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**The Rule Of Nutrition In The Incidence Of Infectious Diseases And
Dietary Treatment During The Febrile Periods**

Lillie Louise Davis

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THE ROLE OF NUTRITION IN THE INCIDENCE OF INFECTIOUS DISEASES
AND DIETARY TREATMENT DURING THE FEBRILE PERIODS



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THE ROLE OF NUTRITION IN THE INCIDENCE OF
INFECTIOUS DISEASES AND DIETARY
TREATMENT DURING THE
FEBRILE PERIODS

By

Lillie Louise Davis

A Thesis in Home Economics Education With Emphasis on
Nutrition Submitted in Partial Fulfillment
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BIOGRAPHY

The writer was born in Hillsboro, Hill County, Texas, on August 21, 1926.

Her elementary as well as high school education was begun and completed in Peabody High School, Hillsboro, Texas, graduating from high school in May, 1944, with honors.

In June, 1944, she went to San Francisco, California and began working in Civil Service. After remaining there for two years, she came back to Texas and enrolled in Prairie View Agricultural and Mechanical College in September, 1946. After four consecutive years of college work, a Bachelor of Science degree was conferred in May, 1950, with honors. She began graduate work as a fellowship student in September, 1950.

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To Mrs. E. M. Galloway, Dean, School of Home Economics, Prairie View A. and M. College, the writer is indebted. Her encouragement, valuable suggestions and constructive criticisms were of great help. The help of each and everyone is deeply appreciated.

DEDICATION

To my husband and parents who have been constant sources of inspiration.

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CHAPTER I

INTRODUCTION

A general interest in the causes of the absence of school children at Rockdale, Texas, during a questionnaire program served as a motivation for the study undertaken. This interest was created when the writer was asked to assist with the questionnaires that were designed to check on the need for a hot lunch program under the supervision of the Aycock School. At that time, the principal reported that approximately fifteen per cent of the children enrolled in the school were absent due to some type of infection. As a result, some of the questionnaires had to be taken to the various homes for execution. From observations the writer has begun to wonder whether or not malnutrition was one of the factors that added to the susceptibility of the children to infections.

The observations were given emphases when the data were tabulated and the results showed that there were definite signs of malnutrition among many of the school children. This served to stimulate other questions in the mind of the writer that could only be satisfied through a thorough investigation.

This problem was approached from a nutritional standpoint since nutrition was the primary interest of the

investigator, however, she felt that other factors related to the health and sanitation conditions of the community were also responsible for the infections. In view of this fact, questions concerning the preventive measures such as inoculations against various diseases, health examinations, and a safe milk and water supply were included in the questionnaire form.

The purpose of this study, therefore, was to determine, if possible, the relationship between diet and the incidence of infectious diseases and, in the case of the disease, to discover how diet can be used in the treatment of the diseases during the febrile periods. It was also hoped that as a result of the study the parents concerned might become convinced of the need for nutritional improvement, and come to realize that a child is malnourished whenever his body is not receiving the materials necessary for normal growth and functioning. It is hoped that the parents might be made aware of the preventive measures that might be used for certain diseases. This could be accomplished if parents would examine themselves with critical, unprejudiced eyes and then make amends that would insure the optimum development of their children both from the standpoint of health and nutrition.

The increased susceptibility of malnourished children to disease is perhaps the most commonly marked effect of

undernourishment. Physicians seem generally agreed that such children take diseases more readily than do well-nourished children, have more severe and prolonged cases of illness, and because of this lessened resistance are more likely to succumb to the disease. Other factors besides the nutritional factor may enter in a study of the incidence of infections. Authorities seem to think that the natural or acquired immunity of the child and the virulence of the attacking organisms, are undoubtedly bigger factors than is the state of nutrition. Other factors being equal, however, the well-nourished body should resist infection better than a poorly nourished one.¹

Infectious diseases that were prevalent in the community are discussed in this study. A list of these diseases was obtained through observation and interviews with physicians in the community. See Appendix, Exhibit A.

Diphtheria was one of the diseases that was prevalent in the community. According to Rosenau (32) the morbidity incidence of diphtheria is highest in children between five and seven years of age, however, the mortality incidence is highest in infants under twelve months of age.

Pneumonia is one of the most prevalent of all infections. Since it is a secondary cause of death, its true

¹L. J. Roberts, Nutrition Work With Children, 1944, p. 235.

mortality rate is not known, however, authorities agree that it is declining. Complications from measles often result in broncho-pneumonia. Deaths seldom occur as a result of measles although almost ninety per cent of all children have this disease at one time or another.

Meningitis occurs in people of all ages. According to the 1940 census reports, the morbidity and mortality rates have been reduced to eighteen and six per cents, respectively.

The morbidity incidence in scarlet fever is lower than in any other infectious disease and the mortality rate is constantly being lowered. According to the 1940 census reports, the mortality rate from this disease was down to less than two per cent.

Typhoid fever is most prevalent in communities with poor sanitation. The mortality incidence varies from five to ten per cent in children under fifteen years of age to practically zero in adults over twenty years of age.

Whooping cough is so prevalent that practically all persons have had the disease by the time they reach the adult age. It is seldom fatal, however, ninety-five per cent of the deaths that occur from this disease are among infants under twelve months of age. Mumps are as prevalent as whooping cough, however, the disease might occur during adult life. The mortality rate from this disease is less.

than one per cent.

The diets for the febrile periods of these infectious diseases should be prescribed by a physician for he is one who determines the type and character of the disease through his observations of symptoms and from the results of laboratory tests. According to the best authorities, only fluids should be given during the preliminary observation period in order to eliminate any unnecessary strain on the digestive organs, to prevent dehydration and to afford time for specific treatment. In febrile conditions the pathological changes which occur in the body must be met by proper adjustment of the diet.

After the doctor has determined the character and type of the infection, certain definite procedure is suggested by Barborika (1) who lists the following factors as those which are common to most fevers and must be taken into consideration in making the modifications necessary for dietary treatment:

Seat of Infection. The location of the infection should indicate with a fair degree of accuracy the type of diet to be instituted.

Increased Metabolic Rate. There is an increase in metabolism amounting to 7.2 per cent for every degree of rise in temperature. This increased rate must be compen-

sated for by an increase in the energy or caloric intake.

