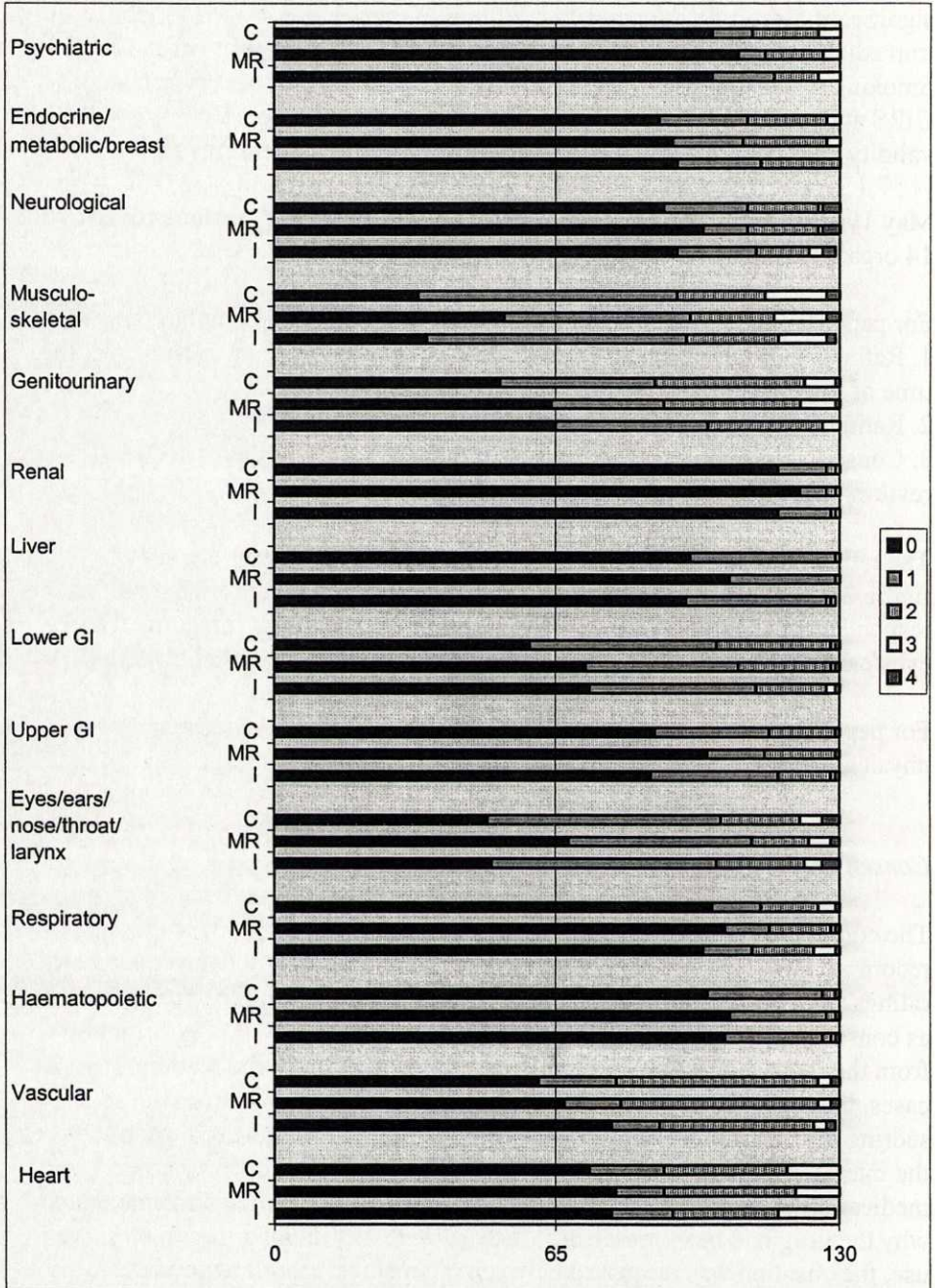
The rating from the three data sources for each organ systems are shown in figure 7. For most organ systems all ratings has given a 0 for almost half of the respondents or more, with the exception of musculoskeletal/integument and eyes/ears/nose/throat/larynx. Few have been given a 3, and even fewer a 4.

For paper IV and V, the consensus ratings were utilised as assessment of physical illness.

Consensus rating

The consensus ratings were made on information from both interviews and record reviews. They were made by the record reviewer (ER) after the record ratings were completed. The two scores were compared and they were accepted as consensus rating if they were in accordance. If they differed, information from the interview was compared to the information from the records. In most cases, the higher score were used, due to lack of information from the source scoring lower. In some cases, however, the lower score was used, such as when the interview revealed that the respondent no longer took the prescribed medication or when the records showed that the respondent had misunderstood why the drug had been prescribed. If there were any doubt as to which score to use, the question was discussed between the medical record reviewer and the interviewer until consensus was reached.

Figure 7. The illness burden ratings for the different organ systems.
 C=consensus, MR=medical records, I=interview. 0=no problem, 1=current mild problem/past significant problem, 2=moderate problem, 3=severe problem, 4=extremely severe problem



Statistical analyses of paper III

Tests were made on the agreement between data derived from the three modes of rating: interviews versus medical records, interviews versus consensus, and medical records versus consensus. The measurements used were Kappa coefficient [161] and the Svensson Paired Rank Measurement [162,163]. The Kappa coefficient [161] is one of the standard methods for analysing agreement, but one of its weaknesses is that it requires identical marginal distributions. The Svensson Paired Rank Measurement [162,163] is used to estimate the systematic and random differences in ordinal rating scales and does not require identical marginal distributions. Further information of the Svensson Method is given in paper III. The two measures used in paper III were the Augmented Rank-Order Agreement Coefficient (RA), which measures random differences in classification, and Relative Position (RA), which measures whether the classifications differ in position in the ratings, i.e. if one rater or one data source systematically tends to rate higher or lower than the other. RP were calculated with 95% confidence intervals. In addition, a permutation test was used to test the hypothesis that ratings from the interviews and medical records had the same agreement when compared to the consensus rating (as measured by the Kappa coefficient). Information of the permutation test is documented in the appendix in paper III.

