HEALTH EDUCATION AND THE NUTRITION CLASS

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A Report of
The Bureau of Educational Experiments

Descriptive and Educational Sections
By JEAN LEE HUNT

Studies of Height and Weight and Mental Measurements
By BUFORD J. JOHNSON, Ph.D.

Report on Physical Examinations 1919–20
By EDITH M. LINCOLN, M.D.

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TO

Elizabeth Sprague Coolidge

WHOSE GENEROSITY HAS MADE POSSIBLE
WHATEVER CONTRIBUTION THIS STUDY MAY OFFER
TOWARD THE BETTER KNOWLEDGE OF CHILDHOOD,
AND THE INCORPORATION OF SUCH KNOWLEDGE
IN THE SCHOOL'S PRACTICE AND THINKING

ACKNOWLEDGMENTS

To recall the history of the Nutrition Classes at P. S. 64 is to recall devoted service and generous contributions of many kinds and from many sources. The text of our report in itself reflects the coöperative nature of the undertaking, compiled as it is from a diversity of special and partial reports made by different workers at various stages of the experiment. We desire to make special acknowledgment to the following:

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FOREWORD

By publishing this detailed study of our experiment with nutrition classes in a city school, it is our hope to place at the disposal of other workers such an account of the experience, of the questions raised by it, and of the varying degrees of success and failure attending it, as may serve materially to further the success of other enterprises in the same field of service. The experiment has brought to us clearer understanding of the essential problems of health education, and better appreciation of its true scope and possible place in general educational procedure. If our readers will consider with us the successive problems incident to our work at the different stages of its development, we believe they will arrive with us at that inevitable conclusion of educational experiment, the beginning of further experiment, with enlarged knowledge and improved technique in prospect. Only thus may we account our undertaking successful and our record to have served its purpose.

THE BUREAU OF EDUCATIONAL EXPERIMENTS.

NEW YORK CITY,
June, 1921.

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CHAPTER I

PLACE OF THE EXPERIMENT

PREMISES

The experiment here recorded was undertaken to explore the possibilities of the nutrition class in a public school, to determine how far a school can successfully employ the nutrition class procedure, and in particular how far the procedure itself can be expected to reinforce the school's general program of health education. Our classes at Public School 64, Manhattan, have constituted, we believe, the pioneer attempt to remedy malnutrition in a school population by employing the methods of the hospital nutrition clinic or class within the school. In conducting them, however, we have had broader educational interests very definitely in view, and our aim has been primarily the enrichment of general educational procedure rather than the development of special provisions for children needing particular care.

The health program of the school, if it is to be developed in accordance with educational conceptions of the present day, must conform to the general thesis that the child's environment shall afford the conditions for certain necessary experiences, and that his intelligent coöperation with regard to these experiences must be secured; it must give to the school and to the individual child within the school a creative attitude toward the problem of health; it must function appreciably in better habits of health and in better individual well-being.

Moreover, if such a school program is to be adequate as a health program, its development requires the services of the physician and of other specialists in several fields of science, for the school cannot be expected to take over and handle through its regular professional staff a serious attack on the technical problems involved. Thus the situation of the school in regard to health education is characteristic of its situation with regard to any supplementary activity involving a considerable body of specific knowledge or particular technique for its conduct. The great majority of teachers to-day are but inadequately equipped, so far as understanding of the science and technique of their own profession is concerned. To demand that the class-room teacher shall be conversant with any considerable outside body of scientific facts or any highly developed technique belonging to another profession, is to demand the impossible. It is only as specialists from other fields can enter the school, introducing their own techniques and adapting them to the school's requirements, that their various contributions to the service of childhood can be successfully incorporated with school activities, and the school's thinking and service correspondingly broadened.

It is in this field of educational experience that the Bureau of Educational Experiments has been particularly interested to work. The position of the school makes it the logical clearing-house for those members of the community who hold in their united thinking the community's available knowledge in regard to children and their needs, and the attempt to bring together coöperatively the school and the specialists best prepared to deal with children's problems, presents in our estimation an opportunity for educational experiment offering particular promise for the future.

Thus a number of considerations led us to experiment with the nutrition class as a tentative procedure in a school program. It was in essential agreement with our educational thesis. It necessitated introducing within the school the services of the pediatrist and of his trained social service assistants and relating their special knowledge and techniques as closely as possible to the school's problems and the school's thinking. It offered an attack on health from the positive side. If by its adoption the school could secure a satisfactory procedure and appreciable gains for underweight children, we believed it would at the same time serve to demonstrate the essential features of a general program of health education much needed at the present time.

THE GENERAL HEALTH PROBLEM

We have had abundant illustration during the years just past of the importance of physical fitness to the national life. Attention has been increasingly focussed on problems of public health and it has been unnecessary to contemplate disasters in foreign lands for our own experience with such epidemics as those of "polio" and "flu" have brought into general public consciousness the importance of measures for health conservation. We have all witnessed the dramatic sequence of events attending army recruiting,—the rejection of great numbers of young men because of physical defects, the raising to maximum physical well-being of the men in training through the carefully regulated régime of the camp,* and to-day the third stage of the object lesson, the waning of that standard of well-being among the men mustered out as they go back to the daily occupations and ill-regulated régime of American private life.

Possibly no circumstances less dramatic would have served to arouse public consciousness to the needs of the situation. Certainly there is throughout the country to-day a very general interest in problems of public health and a desire for betterment. The outstanding fact that must be evident to all is the need of a nation-wide program of prevention rather than correction, and the inadequacy of such limited lines of attack as military training and athletic programs on the one hand, and the traditional activities of medical and welfare agencies on the other.

THE PROBLEM OF MALNUTRITION

The problem of malnutrition among school children plays an important part in this general health

* Chamberlain, Col. Wm. P., *Effects of Army Life on the Health of Men,* Proc. Int. Conf. Women Physicians, Vol. I, p. 244. Womans Press, 1920.

problem. It is claimed to be largely responsible for after ills and weaknesses in later life. Its chief causes are main factors in the general public health problem, and a successful attack upon it in any group or community may be assumed to typify in miniature the kind of attack required in any comprehensive campaign on a nation-wide scale.

Prevalent as the condition is to-day it was hardly recognized as a school problem ten years ago. We have only to examine the past reports of school medical inspectors to realize how little it figured in their thinking. Take for example the figures given for New York City Schools in 1911* where malnutrition is reported as affecting 2.5% of the total number of children examined, and compare them with the total of 17.7% similarly reported in 1920.† A survey of 43 schools in the poorer districts of the city made in 1918 revealed a percentage in one school population of 61% affected and 32% as the average found for the whole number surveyed.‡ While these last figures represent extreme conditions and at once suggest questions as to the standards used in obtaining them, the testimony of school and health authorities the country over, in rural as well as in urban communities, is unanimous in its emphasis on the prevalence of the condition.

We may account for this astonishing increase only by taking into consideration two types of factors that have been working consistently toward it

* Gulick and Ayres, *Medical Inspection of Schools*, Russell Sage Foundation Monograph, 1913, Table p. 40.

† Monthly Bulletin, Dept. of Health, City of New York, May, 1921.

‡ Baker, Josephine D., *Annual Report, Bureau of Child Hygiene*, Dept. of Health, City of New York, 1918.

in recent years. First among these is the growing recognition of the condition as one of ill-health, or at least of ill-being. A few years ago only extreme cases were recognized. With greater knowledge, however, has come the emergence of standards for diagnosing malnutrition, among them the now generally accepted height-weight-age index. Such standards as we have are still most imperfect, yet, such as they are, they are widely accepted and play an important part in the rise of the percentage reported to-day as against that reported ten years ago.

Developing standards of nutrition do not, however, sufficiently account for everything. The lowered standard of living during the war period, when certain necessary commodities, as butter-fats, meats and sugar, became scarce and unduly expensive, and the increased cost of living exceeded in the majority of homes whatever increase to the family income was contributed by the rising wage-scale, has undoubtedly been an important factor. Yet, in this country where little actual want existed, where even in the greatest crises of the war food has been sufficient and employment general, the resulting drop in the standard of well-being among our children seems to demand further explanation. The theory that the average standard of living in American homes does not provide for the maximum well-being of the individual, and is indeed so near the margin of ill-being that it permits of no reduction without an immediate resulting drop below the safety line, probably offers the most satisfactory hypothesis and one that the workers concerned in our experiment are ready to support.

SOME MISCONCEPTIONS

When during the winters of 1917 and 1918 the rapidly increasing percentage of malnutrition among children began to occupy the attention of the public, popular misconceptions in regard to its causes, remedies, and results to the individual, became evident. First among these was the relation between malnutrition and hunger. It was claimed that our schools were full of hungry children whose parents were unable to supply them with necessary food. Popular discontent and alarm at rising prices added to this belief, and the obvious remedy seemed to lie in the general provision of school lunches at nominal prices, and at public expense for those unable to pay.

In the brief time that has elapsed, there has been a considerable accession of popular knowledge on this subject, and it is almost difficult to look back to-day and understand the uncertainty with which such statements were met three years ago. As long as our chief sources of information in regard to the existing malnutrition in any community were the welfare and hospital agencies, no comprehensive view of the situation was possible, for their inquiry was, perforce, limited to those candidates for relief applying at their doors. The experience of the private practitioner with individual cases hardly carried over into the general picture of the community and its needs, and the conditions in middle class and wealthy homes were thus entirely excluded from the picture.

Comparatively few as the community surveys of malnutrition through the agency of the schools have been, the light they have thrown on the relation of malnutrition to economic conditions has been clarifying. Foremost among such attempts must be noted the survey of 1920 by the Elizabeth McCormick Memorial Fund in Chicago, where the height-weight-age index was applied to 10,000 children, representing several school populations from different sections of the city that presented wide contrasts in economic conditions. Among the statistics gathered, one school with a percentage of 57.7 of its enrollment underweight was reported from "a comfortable semi-suburban neighborhood," as contrasted with 16.2% for one school of "the stockyards district." This is undoubtedly the clearest answer yet returned to the misconception that confuses hunger with malnutrition.* Hungry children may be present in our public schools, but their problem does not explain the more general one of malnutrition.

Another popular conception frequently voiced and less easily answered is that malnutrition results in dulling the mental faculties, and that such children are mentally handicapped. That hungry children are incapable of using their school opportunities with the same degree of profit as well-fed children, hardly needs demonstration. With a clear picture

* Wood, Mrs. Ira Couch, *Nutrition Classes in the Chicago Schools*, Modern Medicine, May, 1920.

See too, Bliss, D. C., *Malnutrition a School Problem*, El. Sch. Journal, March, 1921—where a similar survey in the schools of Montclair, N. J., is described. The poorest section of this city made the best record.

of the facts before us, however,—that relatively few of the malnourished children in our schools are hungry cases, other questions arise, for another popular conception, still current in many sections, though not as general to-day as it was fifty years ago, is the idea that the child of full physical vigor is less likely to make a good student than one of lower vitality and less abounding activity.

Inasmuch as science has been unable to return unmistakable answers to these and other theories, popularly held and confusing to the issue, the progress of the nation as a whole toward better standards of well-being has been definitely retarded, and there still remains a considerable field of scientific endeavor to be covered before replies can be presented in terms sufficiently popular and convincing.

INADEQUACY OF ATTACK

If the general conception of the problem has been obscured in the past because of the character of our sources of information, the attack on malnutrition has been subject to equally serious limitations, although the medical profession, social agencies, the school, have all contributed to the attempt. The medical profession and the social welfare agencies have of necessity focussed their efforts on the corrective side, working for immediate results to the individual. In recent years the development of social service departments in connection with our hospitals, and the emergence of the visiting nurse, the public health nurse, the hospital social service worker, have resulted in a closer relationship between the techniques of the social agency and of the medical profession, and the development of the nutrition clinic is a pooling of their techniques and common experience. The attack of the school, however, until a very recent period, was a fairly isolated one. Recognizing its essential function to be educational and preventive it has been content for the most part to await long term results, and to make no attempt to evaluate its health procedure currently in terms of appreciable increase to individual well-being. The hygiene lesson of the physiology class, the work of the domestic science and home economics classes, with their instruction limited to girls, the school lunch service, too often existing where it existed at all, on a purely commercial basis,—none of these possible vehicles for health education can be proven (unless in some exceptional cases) to have functioned definitely in the community by the establishment of health habits and a better standard of physical fitness. Our departments of physical education at their best are concerned only with a limited portion of the whole field of physical education and, in our public schools at least, are for the most part entirely inadequate in their provisions for that portion of it that they do attempt to cover. The medical examiner and the school nurse, working it is true within the school building, can hardly be said to have affected educational procedure. Their function has been rather to prevent the spread of infectious diseases, and, so far as malnutrition is concerned, to diagnose extreme individual cases and refer them to the private practitioner or the hospital clinic. Their work has constituted the school's attack on the corrective side and has been at best a negative one. Thus our schools cannot be said to have developed anywhere a comprehensive educational procedure calculated to function appreciably in better habits of health, to develop a creative attitude on the part of the child towards his own health, or to lend itself to current evaluation in terms of individual well-being.

THE EXPERIMENT OUTLINED

It will be evident that a first requisite for successful experiment with nutrition classes as a school procedure is the coöperation of a pediatrist of standing in his profession who can visualize the possibilities of such an experiment and who in his own thinking emphasizes the educational attack. Dr. Wm. R. P. Emerson of Boston has been the pioneer among pediatrists in calling attention to the serious consequences of malnutrition among school children, and in recognizing its milder stages as a condition of ill-being if not of actual ill-health. He has long recognized the important part played by education in the successful treatment of such cases, and since 1908 has used a technique in the nutrition clinic of the Massachusetts General Hospital, now widely known as the "Class Method," by which the work of the clinic is conducted along the lines of a class in school. A visit to one of these "nutrition classes" in the Spring of 1917 first suggested to a member of our organization the experiment subsequently tried by us, that of transferring the nutrition clinic or "class" as developed by Dr. Emerson in the outpatient department of the hospital to a public school.

In the fall of 1917 we enlisted Dr. Emerson's interest in our plan, and later when we accepted the offer of P. S. 64 as a school laboratory, we secured his services for organizing the work and training the necessary workers. From February, 1918, when the classes began, until June, 1919, Dr. Emerson was associated with us, at first in a supervisory, later in an advisory capacity. During the last year, 1919-1920, the experiment was continued with our own staff.

The original program as agreed on with Dr. Emerson was an adaptation of the procedure used by him in the clinic of the Massachusetts General Hospital.* Our special interests in the educational and research aspects of the experiment led first to certain changes of detail, and later to substantial divergence as to the methods employed. In addition, certain modifications and developments were made to meet conditions imposed by the school and community environment, and by unexpected situations that developed in the course of the work.

In June, 1921, when the classes were discontinued, we were using a procedure differing in many respects from the initial plan, though never approximating a general health program. Indeed it may be well to realize at this point that the adoption of the nutrition class procedure, by confining our work to underweight children, proved confusing to our ultimate purpose for the entire period. To the workers actually engaged the tendency was always for the corrective procedure to become the all-important consideration, and as increasing public recognition of the problem of malnutrition further emphasized

* For a description of this procedure see *Standards of Child Welfare,* Publication No. 60, Conference Series No. 1. Children's Bureau, U. S. Dept. of Labor, 1919, pp. 238-241.

the existing need of corrective work, our experiment was naturally looked to for practical suggestions as to the conduct of a corrective program in the school. Thus the corrective aspect has always played a larger part in the experiment than was anticipated by us and has largely dictated the lines of development followed. It is probable, however, that the experience has gained in some respects by this fact, for the increased emphasis placed by the corrective procedure on the securing of results to the individual, reinforces an educational program at its weakest point.

In addition to special provisions for physical diagnosis and care of individuals showing defects or morbid conditions, the nutrition class calls for a daily régime of good eating habits, abundant food, frequent rest, constant fresh air. To provide adequate conditions in respect to these essentials the coöperation of the adults responsible for the twenty-four hour environment of the child is demanded. It seems desirable, therefore, before discussing the procedure used in detail, to describe the environmental conditions of the community in which we worked, both in the homes and at the school.

CHAPTER II

THE SOCIAL BACKGROUND

THE SCHOOL POPULATION

The necessary arrangements preliminary to the experiment were not completed until January, 1918, for in addition to enlisting the interest and securing the necessary permission from the school authorities, the question of a suitable school plant was one for serious consideration. For years the City of New York has been behind in its school-building program, and the increasing shortage of labor and material since 1914 has greatly increased the problem. The consequent overcrowding of the school-buildings has made space for additional activities problematical in the majority of schools, and this factor in itself rendered opportunities for a pioneer undertaking very limited. Quite as important was the problem of school population. As our undertaking involved intimate questions of home surroundings and habits of personal hygiene, considerations of economic status, racial stocks and foreign customs assumed particular importance for it. The desideratum would have been a school population representative of the typical American home, but the New York schools can offer few such opportunities. Instead, there is a choice of districts predominately Italian, Bohemian, Irish, Jewish, as against more heterogeneous units. As to economic conditions, it was our purpose from the first to avoid the poorest districts. Obviously, those sections which furnish annually the greatest number of candidates for relief do not present an adequate opportunity for securing or evaluating results from an educational program. Public School 64, where we finally accepted the opportunity to conduct our classes, offered a fairly homogeneous Jewish population, in a section somewhat removed from the worst slums, though the neighborhood is crowded and unsightly.

HOME ENVIRONMENT

The social and home environment of the East side child has become fairly familiar through many careful reports* made in the general interest of child welfare, and for the purposes of this study it is probably sufficient to discuss only those aspects which have particular bearing on the problem of nutrition. No thorough-going analysis of the economic situation is attempted, therefore, but rather a record of certain problems reported by our home visitors, experienced social workers who for years have studied life in the tenements and poverty in its varying degrees, and who in many cases have been admitted into the guarded confidence of the heads of families. That there is an abiding fear of want brooding over many homes where there is, at present, no acute distress is undoubtedly true, but there are also many families who regard their present surroundings merely as a

* In particular see Dewey, Child and Ruml, *Methods and Results of Testing School Children,* pp. 134 and 141-150, E. P. Dutton & Co., 1920—where the results of an intensive social study in an adjoining district presenting similar features are given.

foothold till they become prosperous enough to move where air and sunshine do not command so high a price. In none of the homes has there been evidence of inflated incomes due to war industry. Rather has it been true that with the majority there has been added hardship, due to the increased cost of living and to loss of their wage-earning members. Few of the mothers work outside of the home and a relatively small percentage take in work. Many parents have their own small business, the wife being occupied much of the time in helping her husband. In a number of cases rent is reduced or given free in exchange for janitor's service, largely performed by the mother in addition to her home duties.

Relief was received by only a few of the families concerned in our study, though many more had at some time been known to charitable agencies. Self-help and self-respect are highly prized and jealously guarded. In those cases under our observation where illness or misfortune had resulted in the acceptance of temporary relief, speedy return to position of independence was usual. These sterling qualities and their attendant reserve rendered infinitely difficult the task of the nutrition worker whose problem is to secure modification of many of the intimate details of family life.

As has been said, the population of this quarter is almost entirely Hebrew, the great majority being of Russian origin, the remainder are principally from Austria, with a scattering of Galicians, Hungarians and Rumanians and a few Italians. The older generation is fairly orthodox, consequently there is present the serious problem of family disintegration and friction between older and younger members that obtains wherever such conditions are found. The public school is an important factor in this family problem for it is mainly through the school that the younger generation is Americanized. Our schools in the main have had but little understanding of this situation in the foreign family, and few have developed a technique whereby the necessary instructions and messages to the home shall appear less like commands to the older from the younger generation, who are entrusted to deliver them. "You tell your mother," the usual teacher's formula, becomes an unthinkable medium for transmitting directions as to diet, sleep and clothing. The nutrition worker is keenly aware too of the importance of strife and emotional disturbances in relation to her problem.* A technique which will avoid any widening of this breach between parents and children must be hers if she would succeed, and her problem should offer more than a suggestion for general school practice when the foreign home is to be reached.

Since the diet is in the hands of the mother, it remains true to tradition and unaffected by the factors which are in process of modifying the lives of the younger generation. The standards imposed by the Hebrew ritual are strictly adhered to, and there is little realization of other standards. Ceremonial "cleanliness" is accepted as absolute cleanliness, with an acquiescence that is at times startling. Our workers found, however, no lack of food and of good

* Cannon, Walter B., *Bodily Changes in Pain, Hunger, Fear and Rage*, D. Appleton & Co., 1915.

food in the majority of homes. Insufficient knowledge of the properties of foods and faulty food habits were the evident factors militating against the adequacy of the home dietary. The long slow cooking which characterizes most of their dishes has its advantages in rendering food easily assimilable, but possibly results, too, in the loss of some of the essential vitamines with which the dietary as a whole is none too liberally supplied.*

For years the public has been more or less aware that many children come to school without adequate breakfast, very many with no breakfast, and much restlessness and inattention, with consequent lowering of school standing is attributed to this fact. Social workers and conservative members of our school boards alike seem unaware of a similar problem existing in the private school when they argue for, and against, the supplying of mid-morning lunches, on the basis of economic insufficiency and the pauperization of the working home. Private schools to-day frequently provide a light lunch of cocoa or milk, and crackers or bread and butter for those children who in spite of long hours of carefully guarded sleep with open windows, the invigorating tonic of the morning bath, and the well-appointed breakfast table, are without appetite for food in the early morning. On inquiry they will be found in any school.

In homes like those of the children of P. S. 64 we may well consider whether any but the most robust appetite can survive the conditions surrounding

* Schapiro, Mary L., *Jewish Dietary Problems,* Journal of Home Economics, Feb., 1919. This article well describes the characteristics of the Jewish dietary as found by us in the neighborhood.

breakfast time. In most instances every room in the flat including the kitchen is used for sleeping, and seldom has the individual child the common right of childhood to his own bed. Bed covering seemed adequate in all but a few instances, but the continental fear of cold night air obtains, and windows are generally kept carefully closed, while for those able to afford it, the indoor air is further vitiated in winter, by keeping the gas range burning through the night. In mild weather the conditions as to ventilation at night are but little better, as the rooms are small, and at least two out of the four-room apartment receive their air only from a narrow inner court, often foul with odors from adjoining apartments.

The congestion within the flat makes breakfast a disturbed meal. The older wage-earners of the family who must needs start away early, are given preference over the school children, who have been late to bed and for whom the longer rest is needed. When finally roused the little people are torn between their desire to sleep and their fear of being late at school. With barely time for a hasty toilet and breakfast often eaten standing or walking about, the result is inevitable haste and strife on the part of the child, or an apathy which a nervous and irritable mother attempts to overcome. The result in either case is a disastrous one. The habit of crowding the mouth and washing down the food which prevails with large numbers of school children is often begun in this way and is most difficult to break down. The unfinished mastication and consequent shortening of the process of mouth digestion is no doubt frequently the beginning of serious interference with digestion, and the accompanying hurry and irritation renders a thoroughly unsatisfactory meal even less desirable. The continental custom of serving only rolls and coffee for breakfast is the rule, and only occasionally does one find eggs or cereal added as a result of the propaganda for better feeding. In an appreciable number of homes, however, cocoa now replaces coffee for the children.

The noon meal is usually a better one, though delay in its preparation or too great haste in its consumption because of the child's desire to have time for play is often the cause of friction at home. It is the habit in some cases to have only a "snack" at this time, and to defer till school is over any attempt at a real meal. The three o'clock meal of some sort is usual, and may or may not be a hearty one. In the main, convenience and economy urge that meals through the day be regarded rather as "stayers" until the wage earners shall return home, or the shop be closed, and the entire family can assemble for dinner, which is accordingly served late, often at eight or even nine o'clock. It needs little imagination to realize that the children, after a long school day and hours of strenuous play in the street, are not able properly to digest this late meal, even were the menu planned with better regard for their years.

The dinner consists usually of soup, which is regarded as an essential dish, meat, frequently chicken, and such vegetables as potatoes, onions, beets and (cooked) cabbages. No salads or greens are found in the Jewish dietary and few puddings, though cakes of various sorts and pastry filled with fruit or cheese are used. High seasoning and condiments characterize almost all the dishes, and pickles and mustard in quantity are rated among the essentials of a satisfactory menu even for quite little children. Much soda water is consumed between meals as well as cheap candy. The homes were found fairly well supplied with the more usual fruits, apples, oranges and bananas.

The amount of milk used in these homes is for the most part far below the daily pint per individual recommended by Dr. Sherman of Columbia and others, and cutting down of the customary supply is one of the first economies to which the family in straitened circumstances has recourse. The Jewish restriction on the use of milk and milk products at any meal where meat forms part of the menu, limits the consumption of butter as well as of milk, and this restricted use of butter plays an important part in making vegetables less savory and therefore less popular than they should be. While there is a general understanding that "loose milk" should not be used until "boiled," ideas on the subject are far from clear. There is a general impression that all milk is unhealthful unless taken warm or hot, and that changes in its properties may attend heating is quite unknown. Even the best grade of bottled milk will often be placed immediately on the gas stove and allowed to heat indefinitely. It will be obvious that much of the dislike for milk found among the children may be traced to this method of treating it.

Cold running water is supplied in these homes but bathing and toilet facilities are poor. In the majority of cases the occupants of the four or more flats on a floor share a single toilet, ill-lighted and poorly ventilated. Even where more modern appointments exist and the flat contains a bathroom, family habits are but little affected by the added facility and the school weight-taking discloses only too many grimy little bodies, whose clogged pores have little chance to play their part in the man-building process.

At the age of six the sons of the orthodox must begin attendance at the rabbi's school for instruction in the faith and in the Hebrew tongue. The sessions follow directly after dismissal from the public school and although the compulsory time is brief in the early years, at first only fifteen minutes a day, the little children are encouraged to stay after the sessions and, indeed, the younger ones are often sent by their mothers to be taken care of in the afternoons in the belief that they will be safer there than in the streets. Thus physical restraint in ill-ventilated surroundings is substituted for valuable hours of play in the open air, and the older boys who are preparing for confirmation in the faith are often severely taxed by the requirements made of them in addition to the work and hours of their regular school day. It would seem as if, between the crowded home flat, the crowded school, and the after-school care of the rabbis, few stones were left unturned in the adult plan of this environment to cut the child off from activity in the open and a constant supply of fresh air. But were we to inquire as diligently into the environment provided by many "typical American" homes far removed from any kind of slum surroundings, there is at least a probability of their affording a fair parallel to the main features in this picture,—abundant food, inadequate dietary knowledge, poor eating habits, inadequate sleep and inadequate fresh air.

SCHOOL ENVIRONMENT

Public School 64 has one of the largest and best equipped school plants in the city and offers special facilities in its manual-training shops, auditorium, yard space, open air and ungraded classes. The principal, Dr. Louis Marks, is keenly interested in educational progress and has frequently coöperated with outside agencies in securing special activities and facilities for the school. Thus, the attitude, not only of the principal but of the teaching staff, is one of far greater interest, understanding and tolerance for supplementary activities than is usually the case. Unusual opportunities for supplementing the school resources are to be found in the near proximity of Tompkins Square with its big playground and of such community agencies as the Boys' Club on Avenue A, the nearby branch of the city library, and Christodora Settlement House, which stands adjacent to the school.

Because of its extensive shop equipment the school has for some years been used almost entirely for boys, girls being admitted only in the Terman classes. (See p. 29.) This predominance of boys in the school population has had its effect on the experiment in certain particulars. Much of our work was concerned with the fifth and sixth grade boys, whom we must assume to be at that stage of prepubertal development characterized by minimum growth when the individual is probably least able to respond to favorable conditions, and appreciable results from treatment are likely to be minimized.

Food.—The time is not yet when the public school can gratify the small boy's native interest in food by admitting him to a cooking class, and domestic science equipment was, of course, entirely lacking as were lunch-room facilities. During the first year, when a mid-day meal was included in the nutrition program, it was supplied by the New York School Lunch Committee and served in Christodora House where special opportunities for rest periods were also provided.

Fresh Air.—The importance of the air supply in relation to the processes of assimilation is too little understood, and public opinion in consequence too little informed, for school conditions generally to reflect the influence of scientific findings in regard to temperature, humidity and air movement. The equipment for heating and ventilation at P. S. 64 is of the forced-air type generally accepted as the best in modern school building but is none the less open to some serious questions on the score of healthfulness. The atmosphere of the class-rooms in winter is undoubtedly better than would be found in the majority of our city schools, as more intelligent use is made of the facilities the equipment affords than is often the case, but it is probably no exaggeration to say that the air is at all times too warm, too dry, too still for the health of those who must spend long hours there five days a week.

If by fresh air we mean cool air, in motion, and of optimum humidity, it must be evident, that except for the groups in open-air rooms, the children of our nutrition classes did not receive a constant supply during their school hours, nor probably at any other hours through the winter weather, save in their play time on the streets.

Over-Fatigue and Bodily Activity.—By taking the children from active outdoor play for a considerable portion of the day and imposing the seated tasks and quiet of the class-room, there is no doubt that the school prevents much over-exertion on the part of the more delicate children. However, the probable loss to the average child resulting from the school's restraint of bodily activity and fixing of sedentary habits is of far greater importance for the general problem of health. Until the significance of this is more generally appreciated, however, school tradition and equipment, together with the size of school classes, will continue to impose conditions where fatigue results from lack of bodily activity rather than because of it. There is, moreover, an inevitable nervous and physical stimulation for children in the mere presence of other children in numbers, and we may well ask ourselves the significance in terms of nutrition of the scrambling crowds gathered about the doors of P. S. 64 before each session, and of the general tension that necessarily attends the school day where 3000 boys are housed under a single roof. It seems evident that such conditions demand an increased expenditure of energy that must have a direct bearing on the nutritional processes of the individual.

Additional Facilities.—P. S. 64 is well provided with toilet facilities and with running water and drinking fountains. A fine gymnasium equipped with shower baths is available at the Boys' Club nearby and another is provided at Christodora House. These are used by many of the older children.

CHAPTER III

THE INITIAL PROGRAM, FEBRUARY-JUNE, 1918

Basis of Selection

STANDARDS

The children selected for our nutrition classes were first measured for height and weight, the Burk-Boas Height-Weight-Age Tables being used as standards.* Those found to be 7% or more underweight became candidates for enrollment, although it was never possible to enroll them all because of the administrative difficulties involved. The use of 7% as a standard for determining malnutrition instead of the more usual 10% standard, was in accordance with Dr. Emerson's opinion that 7% *habitual* underweight is indicative of a condition calling for attention. In our practice, however, because of the necessity the school was under of arranging definitely for the personnel of classes at the earliest possible date, the qualification "habitual" had to be disregarded and all children found 7% underweight were admitted if provision could be made for them. While we realized that the adoption of so high a standard, especially for Jewish children of middle European antecedents, was open to question, we employed it tentatively throughout

* Burk, Frederic, *Growth of Children in Height and Weight*, American Journal of Psychology, April, 1898.

the experiment with a view to making an assessment of it, and of any special possibilities it might offer toward a program of preventive work.

GROUP SELECTION

Five classes were organized during the first year. A group of seventh grade, one of sixth grade, one of first grade children, a group of children from one of the regular open-air classes, and a group from the Terman or special classes, which existed as an experiment within the school, were included. In addition, a group of 20 fifth grade boys were selected and given a program of school feeding for purposes of comparison. The children from the upper grades were recruited in the belief that they were sufficiently advanced in school to coöperate intelligently in the experiment. The nutrition class procedure had been developed by Dr. Emerson with special reference to these older children, and the addition of the first grade group introduced problems of standards and of teaching methods not anticipated in his original plan. They were included because of an attempt on the part of the school to give particular care to members of the entering class, with a view to insuring individual adjustment to school life. It was believed that the nutrition class would supplement the school program effectively by affording special treatment for those showing need of physical attention. A program of health education carried out for six-year-olds seemed to offer, too, the logical beginning for a general health program in the school. The children of the open-air group were included partly because their condition as anaemic and pre-tuber-

Mid-morning Lunch at Christodora House

ular cases demanded every assistance the school was able to afford, partly because their inclusion was the best response the school could offer to Dr. Emerson's request for open-air treatment and a lighter program of school work. The Terman classes were included because of special interest of the school in them, and the fact that a surprisingly large percentage of underweight was found to exist among them.

HE TERMAN CLASSES

These classes consist of gifted children whose deviation from the average intelligence quotient represents about the same range above normal as that of the defective in the ungraded classes does below. As children showing an I. Q. of 75 or less are placed by the school in special classes for defectives, so those showing an I. Q. of 125 or above have special provision made for them in the Terman classes. This experiment was in its initial stages at the time the nutrition classes began and was at that time limited to the sixth, seventh and eighth grades. In all, 69 children had been withdrawn from these grades and placed in two groups, one of which graduated in the spring of 1918, the other the following year. The average I. Q. was considerably beyond 125 and some individual ratings were much higher. The classes included girls as well as boys, and the age range was from ten to twelve years.

The children in the more advanced group very generally exhibited the accelerated height increase, and consequent decrease of weight for height due to the approach of puberty. This factor undoubtedly contributed somewhat to the percentage of underweight recorded among them, as the Burk-Boas Height-Weight-Age Index is based principally on the measurements of children of other racial antecedents, in whom pubertal development presumably takes place at a less early age. They were, however, at no greater disadvantage in respect to this factor than were the children of the regular sixth and seventh grades who showed by the same standard percentages of 15.9 and 14.4 respectively in comparison with the 27.5 average of the Terman class. A corresponding contrast is presented by the percentage of overweight found among the Terman and regular grade children, the sixth and seventh grades showing a percentage of 18.7 overweight and the Terman groups a percentage of only 8.6.*

The general impression created by these gifted classes, however, was one of physical superiority rather than the reverse. Their relatively poor showing in the initial height and weight taking created considerable surprise; and even after the stripped examinations had revealed the usual characteristics —winged scapulæ, poor muscle tone, prominent rib bones, etc.—their faces, alert and often rosy, seemed to contradict the evidence.

Possibly three-fourths of them came from homes distinctly above the general economic level of the district. This was primarily due to the higher average intelligence of their parents, for whom the difficulties of getting a foot-hold in America had been reduced by their exceptional ability. A number were children of East side physicians who combined

* Seven per cent or above in excess of normal is the basis on which this overweight is computed. See Distribution Table, Appendix A., also Tables I and II, pp. 49-50.

the advantages of education with those of superior intellect. The less prosperous represented families where some special factor, like relatively recent immigration and consequent difficulty with a foreign language, kept the family fortunes at a lower level in spite of native ability.

The members of the older class were looking forward to graduation in the spring, and were working under considerable pressure to prepare for the coming examinations. Ambition to excel was very general, and increased the high tension characteristic of the class as a whole. It is possible that overstimulation had much to do with their condition of underweight and it is probably significant that 58% were borderline cases averaging less than 10% underweight.

In providing for these children the school had not followed the usual rapid advancement plan by which gifted pupils are put through the standard curriculum in the shortest possible period. The attempt had been rather to broaden the school experience for those, who by reason of superior ability could best afford time for additional activities, and could be expected to profit most from them. A careful canvass of neighborhood facilities had resulted in securing for them special opportunities for library, playground and gymnasium activities, and instruction in music and drawing. The usual school discipline was considerably relaxed in the conduct of their classes, and their attitude toward every new interest and opportunity that was secured for them, was one of eager participation. Thus there had been much in their previous experience to prepare them for benefiting from the suggestions of the nutrition class.

Physical Care

EXAMINATION AND DIAGNOSIS

Every child enrolled in the class was given a careful stripped examination by one of the physicians to insure correct diagnosis and the prescription of treatment if conditions of disease were found to exist, and to discover indications of physical defects calling for the advice and treatment of a specialist. Local legislation required that special permission from the parents must be obtained in every case before the stripped examination could be made, and this provision was always carefully followed. The nutrition worker secured the necessary permissions and urged the attendance of one of the parents at the examination in the hope of enlisting home interest and coöperation as far as possible from the start.

The efficiency fetish which plays so important a part in public school thinking to-day, is only too likely to exert an undue influence on any program demanding the amount of individualization entailed by the nutrition class. Even our workers, who were under no necessity for observing standards other than thoroughness, and were free to expend time and care as the necessity of the individual required, felt keenly at first the desirability of making the experiment "efficient" from the school board viewpoint by limiting the time and effort expended to outstanding essentials, in the belief that the amount of time and work, and the consequent number of workers demanded, must be limited, so far as possible, in order to commend the undertaking to the school as a practical one. As experience increased, however, and our workers became better aware of the complex factors involved, the fallacy of confusing expedition with efficiency became more and more apparent. The time required for the examinations was found to average from twenty minutes to a half hour.

THE CORRECTION OF DEFECTS

Naso-Pharyngeal Obstructions.—Children who appeared to be suffering from physical defects bearing in any way on the nutritional processes were taken by the nutrition worker to one of the available clinics for re-examination by a specialist. Naso-pharyngeal obstructions were the chief concern, as the presence of tonsil and adenoid growths definitely reduces the underweight's ability to gain, and the effect of their removal has been aptly characterized as rendering him "free to gain." The ideal program is therefore, to have all cases recommended for operation treated at as early a date as possible after the formation of the class. The attempt to secure these operations for children needing them involved much expenditure of time and effort throughout the entire period. It was generally difficult to persuade the parents of the necessity for such treatment, and as the facilities afforded by the city hospitals were limited, operations had often to be delayed after the parents' permission had been secured. Both Bellevue and the Post-Graduate Hospital treated cases for us. In the five classes organized during this first term, 69 children, or 66% of the entire number enrolled were recommended for removal of tonsils or adenoids or both, and operations were secured for only 20 children, or 29% of the number needing them. In the majority of cases the treatment was delayed until the term was considerably advanced.