Increased Protein Metabolism. With the increase in the metabolic rate there will be a like increase in protein losses due to the breakdown of the muscle tissues. The additional end products of protein metabolism place a heavy burden on the kidneys which are called upon to eliminate them.

Decreased Glycogen Store. Increased metabolism brings about a marked decrease in the body's glycogen store and may result in acidosis and other complications.

Dehydration. An increase in metabolic rate causes a loss of body fluids.

No matter how ill the patient, his general resistance must be maintained. This is accomplished by the ingestion of nutritious food. There are so many diets recommended for patients ill with febrile diseases that at times one wonders if the objectives in feeding have not been forgotten.

The food of the patient during the febrile period should meet two major specifications: (1) It should contain no article which is harmful, and (2) it should be sufficient in amount to cover the metabolic needs. The most common diets used are the full, the soft, and the liquid. The full

diet contains all of the necessary food elements, such as proteins, carbohydrates, fats, minerals, and vitamins. The soft diet has the same nutritional factors as the full diet but in a more liquid form without bulky residue elements. Of the two types of liquid diets, one is the full liquid diet which contains the same food elements and calories in liquid form as does the full diet, and an ordinary liquid diet which has little caloric value and is mostly fluid.

The subjects used in the study consisted of children of school age in the Aycock School at Rockdale, Texas. The term "school age," as used in this study, does not refer to the compulsory school age set by law, but to all students who were enrolled in that school, regardless of their ages. The diets used at City Hospital, Cleveland, Ohio, were employed as the basis for comparison because they are accepted as a standard for dietary regimens. The diets are not given the entire length of the illness, but only during the febrile period.

Definition of Terms

Acquired Immunity: Resistance against diseases that is the direct cause of infections or from having had the various diseases.

Boiled Milk: Milk that has been heated from three to ten minutes in a double boiler or over a direct flame

after scum has formed on the milk.

Communicable Diseases: Diseases that are spread by contact infections.

Febrile: The name given to that period in infectious diseases that is accompanied by fever.

Homogenized Milk: Milk that has been subjected to a process that breaks up the fat globules so that they may remain suspended evenly throughout the solution.

Immunity: The power to resist a given disease.

Infectious Disease: A disease that is caused by bacteria, protozoa and filtrable viruses.

Inoculation: The communication of a disease virus to a healthy individual in order to produce a mild form of the disease and immunity.

Malnutrition: A state in which the food intake is inadequate in some respect to meet the body needs, or in which physiological and environmental conditions are such that the body is unable to utilize sufficient food materials to provide for its proper growth, maintenance, and repair.

Morbidity: The state of being diseased.

Mortality: The condition or quality of being subject

to death.

CHAPTER IV

Nutrition: The science of nourishing the body properly.

Standardized Interview: A form of interview in which the interviewer has planned the questions to be asked.

Vaccination: Protective inoculation with a virus.

CHAPTER II

REVIEW OF LITERATURE

A search through the literature related to the study revealed that before the beginning of the twentieth century, practically all fevers were treated with what amounted to a starvation diet--a diet composed of approximately a quart of milk and a small quantity of broth given daily, the sum total of which did not furnish a sufficient amount of energy to cover even the basal energy needs and certainly fell far short of covering the needs of patients whose energy losses were greatly increased by fever.¹ Coleman (8) introduced a new form of dietary management by means of which losses suffered by typhoid patients were greatly reduced and the individual was spared the tedious and discouraging effects of long convalescence periods. He showed that by increasing the caloric value of the diet and by adding more protein in easily digested form, the patient's nutritional needs could be adequately covered. The new diet was looked upon with doubt as it represented such a marked change from the accepted treatment for typhoid fever. However, after DuBois (10) proved through laboratory and metabolism tests that the

¹J. L. McLester, Nutrition in Health and Disease.
1947. p. 660.

average patient gave no evidence of being unable to handle such a diet as was recommended by Coleman, it came into universal use.

Shaffer and Coleman (33) through experimentation proved that the protein intake of the patient ill with fever should be increased because of the destruction of protein by bacterial invasion. They maintained that because of the protein decrease in the fevers, metabolism did not experience from protein the usual specific dynamic action. In spite of the increased destruction of protein, they insisted that the nitrogen equilibrium could be maintained by a diet which supplied sufficient protein and an abundance of calories. They assumed that the absence of the specific dynamic action of protein was probably explained by the fact that the fever impulses took its place. They concluded that their findings were of clinical significance, because they demonstrated that there was no basis for the fear by older clinicians that a liberal intake of protein would stimulate fever.

Breeze (6) found that no definite relationship existed between malnutrition and the incidence of acute infections such as diphtheria, scarlet fever, measles, whooping cough, mumps and smallpox. His experiments led him to believe that malnutrition was a more important factor in respiratory diseases. He concluded that both the degree and type of malnutrition may be determining factors in the

susceptibility to infections.

Through experimental and observational work with children, Daniels (9) was convinced that an abundance of Vitamin A aided in the resistance against respiratory infections. Gardner and Gardner (13) had observed that a high Vitamin A intake played a definite role in decreasing incidence and severity of colds among school children as well as in producing gains in weight.

Ellison and Green (11) submitted reports on the effects of the fat-soluble vitamins in measles. They found that a lower mortality rate (3.7 per cent) was observed in 300 cases of measles treated with a concentrate of Vitamins A and D than was found in an equal number of untreated cases (8.6 per cent).

Green and Mellanby (14) also reported an investigation on the effect of Vitamin A deficiency on the susceptibility of rats to disease. Ninety-three rats were given a diet deficient in Vitamin A, and fifty other rats were used as controls. The control rats were given codliver oil, butter fat, dried cabbage and carrots as sources of Vitamin A. The ninety-three rats deprived of Vitamin A grew fairly well for a time, then refused to eat, lost weight and died. Autopsies showed that all but two of the rats had infections in one or more parts of the body. Abscesses at the base of the tongue, involving the salivary glands and

lymphatic glands of the neck, were found in seventy-two per cent of the animals. Infections of the kidney and bladder occurred in forty-four per cent. The alimentary canal was the seat of infection in twenty-one per cent of the animals. Pus was found in the middle ear or nasal sinuses in twenty per cent. The incidence of infection in the lungs (septic-bronchial pneumonia) was found in nine per cent of the animals.

