AN EVALUATION OF THE SCHOOL LUNCH PROGRAM FOR GRAMMAR SCHOOL CHILDREN AT VISITATION SCHOOL, DETROIT MICHIGAN

Thesis for the Degree of M. S.

MICHIGAN STATE COLLEGE
Sister Joanne Marie Sullivan, O. P.

1952

This is to certify that the

thesis entitled

An Evaluation of the School Lunch Program for Grammar School Children at Visitation School, Detroit, Michigan

presented by

Sister Joanne Marie Sullivan, O.S.U.

has been accepted towards fulfillment of the requirements for

M. S. degree in Foods and Nutrition

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Major professor

Date August 11, 1952

O-169

AN EVALUATION OF THE SCHOOL LUNCH PROGRAM FOR GRAMMAR SCHOOL CHILDREN AT VISITATION SCHOOL, DETROIT MICHIGAN

By

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A Thesis

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department of Food and Nutrition
School of Home Economics

1952

THESIS

ACKNOWLEDGEMENTS

The author wishes to express her sincere thanks to Dr. Dena C. Cederquist, under whose supervision and unfailing interest this thesis was written.

She is also greatly indebted to Dr. Margaret A. Ohlson for her valuable guidance and kind help in laying the foundation for this investigation and in collecting and analyzing the blood samples which were taken.

Grateful acknowledgement is also due to Dr. Wilma D. Brewer, Mrs. Ruth Marin Beegle, and Lois M. Jackson for their help in the collection and analysis of the blood samples.

The investigator extends her sincere thanks to the children who took part in the study and to their parents for their persevering and kind cooperation.

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INTRODUCTION

INTRODUCTION

In 1942 Wiehl, and in 1943, Hardy and associates, reported surveys which suggested that a considerable proportion of the American people did not consume optimum or even minimum amounts of the essential food nutrients. Before World War II, concern for the health and well-being of American children had resulted in a school lunch program which was originally instituted to supplement the diets of the poor. The interest in nutrition which developed during the second world war furnished an impetus for the expansion of this program.

It is assumed by many nutritionists, educators, and parents that great nutritional benefits are derived by children from participation in the school lunch program. However, few actual experimental studies to support this thesis have been reported in nutrition literature. There appear to be many possibilities for improving the nutritional status of the children of America through this program. Thus, carefully designed studies should be planned and carried out to ascertain possible benefits so that improvement in feeding techniques and methods of food preparation may be developed. Moreover, carefully designed studies should be planned and carried out to obtain a clearer picture

of the areas in which the American children need to have their diets improved.

The present investigation had for its purpose a study of the hot lunch served at Visitation School, Detroit, Michigan, in the hope of improving the future program there. This study was planned to compare the nutritive value of the diets, the plasma ascorbic acid concentrations, and the degree of food acceptance of two groups of children; one group of children participated in the regular school lunch program; the second group of children brought their lunches from home but could purchase milk at school.

REVIEW OF THE LITERATURE

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The use of food-intake records as a basis for a qualitative estimation of nutritional status is based upon the premise that a person who regularly consumes a balanced diet enjoys better health than a person who is malnourished. Various methods have been used to estimate the food intakes of individuals and population groups. The dietary history, twenty-four hour food recall, and estimated and weighed food-intake records are four types of diet records which have been used to obtain an estimate of food consumption. The degree of accuracy of the estimate obtained depends upon the method used and the circumstances under which it is used.

According to Todhunter (1942) and Stiebeling (1949) diet records must be kept over a sufficiently long period of time to be truly representative of the over-all dietary pattern of a subject. Darby (1947) pointed out that week-by-week variations in eating habits should be taken into consideration as well as day-by-day variations. Stiebeling (1949) expressed the opinion that if food records were kept as long as two weeks, they would be less accurate during the second week than during the first.

Burke (1947) stated that dietary history studies have been introduced to obtain an over-all, long range picture of a subject's dietary pattern. In carefully planned studies,

a trained nutritionist has interviewed each subject and, through tact and a thorough knowledge of food-value, has obtained the information necessary to secure a representative picture of the subject's normal dietary pattern. Burke (1947), however, pointed out the importance of recognizing the qualitative nature of information obtained in this way.

Twenty-four hour recall diet records are obtained by having the individuals being studied list all food eaten during the past twenty-four hours. This method has recently been used by Eppright (1950) and Storvick and associates (1951) as an economical means of obtaining a qualitative picture of the food-intake of large groups of subjects. It has the advantage of presenting a record of the food ordinarily eaten when the subjects are not under the strain of knowing that their diets are going to be recorded.

Darby (1947) found that many subjects have been able and willing to keep estimated food-intake records for a period of time such as three or seven days. According to Burke (1947) many estimated food-intake reports have required the recording of all the food consumed by the subjects as well as the recording of the approximate measure eaten and the procedures used in the preparation of each item. Since the results of chemical analyses of representative dietaries used in several experiments and the calculated vitamin content of the same dietaries agreed satisfactorily, Darby (1947) concluded that the estimated food-intake method yields useful

information about the mean intakes of a population, but has less value for assessing the intake of an individual than for assessing the intake of a population.

Weighed food-intake studies have been designed to give a quantitative picture of the amounts of particular foods ingested by the subject. According to Hunscher and Macy (1951), weighed food-intake studies require that records be kept of the weight and method of preparation of all food consumed by the subject. If aliquots of food are obtained and analyzed for the nutrients being studied, the procedure becomes more quantitative than the procedure in which the individual portions are weighed only. The weighing of the food may be carried out by someone else or by the subject himself. According to Burke (1947) few individuals are sufficiently cooperative to carry out the weighing of all their food over any extended period of time. On the other hand she also pointed out that when the food consumed by the subject has been weighed and recorded by someone else, an artificial situation has been created which may have caused the subject to change his ordinary dietary pattern. If an artificial situation has resulted where the weighings have been carried out by someone other than the subject, the results may not have been representative of the normal amounts of the particular foods or nutrients ingested by the subject.

The balance study combines the results of a weighed food-intake study in which aliquots are analyzed for the

nutrients under consideration and the chemical analysis of the urinary and fecal outputs of these same nutrients. According to Burke (1947) the balance study has offered the most accurate method of calculating the actual food utilization of an individual. Burke (1947) also pointed out, however, that this method is time consuming and costly. The results obtained seldom have lent themselves to interpretation of the nutritional status of a population because the number of subjects who have been observed at one time rarely has been great enough to permit such interpretation.

After a record of food intake has been obtained, the nutritive value of the diet may be estimated in one of several ways. Separate computations for each food item may be carried out; the food items may be classified into groups composed of foods which make similar nutritional contributions to the dietary and average figures used for the computations of the food groups; or a combination of the afore-mentioned methods may be employed. According to Donelson and Leichsenring (1945) the estimation of the nutritive value of a diet, following the procedure in which separate computations are made for each food item, assumes a greater degree of accuracy than is justified when the wide variation in composition of any given food is taken into consideration. Therefore, these workers grouped together foods of similar composition and, for each food group, established mean values for the nutrients which are generally included in food

tables. Certain foods deviated sufficiently in composition from the means of any food group to require that they be listed as separate items.

Donelson and Leichsenring (1945) tested the accuracy of the values in the grouped-food composition table. A series of 30 three day diet records were computed first by separate computations for each food and then using the food groups. Comparison of the results obtained by the two methods showed a high degree of accuracy for the values in the grouped-food composition table. When tested statistically, the observed differences were shown to be due to errors in random sampling and not to real differences between the two methods.

Physiological Fluid Studies: It has been widely recognized that malnutrition results from dietary deficiency or deficiency due to abnormal physiological conditions. Cooperstock and associates (1948) stated that nutritional inadequacy may result from a deficiency attributable to factors which interfere with the ingestion, absorption, or utilization of essential nutrients, or from factors such as growth and destruction of nutrients in the body, which result in increased requirements. For this reason, any method which measures nutritional status in terms of food intake is subject to error in cases where the food requirements of the individual are greater or less than those which are considered normal. Therefore, the relation of nutritional status to

food intake has been studied by noting the changes in clinical signs and in blood and urine concentrations of the various nutrients which have resulted from changes in diet. Moyer and her associates (1948) reported that the greatest difficulty encountered in using physiological fluid concentrations as indices of nutritional status has been inadequate knowledge of the concentrations which define the zones of nutritional adequacy and inadequacy.

Kaucher and associates (1948) pointed out that hemoglobin concentrations have been useful in assessing the adequacy of the diets of groups of individuals, but, because such a variety of factors operate to influence hemoglobin levels no satisfactory standard for all individuals in a mixed group has been found.