Statistical analyses of paper IV

The results were calculated for men and women separately, since men were over-represented compared to the general older population. The results are presented as proportions, to increase the comparability across subgroups, and they are presented with 95% confidence intervals. Statistical testing of differences between subgroups yielded no more significant results than mere chance due to small sample size, and they are not presented.

Statistical analyses of paper V

Odds ratios (OR) for suicide were calculated with logistic regression. Adjustments for age were made in all analyses of OR, since the controls were slightly older than the suicides due to a lag time between the suicide deaths and the control interviews. Fisher's exact test was used to analyse differences in proportions between subgroups when ORs could not be calculated. The variables included in the multivariate logistic analysis (forward, conditional) were age, sex, loneliness, home care assistance, interpersonal conflict, operationally defined physical illness and major depression. All exploratory and formal statistical analyses were performed with SPSS version 10.1 for Windows.

Ethics

The Ethics Committee for Medical Research at Göteborg University approved the study. The participants had given their informed consent, after they had received oral and written information about the study, including an assurance that they could withdraw from the study at any time. For persons suffering from dementia, a close relative gave consent by proxy.

RESULTS

Paper I

Cohort 2 and 3 had significantly decreased mortality compared to cohort 1 (RR 0.86; CI 0.78-0.95 and RR 0.88; CI 0.78-0.995 respectively). There were no differences between cohort 2 and 3. Women had lower mortality than men in all cohorts.

People not living in an institution had a decreased mortality in the later born cohorts compared to the first born, while persons living in an institution had about the same mortality in all three cohorts. Other subgroups that had a lower mortality in the later born cohorts were ex-smokers and those who never had smoked, men reporting too little contact with their children, people reporting never or seldom feeling lonely, not feeling tired, having one or more diseases, and people without nursing needs and mobility impairment. There was no difference in the development of mortality by marital status or educational level.

There were significant interaction effects between cohort 1 and 2 and having more than one disease and having need of care. Significant interaction effects were also found between cohorts 1 and 3 and living in an institution, being ex-smoker and current smoker, and reporting feeling tired. Among men there were also interactions between the first-born cohort and both the later born cohorts and reporting too little contact with the children.

Paper II

There were fewer 70-year olds not feeling healthy in the two later born cohorts (OR 0.68; CI 0.56-0.83 and OR 0.67; CI 0.53-0.84 respectively) and fewer with many symptoms. There were also more participants in the later born cohorts who had no symptoms, and fewer men having impaired hearing. Women had problems rising from a chair to a lower extent in the later born cohorts. Both men and women had almost half the odds ratio for having nursing needs in cohort 2 compared to cohort 1, but women had the most pronounced decline. There were fewer men in cohort 3 having no diseases.

There were fewer current smokers having no diseases in cohort 3, more not being able to rise from a chair easily and not being able to walk without assistive devices. The current smokers did not have as low OR for nursing needs in cohort 2 as those who had never smoked or were ex-smokers.

Regarding marital status, the divorced had a different development. They had an increase in nursing needs and they were the only subgroup where having many symptoms was more common in the later born cohorts compared to the first-born. On the other hand, they were more likely to report having no symptoms in the later born cohorts. However, those divorced were rather few, giving few statistically significant differences.

Most variables did not differ substantially by level of education. Having more than four diseases was more common for the low educated in the later born cohorts compared to cohort 1, as was not being able to walk without assistive devices, while those with more than elementary school had a lower OR. As to impaired hearing those with low education had an improvement in the later born cohorts, with a statistically significant trend.

Those 70-year olds who reported having too little contact with children, neighbours and/or friends had somewhat lower OR for having more than five symptoms in the later born cohorts than those with sufficient contact. They had also a lower OR regarding impaired hearing and nursing needs. Persons with sufficient contact had an improvement regarding having no symptoms in the later born cohorts.

One subgroup had not gained as much as the others ones, namely those living in an institution. They were about as likely to feel healthy in all cohorts, and they did not have the same improvement regarding having no symptoms as those not living in an institution. They had also a significantly higher OR for nursing needs in cohort 2 compared to cohort 1 (data not available for cohort 3).

Paper III

Medical records rated higher (positive Relative Position, RP) than the interviews for the vascular system, whereas the interviews rated higher (negative RP) for five organ systems: respiratory, eyes/ears/nose/throat/larynx, upper GI, liver and musculoskeletal/integument. The Augmented Rank-Order Agreement Coefficient (RA) showed low random difference between interview and medical records. The agreement measured as the Kappa coefficient ranged from 0.47 to 0.80, with the lowest agreement for the eyes/ears/nose/throat/larynx and lower GI systems, and the highest for endocrine/metabolic/breast category.

Low random difference was found for both interviews versus consensus and medical records versus consensus. Statistically significant systematic difference in position (RP) between interviews versus consensus was found for four organ systems, three of them remarkably higher than others (above 0.1): vascular, lower GI and genitourinary. For medical records versus consensus, a statistically

significant systematic difference in position (RP) was found for 11 organ systems, three of them at or above 0.1: eyes/ears/nose/throat/larynx, lower GI and musculoskeletal/integument.

Statistically significant difference in agreement was found between interview versus consensus and medical records versus consensus for the vascular system (medical records best), eyes/ears/nose/throat/larynx and musculoskeletal/integument (interview best).

Paper IV

Answers to the open-ended question were grouped into 8 categories, with *social relations* being the most frequent response, followed by *health, activities, functional ability, well-being, personal beliefs and attitudes, the own home and personal economy*. *Functional ability* was the domain most selected from the show card of both men and women, followed by, for the men: *physical health, to be able to remain living in one's home, social relations and mental health* by the men; and for women: *social relations, physical health, the own home and mental health*. Women selected *functional ability* and *social relations* to a higher degree than men, while men selected *physical health* to a higher degree. Those age 80 or older selected *functional ability* to a higher extent than their younger counterparts. Persons with a severe illness selected *social relations* and *having no pain* to a higher degree than those without severe illness.