None of the fifty controlled rats was reported as having had any gross infective lesions. These findings led Green and Mellanby to conclude that Vitamin A was more directly related to resistance in infections than any other food factor.

There are reports of experiments that have yielded negative results as to the importance of vitamins in the incidence of infections. In an article entitled "Does Our Dietary Require Vitamin A Supplement?" Hess (15) and his co-workers reported no difference in the incidence of colds in children given additional Vitamin A and those not receiving this supplement. Shibley and Spies (36) made similar observations on over 200 adults in Western Reserve University, and likewise reported no beneficial effects from the additional vitamin, except perhaps for a slight shortening of the duration of winter colds.

McCarrison (19) suggested the possibility that ultimately it would be found that Vitamin A works in harmony with

other factors such as proteins of high biological value in promoting resistance to the various infectious diseases, and expressed his belief that "the relationship of nutrition to infection will ultimately prove to be a subject of great practical importance, although the facts so far established may require a different interpretation."²

While there is little or no disagreement on the facts as observed in laboratory animals, direct application to human beings is yet to be warranted, however, it would not be expected that the same striking results would be observed since even the poorest diets of human beings are not as devoid of Vitamin A as the diets of the experimental animals. Whatever may be the explanation, it is certain, as pointed out by Mellanby and numerous other workers, that the types of disorders which occur in animals are more commonly found in people whose diets are low in Vitamin A than in those having an abundance.³

After more than twenty years of observing and caring for patients ill with acute infectious disease, Toomey (39) came to the conclusion that most of the special diets recom-

²R. McCarrison, "A Good Diet and a Bad One," Journal of the American Medical Association, September, 1926, p. 709.

³L. J. Robers, Op. cit., p. 234.

mended for diseases are needed only rarely. He felt that if the fluid intake is kept up to prevent dehydration, one need not worry about the diet in the case of acute but brief fever.

formulate a definition of the problem under investigation. Then a search through the literature was made for research of a similar kind and dealing with a similar case. No study was found that would have influenced the work done in the study. Information given by specialists and pathologists served as a basis for formulating the questionnaire form that was used for collecting and recording the data used in the study.

A questionnaire form was prepared and submitted to the Director for approval. After several revisions as a result of her criticisms, the questionnaire was approved and the necessary steps were taken to make it ready for use.

In the meantime, the writer had received the preliminary report of the preliminary research--based on the fact that there is a certain relationship between the amount of fluid intake and the amount of fluid lost in the body.

Students were made out according to the suggestions of the parents as to the time that they would be available for the interview. The student form of the interview was

CHAPTER III

METHOD

It was felt necessary to limit the area of study and formulate a definition of the problem under investigation. Then a search through the literature was made for research of a similar kind and dealing with a similar area. No study was found that could have influenced the methods used in the study. Information given by nutritionists and pathologists served as a basis for formulating the questionnaire form that was used for collecting and recording the data used in the study.

A questionnaire form was worked out and submitted to the director for approval. After several revisions as a result of her constructive criticisms, the questionnaire form was approved and the necessary steps were taken to render it ready for use.

In the meantime, the writer had contacted the president of the Parent--Teacher Association of Aycock School and asked her help in orientating the parents in order that they would be willing to give the information needed for the study.

Schedules were made out according to the suggestions of the parents as to the time that they would be available for the interview. The standard form of the interview was

used. Since this method of interviewing was adopted, the writer had to secure the help of another person. The person selected was a member of the community who had a Bachelor of Science degree in vocational home economics from Tillotson College, Austin, Texas. After she had been thoroughly orientated in what to look for through observations and how the interview was to be conducted, the community was mapped out into sections to be covered by each person.

The interviewers decided upon the indirect method of questioning in dealing with the more personal questions in order to prevent embarrassment. The observational method was just as effective as the indirect method of questioning in securing information. Due to the excellent leadership of the P. T. A. president and the confidence that the parents had in the interviewers, the information was given willingly by the parents.

The data collected were arranged in an organized form in order to get an adequate picture of the group as a whole. Large tabulation sheets were used to tabulate and record the data found. All tabulations were made in vertical columns with the tallies placed in horizontal rows. A separate number and space were provided for each item and sub-item. The tabulation sheets were inspected for data that could be made more meaningful by the use of tables and graphs. Then the findings were written up according to the information found on the tabulation sheets.

CHAPTER IV

FINDINGS AND DISCUSSION

The homes of seventy-six families with children of school age in Rackdale, Texas, were visited and the parents were interviewed to secure the data necessary for the study undertaken. Both the direct and indirect methods of questioning along with observations were used in securing the data.

The writer reported the findings under the following topics for discussion:

1. GENERAL INFORMATION
2. THE RELATIONSHIP BETWEEN DIET AND THE INCIDENCE OF DISEASE
3. THE USE OF DIET IN THE TREATMENT OF DISEASES DURING THE FEBRILE PERIODS
4. HEALTH AND SANITATION FACTORS THAT MIGHT HAVE BEEN INCIDENTAL IN THE CAUSE OF THE DISEASES

General Information.

Out of the 266 pupils enrolled in the Aycock School, 205 were used in the study. This was an average of 2.7 child per family with an age range of from six to nineteen years. The age range and percentage of pupils in each group may be found in figure 1. The largest per cent of

the children fell within the age range of six to eight years and the smallest per cent was found in the age range above seventeen years. As the ages of the children increased the per centage of children at each succeeding age level tended