Serum protein concentrations were formerly believed to be a reliable index of protein nutrition. Beach (1948), however, reported the total blood volume of subjects whose diets had been deficient in protein. These total volumes had undergone a compensatory reduction which had left the unit concentration of blood protein unaltered. This would indicate, therefore, that a dietary deficiency of protein was masked by a corresponding reduction of the total blood volume.

Interpretation of the data with regard to vitamin A has been complicated by the capacity of the body for storage of this vitamin. Both Callison and associates (1947) and Robinson and associates (1948) showed that this capacity has

made it possible for the diet to change from an abundant supply of this vitamin to a marked lack of it for a period of months without having changed appreciably the blood concentration of vitamin A.

Chemical and microbiological methods for the determination of thiamin, riboflavin, and niacin have been developed. According to Goldsmith (1949), fluorometric methods for the determination of riboflavin check well with the microbiological procedure when interfering fluorescent substances can be removed, but the numerous chemical tests for the appraisal of niacin nutrition have been far from satisfactory. Kark and associates (1947) demonstrated a correlation between the intake of riboflavin and the fasting one-hour excretion of this vitamin. According to Suvarnakich and associates (1952) the study of the serum riboflavin concentrations obtained from one-hundred-forty-one normal individuals indicated that human serum flavin-adenine-dinucleotide indicates riboflavin nutriture and is of diagnostic value in detecting riboflavin deficiency. Mickelsen, Caster and Keys (1947) showed that the excretion of thiamin is characteristic of the individual as well as of the intake.

Thus far vitamin C studies have yielded promising results as to the blood concentrations defining adequacy and inadequacy of nutritional status with respect to this vitamin and to the interrelationship among dietary intake, blood concentrations, and related physiological conditions of the body

tissues. Moyer (1948) pointed out that the great amount of research conducted on blood vitamin C has resulted in a more definite knowledge of the desirable blood levels of this constituent than is available for any of the other vitamins. However, the Committee on Nutrition Surveys of the National Research Council (1949) pointed out that the significance of findings concerning vitamin C blood concentrations has been controversial and, for any one individual, temporary fluctuations in plasma ascorbic acid concentrations may be frequent, showing a wide range of values at any given level of intake.

Minot (1940) and Johnson (1945) considered serum ascorbic acid concentrations below 0.3 milligrams percent as indicitive of serious deficiency. Minot also regarded a serum ascorbic acid concentration of over 0.7 milligrams percent as indicative of satisfactory vitamin C nutrition. Goldsmith (1949) reported that many of those who had studied the problem most carefully considered plasma ascorbic acid concentrations below 0.6 milligrams percent less than desirable.

Johnson and associates (1945) and Johnstone and associates (1946) found that in order to maintain blood ascorbic acid at a high concentration its frequent ingestion is necessary. Consequently, tests for ascorbic acid levels in the blood have appeared to give better correlation with the current diet than is found in some other measures of nutritional status. Putnam and associates (1949), in studying the

relationship between the ascorbic acid intakes of two large groups of subjects and their corresponding blood concentrations, reported that the correlation coefficients were indicative of a significant relationship. When the data were assembled, the coefficients were: +0.395 and +0.416

Moyer and associates (1948) stated that while a single blood sample from an individual has furnished a poor picture of the person's state of vitamin C nutrition, the overall picture of the population which is obtained by taking a single sample from each of a large group of subjects has been of much greater reliability.

The ascorbic acid content of the white cells of the blood has been shown by Crandon, Lund, and Dill (1940) to be more indicative of actual tissue concentration than the ascorbic acid content of the plasma. These workers found that plasma was lacking in ascorbic acid thirteen weeks before clinical scurvy became evident in their patients. Whereas clinical signs of scurvy developed soon after the ascorbic acid values in the leukocytes approached zero. According to Peters and associates (1948) the plasma ascorbic acid values reflect the immediate dietary intake, but the white cell ascorbic acid values give a better picture of the tissue store. These authors found that on a vitamin C-free diet about one-hundred days elapsed between the virtual disappearance of vitamin C from the plasma and the occurance of the first clinical signs of scurvy in their subjects. On

the other hand, the concentration of vitamin C in the white cells reached its lowest value three to six weeks before clinical scurvy appeared. In this same study it was found that, in general, the vitamin C concentration in the white cells was about twenty-five times that in the plasma.

Johnson and associates (1945) showed that the excretion of ascorbic acid for three and six hours after giving one gram of the vitamin orally reflected the previous dietary intake. Youmans (1942) pointed out that the results following load tests paralleled plasma ascorbic acid values obtained during fasting.

Clinical Observations: According to Burke (1947) diet records become more meaningful and reliable when the intake of essential nutrients is related to the appearance or lack of appearance of certain clinical or laboratory findings in the subjects studied.

For many years anthropometric measurements were used to evaluate nutritional status. Sevringhaus (1949) found that anthropometry as a detached and academic scientific approach has provided many contributions, but these often have been stated as correlations with racial or geographic background, seldom with any nutritionally useful correlates.

Darby (1947) found physical signs of deficiency states which may have had several causes. These physical signs are not specific. For example, oral lesions, which upon examination cannot be distinguished with certainty one from the

other, may be caused by deficiencies of niacin, riboflavin, or possibly pyridoxine or pantothenic acid. On the other hand, Todhunter (1942) stated that some gross deficiencies such as scurvy, rickets, xerophthalmia, and night blindness are readily recognized and, therefore, aid in the evaluation of extremely poor nutritional status with regard to the particular nutrients concerned.

According to Kruse and associates (1943) clinical manifestations of nutritional deficiencies severe enough to result in the classical symptoms of avitaminosis seldom have been encountered in the United States but there has been a widespread prevalence of moderately deficient diets which have evidenced themselves in vague and indefinite feelings of fatigue and "lack of pep". Clinicians and research workers, therefore, have been limited in the degree to which clinical findings could be used to estimate the nutritional status of the population, although occasionally such findings have been used to help estimate the nutritional status of an individual.

Food Habits: In 1945 Guthe and Mead stated that enough scientific knowledge had been amassed in the field of nutrition to enhance enormously the well-being of mankind by its application. They pointed out that one of the major problems in nutrition work is the attainment of widespread application of this scientific knowledge to everyday living.

With regard to attempts to improve the nutritional status of an entire nation by the use of this knowledge, two general procedures have been followed: (a) enrichment, restoration, or reinforcement of common foods, and (b) nutrition education for the people. The genetic alteration of hereditary strains of plants and animals, enrichment of flour, and the addition of iodine to salt illustrate the first procedure. These methods havemade no attempt to change the food habits of the population, but has been valuable when used to remedy deficiencies which could not be checked by a reasonable increased intake of readily available foods which were within the purchasing power of the population. The second procedure was followed in the wide publication of the basic food chart which was introduced in 1941 in the national nutrition movement.

Food-habit studies laid the foundation for the effective application of both of these procedures for the improvement of the nutritional status of the nation. Unless the foods to be enriched, restored, or reinforced were readily accepted by the people who needed to have their diets improved, the results obtained would have been almost worthless. In addition, food-habit studies have provided information which has been useful in planning a psychological approach to nutrition education. Guthe and Mead (1945) stated that the study of food habits might be defined as the study of the manner in which individual subjects, in response to social and cultural pressures, select, consume, and utilize parts of the available food supply.

In 1950 Grant reported the results which a nine week period of nutrition education given to fifty fifth grade school children had on the number of times they included fruits and vegetables, other than potatoes, on their lunch trays. Before the nutrition unit began, fifteen percent of the children took a vegetable and thirty percent took a fruit. Five weeks after the unit was completed, forty-nine percent took a vegetable on their trays and thirty-nine percent took a fruit. The parents of the majority of these children were professional people in a fortunate socio-economic group. The nutrition unit had been concerned with the nutritional requirements of hamsters which the children observed in their class rooms.

A study of the food habits and preferences of Iowa adults was reported by Eppright in 1950. A large number of subjects were asked to make out what they considered an ideal menu for an entire day if they could have any foods that they wanted. They were also asked to record their actual dietary intake for one day. It was found that the preferred menus did not differ markedly from the actual. In the Southern Pasture area of Iowa, which rates lower economically but higher educationally than the other two areas studied, people used milk and green and yellow vegetables more frequently than the other two areas. The frequency of use of fruits and vegetables, other than the green and yellow, tended to increase with an increase of income. The frequency of use of

the green and yellow vegetables, however, appeared to be unaffected by economic level. Satiety value and a pleasant taste were given most frequently as the reasons why people liked particular foods. Odor was mentioned as an unfavorable quality but seldom as a favorable one.

In 1951 Storvick and associates reported a study of the food habits of fourteen, fifteen, and sixteen year old school children. A twenty-four hour food-intake record and a dietary history based on a check list of foods were used to obtain information about the food habits of the children. The twenty-four hour food-intake-records were used to check the validity of the dietary histories. The results indicated that almost all of the children had high intakes of protein and vitamin A and quite high intakes of calcium, but consumption of vitamin C was low.