Paper V

Family conflict, serious physical illness, loneliness and major and minor depression were associated with increased risk of suicide in the 75+ group. Economic problems predicted suicide in the younger but not in the older elderly, while serious physical illness was not a statistically significant predictor of suicide in the younger group. Serious illness in the eyes, ears, nose and throat category was over-represented in the older suicide group. Visual disability was the most common cause of infirmity in this group, and was therefore analysed separately. Seriously impaired vision was associated with an eight-fold increase in suicide risk for the older group, an association that could not be shown for the younger group. Malignant disease was associated with a three-fold risk of suicide for those aged 75 and above. Old elderly suicides with depression (major or minor) were less likely to have received depression treatment than their younger counterparts (75.9% vs. 48.0%). The logistic regression models showed that major depression, serious physical illness, family conflict and loneliness were independent predictors for the older elderly, but the significance of loneliness was marginal.

DISCUSSION

Strengths and limitations

H70 (paper I and II)

The gerontological and geriatric population studies in Göteborg (H70) is one of few population based longitudinal studies with different birth cohorts followed for long enough time to do time and trend analysis of mortality and morbidity. As almost all other studies, it has experienced declining participation rate in the later born cohorts, but still it is as good, or better, than that of many other studies for the same age groups and for the same time studied [164,165]. The H70 project is a true random sample of the elderly population, since it also includes the institutionalised persons. Those living in institutions are among the most disabled persons, and it is important to include elderly living in institutions when assessing changes over time [76]. All participants were 70 years old at base line, which enables us to rule out any age-effects. On the other hand, 70 years can be seen too young an age, since the sharp decrease in functioning has been seen for those aged 80 and older [166]. Using a higher age, might have improved our ability to detect changes between the cohorts. We have used data collection from 1971, 1976 and 1981, which can seem to be quite far in the past. On the other hand, it yields long follow up, which makes it possible to analyse the mortality in the same cohorts. Thus, the use of data from 20 – 30 years back can be seen as both a strength and a limitation. The cohorts are born only five and ten years apart. With no doubt, this is a limitation, influencing our possibilities to find significant changes, as do the fact that we have only used 3 cohorts. The variables used have had exact the same wording in the interview for all three cohorts, which make the comparison between the cohorts valid. The variables we have chosen to measure morbidity were to a large extent self-reported. Self-reported data from interviews with elderly people yield sound information on health status, especially of illness, functional impairment and health in a broader sense, as was shown in paper III.

We have used many variables to measure morbidity and to classify subgroups. Therefore, there is an obvious risk of mass significance. Adjustment for multiple analyses was considered, but many authors do not advocate such methods [167,168], so we have refrained from doing so. The variables were carefully selected from a large set of variables in the H70 project, so there is a specific thought behind each of the variables included. The use of many variables to measure morbidity can also be seen as a strength, since health and morbidity have many aspects and cannot be measured by a single variable [101].

The suicide project (paper III-V)

The main strengths of the suicide project was the fact that we included all suicide cases in the area and a matched control group selected from the general population, allowing us to estimate the risk associated with a number of different predictor variables. However, the suicide cases were interviewed by proxy, while most of the control persons were interviewed in person. This asymmetry in data sources is a limitation [169], even if recent research speaks for the validity of the proxy approach [170,171]. The participation rate for the control group was not high (64%), but was similar to that in other studies of older persons [164,165]. In addition, there is a problem of small sample sizes for the 75+ group in paper V and for subgroups in paper IV. The use of operationalised criteria to rate mental and physical disability is a strength, as is the inclusion of almost certain suicides and the inclusion of both rural and urban areas. Sweden is an appropriate setting for this type of research. The rate of forensic examination is high and medical records are relatively accessible. We were able to locate psychiatric records dating back as early as 1918.

The use of a consensus based on information from interviews and medical records as "gold standard" might lead to a circular comparison when the original data sources are compared to consensus. However, the consensus uses the combined information from the two single sources, and enables an evaluation of the quality of data from interviews and medical records.

A limitation in paper IV is the sample used. It is not totally representative of the older population since men are over-represented in the study group. However, results are shown separately for men and women, and the subsamples distributed by sex can be seen as representative of elderly men and elderly women, respectively.

Cohort differences in health

Mortality

There was a significant decrease in mortality between the first-born cohort and the two later born cohorts, but no difference between the later born cohorts. The fact that there were no difference in mortality between the two later born cohorts could indicate that the increase in longevity is levelling of and reaching a plateau. On the other hand, there are other possible explanations. As mentioned

under strengths and limitations, there are only three cohorts analysed, and they are born five and ten years apart, which limits the possibility to detect a difference. But the difference is between the two first-born cohorts, which speaks against too few years between the birth years as the explanation.

The mortality data are only followed up until 1998, in which the latest born cohort only had reached the age of 86. Other studies have shown that the decrease in mortality during the last decades has been substantial for the old and oldest-old, and in many cases just as great as for the younger [4,5,7,8,172,173], although there has been a report of lack of improvement of life expectancy at advanced ages in the Netherlands in the 1980s [174]. If the decline in mortality is greatest for the ages above 80 or 85, it might need five or ten years more of follow-up to detect the decline for the latest born cohort. One other important explanation could be different cohort and period effects. These might have been considerable, due to the rapid development during the 20th century. The latest born cohort was born 1911/12, only a few years before the beginning of World War I. This could have led to differences in the life situation during their early childhood years, even if Sweden was not involved in the war. During the war there was also the epidemic of the Spanish flu. In addition, they were entering the labour market during the economic depression. It may be speculated that such major life events occurring at critical points in life may explain why we did not find any difference in mortality between the two later born cohorts.