Dental Caries.—Second in importance was the treatment or removal of carious teeth. No such obvious results in weight increase attend the remedying of this type of defect as follow the removal of tonsils and adenoids. It was, however, always given an important place in our program, as an essential of any general health program where preventive as well as corrective work is the aim. Eighty-eight of our children out of the total 105 were persuaded to undergo examination by the dentist and of these, 63 were found to have from 1 to 12 carious teeth. Treatment progressed slowly owing to the indifference of many parents, and the limited clinic facilities. The Stuyvesant Clinic and the Twenty-Third Street Clinic both treated dental cases for us.

Eye Strain.—Examination for eye refraction was given in a few cases by request of the nutrition workers, but in general our staff did not assume responsibility for this type of defect as the Board of Health Eye Clinic, located in the building, provided excellent facilities for the children of the school. A strong prejudice against glasses, however, existed in the homes of the community and was shared by the children. Even after purchasing glasses few could be persuaded to wear them regularly in spite of strenuous efforts on the part of the nutrition worker and the class teacher to bring this about.

Coöperation of the Home

CONTROL OF THE ENVIRONMENT

The educational features of the nutrition class may be said to begin with the school and home environment, and such opportunities as they afford for experience leading to proper intake of food, better digestion and increased assimilation. If children are to coöperate in a program of health experiences, certain conditions as to food, eating habits, fresh air, rest and sleep must be provided. How far the homes of the community could be enlisted to make necessary changes in customary habits, and how far they would be found able to do so, were therefore points of particular interest and importance for the experiment. By visits of the nutrition worker and the attendance of the parents at the weekly sessions of the class, we hoped to secure the necessary coöperation of the home in providing the following conditions:

Food.—Adequate caloric intake averaging 2000 calories a day.—While individual needs must determine variation in the figure, it was believed this amount would be found to constitute an increase over what the average child was receiving.—Mid-morning and mid-afternoon *lunches,* designed to add from 250 to 300 calories to the amount received at the usual meals.—These lunches were not to consist of foods like sweets calculated to take away the appetite for the regular meal. They were advised by Dr. Emerson on the theory that undernourished children, like invalids, will assimilate better if food is taken in smaller quantities at briefer intervals.

Diet.—To increase the caloric intake, milk and cereals were recommended, as the best foods by which the home table could be supplemented for the underweight child, with the least disturbance to family preferences and eating habits. The elimination of tea and coffee, and of any other stimulants the home table might afford, was especially stressed, as well as the necessity for an adequate breakfast.

Prevention of Over-Fatigue.—A half hour rest period before the mid-day meal and avoidance of undue physical activity, as roller-skating and ball-playing for protracted periods, and the need for proper hours of sleep with open windows, were especially emphasized.

Personal Hygiene.—In addition, the intelligent supervision of the home was sought in habits of eating, bathing and elimination.

HOME VISITING

Permission for the stripped physical examination and the gathering of information concerning birth and infancy, previous diseases, and general health habits, with other social data regarding members of the family was the primary cause of home visiting by the nutrition worker, and required at least two visits to each family. Arrangements for securing the removal of physical defects when recommended necessitated further visits. During this first school term, however, a definite attempt was made to limit the home visiting and to make the necessary contacts with the parents through their attendance at the weekly class sessions. This was especially urged by Dr. Emerson, who was accustomed to securing the attendance of mothers at hospital classes, and was anxious to develop the school nutrition class with as small a staff as was consistent with the demands of the situation. But the attempt to secure the mothers' attendance at the weekly class meetings was never very successful. The aversion of these foreign mothers to leaving their homes for any purpose outside the usual one of shopping and marketing is very great, and their attendance as secured by the hospital clinic, is of itself indicative of their conviction that the children concerned are really ill. Where this is not obvious, it is often a slow process to convince either parent that any extra attention is needed.

Coöperation of the School

THE EYE CLINIC ROOM

Through the courtesy of the Board of Health we were allowed to conduct our work in the one available spot the crowded school building afforded. This was the eye clinic room, a class-room that had been set aside for that purpose. Sessions of the clinic were held here every morning, but after twelve the room was used only by the clinic nurse who worked at her desk, leaving the rest of the room free for the activities incident to the nutrition classes. Our equipment consisted of a Buffalo scale, a stadiometer, two screens, an examining table, and a cabinet file for records. Except for these, and the eye clinic desk and vision charts, the room presented no special features of equipment. Settees replaced the customary forms and desks, and offered certain advantages in rearranging the room for our purposes.

These, with blackboards, and a table and chair for the teacher, constituted the furnishings. A good north light was secured from large windows along one side. When the classes met the children's charts were ranged against the blackboards in the back of the room for discussion. The screens were used when physical examinations were made or stripped weights taken.

How far the work of the eye clinic may have been embarrassed or impeded by this partnership arrangement, we were never informed, for at all times our work and our workers received the utmost consideration and sympathy both from Dr. Robert Kahn, the oculist, and from Mrs. B. G. Reid, the nurse. If our own workers felt seriously the restrictions imposed by the situation we cannot feel very sanguine over the effect of our strenuous program on theirs. At no time was it possible for the room to be given over entirely to the nutrition work, and the nutrition staff was always conscious of the necessity for conducting its work of weighing and measuring, checking up and recording, with the least possible disturbance to the others. During the first term when Dr. Emerson's visits were frequent and his limited time perforce divided among several classes, preparation for the class instruction had to be made even before Dr. Kahn had finished his regular clinic sessions. When weights were taken the combined requirements imposed on the nutrition worker for accuracy in the records, quiet in a group of restless boys, and expedition, that the children might be returned to their class-rooms with the least possible loss of time, rendered the work particularly trying.

The difficulty of taking stripped weights under these conditions will be apparent, but the regular weekly weight-taking without shoes was in itself a sufficient problem. The first grade boys at the beginning of the term could not take off their shoes nor put them on without assistance, and for all ages it was apt to be a relatively slow process. Shoe laces with frayed ends were common, and they were often wet and knotted. Shoes and stockings, too, were frequently water-soaked. Nor could the littlest boys manage to pull off and on the tight-fitting sweaters that were universally popular.

The location of the room, overlooking the playground and next to the metal workshop, rendered the work of recording particularly difficult because of noises from outside, especially the shouts and cries of the second session children gathered about the doors waiting for their classes to begin.* To add to the responsibility of these sessions rapid dismissal signals (fire alarm) which could not be disregarded were frequent, and visitors came at all times to observe our methods. It will be evident that whatever educational possibilities the experience of weight and height-taking might in itself have afforded, were seriously impaired by the conditions under which these activities had to be conducted.

CONTROL OF THE ENVIRONMENT

In addition to furnishing headquarters for the work and facilities for the physical examinations, weekly weight-taking and class sessions, the school was asked to coöperate in the attempt at better con-

* See p. 112.

trol of the environment. Compliance with Dr. Emerson's request for shorter hours of work and open-window rooms for all the nutrition class pupils, seemed quite beyond the possibility of the situation except in the case of a few children, 11 in all, who because of pre-tubercular or anaemic condition were enrolled in one of the school's regular open-air classes. Opportunities for additional food intake and for rest periods were arranged during school hours but, partly for purposes of comparison, partly because it was found impossible to secure like opportunities for all, the school program was varied for the different groups. Three of the classes were given a mid-day dinner with a value of approximately 1000 calories. For four classes a special mid-morning lunch was arranged. Three classes had opportunities for a half hour rest during the school session, and the little group in the open-air class received the regular mid-morning lunch provided in all the open-air class-rooms. They had in addition the special facilities of the open-air rooms for rest-taking and fresh air, as well as a lighter program of work. The group of 20 boys from the fifth grade, received only the mid-day dinner and was not included in the general program of physical care and instruction. This group therefore in some particulars resembled a control group. The chief consideration in making these special provisions for different classes was a desire to determine the relative value of school feeding in the program. It was through the generous coöperation of Christodora House and of the New York School Lunch Committee that we were able to secure the requisite facilities for this part of the work.

MID-MORNING LUNCHES

These were supplied and served by Christodora House to the children of the sixth grade, seventh grade, first grade, and Terman classes, and consisted of hot cocoa with crackers or bread and butter. The children enrolled in these groups went next door to the settlement to get this lunch beween ten and eleven o'clock every morning during "out time" periods afforded by the school's double session schedule.* As the school was entirely without lunch room or domestic science equipment this appeared to be the only arrangement possible. It involved much extra time and loss of energy, especially in cold or stormy weather. Many of the children too were embarrassed and rebellious over other circumstances attending it. The necessity of going for it when the other children did not, rendered them conspicuous, and "different" from their classmates who did not fail to taunt them over their peculiarities. Thus many came only under protest, after being "rounded up" by the nutrition workers and "cutting" was frequent. Moreover, as no charge was made for the lunch, the stigma of "charity food" was attached to it at first, and many parents objected until its nature and purpose was fully explained to them. These difficulties became less as time progressed and most of the children came to understand and appreciate the significance of the nutrition program. The luncheon itself was

* "Out time," periods when the children are not in their classrooms but are under supervision.

always acceptable to them and taken with apparent enjoyment, even by those who protested most vigorously over going for it.

MID-DAY DINNER

The mid-day dinner was supplied by the School Lunch Committee and delivered at Christodora House where service and supervision were furnished. Sixty-five children from the Terman, the sixth grade and the fifth grade groups received this meal. As the dining room capacity at Christodora House was limited to 35, the children were served in two groups. The menus were planned to provide 1000 calories and to broaden dietary habits with respect to vegetables, milk dishes, and cooked fruits. This deliberate attempt to supplement the deficiencies of the home dietary and develop a taste for new dishes, however excellent and important from the theoretical standpoint, presented very serious practical difficulties. In addition to the aversion felt by most children for unaccustomed dishes, the carefully inculcated prejudice of the Jewish child against strange foods, the fear that they may not be kosher, had to be reckoned with. This fear conditions the attitude of the Jewish child toward any unaccustomed food and greatly increases the difficulty of persuading him to eat new dishes. The high seasoning to which his home cooking accustoms him presents another serious problem. Bland and relatively delicate flavors are unappetizing to palates demanding pickles, mustard and spice as a matter of course. In addition it must be remembered that few, if any of these children could be classed as "hungry cases," and both the Terman and sixth grade groups were receiving mid-morning luncheon in addition to dinner. Under the circumstances it is not surprising that the children were indifferent to the dinner. Indeed, many of them were never persuaded to eat much, although as time progressed the general attitude was better, as in the case of the attendance at the mid-morning luncheon. In the beginning there was much disorder and even "rough house" in the dining room. The intervals occasioned by the Easter vacation and the Jewish holidays at Passover broke up the continuity of the experiment, and during June, after the children had really begun to take the meal with some degree of satisfaction, the hot weather made serious inroads on appetite. Some concessions to the children's tastes, which the workers in charge felt could be made without sacrificing the nutritional and educational value of the meal, were made. Such dishes as rice pudding and custards, for example, were given up, and desserts of cooked fruits substituted. Two sample menus reflecting this modification follow; as has been previously noted, they were planned to supplement deficiencies of the home dietary, not as model balanced meals.*

Rice Soup (with milk)	Potato Salad
Mashed Potato and Turnip	Rye Bread and Butter
Rye Bread and Butter	Prune Pudding
Baked Apples	Cocoa

REST PERIODS

These were taken in the gymnasium at Christodora House for a half hour before the luncheon period. The sixth and seventh grade groups were required to take this rest period. The Terman

* See Appendix D.

groups were advised to take it, and many of them did so. The children lay on the floor each wrapped in a blanket. There was always more or less difficulty in securing coöperation, especially from the older boys, and the task of supervising the rest period was not an easy one. The shouts and cries of their class-mates at play in the square outside could be plainly heard, and this made resting seem even more "babyish" than it already appeared to restless spirits. Occasionally one or two of the more obstreperous would decide to endure it no longer, and would suddenly cut out of the room, and escape to freedom. In spite of these disturbing elements, there is no doubt that the children whose interest had been enlisted, succeeded in getting benefit from the period, and learned to lie quietly relaxed without being seriously disturbed by their more restless neighbors.

Enlistment of the Child's Coöperation

INDIVIDUAL INSTRUCTION

To secure the second half of the educational program, the coöperation of the child within his environment, both individual and class instruction were provided. Following the weekly measurements a brief interview between pupil and nutrition worker took place. Each child was given a specially devised booklet* containing a table of 100 calorie portions of common foods in which to record his food intake for 48 hours. He was asked to make a list of the actual food taken; slices of bread, ounces

* Emerson, Wm. R. P., *A Record Book for Measured Feeding*, Pub. No. 3. Nutrition Clinics for Delicate Children, Boston, Mass.

Rest and Restlessness in the Gymnasium at Christodora House

of milk, tablespoonfuls of cereal, etc. This 48-hour record was returned each week and the caloric intake figured by the nutrition worker.

Further data were obtained by the nutrition worker on the entire week's record with regard to observation of the prescribed program, rest periods, lunches, hours of sleep, drinking of tea and coffee, water at meals, fresh air, breakfast habits, rapid eating, exercise, fatigue, colds, clothing and any other facts of significance in the week's history. Notes made at the time of this interview were used later as a basis for discussion of the individual charts at the class meeting. These charts were designed to record the outstanding features of the week's history. Gain or loss of weight, number of rest periods, mid-session lunches, use of tea and coffee, and caloric intake as well as progress in the correction of defects, were graphically indicated by this means.*

CLASS INSTRUCTION

During the first term the several nutrition classes met for weekly half hour class sessions in the eye clinic room. As several classes of the same grade exist in P. S. 64, each of the nutrition groups was recruited from children belonging in more than one class-room. Thus many members were strangers to each other and this fact, together with the unaccustomed room and special teachers, was partly responsible for the formality and restraint which characterized the class sessions at first. The average age range was sufficiently limited to make a similar pro-

* See Appendix C.

cedure feasible for all the groups with the exception of the first grade. For them, however, the type of class instruction employed was quite unsuited and beyond their ability to comprehend. Though they did acquire a conception of the chart and its meaning and a few outstanding facts concerning health habits, relatively little was accomplished during the term toward developing methods better suited to their years. At first the conduct of the class devolved on the physician, Dr. Emerson at the beginning, and later Dr. Henry J. Schreiber who assisted him. The individual charts were arranged on the wall facing the class, in the order of greatest gain for the week, and each child was seated before his own chart. Thus the distinction of "head" and "foot" of the class was made prominent, and any mothers present were seated, each behind her own child, with the view of further emphasizing the idea of success and failure. The subject matter of the lessons was chiefly derived from consideration of the individual charts, and the conclusions to be drawn from the relative gain and loss they indicated. Interpretations were supplemented by the nutrition worker's notes made at the time of the weekly weight taking. There was also discussion of related informational matter. Nutritional standards, the significance of measured feeding, the value of milk and cereals, the bad effects of tea and coffee, food habits and general health habits were thus presented to the children's attention in their direct bearing on their own physical welfare. Special deductions and recommendations in regard to individual children resulting from this class discussion were noted, and repeated later to the child or his mother by the nutrition worker.

It will be evident that little opportunity was afforded the physicians for special planning of the day's discussion in advance, as they were under the necessity of receiving the material for discussion from the nutrition worker at the time the class assembled. Such a situation invariably results in much repetition, and relatively little opportunity for developing the possibilities of the subject matter. It is the usual procedure where the class method has been adopted for clinic use, and this first term might well be called the "clinic stage" of our class procedure. The problems arising as well as the techniques employed are, we believe, fairly characteristic of the usual clinic experience. The limitations disclosed, so far as they concern the enlistment of coöperation from the children, were inherent in the situation and arose first from the *unequal physical endowment of individuals and consequent inability to accomplish results in direct ratio with effort,* secondly from the *inequality of home facilities for coöperation* which contributed in increasing measure to the workers' sense of injustice toward certain children. In addition, there was the inaccuracy of home records and the attendant difficulty of exercising proper judgment in regard to a child's veracity. Every attempt on the school's part to secure data from the home is more or less subject to this difficulty and the possibility of encouraging inaccuracy or even conscious deceit is a serious one.

In addition to these difficulties others arising from faulty techniques should be mentioned. The use of competition was certainly questionable in view of the fact evident to all, that often conscientious children failed to gain as much as others who were careless or lacking in interest. The discouragement felt by the individual who could not approximate his normal weight line, was only increased by the introduction of the competitive idea, and the arrangement of the charts each week in the order of weight increase with the best record at the "head of the class." The appeal to future benefits to be secured, as a "place on the ball team in high school," was also employed, although generally recognized by the modern school of teaching as insufficient for enlisting continued coöperation from the average child.

Half an hour for discussion of the kind involved, in a class of 20 to 25, led to hasty and occasionally to false deductions as to causes of failure, the injustice of which was deeply felt by the children concerned. But the didacticism and formality of the class procedure effectually prevented remonstrance or explanation in such cases, especially as the centering of attention on the chart made for self-consciousness. The impressions of a teacher who made a number of visits to the several classes may well be quoted here: "The children clearly showed self-consciousness; their attitude was a listening one; they seldom had a chance to say anything except in reply to direct questions. They were talked to rather than with; the latter takes more time, but does it not make for a greater feeling of responsibility, less direct adherence to direction and more thinking out, less mere cure and more growth of judgment? Moreover, much of the talk is for each child a repetition of what the nutrition worker has already gone over with him, when she weighed and measured him and made his diet list. It must seem to him unimportant, except to make him conspicuous, with the attention of the doctor and others focussed on him. Do we wish him to like this? The social element seems unnecessarily left out. Should not public discussion be reserved for topics of common interest, topics of an interest that is clearly common to all of them, something that cannot seem an exploitation of individual ailments? After all it is not a difference of subject, but of approach. Health rather than cure should be the function of a classroom talk."

Statistical Data and Interpretations

GROUP SELECTION

Eight hundred children of the four grades selected were weighed and measured with the results shown in Table I:

TABLE I*

RESULTS OF MEASUREMENTS, CHILDREN OF FOUR GRADES

	Grade VII	Grade VI	Grade V	Grade I	Total
Total number	173	245	127	255	800
7% or more underweight	25	39	27	43	134
Per cent underweight	14.4	15.9	21.3	16.9	16.8

* The computations of statistical data and charts appearing in this chapter and the next were made by Dr. David Mitchell and published in *The Pedagogical Seminary*, March, 1919 and March, 1920. They are reproduced here by courtesy of the editors.

At no time was the attempt made to weigh and measure the entire school population, as P. S. 64 enrolls approximately 3000 pupils and from the first it was our purpose to work intensively with a relatively small number of children. In so far as these four grades may be considered to represent a cross-section of the school population at the beginning of our work in February, 1918, the above average, 16.8%, approximates the average of children 7% or more underweight throughout the school at that time.

The children of the Terman and open-air group are not included in the above cross-section, as they cannot be considered representative of the average since they were drawn from two specially selected groups. Results of the initial weight-taking in these two groups and comparison with the results in the regular grades are shown in Table II.

TABLE II *

RESULTS OF MEASUREMENTS, SPECIAL CLASSES AND REGULAR GRADES

	Terman	Open-air	Grades	Total
Total number	69	25	800	894
7% or more underweight	19	7	134	160
Per cent underweight	27.5	28	16.8	17.7

* For distribution table of the total number weighed see Appendix A.

COMPARATIVE RESULTS IN WEIGHT INCREASE

Of the total 160 children found 7% or more underweight, 105 were enrolled in nutrition classes. Twenty more were included in the group of fifth grade boys given the mid-day dinner. The results of the experiment in terms of weight increase for the several groups after nineteen weeks are given in Table III.

TABLE III *

COMPARATIVE WEIGHT INCREASE OF THE SEVERAL GROUPS AFTER 19 WEEKS

Group	No. Enrolled	Pounds Total Gain	Normal Expected Gain	Net Gain	Percentage of Normal Gain
7th grade	23	72	64.8	7.2	111.1
6th grade	28	109	89.9	18.1	120.1
1st grade	26	55.7	40.5	15.2	137.5
Terman	17	61.6	43.2	18.4	142.6
Open air	11	13.7	23.4	− 9.5	59.1
	105				
5th grade	20	6	23.2	−17.2	25.9

* The estimates of normal expected gain were calculated in the accepted way from the average yearly increase as given in the Burk-Boas table of normal weights. That is, a proportional increase for the period (19 weeks) was estimated on the basis of a supposed steady increment in weight from month to month throughout the year. Thus if the normal annual increase for a 12 year old boy of a certain height is 8 pounds, in nineteen weeks he would be expected to gain approximately 3 pounds. In view of subsequent findings as to seasonal variation in weight increase (see p. 127) it will be apparent that the normal expected gain for fractions of a year cannot be so simply determined, and that the results in the given tables, except for the total number of pounds gained, have been seriously undercut. They are included here, however, because they still afford a basis for assessing the comparative results obtained in the different groups.

Comparison of the weight increase for these groups with variations in their several programs is shown in Table IV.

TABLE IV *

COMPARISON OF VARIATIONS IN THE SEVERAL PROGRAMS AND RESULTS IN WEIGHT INCREASE

Group	Physical Care	Instruction	Rest	Lunch	Dinner	Fresh Air	Lighter Program	Results in percentage of Normal Gain
Terman	*	*	*	*	*	x	x	142.6
1st grade	*	*	x	*	x	x	x	137.5
6th grade	*	*	*	*	*	x	x	121.25
7th grade	*	*	*	*	x	x	x	111.1
Open air	*	*	*	*	x	*	*	51.
5th grade	x	x	x	x	*	x	x	25.9

(* = Yes. x = No.)

INTERPRETATIONS

While only tentative conclusions are possible owing to the small number of individuals in each of the groups discussed, certain interpretations can be offered in connection with these tables. The most striking fact recorded is the apparent failure to secure results in weight increase that are directly attributable to the school feeding program. From Table IV it is evident that some children, to whom the mid-day dinner of 1000 calories was served, gained considerably less than others in whose program it was not included. While the greatest average percentage of gain was made by the Terman class who received both mid-day dinner and mid-morning lunch, the average gain made by the first grade was nearly as great, yet no dinner was attempted for them. The fifth grade children whose program was limited entirely to the mid-day dinner, show the least satisfactory results, as they lost weight steadily through the four months of the experiment.

These results are not surprising in view of the problems attending the mid-day dinner. As has been already indicated (p. 42) the children were afraid of unaccustomed food and used to high seasoning. Thus they did not find the meal appetizing and they were not hungry enough to eat what they did not like. Had the period of the experiment been a longer one, a greater degree of coöperation might have been secured from them as a result of the program of instruction. How far the results to weight increase would have been augmented, however, remains a speculation. Aside from demonstrating some practical difficulties of a school feeding program, our results for the mid-day dinner are quite inconclusive.

As mid-morning lunches were served to all the children with the exception of the fifth grade, we must look to other factors for the interpretation of the relative gains shown by Table IV.

The distinguishing feature of the Terman group is its intelligence (measured by a special standard) and this may be supposed to have made the instruction given it more effective. An intelligent over-control of the environment by adults is one of the goals set by our attempted program. To such an over-control the intelligent self-control of the Terman group might be said to approximate. The eager-minded and participatory attitude of these children toward all their school activities, ensured better coöperation on their part than could be obtained from children of the regular grades. Thus intelligence in the group, or in direct application to the control of the group, is suggested as one explanation of the satisfactory results they achieved. It is also probable that as a group the chief causal factors of their underweight were of a nature calculated to permit ready response to an improved régime. It is quite possible that the Terman children were underweight largely because of an increased metabolism, and that their ability to respond to improved conditions of food taking, rest and fresh air was therefore proportionately better than that of individuals in the other groups.*

Second only to the gain made by the Terman class is the record of the first grade children, yet their program included only the provisions for physical care and instruction and was considered by members of the staff the least satisfactory of any afforded. Because the program of instruction was ill-adapted to their age period, increased necessity for coöperation from the home was felt by the staff, and therefore much greater effort was made to interest the mothers and secure their attendance at the class sessions. Our efforts were reinforced by the greater readiness of parents to maintain intelligent control and lend coöperation to special efforts on behalf of young children. Thus better environmental control was secured for this group than we were able to secure for the others, and the special factor of in-

* See Burnham, Wm. H., *The Metabolism of Childhood*, Pedagogical Seminary, Dec., 1920, pp. 304-322. Where the hypothesis is presented that the curve of learning is correlated with the curve of metabolism.

telligence in the Terman group was paralleled, in the case of the first grade, by the factor of adult supervision. In addition, we must consider too, the readier response of little children to conditions affecting them for good or ill. This better ability of their age period to respond, again parallels the probable better ability to respond on the part of the Terman group.

Intelligent control of the environment was less easily secured for the children of the sixth and seventh grades. It was not only more difficult to secure coöperation from the homes but, with children of their age, home coöperation was less effective, as many of them were quite beyond parental control. Moreover, it was far more difficult to enlist their own coöperation. This was especially true of the seventh grade in which there were a number of over-age boys, who had lost all interest in school activities, and were merely marking time, and waiting to take out their working papers. These big fellows constituted an unruly element, and to a certain extent were leaders because of their years and daring. Obviously, their level of intelligence was inferior. Their coöperation was never successfully enlisted. The nutrition program was regarded by them as "babyish," and the difficulties in discipline experienced in the lunch room and during the rest period emanated for the most part from them. The sixth grade group had also its quota of retarded boys, but they were proportionately fewer and the greater differences in physiological age existing between them and the younger members of their class rendered their influence less disturbing. The comparative results obtained in these two groups, 120% for the sixth grade group and 111% for the seventh grade, seem to depend in the main on this factor of their personnel.

The failure of the fifth grade to make gains is easily explained in view of the circumstances surrounding the mid-day dinner, and the additional fact that no attempt to enlist their coöperation by a program of instruction was made. It will be noted (Table I) that this grade showed the largest number of underweights and as individuals they may have represented more serious problems of malnutrition or of physical defect than did the other classes.* In addition, the age period of the average fifth grade boy offers a possible contributing cause. (See p. 23.) The only fact established by their place in the experiment is the failure of the school lunch to compete with a more comprehensive program.

Like the fifth grade, the open-air group of this first year cannot be considered comparable to the others. It undoubtedly included incipient cases of disease and its members were probably candidates for a far more controlled régime than could be supplied through the school procedure. As it seemed impractical to send the members of this group to the eye clinic, class instruction was given them in their own room. As the rest of the class did not share in this, there was always a consciousness among them that they were on a different basis from the others, and a resulting lack of coöperation was probably a factor in their poor record.

Although the program of school feeding plays no

* No physical examinations were made or social histories taken for this group. After the initial height and weight taking they were merely given the mid-day dinner.

part in our interpretation of relative gains made by the several groups, there can be little doubt that the actual gains made by the Terman, sixth, seventh, and first grade classes were due in considerable part to the mid-morning luncheons. It is also probable that the mid-day dinner afforded some results for the Terman group, because of probable better and more intelligent coöperation on their part in this, as in other features of the program.

PHYSICAL DEFECTS

Naso-pharyngeal Obstructions.—A comparison of the 49 children who were recommended for tonsil and adenoid operation and failed to secure treatment, with the 32 children who were free from such defects appears in Table V. As the groups were not of equal size the percentages best indicate the relative results.

TABLE V

COMPARATIVE GAINS OF CHILDREN WITHOUT NASO-PAHRYNGEAL OBSTRUCTIONS AND THOSE RECOMMENDED FOR OPERATION

	With Obstructions		Without Obstructions	
	No.	Per Cent	No.	Per Cent
Lost weight	4	8.2	1	3.1
Gained less than normal	18	36.7	9	28.1
Gained more than normal, 1 to 100%	24	49	12	37
Gained more than normal, over 100%	3	6.1	10	31.3
	49	100	32	100

From this table it is evident that 55.1% of the children from whom these defects were not removed made gains in excess of normal while 68.8% of the children without such defects gained in excess of normal. The relative amount of gain must be noted, however, and the record of gains showing over 100% in excess of normal is only 6.1% for children having defects as against 31.3% for those without defects.

A study of the gains made by 19 * of the cases operated for a period of five weeks before and five weeks after the operation is given in Table VI. In practically every case the child lost weight at the time of the operation and recovered it in about a week. The five-week periods are therefore separated in each case by a few intervening days in which this recovery was taking place.

TABLE VI

PER CENT GAIN OF 19 CHILDREN FOR PERIOD OF FIVE WEEKS BEFORE AND FIVE WEEKS AFTER TONSIL AND ADENOID OPERATION

No.	Before	After	No.	Before	After
1	2.4	1.4	11	−1.3	2.5
2	3.6	8.2	12	1.1	3.3
3	1.7	1.0	13	0.6	1.9
4	0.5	5.6	14	−0.9	3.4
5	−0.3	1.5	15	3.3	4.6
6	−1.3	3.4	16	5.8	−1.3
7	0.6	2.5	17	0.9	4.0
8	−2.8	5.8	18	−0.3	4.7
9	2.8	3.9	19	−1.7	1.5
10	0.9	6.4			

Carious Teeth.—Of the entire group 88 were examined for dental caries and 63 were found to have

* One child of the 20 operated is not included owing to an attack of influenza following his operation.

from 1 to 12 carious teeth. An attempt was made to correlate this defect with the degree of underweight found, but this was unsuccessful. The results of the study are given in Table VII.

TABLE VII

COMPARISON OF DENTAL CARIES AND AVERAGE PERCENTAGE UNDERWEIGHT

No. of Carious Teeth	No Record	0	1	2	3	4	5	6	7	8	9	10	11	12
No. of children......	17	25	21	12	9	8	3	3	2	2	1	1	0	1
Average per cent underweight........	10	10	9	8	13	9	10	10	16	10	13	9	0	13

Summary

At the end of the first school term no spectacular gains had been made by the children enrolled in our nutrition classes. On the contrary, progress had been slow and discouraging. The results achieved in "percentage of normal gain" fell far short of our attempted goal, and of the entire number enrolled (105) only two had "graduated" by reaching the standard weight for their height and age.

In the light of subsequent experience these results appear less disappointing and we can appreciate today that the standards used in making our evaluations were too high, as they were based on an "expected gain" in the determination of which no allowance for the factor of seasonal variation had been made. Not until two years later did our staff become aware of the importance of this seasonal factor and of its effect on previously accepted standards. But the complexity of our problem, and of the underlying causes and contributing factors of malnutrition had been pretty well revealed to us by June of the first year.

The outstanding facts of the first five months' experience may be briefly stated as follows: The wide variations in response shown by the individual records had emphasized the importance of the child's physical status and home conditions in determining results. At the same time the relative gains of the several classes had brought into relief the dependence of success on the child's own coöperation and the necessity of better techniques for enlisting it. In comparison with these essential factors the differences in the various programs arranged were shown to be negligible. Better coöperation from the home, better progress in the correction of defects, more careful physical examination and diagnosis and a better class procedure were felt to be necessary lines of development, if we were to cope successfully with the problems involved.

Certain limitations, too, were apparent in the chart forms and other records used during the first term. These had been copied from those in use at the Massachusetts General Hospital and were better adapted to gathering the type of material needed for purposes of clinical diagnosis than for collecting data for statistical treatment.* As a result of our experience in the first term's work we developed an

* For similar difficulties experienced with physical examination records see Dewey, Child and Ruml, op. cit., p. 160, and Heron, *The Influence of Defective Physique and Unfavorable Home Environment on the Intelligence of Children*, Galton Laboratory Memoirs VIII, 1910.

individual record blank resembling in some respects that used by the visiting teachers of the city. The weight chart was somewhat modified as well to suit our particular needs.*

* See Appendix B and C.

CHAPTER IV

DEVELOPMENT OF PROCEDURE—GRAMMAR GRADES—SEPTEMBER, 1918—JUNE, 1919

Basis of Reorganization

In organizing the classes for the second year, an attempt was made to develop our program in directions calculated to secure better control of the environment and added opportunities for enlisting the children's coöperation, since the experience of the first year had emphasized the importance of these factors in securing weight increase. As no convincing results in favor of the mid-day dinner had been afforded, it was decided to give up this feature of the experiment and to work more intensively along other lines. The work of the New York School Lunch Committee had been discontinued at the end of the previous term and their coöperation was no longer available. Without their aid an attempt to secure a hearty meal at school for any of our classes presented many difficulties beyond the increased expenditure of money and service involved. Dr. Emerson's belief, that such a meal though advantageous is not necessary to the success of the nutrition class program, was an influential factor in reaching the decision to discontinue it, especially since his opinion appeared to be confirmed by our data.

Comparing Progress—Open-air Boys of 1918-19

Viewed in the light of our subsequent experience and with the statistics for three consecutive years available, the decision to discard entirely so important a feature of the program at so early a stage of the experiment now appears questionable. More serious, however, was the basis on which the new classes in the fall of 1918 were organized. Not one of these will be found strictly comparable to any of the groups organized in the previous year. Thus the advantages to be gained by continuing to set up really comparable groups within a single experiment, and at the same time incorporating new features of treatment, were largely lost at P. S. 64, and the statistics gathered in the three successive years hardly lend themselves for purposes of comparison. Two types of influence were responsible for the changes which so seriously affected our program of research: on the one hand the advisability of conforming to the practical situation and modifying plans in accordance with administrative and financial considerations, on the other the temptation to sacrifice the statistical requirements for possible benefits to the individual child. The organization of the classes in the fall of 1918 exhibits the latter influence very clearly. Any such undertaking as ours must inevitably experience the pressure of influences in these two directions, and workers should realize that so far as they find it inadvisable to carry out a consistent program on the basis of verifying and expanding previous experience and accumulating comparable data, the possibilities for much-needed research are endangered.

GROUP SELECTION

From the viewpoint of benefit to the individual our first need in the fall of 1918 appeared to be provision for those children who had been in our classes the year before and were still underweight. With a view to securing the best environmental conditions available for them Dr. Louis Marks, the Principal of P. S. 64, arranged for two open-air classes, one for sixth and seventh grade children, the other for those of the fourth and fifth grades. In these were enrolled members of the nutrition groups from the fifth, sixth and seventh grade and open-air classes of the previous year. To these were added a number of boys from the same grades, selected at the opening of school as conspicuously underweight. There were also a few pre-tubercular cases for whom the school had to provide open-air facilities. Thus the two open-air classes presented the special problems of a higher average underweight, and a more or less chronic condition of malnutrition, as shown by failure to respond to previous treatment.

A third class was recruited entirely from fifth grade boys whose average condition as to underweight was not serious. This group was selected with a view to developing an educational procedure under usual class conditions, and determining how far the borderline and low percentile cases would respond to such a procedure. It was hoped results would show that by making special provision for the more serious cases, a school could secure satisfactory results for the majority of its underweight children, through further development and adaptation of the nutrition class program to typical school conditions.

The choice of fifth grade children for this experimental group was determined partly by the unsatisfactory showing of the fifth grade in the previous year, partly by considerations of administrative convenience.

ADMINISTRATIVE ADJUSTMENT

Dr. Marks' decision to form entire classes of underweight children was a distinct gain to our procedure, as it made possible the development of an esprit de corps among the class members that was impossible as long as they were distributed among the different classes of their grade, and assembled only for the weekly sessions in the eye clinic room. Class instruction for the open-air groups was of necessity given in their own class-rooms, and at mid-year the same plan was adopted for the fifth grade boys. Thus the eye clinic came to be used only for measurements, examinations and individual interviews. The conduct of the weekly class sessions was given to the two nutrition workers who now assumed this responsibility in addition to their previous duties.*

Physical Care

This change made for efficiency in the program of physical care, as the physician's time could now be devoted entirely to the physical examinations and diagnosis, and to individual interviews, when it seemed necessary to true up the findings of the nutrition worker or give special advice. The added au-

* The subsequent developments in teaching methods, and techniques for better enlistment of coöperation from the children and from the homes, were made under the direction of Miss Harriet A. Forbes.

thority of any recommendation from the doctor was always evident and could be relied on for securing additional emphasis when necessary.

Results obtained in the correction of defects showed an appreciable gain over those of the first year.* Tonsil and adenoid cases were treated at the Metropolitan Hospital. The treatment of dental caries was continued conscientiously but progressed slowly owing to the inadequate provision of clinics for the purpose. Had it not been for the interest and kindness of a skillful and busy dentist in practice, Dr. H. A. Koonz, who treated many of our children without a fee, it would have been impossible to secure dental treatment for them.

Coöperation of the Home

In spite of the failure of parents to attend the class meetings of the previous year, we continued to urge them to be present in the belief that our work would gradually enlist interest and better coöperation, as the individual families and the community at large became more fully aware of its significance. Our attempts to secure their attendance continued all through the second year of the experiment, but as time wore on and our realization of the need of home coöperation increased, we were led to increase the number of home visits considerably. The better to enlist the mother's interest a miniature copy of the child's weight chart was taken by the nutrition worker on these visits and carefully explained to her.

Frequently during such a visit the nutrition

* See p. 87 (statistical data).

worker was able to persuade the mother to prepare cereal and to serve smaller portions when trying to establish the habit of eating more nourishing food; or she was encouraged to make greater effort to prevent late hours, and in various other ways to give her aid to the experiment. Almost invariably we found her keenly interested in her boy's health, and frequently the coöperation given was invaluable. A special problem of the nutrition class program is the difficulty of assessing the accuracy of the children's statements concerning their home régime. Facts gathered during the home visits served as a check on the child's reports as to his habits and were used to corroborate them or the reverse. Where testimony was conflicting, that bearing the best indication of good faith and accuracy was taken.