School Lunch Studies: In 1936 the school lunch program, as a nationwide Works Progress Administration project, was instituted to provide free lunches for children from relief families. By 1937 (Woodward, 1937), it had become the policy in many communities to serve all the school children who cared to partake in the program. At that time an average of 500,000 were participating daily in 10,000 schools throughout the country. According to Ratcliff (1941), it was stated that on October 1, 1943, the number of public school children who obtained their lunch at school totalled

6,060,500. Although more recent figures are not available, the number who benefited from this program during 1950 may be estimated from the data published in The National Education Association Journal (1950) which showed the total appropriation of funds for the operation of the National School Lunch Program to have been $83,500,000. As was also pointed out, each dollar of federal funds had to be matched by one and one-half dollars from the state.

From the onset of the program many nutritionists agreed with Pendergast (1938) when he stated that this plan presented unlimited possibilities for an important contribution to a long term effort to improve the food habits of the American People. However, very few actual studies conducted with the purpose of evaluating the nutritional benefits derived from the school lunch program by the children who participate in it have been published. Mack (1947) reported the school lunch fed to a large number of children in Pennsylvania produced no improvement in their general condition.

Velat and associates (1951) studied children who were divided into two groups: those who partook of the school lunch four or more days a week and those who did so one day a week or less often. The second group included those who carried their lunch as well as those who went home to eat. During each of two successive years, these children were examined. In regard to several physical signs of nutritional

inadequacy, the school lunch group showed a higher percentage of children with signs suggestive of nutritional disturbance than the group without school lunches. There were more underweight children in the school lunch group and more overweight children in the group without school lunches. In all cases, however, only the mildest symptoms of nutritional deficiency were present, and clinical signs of deficiency proved insignificant as a means of evaluating the program.

The blood concentrations of hemoglobin, carotene, and ascorbic acid of this group of children were determined. The hemoglobin levels gave no evidence of advantage for the children who received the school meal. Ascorbic acid concentrations of non-fasting blood samples showed that in the group of children who did not take part in the school lunch, 33% were below 0.35 milligrams percent and 70% were below 0.75 milligrams percent. Of those who participated, 15% were below 0.35 milligrams percent and 49% were below 0.75 milligrams percent. With regard to the serum carotene concentrations, about the same percentage of children in both groups were in the intermediate category (between 70 and 129 micrograms per 100 milliliters of blood). The percentage of children with serum carotene concentrations in the lowest category (below 70 micrograms per 100 milliliters of blood), however, was less in the group which partook in the school lunch program than in the group without school lunches.

The data presented indicated that fewer children who ate the school lunch had very poor diets than those who ate at home or carried their lunch. In the group which purchased their lunch at school, 29% consumed fewer calories than the recommended daily allowances of the National Research Council, 13% ate less protein, 68% less calcium, 34% less vitamin A, and 18% less vitamin C. In the group which carried their lunch, 50% consumed fewer calories than the recommended daily allowances, 25% ate less protein, 76% less calcium, 38% less vitamin A, and 49% less vitamin C.

A study reported by Abbott (1946) made in a part of Florida where nutritional disturbances were common, indicated that a school lunch which furnished more than liberal amounts of all the nutrients as well as supplements of vitamins and minerals when needed resulted in considerable improvement in the well-being of the children. In a study in a rural county in South Carolina where the dietary patterns were particularly poor, Moser (1945) found that the physical and biochemical findings which are used to estimate nutritional status indicated a greater improvement in the health of the children who ate a complete lunch served in one school than in the health of the children who ate a "partial" lunch served in a second school.

The results of the experiment performed by Velat and associates (1951) indicated that an ordinary school lunch decreased the percentage of children who consumed extremely

poor dietaries and produced a well-defined increase in serum carotene and plasma ascorbic acid concentrations. It appears that the more than liberal lunch reported by Abbott (1946) produced a very marked improvement in the well-being of a group of poor children who partook of it.

Another study reported by Augustine and associates (1950) indicated that the lunch served in an Iowa school furnished one-third of the recommended daily allowances only twenty-two percent of the time. The fact that the primary school children ate before the intermediate and high school children was believed to be partially responsible for the deficiency since less food was available for the older children whose requirements were greater.

EXPERIMENTAL PROCEDURE

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Subjects: A group of third and fourth grade children who carried their lunch but who were able to buy milk were matched according to height, weight, age, and economic status with a second group of children who participated in the school hot lunch program.

In September, 1950, all the third and fourth grade children of Visitation School, Detroit, Michigan, who carried their lunch or who took part in the school hot lunch program were weighed and measured. Weights were taken with their clothes on but without any heavy articles such as coats and books. Heights were taken with their shoes on, since all the children, without exception, wore shoes with one-half inch heels and ordinary soles.

In order to obtain some idea of which children would be used as subjects in this study, the second and third grade teachers estimated roughly the economic status of the family of each of the above-mentioned children. On the basis of this information, those who carried their lunches were tentatively paired with those who partook of the hot lunch at school. This obviated the necessity of having to make out economic status reports for all of the children who were weighed and measured. Thirty pairs of children were obtained who were matched according to height (within one inch), weight

(within two and one-fourth pounds), age (within six months), and approximate economic status.

The children who regularly brought their lunches from home but were free to purchase milk at school if they wished made up the control group. Those who regularly partook of the hot lunch at school made up the experimental group. The parents of the children in the control group were contacted and asked if it would be possible to have the children carry their lunches continuously from the last part of September, 1950, through February, 1951. The parents of the pupils in the experimental group were also contacted and asked if their children might take part in the school hot lunch program continuously from the last part of September, 1950, through December, 1950; bring their lunch from home during January, 1951, and take part in the school lunch program during February, 1951. The mother of one of the pupils in the control group found it impossible to take part because of family circumstances.

At the time the parents were contacted, inquiry was made concerning the health of the children, and those pupils who were suffering from heart trouble, asthma, or other serious diseases were dropped from the study. Pupils who were receiving supplements of vitamin C were eliminated also. At the time the parents were first contacted, the economic status records, designed by F.S.Chapin (1947) were filled out. This method uses the type, size, quality, and condition of

the household furnishings as well as the overall condition of the home and the presence of books, magazines, and newspapers as measures of the economic status of the family.

After the economic rating of each child was computed, it was necessary to re-pair the control and experimental pupils. Twenty-seven pairs were available for study after the preliminary preparations were completed.

Food Acceptance: During the first ten days of October, 1950, the sixty original subjects were interviewed, in groups of five or six, to determine their food likes and dislikes. An original form listing seventy-six foods was used. The foods included in this list were divided equally into two groups: those which could readily be used in a packed lunch, and those which could readily be served in the cafeteria. In addition to this, the foods which ordinarily are disliked by grammar school children were divided equally between the two above-mentioned groups.

Each food listed on the form was described to the subjects. They then placed a "Y", "N", or "-", after each food item. "Y" indicated that they liked the food, "N" that they did not, and "-" that they were not familiar with it. Care was taken to maintain a quiet and reserved atmosphere in the room so that the children would not influence each other's answers. The decision to question the children in groups of five or six was made after the first two subjects were interviewed

privately and attempts to check their answers led to the conclusion that they were incorrect because responses which should have been similar were not. It was obvious to the investigator that her personal contact with these small children stimulated their imaginations and their answers were biased by their desire to say that they liked what was good for them. On the other hand, the composite picture of the food likes and dislikes of the subjects, which was obtained from the analysis of the questionnaires after the children were interviewed in groups of five or six, was more in accord with the likes and dislikes which the interviewer had noted when she served these children in the cafeteria and when she watched them eat or fail to eat the food which their mothers had prepared for their lunches.

The diet records kept one week in January and one week in February were studied and the number of times each child ate foods listed as disliked or unknown were tabulated. The average difference between the acceptance of disliked or unfamiliar foods by the two groups of children was taken as a measure of the increase or decrease in the food acceptance which had been developed in the subjects. A copy of the form used may be found in the Appendix.

Diet Records: One and one-half to two weeks before the blood samples were taken on January 27, 1951, forms to be used to record the diets of the children were mailed to each

home. The parents were asked to record the foods eaten by their children, the method of preparation, and the number and size of the servings. Two weeks before the second series of blood samples was taken on February 23, 1951, duplicate forms were mailed to the home of each child. During both periods the diet records were kept for the seven consecutive days immediately preceding the taking of the blood samples. Subjects were on unrestricted diets. Pupils participating in the school lunch program were encouraged to eat everything on the menu, just as they were during the entire school year. However, they were not required to do so. Copies of the form used to record food intake may be found in the Appendix. Intakes of calories, protein, calcium, vitamin A, and vitamin C for the two week periods were estimated by the use of the short method of Donelson and Leichsenring (1945). Average daily intakes for each of these nutrients were then computed.