The decrease in mortality in the later born cohorts was not evenly distributed across subgroups. Those with diseases had lower mortality in the later born cohorts compared to the first-born. This might speak for more years with diseases and an expansion of morbidity. However, having a disease does not necessarily mean ill health. Getting a diagnosis enables you to get treatment, and by that feeling better. The fact that those who reported feeling healthy and not feeling tired did have a lower mortality in the later born cohorts – as had those without need of care and mobility impairment and those not living in an institution - indicates that there are years of good health, but for some in spite of diseases, that has been added.

Smoking is a well-known predictor of mortality [31,175,176]. There was a significant decrease in mortality for those who had never smoked in the younger cohorts compared to the oldest, while current smokers had about the same mortality in all three cohorts, especially for men. Thus, the gain in survival is restricted to non-smokers, which indicates that the decrease in mortality is influenced by lifestyle factors. Another predictor of mortality is social network [31,33]. It is hard to interpret the finding that men in the later born cohorts reporting too little contact with their children had lower mortality compared to the first-born cohort. Is it due to more people wanting to have more contact with their children and a better health among them, or is it due to an alteration in the

effect of social network on mortality? This is not possible to answer from these results.

Morbidity

Comparing the mortality development with the morbidity at age 70 in the different cohorts gives us further indications of good years being added. Just as for the mortality, the differences in morbidity were mainly between the two first-born cohorts. The explanations for this are probably similar to that of the mortality, as discussed above. During the last decades, there has been several hypothesis of how childhood and young adult life – and even in utero - circumstances influence the late life morbidity [177-181]. Giving the huge changes during the 20th century, it is likely that the three cohorts have experienced different impact at different ages in their early life, which might explain why the latest born cohort does not differ substantially in morbidity and mortality from cohort 2.

Self-assessed health

The improvement concerning self-assessed health was somewhat greater than for the mortality (OR 0.68 and 0.67, compared to RR 0.86 and 0.88), speaking for a compression of morbidity. The improvement in self-assessed health between the cohorts is in accordance with some studies [54,56] and contrary to others [57-59]. The later born cohorts had also an improvement regarding self-reported symptoms. There were more 70-year olds reporting no symptoms in the later born cohorts compared to the first-born and fewer reporting many symptoms. Also for having many symptoms there was an improvement greater than the mortality decline (OR 0.73 and 0.80 compared to RR 0.86 and 0.88).

Diseases

The participants in the later born cohorts were more likely to have got a diagnosis, and those with multiple diagnoses were about as many in all three cohorts. But as discussed above, getting a diagnosis is not equal to perceive ill health if you get an effective treatment. The improved ability nowadays for the health care to detect diseases, gives us more people with diagnoses [182], but hopefully less people with ill health. The results from paper II, with more 70-year olds with diseases in the later born cohorts, but fewer with symptoms, speaks for an effective treatment of the diseases and enhancement of health status in spite of diseases.

Functional impairment/disability

The improvements in physical function differed by measurement. The ability to walk without assistive devices was about the same in all three cohorts, while there was a decreased mortality in the later born cohorts for those without

mobility impairments. However, this was an estimate of the walking ability without using assistive devices. With improvements in the devices, the ability to walk is enhanced for those with walking impairments. Thus, it seems likely that those with mobility impairments in the later born cohorts might have better walking ability with assistive devices, compared to the first-born cohort [183]. 70-year olds reporting not being able to rise from a chair easily were fewer in the later born cohorts, as were those with impaired hearing ability. The improvement concerning nursing needs was greater than the decline in mortality (OR 0.58 compared to RR 0.86). Taken these measurements of functional impairment together, it seems as good years have been added - especially as the elderly people value functional ability as important to their quality of life, as was shown in paper IV. The decline in disability is in accordance with most of the recent studies that has compared disability in different cohorts [50,64-66,68-72,74,75].

The results from paper II, with lower functional impairments but more 70-year olds having a diagnosis in later born cohorts is in accordance with other studies showing that improvements in function have occurred despite increased reports of chronic conditions [81,184]. It is also in accordance with the summation of recent reports by Crimmins: the number of diseases people have and the number of people with major and multiple diseases have increased in the older population, while the disability connected to the diseases has generally decreased and the proportions of people with only moderate disability appear to be declining slightly [185]. Grundy reported that the extent of self-reported limiting long-term illness has risen, but there are signs that the extent of serious disability has fallen [186]. Van de Water states that trend studies of health expectancies suggest that, although the total amount of morbidity is increasing with ageing, there is a shift towards less severe disability, which supports the "dynamic equilibrium" theory [44]. Freedman and Martin concludes that earlier diagnosis and improved treatment and management of chronic conditions may be important contributing factors to improvements in upper- and lower-body functioning among older Americans [184]. The decline in disability is particularly encouraging since disability is associated with suicidal thoughts among elderly [128]. It might be speculated that we would have seen greater declines in functional impairment if we had used older participants, for example 80 years of age instead of 70. Freedman and Martin found the largest gains for those aged 80 and older [187].

Why has there been a decrease in disability? The decrease is still largely unexplained [76]. There are, however, some reasons that have been discussed. Among those are improved technology and medical care [67]. Cataract surgery and joint replacement are examples of improved technology that has benefited elderly persons, and reduced the impairments in sight and mobility, which are common in older ages and non-fatal. New pharmaceutical drugs, for example

non-steroidal anti-inflammatory drugs diminishing the symptoms of arthritis and anti-hypertension medication giving declining stroke incidence – both common in old age – reduces the disability. The use of and improvements in assistive devices are also seen as contributing to decrease in disability, despite functional impairment. Changes in socioeconomic status are also related to the decrease in disability. There has been a shift from manual to white-collar jobs, and the educational level is higher in later born cohorts, both contributing to lower disability through less hazardous exposure at work and more favorable health behavior [67,82]. Waidmann and Liu found that the trend toward a more educated elderly cohort explained some, but not the entire decline in disability among elderly persons [188]. Even if we could not find any difference in the development in morbidity by level of education in paper II, there was a difference in the proportion of subjects reporting different health status in favor for those with higher education (Table 5). Thus, more people with higher education give better health status on the population level. The most obvious change in health behavior is the decline in smoking. This was seen for men, but not for women, in the H70 study [63]. Smoking affecting mortality and morbidity is in accordance with the findings in paper I and II, where non-smokers had a more favorable development than the current smokers. The decline in infectious diseases throughout the lifespan can also give less late-life disability, for example rheumatic fever leading to valvular heart problems at old age [67,82]. It seems reasonable that further increases in health can be achieved with changes in lifestyle factors such as decreased smoking, and with further development in medical treatment and care, including better recognition of depressions in elderly people.