Fifth Grade Class

ENVIRONMENT

Except in the extreme winter weather the windows of the fifth grade room were kept open. The boys wore their outdoor sweaters and coats, and enjoyed the fresh air. Rest periods were arranged during the morning session, the children remaining seated with arms and heads on the desks before them. Instruction in relaxation was given in connection with these attempts at conserving energy, and a certain success was achieved, though with boys of this age the problem was difficult, and five minutes of real relaxation was almost as much as could be secured in a fifteen minute period. The children were urged to bring mid-morning lunches from home and a regular time was arranged for eating them. The attempt to secure home coöperation in the provision of these lunches was never more than partially successful. Failure to supply them was frequent, and those brought averaged much below the caloric value prescribed (250-300 calories). Often a small apple or an unappetizing roll would be their only constituent.

MOTIVATION

Every effort was made to enlist a spirit of coöperation among the children sufficient to ensure the carrying out of the health program at home. As has been stated, the change in class organization was a gain in this respect, and a further advantage resulted from the decision reached at mid-year, to hold the class instruction sessions in the regular class-room instead of the eye clinic room. The familiarity of the surroundings, better acquaintance between the members of the class and the presence of the class teacher, the resulting informality and closer identification of the procedure with usual school interests and attitudes, all contributed to establishing a class spirit. The idea of competition between individual members of the class was dropped, and children were urged to exceed their own previous record instead. A significant change, too, was made in the chart where the normal weight line was supplemented by the "line of expected gain" for the individual, the two together forming a zone within which progress could be considered achievement.* By this device some discouragement on the part of those who could not approximate the standard of normal weight for height was avoided. At the same time the use of

* See Appendix C.

the colored markers in connection with the charts became more evidently one of records rather than rewards. The familiarity of the nutrition worker with the weekly records, and the facts of home environment and individual history, made possible more careful interpretation of the charts, at the same time that discussion of them was made briefer and more impersonal.

These changes in class-room technique made for increased effectiveness in securing the coöperation of the children. An additional stimulus was furnished by giving the boys some realization of the meaning of the class as an experiment. They were interested to feel themselves part of a serious investigation of the means by which the percentage of underweight in their school could be reduced. That they really grasped something of their own place in the experiment and of its social significance, was evidenced by the increased care with which they made their weekly reports as this conception became clearer. The question may well be raised how far such a special appeal can be regarded as legitimate in an educational experiment. Certainly any successful results obtained are less convincing for a general program because of its use. Whatever response may be secured from an individual group by keeping before them the fact that they are pioneers, and that the future of others depends on their record of success or failure, the necessity of securing no less active coöperation from succeeding classes must be kept in mind.

The work was started late in November. By mid-January an attitude of habitual participation and ease of manner during discussions was manifest, and there was no sign of the self-consciousness noted the previous year nor of the clinical atmosphere.

SUBJECT MATTER

If the teaching of the nutrition workers was less authoritative than that of the physicians, it was also less didactic and more stimulating to the child's own thinking. An aim kept constantly in view was to lead discussion away from the individual records and consideration of the charts, to topics emphasizing health and constructive suggestions for living habits, not only for the class but for their families and the community. This resulted in the development of a considerable program of subject matter which proved full of interest for the children. The content involved is shown in the following summary, derived from the class discussions for a period of 28 weeks. Subjects were reviewed repeatedly with no apparent loss of interest, and a new fact was received with absorbed attention by the majority of the class.

Correct weighing and care of scales.

The nature of an experiment—its social value—the scientific attitude of mind.

What constitutes good nutrition.

The calorie—a unit of heat.

The uses of food:

- As fuel—for heating the body.
- As fuel—for maintaining the internal activities (respiration, circulation, etc.).
- As fuel—to produce energy for all kinds of work and play.
- As fuel—for reserve energy, storage for emergency uses.
- For repair.

The significance of measured feeding.

The value of certain foods—milk, cereals, vegetables, fruits, meat, eggs.
The nature of habit formation.
Food habits.
Other factors in promoting good nutrition—fresh air, rest, exercise.
Prevention and treatment of physical defects.
Care of the teeth.
Effect of tonsil and adenoid obstructions.
Eye strain.

It took several weeks for the children to get a working knowledge of caloric values, and to understand not only the term but the significance of the body's fuel needs. The dramatic story of the college boys whose willing immolation in the calorimeter made them heroes in the minds of the class, was used as the starting point of this interest. The idea of measured feeding followed naturally, with the conception of food as fuel and a source of energy for the human machine. The need to regulate the supply as the engineer does for his monster of iron and steel was also evident. Then followed special uses of different foods and the relative values of those found in their own dietaries or available for them. Wax models showing 100 calorie portions of suitable breakfast dishes were secured, to assist in the interpretation of caloric values in terms of daily experience, and to demonstrate a few menus for the ideal breakfast. On one occasion several children from the open-air classes were taken for a trip to the Post-Graduate Hospital, where a very complete exhibit of this kind is to be seen, with a view to helping them estimate more accurately the caloric value of the food portions served them at home. Samples of real food were occasionally used in conjunction with the wax models for this type of illustration. Mention was made of acquiring proper food habits, and at one lesson a psychologist was present, and explained habit formation to the class. This talk was frequently referred to by the children afterwards. Incidentally, some important conceptions of the value and interest of work done in the scientific spirit, and of the exactness required in carrying out the details of scientific work were gained. In the study of pure milk, for example, each child could get a picture of the interrelationship of the processes involved in getting milk from farm to child consumer, and could feel the disastrous effect of failure on the part of any individual to perform his part conscientiously. Their interest in facts and changes recorded on charts other than their own was indicative of this budding scientific spirit, and as the year progressed the class discussions increasingly reflected it. The boys would gather around the charts eagerly talking about the gains and losses in a surprisingly impersonal tone. The assertion of a boy on one occasion, "When I drink milk I don't gain; when I drink coffee I do," was met by a chorus of exclamations and demands for an explanation. During a discussion of the plan to give a demonstration in the auditorium, one boy volunteered the suggestion that all charts should be shown whether good or bad. This was talked over pro and con as to its usefulness, and no one suggested that his chart should be omitted.

This auditorium program took place late in the year and was arranged by the class at the suggestion of the principal. It was sufficiently successful to bring a request from the teachers that a regular auditorium period be taken over by the nutrition classes. The wax food models were shown and explained by the boys, as well as several of the weight charts, two from the fifth grade, and two from each of the open-air classes. The boys who had secured treatment for physical defects then marched on the stage in two groups, and a spokesman explained what they had done to become better fit.

The few stories introduced in the class work were true ones. Interest in Roosevelt and his determination to overcome his weakness of body was keen, and Horace Fletcher, with his ideas about eating, was well received. On several occasions a visitor recorded portions of the class discussion to which she listened, and the following quotations from her note book are of interest in connection with the problem of home environment: "My baby leaves out his milk, but now I make him drink it." "My sister goes to bed earlier." "My big brother didn't believe in eating slowly, but he tried it and he gained." "Now I get my brother and sister to eat the same things."

In the month of May the boys were asked to write compositions on the value of the Nutrition Class and urged to tell exactly what they thought of it, "for and against." About one-half of the 33 papers were against the class, largely because of the "bother of tonsil operations." Rest was also referred to many times as perhaps the greatest "bother" of all, requiring much self-control and resolution to put through. The compositions in general are noteworthy for their sincerity and freedom of speech, in decided contrast to what is usual in the class-room.

Even where disapproval is expressed, as in the following excerpt, we can realize that the writer had gained something from the experience: "I like to go to bed late and I like to eat fast. I don't like the idea of the calories. The nutrition class is good for those who like it." A more submissive spirit tells us: "I used to take a roll and run out in the street and play. Now I learned to eat a roll and sit down by a table and have more a joyable time." The following quotation shows the common attitude of the boys when they were in the class-room: "I am in the nutrition class and I think I am here long enough to know whether it has helped me or not. When I was not in the nutrition class I did not know that I ought not to drink tea or coffee. I know enough to go to sleep early and try to take rest periods or lunch periods and know nearly everything that will make me gain."

ESTIMATE OF METHODS

It will be recalled that the program developed for this group was undertaken to determine how far results could be secured from the nutrition class under typical school conditions. For this reason the type of class instruction used presents several features for special consideration, and well illustrates the possibilities and limitations of health teaching under the conditions imposed. It will be evident that the socialized recitations with their appeal to group psychology, effectively secured the interest of the children, whose enjoyment of the weekly discussions, and increased facility of expression and ease of manner as the year progressed, were noted by all who observed them. Partly because of these conditions, partly because of the natural interest nearly all children feel for the subject matter covered, it was possible to present it always in its scientific aspect and from the "work level" approach. The class instruction used will be recognized as the best of its kind and, as an informational procedure, was highly successful. The subsequent record of the children affords evidence that it was fairly successful also, in establishing a creative attitude on their part toward the problem of health. As a weight-getting and habit-forming program, however, it undoubtedly left much to be desired, and in this respect its limitations were the limitations incident to the usual public school environment, when equipment and facilities for radical readjustment of existing conditions are not provided. We may well ask ourselves what might have been the results in weight increase, had mid-session luncheons or a mid-day dinner and rest facilities, similar to those provided for groups in the previous year, been arranged for these children, whose coöperation and interest had been so effectively appealed to, and the causal factors of whose underweight were, for the most part, of a less serious nature than in the case of other groups considered.

Open-Air Classes

ENVIRONMENT

The open-air classes throughout the school system are designed to provide special conditions to meet the needs of children handicapped because of tubercular diathesis, anæmia or serious malnutrition. Children suffering from various other maladies of a nature which does not exclude them from school, easily drift into these classes, so that in the minds of many children they have become identified with the idea of sickness and ill-health and to a certain degree carry a resulting stigma.

As existing in P. S. 64 they presented the following points of distinction from the rest of the school: a sunny room with windows adjusted in order to swing and be open the year around, army cots with blankets or sleeping bags for daily rest periods, movable desks and chairs, mid-morning luncheon, a bonus for the teacher in order to secure a woman with special social and technical qualifications. With such a modification of the school environment, and with health rather than school progress the goal before the class, there is an inevitable slowing down of the usual speed in class-room procedure, with a consequent gain in informality, all of which is obviously of benefit to the child, and in close accord with the ideal program for the nutrition class. In the two rooms placed at our disposal, therefore, we had only to make use of features already existing, the daily rest period with the children lying flat on the back for three-quarters of an hour, sleeping when possible, but always remaining quiet in a recumbent position, and the mid-morning lunch which was served in the class-room. In the open-air rooms the need of extra nourishment, especially in winter weather, is always recognized, and lunches for them have been regularly supplied at P. S. 64 through outside subscription.

During the coldest weather oatmeal or farina with milk was served and taken generally with relish, although appetites for the most part needed tempting in these particular groups, and it was found necessary to vary the luncheon as circumstances permitted. Hot cocoa was sometimes substituted for the cereal and milk. The cooking was done by one of the teachers on a small gas stove in the teachers' lunch room; and a fireless cooker was available, thanks to the teacher of one class, who had been sufficiently energetic to have it made by one of the boys in the school shop. In warm weather a good grade of bottled milk was served, also bread and jelly sandwiches, or bread and jam.

With the facilities at her disposal the serving of even these simple lunches was something of an achievement for the class teacher Any educational possibilities incident to the selection, purchase, and preparation of them could not be made available for the children under the circumstances. The actual serving and eating, however, presented opportunity for a certain training in food habits, and for discussion of caloric intake and food values, while the group example doubtless played its part in helping individuals to cultivate a taste for milk and cereals.

INSTRUCTION

The open-air groups offered less opportunity for the development of class discussions and subject matter content, because of the shorter lesson periods arranged for them. A special feature used by the nutrition worker in these classes was a small individual chart which the child himself prepared at his desk and took home with him, being thus enabled to discuss his record with his family from week to week.

A unique use of stories was made by this worker, who finding the boys in the lower class familiar with and fond of some of the wonder book tales, retold The Golden Touch and the story of Penelope, the boys making their own applications, in the case of Midas sufficiently evident. Penelope, who unravelled at night the work of every day, was compared to those children who undid the benefits of fresh air during their school day by sleeping with closed windows at night.

Statistical Data and Interpretations

GROUP SELECTION

Open-Air Classes.—Of the 48 children enrolled in the open-air classes, 29 had been carried over from the nutrition classes of the previous year for failure to respond to treatment. Of this number 12 presented special problems and, although they were seriously underweight, no satisfactory diagnosis of the causes for their condition was made in the two years they remained under our care, nor did they make gains in spite of their own sincere efforts at coöperation, the enlistment of their parents' interest, and the best efforts of our staff. Sixteen of the class, one-third of the total enrollment, were pre-tubercular cases and, while a number of these were not seriously underweight, they contributed their quota to the difficulties of securing gains. The remaining members had been enrolled because they were conspicuously underweight. Table VIII shows the distribution of percentages underweight for these groups at the initial weighing in September, and again at the final weighing in June. It will be seen that just half of them were seriously underweight, above 11% for height, and only 13 of the 48 were low percentile cases. The results at the final weighing show a slight approximation to normal.

TABLE VIII

OPEN-AIR CLASSES: DISTRIBUTION OF PERCENTAGES UNDERWEIGHT AT DIFFERENT DATES

	First Weighing	Final Weighing
− 3 − 5	..	5
− 5 − 7	..	2
− 7 − 9	13	7
− 9 −11	11	11
−11 −13	6	8
−13 −15	10	7
−15 −17	3	5
−17 −19	2	2
−19 −21	3	1
	48	48

Fifth Grade Classes.—Five classes of fifth grade boys, 223 pupils in all, were weighed and measured and of the total number 74, or 23.19% were found 7% or more underweight. Of this number 13 were placed in the lower open-air group, and 39 were enrolled in the fifth grade nutrition class, measurements being taken with indoor clothing and without shoes. Owing to various delays, the Liberty Loan drive in which the older children were active, and the epidemic of Spanish influenza, which disorganized the schools for a period, this class did not begin its sessions until nearly seven weeks after the initial weighing, when it was found that 22 of the number were no longer 7% underweight. Table IX gives the distribution of their percentages underweight at the initial weighing in the latter part of September, and again at the first class meeting in November when, as may be seen, 12 individuals were found to be between 5 and 7% underweight and 10 more were from 1 to 5% underweight.

TABLE IX

FIFTH GRADE CLASS: DISTRIBUTION OF PERCENTAGES UNDERWEIGHT AT DIFFERENT DATES

Percentages	First Weighing	First Class	Final Weighing
3 1	..	..	1
1 − 1	..	..	..
− 1 − 3	..	1	1
− 3 − 5	..	9	..
− 5 − 7	..	12	2
− 7 − 9	19	8	8
− 9 −11	11	4	5
−11 −13	4	1	6
−13 −15	4	2	7
−15 −17	..	1	6
−17 −19	1	1	5
−19 −21	..	..	2
Total....	39	39	43

These unexpected graduates afforded the spectacular element in the year's record. It will be recalled that of the total enrollment (105) in the previous Spring, only two were "graduated" in the course of 19 weeks of serious effort to provide a corrective program. Now by contrast, we had 22 ready to "graduate" from a group of only 39 after a term of seven weeks and before any program of care or instruction had been begun. Not until the publication, eighteen months later, of Dr. Porter's * statistics on seasonal variation was a satisfactory interpretation offered. For although the fall has long been recognized as the probable season of maximal weight increase, no previous study has shown how large a percentage of the total annual increment is involved in such variation. In the light of Dr. Porter's investigation our spectacular feature appears easily accounted for. Heavier under-clothing at the second weighing in November probably proved a contributing factor, but it is not sufficient of itself to provide an explanation.

Since it was impractical to reorganize the class, all school arrangements for the term having been made, and the usual school program being more or less seriously delayed already by the unusual conditions attending the influenza epidemic, these 22 children remained in the class. The final approximation to normal weight and its distribution is shown in the last column of Table IX. Here the effect of Dr. Porter's season of minimal weight increase seems as apparent as that of the season of maximal increase in the results for the period of the first seven weeks. Less spectacular perhaps, it proved far more disconcerting to the workers conducting the experiment. Comparing the first weighing with the final weighing, the cases are found to

* Porter, Wm. T., *Seasonal Variation in the Growth of Boston School Children*, American Journal of Physiology, May, 1920.

be more uniformly distributed but no decided approach to normal is shown.

Control Group.—

A Control Group of 35 children who were approximately of average weight for their height was selected at the time of the first weighing, with a view to studying the variability exhibited by normal children, for the light it might throw on problems of

TABLE X

CONTROL GROUP: DISTRIBUTION OF WEIGHT PERCENTAGES AT DIFFERENT DATES

Percentages	First Weighing	Second Weighing	Third Weighing
12	..	1	..
11	..	..	..
10	..	..	..
9	..	1	..
8	..	1	..
7	..	1	..
6	..	4	..
5	..	2	1
4	..	1	1
3	4	3	2
2	3	3	4
1	4	4	..
0	6	5	6
-1	4	3	3
−2	7	1	3
−3	7	3	..
−4	..	..	1
−5	..	1	1
−6	..	..	3
−7	..	..	1
−8	..	..	1
−9	..	1	..
	35	35	27

underweight, especially in regard to the discrimination of temporary and chronic cases. A study of mental ability in underweight children which formed part of our program demanded similar data derived from well-nourished children for purposes of comparison. Table X shows the results of the measurements for this group taken in the fall, in February at the beginning of the second school term, and in the first week of May. Unfortunately, at this third weighing 8 of the children could not be secured, so our results are for 27 instead of 35. At the first weighing all the children were within 3% of average weight for their height, at the second weighing they varied from 9% under to 12% overweight, and at the final weighing the 27 children measured ranged from 8% underweight to 5% overweight. A marked variability is thus apparent, first in the general direction of gain, only two falling below the original minimum (−3%) for the entire group, later a very general trend in the direction of loss is apparent. It will be seen that the history of the Control Group exhibits the same general features as to variability shown by the Nutrition Groups and further confirms Dr. Porter's findings.

RESULTS IN WEIGHT INCREASE

The comparative results achieved by the open-air and indoor groups are shown by Chart A, where the shaded column represents the fifth grade classes and the plain column the open-air classes. The base line indicates the periods for which results were calculated: *A* the first seven weeks, *B* the first twelve weeks, *C* after nineteen weeks, and *D* the final re-

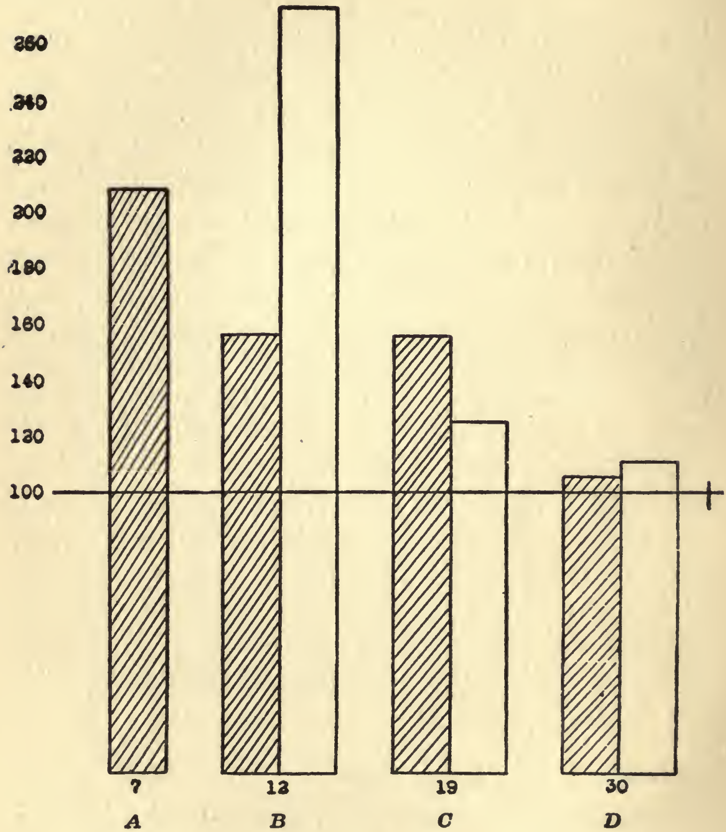


CHART A

COMPARATIVE GAINS, FIFTH GRADE AND OPEN-AIR CLASSES sult, after twenty-seven weeks for the fifth grade and thirty-two weeks for the open-air classes. The height of the columns shows the average per cent of gain. It will be seen that the open-air classes in the first twelve weeks increased 274% of the normal gain, whereas in nineteen weeks their increase was 125%, and in the entire period 111%. The first and final difference is not so great for the children of the fifth grade classes. In the first seven weeks between the original weighing and the first meeting of the class, the average gain in relation to normal was 208%. In the first twelve weeks it had decreased to 156% and was approximately the same at nineteen weeks, but for the entire period it was only 106%.

The percentage of gain for the fifth grade class from week to week is shown in Chart B, the base line indicating weeks, and the figures at the left percentage of gain. The chief interest of this record is the fluctuation shown in parade week and again in promotion week. The loss incidental to the excitement and strain of examinations is approximately 0.6%. The gain for the entire period of twenty-seven weeks is approximately 9%.

Our attempts to find correlation between the percentage of gain and such features of our procedure as caloric intake, the number of rest periods observed, the number of lunches taken, were unsuccessful. With data gathered from a larger number of individuals it might have been possible to establish clear cut correlations but even so the evidence as to the value of any one of these taken by itself would hardly be convincing—such testimony would indi-

CHART B

PERCENTAGES OF GAIN FROM WEEK TO WEEK—FIFTH GRADE CLASS

NOTE.—*The fluctuation shown in the eighteenth week coincides with the date of the parade by which the return of the city troops was celebrated.*

cate rather their value as contributing factors to the results obtained by the general régime.

PHYSICAL DEFECTS

Naso-pharyngeal Obstructions.—Thirty children, or 35% of the 87 enrolled, were recommended for removal of naso-pharyngeal obstructions, and of these 23, or 76.6% of the number recommended, had operations arranged for them in the course of the year, although the conditions incident to the influenza epidemic delayed the treatment in all but two cases until early Spring. Any resulting benefits therefore cannot have played an appreciable part in the class record of gains for the year.

Of the 30 children recommended for operation, 13 were from the open-air group and represented 27% of their total enrollment. This relatively low percentage of naso-pharyngeal defects among the group of high percentile, chronic underweights was partly accounted for by the enrollment among them of children operated on the year before. The indoor groups also presented a better condition in respect to these defects than had been the case the previous year, only 17 children, or 44% of their enrollment being recommended for operation.

Only 10 of the 23 cases operated secured treatment at a date early enough to permit a five weeks' period of observation after the necessary interval for weight recovery. Chart C shows the curve of gain for these 10 cases for five weeks previous to the operation, as well as for the five weeks following their recovery of weight. The intervening period, 4.6 weeks, during which they were recovering from

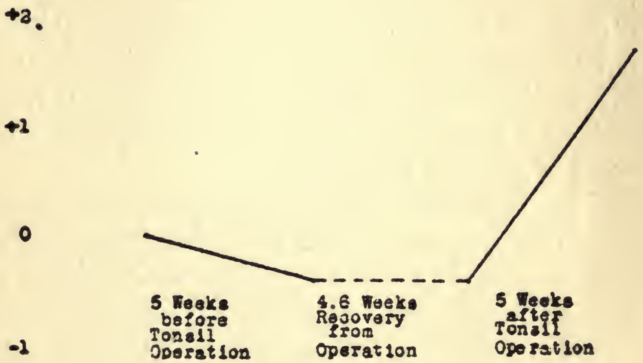


CHART C

PROGRESS OF 10 CHILDREN BEFORE AND AFTER OPERATION FOR NASO-PHARYNGEAL OBSTRUCTIONS the effects of the operation, is indicated by the dotted line. The percentage of gain is —.4% for the period before and 2.1% for the period after the defects were removed.

MENTAL ABILITY

The results of the comparative study of mental ability in underweight and normal children undertaken this year * were briefly as follows: In tests of motor control there was no marked difference shown between the Nutrition and the Control Group either in the separate series of tests as given at the beginning and at the end of the Nutrition Class period, or in improvement as shown by the differences between the first and second results. When the combined scores for the two series are considered we get a slight difference in favor of the Control Group in the two tests measuring physical endurance—Rapidity of Movement (Tapping) and Strength of Grip (Dynamometer). In the Steadiness Test the Nutrition Group has a little advantage.

	Tapping		Dynamometer		Steadiness	
	R. H.	L. H.	R. H.	L. H.	R. H.	L. H.
Nutrition.........	298.5	269.4	32.0	29.6	4.8	3.55
Control..........	306.7	265.6	32.6	30.4	4.45	3.4

In the following tests of mental processes the averages of the combined scores for both trials show

* For a more complete report of this study see *Malnutrition and Health Education*, by David Mitchell and Harriet A. Forbes, Pedagogical Seminary, March, 1920.

superiority of the Nutrition Group in five of the seven tests.

	Nutrition	Control
Trabue Completion	10.05	8.85
Memory Span	6.4	6.05
Association Reaction Time	2.6	3.1
Directions	3.5	3.3
Cancellation	6.95	5.95
Knox Cubes	6.9	7.3
Dearborn Reconstruction	151.	148.5

The Trabue Completion Scales which give a high correlation with standardized intelligence scales show similar distributions of scores. Superiority of the undernourished children is indicated. These average scores differ so little and the sampling is so small, one is not justified in asserting that significant differences are found between the two groups. It can be claimed that these undernourished children are equal in mental ability if not superior to the well-nourished children.

INTERPRETATIONS

Evaluation of procedures in this second experiment is more difficult than in the case of the preceding one, where groups were established on a fairly equal basis and with definite variables as points of comparison. It will be apparent, however, that the advantage in gain shown by the open-air classes is of significance in view of their personnel. The variety of retarding factors they exhibited must be borne in mind when we contrast the year's record made by them with that of the fifth grade. When allowance is made for the physical disparity between the two groups, and especially when we recall that of 48 open-air boys, 12, or 25% of the number, failed to respond at all owing to unknown factors presumably of disease or organic deficiency, the facts of their relative response become emphatic. It would appear that the special factors determining this response must have particular significance for the efficient health program, if on analysis they can be isolated.

It will be recalled that special emphasis was laid on fresh air in the fifth grade class-room and that their windows were kept open except in extreme weather. Thus it is evident that the results for the first twelve weeks shown at *B* (Chart A) were for gains made in a season during all, or nearly all of which the windows were kept open. In the interval between *B* and *C*, however, we may assume that the fifth grade was conducted as a closed-window class, with frequent changes of air by direct ventilation and temperature lower than that of the average class-room. During the greater part of the interval between *C* and *D* this arrangement must have obtained as the final determinations were made for the fifth grade early in May. Comparison of results at *B*, *C* and *D*, therefore, gives no evidence that open windows were a determining factor, as the superior gains of the open-air groups at *B* were made when the fifth grade was conducted as an open-window room, the superior gains of the fifth grade at *C* and its inferior gains at *D* seem to argue the dependence of the results obtained on factors other than open air.

The food experiences arranged for the open-air groups were much better calculated to influence gains than those given to the fifth grade. The hot mid-morning luncheons of cereal and milk or cocoa were admirably calculated to supplement the home dietary and educate a taste for the milk and cereals so lacking in the Jewish bill of fare. The meagre cold lunches brought from home by the fifth grade boys added little to the actual caloric intake and nothing to the broadening of dietary habits. But there is probably an added reason for the greater effectiveness of the lunches served to the open-air groups in the undoubted stimulation to metabolism and consequent better assimilation resulting from out-of-door atmosphere. We may go further in making our comparison here and infer that the inadequate lunches brought by the fifth grade boys were less adequate during the period of open windows, when metabolism and assimilation were thus stimulated, and more adequate in the period preceding the determinations made at *C*, after a season of closed windows.*

Comparison of the rest periods for both groups of children is obviously greatly in favor of the open-air classes. Indeed it is hardly an exaggeration to say that the rest periods in the fifth grade provided a dramatic rather than a real experience of rest, although a certain conception of relaxation and how to secure it was doubtless gained by the children.

* See Hill, Leonard, special report, English Medical Research Committee, The Science of Ventilation and Open Air Treatment, Part I, 1919. A series of observations on heat production of man in- and out-of-doors is discussed.

Again, we cannot isolate the factor of rest from that of temperature, but must consider the combined effects of both in estimating the open-air environment. That the physiological effects of rest and sleep in cold air with warm body coverings are of particular tonic value, is a fact well recognized in therapeutics although as yet not fully explained by science. That blood pressure is thereby increased, heart action strengthened, and nerves steadied, has been demonstrated in some cases of acute illness, notably pneumonia.*

How far data on the blood pressure and heart action of well children under similar conditions may serve to reinforce the open-air program has yet to be ascertained. It seems apparent, however, that the significance of the open-air class does not lie in any one of its special provisions but rather in the physiological effect resulting from the interaction of all three.

The factor of sunshine like that of "fresh" air evidently played no determining part in securing results, as the open-air class-rooms both had a southern exposure and were flooded with sunshine, while the fifth grade was in a north room until mid-year or during the two periods *A* to *B* and *B* to *C*, when their gains were successively less and greater than those of the open-air boys.

Coöperation on the part of the children and of the homes was fairly comparable in both groups, although interest was probably established somewhat earlier in the open-air classes, because of their

* See Discussion of Papers on Fresh Air Schools by Dr. John W. Brannan—Transactions Fourth Int. Congress on School Hygiene, 1913, Vol. II, p. 171.

special significance in the minds of both parents and children, and because of the number of children in them carried over from the experiment of the year before. The longer period of educational influence to which these had been subjected may well have resulted in better coöperation at the outset, and greater gains during the period of maximal weight increase may also have resulted from a previous improvement in their home régime. The removal of tonsil and adenoid defects during the preceding year probably proved a contributing factor too, but we must assume that these possible advantages could hardly offset the failure on the part of 25% of their total enrollment to gain at all. Rather it seems reasonable to accept the difference between the gain of 274% and 156% shown at *B*, as the probable increase resulting from the combined environmental factors of lunches, rest, fresh air and lighter school program at the season specially favorable to increase, over and above the gains to be expected from the seasonal period itself and the program of instruction.

The results shown at *C* suggest that the seasonal period of minimal growth may retard gains for the high percentile underweight rather more than for the low percentile and normal child, and that the advantageous factors of environment for the open-air classes were insufficient to compensate for the better resistance to winter conditions offered by the fifth grade, who were now probably beginning to show the results of educational influences and improved home régime, in addition to their better physical endowment.

The determinations at *D* demand a special word of explanation. As all but two of the children operated for tonsil and adenoid obstructions during the school year were treated in the period between *C* and *D*, results for weight increase in both groups are correspondingly lowered. In addition the general discouragement felt by children and parents as the year drew to a close and it became obvious that the promised results of the nutrition program were not being realized, resulted at last in lessened efforts and frequent lapses in régime. Thus the lessened results at *D* are really not representative and a final estimate of the year's work should not be based on them.*

So far as the results shown by Chart A lend themselves to analysis, we may conclude their testimony is to the importance of environmental factors for securing early results, and to the better ability of the low percentile and normal child to gain, even under less favorable circumstances of environment, during the period of minimal weight increase.

Summary

In June, 1919, after a full school year of intensive work our results in terms of weight increase appeared so slight as to be almost negligible. Appreciable improvement in our procedure had not brought corresponding gains to the children in our classes. In spite of more adequate physical care, increased control of the environment and better teaching technique, we seemed as far from our goal as we had been in the previous June. The facts of

* See later showing of fifth grade boys, pp. 146 and 149.

Dr. Porter's investigation, it will be remembered, were not available to our workers until nearly twelve months later, and we were therefore without the key by which our apparent failure could be properly interpreted. The initial gains of the fall were forgotten, in view of the inexplicable failure to gain through the second term of school, and as the year progressed and the discouragement of the season of minimal increase was felt by all, the educational fallacy of holding out to the children promises of results that were not to be realized, however well informed or willing their coöperation, was keenly appreciated by the members of our staff.

While the conviction remained with those who had observed the fifth grade class, that such a subject matter program as had been developed for them was a valuable addition to the procedure, the statistical data for the year brought into relief the better showing of the open-air classes, and emphasized the importance of more adequate provision in the school environment for the actual practice of health-making activities by contrast with class discussion of them. As a natural corollary the importance of parental coöperation to provide increased opportunities for a health-making régime at home received corresponding emphasis.

But the development of a subsequent program planned to secure further enlistment of home coöperation, and to permit greater emphasis on activities and environmental conditions in the school, hardly promised a solution of our major problems, even though the general efficiency of our procedure should be increased thereby. Our experience with the "graduates" of the early fall who later fell back into the ranks of underweight, and the fluctuations shown by the control group had raised serious questions as to the standards we were using. The failure to secure response from, or even to diagnose the twelve cases transferred from the groups of the previous year to the open-air classes, indicated the insufficiency of our knowledge in regard to certain types of malnutrition. The need for a program of study involving more detailed observations of height and weight increment, and more careful physical examination and diagnosis had become apparent, if we were to make real progress in solving the problems raised by our experience. Moreover, the negative results from our study of mental ability called for further investigation in this field, where we had obtained findings so much at variance with preconceived opinion.

CHAPTER V

DEVELOPMENT OF PROCEDURE—PRIMARY GRADES—SEPTEMBER, 1919—JUNE, 1920

Basis of Reorganization

In planning our work for the next school year it was decided to experiment with first grade children and to concentrate our efforts on developing a procedure suited to their needs. It will be recalled that our initial program in 1918 included a first grade class and that they had shown surprising gains in comparison with the other classes, in spite of the fact that little attempt had been made to adapt our procedure to the special demands of their age period. In the belief of our workers the great solicitude felt by the parents for children in their first school year, and the type of home coöperation afforded in consequence, offered an explanation of our relative success with the first grade class; and it was believed that by development of a program further enlisting home coöperation for such a group, proportionally better results could be secured. At the same time, the first grade was felt to be the logical beginning for any program of instruction depending in the main on activities rather than subject matter. If school tradition still confuses the teacher who is trying to think in terms of activity rather than information, the same is equally true of the nutrition worker. But in classes where the possibility of informational content is reduced to its lowest terms by the limitations of the age period, it would seem possible to carry out such a change in class procedure to the best advantage. The immaturity of the six-year-old makes equally impossible the reduction of the educational program to informational material, and the shifting of responsibility for gains from the adults in control of the environment to the child himself.

In addition to our program for first grade children, the boys of the previous year's fifth grade class were weighed and measured monthly, with a view to studying their record and determining, if possible, any long term results that might have been afforded by the nutrition class procedure. Careful measurements of control groups for both classes, the first grade and the previous year's fifth grade were planned, more thorough physical examinations were arranged, and a more extensive program of mental measurements was included.

GROUP SELECTION

Forty first grade children ranging from 8 to 20% underweight were enrolled in the nutrition class organized in September, 1919. The group was segregated and an experienced class-room teacher who was interested to coöperate with the nutrition staff was assigned them for the school year. Owing to the early transfer of 2 boys the class was reduced to 38 members. Of this number 8 were replaced later in the school term because of transfer to other schools or failure of promotion at mid-year.

In February, 14 children from 7 to 22% underweight for height, were found among the mid-year entrants to the first grade.* These formed a second nutrition group. Associated with them were 5 boys not promoted with the September group.

School Procedure.

INDIVIDUAL INSTRUCTION

Weights were taken weekly in the eye clinic room and the results written on a report slip for each child to take home. These slips created much interest at home and among the children. Every other week individual instruction was given in connection with the weight taking. The child's chart was used and his progress marked by a red crayon dot placed on it in his presence, the black line being filled in by the nutrition worker afterwards. Neither the "normal weight line" nor the line of "expected gain" appeared on the charts,† and the boys were not conscious of being underweight, they were simply encouraged to form health achieving habits, to try to make gains and if possible to beat their own previous records. In the beginning the charts were meaningless to them, as they could not read their own names nor follow the figures; but they soon grasped the significance of the "up and down" weight line.

CLASS INSTRUCTION

On alternate weeks class instruction was given by the nutrition worker for a period of fifteen minutes

* See "Growth in Weight and Height," p. 119.
† See Appendix C.

ınd included a story. The chart showing the best ɔrogress for the fortnight was displayed on the wall ınd attention called to it as a recognition of achieve-nent. Except for these best records the children aw only their own charts, and discussed their indi-ridual progress only with the nutrition worker, or ıt home.

A special subject for class discussion was selected or each month, and the short stories told at the end f the session were chosen to emphasize the subject ınder consideration. Each contained an obvious ınd simply expressed lesson on health habits, and a eature was made of repetitive and rhythmical para-graphs in which the class could join and thereby ecure the active sense of participation so important or holding interest at this age period. "What the Iilk Told Me," "The Pig Brother," "How Bobby's 'ood Turned into More Bobby," "The Rain-drops," 'Little Potato," were the stories successfully used or these children.* Their recital was followed by nformal discussion and by the spontaneous dram-tizations characteristic of modern story telling for he primary grades. The particular content covered y the series involves the importance of cleanliness, f water drinking, of milk and vegetables in the diet, nd a conception of the processes of digestion, re-uced to very simple terms. The class dramatiza-ion of "The Story the Milk Told Me" was given y 12 of the boys at the Grand Central Palace during he week of the New York Milk and Child Health 'ampaign. The breakfast food models were shown

* "What the Milk Told to Me," by Gertrude Noyes, from the ɔllection *In the Child's World,* by Poulsson; "The Pig Brother," by ·aura E. Richards; the other three stories are unpublished.

in connection with class discussion, and were supplemented by specimens of fresh green vegetables brought by the nutrition worker.