The menus served in the school cafeteria during the week in February when diet records were kept may be found in the Appendix.

Height and Weight Records: The height and weight of each subject were taken at the beginning of the study and again at the time the first blood samples were obtained on January 27, 1951. The scale was of the balance type, and the sliding rule on it was employed in the measurement of height.

Plasma Ascorbic Acid Determinations: The blood plasma concentration of reduced ascorbic acid was determined on January 27, and February 23, for each control and experimental subject who showed no signs of being ill.

The finger-tip blood samples were taken at school from 7:30 A.M. to 11:30 A.M. on January 27, and from 7:30 A.M. to 10:30 A.M. on February 23. The day before the samples were taken, the children were reminded not to eat fruit, fruit juice, vegetable, or vegetable juice for breakfast. Subjects whose diet records indicated failure to carry out this instruction were eliminated from the study.

Analysis for ascorbic acid was carried out according to the micromethod of Farmer and Abt (1936). Approximately 1.0 milliliter of capillary blood from a finger cut was collected into a vial containing the dried lithium oxalate from two drops of a two percent solution. The oxalated blood samples then were centrifuged for five minutes to separate the plasma from the corpuscles. An aliquot of 0.2 milliliter of plasma was transferred to a centrifuge tube and 0.2 milliliter of glass distilled water and 0.4 milliliter of five percent metaphosphoric acid were added after which the samples were frozen.

The samples were thawed and centrifuged and two 0.2 milliliter portions of the deproteinized plasma were titrated immediately with a standard solution of sodium 2, 6 dichlorobenzenone-indophenol to an end-point of the first

faint pink which persisted for twenty seconds. Two reagent blanks were titrated to the same end-point. The Farmer and Abt microburette was used.

Calculations were based on the formula:

ml. of dye to titrate sample	-	ml. of dye to titrate blank	x	micrograms of ascorbic acid required to reduce one ml. of dye.	x 2 =	mg. of ascorbic acid per 100 ml. plasma

All solutions were prepared with glass-distilled water.

RESULTS AND DISCUSSION

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Twenty-two pairs of subjects were studied at the first blood sampling on January 29, 1951. During February, 1951, many of the children were stricken with influenza. Therefore, only thirteen pairs were studied at the time of the second blood sampling on February 23. The figures for these thirteen pairs will be reported. The description of the children may be found in Table I. According to the data (Tables II and III) the control group gained an average of 7.7 pounds and 1.2 inches from September to January while the experimental group gained an average of 7.5 pounds and 1.1 inches. The differences of 0.2 pound and 0.1 inch are within the margin of experimental error.

The economic status record for each child, as determined in October, 1950, is shown in Table IV. The ranges and average economic ratings for the two groups were similar. The average rating of the control group was 142.5, and the average rating of the experimental group was 140.0. Scores ranging from 100 to 199 indicate lower middle class to upper middle class economic status. Only one child in each group was in the upper economic status class (200 and over). Three children in the control group were in the lower economic class (100 and under), but one of these three children had a score (99.4) only a fraction of a point below the middle

TABLE I

DESCRIPTION OF THE SUBJECTS

Control Group						Experimental Group					
Subject code number	Boy	Girl	Age yr.	Height in.	Weight lb.	Subject code number	Boy	Girl	Age yr.	Height in.	Weight lb.
7		x	9.5	53.3	80.5	1	x		10.5	53.2	73.5
9	x		9.0	54.5	73.0	2		x	9.5	52.4	77.0
10		x	9.5	56.0	75.0	3	x		9.0	49.0	55.0
11		x	8.5	51.3	71.0	4	x		9.0	52.0	65.5
14		x	9.0	54.0	62.0	5	x		9.0	55.5	75.5
15		x	9.0	51.0	53.0	6	x		10.5	57.5	76.0
16		x	9.5	50.5	55.5	12	x		9.0	50.0	58.0
21	x		9.5	55.0	76.5	13		x	9.5	51.8	58.0
22	x		8.5	49.0	55.0	17	x		9.5	53.8	71.5
24	x		8.0	51.0	80.5	18		x	9.5	50.5	55.5
25	x		8.0	50.5	55.5	19		x	8.5	52.3	57.5

TABLE I CONTINUED

Control Group						Experimental Group					
Subject code number	Boy	Girl	Age yr.	Height in.	Weight lb.	Subject code number	Boy	Girl	Age yr.	Height in.	Weight lb.
26	x		8.5	52.0	59.5	20	x		9.5	55.5	75.5
27	x		8.5	52.8	63.0	23		x	9.0	51.0	54.0
Average			8.8	52.4	66.2				9.4	52.7	65.6

TABLE II

HEIGHTS OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group				Experimental Group			
Subject code number	September Height in.	January Height in.	Gain in.	Subject code number	September Height in.	January Height in.	Gain in.
7	52.0	53.3	1.3	2	51.0	52.4	1.4
9	54.0	54.5	0.5	17	53.0	53.8	0.8
10	54.0	56.0	2.0	6	56.0	57.5	1.5
11	50.3	51.3	1.0	4	51.5	52.0	0.5
14	53.0	54.0	1.0	5	54.8	55.5	0.7
15	49.5	51.0	1.5	3	48.0	49.0	1.0
16	49.0	50.5	1.5	19	51.0	52.3	1.3
21	53.0	55.0	2.0	20	54.0	55.5	1.5
22	48.0	49.0	1.0	23	49.5	51.0	1.5
24	49.5	51.0	1.5	1	53.0	53.2	0.2
25	50.0	50.5	0.5	18	49.0	50.5	1.5
26	51.0	52.0	1.0	13	50.0	51.8	1.8
27	51.5	52.8	1.3	12	49.0	50.0	1.0
Average	51.1+	52.4-	1.2+		51.5+	52.7-	1.1+

TABLE III

WEIGHTS OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group				Experimental Group			
Subject	September Weight	January Weight	Gain	Subject	September Weight	January Weight	Gain
code number	lb.	lb.	lb.	code number	lb.	lb.	lb.
7	58.0	80.5	22.5	2	66.0	77.0	11.0
9	64.0	73.0	9.0	17	64.0	71.5	7.5
10	68.0	75.0	7.0	6	66.0	76.0	10.0
11	61.0	71.0	10.0	4	58.0	65.5	7.5
14	64.0	62.0	-2.0	5	69.0	75.5	6.5
15	49.0	53.0	4.0	3	48.0	55.0	7.0
16	52.0	55.5	3.5	19	51.0	57.5	6.5
21	71.0	76.5	5.5	20	64.0	75.5	11.5
22	48.0	55.0	7.0	23	47.0	54.0	7.0
24	67.5	80.5	13.0	1	70.0	73.5	3.5
25	49.0	55.5	6.5	18	48.0	55.5	7.5
26	54.0	59.5	5.5	13	52.0	58.0	6.0
27	55.0	63.0	8.0	12	52.0	58.0	6.0
Average	58.5	66.2	7.7		58.1	65.6	7.5

TABLE IV

ESTIMATED ECONOMIC STATUS OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group		Experimental Group	
Subject code number	Rating	Subject code number	Rating
19	252.2	16	218.8
1	191.4	15	179.6
3	191.4	24	172.5
12	186.7	27	163.7
5	159.2	9	150.5
17	149.0	21	147.0
20	143.4	25	135.9
18	123.6	14	133.5
2	106.5	10	124.5
4	102.4	11	124.5
13	99.4	7	112.9
23	81.6	22	104.8
6	65.4	26	52.4
Average	142.5		140.0

class scores. One child in the experimental group was in the lower class.

From the diet records obtained at the time the blood samples were taken, the calorie, protein, calcium, vitamin A and ascorbic acid intakes of each subject were estimated by means of the short method of Donelson and Leichsenring (1945). The results obtained may be found in Tables V through IX.

With regard to the diet records, the only differences in the estimated intakes of the nutrients studied which proved to be significant at the ninety-five percent confidence level were those of ascorbic acid. When the estimated average intakes were compared to the daily allowances recommended by the National Research Council (Tables V through IX), it was found that ascorbic acid was the only one of the nutrients studied, except calories, which was not well above the recommended allowances. This is in agreement with the findings of Storvick and associates (1951) that fourteen, fifteen, and sixteen year old children generally have high intakes of protein and vitamin A, quite high intakes of calcium, and low intakes of vitamin C. Velat and associates (1951), in studying two grade school lunch programs found that the children partaking of the school lunch consumed fewer calories but more vitamin C than did the children who carried their lunches or ate at home.