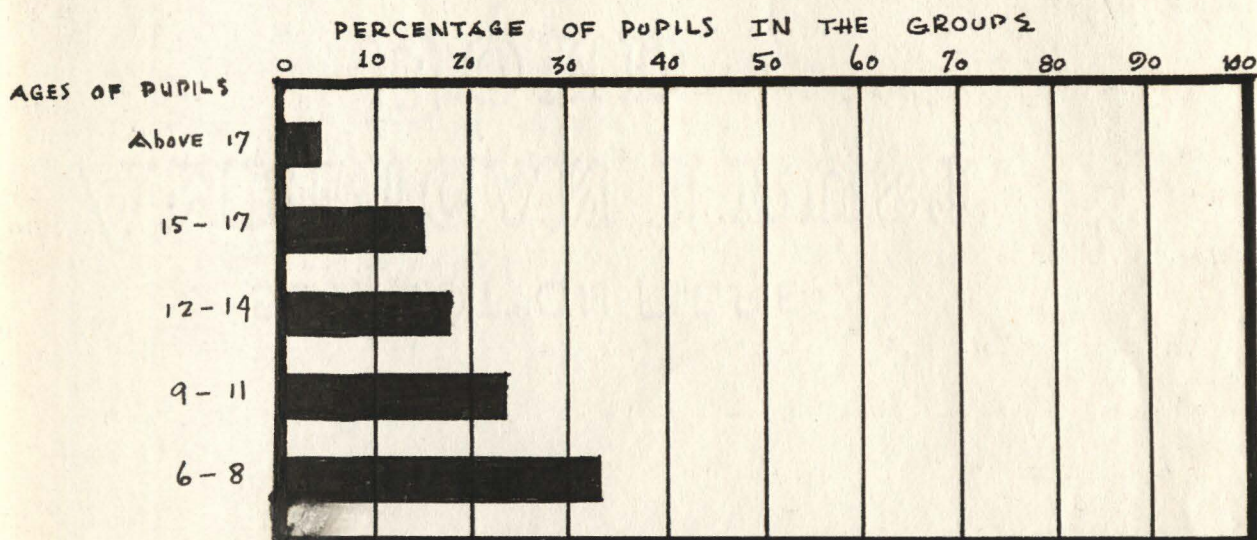


Figure 1. Age Range and Percentage In Each Group

to decrease.

Seventy-six families were used in the study of whom forty-seven per cent listed their occupations as farmers; forty-six per cent listed their occupations as laborers and seven per cent were employed in the professions.

The Relationship Between Diet and the Incidence of Disease.

The findings revealed that a variety of the necessary and protective foods was included in the diets, how-

ever, no information as to how much of these foods was eaten by the pupils was available. According to ninety-one per cent of the parents, green vegetables were included in the daily diets in some form. The vegetables were usually home grown. Thirty-three per cent of the parents indicated that fresh fruits and juices were a part of the daily diet. The reasons given by the remaining sixty-seven per cent for not including servings of fresh fruits and juices in the daily diet were that these foods were expensive except when they were in season, and that they could never buy a supply of them as they could of other articles of food. Fruits are needed along with vegetables to aid in the elimination process. Poor elimination leads to putrefaction in the alimentary canal, thus developing a situation for bacteria to breed that might lead to infections. There is a current belief, though little scientific evidence to support it, that bacterial invasion is associated with the maintenance of excess basic elements in the tissues, and that a condition of that kind may be corrected through the use of medicine. It is far better to prevent such a condition by including in the diet an abundance of fruits and vegetables to act as bearers of needed vitamins and minerals.¹

¹L. J. Bogert, Nutrition and Physical Fitness, 1943. p. 295.

Eggs are considered by nutritionists as being an excellent source of protein that is needed by the body for building purposes and as an aid in resistance against infections. Sixty-six per cent of the children studied ate at least one serving of eggs per day, however, the other thirty-four per cent probably received eggs incidentally through their use in cooking. The majority of children who had daily servings of eggs lived in homes where eggs were produced.

All of the families used some type of enriched cereals and breads that were on the market, although many were not aware of the facts of enrichment. Hence, this particular part of the study served an informative purpose to the majority of the parents. Seventy-one per cent of the children drank at least one pint of milk a day. The remaining twenty-nine per cent seldom ever drank milk, however, it was possible for them to receive milk in some form through cooking foods that required the use of milk. The average milk consumption in the United States, including that used in cooking, was estimated as having been a little over one pint a day in 1940. Experimental studies of children from one to thirteen years of age have established scientifically that such children must receive a full quart of milk per day in order to insure the best growth and development.²

²H. C. Sherman, Science of Nutrition. 1944. p. 51.

Although a high percentage of the necessary foods was included in the diet, a large percentage of the children were able to take all of their meals at home since they lived within walking or easy riding distance from the school. The forty per cent who ate breakfast and dinner at home were either bus students or lived too far from school to go home for lunch. They either carried their lunch or were given money to purchase it. The remaining forty-two per cent seldom ate more than one meal at home. This group was also given money to purchase their lunch when it was not prepared as a box lunch. Observations of similar situations by Roberts (31) have convinced her that breakfast was the meal most commonly missed and that the lunch eaten by school children was frequently inadequate. She also noticed that when children were left on their own to buy their lunches, the majority of them purchased odds and ends that could be eaten hastily as they dashed off to play.

If any of the forty-two per cent who seldom ate more than one meal a day at home decided to miss lunch at school, that meant that they went from dinner one night to dinner the next night without having had a real meal. Even if dinner at home had been complete from the nutritional standpoint, nutritionists believe that it is impossible to crowd a day's dietary requirement into one meal. The information showed that a hot lunch program was definitely needed along

with a nutritional program that would benefit all grade levels as well as parents. A group of children as under-nourished as these probably were, judging by the number of meals missed and the kinds of foods eaten, would probably have lowered resistance and, therefore, be susceptible to practically any of the diseases that are common to children.

The Use of Diet in the Treatment of the Diseases During the Febrile Periods.

Table I presents a list of the diseases with the classification of diets used in the treatment during the febrile periods. The findings on these diseases have been discussed under their prospective titles.

Diphtheria.

Only twelve cases of diphtheria were reported which amounted to six per cent of the children studied. The diagnoses had been made by a physician in all cases. The diets prescribed by the doctor in charge were purely liquid and were taken as the condition of the patient permitted. Bond (5) pointed out that the diet for a patient ill with diphtheria depends upon how severely the patient has been damaged by the disease. All authorities agree that the liquid diet is the best diet to give during the febrile period, if any diet can be given at all, because it puts less strain on the patient.

Influenza.