ENVIRONMENT

Lunches.—The attempt to have mid-morning lunches provided by the homes was definitely abandoned and an 8-ounce glass of good milk substituted for the uncertainties of home catering. This was served at the Nathan Straus Milk Station in Tompkins Square at 10:15 every day, when the children went over to the square for their playground period. Later, when severe weather made this impracticable, the milk was delivered at the school by special arrangement and served by the class teacher. Each child brought his own cup from home, and these were kept in one of the class-room cupboards, and washed after school by one of the janitor's assistants. This coöperation on the part of the Nathan Straus milk depot made it possible to serve really delicious milk at a nominal cost. The expense was partly met by the children who paid a cent a day for it. For many this was their first experience with milk as a cool and palatable beverage. Several of the mothers had fears as to its safety and healthfulness, and were reassured only with difficulty; but it soon became popular with the children. Although adding only about 150 calories to the daily intake, it proved a most satisfactory solution of the mid-morning lunch problem for this group of children. Mid-afternoon nourishment was provided at home by the mothers.

Rest.—As in the fifth grade class of the previous year, rest periods were taken in the seats for a few minutes each day under the class teacher's supervision.

The double session schedule necessitated a noon period of an hour and a half for children of the X-school, to which the nutrition class belonged, and as all the children lived in the near neighborhood, rest periods of from twenty to thirty minutes at home were advised. Owing, however, to congested home conditions mothers found this too difficult a task to accomplish with any degree of regularity.

FEBRUARY ENTRANTS

The group of 19 children recruited from those found underweight among the entrants to the first grade at the beginning of the second term, was not segregated as the September group had been because, even after the addition of 5 boys from the September group who failed of promotion, their total number (19) was too small to organize an entire class for them. They were divided between the two first grade classes enrolled in February, and the nutrition worker was assigned a weekly period in each class. On alternate weeks when the group instruction was given and stories told, all the pupils in the room shared in the experience. Thus, for the first time the children of the control group, and members of the class who were not subjects of special care or study, were included in this part of the nutrition program.

Mid-morning milk was provided for the children of the nutrition group only and they were excused from their own class-rooms for a fifteen-minute period each morning to get it. It was served in one of the open-air class-rooms at the same time that the open-air boys received their mid-session luncheon.

Home Coöperation

The attempt to secure the attendance of mothers at the weekly class sessions was definitely abandoned at the beginning of the year, as we felt that without far more energy and time than we had at our disposal, we could not present a claim sufficiently important to outweigh the pressure of work for a large family, the demands of the shop or push-cart, or the inertia incident to a foul environment. A monthly mothers' meeting was tried as a substitute, in the belief that the greater convenience and attractiveness of a meeting, arranged at less frequent intervals, and entirely with a view to adult interests, would make a stronger appeal, but the relative success that followed this change was due to other factors as well. It seems reasonable to believe that results of our attempts in the two previous years to enlist interest and confidence were beginning to be felt in the community; in addition, the general health propaganda stimulated by the war may have permeated the neighborhood sufficiently to have had an effect. Then too, the mothers of first grade children form, in many respects, an ideal group to be approached. Many of them have small families and are launching a child for the first time on his school career. Some, through the kindergarten, have already made social contact with the school a familiar experience. Moreover, the type of mother represented in this group has not yet resigned her child to outside influences to any such degree as she tends to do later on. Many still hold rather freshly in mind the precepts received through the baby clinic and the prenatal work of welfare workers, and it is thus relatively easier to get attention on matters of growth and development at this period than later on.

The factors working for increased coöperation were apparent early in the fall when parents were asked to be present for the physical examinations. Twenty-one mothers and two fathers responded, 60.5% of the thirty-eight requests sent out at that time. Later in the term when stool and urine examinations were undertaken, 34 specimens or 58.6% of the number requested were brought to the school at the appointed time.

MOTHERS' MEETINGS

Postal cards sent to all the mothers of the first grade nutrition class announced the first mothers' meeting, and stated that the school desired to see present every mother who was interested to coöperate with us in a special health program. The response was felt to be encouraging, as nearly half the number were present at the first meeting. It was held in the eye clinic room. The large individual charts were hung against the black-boards, and these were explained to each mother separately before the meeting. This gave a pleasant informality at the start. As it seemed important for the mothers to realize that our work held a real place on the school program, Dr. Marks, the Principal, was present at this first meeting and at our request outlined for them the need for the work, the opportunity that the school was offering, and their responsibility for any success that the new class might achieve. This he did skilfully and aroused a sense of pride in the venture that carried throughout the entire year. The nutrition worker in charge then presented a few of the specific objectives for which we expected to work, and for the attainment of which the help of the home was essential. As a result there was a promise to stand by us, and we felt at the end of the year that the interest stimulated at this initial meeting had been really well-sustained throughout the period.

The meetings were held each month from October to June with an average attendance of a third of the group. The women responded to notifications with very little special pleading on our part. Dr. Marks or his assistant usually attended, and the class-room teacher was always present and met the mothers informally after each session.

Attendance cards were distributed and considerable pride was shown in presenting them to be punched. At the last meeting several prizes were given to those having the best showing on the cards.

In formulating a program for these meetings we aimed to create a background of knowledge regarding bodily processes explaining the reasons for our concern with the underweight child. We took up for discussion simple matters of personal hygiene, more or less familiar in the abstract, but which we knew often failed to function in action, because of entire lack of understanding of the body mechanism and the laws governing growth. The exhibit of food models was used, and the stories told the children were occasionally retold to the mothers, with a view to informing them in regard to the class-room instruction. We were careful to attack only one important matter at a time, and much important ground was thus left uncovered at the end of the year. The following topics were discussed with the mothers' group:

Milk: an essential food for the growing child.

Sleep: why the young child needs more sleep than the adult; the conditions most advantageous for sleep, and their value to all the family.

Food: what kinds are best for children; how best prepared and served; purpose of the different kinds of foods.

Health Habits: water drinking, its use and abuse; need of establishing slow eating and thorough chewing; elimination of worry and emotional disturbance at table; need of daily rest period, with emphasis on its desirability before eating; need of securing regularity of stool, and conditions necessary to obtain this, bad results of depending on the use of cathartics or enemata; results of stool and urine examinations explained.

Dental Care: the need for—emphasis on the treatment of the first teeth.

As the year progressed the members of our staff became increasingly aware of appreciable results due in part at least to these discussions at the mothers' meetings, among them the following: (1) Increased interest in milk-drinking. The frequent remark which we had at the beginning, "My child won't drink milk," was very soon replaced by the announcement that "Maxie must have his penny now every day for milk," or "He loves now to drink milk; I must buy." (2) More use of cereal foods and green vegetables. (3) Attempts in a few cases to supervise a daily rest-period and in general an increase in the number of children put earlier to bed. (4) The excellent returns in securing the stool and urine specimens.

Throughout the year home visiting was continued and no attempt was made to curtail this part of the nutrition worker's program. The average number of visits paid each family was five, but when children were recommended for the correction of defects, the number was often considerably increased. Data on family measurements of weight and height were gathered during the home visits. This was a matter of interest to all members of the family, and 24 fathers, representing 41% of the families, were interviewed on the subject in their homes by the nutrition worker. The considerate attention paid the mother by the Bureau physician at the time of the physical examination did much to establish confidence at the outset, and the weekly slips sent to the homes reporting the results of weight-taking, contributed materially to sustaining interest.

CORRECTION OF DEFECTS

Twenty-one of the 58 children given physical examinations, or 43.5% of the total enrolled, were recommended for tonsil or adenoid operations. Ten cases were recommended for operation in the fall. At the same time eleven more were recommended for observation and of these, all were recommended for operation in March. These recommendations came too late, however, to secure necessary arrangements before the end of school and therefore the total number operated, 8 cases, was relatively small, only 38% per cent of the number recommended. The Post-Graduate Hospital received them.

The record for dental work was far better, as 45 of the 48 children enrolled in the September group were examined and 38 or 65.5% were treated, 10 by the family dentist. The remainder were taken to the Stuyvesant Clinic or were treated by Dr. L. A. Leichter, a dentist, whose office adjoined the school and who generously offered to give his services, but in accordance with a suggestion from our staff decided to ask a nominal fee. A developing disposition on the part of the parents to pay the fees was one of the most encouraging features of the year's experience. Fourteen mothers paid the fees for dental treatment in full; others paid in part. The total work done amounted to 76 fillings and 74 extractions.

It was found impossible to carry out recommendations for correction of defects found among the little group enrolled in February. As we were unable to begin the nutrition procedure for them until March, the period available was too brief to secure the necessary permissions from parents, and obtain appointments at the various crowded clinics.

Physical Examinations

Of the 58* physical examinations, 43 were done by the Bureau physician and 15 by Dr. I. H. Goldberger, a physician of the Board of Education.

* Of the total number (62) enrolled during the year, 4 were transferred before physical examinations had been made; thus the tabulations in Dr. Lincoln's report are for a total of 58.

Partial reëxaminations were done by the Bureau physician on 11 cases.

The mother was usually present at the examination and was encouraged to ask questions regarding the child, and a short interview was usually given at the close of the physical examination, giving results of the examination and recommendations. Occasionally, in order to stimulate the confidence of the mother, advice about her own condition was given when requested.

As complete a general physical examination as possible was given to each child, consuming on the average half an hour, including otoscopic examination and rough hearing tests. No eye examination beyond the usual routine was done, as all these children were examined in the eye clinic of the Board of Health in whose room the physical examinations took place.

No attempt was made to diagnose tuberculosis except on physical signs. The only case suspicious of pulmonary tuberculosis was referred to the children's tuberculosis clinic at Bellevue Hospital, and was taken there by one of the nutrition workers for x-ray and the von Pirquet test. No other tuberculin tests were made.

Besides the routine examinations of the heart, exercise tolerance tests were occasionally done on suspicious cardiacs. One case diagnosed as cardiac, and one suspected case were cardiographed at Bellevue Hospital by Dr. Kelley.

Stool examination was done on 47 cases and urine examination on 49 out of 58 children. These were added in the first place as further means of diagnosis, and proved of particular value for convincing the mother in cases where corrective dietetic measures were indicated. An undernourished child, whose mother is concerned about his condition, is apt to receive extra rations of food considered fattening, especially carbohydrates, but often in the cases of the Jewish children studied, an attempt is made to add to the diet by giving cream with food, or even as a beverage. Obviously where there is faulty digestion of any one food component and particularly in the case of fats, no good and possibly harm can be done by overfeeding this element of the food.

In addition to the large number of cases of constipation, 22 out of 47, 5 cases of fermentation were found, large numbers of undigested starch cells in 11 cases, of undigested muscle fibres in 8 cases, and a large amount of neutral fat in 3 cases.

Since no second examinations were made, it is recognized that these results are not unimpeachable; but at least they are very suggestive, and corrective dietetic measures were instituted in the cases of fermentation and fatty indigestion and constipation, because of the large proportion of cases confirmed by stool examination.

It was decidedly a surprise to find all the stools negative for ova and parasites on routine examinations. Oscar M. Schloss * in consecutive examinations of the stools of 280 children found parasites or ova in 28.5%, 78% of the positive cases being in children over five years of age. For this reason a

* Schloss, Oscar M., American Journal of Medical Science, May, 1916.

second examination was made in 10 cases taken without selection from the nutrition group. Stools from these cases were examined by the Loop Flotation Brine method of Kofoid and Barber,* this being the method used in the army in search for parasites and ova.† All these stools were again negative.

Urine examinations were negative in 48 out of 49 cases, albumen being present on one occasion in one specimen. They were therefore not nearly so suggestive nor helpful as stool examinations.

Owing partly to the difficulties encountered in the examining room, due to its size, proximity to street noises, and numbers of mothers and children waiting for examination, a good many discrepancies and omissions occur on the charts. They cannot therefore be used to obtain exact statistics regarding presence or absence of abnormalities in this group of undernourished children. In some instances, however, the records are fairly complete, as on teeth, where note of some kind has been made on each child examined, even if the number of decayed teeth has not been mentioned.

General Condition:	No. of Cases	%
Good	13	22.4
Fair	14	24.1
Poor	8	13.8
Not noted	23	39.7
Total	58	100.0

Muscle Tone:	No. of Cases	%
Firm	13	22.4
Fair	19	32.7
Flabby	21	36.2
Very flabby	1	1.7
Not noted	4	7.0
Total	58	100.0

* Kofoid and Barber, Journal of the American Medical Society, Vol. LXXI, p. 1557.

† Kantor, Journal of the American Medical Society, July, 1919.

Breathing:	No. of Cases	%
Obstructed	9	15.5
Partially obstructed	21	36.2
Free	22	38.0
Not noted	6	10.3
Total	58	100.0

Teeth:	No. of Cases	%
One or more decayed	52	89.7
None decayed	6	10.3
Total	58	100.0

Approximation	No. of Cases	%
Good	27	46.6
Fair	8	13.8
Poor	9	15.5
Bad	1	1.7
Not noted	13	22.4
Total	58	100.0

Ears:	No. of Cases	%
Drums—Normal	22	38.0
Thickened	17	29.2
Otherwise diseased	7	12.1
Not seen	7	12.1
Not noted	5	8.6
Total	58	100.0

Tonsils:	No. of Cases	%
Complete removal	2	3.4
Apparently normal	12	20.7
Moderate enlargement only	8	13.8
Very large or with evidences of disease	36	62.1
Total	58	100.0

Glands:	No. of Cases	%
No enlargement of glands	4	7.0
Moderate enlargement	38	65.4
Marked enlargement	16	27.6
Total	58	100.0

Note.—Marked enlargement includes both general glandular enlargement and marked enlargement of a single group of glands.

Thyroid was palpable in one case only.

Eyes:	No. of Cases	%
Normal	30	51.7
Sl. conjunctivitis	14	24.1
Conjunctivitis	3	5.2
Marked conjunctivitis	2	3.4
Strabismus	2	3.4
Stye	1	1.7
Blepharitis	3	5.2
Sluggish reaction to light	1	1.7
Not noted	3	5.2

Heart:	No. of Cases	%
Normal	50	86.2
Poor muscle sounds	2	3.4
Organic murmurs	3	5.2
Enlargement	3	5.2
Diag. of cardiac disease	2	3.4

Lungs:	No. of Cases	%
Normal	52	89.7
Bronchitis	4	6.9
Sl. impairment	2	3.4
Total	58	100.0

D'Espine Sign:	No. of Cases	%
Negative	35	60.3
Positive	23	39.7
Total	58	100.0

Note.—D'Espine Sign has been considered positive where increased whispered voice was heard at or below the third dorsal vertebra. There were **5** cases not heard below the third.

Abdomen:	No. of Cases	%
Normal	36	62.1
Prominent	13	22.4
Hernia or enl. ring	10	17.3
Umbilical hernia. 2		
Inguinal hernia.. 8		
Lax muscles	1	1.7

Genitals:	No. of Cases	%
Normal	45	77.6
Undescended testicles	10	17.3
Phimosis	2	3.4
Other condition	1	1.7
Total	58	100.0

Extremities:	No. of Cases	%
Normal	22	37.9
Enlarged epiphyses	1	1.7
Knock knees	23	39.7
Bowing of tibiæ	1	1.7
Hyperactive reflexes	17	29.3
Knee jerks...... 16		
Upper reflexes... 1		
Babinski	2	3.4
Edema	1	1.7

Skin:	No. of Cases	%
Normal	50	86.4
Pediculosis	2	3.4
Scabies	1	1.7
Alopecia areata	1	1.7
Not diagnosed	2	3.4
Not noted	2	3.4
Total	58	100.0

Mucous Membrane:	No. of Cases	%
Good color	19	32.7
Fair color	12	20.7
Pale	20	34.5
Not noted	7	12.1
Total	58	100.0

Chest:	No. of Cases	%
Normal	26	44.8
Harrison's groove:		
Slight or moderate	20	34.5
Marked	4	6.9
Depressed sternum	11	19.0
Rosary	3	5.2
"Rachitic"	1	1.7
Flat	2	3.4
Narrow	1	1.7

Spine:	No. of Cases	%
Kyphosis	5	8.6
Scoliosis	3	5.2
Lordosis	3	5.2
Normal	47	81.0
Total	58	100.0

Feet:	No. of Cases	%
Normal	33	56.9
Weak	25	43.1
Total	58	100.0

Posture:	No. of Cases	%
Poor	11	19.0
Good	5	8.6
Not noted	42	72.4
Total	58	100.0

Stool Examination:	No. of Cases	%
Not examined	11	19.0
Normal	15	25.9
Constipated	22	38.0
Fermentation	5	8.6
Many undigested starch and vegetable cells	11	19.0
Many undigested meat cells	8	13.8
Much free fat and many fatty acid crystals	3	5.2
Ova and parasites not found.		

Urine:	No. of Cases	%
Normal	48	82.8
Small amount of mucus	6	
Albumen on one occasion	1	1.7
Not examined	9	15.5
Total	58	100.0

Electrocardiograms:	No. of Cases	%
Slight left preponderance	1	1
Right preponderance with poor muscle tone	1	1

Recommendations	No. of Cases	Per Cent
Dental care	52	89.7
Removal of jaw polyp	1	1.7
Tonsillectomy and adenoidectomy or adenoidectomy alone	20	34.5
Observation of nose and throat	20	34.5
Eye examination	9	15.5
Treatment scabies	1	1.7
Cardiac precautions	2	3.4
X-ray chest advised	1	1.7
Circumcision	1	1.7
Observe testicles	4	6.9
Observe hernia	1	1.7
Foot exercises	20	34.5
Other corrective measures	1	1.7
Attention to posture, including exercises	4	6.9
Dietetic advice	3	5.2
Tonics given	2	3.4
General hygiene	1	1.7
Hygiene for eneuresis	1	1.7
Observe for achondroplasia	1	1.7

SEPTEMBER AND FEBRUARY NUTRITION GROUPS
Per Cent Underweight of Children with Physical Defects

	First Weighing			Last Weighing			
	No. of Cases	Av. % Under-weight	P.E.	Av. % Under-weight	P.E.	P.E.D.	$\frac{D}{P.E.D.}$
Fermentation.....	5	14.40	1.232	10.20	1.568	1.994	2.106.
Poor general condition............	9	10.88	.4284	9.00	.5510	.6979	2.693
Poor muscle tone..	22	11.77	.5415	8.95	.5974	.8062	3.495
Hyperactive reflexes..........	17	9.41	.4946	6.59	.5676	.7528	3.750
Decayed teeth....	10	10.40	.4061	5.70	.7067	.8150	5.766
Diseased tonsils...	36	10.64	.3040	7.33	.4743	.5633	5.876
Constipation......	22	10.09	.3394	5.82	.5600	.6547	6.527
Harrison's groove.	24	11.04	.3329	5.58.	.5198	.6172	8.843
Sept. and Feb. nutrition groups...	58	11.20	.2880	7.37	.3769	.4743	8.077

CHAPTER VI

GROWTH IN WEIGHT AND HEIGHT

First Grade Children

SELECTION

The total number of entrants to the first grade classes of Public School 64, in September, 1919, were weighed and the height measured. One hundred and twenty-three of these boys were measured between September 9th and September 24th. Two entered in October and one in November, making 126, from whom the Nutrition Class was selected. Forty boys, ranging from 8% to 20% underweight for height, and with an average per cent underweight of 11.6, were segregated in this class. The early transfer of 2 boys reduced the group to 38. Of the boys weighed after September 18th, ten were found to be more than 8% underweight. By the first of December, four of these had entered the Nutrition Class to replace members who had been transferred to other schools, and in February, 1920, four more entered to replace boys who were not promoted with the group. The other two underweight boys are tabulated with the general group.

A Control Group was formed of those nearest the normal standards for height-weight index at their ages. There were found 41 boys who ranged from 4% above to 4% below normal weight for height, and 6 boys from 5% above to 8% below normal. The last case was included in the Control Group through error in first calculation. The average per cent underweight of this group was 0.83.

Measurements were taken without shoes or coats. The Nutrition Group was weighed weekly from September to June, and the height was measured monthly. The Control Group was measured every two months and the others of the general group, not included in these two classes, were measured again in May, 1920.

The chronological age of the Nutrition Group ranged from 5.25 to 7.39 years, with an average of 6.3 years. The range for the Control Group was 5.96 to 7.54 years, with an average of 6.3 years. The nationalities represented were as follows:

Nutrition Groups

September 1919 *Group*

Russian	25	79½% Russian and Austrian
Austrian	10	
Italian	2	
Galician	1	
Hungarian	4	
Rumanian	1	
German Jew	1	(Born N. Y. C.)

February 1920 *Group*

Russian	6	79% Russian and Austrian
Austrian	5	
Hungarian	1	
German American	1	
Irish American	1	

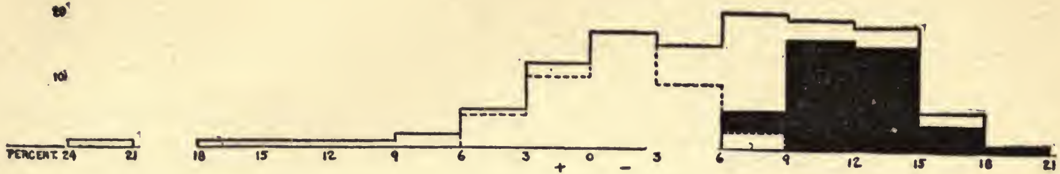
In February, 58 boys entered the first grade classes. They were measured and a group of 14, ranging from 7% to 22% underweight, was formed on March 2. Five boys of the September class, who failed of promotion, were placed with this group. Twenty-three entered school during March and April, and of these 7 ranged from 8% to 12% underweight. Twenty-two boys of the February entrants formed a Control Group, ranging from 4% above to 4% below normal standards. These mid-year entrants were not segregated into groups, but divided between two class-rooms.

DISTRIBUTION OF PERCENTAGES OVER AND UNDERWEIGHT

Chart I represents the distribution of the percentages over and underweight for all the children who entered the first grades in September, 1919. Of 126 children, measured at entrance in the fall, 8 were of normal height and weight; of the remaining 118, 25 or 21% were from 1–24% overweight and 93 or 79% were from 1–24% underweight; 55 children or 43.7% were from 8–24% underweight, 6 children or 4.8% were from 16–24% underweight. Contrasted with these we have only 6 children or 4.8% who were from 8–24% overweight, 2 children or 1.6% who were from 16–24% overweight.

There were 81 boys entering in February and March. Of these 10 were of normal weight for height, 29 were from 1–24% overweight, 16 were from 1–6% underweight, and 26 were from 7–22% underweight.

If we take a seven per cent standard for selecting the undernourished child, and if we consider this general group a typical one for the age, sex, stock and social group studied, we find nearly 50%



DISTRIBUTION OF PERCENTAGES OVER AND UNDERWEIGHT

CHART 1

DISTRIBUTION OF PERCENTAGES UNDERWEIGHT AND OVERWEIGHT FOR SEPTEMBER ENTRANTS. THE BLACK AREA REPRESENTS THE NUTRITION GROUP, THE BROKEN LINE THE CONTROL GROUP.

or half of them are undernourished when measured in September; a little more than 25% or a fourth are undernourished when measured in February. The seasonal variations shown in all the groups studied would account for this difference in percentage between September and February. The large percentage found for the September group indicates need of more careful determination of the criteria of malnutrition or undernourishment.

The children of the September Nutrition Group averaged 11.56% underweight at the first measuring, the range being from 8–20% underweight. The Control Group averaged 0.83% underweight at that time, with a range from 8% under to 5% overweight. The wide variation between these two averages and the fact that the average percentage underweight of the Control Group so nearly approximates zero would seem to indicate that likenesses or differences between these groups are significant ones and are not due to faulty selection from the standpoint of nutritional status. However the demarcation of 8% under for a Nutrition Group is not established, and the nutritional behavior of the children in both groups near this borderline should help to determine standards of malnutrition.

The accompanying tables, I*a* and I*b*, show the percentages underweight of the September Nutrition and Control Groups for October, December, February, April, and June, according to the Burk-Boas norms of weight for height. These percentages are derived from a height and a weight taken on the same day, this day falling for a given month between the

8th day of that month and the 8th day of the preceding month. For example, the percentages underweight for October are based on a height and a weight measured for any one individual on the same day, this day falling between September 8th and October 8th, etc.

COMPARISON OF UNDERWEIGHT AND CONTROL GROUPS

The total gain in weight is reckoned from the time the individual entered the Nutrition or the Control Class until approximately June 1st, when the last weighing was made, and includes those individuals who missed not more than four weekly weighings either at the beginning or the end of a period of eight months, during which the class was conducted. The deviations from normal gain are given for these same individuals and are obtained by subtracting the total gain in weight from the normal gain for eight months, as given by Burk and Boas.

Similarly, Table II contains percentages for the minor groups, selected in the following February, for February, April and June, the measurements being made between the 20th of the given month and the 20th of the preceding month. The gains in weight are given for the children who missed not more than two weekly weighings either at the beginning or the end of the class period. The deviation from normal gain is obtained by subtracting the total gain for the class period from the normal gain for four months, as given by Burk and Boas.

The Total Gain for the Nutrition Group (Table I*a*) during the class period shows an average of 3.69

TABLE I *a*

Percentage Underweight

September Nutrition Group

No.	October		December		February		April		June		Total Gain (lbs.)		Dev. from Normal Gain	
	+	−	+	−	+	−	+	−	+	−	+	−	+	−
1		10		5		5		8		8	2.7			0.1
2		11		7		4								
3		10		3		5				5	4.2		1.4	
4		11		7		7		4		8	4.0		1.1	
5		9												
6		8	0		4		0			2	4.8		1.9	
7						7		4		7				
8		11		4		2		6			4.0		1.0	
9		12		10		8		6		6	3.9		0.8	
10		12		7		2		7		7	3.6		0.6	
11		9												
12		14		7		7		7		9	2.7			0.2
13		12		7		9		7		7	4.1		1.2	
14		16		9		5		7		9	3.8		1.0	
15		17		9		10				12	2.1			0.7
16				8		8		8		10				
17		8		4		2	0		4		5.4		2.5	
18		20		14		10		6		9	6.3		3.3	
19		12		5		5		2		7	1.7			1.2
20		8		6		2	0		0		5.8		3.0	
21		12		4				6		4	4.6		1.8	
22		13		11		9				10	3.1		0.2	
23		12		11		9		9		12	3.2		0.2	
24		10		2	5		2		0		3.0		0.2	
25		13		9		7		10		12	2.0			1.0
26		14		7		11		9		9	3.1		0.1	
27		10		7		2		2		7	1.4			1.5
28		8		6		6		2	0		5.1		2.0	
29		12		2		2	0							
30		8		2		6		2		6	4.4		1.6	
31		9		7				4		8	3.4		0.4	
32		15		5		2	2			5	2.6			0.2
33		10		10		7		9		9	1.9			0.9
34		10		12		7		2						
35		16		7		9		7		11	2.2			0.9
36		9	0					4		2	5.1		2.1	
37		14		12		11				9				
38		12		7		5		4		7	2.7			0.3
39		9		2		2		2	0		5.7		2.9	
40		12		6		6		6		4	5.5		2.3	
41		14												
42		12		12		10		4		9				
43		10				8				10				
44						8		4		6				
Av.	−11.56		−6.66		−5.68		−4.4		−6.54		3.69		0.769	
σ	2.691		3.330		3.670		3.217		3.811		1.305		1.250	
P.E.	.2725		.3629		.40		.3667		.423		.1552		.1487	

TABLE I *b*

Percentage Under or Over Weight

September Control Group

No.	October		December		February		April		June		Total Gain (lbs.)		Dev. from Normal Gain	
	+	−	+	−	+	−	+	−	+	−	+	−	+	−
1			4				6		6		4.4		1.6	
2		4	0		0		2		4		4.6		1.6	
3		6		2	2		0			2	4.0		1.1	
4		2	0		2			2		2	2.8		0.0	
5	5				10		7		7		1.2			1.8
6		2	2		7		5		2		3.5		0.7	
7	2						4		4		3.3		0.5	
8		4	0		2		0			2	3.6		0.8	
9		5	0				0		0		4.0		1.1	
10	0		0		2									
11		8		4		2	0		2		5.4		2.4	
12		2	5		2		7		2		5.7		2.8	
13		4	0		2		2		0		4.7		1.9	
14		2	0				2		4		6.9		4.1	
15	2		9				2		2		3.1		1.3	
16		4	2		4		6		2		4.7		1.7	
17		7		2		2		7		7	3.0		1.2	
18		2	5		5		2		2		3.5		0.7	
19	5		9		7		11		4		5.1		2.3	
20	2		7		7		12		7		4.5		1.7	
21		2	7		7		2		8		7.0		4.1	
22	2		0			2		2		2	4.5		1.7	
23	0			5		5		7						
24	2		5		7		7		7		4.3		1.5	
25	0		2		7					2	3.7		0.8	
26	4		0		0		4		2		3.5		0.7	
27		2	0			2	2		4		5.5		2.6	
28		4	4			2	0		0		4.3		1.4	
29	2		2		5		5		5		1.9			0.9
30	4		9		9		4		6		4.2		1.4	
31	2		2				7		2		3.2		0.1	
32		2	2		4		0		0		3.1		0.0	
33		4		4	0			2						
34	0		11		11		4							
35		2	0		0		0			4	3.2			0.2
36	0		2		5		10		2		3.7		0.8	
37		4	2				6		2		6.6		3.6	
38	2		12		4		7		0		3.6		0.8	
39	4				4		4		0		3.5		0.7	
40	2		5											
41	2		4		8		10		8		4.7		1.8	
42		4	0		2			4	0		4.4		1.2	
43	0		3			5		2	0		1.9			1.1
44	0		8		10		4		8		6.5		3.4	
45		2	0		2		0		4		4.7		1.9	
46		4	2		2				0		3.9		0.9	
47	2		2		6		2		6		4.8		1.7	
Av.	.826		2.50		3.21		2.79		2.17		4.16		1.3	
σ	3.191		3.864		4.048		4.289		3.433		1.248		1.234	
P.E.	.3158		.3941		.4372		.4418		.3570		.1297		.1283	

TABLE II

Percentage Underweight of February Groups

Nutrition Group

No.	February +	February −	April +	April −	June +	June −	Total Gain (lbs.) +	Total Gain (lbs.) −	Dev. from Normal Gain +	Dev. from Normal Gain −
1		8		4		8	1.0			0.1
2		22		16		20		0.4		0.7
3		7		12		8	1.5		0.4	
4		10		5		10	0.5			0.7
5		10		3		10	0.2			0.9
6		11		7		4	0.8			0.3
7		10		6			0.8			0.3
8		7		9		9	0.4			0.7
9		8		8		6	0.3			0.8
10		14				15	0.3			0.8
11		11		7		9	1.0			0.1
12		10				12	0.9			0.2
13		10		10		12	0.0			1.3
14		22		20		20		0.3		1.4
Av.	−11.43		−8.92		−11.		0.5		−0.564	
σ	4.651		4.780		4.657		.5154		.4748	
P.E.	.8372		.9321		.8708		.0927		.0854	

Control Group

No.	February +	February −	April +	April −	June +	June −	Total Gain (lbs.) +	Total Gain (lbs.) −	Dev. from Normal Gain +	Dev. from Normal Gain −
1	4		2		2			0.5		1.9
2						7	1.2			0·2
3	2		2		0			1.1		2.5
4		2		2		7		1.0		2.4
5	0		4		0		0.3			1.1
6	0		2				2.3		0.9	
7	0		4		0		1.3			0.1
8	2									
9		4		2		6		1.4		2.8
10			2			2	0.5			0.9
11	0			2		2	3.7		2.3	
12	2		4			2	0.4			1.0
13	2		2			8		1.5		3.2
14	2		2				0.8			0.6
15	4		4		0			1.3		2.7
16	4		2				0.8			0.6
17		2		2		10		0.2		1.6
18				2		2	0.8			0.8
19	0		2			4		1.0		2.4
20				4		8		1.8		3.2
21	2		2				0.9			0.5
22	2					2		0.4		1.8
Av.	1.00		1.05		−3.41		0.133		−1.29	
σ	2.134		2.460		3.466		1.341		1.356	
P.E.	.3393		.3813		.5684		.1871		.1993	

lbs. with a range from 1.4 to 6.3 lbs.; moreover the average deviation from normal gain is a slightly positive one, 0.769 lb. For the Control Group the average gain in weight is 4.16 lbs. with an average deviation from normal gain of 1.3.

The Probable Error of Difference between the total gains of the groups is 0.2022, the Difference being 2.324 times this Probable Error.

The Probable Error of Difference between the average deviations from normal of these groups is 0.1963, the Difference being 2.705 times this Probable Error.

SEASONAL VARIATION

Chart 2 is a graphic representation of the averages in Tables I*a*, I*b*, and II, including an average obtained for September, 1920, after the summer vacation. The upward trend of the curve indicates a decrease in the percentage underweight, the downward trend, an increase in this percentage. It can be seen that the September Nutrition Group shows a marked rise in its curve from October to April, which is indicative of a rapid reduction in its percentage underweight, a reduction from 11.56%$\pm$2.691 underweight in October to 4.4% $\pm$3.217 in April; the greatest percentage of gain occurred before December. This is followed from April through the following September by a drop in the curve or an increase in percentage underweight; in June this was 6.54% and in September, 1920, 8.4%.

The Control Group Curve for percentage under-

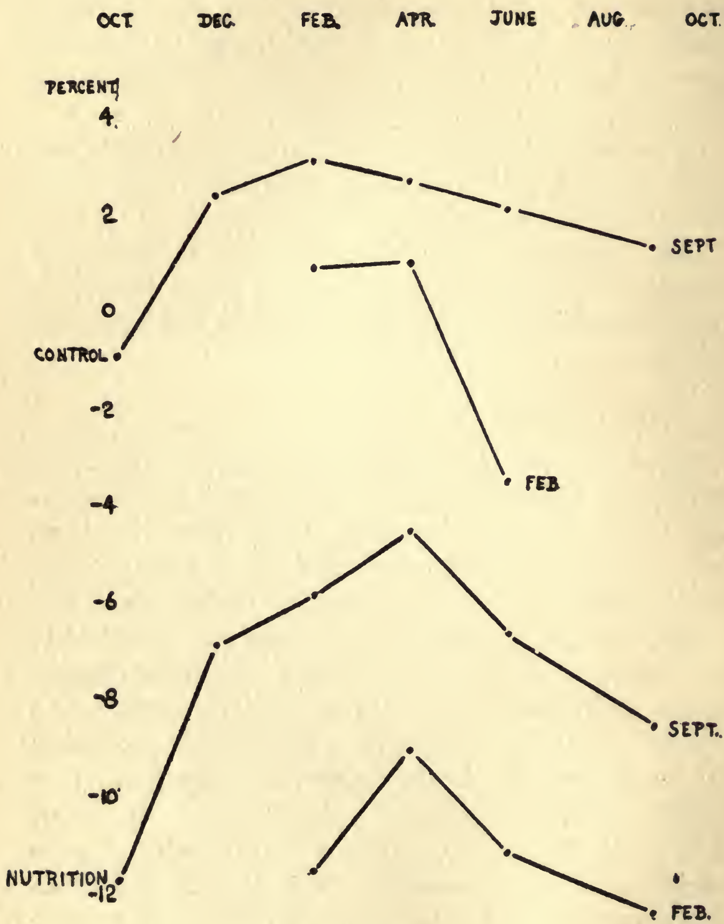


CHART 2

PERCENTAGE UNDERWEIGHT—FIRST GRADE

weight follows the same general trend except that its fluctuations are smaller. Starting at 0.83% underweight in October, it rises rapidly to 2.5% overweight in December. In February it reaches its highest point, 3.21% overweight, after which there is a decline through April, June and September, when the group is 2.17% overweight.

The similarity between all four of the curves in Chart 2 is striking, the exception being that the September Control Group reaches its highest point in February instead of April, as is the case for the other groups.

The averages for height and weight contained in Table III are plotted in Chart 3, together with curves of growth in weight according to the Thomas D. Wood norms * and the Porter norms † as indicated by the dotted line. The similarity between these normal curves and that of the Control Group establishes the value of the latter as a control.

The Weight Curves of the Nutrition and Control Groups while alike in trend are widely different in placement on the weight scale; there is a difference of 4.99 lbs. in the October measures and a difference of 5 lbs. the following September. The largest increase for both groups occurs between October and February; from February to June there is a marked decrease in rate of gain and a still further decrease between June and September. The following figures indicate these fluctuations in percentages:

* See Wood tables of height and weight published in the pamphlet by Dr. L. Emmett Holt, *Standards of Nutrition and Growth,* Child Health Organization, New York City.

† Op. cit.

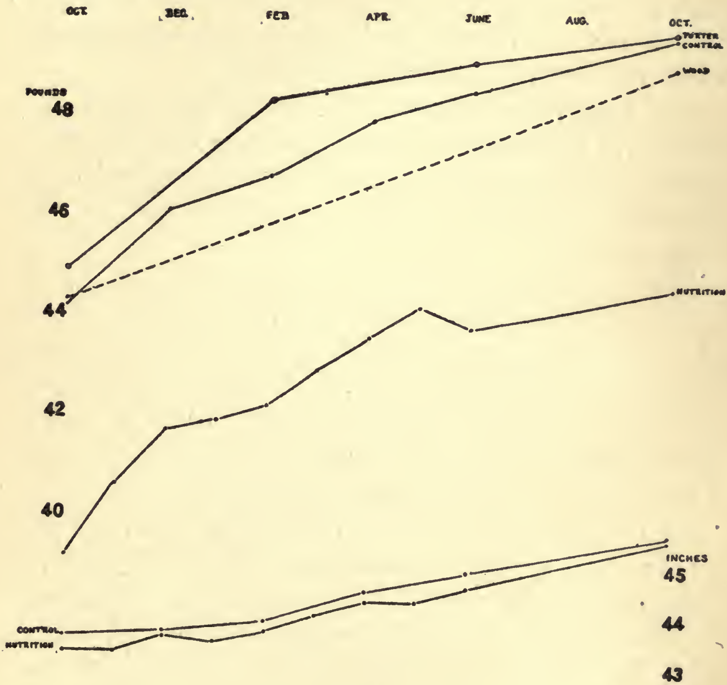


CHART 3

CURVES OF GROWTH IN HEIGHT AND WEIGHT FOR SEPTEMBER NUTRITION AND CONTROL GROUPS, ALSO THE NORMAL WEIGHT CURVES OF WOOD AND PORTER.