With regard to the plasma ascorbic acid concentrations presented in Table X, the average of the control group fell

TABLE V

ESTIMATED MEAN DAILY INTAKE OF CALORIES OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject	January Calorie Intake	February Calorie Intake	Subject	January Calorie Intake	February Calorie Intake
7	2,342.9	1,780.8	2	2,130.7	2,197.9
9	3,006.4	2,358.1	17	2,888.6	2,043.0
10	2,906.8	2,663.0	6	2,094.3	1,962.7
11	2,772.5	2,755.1	4	2,338.9	2,289.4
14	2,268.9	2,053.1	5	2,914.8	1,832.8
15	2,347.9	2,685.4	3	1,989.1	2,087.2
16	2,655.9	2,481.9	19	1,798.2	1,823.3
21	2,230.7	1,884.3	20	2,784.1	2,564.9
22	2,528.6	1,685.9	23	1,865.6	1,833.3
24	2,828.8	2,568.3	1	1,998.9	2,204.4
25	1,967.4	1,951.6	18	1,717.9	1,539.5
26	1,937.8	2,444.8	13	2,176.9	2,417.1
27	2,248.6	1,774.6	12	2,304.0	1,885.4
Average	2,464.8	2,237.5		2,231.0	2,052.4

Recommended Daily Allowance: 2,000

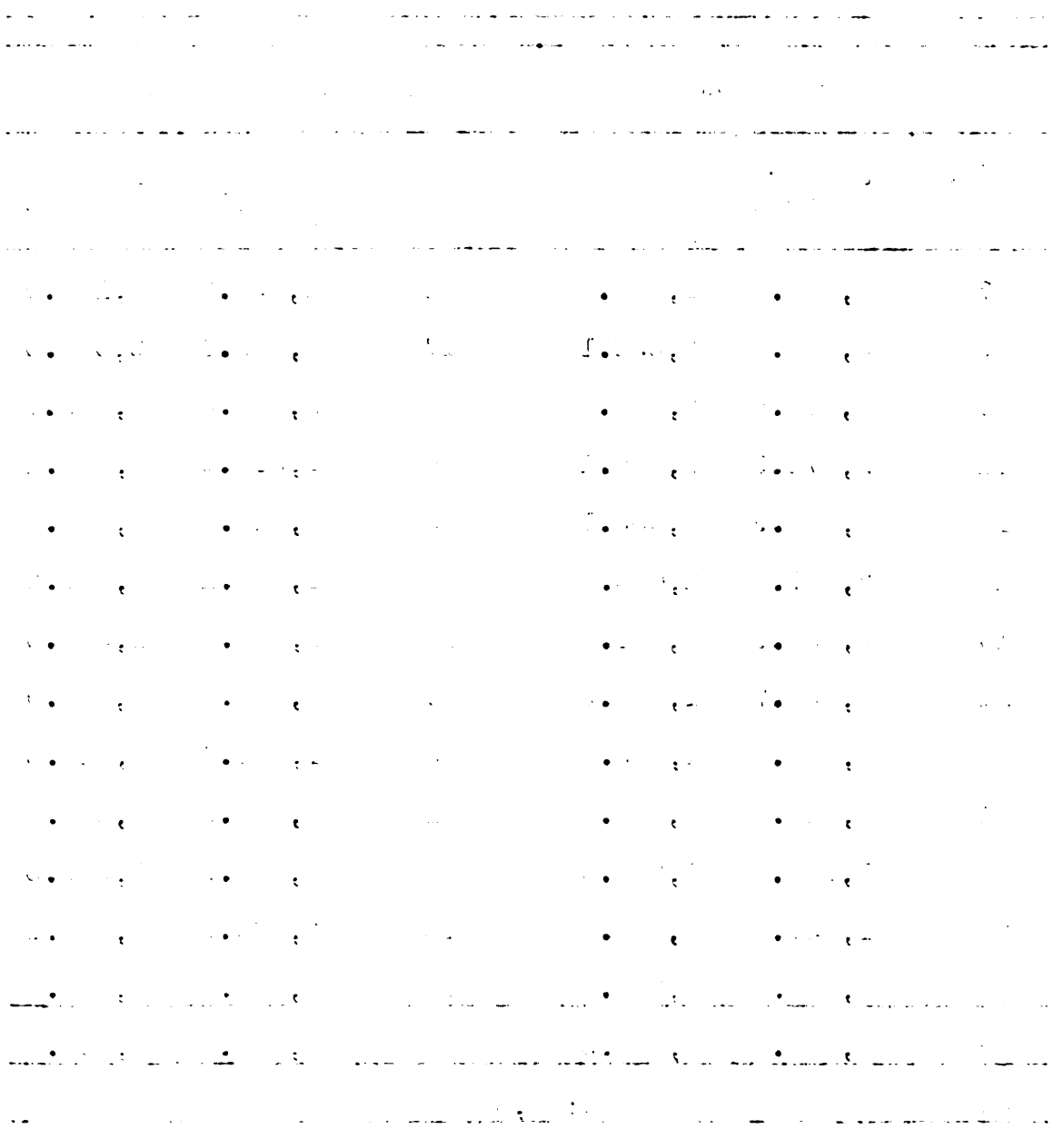

TABLE VI

ESTIMATED MEAN DAILY INTAKE OF PROTEIN OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject code number	January Protein Intake gm.	February Protein Intake gm.	Subject code number	January Protein Intake gm.	February Protein Intake gm.
7	102.29	71.82	2	80.79	80.49
9	101.29	74.90	17	92.82	74.50
10	87.11	88.70	6	83.18	72.49
11	83.20	97.10	4	82.39	91.95
14	70.60	64.00	5	93.79	72.70
15	79.60	91.80	3	77.11	74.99
16	97.30	85.80	19	64.79	70.70
21	92.50	76.60	20	112.96	101.98
22	96.87	66.00	23	71.98	70.32
24	114.54	105.00	1	83.20	78.49
25	72.91	69.27	18	79.25	65.98
26	68.38	70.96	13	79.92	100.45
27	87.11	76.54	12	84.38	82.38
Average	88.75	79.88		83.58	79.80

Recommended Daily Allowance: 60.00 gm.

TABLE VII

ESTIMATED MEAN DAILY INTAKE OF CALCIUM OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject code number	January Calcium Intake gm.	February Calcium Intake gm.	Subject code number	January Calcium Intake gm.	February Calcium Intake gm.
7	1.37	1.14	2	0.79	1.13
9	1.47	1.26	17	1.03	1.39
10	1.50	1.41	6	0.82	0.88
11	1.38	1.59	4	1.21	1.36
14	1.02	1.04	5	1.22	0.87
15	1.08	1.33	3	0.71	0.74
16	1.35	1.15	19	1.04	1.00
21	1.16	1.24	20	1.78	1.67
22	1.21	0.97	23	1.14	0.99
24	1.48	1.47	1	0.55	0.69
25	1.14	1.02	18	1.17	1.25
26	1.02	0.99	13	1.11	1.15
27	1.54	1.13	12	1.24	1.18
Average	1.29	1.21		1.06	1.10

Recommended Daily Allowance: 1.00 gm.