Gender and health development

As with the mortality, the improvements in morbidity were not evenly distributed among subgroups. Women seem to have a better development between the cohorts concerning morbidity than men. Women in the later born cohorts had decreased risk of not being able to rise from a chair easily compared to cohort 1, and had also a greater decline in nursing needs than men. There were also some gender differences in women's favour, concerning symptoms and diseases, which is in accordance with the study from Jyväskylä, Finland [56]. As the mortality development was about the same for both genders, it seems as women have gained more healthy years than men. Winblad et al and Hoeymans et al could not find any decrease in disability in later-born cohorts for men [60,77]. Also other studies have found greater improvements for women and a decreasing gender difference [56,66,69,73]. Elderly women are known to have greater morbidity than men [66,189-192], so this indicates that the gender gap concerning morbidity is decreasing. The decreasing gender gap for some of the variables in paper II can be seen in table 6, where the results are presented as proportions of men and women in the three cohorts reporting different health indicators. The female excess in disability has been attributed to their longer

Table 5. Distribution (percentage) of participants reporting different health indicators in the three cohorts, by level of education.

		Cohort		
		1	2	3
		%	%	%
Not feeling healthy	Elementary	35.1	27.8	26.8
	More than elementary	30.9	21.3	21.9
More than five symptoms	Elementary	28.3	23.3	24.2
	More than elementary	23.0	15.2	19.7
No symptoms	Elementary	9.3	10.9	17.2
	More than elementary	11.8	15.7	16.4
More than four diseases	Elementary	20.4	21.9	23.1
	More than elementary	30.9	22.5	27.0
No diseases	Elementary	7.0	5.9	5.0
	More than elementary	5.9	6.2	3.9
Impaired hearing	Elementary	8.1	6.5	4.3
	More than elementary	2.0	3.4	2.8
Not able to rise from chair easily	Elementary	9.6	6.4	9.7
	More than elementary	6.6	3.9	4.8
Not able to walk without assistive devices	Elementary	8.0	8.3	10.6
	More than elementary	7.2	2.8	6.8
Nursing needs¹	Elementary	7.5	3.7	
	More than elementary	3.9	2.8	

¹Having at least one of the following problems: urinary/fecal incontinence, needing help with walking, eating, dressing, going to the toilet, personal hygiene or being disturbing

survival [166] and lower recovery rate [193], and that women are more likely to suffer from arthritis and other musculo-skeletal diseases [190,194-196]. Thus, women might have benefited more than men by the improvements in assistive devices and new pharmaceutical drugs, diminishing the symptoms and disability of arthritis. It is unlikely that the decreasing gender gap could be attributed to changes in smoking, since there were more women smoking in the later born cohorts [63].

Table 6. Distribution (percentage) of participants reporting different health indicators in the three cohorts, by gender.

		<u>Cohort</u>		
		1	2	3
		%	%	%
Not feeling healthy	Men	32.9	21.0	26.4
	Women	35.8	31.1	25.5
More than five symptoms	Men	21.2	14.6	17.5
	Women	32.8	27.8	28.4
No symptoms	Men	15.4	14.9	23.9
	Women	5.0	9.3	10.4
More than four diseases	Men	15.9	15.1	20.9
	Women	27.1	27.4	27.1
No diseases	Men	9.8	7.6	5.6
	Women	4.6	4.3	4.4
Impaired hearing	Men	11.2	8.3	6.6
	Women	3.5	4.4	2.0
Not able to rise from chair easily	Men	5.6	6.1	7.4
	Women	12.9	5.9	9.3
Not able to walk without assistive devices	Men	6.5	8.1	9.8
	Women	9.8	7.0	9.6
Nursing needs¹	Men	6.0	4.9	
	Women	8.6	4.1	

¹Having at least one of the following problems: urinary/fecal incontinence, needing help with walking, eating, dressing, going to the toilet, personal hygiene or being disturbing

Need of institutional care and health development

More 70-year olds living in an institution in the later born cohorts had functional impairments compared to the first-born cohort, especially regarding hearing

impairment and nursing needs. In addition, they had less improvement in self-assessed health than those living in their own home. Since the mortality was about the same in all three cohorts for those living in an institution, it seems as if it is an expansion of morbidity for those living in institutions. The interpretation of the analyses of the institutionalised must, however, be done with caution. It was rather few of the 70-year olds living in an institution (around 3% in all three cohorts), and we do not know how their health status was when they moved into the institution. Probably there has been a shift towards a worse health status among those taken into institutions. The fact that those living in an institution had worse health in later born cohorts, points out the importance of including the institutionalised when comparing morbidity between different birth cohorts.