GAIN IN WEIGHT

	September Nutrition	September Control
Total Oct.–Oct.	5.62 lbs.	5.41 lbs.
Oct.–Feb.	3.63 lbs. or 64.6%	2.57 lbs. or 47.5%
Feb.–June	1.02 lbs. or 18.1%	1.55 lbs. or 28.7%
June–Sept.	0.97 lb. or 17.3%	1.29 lbs. or 23.8%

The curves of growth in height show a similar trend for both groups and their initial points as well as their final points are close together. Both show little increase between October and February; from February through June and September there is an approximately constant rate of growth, the Control Group gaining more from February to June than from June to September, and the Nutrition gaining more from June to September than from February to June. Rate of increase in height is apparently not affected to any extent by the percentages of underweight we are considering. The percentages of growth in height are as follows:

GAIN IN HEIGHT

	September Nutrition	September Control
Total Oct.–Sept.	2.24 ins.	2.13 ins.
Oct.–Feb.	0.57 in. or 25.4%	0.30 in. or 14.1%
Feb.–June	0.81 in. or 36.2%	1.03 ins. or 48.3%
June–Sept.	0.86 in. or 38.4%	0.8 in. or 37.6%

Chart 4 contains individual curves for growth in height and the composite curve for the September Nutrition Group. Only those individuals have been

TABLE III

MONTHLY MEASUREMENTS OF FIRST GRADE PUPILS 1919–20

	September Nutrition Group				September Control Group			
	No. of Cases	Average	σ	P.E.	No. of Cases	Average	σ	P.E.
October:								
Wt., lbs...	44	39.32	3.371	.3438	47	44.31	3.128	.3065
Ht., ins...	44	43.35	1.703	.1737	47	43.66	1.602	.1569
November:								
Wt., lbs...	33	40.74	3.260	.3814				
Ht., ins...	35	43.36	1.559	.1777				
December:								
Wt., lbs...	36	41.81	4.499	.5038	44	46.15	3.457	.3526
Ht., ins...	36	43.71	1.730	.1937	44	43.84	1.367	.1394
January:								
Wt., lbs...	37	42.04	3.637	.4037				
Ht., ins...	35	43.56	1.657	.1888				
February:								
Wt., lbs...	31	42.32	3.454	.4179	39	46.90	3.577	.3863
Ht., ins...	31	43.84	1.755	.2123	39	43.96	1.438	.1553
March:								
Wt., lbs...	36	43.01	3.943	.4416				
Ht., ins...	36	44.05	1.894	.2121				
April:								
Wt., lbs...	38	43.73	4.182	.4558	43	48.04	3.628	.3736
Ht., ins...	28	44.35	1.798	.2283	43	44.59	1.659	.1708
May:								
Wt., lbs...	33	44.25	4.340	.5077				
Ht., ins...	34	44.39	1.985	.2302				
June:								
Wt., lbs...	36	43.88	4.331	.4850	42	48.57	3.739	.3888
Ht., ins...	35	44.67	1.918	.2186	42	45.04	1.584	.1647
October:								
Wt., lbs...	37	44.72	4.319	.4794	41	49.72	4.492	.4716
Ht., ins...	37	45.69	2.058	.2284	41	45.82	1.755	.1842

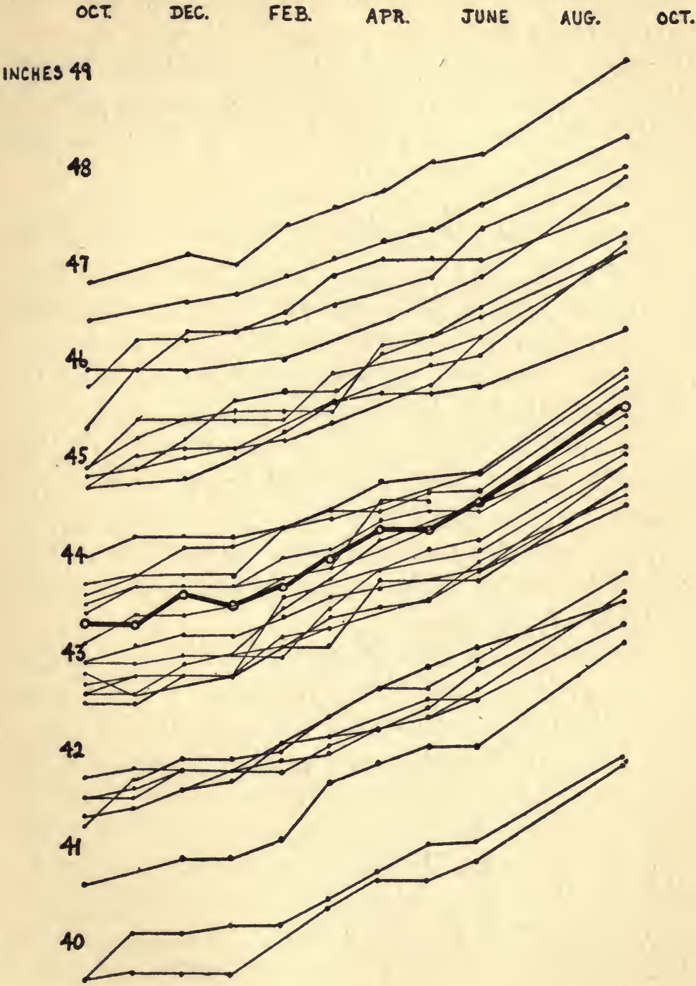


CHART 4

CURVES OF GROWTH IN HEIGHT ——— INDIVIDUAL
——— COMPOSITE

included who had sufficient measurements to make comparable curves.

Their significance lies in the similarity between the individual rates of growth in height with but little deviation from the trend of the composite curve.

RELATIVE GAINS AND VARYING DEGREES OF UNDERWEIGHT

In order to throw some light upon the variation in growth within the Nutrition Group, we have subdivided it into three sections; one is made up of the children 8 and 9% underweight (Section 1), another of the children 10–12% underweight (Section 2), and a third of the children 13–20% underweight (Section 3). These sections contain 8, 20, and 9 cases respectively, the first and third each comprising approximately 25% of the entire group. Only those children are included for whom we had weighings in October, February, and June.

In Chart 5, we have plotted the averages for these sections; it is evident that there is a close correspondence between Section 2 and Section 3 both in their initial measurements and in gains in weight during the time of the Nutrition Class. Starting at 39.3 lbs. and 38.6 lbs. respectively in October, they are 41.4 and 41.6 in February, and 42.2 and 42.4 in June. Section 2 gains 3.8 lbs. in the 8 months period; Section 3 gains 2.9 lbs. The expected gain for children of this age and height according to Wood is 3.2; according to Porter, who has considered seasonal variation, 4.2 lbs. Considering Section 1, we find the average weight in October to be nearly 5 lbs. higher than that for the other Sections.

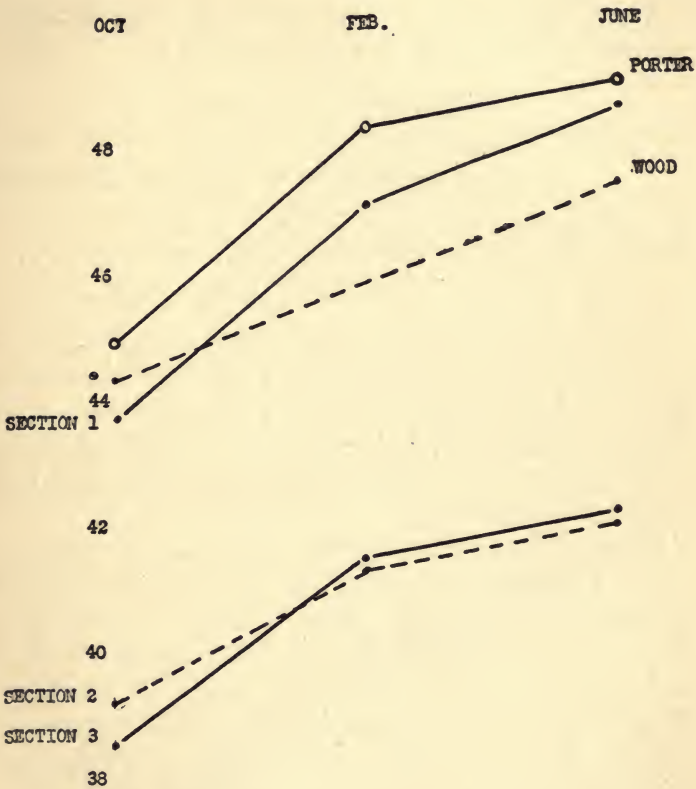


CHART 5

GAIN IN WEIGHT OF SECTIONS IN FIRST GRADE NUTRITION CLASS.

The curve of growth also shows a more rapid rise and a total gain of 5.0 lbs, or more than the expected gain.

The averages of the Control Group for the same months are much like those of Section 1.

AVERAGE WEIGHT IN POUNDS

	October	February	June	Total Gain
Control Group.......	44.3	46.9	48.6	4.3
Section 1............	43.8	47.2	48.8	5.0

These results suggest that a percentage of 8 or 9% underweight as determined by present standards does not materially affect the normal growth of a child in weight; a percentage underweight of 10 or more involves less absolute gain and less than the expected normal gain.*

Further illustration of this point can be found in Chart 6. Individual curves of growth in weight by weekly weighings have been plotted for the five children in the Nutrition Group who were the least underweight and for the five most underweight. Those in the first group were all 8%, the second ranged from 15–20% underweight. Composite curves from the averages have also been plotted for each of these divisions.

The 8% underweights group themselves closely together and follow the same trend. The initial measures of the individual curves lie between 44 and

* Benedict, F. G., Miles, W. R., Roth, P., and Smith, H. M. Publication No. 280, Carnegie Institution of Washington.—The percentage underweight of fasting men related to the lowering of basal metabolism is noted.

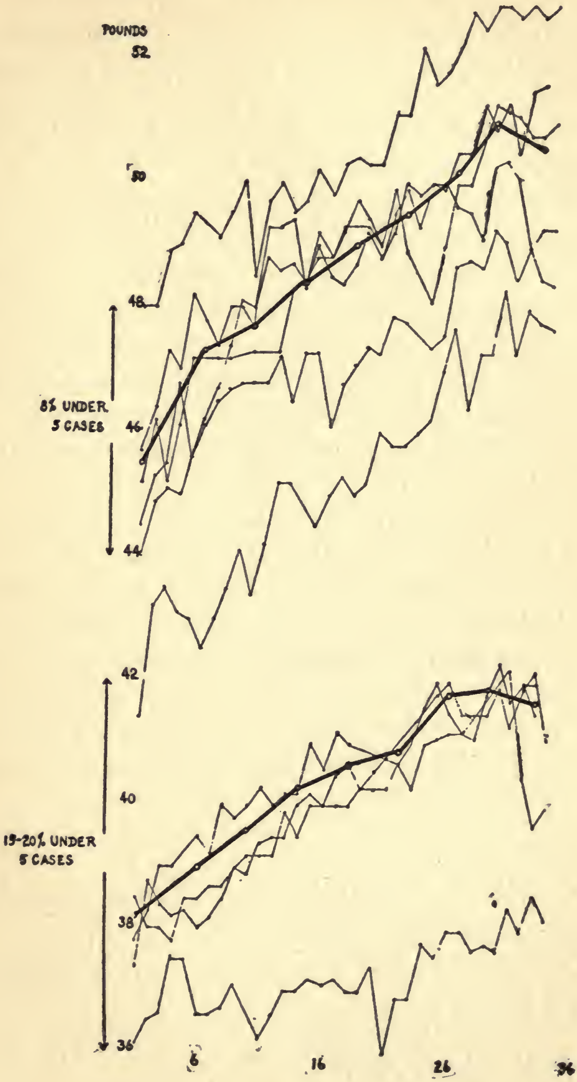


CHART 6
SEPTEMBER NUTRITION GROUP
GAIN IN WEIGHT ACCORDING TO WEEKLY WEIGHINGS.

48 lbs., the final measures between 48.4 and 53 lbs., the ranges for both being 4 and 4.6 lbs. respectively. The average gain shown in the composite curve is 4.9 lbs. in comparison with 3.2 lbs., the expected gain according to tables of Wood.*

The gain of those most underweight is not so consistent; this would be expected from the wider range of underweightness. This group ranges in initial measurement from 36.1 to 41.4 lbs., the variation being 5.3 lbs.; in final measurement it ranges from 38.2 to 47.7 lbs., the variation being 9.5 lbs. The average gain shown in the composite curve is 3.5 lbs., or 1.5 lbs. less than the least underweight division.

Three individual curves are closely allied, variations being limited to approximately 1 lb. Of the remaining curves, one is for an individual 17% underweight, whose curve shows many fluctuations and whose gain in weight for the whole year is only 2.1 lbs. The other curve is for the individual who is the most underweight of the whole September Group and who shows a larger gain than anyone else in the entire group.

VARIATIONS IN TYPE

The following cases illustrate variations in type of undernourished child:

A. 20% underweight in October, 9% underweight a year later.

In General Intelligence bright by the two Scales and Performance Tests.

In Highest Rank by Teacher's Rating.

* In computing this expected gain we have referred in Wood's table to the height and age of the Nutrition Group.

Motor Control.—In precision of movement and coördination not involving great expenditure of muscular energy, very good.

In control of involuntary movements and in fatigue index shown by decrease of output in continuous movements, he is considerably below the average of the group. There are evidences of emotional instability both from the objective evaluation of Questions and Dark Room Scores and from the types of responses.

He has various fears: of the dark, of loud noises, of crossing a bridge over water, of trying to swim, is ill from riding in a subway or from sight of blood, and does not stand pain quietly. He has no tremors or twitches; does not stutter. It would seem from the picture a case of bad adjustment habits to be overcome primarily by an analysis of these and a reconstruction from the viewpoint of conscious control either on the part of child or parent in the formation of new habits. This involves a motivation which in this case seems to have been secured by the social contact with the mother which gave her an appreciation of the needs of her child, whom she puts above other interests. Also the child himself was clever enough and sensitive enough in his responses to make new adaptations.

B. 17% underweight in October, 16% underweight a year later.

In General Intelligence he is in the low normal grouping and is rated medium by his teacher. In Performance Tests he is quick in reaction time but only fairly accurate. In Motor Control he is not up to the average of the group either in rate of simple discriminative movements or in control of involuntary movements. He shows little fatigue in muscular expenditure, but his early efforts are so far below the average there is not a comparable output, though a low threshold of fatigue is indicated. His ability to profit by experience is fair, and the time and accuracy of association responses are about the average of the group. He shows few signs of emotional instability.

The environment seems to induce faulty habits of living which make for a low state of physical well-being that has probably been chronic for years. Other children in family are reported as much underweight as he.

In Chart 7 we have plotted the curves of growth in weight for those cases that seem to be chronic underweights, showing but little actual gain.

FAMILY CHARACTERISTICS

In order to obtain some information concerning the relationship between the percentage underweight of the child and of his parents, cards were sent to the various homes asking that the weights and heights of the members of the family be recorded. Wherever possible these were checked up by measurements made in the school clinic. In this way accurate averages have been obtained for 23 of the mothers, but the fathers' averages are based for the most part on information given by them.

The average age for the mothers is 34.9 years, with a range from 26 to 45 years; for the fathers, 39.1 years, with a range from 28 to 56 years.

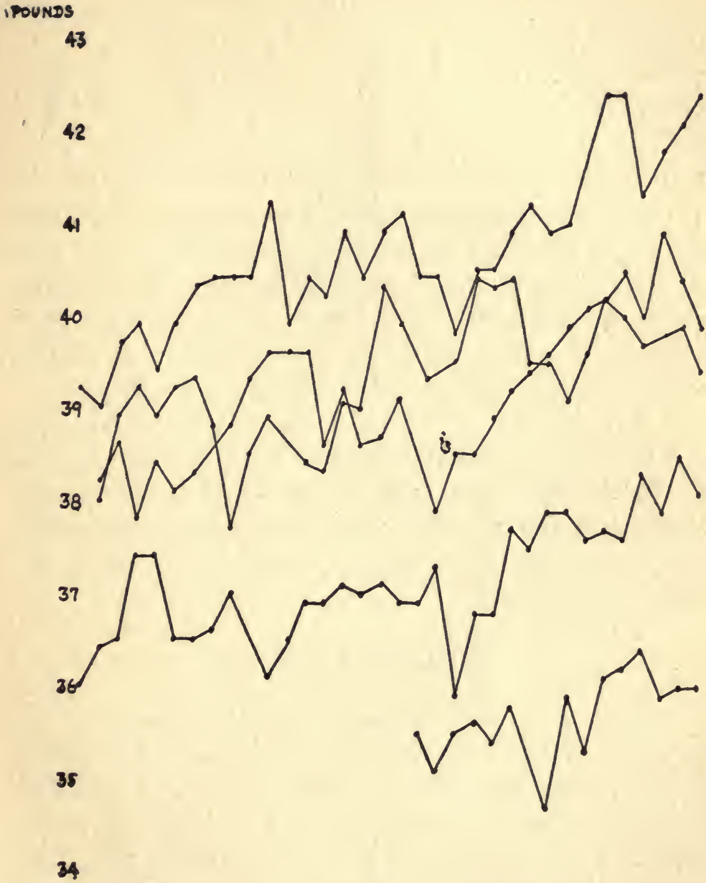


CHART 7

CURVES OF GROWTH IN WEIGHT FROM SEPTEMBER TO JUNE OF SELECTED INDIVIDUALS SHOWING ONLY SLIGHT INCREASE.

	No. of Cases	Average	σ
Mothers' weight..........	34	138.11 lbs.	22.715
Mothers' height..........	31	59.74 ins.	3.523
Fathers' weight..........	26	149.29 lbs.	19.149
Fathers' height..........	21	61.60 ins.	2.886

The above averages have been compared with the norms of the Metropolitan Life Insurance Company of weight for a given age and height. Accordingly the mothers are 5% overweight and the fathers 12% overweight. We note that the parents are low in stature compared with the average for adults.

A correlation of .126 has been obtained between the percentage underweight of the child at his first weighing and the weight of the mother. Although not significant there is a slight tendency in this group for the most underweight children to have the heaviest mothers.

Fifth Grade Group

The boys of the fifth grade Nutrition Class formed in September, 1918, were also measured monthly from September, 1919, to June, 1920, and again in September, 1920. Their Control Group was measured in February and in June, the October measures being omitted through error in the organization of the program.

DISTRIBUTION OF PERCENTAGES OVER AND UNDERWEIGHT

Chart 8 represents the distribution of the percentages over and underweight for the entire fifth grade

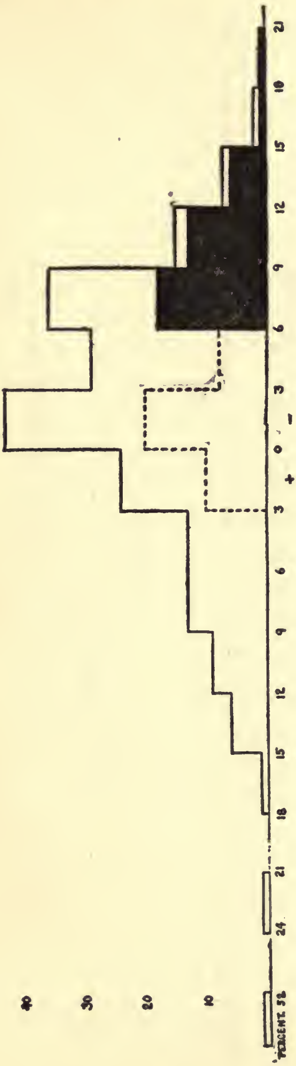


CHART 8

DISTRIBUTION OF PERCENTAGES UNDERWEIGHT. FIFTH GRADE. SEPT. 1918

- - - Control
▬ Nutrition

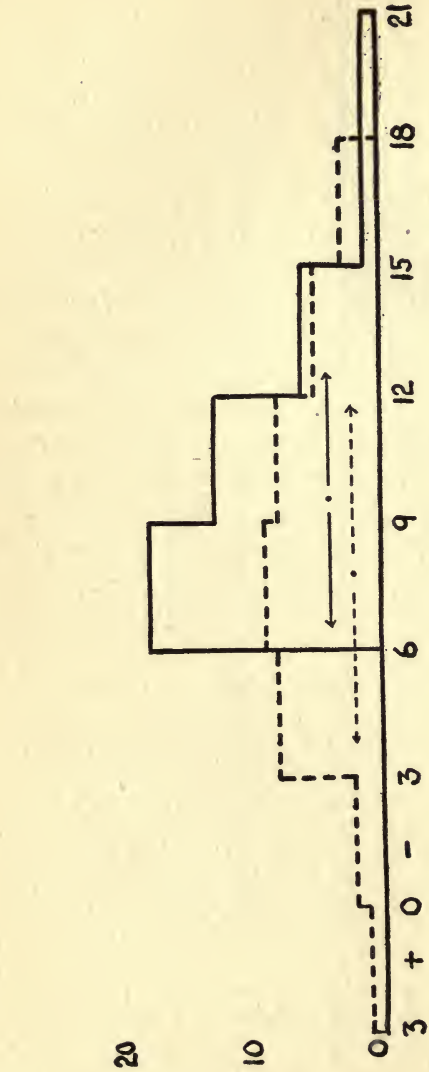


CHART 9

DISTRIBUTION OF FIFTH GRADE NUTRITION GROUP

——— % Underweight in Sept. 1918
- - - - % Underweight in Sept. 1919

entrants in September, 1918. Of 223 individuals in the grade, 39, ranging from 7–20% underweight, formed the fifth grade Nutrition Group and 38 individuals, ranging from 3% over to 3% under formed the Control. The Nutrition Group averaged 9.69% $\pm$2.873, the Control, 0.632%$\pm$1.952 underweight.

Considering the entire grade, we find 22 individuals are of normal weight for height, and 53 or 26.3% are 7% or more underweight; 31 or 15.4% are 7% or more overweight; 2 or 1.1% are over 15% underweight, 3 or 1.7% are over 15% overweight, one reaching 52% overweight.

Chart 9 shows the distribution of the fifth grade Nutrition Group when it was originally selected and of the same group in September, 1919. The chronological age of this group ranged from 9.7 to 14.4 years with an average of 11.2 years. The average percentage underweight in September, 1918, had been reduced from 9.69%$\pm$2.873 to 7.73%$\pm$4.146 in September, 1919; the range which had been 7–20% under became 1% over to 16% under. The Probable Error of Difference between the percentages is 0.5583, the actual difference being 3.510 times this Probable Error, which shows significant gains.

In 1918 and again in 1919 there were 8 individuals 12% or more underweight. In spite of this similarity in the high percentages underweight, we find the low and medium percentages grouping themselves more closely around the normal point; while in 1918 no children were less than 7% underweight, in 1919 we find 14 who are less than 7%, 4 of whom are within the Control Group limits.

COMPARATIVE GAINS AND SEASONAL VARIATION

Table IV shows the variations in the percentages underweight throughout the two-year period which are plotted in Chart 10. The decrease in percentage from October to February is again noted. It is especially significant that this group makes a gradual but consistent reduction, bringing itself according to group average to a normal standard by October, 1920.

In Chart 11 we have plotted the growth in weight and height for the fifth grade Nutrition and Control Groups together with the Porter and Wood norms. Averages are taken from Table V.

The weight curves for these groups are much alike, the gains in weight from October, 1918, to June, 1920, being 12.64 lbs. for the Nutrition Group and 12.11 lbs. for the Control. It is interesting to note the fact that the Control is approximately 1.3 inches shorter than the Nutrition Group.

The average gain in weight of our Nutrition Group slightly exceeds the norms of Wood and Porter, although in actual weight the latter norms are considerably higher than ours.

GAIN IN POUNDS

	1918–1919	1919–1920	1918–1920
Nutrition................	8.03	8.37	16.4
Wood....................	7.00	7.00	14.0
Porter..................	5.50	8.00	13.5

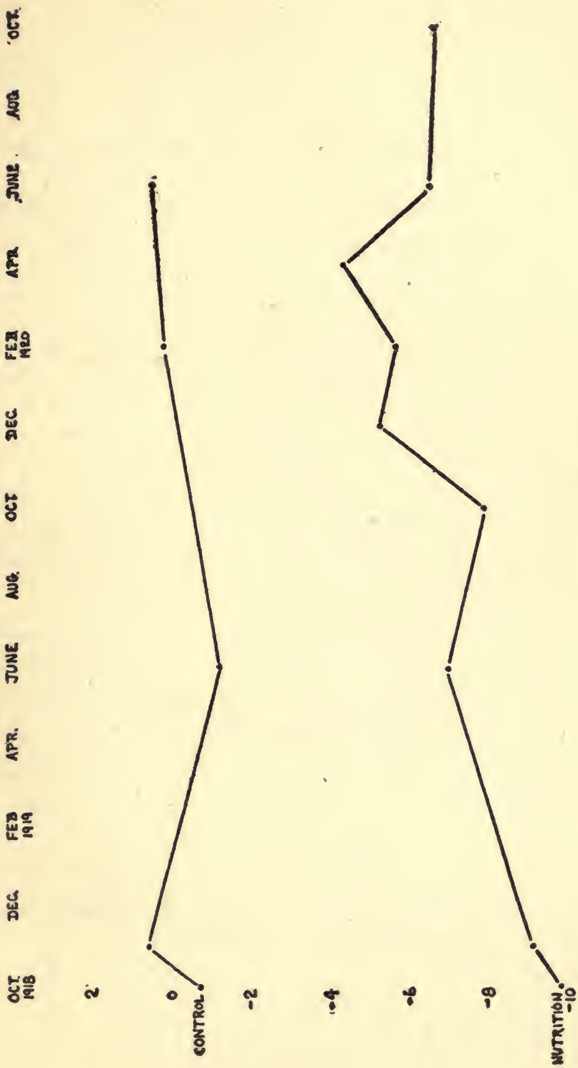


CHART 10

FIFTH GRADE NUTRITION AND CONTROL GROUPS—PERCENTAGE UNDERWEIGHT OCT., 1918-OCT., 1920.

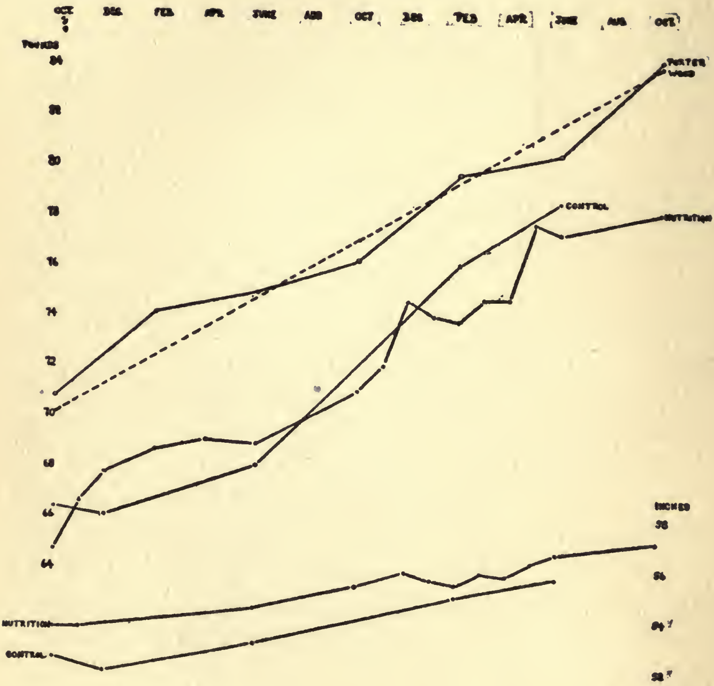


CHART 11

CURVES OF GROWTH IN HEIGHT AND WEIGHT, FIFTH GRADE NUTRITION AND CONTROL GROUPS

TABLE IV

Percentage Underweight

Fifth Grade

	Nutrition			Control		
	No. of Cases	Average % Under-weight	σ	No. of Cases	Average % Under-weight	σ
October, 1918.....	39	9.69	2.873	38	0.632	1.952
November, 1918...	41	7.02	3.412	25	+0.72	3.954
June, 1919........	38	6.76	4.366	27	1.11	3.457
October, 1919.....	37	7.729	4.146			
December, 1919...	38	5.144	4.584			
February, 1920....	36	5.525	5.296	25	+0.32	4.805
April, 1920.......	34	4.176	4.749			
June, 1920........	34	6.264	5.002	25	+0.60	4.808
September, 1920...	31	6.419	5.296			

TABLE V

MONTHLY MEASUREMENTS OF FIFTH GRADE PUPILS, 1918–20

	Nutrition Group			Control Group		
	No. of Cases	Average	σ	No. of Cases	Average	σ
Oct., 1918—Weight, lbs. .	39	64.82	8.140	38	66.54	8.307
Height, in. . .	39	53.72	2.721	38	52.47	2.678
Nov., 1918—Weight, lbs. .	41	66.74	8.745			
Height, in. . .	41	53.70	2.693			
Dec., 1918—Weight, lbs. .	38	67.89	9.190	25	66.20	7.574
Height, in. . .				25	52.02	2.527
Feb., 1919—Weight, lbs. .	42	68.82	9.890			
Height, in. . .						
April, 1919—Weight, lbs. .	42	69.23	9.126			
Height, in. . .						
June, 1919—Weight, lbs. .	40	69.11	9.558	27	68.17	8.303
Height, in. . .	38	54.50	2.905	27	53.07	2.568
Oct., 1919—Weight, lbs. .	37	71.16	10.506			
Height, in. . .	37	55.36	3.193			
Nov., 1919—Weight, lbs. .	36	72.19	10.699			
Height, in. . .						
Dec., 1919—Weight, lbs. .	38	74.70	12.069			
Height, in. . .	35	56.00	3.324			
Jan., 1920—Weight, lbs. .	38	74.17	11.330			
Height, in. . .	38	55.69	3.086			
Feb., 1920—Weight, lbs. .	37	73.96	9.664	26	76.15	9.373
Height, in. . .	37	55.53	2.905	26	55.02	2.635
March, 1920—Weight, lbs. .	36	74.87	11.868			
Height, in. . .	36	56.01	3.164			
April, 1920—Weight, lbs. .	35	74.85	10.431			
Height, in. . .	35	55.91	2.800			
May, 1920—Weight, lbs. .	35	77.89	13.325			
Height, in. . .	36	56.44	3.322			
June, 1920—Weight, lbs...	34	77.46	12.881	25	78.65	9.861
Height, in. . .	34	56.81	3.478	25	55.79	2.677
Oct., 1920—Weight, lbs...	30	78.30	10.574			
Height, in. . .	30	75.25	3.033			

The percentages which follow show gains made in periods of four months by the Nutrition Group.

FIFTH GRADE NUTRITION GROUP

Gain in Weight

	No. of Cases	1918	No. of Cases	1919
Oct.–Oct.		8.03 lbs. or 100%		8.37 lbs. or 100%
Oct.–Feb.	38	4.64 lbs. or 57.8%	36	3.58 lbs. or 42.8%
Feb.–June	38	1.58 lbs. or 19.7%	33	2.3 lbs. or 27.5%
June–Oct.	36	1.81 lbs. or 22.5%	29	2.49 lbs. or 29.7%

Gain in Height

Oct.–Oct.		2.08 ins. or 100%		2.12 in. or 100%
Oct.–Feb.	}	1.35 ins. or 64.9%		0.32 in. or 15.1%
Feb.–June				0.97 in. or 45.8%
June–Oct.		0.73 in. or 35.1%		0.83 in. or 39.1%

Here again the greater increase in weight can be noted from October to February. From February to June we again have a reduction in rate of growth, but in 1918-19 it is a very pronounced one, due in a measure to the fact that 13 children of the group had tonsil operations from March to June and lost an average of 3 lbs. in weight.

RELATIVE GAINS AND VARYING DEGREES OF UNDERWEIGHT

Relative gains made by groups differing in degree of percentage underweight are shown in Table VI.

The two sections are formed by taking from the entire grouping the 22 cases who gained enough

TABLE VI

Percentage Underweight

Fifth Grade Nutrition Class

	No. of Cases	Average % Underweight	σ
October, 1918			
Section 1	17	11.47	3.311
2	22	8.32	1.316
November, 1918:			
Section 1	18	9.94	2.967
2	23	4.74	1.386
June, 1919:			
Section 1	21	8.33	4.275
2	17	4.82	3.638
October, 1919:			
Section 1	19	9.74	4.170
2	19	5.84	3.137
February, 1920:			
Section 1	19	6.58	5.038
2	18	2.11	3.650
June, 1920:			
Section 1	19	8.00	5.026
2	19	4.42	3.775
September, 1920:			
Section 1	15	7.73	4.828
2	14	5.93	5.402

GAIN IN WEIGHT

1918–1919

	No. of Cases	Section 1	No. of Cases	Section 2
Oct.–Oct.		6.83 lbs. or 100%		9.01 lbs. or 100%
Oct.–Feb.	17	3.5 lbs. or 51.2%	21	5.57 lbs. or 61.8%
Feb.–June	20	1.78 lbs. or 26.1%	18	1.36 lbs. or 15.1%
June–Oct.	18	1.55 lbs. or 22.7%	18	2.08 lbs. or 23.1%

1919–1920

Oct.–Oct		8.16 lbs. or 100%		8.59 lbs. or 100%
Oct.–Feb.	18	3.26 lbs. or 39.9%	18	3.89 lbs. or 45.3%
Feb.–June	18	2.16 lbs. or 26.5%	15	2.47 lbs. or 28.7%
June–Oct.	15	2.74 lbs. or 33.6%	14	2.23 lbs. or 26%

in the period elapsing between the original weighing in October, 1918, and the forming of the class in November to bring them to a normal standard. These are called Section 2. While the numbers vary for these two groups because of additions to the sections throughout this period, there was no interchange from one section to another. It is evident that at least half of this group were not undernourished and that their rate of growth corresponds with the normal expectations. It is gratifying to note the gains made by Section 1 during the two years. They increased from 11.47% underweight in October, 1918, to 7.73% underweight in September, 1920.

The percentages of gain made by the two sections are of interest because of the similarity in seasonal growth which is shown. The largest increase in weight occurs between October and February. The increase in weight for both sections compares favorably with Wood's and Porter's norms.

GAIN IN WEIGHT

	1918–1919	1919–1920	1918–1920
Section 1	6.83 lbs.	8.16 lbs.	14.99 lbs.
Section 2	9.01 lbs.	8.59 lbs.	17.6 lbs.
Wood	7.00 lbs.	7.00 lbs.	14.00 lbs.
Porter	5.50 lbs.	8.00 lbs.	13.50 lbs.

It is of interest that the most underweight section gains slightly more than the normal groups of Porter and Wood for the two-year period.

Interpretations

While a sampling of 207 Hebrew boys, 79½% of whom are of Austrian or of Russian parentage with homes in New York's crowded East side, may not be considered representative of children at large between the ages of five and a half and seven and a half years, we can compare the two first grade groups similarly selected for study, consider the variations within the groups, and summarize certain findings as to growth in height and weight. It is significant that these findings are corroborated by the results from the measurements of the older boys throughout a two year period.

(1) *A comparison of the numbers underweight in various school populations is not valid, aside from other conditioning factors, unless the measurements are taken at the same period of the year.* There is a marked seasonal variation in gain in weight; the greatest increase both absolutely and relatively occurs between September and February. There is a more constant rate of increase in height with slight acceleration from February to September, inverse to the increase in weight. These two factors cause an appreciable difference in height-weight indices throughout a year. This was found true not only for the first grade children but also for those of the fifth and sixth grades; for the Control or approximately normal groups as well as for the undernourished. While 25% of the February entrants to the first grade were found to be 7% or more underweight, 50.7% of the number entering in September were 7% or more underweight.

(2) *The definition of malnutrition or undernourishment as a function of the height-weight-age relationships with the acceptance of a 7% standard is not statistically justified.* The children of the First Grade group who are 7, 8 and 9% underweight at the end of the season of minimal increase in weight behave as the Control Group in rate of growth and compare favorably with the growth records established as normal for a large group of children at large. Those who are 10% or more underweight are more erratic. Two types are specifically noted: the markedly retarded case who gains and loses irregularly and remains practically upon a level for a long period of time; the rapid gainer who surpasses the

normal rate but shows more fluctuations in his progress and finally attains a normal level. For him environmental control works wonders. The former offers a distinct problem in the field of malnutrition.

(3) *The static standards, as 7% for all ages, do not seem justified.* From this same school only 23% of 223 fifth grade children entering in September, 1918, were found underweight according to this standard; 50.7% of 126 first grade children entering in September, 1919, were found underweight. In February, 1918, there was not a marked difference in the percentage underweight of the various grades. The difference in percentage of gain in excess of normal was made more striking. The first grade children gained 37.5% more than the normal gain for the period of observation, which considerably exceeded the gain made by all other classes except the Terman group. While the factor of greater home control and parental coöperation largely accounts for this record, it is probable too that it indicates a better nutritional status for the first grade.