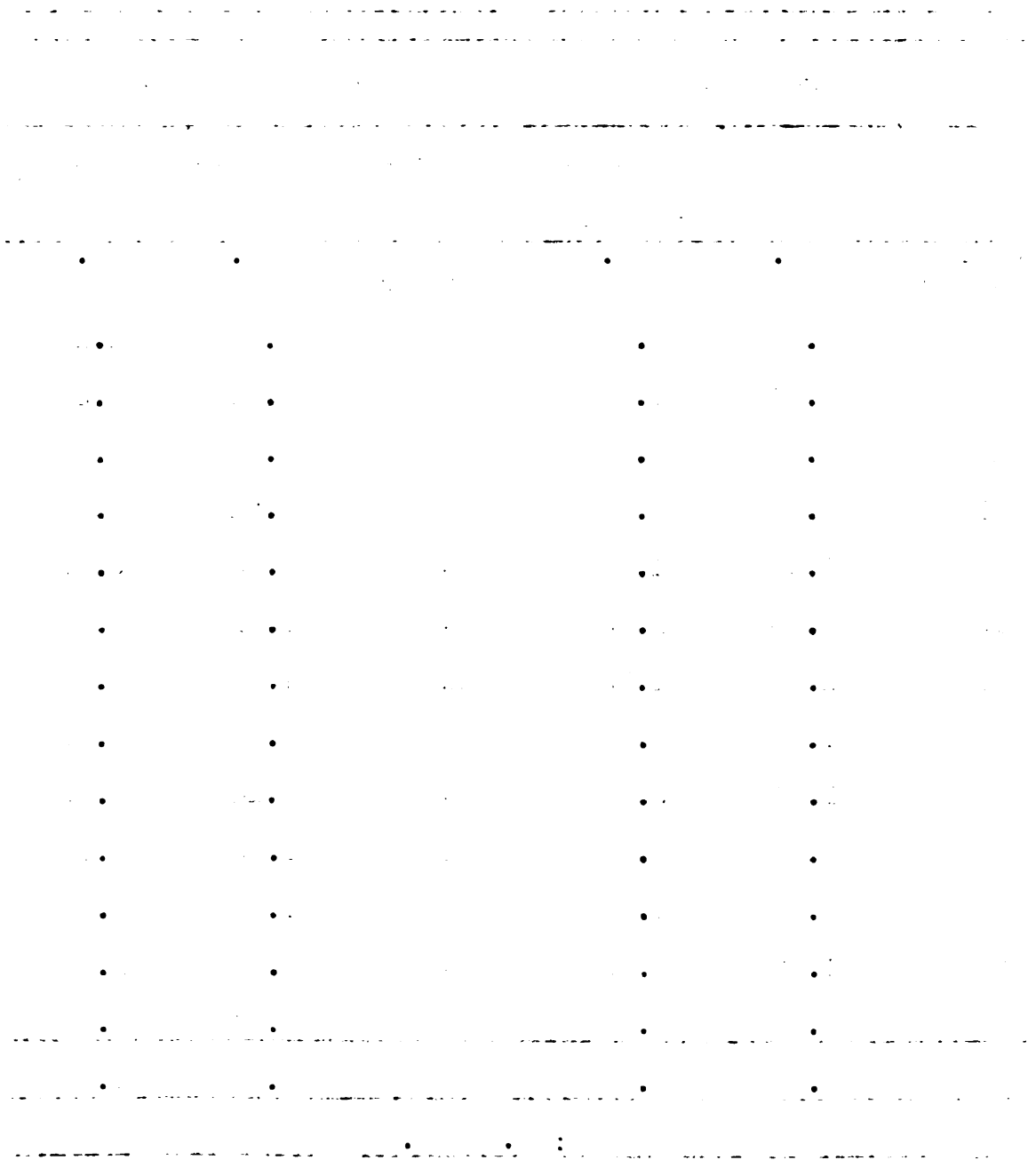

TABLE VIII

ESTIMATED MEAN DAILY INTAKE OF VITAMIN A OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject code number	January Vitamin A Intake I. U.	February Vitamin A Intake I. U.	Subject code number	January Vitamin A Intake I. U.	February Vitamin A Intake I. U.
7	9,657.1	12,487.5	2	5,265.0	5,099.7
9	6,745.0	12,817.9	17	19,114.6	7,594.8
10	16,505.9	8,584.6	6	7,362.5	4,999.0
11	14,121.8	9,301.8	4	8,337.9	11,653.4
14	7,305.4	5,612.9	5	14,152.0	3,829.4
15	5,613.8	9,164.4	3	4,749.0	5,082.5
16	4,582.9	3,444.6	19	10,212.9	6,933.0
21	12,969.6	18,778.6	20	15,381.4	16,478.7
22	7,127.1	8,603.9	23	2,351.7	3,749.0
24	12,223.9	6,907.1	1	2,192.9	4,351.4
25	2,197.4	7,381.6	18	9,111.8	4,659.0
26	3,155.7	3,955.8	13	6,548.9	8,572.0
27	9,304.3	4,670.4	12	23,474.7	17,317.0
Average	8,577.7	8,593.2		9,865.9	7,716.8

Recommended Daily Allowances: 3,500 I. U.

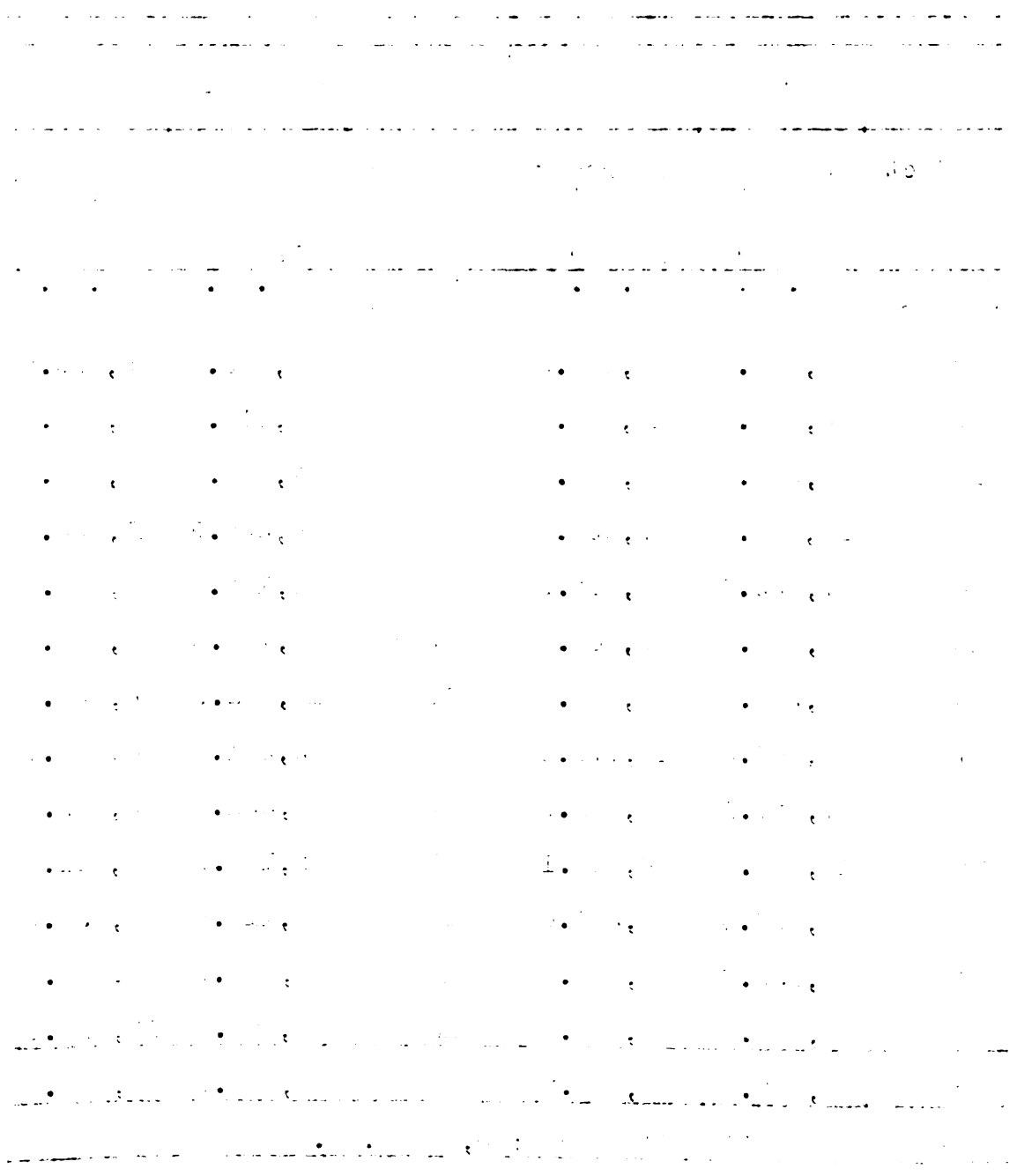

TABLE IX

ESTIMATED MEAN DAILY INTAKE OF ASCORBIC ACID OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject code number	January Ascorbic Acid Intake mg.	February Ascorbic Acid Intake mg.	Subject code number	January Ascorbic Acid Intake mg.	February Ascorbic Acid Intake mg.
7	77.7	58.5	2	54.0	59.1
9	142.1	27.2	17	99.2	51.7
10	107.6	86.2	6	37.4	59.9
11	126.8	74.7	4	72.8	72.2
14	42.6	53.3	5	95.7	88.9
15	74.0	77.6	3	45.6	83.1
16	47.8	47.3	19	91.2	78.1
21	76.6	73.8	20	109.0	93.0
22	65.3	50.7	23	54.3	45.7
24	63.9	74.4	1	37.9	66.6
25	134.6	94.0	18	26.3	49.3
26	26.9	29.7	13	86.1	98.0
27	47.0	44.9	12	140.9	134.4
Average	79.5	60.9		73.1	75.4

Recommended Daily Allowance: 60 mg.