Parents reported that forty-five per cent of the children had had influenza, however, only fifteen per cent of the cases had been diagnosed by a doctor. The doctor had recommended a pure liquid diet until all of the fever subsided. The actual amount of nourishment that the patient

Table 1. Per Cents of Diseases, and Diets, Prescribed and Unprescribed

Disease	% Having Disease	% Attended by Physician	Diet Prescribed	Diet Unprescribed
Diphtheria	6	6	liquid	-
Influenza	45	15	soft - liquid	regular diet
Malaria	6	6	liquid	-
Meningitis	-	-	-	-
Mumps	87	17	full diet	regular diet
Measles	96	6	liquid - soft	regular diet
Pneumonia	77	77	liquid and soft	-
Smallpox	12	12	soft	-
Tetanus	-	-	-	-
Typhoid Fever	43	43	liquid	-
Scarlet Fever	5	5	liquid	-
Whooping Cough	86	40	soft and liquid	regular diet

receives is of comparatively little importance. He needs liquids and should be given them in sufficient amounts. Liquids are needed to prevent dehydration that could be

caused by a very high fever.³ The remaining thirty per cent that had not been diagnosed by a doctor had been given different diets. Parents stated that they used what has been called the soft diet (see appendix, Exhibit C), however, no complications seemed to have developed as a result of these diets. Influenza is akin to pneumonia in that the seat of the infection is in the lungs which more or less limits the oxygen intake. Large amounts of food call for greater amounts of oxygen for combustion, thus placing an added strain on the lungs. It is, therefore, necessary to give small feedings of nutritious liquids at frequent intervals in order to spare the patient all possible effort.⁴

Measles.

Ninety-six per cent of the children were reported as having had measles. Six per cent of these cases were attended by a physician at which time he prescribed a liquid diet to be followed by a soft diet after the first day. The diets given those not attended by a doctor were the same as those eaten by other family members, however, fats were excluded. Bond (5) pointed out that most children eat well even when they have fever but if the temperature is high, a liquid diet can be given for a few days to be followed by a

³McLester, Op. cit., p. 661.

⁴F. T. Proudfit, Nutrition and Diet Therapy, 1942. p. 494.

full diet when the fever subsides.

Pneumonia.

Seventy-seven per cent of the children had had pneumonia according to the reports of parents. A physician diagnosed all of the cases and prescribed diets classed as liquid and soft. McLester (21) indicated that since pneumonia is a brief illness, the outcome of which is usually determined within a few days, the actual amount of nourishment which the patient should be given is of comparatively little importance. He thought that soft foods should be given when the patient enters the convalescent period rather than when he is in the febrile period.

Scarlet Fever.

The findings revealed that five per cent of the children had had this disease. A physician was in attendance in all of the cases and prescribed liquid diets. Many diets have been recommended for patients in the early stages of this disease on the theory that the kidneys are overloaded and need rest. Doctor Toomey (39) stated that his patients get along well on an ordinary house diet (regular full diet) and at City Hospital they do not restrict the fluid intake unless it is absolutely necessary.

Typhoid Fever.

Forty-three per cent of the children were reported

as having had typhoid fever. The physician had been in attendance in all of the cases. The diets prescribed by physicians for these patients were classified as liquid diets. Wohl (40) pointed out that it was no longer necessary to keep the patient on a liquid diet since it had been proved that he can get along just as well on a soft diet. Bond (5) believed that the diet should be high in caloric content with sufficient energy value to maintain normal weight. Nutritionists agree that a liquid diet can be just as nutritious as a full diet providing a variety of liquids are used.

Whooping Cough.

Parents reported that eighty-six per cent of the children had had whooping cough, however, only forty per cent of the children had been attended by a physician who recommended a soft strained diet for the patients. Monsch (25) indicated that undernourishment was one of the dangers of whooping cough; so it is very important that the food be nutritious and easily digested and food that will be retained. Authorities agreed that a semi-solid diet that was free of roughage was the desirable diet to prescribe for patients who have the disease. The parents who did not call in a doctor to the patients gave them an ordinary house diet. It is believed by authorities that the ordinary house diet is irritating to the patient due to the amount of roughage that

it contains.

Malaria.

Parents reported that six per cent of the children had had this disease. All of the cases were diagnosed by a physician. The diets prescribed were mainly liquid with buttermilk supplying most of the liquid. Authorities agreed that the patient ill with the disease should be given simple, well-prepared foods and if in the event it is not possible to secure these foods, the physician in charge of the patient should prescribe large quantities of milk and eggs to be given daily in various forms.

Mumps.

Eighty-seven per cent of the children had had this disease at the time the study was made. The diets prescribed by the physicians were the same as those that were given the patients by the parents who did not call in physicians to attend the patients. An ordinary house diet was given to all of the patients who had mumps. Authorities have agreed that mumps do not demand dietary precautions other than those demanded for the comfort of the patient, however, highly seasoned foods and acids are not recommended because they add to the discomfort of the patient.

Small Pox.

Twelve per cent of the children were reported as having

had this disease at the time of the study. Physicians diagnosed all of the cases and prescribed a full, soft diet for all of the patients. Authorities agreed that the diet prescribed for this disease should depend upon the height of the fever and the severity of the disease, however, the patient needs liberal amounts of food in order to keep up the energy requirement.

Health Factors that Might Have Been Incidental in the Cause of the Disease.

School children of the United States between the ages of six and eighteen have an average of two cases each of disabling illnesses per school year and lose on the average seven or more days per child from school. The morbidity rate of various diseases among children has prompted many communities to take action in the form of community health programs that provide sanitation for the community, periodic health examinations for school children along with immunization programs and other health facilities.⁵

The findings of this study revealed that thirty-four per cent of the school children were given periodic health examinations at least once each year. Two per cent

⁵"Statistical Report of Infant Mortality for 1940," American Journal of Child Health, December, 1947, p. 1201.

of the children were given health examinations twice each year. This low percentage of health examinations might have been accounted for by the fact that the school did not require health certificates for entrance in school.

The number of children that had had inoculations against the various diseases was fairly large in some instances. Figure 2 shows the comparison between the percentage having had the inoculations against the various diseases and the percentage having had the diseases. The findings revealed that those diseases having the greatest percentage of inoculations against them had the smallest percentage of cases reported. The largest percentage of inoculations were against scarlet fever, tetanus and typhoid fever. None of the pupils were inoculated against influenza, malaria, meningitis and mumps.

Sixty-nine per cent of the families used milk supplies that had not been tested. Seven per cent of these families indicated that they attempted to make their milk supply safe by boiling the milk and chilling it before it was used. A county agent in the community could have worked with the families in setting up an adequate testing program to safeguard the milk supply.