Summary

The experiment of 1919-1920 proved reassuring in many respects. That the procedure developed for first grade children yielded better results than that previously used by us is shown by the number of individuals "making normal" during the period of instruction and by the definite reduction effected in the average percentage of underweight. Of the 48 children enrolled in September, 20 or 45% had reached normal weight for height in June and the average underweight of the class had been reduced from 11.56 to 6.54%. It will be evident that the inferior record of the smaller group enrolled in February, 2 children out of 10 (20%) making normal, and the average of underweight reduced only from 11.46 to 11%, is perfectly in keeping with the general facts of our experience, that the factor of seasonal variation renders results in weight increase relatively slight during the second term of school.

That the enlistment of effective home coöperation in conjunction with the earlier age period of the children furnishes an adequate explanation for the relative efficiency of this third program of experiment will be obvious. The program of instruction was a slender one but was calculated to enlist the child's coöperation successfully. We can appreciate that additional school facilities for concrete experiences especially in food taking, selection, and preparation, and for additional rest and fresh air, might have considerably augmented the results obtained.

The data collected on physical histories and the more careful physical examinations made of the children in this third experiment have resulted in a far clearer appreciation of the causal factors and of the conditions governing individual response than had been ours previously, while the detailed study of growth in height and weight has been clarifying to the entire experience. At the same time the need of a very considerable amount of research in respect to standards of growth, and in respect to causal factors, has been made apparent. For this reason we submit, in a subsequent chapter, some general interpretations of our experience, and recommendations for such further experiment as seems to us most obviously needed, to place both corrective work for malnutrition and general procedures in health education on a more secure scientific basis.

CHAPTER VII

MENTAL MEASUREMENTS OF FIRST GRADE CHILDREN

Group Selection

The formation of a Nutrition Class and a Control Group from the first grade entrants in September, 1919, was determined solely by the respective percentages underweight. These two groups were not made equivalent as to physical status, economic status, racial or stock differences, nor was the distribution of percentages underweight similar with respect to variations from the central tendencies. The set-up was arranged for a comparative study of growth in weight and height of these groups and did not permit the control of such factors as given above. This makes unsatisfactory experimental conditions for direct comparison of mental traits.

All the children in these classes were boys and 95% of those in the Nutrition Class were Hebrews. The racial distribution of the two groups was approximately the same. The Nutrition Group varied from 8 to 20% underweight as compared with norms, while the Control Group ranged from 7% underweight to 5% overweight. Physical examinations were made of the Nutrition Group. (See pp. 109-117.) No physical examinations were made of the Control Group. The Nutrition Class was segregated into one class-room and came into direct contact with various members of the staff each week. They were also given milk each day. This makes for a very different attitude as compared with that of the Control Group, who were separated in two class-rooms and after the first weighing and measuring had no other contacts preceding the mental examinations. These conditions seem to offer a better opportunity for an intensive study of a small group of undernourished children than for comparative records.

It was decided to evaluate the Nutrition Class and the Control Group as to general intelligence rating, and to compare them in a few specific performances including a simple learning process, then to make a more intensive study of the types of responses made by the undernourished boys under varying forms of control. These examinations were given during January and February after the children had become accustomed to the routine class procedure.

A series of tests was given to the children of the Nutrition and Control Groups in the Nature Study laboratory of the school, one section of which was screened off so that the distraction from the rabbits and chickens seemed negligible. Each child was taken individually for an examination which lasted approximately half an hour between the hours of nine and eleven in the morning. This series included the following tests: Card Sorting, Cancellation, Action-Agent, and Cylinders.

After this series was completed the children in the Nutrition Group were brought to our laboratory in the afternoon in groups of four and five, and were given individually the following series of tests: Tapping (Single Plate), Tapping (Double Plate), Target, Steadiness, Walking Board, Substitution, and Ship Test. The scores for the Haggerty Mental Examination, the Intelligence Quotients by the Stanford Revision of the Binet-Simon Scale, and the teacher's ratings were obtained from the school authorities. The Haggerty tests were given under the auspices of the Bureau of Reference and Research of the New York City school system, under the direction of Mr. J. L. Stenquist. The Stanford Revision examinations were given by Miss Elisabeth Irwin, the school psychologist, and the teacher's marks were obtained from Miss Louise Specht, assistant principal of the school. The tests given in the laboratory were selected for the purpose of measuring the rapidity and accuracy of responses in varying performances with special reference to fatigue and practice effects.

Apparatus and Procedure

Slight variations from the standard test procedures were made where it seemed necessary for a complete understanding of the requirements by six-year old subjects.

Card Sorting.—The method followed was that given in the *Monograph* by Woolley and Fischer, "Mental and Physical Measurements of Working Children," page 100, with the exception that two sets of 24 cards were used instead of one set of 48 cards. The time for each of the two trials was recorded.

Cancellation.—The capital A blank was used and the method of Woolley and Fischer (page 108) followed, except that when the examiner showed the practice sheet, the subject was instructed to "mark out the next two A's," the examiner helping the child to find them and correcting any errors at once.

Action-Agent Association Test.—The instructions in the *Monograph* "Association Tests," by Woodworth and Wells (page 63) were followed. Only nine of the words listed by them were used in our series. The comprehension of English by these young children, in whose homes a foreign language is usually spoken, was not good enough to include all the words of that list. The words used were: gallops, bites, cuts, rings, scratches, growls, cries, stings, flies, ticks, shines, blows, rolls, creeps, burns. This list of words has been used with a number of children of the same age, which offers an opportunity for comparison of results as to reaction time and accuracy of response.

Cylinders.—(Witmer.)—A description of this test, together with suggestions for its use, is given by Paschal in the *Psychological Clinic,* April 15, 1918, and by Ide in the same Journal for May 15, 1918. Our procedure was to set the box with the cylinders correctly placed before the subject with the largest cylinders farthest from him. The examiner said, "Do you see this box with the blocks fitted into it? Each one has its own place." While removing the cylinders from the box the examiner said, "I am going to put them in the center and I want you to put them back where they belong. You may use one hand or both and work as fast as you can."

The child was allowed to work as long as he showed indications of completing the test correctly. If he did not succeed at the end of five minutes, he was assisted with suggestions until all the cylinders were correctly placed. The time for each of three trials was recorded, also the number of wrongly placed cylinders at the end of each trial.

Rapidity of Movement of the Hand in Single Tapping.—The method of administering the test was that described in the *Monograph* by Woolley and Fischer (page 75) with the exception that the tapping was continued for 1½ minutes and readings of the dial were taken for each half minute instead of for each 15 second period. The index of fatigue was calculated by considering the loss in the last 30 seconds as compared with the first 30 seconds.

Rapidity of Movement—Tapping on Double Plate.—This was a more complex form of movement than the tapping on the single plate. The plate was devised by Professor Knight Dunlap and consists of a black, hard rubber base, 6 inches by 3 inches, upon which two brass plates, 3 inches by 2½ inches, were attached, separated by a black bar 15/16 of an inch in width. To each brass plate there was attached a binding post, so that the taps for the two plates could be registered separately. The plates, stylus, and electric enumerator were wired in series with battery, so that contact of stylus with either plate recorded a count in the enumerator. After subject had been told that he was to grasp the stylus in his right hand and tap first upon one plate then upon the other, just as rapidly as possible, the procedure was illustrated, and he was allowed to make a few taps so that he understood what was expected of him. He was told that he should continue tapping until the command to stop. The counter was screened from his view, and the experimenter sat facing him. Each child stood during this performance, and by means of a wooden platform the plate was adjusted according to the height of the child.

When the command to begin was given a stop-watch was started. This was placed upon a stand by the side of the enumerator, so that the score for 30 second periods could be recorded. We realized the difficulty in following two moving hands for making accurate records. The tapping was continued for a minute and a half, and we believe the control was sufficient to give indications of fatigue effects. At the onset of fatigue there was a tendency to scrape across the dividing board from one plate to another, to strike the dividing board instead of one of the plates, to hit several times on one side and then several times on the other, and to stop for rest. If the stylus was held too loosely it sometimes failed to record. Holding of the stylus too tightly was usually accompanied by pounding. If the child stopped he was told to go on. If he continued to hit several times on one side of the plate he was told to "hit first one side then the other," and if the failure to register seemed to be due to a loose grasp, it was suggested that he hold the stylus more tightly. The rate of these young children was such that there was not a large probability of error in recording the score for the different periods.

The Target Test.—This apparatus and the procedure for conducting this test were described by Johnson in the *Psychological Review* for July, 1919, "Practice Effects in a Target Test. A Comparative Study of Groups Varying in Intelligence." The procedure was modified in adaptation to the age of the children, and only thirty throws were given to each child in series of ten throws each, one dart thrown immediately after the other at a distance of ten feet from the target.

The Steadiness Test.—The procedure followed was that described in the *Monograph* by Woolley and Fischer, "Mental and Physical Measurements of Working Children" (page 63), with the following modifications: instead of seating the child, he was standing, and the adjustments for individual heights were made by means of a wooden platform upon which he stood; instead of beginning with the fourth hole for these young children we began with the first hole, taking as an arbitrary limit that hole in which not more than twelve contacts were made. Scores were recorded in terms of the hole reached and the number of contacts made.

The Walking Board.—This board was devised for the purpose of getting at some measure of general bodily control, and consisted of a piece of hard wood, 6 feet long, 2¾ inches wide, and 2½ inches thick. The upper side of the board had a half inch rounded off on either edge. This board was securely fastened upon wooden end supports which raised it from the floor a distance of 5 inches to the level of the upper side, and had the appearance of a rail. This rail was divided into four equal parts by means of cylindrical insets having a base 1¼ inches in diameter. These divisions were called I, II, III, IV.

The subject was asked to walk from one end to the other without stepping off if possible, and was told that if he did step off to step back on again and continue to the other end. This was done for three times in succession. Scores were kept of the number of steps off in each division and for each trial. In the tables only the total scores for these three trials are given.

Substitution.—(Woodworth & Wells.) The first half of the Woodworth & Wells blank was used with the instructions given in Mrs. Woolley's study. Slight changes were necessary because of the presence of the key at the top of the blank instead of on a separate card. The child was allowed to fill in the first two figures with the examiner's assistance. When the fifth line was reached the key and the first four lines were covered up and the child told to "do it from memory."

The Ship Test.—This test is described by Pintner and Patterson in "A Scale of Performance Tests," (page 58). Their method of giving the test was followed.

Dark Room Experiment.—A number of these children gave evidence of emotional instability and of fear of the dark, so a form of getting some objective measure of reactions to remaining in a dark room was attempted. The steadiness plate, used in the test of control of involuntary movements, a kymograph, Jaquet time marker, and an electric marker were wired in series with a battery so that contact of a stylus resting upon subject's hand was recorded upon a smoked paper on a revolving drum. The subject was seated by a table and his arm was placed upon a resting board so that the entire length of the arm and hand was in contact with the board. The hand was allowed to rest easily with the fingers extended forward, touching each other. On the back of his hand, so that it fell in the groove between the forefinger and the second finger, the stylus was placed. The steadiness plate was arranged at the end of this board so that hole 4 in the upper row, which was 12/64 of an inch in diameter, was in a vertical plane in such position that the stylus, resting lightly upon the fingers, extended for a distance of approximately a quarter of an inch through the center of the hole.

The light was turned on in the dark room while the child was adjusted to this position. He was told to let his hand rest there, keeping it as still as he could so that the stylus would not move, and that the light would be turned out for a time. He was assured that this would not be for very long and he must remain as still as he could. Then the marker was started, and the drum and a stopwatch were started simultaneously. After 15 seconds the light was turned out, the experimenter stepped outside the door just behind her, closing it so that the child was left in a dark room for 45 seconds. The light was then turned on again and after 10 seconds the drum was stopped. The number of contacts made during the period of darkness was scored.

Questionnaire.—The questions used were taken from a list, given to a number of children for obtaining information that might suggest emotional instability, that was originally developed from Woodworth's list for adults based upon available accounts of symptoms ante-dating mental breakdowns and indicating poorly balanced emotional conditions. For each question one answer is assumed to be wrong. This assumption is based upon the answers given by normal individuals. The score is the total number of wrong answers. A discussion of these questions is given by Franz.* A report of the preliminary study on children was made in "Ungraded" for January, 1920, which describes scoring and interpretation of data. The following questions were given to each child individually and the social investigator asked the mother the same questions as a check upon the child's answers in some cases and to secure exact information in others. The questions were asked informally after the child had taken part in other experiments and was at ease. He seemed interested in his past experiences and his illustrations often gave more direct information than his categorical replies.

Do you wake up frightened in the middle of the night?
Do you ever walk in your sleep?
Do you cry out in your sleep?
Do you want a light in your room during the night?
Do you have a great many bad headaches?
Have you ever fainted away?
Do you like to play alone better than with children?
Do the other children let you play with them?
Are you shy with other children?
Did you ever run away from home?
Did you ever get lost?
Do you get used to new places easily?
Do you find your way about easily?
Do you have trouble walking in the dark?
Are you afraid of the dark?
Does it make you uneasy to cross a bridge over a river?
Does it make you uneasy to go into a tunnel or subway?
Does it make you uneasy to have to cross a wide street or open square?

* Franz, S. I., *Handbook of Mental Examination Methods,* The MacMillan Co., 1919, p. 170.

Do you have a great fear of fire?
Did you ever have the habit of biting your finger nails?
Did you ever have the habit of stuttering?
Did you ever have the habit of twitching your face, neck, or shoulders?
Did you ever have the habit of wetting the bed?
Have you a good appetite?
Are you usually happy?
Do you cry easily?
Are you easy to get angry?
Can you stand pain as quietly as other people do?
Can you stand the sight of blood?
Do you like out-door games?
Have you a nickname?
Do you do well in school?
Have you any unusual fears?
Is there any food you especially dislike?
Do you break things often?
Do you fight other children?
Do you tease others?

Teacher's Ratings.—To the marks given by the teacher no numerical value was assigned, but to facilitate computation we have used an arbitrary numerical value in place of the original alphabetic ranking. The following values were assigned to the school markings:

School Work	Mark	Numerical Value
Failure........................	D	1
Fair........................	C	2
Good........................	B	3
Very good....................	B+	4
Excellent....................	A	5

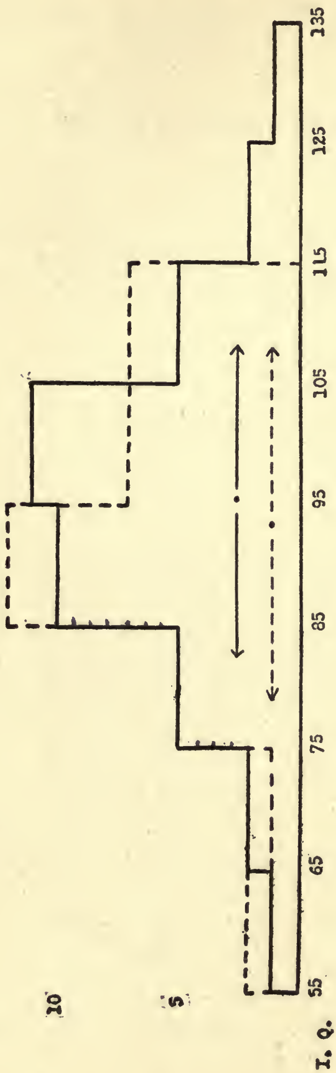


CHART 12.

DISTRIBUTION OF INTELLIGENCE QUOTIENTS. STANFORD REVISION.

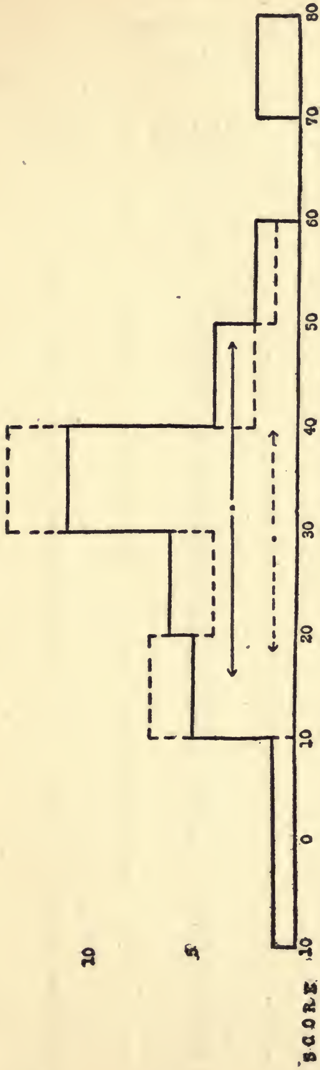


CHART 13.

DISTRIBUTION OF HAGGERTY SCORES. Nutrition ——— Control. — — —

TABLE I

NUTRITION GROUP

First Grade

	Stanford Revision I. Q.	Haggerty Score	Teacher's Rating	Questionnaire
A. B.	100	35	5	7
M. B.	87			
N. C.	87	33	3	11
B. D.	95	30	2	9
S. Fa.	126	71	5	3
J. Fa.			3	4
S. Fi.	100	34		10
J. Fr.	102	42	3	9
N. G.	94	21	4	8
P. G.	100	26	4	15
A. G.	88	17	3	11
B. H.	88	23	3	9
I. H.	91	33	3	4
P. K.	72		2	5
J. K.	104	28	3	4
A. K.	108	47	5	10
E. L.	83	32	5	6
L. Le.	105	36	4	10
J. L.	110	33	4	6
H. L.	115	27	4	9
I. L.	81	17	3	12
L. Lu.	100	32	3	3
L. M.	77	18	3	10
M. M.	104	50	5	5
L. P.	92	27	4	8
J. P.	110	74	5	6
M. R.	92			
S. R.	115	19	3	10
N. R.	103	41	3	10
I. S.	77	−2	1	8
H. Sa.	81	0	1	7
N. S.	96			10
D. S.	108		5	8
H. Sk.	94	15	2	11
M. T.	93	51	5	5
H. U.	100	47	4	4
N. W.	90	37	3	11
J. Y.	64	38	3	6
No. of cases	37	32	34	36
Average	95.46	32.25	3.47	7.89
σ	12.74	16.09	1.12	2.84
P.E.	1.414	1.915	0.1299	0.318

TABLE II

CONTROL GROUP

First Grade

	Stanford Revision I. Q.	Haggerty Score	Teacher's Rating
M. B.	100	17	3
S. B.	104	37	3
W. B.	102	33	3
J. B.	75		3
J. C.	112	53	5
L. D.	93	22	5
A. F.	92	16	3
B. G.	106		
A. Gl.	86	15	3
G. G.	100	34	3
A. Go.	89	20	4
S. H.	111	34	4
D. H.	92	35	3
S. Je.	87	35	3
S. Ju.	108	31	4
A. K.	125	35	3
M. L.	109		
F. L.	84	10	2
L. P.	102	28	3
I. P.	101	38	4
A. P.	79	12	2
F. P.	109	38	3
W. S.	88	45	3
H. Sc.	107	37	4
M. Sche.	84	13	2
S. Schn.	84		
S. Schu.	73		4
B. S.	94	31	3
M. Schw.	61		1
M. St.	100	33	3
H. St.	94	15	4
J. S.	55		1
H. T.	90	28	3
J. V.	85	41	2
J. Z.	92	33	3
No. of cases	35	28	32
Average	93.5	29.25	3.09
σ	14.3	10.73	0.926
P.E.	1.63	1.363	0.1102

Comparison of Nutrition and Control Groups

Intelligence Level.—In general intelligence as measured by standardized scales both the undernourished group and the control group have a normal average rating. According to Terman, the average group of individuals at large make scores that give Intelligence Quotients between 91 and 110, when rated by the Stanford Revision of the Binet-Simon scale.

Charts 12 and 13 show the distribution of scores in the Haggerty Mental Examination and Stanford Revision of Binet-Simon Intelligence Tests.

VALIDITY OF DIFFERENCE BETWEEN NUTRITION AND CONTROL GROUPS.

	P.E.D.	$\frac{\text{D.}}{\text{P.E.D.}}$
Stanford Revision Intelligence Quotients...	2.157	0.901
Haggerty Mental Examination............	2.350	1.276
Teacher's rating..........................	0.1703	2.231

The Nutrition Group has an average I. Q. of 95.46, with a range from 64 to 126, only four falling below 80. The Control Group has a slightly lower average of 93.51 with scores ranging from 55 to 125, and five falling below 80. The scores for the Haggerty Mental Examinations show a similar difference between the two groups and are slightly below the normal of 35 for six year old children.

The average rating given by the teacher signifies good work. In each group approximately a third are slow, border-line cases or clearly defective. If the cases who have decided mental limitations as shown by two or three of the ratings were excluded, the normal range of scores would include all except three of each group, who might be classed as superior. When we calculate the Probable Error of the differences between the averages, we find only in Teacher's Rating is there a difference of as much as twice the Probable Error. All three measurements are consistently favorable to the Nutrition Group, and we seem justified in the statement that the superiority in intelligence lies with the under-nourished group.

The comparison of the gains in weight made by those having high Intelligence Quotients and those of low Intelligence Quotients shows a significant difference in favor of the more intelligent.

Gain in Weight

	No. of Cases	Av. in Lbs.	σ	P.E.
(*a*) I. Q.>105....	8	4.54	1.247	0.2967
(*b*) I. Q.< 90....	9	3.22	1.216	0.2736
(*c*) Entire group..	32	3.69	1.387	0.165

Difference between (*a*) and (*b*) is 3.271 times its Probable Error; (*a*) and (*c*), 2.504; (*b*) and (*c*), 1.464.

TABLE III

NUTRITION GROUP

First Grade

	Card Sorting				Cylinders			Cancellation			Action Agent	
	First Trial		Second Trial		Time in Seconds				Errors			
	Time in Sec.	Errors	Time in Sec.	Errors	Trial (1)	Trial (2)	Trial (3)	Total Time in Sec.	First 6 Lines	Last 6 Lines	Time	Acc.
A. B.	23	0	25	0	150	123	96	300	12	7	4.9	14
M. B.	42	0	40	1	100	48	60	375	4	14	5.5	9
N. C.	66	0	44	3	80	95	85	375	0	2	7.0	8
B. D.	70	0	72	1	105	195	145	285	4	7	4.3	13
S. Fa.	47	0	29	0	115	74	87	268	16	6	4.8	14
S. Fi.	57	2	56	4	240	120	120	259	20	15	9.8	9
J. F.	39	0	25	0	155	75	85	265	1	1	4.1	12
N. G.	243	5	42	1	255	695	145	330	0	0	7.0	10
P. G.	62	0	45	0	185	168	146	200	8	10	3.9	9
A. G.	47	0	36	0	210	136	110	325	1	0	6.6	9
B. H.	55	0	60	0	240	120	180	355	8	10	4.3	13
I. H.	37	0	35	0	335	72	98	345	6	10	3.3	12
P. K.	109	1	106	2	223	194	360	195	36	37	5.0	12

J. K.	50	0	53	0	160	120	92	369	14	8	4.1	12
A. K.	56	0	34	1	190	145	95	365	1	1	2.9	13
E. L.	49	2	45	0	180	110	83	390	5	3	2.3	14
L. Le.	48	3	44	4	205	118	175	340	15	1	2.7	12
J. L.	70	0	74	2	195	130	90	160	19	25	5.4	11
H. L.	35	1	29	2	178	116	118	340	0	1	3.0	13
I. L.	49	0	42	1	105	89	86	300	9	3	7.3	12
L. Lu.	55	1	52	2	540	114	240	278	20	14	2.1	11
L. M.	57	2	43	1	390	75	76	197	9	18	4.6	13
M. M.	40	0	35	0	120	62	60	230	15	6	3.2	13
L. P.	45	1	37	3	175	275	98	426	7	7	2.9	14
J. P.	50	0	53	0	195	97	76	345	8	4	2.0	15
M. R.	30	2	29	0	105	70	100	240	5	7	1.8	12
S. R.	85	0	50	0	205	365	117	302	19	34	4.8	11
N. R.	63	0	50	3	85	97	100	320	0	2	2.7	10
N. S.	74	0	45	0	295	160	143	300	2	14	2.2	14
D. S.	65	0	54	0	215	97	120	420	4	3	2.4	13
H. S.	75	1	63	2	459	90	135	345	4	5	4.9	11
M. T.	33	0	36	1	223	120	75	286	0	1	3.7	12
H. U.	62	5	51	6	105	110	117	325	10	16	5.0	12
N. W.	45	0	34	0	395	85	72	260	7	2	2.7	12
J. Y.	37	0	30	0	385	80	90	356	11	3	9.3	3
H. Sa.	110	0	80	2	375	154	120	240	37	36	6.1	14
I. Sa.	120	0	90	0	95	113	320	377	21	25	8.7	9
No. of cases	37	37	37	37	37	37	37	37	37	37	37	37
Average	62.16	0.703	47.78	1.14	215.4	138	122	307.78	9.68	9.68	4.52	11.62
σ	36.93	1.29	17.85	1.45	110.8	109.9	63.3	61.52	9.	10.03	2.04	2.27
P.E.	4.10	0.143	1.98	0.161	12.3	12.19	7.03	6.83	0.999	1.11	0.227	0.252

TABLE IV

CONTROL GROUP

First Grade

	Card Sorting				Cylinders			Cancellation			Action Agent	
	First Trial		Second Trial		Time in Seconds			Total Time in Sec.	Errors		Time	Acc.
	Time in Sec.	Errors	Time in Sec.	Errors	Trial (1)	Trial (2)	Trial (3)		First 6 Lines	Last 6 Lines		
M. B.	50	0	49	1	212	110	128	578	9	6	2.7	13
S. B.	38	3	25	3	136	140	70	265	5	5	1.4	15
W. B.	43	0	45	0	134	60	105	405	2	4	3.3	11
J. B.	67	5	60	6	93	122	105	540	17	12	4.2	11
J. C.	40	0	35	1	185	127	129	330	5	0	3.1	14
L. D.	105	3	58	1	347	190	62	300	12	3	6.1	8
A. F.	57	2	49	3	370	135	105	430	9	11	2.2	11
B. G.	50	0	38	2	350	67	63	345	0	1	2.1	13
A. Gl.	180	5	105	4	390	188	117	306	17	29	5.1	13
G. G.	50	0	54	1	150	98	114	370	0	1	2.0	12
A. Go.	45	2	57	2	480	180	147	256	35	25	3.9	11
S. H.	57	1	41	3	500	160	227	287	14	7	2.9	12
D. H.	45	0	40	0	335	163	155	360	9	3	3.4	13

S. Je	87	0	90	0	450	63	151	285	16	12	4.0	13
S. Ju	36	0	47	0	260	132	80	475	10	1	2.3	12
A. K	30	1	32	2	136	85	71	275	10	10	3.5	13
M. L	40	0	42	0	115	131	71	210	33	40	4.2	10
F. L	72	0	66	1	150	330	217	180	25	41	3.3	12
L. P	63	2	45	0	115	60	60	415	3	8	2.7	12
I. P	42	0	25	0	70	68	75	375	12	4	4.5	11
A. P	76	1	71	0	450	395	85	350	8	8	4.9	9
F. P	40	1	29	0	282	77	70	373	5	14	4.2	14
W. S	57	2	40	7	180	132	135	257	21	19	4.8	14
H. Sc	92	2	67	0	90	120	200	465	7	7	2.2	15
M. Sche	61	9	73	4	522	225	300	270	21	33	6.3	10
S. Schn	115	0	87	0	375	250	210	395	12	27	2.5	10
S. Schu	114	0	83	3	300	240	154	340	24	35	5.9	6
B. S	48	0	52	0	200	460	75	375	12	7	2.0	13
M. Schw	50	0	59	0	360	84	360	120	40	32	2.5	9
M. St	75	1	54	6	225	247	196	290	6	8	3.3	12
H. St	45	2	30	1	240	107	78	230	1	12	5.8	11
J. S	85	0	65	1	115	70	103	480	12	3	4.3	3
H. T	47	1	45	4	235	117	144	180	26	14	4.5	11
J. V	57	1	35	1	270	335	103	390	5	1	2.9	11
J. Z	47	0	40	0	132	95	110	450	3	10	3.5	11
No. of cases	35	35	35	35	35	35	35	35	35	35	35	35
Average	63	1.3	52.4	1.6	255.8	158.9	130.7	341.5	12.74	12.94	3.61	11.4
σ	29.57	1.86	18.81	1.96	135.5	96	68.1	101.3	9.94	11.86	1.26	2.24
P.E.	3.37	0.212	2.14	0.223	15.44	10.95	7.76	11.54	1.13	1.35	0.144	0.255

Card sorting.—The time and errors in Card Sorting were reduced in the second trial by both groups, but the Nutrition Group has better averages in time required and has fewer errors in both trials.

PROBABLE ERROR OF DIFFERENCE (P.E.D.) BETWEEN SCORES OF THE NUTRITION AND CONTROL GROUPS

Card Sorting	P.E.D.	$\frac{\text{D.}}{\text{P.E.D.}}$
Time—First Trial	5.307	0.158
Second Trial	2.915	1.585
Errors—First Trial	0.2557	2.335
Second Trial	0.2750	1.673

The difference between the Nutrition and Control Groups in time required for the first trials seems insignificant. More absolute improvement in rate is shown by the Nutrition Group on the second trial. The difference between the averages is much larger, and is 1.585 times its Probable Error. The difference of 1.27 in average number of errors on the first trial is 2.335 times its Probable Error, and for the second trial this is only slightly less. This aggregate of differences in favor of the undernourished group indicates a slight superiority over the Control Group.

Cylinders.—A study of the results in the Cylinder Test from the standpoint of the total time required and of the practice effects from one trial to another shows a more marked superiority of the undernourished group.

PROBABLE ERROR OF DIFFERENCE (P.E.D.) BETWEEN SCORES OF THE NUTRITION AND CONTROL GROUPS

Cylinder Test	P.E.D.	$\frac{D.}{P.E.D.}$
Time—First Trial	19.740	2.051
Second Trial	16.386	1.276
Third Trial	10.471	0.829

PROBABLE ERROR OF DIFFERENCE BETWEEN TRIALS

	Nutrition		Control	
Cylinder Test.	P.E.D	$\frac{D.}{P.E.D.}$	P.E.D.	$\frac{D.}{P.E.D.}$
T_1-T_2	17.317	4.464	18.93	5.12
T_2-T_3	14.071	1.137	13.42	2.10
T_1-T_3	14.178	6.582	17.28	7.24

The time required decreases rapidly from first to second trials for both groups with a smaller difference between second and third trials. There is a greater absolute gain for the Control Group, which has a much larger initial time score, but the percentage of reduction shows greater improvement by the Nutrition Group. The differences in the learning process as shown by these averages are significant, since they are more than four times the Probable Error except between second and third trials. The differences in averages of the two groups for time required are not so significant, for the second and third trials, though the difference on first trials is more than twice the Probable Error, which is certainly suggestive.

Cancellation.—The Nutrition Group has a faster rate in Cancellation and makes fewer errors.

	Cancellation	
	P.E.D.	$\frac{D.}{P.E.D.}$
Time	13.410	2.514
Errors—First Half	1.508	2.029
Second Half	1.748	1.865

The difference in the averages of time required for the two groups is two and a half times the Probable Error of this difference. The difference in the average number of errors in the first half of the sheet is twice its Probable Error. The Nutrition Group shows no more inaccuracy in the latter half of the sheet than in the first half, but the Control Group has a slight increase in the average number of errors.

Action-Agent.—In the test of controlled associations there is but little difference between the two groups in accuracy. The errors for both groups were with a few words, as gallops, growls, stings, which were unknown to them. The Nutrition Group has a longer average reaction time. The scores range from 1.8 seconds to 9.8 seconds, with an average reaction time of 4.5 seconds. This is 0.9 seconds longer than the average for the Control Group, and this difference is 3.378 times its Probable Error.

There are five in the Nutrition Group with slower reactions than the longest reaction time for the Control Group, two of them exceeding it by 2 seconds. Among these are three who had low intelligence scores. The longest reaction times for the Control Group were made by those having lowest intelligence scores. The inequality within the groups as to intelligence makes group comparison for a study of the undernourished child far less valuable.

A group of 50 Italian boys of the same age range from another public school of New York had an average reaction time of 5.9 seconds for the same list, which is longer than that for the Nutrition Group. Their accuracy score was 8.44 in comparison with 11.62 for the Nutrition Group. This group of undernourished boys makes fewer errors and has a quicker reaction time than a group in the same city having somewhat similar home conditions. We do not know, however, how many of the Italians were also underweight.

Ship Test.—In the Ship Test the time scores include so many variables that the average is of little value. Some took 6 minutes and made a very good score, others made a score of zero but completed it in a very short time. The average score of 7.26 coincides with the Pintner-Paterson norm of 7 to 8 for six-year-olds, so the performance of these undernourished boys is considered normal. The low scores correlate more closely with Intelligence Quotients than with index of undernourishment.

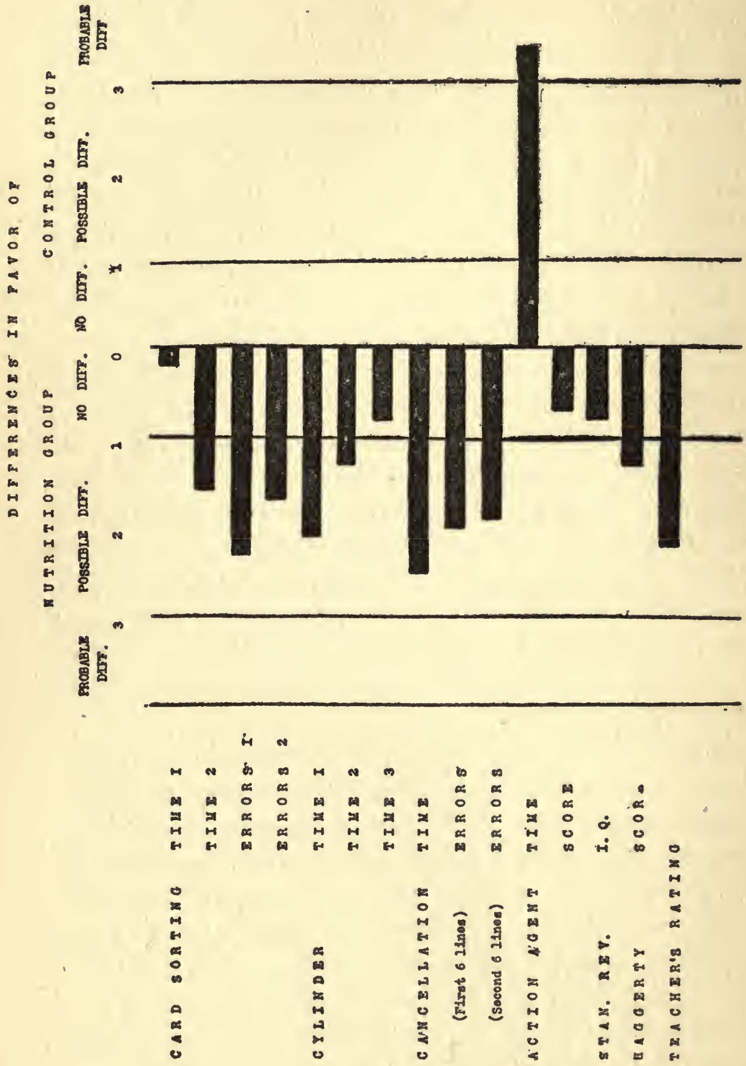

DIFFERENCES IN FAVOR OF
NUTRITION GROUP
CONTROL GROUP
PROBABLE DIFF.
3
POSSIBLE DIFF.
2
NO DIFF.
1
0
NO DIFF.
1
POSSIBLE DIFF.
2
3
PROBABLE DIFF
CARD SORTING TIME 1
TIME 2
ERRORS 1
ERRORS 2
CYLINDER TIME 1
TIME 2
TIME 3
CANCELLATION TIME
(First 6 lines) ERRORS
(Second 6 lines) ERRORS
ACTION AGENT TIME
SCORE
STAN. REV. I.Q.
HAGGERTY SCORE
TEACHER'S RATING

CHART 14.

Substitution.—In the Substitution Test no norms are available for half sheets, which seemed to be a desirable length to give these young children in combination with the other tests used during the period of time available for testing. There was wide variation in the time scores. The last line used as a memory test for 31 individuals was free from errors in 23 cases, or 74.2% of the group; 3 or 9.6% made 1 error; 2 or 6.5% made 2 errors; 2 or 6.5% made 4 errors; 1 or 3.2% made 5 errors.

We find that under conditions of work demanding maximal attention for the best records as to speed and accuracy, appreciation of relationships, and the control of associational responses, the group selected as undernourished make better scores than the Control Group. They also show greater improvement in reducing the amount of time required for repeated performances together with a higher degree of accuracy. Chart 14 shows the significance of difference between scores of the two groups.