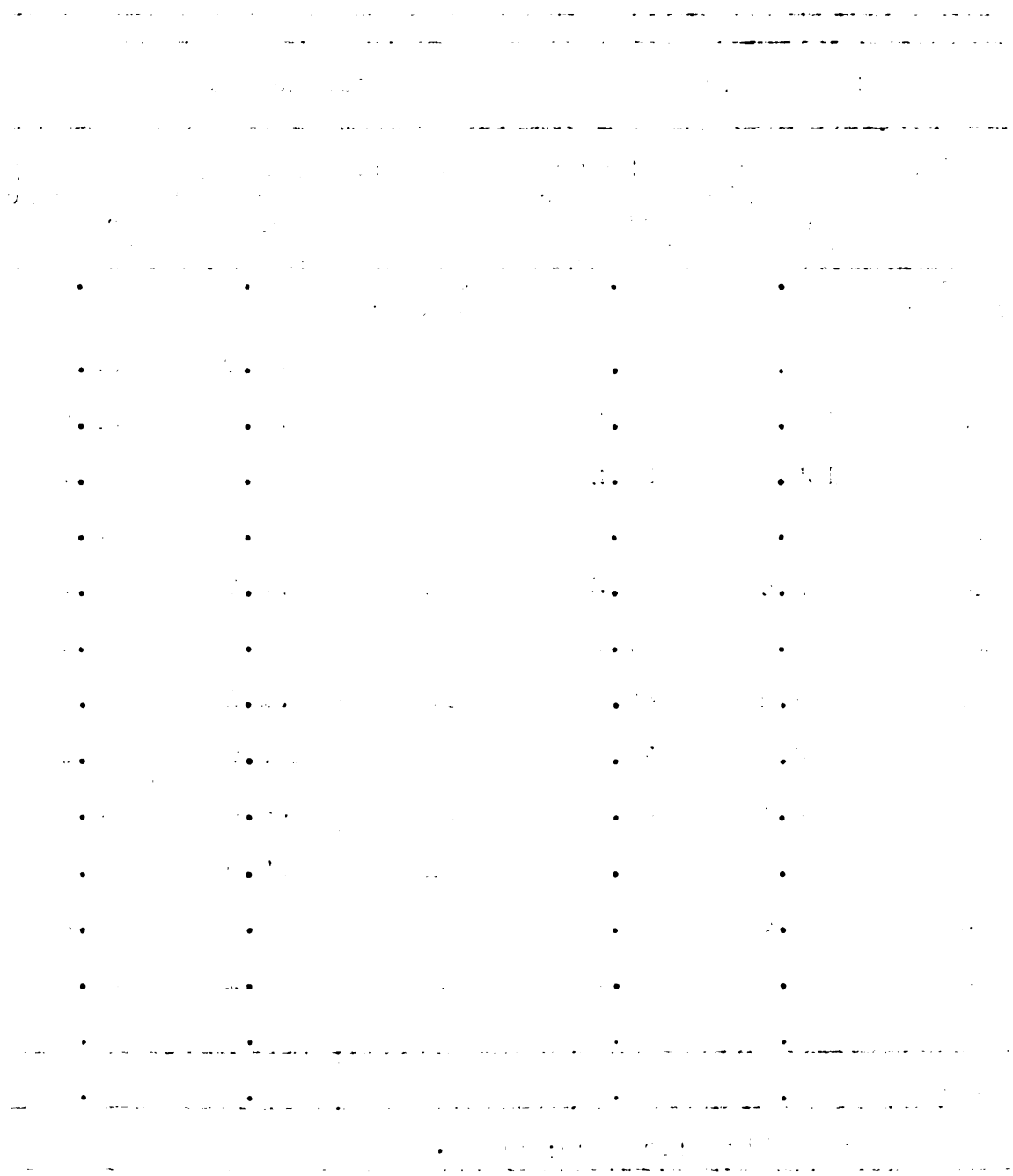

TABLE X

PLASMA ASCORBIC ACID CONCENTRATIONS OF THE THIRTEEN PAIRS OF THIRD AND FOURTH GRADE CHILDREN

Control Group			Experimental Group		
Subject	January[1] Plasma Ascorbic Acid Concentrations	February[1] Plasma Ascorbic Acid Concentrations	Subject	January[1] Plasma Ascorbic Acid Concentrations	February[2] Plasma Ascorbic Acid Concentrations
code number	mg. %	mg. %	code number	mg. %	mg. %
7	0.37	0.59	2	0.37	0.25
9	1.18	0.66	17	0.93	1.22
10	0.50	0.49	6	0.07	0.12
11	0.48	0.35	4	0.22	0.27
14	0.26	0.24	5	0.58	0.56
15	0.16	0.28	3	0.16	0.74
16	0.07	0.12	19	0.65	0.59
21	0.54	0.69	20	0.12	0.25
22	0.91	0.53	23	0.15	0.63
24	0.21	0.15	1	0.52	0.94
25	1.11	0.41	18	0.50	0.99
26	0.11	0.03	13	0.89	0.17
27	0.62	0.78	12	1.18	1.39
Average	0.50	0.41		0.49	0.62

[1]Period when lunches from home were eaten
[2]Period when lunches were purchased at school

0.09 milligrams percent from January to February while that of the experimental group rose 0.13 milligrams percent. At the ninety-five percent confidence level, this difference of 0.22 milligrams percent is significant. A relationship between ascorbic acid intake and blood concentration was evident (Table XI). The results also indicate that the average plasma concentrations of vitamin C were above those considered indicative of a deficiency state but below those believed to support optimum nutrition.

The correlation coefficient between the fifty-two ascorbic acid intakes (Table IX) and the corresponding fifty-two plasma ascorbic acid concentrations (Table X) was calculated to be +0.6. According to Dixon and Massey Jr. (1951) this is equivalent to a +0.4 population correlation coefficient. This is in close agreement with Putnam and associates (1949) who obtained coefficients of +0.395 and +0.416 when they studied the ascorbic acid intakes and blood concentrations of large groups of people.

The food acceptance records obtained in October, 1950, were examined and the data summarized in Tables XII and XIII. It will be noted that in the majority of cases the number of foods disliked by the children was considerably greater than the number of foods which the subjects checked as unknown. Eighteen of the twenty-six subjects disliked more than twice as many of the listed foods as those with which they were unfamiliar. Fourteen of the children

TABLE XI

COMPARISON OF THE ESTIMATED MEAN ASCORBIC ACID INTAKE AND PLASMA CONCENTRATIONS OF THE CONTROL AND EXPERIMENTAL GROUPS

	Control Group		Experimental Group	
	January	February	January	February
Ascorbic Acid Intake (mg.)	79.5	60.9	73.1	75.4
Plasma Ascorbic Acid Concentration (mg./100 ml.)	0.50	0.41	0.49	0.62

TABLE XII

FOOD ACCEPTANCE DATA FOR THE CONTROL GROUP

Subject	Unknown Foods	Disliked Foods	Total Unknown and Disliked Foods	January * Daily Acceptance	February * Daily Acceptance
7	8	2	10	0.00	0.29
9	2	4	6	0.00	0.29
10	2	20	22	0.43	0.43
11	2	15	17	1.00	0.57
14	3	9	12	0.57	0.00
15	2	24	26	2.29	2.71
16	0	7	7	0.00	0.29
21	4	22	26	3.57	3.00
22	2	8	10	0.00	0.00
24	10	13	23	0.71	0.29
25	1	17	18	0.86	0.43
26	0	15	15	0.43	0.14
27	0	0	0	0.00	0.00
Average	2.8	12.0	14.8	0.76	0.65

*average number of times foods previously designated as disliked or unknown were accepted.

TABLE XIII

FOOD ACCEPTANCE DATA FOR THE EXPERIMENTAL GROUP

Subject	Unknown Foods	Disliked Foods	Total Unknown and Disliked Foods	January Daily Acceptance	February Daily Acceptance
2	0	11	11	0.71	1.57
17	4	10	14	0.43	0.57
6	0	0	0	0.00	0.00
4	5	19	24	9.71	7.29
5	15	9	24	5.29	2.71
3	7	34	41	1.71	3.00
19	11	27	38	2.14	4.43
20	6	11	17	0.29	0.86
23	12	16	28	0.71	0.71
1	5	31	36	2.71	4.57
18	1	9	10	0.00	0.14
13	4	3	7	0.00	0.00
12	8	35	43	1.57	1.29
Average	6.0	16.5	22.5	1.94	2.09

disliked four times as many of the listed foods as those with which they were unfamiliar.

In January and February, 1951, diet records were obtained for the seven day periods immediately preceding the blood samplings. These records were studied to determine how often each child ate foods which he had listed in October as unknown or disliked (Tables XII and XIII). The children in the control group (those who carried their lunches from home both in January and in February) showed little acceptance of unknown or disliked foods. This may have been due to the efforts of the mothers of the children to include in the lunches the foods which the children liked. The experimental group (those who carried their lunches in January and participated in the school hot lunch program during February) showed three times as great an acceptance of foods which they had listed as disliked or unknown as did the children in the control group. These data suggest a broadening of food acceptance in the experimental group. It is recognized that changes in food habits take place slowly. Therefore, no great change in eating habits would be expected in a five month period.