Social network and health development

Social network is known to influence both mortality and morbidity [31,33,197-199]. The participants reporting too little contact with their children, neighbours and/or friends had improved self-assessed health in the later born cohorts, fewer hearing impairments and fewer nursing needs, while those with sufficient contact had an improvement when health was measured as having no symptoms. The decrease in mortality was most pronounced for men reporting too little contact with their children. The proportion of 70-year olds reporting too little contact was higher in the later born cohorts. 12% of the women in cohort 1 reported too little contact with their children compared to 17% in cohort 3, for men the corresponding figures were 9% and 16%. For the combined variable too little contact with children, neighbours and/or friends, the proportion increased from 22% to 25% for women and from 16% to 22% for men (results not shown). As can be seen in table 7, there was a difference for most of the health indicators in paper II in favour of those reporting sufficient/too much contact compared to those reporting too little in cohort 1, but the difference is much smaller in cohort 3. Whether the differences in mortality and morbidity between the cohorts for the group reporting too little contact is due to a modification in the role of social network as a risk indicator for ill health and mortality, or if it is due to a shift in the wish to see the children, neighbours and friends more often because people feel healthier, is not possible to assess from our results.

Smoking and health development

The current smokers in the later born cohorts had not had the same positive development in health status as the non-smokers. There were fewer current smokers with no diseases, more not being able to rise from a chair easily and not being able to walk without assistive devices in the later born cohorts. They had neither the same decrease in nursing need as the non-smokers nor the same increase in having no symptoms. The results from paper I and II indicates that

Table 7. Distribution (percentage) of participants reporting different health indicators in the three cohorts, by social network.

		<u>Cohort</u>		
		1	2	3
		%	%	%
Not feeling healthy	Sufficient/too much	32.0	24.4	26.3
	Too little	45.1	34.6	24.8
More than five symptoms	Sufficient/too much	24.2	21.2	22.2
	Too little	41.3	23.8	26.0
No symptoms	Sufficient/too much	10.4	13.5	18.2
	Too little	7.1	4.9	13.0
More than four diseases	Sufficient/too much	20.8	20.4	23.5
	Too little	26.6	27.2	26.0
No diseases	Sufficient/too much	7.1	5.7	4.7
	Too little	6.5	6.3	6.2
Impaired hearing	Sufficient/too much	6.4	6.3	4.2
	Too little	9.8	5.5	4.3
Not able to rise from chair easily	Sufficient/too much	9.4	5.7	8.6
	Too little	9.9	7.3	7.5
Not able to walk without assistive devices	Sufficient/too much	7.8	7.0	9.7
	Too little	10.4	9.3	9.6
Nursing needs¹	Sufficient/too much	6.9	4.6	
	Too little	9.8	3.9	

¹Having at least one of the following problems: urinary/fecal incontinence, needing help with walking, eating, dressing, going to the toilet, personal hygiene or being disturbing

further gains in both longevity and health status is probable if positive changes in lifestyle behaviour occur, which is in accordance with the findings from other longitudinal studies of aging showing strong associations between lifestyle risk factors and the incidence of disability [42,47,200-207] and Leveille et al who found that physical activity was a key factor predicting non-disability before

death [175]. Nusselder et al conclude that eliminating smoking will extend life, increase the numbers of years lived without disability and also compress disability into a shorter period [176]. The greatest future declines in disability may result from reductions in lifestyle risk factors [76].

Education and health development

Education, as a measure of socioeconomic status [85], is known to influence both mortality and morbidity [45,84,208-212]. As can be seen in table 5, there was a difference in the health indicators in the three cohorts by level of education, with those with higher education having better health status than those with only elementary school, with the exception of having many diseases. There were no clear differences between the cohorts by educational level for neither mortality nor morbidity. There was an improvement in younger cohorts in low as well as high educated for self-assessed health and number of symptoms, while those with lower education had an improvement in younger cohorts regarding hearing ability (which might be due to decreased exposure to noisy work environment). Thus, from our results it is not possible to determine whether there is a narrowing or widening gap by level of education. Crimmins and Saito found that educational differences in healthy life expectancy increased between 1970 and 1990 in the US [213]. Pappas et al found a reduction in mortality for all educational levels between 1960 and 1986 for ages 25-64 in the US, but an increasing disparity in mortality by level of education [214], while Martelin could not find any convergence of mortality levels according to socio-demographic factors 1970-1990 in Finland[36]. In another study from Sweden, they could not find any change over time in the discrepancy in mobility limitation between white- and blue-collar workers [66], and the Finnish study from Jyväskylä found that the difference between social groups had not diminished between 1972 and 1992 [56]. In their review article, Freedman et al conclude that trends in disability and function by education level have been inconsistent [73]. However, since later-born cohorts have better education, for example a rise in the proportion of participants in H70 having more than elementary school from 13% of the women and 18% of the men in cohort 1 to 21% and 28%, respectively, in cohort 3 (results not shown), it is probable that the decrease in morbidity can partly be due to higher education in later born cohorts [67,82], and future expected increases in ill-health due to the aging of the population might be counteracted by increase in educational level [215].

Information on health status

The results from paper III indicate that both interviews and medical records generate sound and reliable data for most organ systems. The interviews yielded better information for the eyes/ears/nose/throat/larynx and musculoskeletal/

integument categories than medical records. These organ systems reflect to a high degree functional impairments such as impaired sight and hearing, and stiff or painful joints and muscles. Conditions that can be seen as aging related for which elderly persons do not always seek medical care for, they are endured or treated with over-the-counter drugs. Thus, medical records often lack information on functional impairments. It is in accordance with the findings of Ockander et al, who found that diseases of the nervous system, the sensory organs and the musculoskeletal system was reported more often at interview than in medical records [216]. This indicates that interviews might be superior to medical records when measuring impairments and disability among elderly people. On the other hand, medical records gave better information for the vascular system, a category including circulatory conditions that are known to provide definitional problems for respondents [94]. This is in accordance with Nilsson et al, who conclude that medical records provide valid information for factual diseases, while self-reports are more informative than medical records for illness with predominantly subjective symptoms [217]. Ferraro and Su have shown that self-reports of chronic non-serious illness had greater predictive value for subsequent disability than physician-evaluated morbidity [218].