Motor Coördination of Nutrition Group

Tapping.—In the Tapping Test on Single Plate there are marked individual variations as to total output and fatigue effects. The difference in actual taps between the first and third periods of 30 seconds averages 12.3 or a fatigue index of 4.3%, when this loss is compared with the total number of taps. This can not be directly compared with an index of fatigue determined by Gilbert for eight-year-olds, or by Wells for adults because of varying factors in

TABLE V

NUTRITION GROUP

First Grade

	Ship		Substitution		Target Score	Walking Board Total Steps Off	Dark Room Score
	Time in sec.	Score	Time in sec.	Errors			
A. B......	67	4	274	0	48	0	0
N. C......	70	0	240	1	45	5	8
B. D......	55	8	690	1	21	5	25
S. Fa.....	110	12	604	3	35	1	
J. Fa.....	28	6	329	1	43	0	2
S. Fi......	45	0	263	0	11	4	14
J. Fr......	120	15	612	1	67	3	
N. G......	60	8	290	0	41	0	2
P. G......	80	8	342	0	46	6	20
A. G......	40	6	290	0	78	1	13
B. H......	62	6	255	2	75	10	5
I. H.......	25	0	295	4	43	1	10
P. K......	57	10	500	18	25	5	4
J. K......	90	7	435	3	41	1	
A. K......	63	8	273	0	45	7	20
E. L......	80	15	385	11	11	13	22
L. Le.....	45	12	358	4	34	23	17
J. L.......	360	13	302	0	41	14	4
H. L......	150	10	240	1	57	0	26
I. L.......	50	0	285	2	48	6	2
L. Lu.....	85	0	332	4	15	6	0
L. M.....	133	8	550	3	49	8	0
M. M.....	60	10	325	3	39	1	0
L. P......	67	6	315	0	68	0	0
J. P......	65	18	230	1	47	4	32
M. R.....	122	18	315	0	36	1	
S. R......	43	5	285	1	21	5	1
N. R......	30	0	339	0	49	3	0
I. S.......							
H. Sa.....							
N. S......	35	4	306	1	64	3	6
D. S......	85	16	333	4	29	12	23
H. Sk.....	50	8	443	5	72	2	15
M. T.....	95	7	212	0	27	0	1
H. U......	98	0	435	1	59	2	0
N. W.....	72	6	311	11	38	0	28
J. Y......	45	0	249	5	52	8	0
No. of cases	35	35	35	35	35	35	31
Average...	78.34	7.26	349.8	2.31	43.43	4.57	9.68
σ.........	57.32	5.31	114.71	3.95	17.10	4.97	10.11
P.E.......	6.534	0.6053	13.077	0.450	1.949	0.5668	1.223

the procedure. The average total output for the first 30 seconds—99.8 taps—is 12.2 taps less than the score of 112 for 268 six-year-old city boys given by Pyle in the 1920 revision of his manual for the examination of school children.* The loss from the first to the second period and from the first to the third period is a valid difference, being more than three times the Probable Error in each case.

PROBABLE ERROR OF DIFFERENCE BETWEEN AVERAGES FOR TAPPING SINGLE PLATE

	P.E.D.	$\frac{D.}{P.E.D.}$
First 30 seconds—Second 30 seconds.....	3.269	3.319
Second 30 seconds—Third 30 seconds....	3.117	0.465
First 30 seconds—Third 30 seconds......	3.373	3.646

In Tapping on Double Plate the same loss is shown and again the differences are significant.

PROBABLE ERROR OF DIFFERENCE BETWEEN SCORES FOR TAPPING DOUBLE PLATE

	P.E.D.	$\frac{D.}{P.E.D.}$
First 30 seconds—Second 30 seconds.....	2.537	3.532
Second 30 seconds—Third 30 seconds....	2.436	0.472
First 30 seconds—Third 30 seconds......	2.522	3.096

* Miles, W. R., *Journal of Nervous and Mental* Diseases, 1919. Reduction in neuro-muscular activities is noted in subjects on low diet with loss of weight.

Six children of the same age from a private school averaged 138 taps in one minute or a score of 12 more taps than the average of 126 made by the Nutrition Group. No other data are available for comparison.

The fatigue effects as shown in the Single Tapping test were compared with the percentages underweight at the time of the test, and with the gains in weight during the period of the Nutrition Class from October to June. The five cases showing most fatigue made an average gain of 4.42 lbs., while the six cases showing least fatigue made an average gain of 3.43 lbs. The difference between these averages is 1.816 times its Probable Error.

At the time of testing seven boys in the most fatigued group had an average of 7.3% underweight, while the six in the least fatigued group averaged 6.3% underweight. The difference between these averages is 1.15 times its Probable Error.

The total output in the Tapping tests for Single and Double Plate forms was reckoned for groups having specific physical defects. Comparing these averages with those of the contrasting or normal group we find the differences shown in table on opposite page.

In each case those of firm muscle tone and without hyperactive reflexes make better averages than those defective in these respects. The variability is so great, however, the differences are of little significance.

Primarily to obtain some check upon the Double

	Muscle Tone		Reflexes	
Tapping—Single Plate	Poor	Firm	Hyperactive	Not Hyperactive
Number of cases	10	9	9	26
Aver. number of taps in $1\frac{1}{2}$ min	280	285.44	275.89	290.42
σ	45.15	52.45	45.75	63.42
P.E.	9.616	11.801	10.293	8.371
	$\frac{D.}{P.E.D.}=0.3573$		$\frac{D.}{P.E.D.}=1.0951$	
Tapping—Double Plate				
Number of cases	10	9	13	22
Aver. number of taps in 1 min	117.8	125.44	124.54	126.91
σ	24.28	20.462	21.307	26.37
P.E.	5.171	4.603	3.984	3.796
	$\frac{D.}{P.E.D.}=1.103$		$\frac{D.}{P.E.D.}=0.4307$	

Form of Tapping, correlation coefficients were computed.

Tapping—Single Plate with Double Plate	$r=0.436$
Tapping—Single Plate with Intelligence Quotient	$r=0.316$
Tapping—Double Plate with Intelligence Quotient	$r=0.204$

Target Test.—In the Target Test the boys of the Nutrition Group made a better score than nine children of same age in the private school.

TABLE VI

NUTRITION GROUP

First Grade

	Tapping, 30-second Periods, Single Plate				Tapping, 30-second Periods, Double Plate				Steadiness	
	S–1	S–2	S–3	Total	S–1	S–2	S–3	Total (1′)	Hole Cont.	Total, Cont.
A. B.	81	110	95	286				119	2_{10}	10
N. C.	80	65	74	219	52	47	49	99	3_{5}	9
B. D.	50	65	54	169	56	53	47	109	1_{4}	4
S. Fa.				334				135	1_{0}	0
J. Fa.	111	90	87	288	52	42	44	94	1_{3}	3
S. Fi.	102	93	85	290				127	1_{4}	4
J. F.				295				152	1_{12}	12
N. G.	108	92	97	297	71	68	59	139	1_{1}	1
P. G.	104	93	91	288	69	49	50	118	1_{7}	7
A. G.	112	80	70	262	85	66	60	151	1_{4}	4
B. H.	101	73	75	249	65	46	51	111	1_{6}	6
I. H.	70	80	60	210				122	1_{9}	9
P. K.	120	101	99	320	72	46	74	118	1_{4}	4

J. K.				285				111	1_2	2
A. K.	105	80	65	250	82	77	76	159	2_{11}	13
E. L.	103	100	101	304	61	60	71	121	1_2	2
L. Le.	130	113	116	359	66	50	55	116	1_8	8
J. L.	120	100	102	322	51	45	53	96	1_4	4
H. L.				410				181	2_5	5
I. L.	90	83	78	251	55	57	46	112	1_6	6
L. Lu.				290				121	1_5	5
L. M.	109	75	100	284	78	73	66	151	2_9	13
M. M.				300				146	1_3	3
L. P.	90	82	75	247	71	58	52	129	1_0	0
J. P.				353				156	1_2	2
M. R.				300				140	1_1	1
S. R.	100	110	100	310				160	2_9	11
N. R.	140	122	120	382	78	70	68	148	1_3	3
N. S.	75	55	63	193	38	31	32	69	0_0	0
D. S.	118	95	97	310	46	42	50	88	0_0	0
H. S.	73	75	77	225	52	47	39	99	2_{12}	17
M. T.	105	95	106	306	81	68	70	149	1_4	4
H. U.	95	75	73	243				93	1_4	4
N. W.	97	84	86	267				154	1_6	6
J. Y.	105	115	116	336	60	58	65	118	3_{11}	12
No. of cases	27	27	27	35	21	21	21	35	35	35
Average	99.78	88.93	87.48	285.54	63.86	54.90	56.05	126.06	$1.23_{5.14}$	5.54
σ	19.12	16.34	17.56	53.89	12.61	11.79	11.65	24.64	$0.63_{3.6}$	4.30
P.E.	2.485	2.124	2.282	6.143	1.853	1.733	1.712	2.808	$.0721_{.41}$	0.4904

TARGET TEST

	Nutrition	City and Country School
Number of cases	34	9
Average score	43.44	27.44
σ	17.35	16.92
P.E.	2.013	3.807
	$\frac{D.}{P.E.D.}=3.718$	

These groups are too unequal for valid comparison, but in these tests where no norms are established for children of this age indication of their relative performances in comparison with well-nourished children is of interest. In the Target Test they have a significant superiority.

Walking Board.—The average number of steps off in walking the length of the Board was 4.57, with a standard deviation of 4.97. The scores of five boys far exceeded those of the remainder of the group. Without their scores the average number was 2.93 and more nearly approaches the average score for five private school children of the same age, which was 2.6. A correlation of the scores for Walking Board and Steadiness (total contacts) gives r=.157, indicating slight relationship between the control of arm and finger movement and general bodily control for this group.

Steadiness Test.—The control of involuntary movements was poor as compared with the six children of same age in the private school.

STEADINESS TEST

	Nutrition	City and Country School
Number of cases	35	6
Average hole reached	1.23	1.17
σ	0.633	0.362
P.E.	0.072	0.1
	$\frac{D.}{P.E.D.}=0.487$	
Average number of contacts	5.14	3.33
σ	3.6	2.36
P.E.	0.410	0.649
	$\frac{D.}{P.E.D.}=2.356$	
Total contacts	5.54	3.83
σ	4.3	3.39
P.E.	0.4904	0.9322
	$\frac{D.}{P.E.D.}=1.623$	

Dark Room.—The ability to keep the arm still even when supported is a variable, so that we have nothing more than a suggestion of the reaction to the dark. There is a wide range of scores, and the average of 9.68 with a standard deviation of 10.11 is not representative of the group response. The correlation of these scores with the number of total contacts in the Steadiness Test is a negative one, r= −.161, but the correlation with the Questionnaire is positive, r=.321.

Questionnaire.—The average number of wrong answers to the questionnaire was 7.89 and is approximately 20% of the total number of questions. A summary of the information derived shows the following distribution of certain factors:

Only child	2
Fainted	1
Afraid of dark	17
Bites nails	10
Stutters or stammers	2
Twitches	1

FAVORITE GAMES

At School	*At Home*
cards	guns
soldiers	hide and seek (3)
in yard	ball (3)
robbers	robbers
circle games (2)	checkers (3)
tag (3)	lion and mouse
acting	soldier
cat and mouse	basketball
horses	blocks
hide and seek	fire engine
basketball	school
ball (2)	babies
puss in corner	pool
house	fireman
blocks (2)	circle games
bucking boy	auto

FEARS		FOODS DISLIKED	
dark	17	potatoes	3
thunderstorm	11	meat	7
crossing bridge over water	9	soup	5
lions	7	milk	2
water	6	oranges	2
bear	6	apples	4
robbers	4	sour apples	1
loud noises	6	coffee	3
rat	3	candy	4
horse	5	oatmeal	2

Fears		Foods Disliked	
negro	2	barley soup	1
noises in night	3	yellow food	1
dog	6	tea	1
wild dog	2	cream	1
wild animal	2	bananas	2
fire	5	tomato soup	1
crossing wide street	3	beets	1
big animals	1	cheese	1
black animals	1	sour cream	1
animals with big horns	1	cream cheese	1
tiger	2	black fruits	1
snake	2	canned salmon	1
nannie goats	1	canned tomatoes	1
Polack	1	water	1
going in subway	2	bones	1
automobiles	1		
cars	1		

The number of stutterers, 2, or 5.6%, is a much smaller percentage of the group than was found in a Nutrition Class with fifth grade boys the preceding year, when 5 out of 40, or 12½%, were stutterers. In the entire grouping of 75 fifth grade boys, including both a Nutrition and a Control Group, there were 11, or 14.7%, who stuttered. If we can begin early enough with such speech defects we may make headway towards the prevention of such handicaps which occur more frequently in these groups than previous studies would lead one to expect.

The number who bite nails, 10, or 28%, is again smaller than the fifth grade boys, where we found 14, or 35%, of the Nutrition Class who had the habit of biting nails, and 23, or 30.6%, of the entire group. With these first grade children, biting of the nails was caused in some cases by lack of scissors. Two boys spoke of trying knives and razors. Several said they would bite the nails off because the mother did not have time to cut them. In other cases there seemed to be an established habit of biting when restless.

The fears of animals predominate in the naming of fears. In several cases the animals mentioned had never been seen, as lion, wild animal, but descriptions by some child who had been to Bronx Park of their terrifying aspects, or else stories of them, induced the belief that they should be afraid of such. We learned that rats are a real source of annoyance and fright in many of the homes. Robberies are frequently staged in their block and exciting descriptions are often related to them of actual robberies. These facts were elicited upon inquiry as to the causative factors of the fears. Such factors also apply somewhat to other fears as of negro, of crossing a bridge and of lightning during storm. They are not pathological fears but natural fears caused by the stimuli that have been presented. The fear of the dark, however induced, is a real one in many cases. Three boys cried during the short period of 45 seconds during which they were in the dark room and when they knew adults were just outside the door. References to moving pictures, both direct and in dreams, also in play activities, indicate another source of fears. The social investigator reported that all of the children go to the "movies" on an average of once a week, and one boy was taken by his mother three times a week. As a group they do not give evidence of excessive emotional instability.

Summary

We do not recognize these groups as clearly enough differentiated from the standpoint of malnutrition to be representative ones for comparisons of the mental traits of the undernourished child with those of well-nourished children. The Nutrition and Control Groups, however, are similarly selected and are well differentiated in the beginning as to height-weight indices. It is also possible with many of the tests made to compare the undernourished child with standards already established on children of the same ages. It is true that we do not know in many cases how many children are 7% or more underweight in the groups used for obtaining the norms.

(1) In tests of general intelligence the undernourished children distribute themselves similarly to children of normal height-weight-age index. The central tendency is slightly higher than that of the Control Group and there are slight differences in variability. Children of high intelligence scores gain more under the Nutrition Class procedure than those of lower scores.

(2) In a learning series the Nutrition Group is superior to the Control Group both in speed and accuracy.

(3) In motor coördination and performance tests not involving uninterrupted expenditure of muscular energy such as Card Sorting, Aiming, and Dissected Pictures, the undernourished children make normal scores according to established standards and are superior to the Control Group.

(4) In rate of voluntary movements, both simple and complicated and continuous for an appreciably long period, the output for the first 30 seconds is less than that established for children of their age. There is no evidence of a higher fatigue index for the children in the Nutrition Group who are most underweight at the time of the tests.

(5) This group of undernourished boys shows sensitivity to emotional stimuli but not exaggerated responses to the extent of emotional instability.

CHAPTER VIII

INTERPRETATIONS AND RECOMMENDATIONS FOR A PROGRAM OF RESEARCH

Standards of Growth

It will be evident that our ability to evaluate results from our successive programs of experiment has been rendered problematical by the existing limitations of knowledge as to standards and laws of growth, and that a considerable amount of research must be completed in this field before the evaluation of returns from the health program can be placed on a scientific basis.

Seasonal norms must be determined. Such standards as we have are derived from measurements taken without regard to the factor of seasonal variation, which in the case of one of our classes was found to involve no less than 64.6% of the entire yearly increment in the four months from September to February. In view of the facts established by Dr. Porter's investigation and sustained by our experience, the need for seasonal norms becomes imperative.

Before such norms can be determined,* further month to month studies on large numbers of children are needed to secure more definite knowledge regard-

* Dr. Porter has already raised the question of the effect of seasonal variation on the weight and height for age of children born at different seasons of the year. Op. cit.

ing the periods of maximal and minimal weight increase.

Possible climatic variation affecting seasonal norms in differing localities must be anticipated. The causal factors of seasonal variation are unknown. The winter season and confinement within doors appear to offer at least partial explanation. If these are causal factors, seasonal differences established for Boston and New York will not be paralleled in places of such differing climatic characteristics as, for example Minneapolis, New Orleans, Los Angeles, Denver, and Portland, Oregon.*

The relation of the period of minimal weight increase to vitality should be determined for its bearing on the school calendar. This is a question of particular importance for school procedure and health. Does the period of minimal weight increase indicate physical depression? American school tradition considers winter the period for intensive work, and teachers generally depend on the months intervening between the Christmas holiday and the Easter holiday as the recognized period for speeding up the learning process. It will be apparent that the latter part of this period overlaps the season when in our Northern communities at least, the children are passing through the yearly period of minimal increase and, possibly, of corresponding decrease in vitality.†

* Huntington, Ellsworth, *Civilization and Climate*, Yale University Press, 1915.—Investigations of climatic influences on vitality as shown by industrial output are reported. See chart p. 66, where comparison is made with seasonal weight increase shown by tuberculosis patients in the Adirondacks.

† For a discussion of this hypothesis see Huntington, Ellsworth, op. cit. pp. 88-89.

In this connection we may call attention to the slightly accelerated height increase indicated by our data (see p. 133) as coincident with the period of minimal weight increase.* Had Dr. Porter's data on Boston school children shown a corresponding acceleration in height increase at this period, the idea of decreased vitality might be dismissed on the assumption that increase in height is equally indicative of vitality, and that periods of height and weight increase are alternating. Previous to the publication of his initial report, however, Dr. Porter had found no indication of seasonal variation in height increase.

The relation of height increase to vitality and nutritional condition should be more definitely determined. It is common experience that periods of accelerated height increase are attended by a decrease in the proportion of weight for height, but existing standards make little allowance for a range of variation at such periods, or for a range of variation in individuals of exceptional height for age. That exceptional height for age may constitute in itself an index of better nutritional development, is a theory that seems sustained by the greater height development of the more favored economic classes the world over, as compared with peasantry and poor of the same racial stock. Schiötz † has shown that among Norwegian children this height superiority of

* This is in accordance with the conclusions of Godin that growth takes place by alternating periods of height and weight increment. Godin, P., *Growth During School Age,* Richard G. Badger & Co., pp. 106-107.

† Schiötz, Carl, *The Development of Children between the Ages of Two and Six Years,* Pedagogical Seminary, December, 1920, pp. 371-397.

the favored classes is attained by the third year of life and is almost invariably attended by a comparative "emaciation" or decrease in the proportion of weight for height. In his opinion this condition is the outcome of better nurture and is indicative of an accelerated total development, mental as well as physical. Thus it is even possible that early development in height due to a nutritional status above the average may account for a certain percentage of the underweight reported among children from well-to-do homes in this country.*

It is probable that the percentage underweight which may be considered as constituting malnutrition varies at differing age periods and must be determined with special reference to such periods. Further studies of weight and height increase at the age of school entrance, at the period of the second dentition and at the periods of prepubertal and post pubertal development may modify our present static standards of underweight, 7% or 10%, as previous studies have identified the several age periods of growth.

In a population of mixed racial stocks height-weight standards must allow a sufficient range of variation to provide for differing racial characteristics. The school population at P. S. 64 presents a good illustration of racial variation differing from accepted American standards. Where children of similar stocks and of other stocks presenting as distinct characteristics are distributed through hetero-

* For a discussion of height development as an index of nutriional status see Benedict and Talbot, *Metabolism and Growth from Birth to Puberty*, Publication 302, Carnegie Institution of Washington, 1921, pp. 72-75.

geneous school populations, the significance of their variation from American standards is in danger of misinterpretation. Studies of growth with special reference to racial antecedents are needed before the necessary data as to the range of such variation can be determined.

It will be evident, however, that norms derived from school populations where economic and social conditions are as inadequate as those found in the community surrounding P. S. 64 cannot be considered true norms of the racial stock represented, and if progress in national health is to be our aim, *norms of well-being rather than numerical averages should eventually be our determining standards.* Some modifications of the earlier height-weight-age scales have already been made on the basis of school populations specially selected as representative of well-developed children of American parentage.* Further modifications in the same direction may be expected as the result of recent studies.† Children of foreign parentage no less than those of American stock should be held up to standards of well-being derived from measurements on *well-developed individuals* of their own racial stocks.

The susceptibility of the average family and racial standards to improvement is a fact that has yet to become a part of national and individual thinking. Even a few years, however, may bring very radical changes in our conceptions as to the possibilities of such improvement. It is, for example, by no means

* Baldwin, Bird T., *Physical Growth and School Progress,* U. S. Bureau of Education Bulletin, No. 10, 1914.

† For a discussion of "Normal average, and ideal states of nutrition," see Benedict and Talbot, Op. cit., p. 69.

clear how far the facts of seasonal variation uncovered by Dr. Porter must be accepted as natural laws of growth, and how far they may be attributed to inadequate environmental factors affecting the development of the great majority of Boston children of school age. *Month to month studies of even a small group of children living under corresponding climatic conditions but in carefully controlled environmental surroundings* might offer valuable suggestions in this direction. Certainly we must concede that the present scale of living in the great majority of homes is decidedly below the optimum so far as habits regarding food, fresh air and sleep are concerned.

Causal Factors and Individual Response

The importance of environment and the scale of living must not lead us to ignore the part played by other factors in causing underweight, and the significance these may have as determining relative success or failure in securing gains. It will be evident that the children in the groups studied by us exhibited a wide variation in their response to the program of treatment. *While response for the individual was largely dependent on the circumstances of his environment and the extent of his coöperation, his ability to respond was conditioned by the causal factors of his underweight.* These causal factors may be classified in at least five groups, and it is probable that any study of underweight school children comparable with ours as to numbers, will have to deal as we did with representatives from each group.

(1) Children showing results of faulty hygiene and diet due to home ignorance or lack of control. Probably a considerable majority in any school population.

(2) Hungry cases—candidates for relief and occasional cases where individual or parental idiosyncrasy prevents adequate food intake.

(3) Children showing unusual fluctuations because of special circumstances as in the case of convalescents.

(4) Children having wasting diseases, probably in the incipient stage. Pre-tubercular cases were fairly numerous in our experience and the possibility of such maladies as syphilis, diabetes, chronic nephritis, malaria, intestinal parasites, must always be reckoned with.*

(5) Children showing a past history of chronic nutritional disorders or of diseases commonly resulting in impaired nutrition. The so-called "children's diseases" are responsible for many such disorders. Premature birth, malnutrition of the mother during pregnancy, difficult feeding in the first year of life, severe repeated gastro-intestinal attacks, may all result in chronic impairment of the nutritional processes. Change or deficiency in some of the internal secretions may be cited in connection with this type of causal factors. It will be evident that a number of the children treated in our open-air classes belong to this group.

Throughout our experience the ability to respond has been pretty consistently demonstrated to be

* See Smith, Charles Hendee, *Methods Used in a Class for Undernourished Children,* Am. Jour. of Diseases of Children, June, 1918.

greater on the part of children in the first three groups than among those of groups 4 and 5. At the same time the majority of the high percentile cases have been found among the latter groups and the records of our lower percentile cases show for the most part better average gains in proportion to better nutritional status. (See pp. 134 and 151, discussion of relative gains and varying degrees of underweight.) Thus the facts of our experience do not at first glance support the assumption held by many social workers, especially those connected with orphanages and temporary homes for neglected children, that the high percentile cases respond more readily, and that results of treatment are less evident as children approximate normal weight. If allowance is made, however, for the probable difference in the response afforded by high percentile cases from group 2 (hungry cases), and by high percentiles from groups 4 and 5, this apparent discrepancy is easily reconciled. Statistical data from relief agencies whose cases are largely drawn from group 2 would doubtless only serve to confirm our experience that *causal factors rather than degree of underweight determine the individual ability to respond.*

Major defects may be contributing factors and as such influence response. The effect of tonsil and adenoid obstructions on individual ability to respond has been amply demonstrated. Our experience can be said to offer nothing new in respect to these defects except as it argues success for securing such treatment through the agency of the school.

The interrelation of dental caries and malnutri-

tion needs to be more definitely determined. The theory that malnutrition is a cause and an important cause of dental caries, though highly probable and widely accepted has never been conclusively proved. On the other hand, the lack of obvious results in weight increase attending correction of the defect, apparently disproves the theory that dental caries is a chief causal factor of malnutrition. For these reasons health workers have often minimized the importance of dental caries, but in the absence of conclusive proof to the contrary, its possibilities as a contributing factor to the condition of malnutrition cannot be ignored. We must assume that in addition to diminishing chewing surface, its presence may lower general vitality and powers of resistance, either through the introduction of toxins into the system or by presenting possible sources of bacterial infection.

Previous duration of the condition of malnourishment may be to some extent an index of the response to be expected. Where the physical examination reveals signs of rickets or other of the nutritional diseases of infancy, we may be justified in expecting relatively better response from the first grade child than from the sixth grade child, for example. The response shown by our first grade children may be partly explained by this assumption * and the growing emphasis placed by physicians on corrective work for children of pre-school age becomes of additional importance if it be true.

* That long continued or extreme conditions of malnourishment may result in actual organic changes has been shown by the recent investigations of von Pirquet in Vienna. A remarkable elongation of the intestine was found in children subjected to famine conditions.

Moreover, *undiagnosed conditions of disease and physiological facts as yet but little understood must be anticipated as possible causal factors.* The group of chronic underweights reported in our open-air class of 1919-20 for whom no diagnosis was obtained, and who failed to respond in any degree to treatment, are representative of these problem cases whose causal factors need to be determined by further medical research.

That undiagnosed incipient tuberculosis may constitute a causal factor in a large percentage of malnutrition cases is a theory advanced by some physicians. The routine use of von Pirquet Tests on large groups of underweight children should furnish data to confirm or refute this hypothesis, as comparison with the percentage results previously obtained by the same tests on average school children, would establish the relative frequency of positive reactions among the underweight group.

At the same time, it is to be hoped that further research may be successful in determining the relation of diet as a predisposing factor to tuberculosis. The experience of the war has amply proved that insufficient diet is followed by corresponding increase in tuberculosis, but has thrown no light on the relative part played by lowered caloric intake, and the deprivation of special food factors as fats, vitamines, and mineral constituents, as lime or phosphorus. Careful laboratory experiment along this line of inquiry should yield important results for the preventive program.

Latent syphilis has been reported as a causal factor in a considerable percentage of cases treated at one clinic, and further research may establish that this is a causal factor in a much larger number of cases than is now generally recognized.

It is probable that better knowledge of the part played in metabolism by the ductless glands would throw light on many problems of malnutrition. For example, the question may be raised whether an increased thyroid activity was not involved in the case of the underweight children from the Terman classes (pp. 29 and 54).

The part played by emotional disturbances and their effect on digestion has been pretty thoroughly demonstrated by laboratory research,* and the testimony of nutrition workers corroborates its importance in cases where unwise discipline, family friction or worry are characteristic of the home environment.† The fluctuations shown by the growth chart of the fifth grade (p. 86) indicate probable effects of worry or excitement during examination week and parade week.

The scientific interest attaching to these little known factors and the variety of the morbid conditions affecting nutrition must not mislead us, however, in regard to the large percentage of "straight" nutritional cases whose response is dependent on the facts of their daily régime. For obvious reasons we may expect the relative percentage of such children to be greater in the school nutrition class than in the hospital clinic. The facts of the physical examination and the investigation of individual his-

* Cannon, W. B., Op. cit.

† Mitchell, David, *Malnutrition and Health Education*, Pedagogical Seminary, March, 1920, pp. 65-66.

tory should serve to identify the majority of children with one of the five groups enumerated, at the outset of any nutritional program, and provide suggestions as to individual modifications with respect to physical care and régime. Stool and urine examinations should be included wherever possible as an aid to diagnosis.

Further stool examinations on large numbers of undernourished children should be undertaken to determine the frequency of special types of indigestion and for further investigation of parasites. Such a piece of research would undoubtedly afford suggestions as to corrective and preventive procedure with children from Group (1) as well as from Groups (4) and (5). Further urine examinations for large groups of underweight children should prove helpful in disclosing latent disease in relation to malnutrition.

Psychological Implications

It is often stated that a causal relationship exists between mental defectiveness and malnutrition. Bryant * says "the relation of malnutrition to mental defectiveness has long been given substantial recognition both here and abroad in the provision of lunches in special schools for subnormal children." The most frequently used method of determining this relationship in the investigations cited by her has been the calculation of the percentage of mental defectives that show malnutrition. In some cases the criterion of mental defectiveness was failure to be promoted, and no other factors such as

* Bryant, L. S. School Feeding, J. B. Lippincott Co., 1913, p. 225.

specific physical disabilities or attendance were considered as causal in the retardation. If one were looking for the percentage of malnutrition in very bright children, and should take from psychological data obtained in the investigation of large groups of school children the scores of those 7% or more underweight, we might have a very different story. The "pale brow of the scholar" would doubtless get some statistical justification.

In the Terman * class, a group of high intelligence quotients, there was a smaller per cent of children 7% or more overweight and a larger per cent of children 7% or more underweight than in any of the other classes studied during that year (1918).

Discussing the possibility of mental defect being caused by defective bodily nutrition and the dependence of the physical health and development of the growing child upon the quantity and quality of his food, the presence of an adequate amount of sleep, fresh air, light, warmth, etc., Tredgold † states that "on the whole it may be said that these factors in the absence of hereditary predisposition have comparatively little causal influence . . . rickets is sometimes the accompaniment of mental deficiency but I doubt whether it is ever its cause."

Blanton ‡ made a study of the mental and nervous conditions of school children between the ages of 5½ and 14 years, 40-50% of whom were supposed to have suffered from malnutrition for a period of two

* See p. 60.

† Tredgold, A. F., *Mental Deficiency*, Wm. Wood, 3rd Ed., pp. 63-64.

‡ Blanton, Smiley. *Mental and Nervous Changes in the Children of the Volks-schulen of Trier, Germany, Caused by Malnutrition.* Mental Hygiene, July, 1919.

or three years. He made no careful mental measurements but depended primarily upon clinical examinations, observations in the schoolroom and personal histories given by families and teachers through an interpreter. He concludes that "Children free from organic nervous disease and with parents of average intelligence very rarely become feeble-minded through malnutrition even of an extreme degree." One of the most important things shown in this whole study is how the nervous systems of children of good nervous stock can resist malnutrition of an extreme degree extending over three years.

We believe that the more direct method of attack is the better. We should like to see the problem followed up by careful measurements as to intelligence levels, reaction times, attention, and memory spans, motor control and the learning process upon children who are chronically underweight to the extent of 15% or more, with a control group of children whose height-weight indices are normal or above normal. This should be done for varying ages. Do we know that 15% underweight at 7 means the same thing as 15% underweight at 11 or at 17? With the present trend toward exact physical and mental measurements of all children, not neglecting the normal child who has seemed primarily a statistical will-o'-the-wisp, we can best develop criteria of malnutrition. Aside from extreme cases of malnutrition, of prolonged hunger or starvation which like other pathological states would cause disintegration, we cannot say that malnutrition irrespective of other factors produces or runs hand in hand with mental defectiveness. In many types of mental processes the reactions of the undernourished child are equal or superior to the average of his age group. The traits in which he may prove less capable seem to be resistance to fatigue under response to uninterrupted or complex stimuli, and exaggerated emotional responses under normal stimulation. A problem worthy of study both for the undernourished and for the hearty child is fatigue with special reference to the period of recovery.

F

Chart of low percentile case showing excellent response. Boy 6 yrs. of age, Austrian father, Russian mother. Underweight 8% Sept. 1919; 2% May 1920; normal weight Sept. 1920. *Physical history* shows measles (8 mos.), anti-toxin given for suspected diphtheria, bad tonsil condition. *Mental history* shows high intelligence, I. Q. 126 (Terman). *Social history* shows father short, medium build, mother medium height, plump. Family of 8; flat of 5 outside rooms, 6 windows. Comfortable well-kept home, mother a "good cook," *Note*: a case of special interest where the child's determination to follow an imposed régime resulted in later enlistment of the mother's coöperation. Tonsillectomy recommended Oct. 1919; performed Dec. 1920.

H

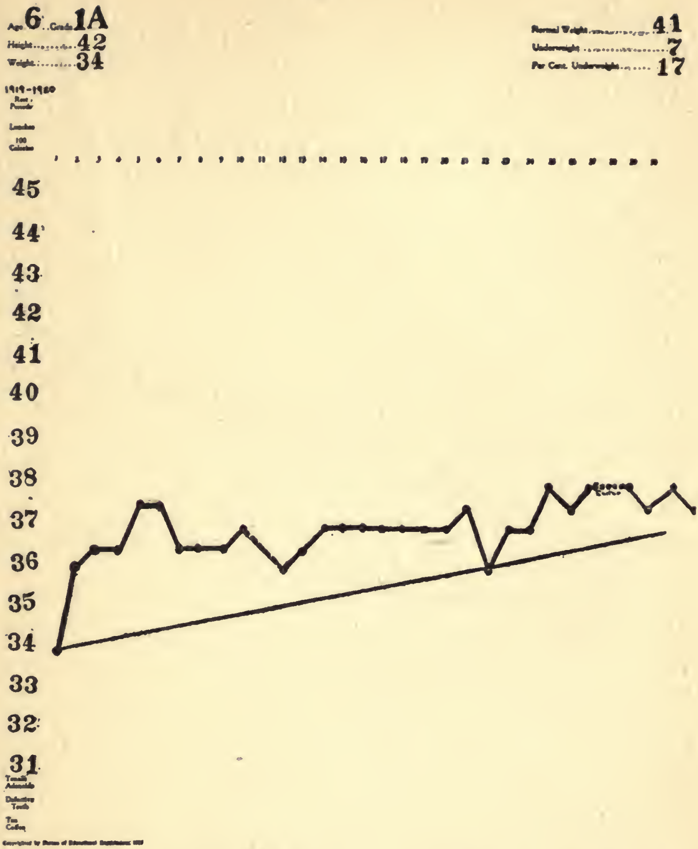


Chart of high percentile case showing unsatisfactory response. Boy 6 yrs. of age, Austrian parentage. Underweight, 17%. Sept. 1919; 12% May 1920; 16% Sept. 1920. *Physical history* shows measles (2 yrs.) chicken pox (3 yrs.) "convulsions" (2-4 yrs.), chronic digestive disturbances apparently due to unwise home régime, especially as to habits of eating. *Mental history* shows I. Q. 91 (Terman). *Social history* shows father thin delicate type, mother 5 ft., 7% underweight; family of 6; flat of 4 small rooms, ground floor, poor ventilation. Entire family suffering from digestive troubles: *Note*: lack of home coöperation and duration of unsatisfactory conditions seem responsible for failure to improve.

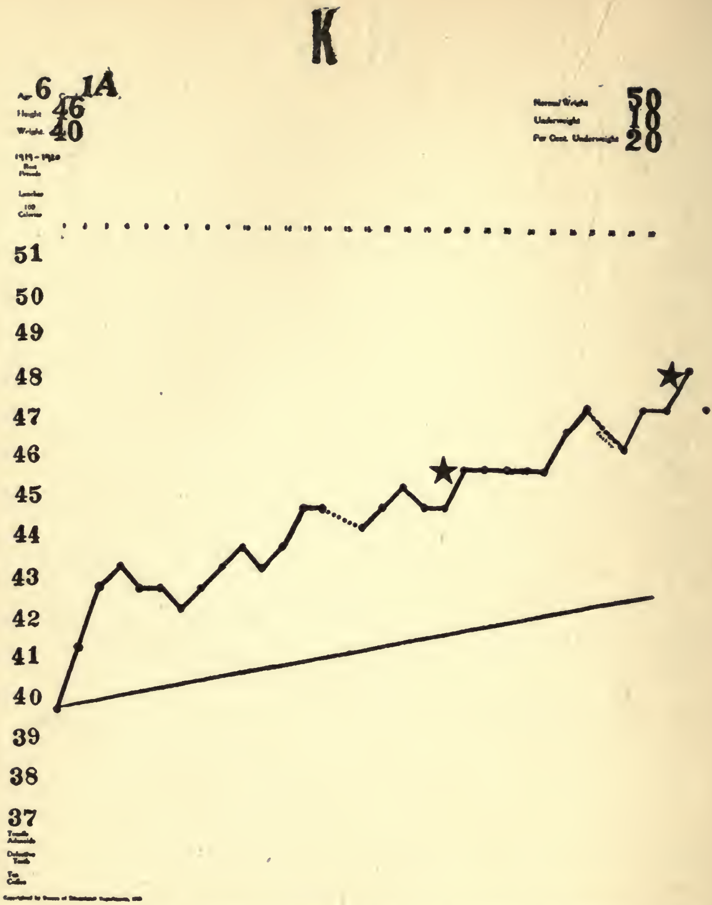


Chart of high percentile case showing unusual response. Boy 6 yrs. of age. Father Russian Pole; mother, Austrian. Underweight, 20% Sept. 1919; 9% May 1920; 9% Sept. 1920. *Physical history* shows small size at birth (4½ lbs.), measles (1½ yrs.), whooping cough (5 yrs.), German measles (5 yrs.). *Mental history* shows I. Q. 108 (Terman), evidences of emotional instability. *Social history* shows parents divorced, mother and child living with grandparents, mother 5 ft. 2 in. tall, 13% overweight, only child, family of 9 adults, flat of 5 rooms, fairly large, all outside windows; comfortable economic circumstances. *Note*: Coöperation of mother and child successfully enlisted.