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

In October, 1950, thirteen pairs of children in the third and fourth grades of Visitation School in Detroit, Michigan, were matched according to age, height, weight, and economic status. One of each of the pairs was requested to bring his lunch to school from October, 1950, through February, 1951, while the other thirteen children were asked to partake of the hot lunch at school from October, 1950, through December, 1950; to carry their lunches from January 3, to January 27, and to partake of the hot lunch at school from January 29, 1951, through February, 1951.

Fasting finger-tip blood samples of each subject in both groups were taken on January 27, and on February 23. Approximately two weeks before each blood sample was collected, forms to be used to record each subject's daily food consumption were sent to the homes of the children.

The blood samples which were analyzed for plasma ascorbic acid yielded results which indicated that the lunch program had a significant beneficial effect on the vitamin C nutrition of the subjects in the experimental group.

The food records were analyzed by use of the short method of Donelson and Leichsenring (1945) and the calorie, protein, calcium, vitamin A, and vitamin C intakes were estimated. The results indicated that the children who partook of the

school lunch consumed a significantly higher amount of ascorbic acid than did the children who brought their lunches from home. In regard to the four other nutrients studied, the comparative estimated increases or decreases of the dietary nutrient levels were statistically insignificant.

The height, weight, and age records indicated no appreciable difference in the average gains for the two groups.

In October, 1950, each child in both groups was questioned concerning his food likes and dislikes. Using the results recorded on this questionnaire, the diet records were studied to ascertain how often the subjects ate foods they disliked or with which they were unfamiliar. The results suggest a broadening of the food acceptance of the children partaking of the school lunch.

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APPENDIX

FORM FOR THE ESTIMATION OF ECONOMIC STATUS[1]

Part I	Material Equipment and Cultural Expression of the Living Room of the Home		
	1. Floor, softwood	8.4	
	, hardwood (usually narrow boards)	13.9	
	2. Large rug	5.6	
	3. Windows with drapes	3.6	each
	4. Fireplace with three or more utensils	34.3	
	5. Artificial light, electric	12.0	
	, kerosine	-3.0	
	6. Library table	-1.0	
	7. Arm chairs	4.1	each
	8. Piano bench	5.2	
	9. Desk: personal, social	2.3	
	10. Bookcases with books	3.4	each
	11. Sewing machine	2.0	
	12. Couch pillows	0.7	each
	13. Alarm clock	-5.3	
	14. Periodicals	1.6	each
	15. Newspapers	7.7	each
	16. Telephone	24.4	
	17. Radio	8.0	
Part II	Conditions of Articles in the Living Room		
	18. Cleanliness of room and furnishings		
	a. Spotted or stained	-19.4	
	b. Dusty	-9.7	
	c. Spotless and dustless	9.7	
	19. Orderliness of room and furnishings		
	a. Articles strewn about in disorder	-19.7	
	b. Articles in place or in usable order	19.7	
	20. Condition of repair of articles and furnishings		
	a. Broken, scratched, frayed, ripped, or torn	-16.3	
	b. Articles or furnishings patched up	-8.1	
	c. Articles or furnishings in good repair and well kept	8.1	
	21. Record your general impression of good taste.		
	a. Bizarre, clashing, inharmonious, or offensive	-5.4	
	b. Drab, monotonous, neutral, inoffensive	-2.7	
	c. Attractive in a positive way, harmonious, quiet and restful	2.7	

Penalties:

1. Use of the living room also as a dining room	-6.0
2. Use of the living room also as a kitchen	-9.0
3. Use of the living room also as a bedroom or as a dining room and kitchen combined	-12.0
4. Use of the living room also as a bedroom, dining room, and kitchen combined	-15.0

Ranges in Scores	Classes		Examples
250 and over	Upper	1. upper part	Professional, physician
200---249		2. lower part	Small town banker
150---199	Middle	1. upper part	Factory manager
100---149		2. lower part	Skilled trades
50--- 99	Lower	1. upper part	Unemployed semi-skilled
0--- 49		2. lower part	Unemployed unskilled

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[1] Chapin, F. S. Experimental Designs in Sociological Research. New York: Harper, 1947, pp. 191-194.

CAFETERIA MENU FEBRUARY 21, THROUGH FEBRUARY 27, 1951

February 21
Noodle and tuna fish casserole
and/or
Toasted cheese sandwiches
Fruit cup Milk
Stewed tomatoes
French fried potatoes

February 22
Chili con Carne
Mashed potatoes
Green beans
Bread and butter Milk
Canned peaches

February 23
Hard boiled eggs
and/or
Toasted cheese sandwiches
French fried potatoes
Peas and carrots Milk
Cherries and/or
orange juice

February 26
Spaghetti and meat balls
American fried potatoes
Stewed tomatoes
Bread and butter
Fruited jello Milk

February 27
Frankfurters and relish
Mashed potatoes Green beans
Bread and butter Milk
Orange or tomato juice

FOOD ACCEPTANCE QUESTIONNAIRE

Vegetables:

Potatoes -mashed ____
-French fried ____
-American fried ____
-chips ____
Peas -plain ____
-soup ____
String beans ____
Carrots -raw ____
-cooked ____
Cabbage -slaw ____
-boiled ____
Lettuce -large peices ____
-tossed ____
Corn -cobbed ____
-canned ____
Tomatoes -fresh ____
-canned ____
-juice ____
Beets ____
Turnips ____
Parsnips ____

Fruits:

Peaches -canned ____
-fresh ____
Pears -canned ____
-fresh ____
Oranges -juice ____
-fresh ____
Cherries -canned ____
-fresh ____
Plums -canned ____
-fresh ____
Grapes -white ____
-blue ____
Raisins ____
Apples -sauce ____
-fresh ____

Meat and Protein Dishes:

Cold meat -liver ____
-boloney ____
Hamburger ____
Frankfurters ____
Roast beef ____
Steak ____
Chicken ____
Turkey ____
Liver ____
Stew ____
Boston baked beans ____
Split pea and bacon casserole ____
Spaghetti and meat balls ____
Ham -cold ____
-hot ____
Roast pork ____
Bacon ____
Pork chops ____
Lamb chops ____
Pork sausage ____
Tuna fish salad ____
Tuna fish and noodle casserole ____

Dairy Products:

Eggs -salad sandwiches ____
-scrambled with bacon ____
-hard boiled ____
Milk -white ____
-chocolate ____
Butter ____
Cheese -grated ____
-sticks ____
-sandwiches ____
-toasted ____

Miscellaneous:

Bread -white ____
-brown ____
Jello -plain ____
-whipped ____
-fruited ____
Pudding -chocolate ____
-butter-scotch ____
-raisin ____

FORM FOR FOOD-INTAKE RECORDS

Dear parents,

On the morning of Tuesday, January 23, trained personnel will be at school to take a small blood sample from the finger tip of each child whom I have asked to help me with my thesis. These samples will be analyzed for their vitamin C content. Since the amount present in the blood is affected by the food eaten at breakfast, it is necessary that I ask the children not to eat any fruit, fruit juice, vegetable, or vegetable juice for breakfast on the morning of the test. Cereal, toast, butter, milk, cocoa, and sugar may be eaten, however, since they do not effect the test. The children will attend school as usual, and I will send to their rooms for them when we are ready.

It would help me very much if you would have bring the inclosed record of his diet for the week of January 16-23, with him when he comes for his test on the morning of January 23.

I would be grateful, too, if you would fulfill the following directions in completing the daily record of his diet. Please list the food eaten with the approximate measure consumed (for example: 1 small orange, 1 large glass of milk, 3 tablespoons of peas, or 2 slices of bread and butter). Under "How prepared," please list: baked, boiled, mashed, or whatever the method might be.

Thank you for your kind cooperation,

Gratefully yours,

_____

Jan. 16, 1951	Amount	Food	How Prepared
Breakfast:			
Lunch:			
Dinner:			
In between meals:			

Jan. 17, 1951	Amount	Food	How Prepared
Breakfast:			
Lunch:			
Dinner:			
In between meals:			

Jan.18,1951	Amount Food	How Prepared
Breakfast:		
Lunch:		
Dinner:		
In between meals:		

Jan.19,1951	Amount	How Prepared
Breakfast:		
Lunch:		
Dinner:		
In between meals:		

Jan.20,1951		
Breakfast:		
Lunch:		
Dinner:		
In between meals:		

Jan.21,1951		
Breakfast:		
Lunch:		
Dinner:		
In between meals:		

Jan. 22, 1951	Amount Food	How Prepared
Breakfast:		
Lunch:		
Dinner:		
In between meals:		

Jan. 23, 1951	Amount Food	How Prepared
Breakfast:		

Name: _____

ROOM USE ONLY