The results from paper III confirms that interviews with elderly persons can yield reliable data, which is in accordance with other studies [216,219-221] while other have shown less accurate self-reports by elderly respondents [96,98]. Many studies analysing trends in morbidity and disability in the elderly population over time use to a high degree self-reported data, as we do in paper II. According to the results from paper III, this is an appropriate approach since self-reported data were shown to be reliable, especially concerning functional impairments. It is important to capture functional impairments when assessing health, since disability and visual problems have been shown to be associated with suicidal thoughts [128]. If the intention is to measure illness, functional impairments and health in a broader sense, interview is a good method, while medical records may be more appropriate when specific diagnoses are the subject of inquiry.

Quality of life and health

Older men and women value social relations, health, activities and functional ability to be important to the quality of life, as could be shown in paper IV. This is in accordance with the few earlier studies that have asked elderly people about their perceptions of quality of life [120-122]. In the light of this, it is promising that there are several reports of declining disability in later born cohorts, something that also was found in paper II. Rather few participants mentioned or chose material circumstances like economics and housing conditions, which also was found in the Swedish study by Nilsson et al [120]. The importance of

activities and functional abilities is in accordance with Bryant et al's model of healthy aging that includes the ability to "go and do" meaningful activity [222]. It also stresses the importance of the health care to enhance people's ability, even when it is not possible to give a curative treatment. Farquhar states that it appears that family relationships, social contacts and activities are as valued components of a good quality of life for older people as general health and functional status, but social contacts and activities are to a certain extent dependent on a reasonable state of health and functioning [107].

Women selected functional ability and social relations to a higher extent than men, which is in accordance with the results of Bowling [121]. This can be seen as part of women's greater responsibility for the household and social networks. It is also worth noting that women in the later born cohorts had a more pronounced decrease in disability compared to the first-born cohort in paper II, and there were more 70-year olds reporting too little contact with their children, neighbours and/or friends in the later born cohorts, especially for men. As argued above, one explanation could be that the expectations of social contacts increases with improved health. Those aged 80 and over selected functional ability and remain living in one's home to higher extent than their younger counterparts, which indicates that the importance of enhancing the functional ability of older people increases with age. In the study by Farquhar, those above 85 years of age answered to be more mobile/able more than twice as often than those aged 65-85 years, when asked about what would improve their quality of life [122].

Remain living in one's own home was chosen from the show card list by 42-44% of the participants, but seldom mentioned in the responses to the open question. Perhaps moving to a sheltered housing can enhance the possibilities to have social relations and improve the ability to do activities. To "give up" their own home might be a sacrifice some old people would choose in order to achieve other things important to the quality of life, if they had the option. An option they seldom are given in the Swedish society today, unless they are severely disabled. Those with a severe illness selected social relations and having no pain to a higher degree than those without severe illness, which also indicates the importance of reducing symptoms and enhancing the ability to socialize, even if we cannot cure the disease. There has been attempts to define "successful ageing", and according to Margret Baltes successful ageing implies having goals and striving for goals against the odds of ever diminishing reserves and increasing vulnerabilities [223]. Facilitating social relations and activities, and enhancing functional ability might improve the quality of life of elderly as much as medical treatment. As discussed above, the lower functional impairment in the later born cohorts in paper II, might partly be due to earlier and better treatment of chronic diseases.

Improving the quality of life of elderly people must besides improving health status and ability include facilitating to do activities and to have social relations. Humans are in need of social contacts, and being seen as subjects. This is also the case for elderly people, of whom many have reduced ability and are in need of assistance in different ways. We must avoid looking at them as objects in need of care and assistance, and see them as the individuals they are. They have a lifelong experience it will need years to achieve for men and women of working age. The future for the elderly population is in many ways dependent on how the society looks upon those not being in the labour force. Elderly of today have built up the welfare we now are enjoying, and it is their right to be the ones to utilize it without being looked upon as a burden. Quality of life is individual and dynamic. Thus, we must listen to the individual, to the needs that individuals have, and how he or she wants to have the assistance – but also enhance the possibility to having goals and striving for goals despite the fact that the ability is diminishing, and thus “aging successfully” [223].

Suicide and health

Risk factors for suicide among the old elderly were family conflict, serious physical illness, loneliness and depression. Seeing suicide as an extremely bad quality of life, it is in accordance with the results from paper IV. Family conflict and loneliness are unsatisfactory social relations. Serious physical illness is bad health status, but also disability since vision impairment was a strong risk factor within physical illness. Vision impairment has a wide-ranging impact on functional status, ranging from physical disability to social functioning and increases the risk of feeling depressed [224]. Decline in health and functional ability have been shown to be predictors of depression, worsening depression and low life satisfaction [225]. It is important that physicians are aware of the possibility of suicidality when elderly patients seek help for somatic complaints, especially as it has been shown that elderly people tend to seek their primary care physician a short time before they commit suicide [124,226]. Old people with visual disability and concomitant depression may be at particular risk.

Depression was the strongest risk factor for suicide in the old elderly group, which is in accordance with recent research demonstrating the importance of affective illness in suicide among older people [130-132,135,136,226]. The finding in paper V that also minor depression was a risk factor, is in line with Draper and Anstey reporting an association between minor depression and attempted suicide in elderly (+65) psychiatric inpatients [227]. The old elderly suicide victims with major or minor depression were less likely to receive treatment than their younger counterparts. There is evidence that antidepressants are still under-prescribed among non-demented very old persons with depression [228], even though the prescription of antidepressants has increased since the

introduction of SSRI (selective reuptake inhibitors) [229]. It has also been reported that more recent born cohorts are at increased risk for major depression [230]. Suicide rates have been declining in Sweden during the period 1991-1996 [231], but less pronounced in men aged 75 and above, and absent in women in this age group. Better recognition and treatment of both major and minor depression, especially in older people with concomitant physical illness, is an important target for the prevention of suicides in the elderly people and for enhancing their quality of life.