A study of the incidence of typhoid fever and diphtheria as a direct cause of an unsafe milk supply was made by Bigelow (3) in Massachusetts over a period of years. He found that from 0.4 to 8.3 per cent of all cases of these

DISEASES
Diphtheria

Influenza

Malaria

Measles

Mumps

Meningitis

Pneumonia

Scarlet Fever

Small Pox

Tetanus

Typhoid Fever

Whooping Cough

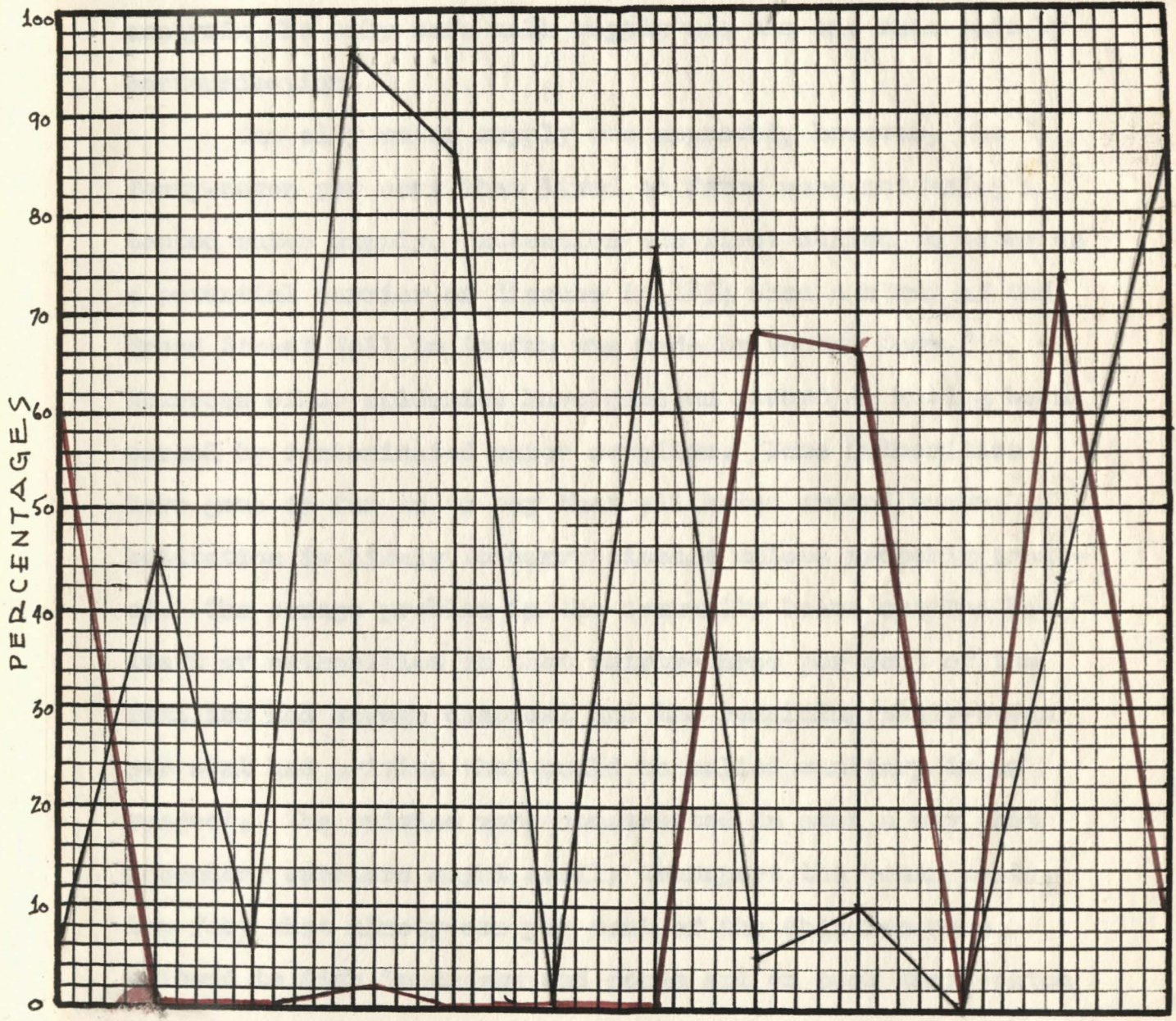


Figure 2. Comparison Between the Percentages of Inoculations and Percentage Having Diseases

KEY

- Percentage having had disease
- Percentage of inoculations

diseases were the result of an unsafe milk supply. From these facts he formed the conclusion that in the final analysis the only safe milk supply was the one made safe by pasteurization.

The city water supply was approved, however, the forty-seven per cent that lived on farms were not using a tested water supply. Attention was first called to water as a potential carrier of disease in 1854 when a study of the Broad Street Well in London was made by Doctor Snow.⁶ Numerous other epidemics have gone on record as having been caused by contaminated water supplies. Some authorities have gone so far as to say that all water around human habitation is likely to carry disease unless properly treated. The sewage problem in the community bears out the beliefs of authorities in that thirty-three per cent of the families had sewage disposal and the remaining sixty-seven per cent had privies that could be called sanitary in no respect. The privies were constructed in such a way that secondary carriers might easily transport the human waste. The fact that ninety-one per cent of the children were allowed to fish in creeks and ponds and to cook their catch was alarming in view of the sewage problem.

⁶L. B. Chenweth, Community Hygiene, 1945, p. 67.

Garbage was removed by city workers within the city limits once each week, in the meantime, the excess was either burned or fed to hogs. The disadvantage of feeding the garbage to hogs were the offensive odors, insects, rodents, and vermin nuisances which develop around hog pens. Authorities favor the burning method, especially if incinerators are available for disposing of garbage.

Through observations, the writer found that forty-two per cent of the homes had adequate screening facilities. Many of the homes had screens at the front doors and windows and none on the back of the houses. Ten per cent of the families had no screens at the doors or windows. Insects that are classified as primary carriers of various diseases had an easy access to these homes without adequate screens.

Seventy-five per cent of the children owned pets. Parents indicated that these pets were never vaccinated. They felt that there was no need to fear the pets as potential carriers of the various diseases. They also expressed the belief that children are supposed to have certain childhood diseases.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The data used in the study were collected from seventy-six parents with children of school age enrolled in the Aycock School at Rockdale, Texas. The school had a total enrollment of 266 pupils at the close of the school year, May, 1951; 205 of whom were used by the investigator to supply the necessary information. The parents of the other pupils could not be contacted because of circumstances that were beyond the control of the investigator. Data concerning the incidence of infectious disease among the school children were collected only in the cases where children had had the diseases since entering the first grade. The foods eaten by the children were considered from the standpoint of the relationship between nutrition and susceptibility to various diseases and the use of diets in the treatment of the diseases during the febrile periods. These conclusions are the results of a careful interpretation of the information collected during the study period. They have been further substantiated by scientific facts established by various authorities.

According to reports made by parents, a majority of the necessary and protective foods were included in the

diets of the school children. On the other hand, figures proved that in some instances the foods had not been eaten with the regularity that would have insured optimum dietary consumption as was judged by authorities. For example, eighteen per cent of the children ate three meals per day at home, forty per cent at breakfast and dinner at home, and forty-two per cent seldom ate more than one meal a day at home. Through extensive work with the nutritional habits of children, Roberts (31) observed that the no breakfast habit was prevalent among children of all classes and in the majority of the cases, it was not due to the lack of food, but rather to the children's failure to eat the foods prepared.

A survey that was made on the school lunches of 200 elementary school children showed that fourteen per cent of the children had lunches which appeared adequate in quantity and kind of food, while the lunches of fifty per cent of the children were plainly too small in amount and otherwise lacking in essentials to a child's diet. When given a free choice, children without training naturally select the foods which they regard as luxuries. Most of the children were given money to buy a good lunch if it were suitably expended, but they purchased too many expensive foods or saved their lunch money to buy candy after school.³ From these findings

³H. C. Sherman, "The Problem of Sweets for Children," Child Health Bulletin, Number 5 (1941), p. 63.

and similar ones, Emerson (12) concluded that extremely irregular meals have their effect on the child's nutritional status and when no definite habits of eating and living are established, ill effects on the child's well being are inevitable. A child is considered malnourished by authorities when his body is not receiving the right kinds and amounts of food at sufficiently reasonable intervals to provide materials for optimum growth and development.

These and other facts aided the writer in reaching the conclusion that at least forty-two per cent of the children were malnourished from the standpoint of irregularity of meals eaten at home even though the diets might have been adequate in kind and amount. The writer did not know the content of the lunches eaten by the pupils, however, nutritionists have proved that unless pupils have had training in selecting their foods, the foods selected by them are inadequate in many respects. The writer felt that a hot lunch program under the supervision of the school could have helped to solve the problem of an adequate lunch for the children who were unable to go home for lunch.

It cannot be assumed that the malnutrition found among the school children was the cause of some of the diseases that were reported prevalent among them. Scientific evidence of malnutrition as a cause of infectious diseases

has not been definitely established, however, authorities do agree that malnutrition lowers the body's resistance to infections.³

Several other factors were found that might have been incidental in the cause of some of the infectious diseases which the school children had had. Sixty-nine per cent of the families used milk supplies that had not been approved. It could not be said that the milk supplies were unsafe since there was no evidence to point to this fact. Nevertheless scientific evidence has proved that tuberculosis, typhoid fever, and diphtheria have been transmitted by the animals, but in many instances they are transmitted through the handlers of milk. When the epidemiologist investigates an epidemic or even an isolated case of typhoid fever, he usually inquires carefully into the source of the patients' milk supplies, inspects the dairies from which the supplies come, and carefully examines the handlers of milk. Epidemics that have been caused by milk led one authority to say that the only safe milk supply was the one made safe through pasteurization.⁴

It is an established fact that satisfactory health standards are dependent upon efficient water supplies and

³L. J. Roberts, Op. cit., p. 345.

⁴B. H. Bigelow, "Milk Borne Diseases In Massachusetts," American Journal of Public Health 23: 511 (June, 1933) p. 511.

efficient waste disposal methods. Many typhoid epidemics have been traced to contaminated water supplies. All water around human habitation is likely to carry diseases unless it is properly treated or protected.⁵ The water supply of the families within the city limits had been approved. Whether or not the untested water supplies of the farm families were contaminated was not known since no adequate testing program had been instituted. The fact that only thirty-three per cent of the families owned sewage disposal, and that the remaining sixty-seven per cent did not have sanitation privies might have indicated that there was ample opportunity for contamination of nearby water supplies by secondary carriers of human waste.

Parents reported that ninety-one per cent of the children were allowed to fish in creeks and ponds and to cook their catch. Had these fishing places been contaminated with human excreta, the catch eaten from them could have been a primary cause of some of the cases of typhoid fever.

Garbage was collected within the city limits once a week. In the meantime, the excess garbage was either burned or fed to hogs. Hog pens presented a problem from the standpoint of sanitation. They gave offensive odors and were a constant source of insects, rodents and vermin.

⁵J. L. McLester, Op. cit. p. 654.

The role of diet in the treatment of the various diseases was more clearly defined than it was in the incidence of the diseases. Both nutritionists and pathologists have agreed that the amount and kind of diet is important in the treatment of infectious diseases. This is especially true during the febrile periods when complications often develop. The diets that were prescribed for the patients ill with the various diseases did not vary too much from the standards accepted by authorities (see appendix, Exhibit C). Conflicting views were found in diets prescribed for typhoid fever patients. There was a tendency to adhere to the so-called starvation diet as explained by McLester (21) earlier in the study. Through scientific experiments and observations, DuBois (10) proved that patients ill with typhoid fever may be given a soft diet without undue complications. According to Doctor Toomey (3^o DuBois' findings are universally accepted. Other authorities have expressed the view that a soft diet would put added strain on the patient which is not necessary since a full liquid diet can be just as nutritious as the soft diet. They justified their belief by the fact that liquids are needed by the body and especially in the fevers to prevent dehydration.

The number of inoculations against typhoid fever, scarlet fever, tetanus and diphtheria were fairly large and

the incidence of the disease was not as high as it was for those diseases against which the children had not been inoculated. The writer felt that the inoculations against the diseases would have been higher if there had been an organized health program within the community or if inoculations against certain diseases had been a prerequisite for entering school. Authorities have agreed that inoculations lessen the susceptibility to the various diseases.