CONCLUSIONS

Main findings

The mortality was lower in the later born cohorts compared to the first-born. The decrease was most pronounced for those not living in an institution, did not feel tired, had no needs of care, those who were ex- or non-smokers, had one or more diseases and for men reporting too little contact with their children. Health was better in the later born cohorts, compared to the first-born, when measured as self-assessed health, physical functioning and having many symptoms or no symptoms. Subgroups that seemed to have gained the most were women, non-smokers and those reporting too little contact with children, neighbours and/or friends, while the institutionalized 70-year olds in the later born cohorts had a deterioration compared to the first-born. Thus, years of well-being and with quality appear to have been added, although people survive longer with diseases.

Elderly people's health can adequately be assessed through self-reports by interview, especially if the focus is illness, impairments and health in a broader sense. Health status is important to the quality of life of elderly - but social relations, functional ability and activities are equally important. Risk factors for suicide among the old elderly are family conflict, serious physical illness, loneliness and depression – factors that also can be seen as contributors to bad quality of life. It is important to notice, that old elderly suicide victims with depression were less likely to have received treatment for the depression than the young elderly.

Conclusions

Longer life? Yes, according to the results in paper I, later born cohorts are living longer. Up to today, there is no evidence of stagnation in the increase in average life expectancy. Thus, we are still experiencing a prolongation of the life. However, no one knows for how long this increase in longevity will continue.

Better life? Yes, there are indications of years with good health, measured as self-assessed health and physical functioning being added – although we live longer with diseases. Further gains in both survival and health can be expected if life-style factors, e.g. smoking, can be changed in a favorable way. Continued improvements in health care technology and treatment does also increase the likelihood of augmented health status and decreased disability, and thereby also increasing the quality of life. One important target for the future health care is to recognize and treat depressions among elderly people, especially in the context of severe illness and impairment.

In closing

This thesis is but one of many pieces in the giant puzzle of elderly people's health and the development over time. But all pieces are important for the complete picture. I have tried to answer the question if the years that have been added are really good years. And - yes - there are good years being added. On the other hand, I cannot rule out that there might also be some years of ill health. The goal of health care of elderly people must be to minimize the years of ill health, even if it is to optimistic to think that all diseases can be cured. Many good years can be achieved by reducing symptoms and disability, and enhance the ability to do the things in life that the specific individual values most. To use the words of Grimley Evans: "Old age is now a human right, to be enjoyed not endured" [232].

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SUMMARY

Background: Life expectancy has been steadily increasing in most industrial countries, and there is no evidence of stagnation. Whether or not the added years are years in good health and with quality of life have been vividly debated during the last decades. Previous studies have found indications of both improved and deteriorated health among elderly. For the planning of health care and prevention for the elderly population, there is a need of increased knowledge of how the development of mortality and morbidity has been in different subgroups in the society. There is also a need to know what elderly people consider being important to quality of life. Knowledge about risk factors for suicide among old elderly is sparse, despite the fact that those aged 75 and above have the highest suicide rates in most developed countries.

Aim:

- To analyse differences in mortality and morbidity - measured as self-assessed health, number of symptoms, number of diseases and physical function - in three different cohorts of 70-year olds with special regard to the impact of social factors.
- To compare data from interviews and medical records regarding illness, symptoms and impairments among elderly.
- To investigate what elderly people consider being important for their quality of life.
- To determine predictors for suicide among the old elderly (75+).

Methods: Paper I and II: A random samples of 70-year old people born in 1901/02, 1906/07 and 1911/12. In the three cohorts there were 973, 1036 and 619 participants, respectively. They were examined for the first time at age 70 and interviewed regarding social background, social network, self-assessed health, need of care and number of diseases. Death records were obtained up to and including 1998. Paper III - V: 85 elderly suicide cases (65 years of age and above) and 153 randomly selected control persons with the same sex, birth year (+2 years) and living in the same area. Information about the suicide cases was collected through interviews with close informants. The control persons were interviewed in person. Medical records for both groups were reviewed.

Results: The later born cohorts had lower mortality compared to the first-born cohort. Participants not living in an institution, those reporting not feeling tired, non-smokers, those with one or more disease and men reporting too little contact with their children were among those who had lower mortality in the later born cohorts. There were fewer 70-year olds not feeling healthy in the later born cohorts compared to those born 1901/02, and there were fewer having many symptoms. There were also indications of better physical functioning in the later born cohorts. Women had a better development than men, while those living in

institution had a deterioration. Medical records gave better information concerning specific diseases and diagnoses e.g. the vascular organ system, while interview data provided better measures of illness, functional impairment and health in a broader sense, such as impaired sight, hearing and mobility. Elderly persons consider health, social relations, functional ability and activities as important to the quality of life. Family discord, severe physical illness, loneliness and both minor and major depression were risk factors for suicide in the old elderly.

Conclusions: Survival has increased, and it seems to be good years, measured as self-assessed health and physical functioning, that have been added - although we live longer with diseases. More good years can be gained with improvements in life style behavior such as reduced smoking. Continued improvements in health services and medical treatment do also increase the likelihood of better health status and decreased disability. One important target for the future health care is to recognize and treat depressions among elderly people, especially in the context of severe illness and impairment.

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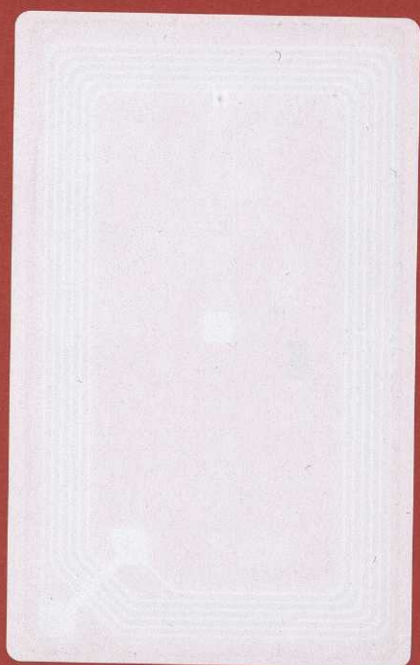
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