Some recommendations have been developed as a result of the study. It is hoped that they might be realized to the extent that the necessary measures will be adopted to rectify the situations that the study has revealed.

- I. A school and community health program that will provide for
 - A. Arrangements whereby each student is constantly observed for signs which indicate examination by a physician.
 - B. Periodic health examinations by the school doctor, school nurse or family doctor.
 - C. Immunization programs for the control of diseases.
- II. A school lunch program under the supervision of trained personnel along with a nutritional program that will meet the needs of the parents as well as

those of pupils in all grade levels.

- III. A county agent to work with the farmers in securing safe milk and water supplies and other matters of importance to their living.
- IV. An adult education program under the supervision of the agriculture and homemaking departments of the Aycock School.
- V. A follow-up study in order to determine the progress that has been made and to offer suggestions that can probably be of use in the future.

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APPENDIX

EXHIBIT A

QUESTIONNAIRE

THE ROLE OF NUTRITION IN THE INCIDENCE OF INFECTIOUS
DISEASES AND DIETARY TREATMENT DURING THE
FEBRILE PERIODS

Name of parent: _____

Occupation: _____ Number of school age children: _____

Ages of children: _____

1. Are children given periodic health examinations?
Yes _____ No _____
2. Is so, how often? _____
3. Do children eat three wholesome meals per day?
Yes _____ No _____
4. If not, how many do they eat? _____
5. Are the following included in the diet in liberal amounts?
green vegetables? _____ fresh fruits and juices? _____
yellow vegetables and fruits? _____ eggs? _____
Enriched cereals and breads? _____
6. How much milk is allowed for each child? one quart? _____
one pint? _____ none _____
7. Is the milk pasteurized? _____ or boiled? _____
8. Is the community water supply approved? _____
9. Is the house securely screened? _____

10. Does the community have adequate garbage disposal? _____
11. If not, how do you dispose of your garbage? _____
12. Do the children play with pets? _____
13. Are the children allowed to fish and cook their catch? _____
14. Do you have sewage disposal? _____
15. List the inoculations that the children have had. _____

Disease	Number Having Disease	Prescribed Diets	Unprescribed Diets
Diphtheria			
Influenza			
Malaria			
Measles			
Meningitis			
Rumps			
Pneumonia			
Scarlet Fever			
Small Pox			
Tetanus			
Typhoid Fever			
Whooping Cough			

REMARKS

EXHIBIT B

MASTER TABULATION SHEET

- 1. Occupations of parents:
 - a. Farmers: _____
 - b. Laborers: _____
 - c. Professional: _____
- 2. Ages of children:
 - a. 6 - 8 _____
 - b. 9 - 11 _____
 - c. 12 - 14 _____
 - d. 15 - 17 _____
 - e. above 17 _____
- 3. Health examinations:
 - a. Once per year _____
 - b. Twice per year _____
 - c. None _____
- 4. Meals eaten by the pupils:
 - a. Three (3) meals _____
 - b. Two (2) meals _____
 - c. Other _____
- 5. Foods included in the diet:
 - a. Green vegetables _____
 - b. fruits _____
 - c. Eggs _____
 - d. Yellow vegetables and fruits _____
 - e. Enriched foods _____
- 6. Milk allowance:
 - a. One quart: _____
 - b. One pint _____
 - c. None _____
- 7. Is the milk pasteurized? _____ or boiled? _____
- 8. Tested water supply _____ untested water supply _____
- 9. Screened houses:
 - a. Adequate _____
 - b. Poorly screened _____
 - c. None _____
- 10. Garbage disposal:
 - a. Feed to hogs _____
 - b. Burn _____
 - c. Other _____
- 11. Pets: _____ Immunized? _____

12. The number allowed to fish and cook their catch? _____
13. The number having sewage disposal: _____
14. The number having had the diseases and their respective diets.

Disease	Number	Diet
Diphtheria		
Influenza		
Malaria		
Measles		
Meningitis		
Mumps		
Pneumonia		
Scarlet Fever		
Small Pox		
Tetanus		
Typhoid Fever		
Whooping Cough		

Inoculations

Diphtheria _____	Small Pox _____
Influenza _____	Tetanus _____
Malaria _____	Typhoid Fever _____
Measles _____	Whooping Cough _____
Meningitis _____	Scarlet Fever _____
Mumps _____	Pneumonia _____

EXHIBIT C

BASIC DIETS USED IN INFECTIOUS DISEASES¹

The Full Diet

Foods Allowed:

Soups of all kinds
 Meats and fish or meat substitutes
 Eggs
 Cheese of all kinds
 Fruits, fresh, stewed or baked
 Potatoes, baked, boiled, creamed or mashed
 Vegetables
 Cereals of all kinds
 Breads of all kinds
 Butter
 Milk
 Beverages
 Desserts - simple

Foods Not Recommended

Highly seasoned foods as spiced or prepared with hot sauces
 Fresh pork, unless ordered by a physician
 Gas forming vegetables, such as raw onions and radishes
 Hot breads
 Rich pastries

The Soft Diet

Foods Allowed:

Soups - strained
 Meats and fish - scraped beef, ground lamb, bacon, ground chicken
 Eggs - soft cooked, poached, scrambled, creamed, and eggnog
 Cheese - cream cheese, cottage cheese

¹City Hospital, Cleveland, Ohio, Wohl, p. 866-70.

Fruits - applesauce and pureed fruits
 Potatoes - baked, mashed or boiled
 Vegetables - purred peas, carrots, spinach, green beans,
 beets, squash, strained tomatoes, asparagus tips
 Cereals - any cooked except bran; gruels and rice
 Bread - dry or toast, crackers, wafers, milk toast
 Milk - 1 quart daily
 Beverages - coffee, tea, cocoa, coffee substitute
 Desserts - jello, ice cream, junket, water ices, puddings
 as rice, tapioca, bread, custards, sponge cake, angel food,
 and fruit whips

The Liquid Diet

Soups - strained cream soups, broths, strained vegetable soup
 Eggs - eggnog (milk), eggnog (fruit juice), albumin milk
 Fruits - fruit juices
 Cereals - strained gruels
 Milk - sweet milk, buttermilk, junket, malted milk,
 barley water
 Beverages - modified lime water, ginger ale, carbonated
 water, coffee, cocoa or tea
 Desserts - jello, ice cream, junket, water ices