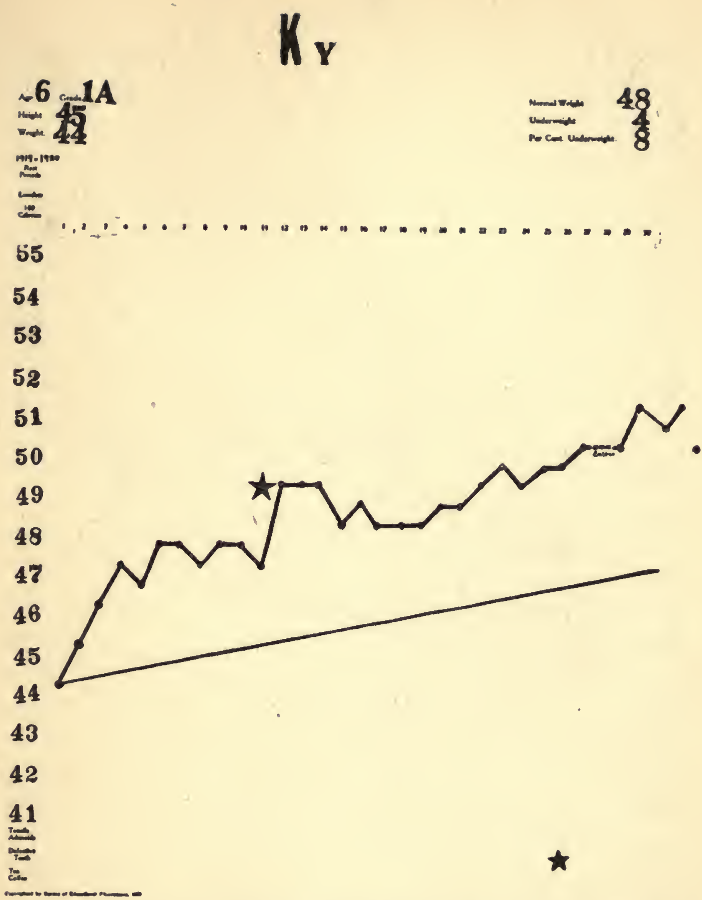


Chart of low percentile case showing excellent response. Boy of 6 yrs. of age. Russian parentage. Underweight 8% Sept. 1919; 2% above normal May 1920; 2% below normal Sept. 1920. *Physical history* shows whooping cough (8 mos.), measles (1 yr.), pneumonia (2 yrs.), tonsillectomy (5 yrs.). *Mental history* shows I. Q. 104 (Terman). *Social history* shows father short, 5% overweight; mother short 13% overweight; family of 6; flat of 4 rooms, light, well-ventilated, well-kept. *Note*: Coöperation of parents willing but rather unintelligent.

R

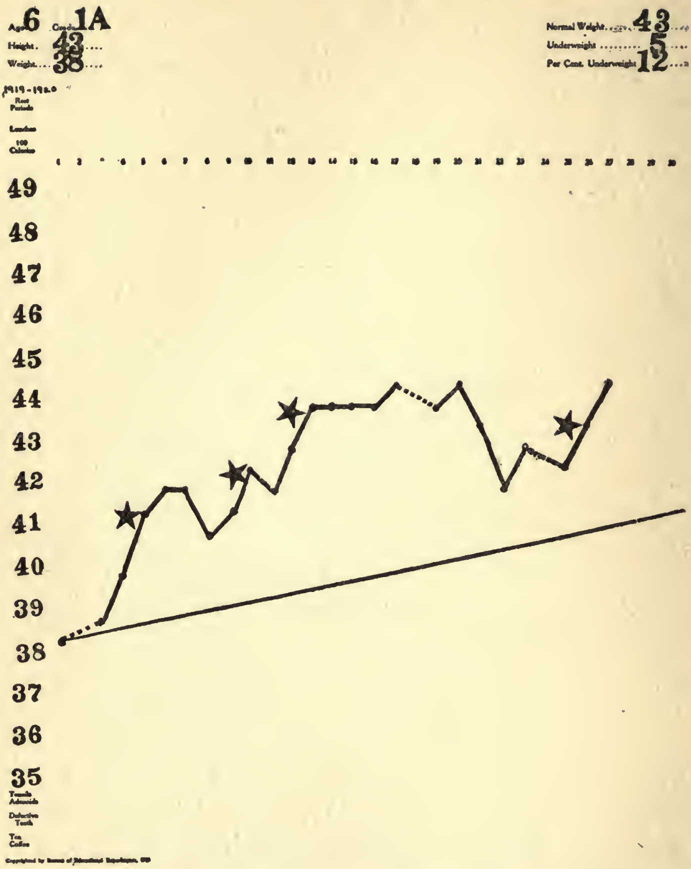


Chart of case 12% underweight showing excellent response. Boy of 6 yrs. of age, Russian parentage. Underweight 12% Sept. 1919; normal weight May 1st, 1920; 4% underweight Sept. 1920. *Physical history* shows diphtheria (3 yrs.); measles (4 yrs.); chicken pox (4 yrs.); frequent sore throats due to enlarged tonsils, cardiac symptoms, imperative need of dental care. *Mental history* shows I. Q. 92 (Terman). *Social history* shows father short (5 ft.), slight (circ. 6% underweight); mother, medium height, normal weight. Family of 7; flat of 4 rooms; all windows on a court. A comparatively comfortable, well-kept home. *Note*: Coöperation of parents resulted in correction of dental defects and tonsillectomy.

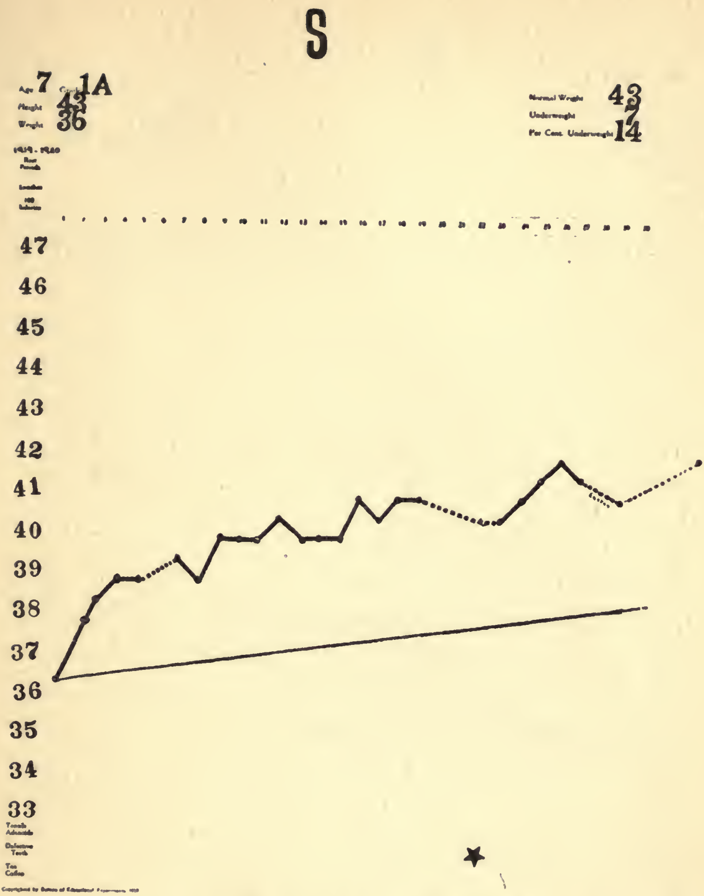


Chart of high precentile case showing unsatisfactory response. Boy 6 yrs. of age, Russian parentage. Underweight, 16% Sept. 1912; 11% May 1920; 8% Sept. 1920. *Physical history* shows small size at birth (4 lbs.) pneumonia in infancy, adenoid operation (3 yrs.); bronchitis frequently, cardiac symptoms present. *Mental history* shows I. Q. 108 (Terman). Evidences of nervous instability and development of chorea. *Social history* shows father short (5 ft.), 10% overweight; mother, medium height, overweight. Family of three; flat of 3 rooms, 1 northern exposure, 2 on court. Home fairly comfortable and well-kept. *Note*: Primarily a medical case. Coöperation of mother unusually good. Hospital care for chorea began July 1920. Child kept constantly in bed, did not return to school 1920-21.

Sn

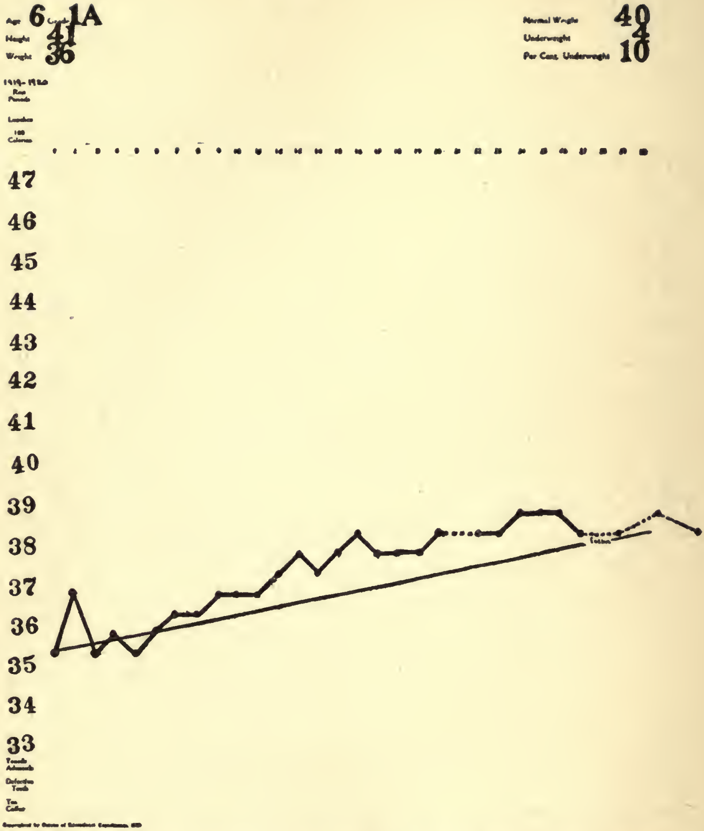


Chart showing failure to respond. Boy 6 yrs. of age. Russian parentage. Underweight, 10% Sept. 1919; 9% May 1920; 11% Sept. 1920. *Physical history* shows small size at birth (3½ lbs.); he was the smaller of twin brothers; 14 months teething; chicken-pox (1½ yrs.), measles (2½ yrs.), *Mental history* shows evidences of retarded development and infantile attitudes. I. Q. 77 (Terman); has failed of promotion during two years of schooling. *Social history* shows father short (5 ft.), normal weight for height; mother 5 ft., 21% overweight for height; family of 7; 3 adults, crowded home, 3 small rooms opening on court. *Note*: coöperation of mother willing.

CHAPTER IX

INTERPRETATIONS AND RECOMMENDATIONS FOR AN EDUCATIONAL PROGRAM

When we review the experiment at P. S. 64 in its entirety and contrast the program offered by the nutrition class with the traditional school attack on health problems, the emphasis placed on demonstrable results for well-being must be recognized as the outstanding contribution the experience has afforded toward the conception of a general educational procedure. *That health education must be rendered susceptible of evaluation is the challenge of the nutrition class to the school.* All the difficulties encountered in our attempt to secure appreciable results and to evaluate them correctly do not lessen this emphasis on their importance for the positive health program.

Principles Determining Results

It will be evident therefore that whatever additional suggestions the experience may offer toward the shaping of a school health program must be determined in accordance with this first and fundamental consideration of returns secured. If we subject our record to the test of appreciable results, what principles emerge as governing the success of an educational procedure for health making? Apparently we must concede the importance of the following:

Gains have been largely dependent on initial physical status and proportionate to the relatively superior or inferior condition of the individuals considered.

Gains have been largely influenced by the technique employed for enlisting coöperation from the children.

Other conditions being equal, gains have been in direct proportion to the influence exerted on the home and the resulting parental coöperation.

Gains appear to have been appreciably increased when favorable conditions directly affecting the nutritional processes have been introduced within the school environment.

The first of these tentative findings is of special significance for its bearing on the possible value of our procedure as a preventive program by which the well-being of the normal child may be increased. Certainly the results shown in those groups most carefully observed by us suggest that *so-called normal children, and children approximating currently accepted norms may benefit by the procedure in proportion to their superior physical condition.* The comparative gains made by Sections I and II of the fifth grade boys may be cited in this connection. It has been shown (p. 154) that the 22 children of this class who "graduated" in the fall of 1918 (Section II) averaged in two years a gain of 3.6 pounds more than the Wood norms and of 4.1 pounds more than the Porter norms for boys of their age and height. This is an average of 2.61 pounds more than that gained by the remaining members of the group (Section I) who were children averaging a greater degree of underweight and who gained in the same period an average of .99 pound more than the Wood norms and 1.49 pounds more than the Porter norms. Similarly, Section I of the first grade children (1919-20 program) those 8–9% underweight gained an average of nearly 5 pounds more from October to October than the children of the sections respectively 10–12% and 13–20% underweight.

The record of gains shown by the fifth grade boys at the end of two years, fourteen months after the period of their instruction had been discontinued, is one of the most striking facts of the entire experience.* It is unfortunate that corresponding fol-

* As the great majority of the children considered were of Jewish-Russian or of Jewish-Austrian parentage the question of racial or stock variation in relation to physiological age may be raised in connection with these figures for gains between 11 and 13 years of age. There are, however, no existing norms from which we may determine how far earlier pubescence and attendant variations in height and weight must be considered. The weights of 686 Jewish boys 14 years of age who were granted working papers in New York City between July, 1914, and April, 1915, were found to average 2 pounds above those of 14 year old boys of other racial antecedents (Frankel and Dublin, *Heights and Weights of New York City Children*, Metropolitan Life Insurance Co., 1916). This average was obtained, however, without discrimination as to national antecedents, whether Jewish-German, Jewish-Russian, Jewish-Polish, or other, and beyond raising the question of racial variation and physiological age throws no light on standards for Jewish-Russian and Jewish-Austrian boys between the ages of 11 and 13.

Twenty-five boys of our Control Group, organized in September, 1918, were observed through 18 months, to June, 1920, during which period their average weight closely approximated the Burke-Boas norms for the given heights from 11 to 12½ years. The gain averaged by the Control Group for this period was 12.11 pounds, that of Section I, 12.25 pounds or .13 pound more than the control and that of Section II 15.37 pounds or 3.26 pounds more than the control. Thus at 12½ years the average gains of Section II in excess of the control group do not differ materially from the gains shown by them six months later (3.6 pounds) in excess of the Wood norms. From the data available it would appear that the superior weight increase of this group was presumably due to a better régime.

low-up records were not attempted for all our groups especially for the children of the open-air and Terman classes, for the possibilities they might have afforded for further suggestions as to comparative long term results. It will be evident, however, that a procedure affording gains for children who approximate normal development, and resulting in continued gains subsequent to the period of instruction, is calculated to meet the fundamental requirements of the educational ideal, a health program that shall combine preventive possibilities with those more immediate and corrective in character.

The technique for enlisting group interest and action must be the first consideration in the conduct of the health procedure. Save for the attempted school feeding program of the first term and the provisions made for our open-air classes, it will be obvious that the actual school programs arranged for our several groups were negligible so far as they afforded opportunity for actual food-taking, rest, sleep, fresh air, and the other details of the health régime. Thus any results from our procedure were chiefly secured by its provision of a sufficient stimulus to ensure the child's coöperation in carrying out the prescribed régime at home and elsewhere in the outside environment. That this is the real function of the class instruction in the nutrition program is a point too little understood. Indeed the subject matter content is too often accepted as its more obvious raison d'être, and the relative value of class and individual instruction is sometimes debated by physicians and nutrition workers, who fail to appreciate that the appeal to group and social interests afforded by the class sessions is what determines their importance rather than their informational character.

The appeal of the class session rests on two important characteristics of the child's psychology, the desire to conform to group standards and the desire for full participation in the activities of the group. The health procedure can and should utilize these native desires for its own purposes. Evidently the disciplinary difficulties met with in our initial program were largely due to disregard of them, especially to failure to appreciate the child's proper aversion to being singled out as different from his fellows. So far as our later programs have been successful in identifying the health procedure with recognized group standards and with the customary group activities of the class-room, our position has been correspondingly strengthened. We can appreciate, however, that a health program recognized by the entire school would have, by virtue of that fact, greater significance for the enlistment of the child's coöperation than a program limited to any class or several classes within the school. That the socialization of the class procedure, and the resulting more active participation permitted the individual, has played its part in securing interest and increasing coöperation in our two later programs, will also be evident.

Evaluation of success and failure for the child must be measured by his coöperation and by individual gain in fitness rather than by his comparative gain in relation to that of his fellows. Attention has already been called to the fact that the original idea of stimulating competition between the members of a class was modified, and later entirely discarded by us, with no loss to the effectiveness of our procedure. So many factors enter into the problem of health that failure to gain or to keep up to standard may result from many causes over which a child has no control. On the other hand, he may show gains by reason of individual endowment while refusing coöperation. To emphasize failure after he has coöperated to the best of his ability, to reward him for gaining when he has not really coöperated are mistakes as unfortunate from the educational as from the moral standpoint, for they are fatal to the continuance of interest and effort. They are, however, the unavoidable accompaniments of the appeal to competition. The situation here is not different from that attending other school activities. Unequal physical endowment is on a par with unequal mental endowment. One of the chief dangers of the appeal to competition is its possible effect on the children of less fortunate endowment. Among individuals of certain nervous organization we may even establish a sense of inferiority with its train of consequences, from apparent indifference and apathy to open rebellion and misdemeanor. The seriously retarded children whose presence in the regular school grades is so universally disturbing to discipline, sufficiently illustrate the seriousness of this problem. Our health procedure must not be allowed to increase the number of irreconcilables within the school. It must ensure to the individual the satisfactions and rewards of his endeavor.

Again, *the child must be held responsible only for* *his coöperation in such activities as his environment affords. The program of instruction that demands from him coöperation he is unable to give, or fixes responsibility on him for environmental conditions he is unable to control will not succeed, however informing or stimulating to action it may be.* Our health program therefore must go beyond the limits of the school environment and the school day. It must make a consistent attempt to secure home conditions that permit the stimulus of the class procedure to function in the activities of the prescribed régime. Thus *the success of the school program of health education is dependent on a serious program of education in the community.* The facts of our experience amply testify to the dependence of success on the coöperation of the home, and it may be well to consider the relative position of the school as an agency for securing coöperation of this kind. Where a corrective procedure is undertaken the school is doubtless at a disadvantage when contrasted with the hospital clinic, not only because its opinion in matters of health does not command the same deference, but from the additional circumstance that the parents asking assistance from the hospital are seeking that assistance primarily because they are aware of the child's need. They are from the outset prepared to accept advice; and the same is true of the parents who, by seeking the assistance of welfare agencies, acknowledge their own inability to supply the necessary conditions for the family's well-being. When the school enters the field, however, it must assume the initiative; it must be the first to apprise many parents of the fact that all is not well. The first intimation that the child is not entirely sound may be the visit of the nutrition worker and the request for the stripped examination by a physician at the school. Malnutrition to the parents in the neighborhood of P. S. 64 is merely the state of being "skinny" and if any relative, near or remote, has been lank or simply unusually tall, this fact has probably been a sufficient answer to any suspicion that a child's small appetite or flabby muscles might indicate ill health. Under such circumstances we must expect that the necessary home coöperation will be difficult to secure. Indeed, our experience seems to show that it cannot be secured without a campaign of patient and consistent effort. Nor is this all, for where progress is slow and discouraging the hospital and social welfare agency may lose the patient. Cases that do not respond, parents that refuse coöperation, inevitably drop from their rolls, but such is not true of the public school. The chronic case, the unadjusted child, the child from the ill-regulated home, will still remain members of the school population; and their records will inevitably contribute to lowering the sum total of results obtained.

Our experience has been limited to the demands of a corrective procedure but it will be evident that an extension of the health program to include normal children and a preventive procedure, must be accompanied by a corresponding extension of the community program. Difficult as the school may find it to enlist the coöperation of parents whose children are normal, whose economic circumstances are independent and assured, it is the one community agency that can attempt to do so. In a program of health education, more clearly perhaps than in any other, the futility of thinking and acting by different standards becomes apparent. In so far as home standards and practices remain at variance with the standards for health habits presented by the school to the children, appreciable results are not to be expected. While it is true that individual children in our experience succeeded in enlisting for themselves the necessary coöperation from their parents, and modifying their home environment to some extent in accordance with the ideals of our health teaching, such cases were few and chiefly confined to the children of superior intelligence. Unquestionably we may expect that a degree of influence will be exerted on the home where the interest of the children has been enlisted. That it will, unaided, suffice to achieve definite results in the great majority of cases appears improbable, and from the larger educational viewpoint undesirable as well. Intelligent adult control of the environment is the goal to be achieved, not dictation to the adult by the child. The function of the school must be to inform and enlist the adults of the home, and at the same time to reinforce intelligent control within the home, through use of its unequalled opportunities for enlisting the child's coöperation.

The efficiency of the health program will be appreciably increased in proportion to the advantageous factors, that is the activities and conditions favorably affecting the nutritional processes, provided by the school environment. It is to be regretted that our series of experiments cannot furnish more varied and convincing examples of such activities and conditions and of their influence on results. The conditions attending the mid-day dinner of the first experiment prevented our realizing appreciable gains from that source. There is some probability, however, that the mid-morning lunches served during the same term appreciably increased the gains and are responsible for the relatively good showing made by our first classes at the least favorable season of the year as compared with that of the fifth grade children during the same season a year later.

The contrast between the results achieved by the open-air classes during the fall months of 1918 and those shown by the fifth grade for the same period is the best example our records afford as to the influence of factors favorably affecting nutritional processes. Optimum conditions of ventilation, sunshine, facilities for rest and food-taking, general relaxation of the usual school tension, these factors *in combination* appear very materially to have increased the gains made prior to the onset of extreme cold weather and the season of minimal increase. (See Chart A, p. 84).

But the value of advantageous factors for the health program is not entirely in their physical effect. Their greater educational significance must be considered as well. From this standpoint they are much more than merely corrective or palliative measures and we may well claim for them a legitimate place in every school environment. The actual weight-getting results to be anticipated from the mid-morning cup of milk or cocoa for example, are relatively negligible as compared with the results to be anticipated from cultivating a taste for them, especially where there is, in addition, an understanding of their desirability as beverages to replace tea and coffee in the home dietary.

Criteria for Educational Experiences in the Health Program

If we analyze the activities provided in the program of the nutrition class we will appreciate they are of two types, those affording the child experiences at first hand, and those affording informational experiences, and that the "advantageous factors" without exception provide first hand experiences. Educational tradition however is so largely bound to informational experience, that it is only with difficulty the school can be brought to think in other terms and to incorporate activities that will supply the necessary advantageous factors in its practice. The weakness of the school's traditional attack on health, as embodied in the text book of hygiene, the home economics course, the civics syllabus, the biology syllabus, or in such socialized group activities as class discussion, story-telling and dramatization is inherent in the fact that the health experiences provided by these activities are informational, and the habits acquired through them are of little or no value as directly affecting physical condition. This distinction will be the more evident if we contrast the procedure employed in another field where health is also the objective and where experience at first hand is frankly accepted as the *sine qua non* of an educational program.

Difficult as the school may find it to think in terms of first hand experience, the department of physical training must of necessity ignore any other kind, and for this reason its procedure affords some comparisons of value.

While a considerable body of subject matter, historical, social and physiological, might conceivably be developed in connection with the gymnasium and playground and such activities as, for example, tennis or baseball, no attempt is made to use such material in the teaching program, nor are the hygienic benefits to be derived from participation discussed in class more than incidentally. The great consideration is that the children actually participate, use the exercises, play the games, enjoy them, become habituated to the demands they make on the bodily machinery and the sensations attending them, and come finally to desire these for their own sake. This is a true habit-forming program. The advantageous factors recognized by the nutrition class procedure afford corresponding opportunities for the acquisition of habits affecting health, and this is the objective that must be kept before us. Although the subject matter afforded is infinitely rich and important to society such claims must not confuse us as to the secondary place to be accorded it in the efficient health program.

The special limitations of subject matter in health education must be recognized before a just estimate can be placed on the value of dramatic activities and their place in a health program. Obviously they provide both first hand and second hand types of experience. It will be easily recognized however that although a certain amount of bodily activity and emotional satisfaction is usually incidental to them, such first hand experiences as they offer fail to supply the more important advantageous factors. Thus, however desirable the opportunities they may afford for first hand experiences in social education, manual activities, and constructive thinking, their value for the health program is as a stimulus to the child's coöperation, and lies in the appeal they make to group interest by affording participatory experiences in relation to informational material.

The use made of dramatization in our series of experiments was limited to the class activities of the first grade (1919-20). It consisted in such recapitulations of subject matter, previously presented in story form, as the children could organize for themselves. Thus it followed the recognized educational ideal for dramatic activities at this age period. By familiarizing the little child with subject matter under conditions of special appeal to interest, that is through participation in group activities, it provided an effective stimulus to coöperation. In developing a procedure for the older classes of our 1918-19 program the need for dramatic activities was not felt, as the socialized class discussions apparently offered sufficient opportunity for participatory experiences and the resulting stimulus to interest. Thus a difference in age period, and the resulting difference between play level and work level activities, very materially affected our use of dramatization.

The greatest use of subject matter was made, as has been described, with the boys of the fifth grade class, in the 1918-19 program, and without appreciable resulting gains, although the question may legitimately be raised whether the excellent long term results shown by this group may not have been influenced by the considerable period of intensive instruction given them. In conceding the probability of this, the importance of the conditions under which the instruction was given must be urged. In addition to the successful enlistment of coöperation from the children and their parents, the subject matter used was closely related to the facts of a daily régime of health habits. Imperfect as the provisions for this régime may have been, either within the home or the school environment, the use of the subject matter in direct relation to the experiences afforded was undoubtedly vital to its effective functioning. *To reinforce and interpret first-hand experiences is the true place of subject matter in a program where health habits are the objectives.* It is through such a use of subject matter that the child's coöperation becomes informed and purposeful, and his attitude toward health a creative one. It is the weakness of the home that it too often insists on uninformed coöperation, and the strength of the school that it is possessed of resources capable of investing the facts of hygiene with all the dignity and importance of their place in the world of science. Indeed, as an approach to the study of science, the subject matter involved is unsurpassed, and as such its development and use by the school is greatly to be desired. As a factor in the health program, however, it is easy to over-rate the place it should occupy and to devote to it time and resources that can be more effectively employed, if our criterion is to be that of appreciable results in physical well-being.

Implications for School Procedure

If the foregoing interpretations may be accepted as offering a true analysis of the factors determining gains in our series of experiments, their implications for practical procedure in the school may be grouped under the following recommendations:

> The essential features of the nutrition class procedure should be incorporated in general school practice, and the resulting health program extended to all children, irrespective of initial physical status.
>
> Closer relationship between the home and the school in matters affecting health habits should be accomplished, through definite provision for community enlightenment, and the enlistment of parental coöperation.
>
> The school should adjust its equipment and procedure to afford the greatest possible number of "advantageous factors," and undertake to interpret these in their relation to a comprehensive program of personal hygiene. It should supply conditions that permit the development of health habits *because* of the environment rather than *in spite of it,* as is so largely the case to-day.
>
> The general and preventive program of health education should be supplemented by special provision for children departing from the range of normal variation in respect to growth, as well as for those showing indications of disease, infections, or the usually recognized physical defects.

SCOPE OF THE PREVENTIVE PROGRAM

That the essential features of the nutrition program may be profitably extended to normal children with a view to further increasing their growth and vigor, appears to be indicated by our data on the comparative weight increase of children of varying degrees of fitness, under an improved régime supplemented by instruction. There is nothing to show that children of standard or superior fitness may not be capable of corresponding improvement under similar conditions. Moreover we hardly need to emphasize the fact that important as growth may be in providing an index of condition, increased physical vigor must yield additional results of greater or at least equal importance. Thus whatever the limitations racial and family status may impose on individual development in height and weight, the possibilities for increasing energy, muscular development and endurance are not correspondingly limited. Health education based on the needs of normal children must consider such results, and be prepared to evaluate them in addition to those in growth.

It will be evident that our nutrition classes gave only passing consideration to results of this kind and that, through them, influence was continually exerted to prevent over-exertion and emphasize the need of rest, rather than to encourage bodily activity or make provision for muscular development. These limitations were imposed by the conditions attending a corrective program for underweight children. Had our work concerned itself with normal children the contribution of the playground and gymnasium must have been included, as they provide the most important "advantageous factors" available in the school environment. The preventive health program must definitely relate the work of the school department of physical training to a broader plan of physical education.

Continuity.—The scope of the health program in regard to continuity is of primary importance if results of lasting value are to be secured. At the outset our program had for its object the "graduation" of the children enrolled, as soon as they should attain normal weight for height and age. Administrative considerations, however, led us to organize our classes with reference to the school year and made necessary the retention of any "graduates" for the fixed period of at least a term. Observation of the fluctuations shown by the individual charts under these conditions, leads to the conclusion that underweight children "making normal" cannot be regarded as definitely "cured," and therefore to be at once dismissed from educational influences. On the contrary they suggest the necessity of an extended period of intensive educational influence, and the desirability of a continuous period of supervision. It is probable that a health program organized to provide continuous environmental influences supplying the necessary "advantageous factors," with current evaluation of growth and physical vigor, will function to the best advantage when combined with a period of intensive educational influence.

Age periods.—This raises the question as to the most desirable age period for the intensive program. Our work was chiefly concerned with children in the pre-pubertal stage of development or at the age of school entrance. It will be obvious that both periods offer advantages.

With the younger children we recognize the desirability of intensive work at a period when habits, especially dietary habits, are still fully under parental control, and where the possibilities of home coöperation are correspondingly increased. Certain facts of growth at this stage, especially those concerned with the formation of the permanent teeth, argue the special importance of intensive educational influence during the first year or two after school entrance. From the standpoint of establishing a creative attitude toward health, the later age period probably affords better opportunities for educational procedure. Other considerations may be urged as well. The great increase of tuberculosis that occurs during the years of pubertal change, reflects the special need of increased physical fitness at this age period. The school, by supplying intensive educational influence prior to this period of special susceptibility, could in a very special sense offer a preventive health program. While our study was of necessity limited to children below the high school, it will be apparent that certain aspects of health education can best be developed in relation to a later age period and that an intensive period of educational influence is especially desirable during one of the years of high school, when the social and civic aspects of health can be more effectively related to the facts of individual development and scientific interest. Consideration of each age period will serve to establish its claim to special provision and lead to the conclusion that our health teaching can be most effectively accomplished by definite provision in the school curriculum for at least one year of intensive work at each of these age periods, providing the necessary experiences and their interpretation at successive educational levels.

The Community Program.—Consideration of the program of home visiting and parents' meetings developed in the course of our work must lead to the conclusion that any suggestions it may afford for the larger program of health education must of necessity be inadequate. For it will be evident that our community work has been limited to the particular needs of the corrective program, in a section whose homes were for the most part ignorant, and little above the low water mark of economic independence. Thus the problems met were very similar to those usually encountered by the social service workers of the hospital clinic and welfare agency, and the solutions offered are unmistakably in terms of relief as well as of education. It will be evident that the basic questions of relationship between home and school are effectually befogged by such conditions. Until successful demonstrations of community enlightenment shall have been made in school communities where education and economic independence are general in the homes, the true character and scope of this part of the health education program will not become apparent. We may anticipate, however, that qualities of leadership are necessary, and a democratic rather than a benevolent attitude. Initiative, social vision, knowledge of both school and community resources, and ability to organize them, these probably are demanded rather than the more specific techniques and special types of training now identified with the corrective procedure.

A few evident facts of our experience are of special significance in relation to any community program. First among them we may mention the necessary time element involved, and the lack of anything spectacular in the results accomplished. These two characteristics argue the educational health procedure ill-adapted to purposes of propaganda, if by propaganda we mean a demonstration necessitating early and spectacular results. Thus attempts to enlist community interest through the organization of demonstration classes, are hardly calculated to achieve success. Initial propaganda should preferably take other forms and be followed by the health program or the nutrition class. On the other hand the whole testimony of our experience points to the possibilities for community enlightenment attending a consistent and long continued demonstration of the educational procedure.

That general educational principles apply to the adult and community program, as well as to the provisions made for the children may also be urged, and thus we may expect informational experiences to function in proportion to their association with experience at first hand. For this reason the records offered by the weight charts and the discussion of them in the parents' meetings offer certain suggestions as to methods applicable to a general community program.

Our experience in connection with reports made by the children as to details of the home régime emphasizes the necessity of accuracy in such reports, and the difficulty of securing it unless very definite provision for verification through home visiting and parental coöperation can be made. Even so there is much opportunity for error, many parents being as inaccurate as the children in regard to specific details. Moreover the additional expense and labor attending such verification makes it prohibitive unless undertaken as in our experiments, for special classes and for children needing a corrective program. Under the circumstances any system of rewards or credits based only on reports from the children appears distinctly undesirable, and to be avoided as placing a premium on inaccuracy, and very possibly on hypocrisy. It would seem that effective relationship between community and school in the health program must be developed along other lines.

Adjustments within the School.—Within the school the health program demands provision for continuous supervision and record-keeping for every child, provision for the greatest possible number of advantageous factors within the school environment, provision for enlisting the intelligent coöperation of all children in respect to advantageous factors both at home and in school.

To effect a continuous supervision of individual condition in regard to health, the best available provisions for physical examinations and medical inspection should be supplemented by frequent records of height and weight. In addition to its importance as a record from which current results may be evaluated, the individual growth chart is a device of undoubted educational value. It presents a graphic record of facts to be interpreted by relating the child's experiences at first hand directly to the necessary informational material. As a means of enlisting interest and holding it, it is without doubt the best device we have, and the only one of its kind. Like all other devices in educational procedure, it is susceptible of misuse. The successive modifications adopted by us in regard to its use reflect the more serious possibilities of this kind.* Weight and height measurements present many opportunities for inaccuracy and the keeping of the current records must be in the hands of careful and experienced adults, if they are really to fulfill their function in affording the necessary data for evaluating the health procedure. For this reason the responsibility for taking measurements cannot be relegated to the children themselves and undertaken as a class activity, excellent as such an experience might be from the educational standpoint. It is a question how far the class teacher may be relied on for such measurements. In our work all measurements and records were made by the nutrition workers who had been carefully instructed as to methods. Under the supervision of trained workers the experiences incidental to height and weight taking may well be made to yield their quota of participatory activities for the children. The conditions obtaining in the eye clinic room a P. S. 64, however, effectually prevented the development of the educational possibilities the measurements should have afforded, beyond informal discussion with the

* See Appendix C.

child of his own gains or losses in relation to his daily régime.

The provision of advantageous factors within the school environment should be such as to supply continuous experiences that will be health building and habit-forming. How can this be accomplished? Obviously the school's function in regard to facilities for feeding, sleeping and bathing must always be limited. Whatever provision it may make in these directions must be of value rather as they afford suggestions for the home or supplement its provisions. The conditions obtaining in the average homes of any school community must determine the relative need for such experiences and, to an extent, the method of supplying them.

Thus the comparative failure of the mid-day luncheon to function in the program of P. S. 64 is inconclusive as to its possible advantages in a different community. Properly conceived and executed, the school lunch could be made an ideal educational vehicle. Examples of a carefully planned lunch-room service may be found in several of our welfare agencies, combining a program of full feeding, with opportunity for the broadening of dietary habits, and the inculcating of healthful table habits. It is, however, a long step from the commercially conducted lunch-rooms of our city schools to the educational ideal.

The difficulties concerning the administration of the school lunch are, indeed, so many, that it is a serious question how far it can be considered a practical undertaking if carried out in the ideal way, which involves not only the careful selection and preparation of the food supplied, but also the supervision of the children in their selection of food and eating habits. The noise and confusion generally found in the school lunch-room, the haste that so often prevails, are questionable attendants to a satisfactory meal. It is only too evident that our large public schools cannot provide a substitute for the home in these particulars, although much can be done to improve the conditions usually found, if the value of serenity and of desirable eating habits can be fully established in the minds of the teaching staff. The results claimed for improvement in the condition of the children where the usual system prevails, and the luncheon is served on the cafeteria plan, with the stipulation that one essential dish, generally a thick soup with bread and butter, must be purchased by every child before he can secure sweets, cannot be said to establish the value of the school lunch as an educational factor nor even as a health-making factor, the inference to be drawn is rather against the unsatisfactory conditions obtaining in the average home of the community concerned.

The desirability of the mid-session luncheon of milk or cocoa as an educational experience seems evident aside from the probable existence in any school population, of children whose breakfast has been inadequate.* When it is recalled that much of the difficulty over the eating of breakfast, and of the hurried conditions attending luncheon in many homes as well, is directly related to the penalties imposed by the school on late-comers, the desirability of better adjustment between the schedules of the school and

* See Appendix D.

home with relation to this particular point suggests itself. Lengthening of the noon hour to include a rest period at home for the younger children would probably be attended in many communities with better results than we were able to secure at P. S. 64.

Except for the special provisions at Christodora House during our first term and in the open-air classes, the conditions we were able to provide with regard to rest periods were really little better than those attending dramatic experiences. As such they served a purpose but their functioning as true advantageous factors is to be questioned.

The possibilities and responsibilities of the school in regard to the advantageous factors related to bodily activity, habits with respect to ventilation, and emotional attitudes, are probably of greater importance to health than those attending any routine experiences it may supply as to food and rest. Indeed we cannot properly estimate the part these might play in the establishment of health habits and increased vigor, unless we first conceive of a school environment successfully affording optimum conditions in regard to each, continuously throughout the school day, the school year, and the years of school attendance. If the total influence to be exerted appears a fairly considerable one viewed in this perspective, what is to be said for the present general adherence to sedentary traditions, questionable winter atmospheres, and frequency of nervous tension and worry in our school-rooms? Unfortunately science has not yet spoken on these matters with sufficient definiteness to make her message to the school an unmistakable one. Comparable experiments carefully planned with a view to ascertaining comparative results in growth under differing school environments are evidently needed before general progress in these directions can be expected.*

Provision for enlistment of the children's coöperation with regard to advantageous factors must in the last analysis depend on the attitude of the school's teaching staff, and especially on the class teacher's appreciation of their essential values for health, and of their scientific and social interest. Constant contact with an adult whose own attitude toward health is informed and creative, must ever be the most potent of influences the school can bring to bear on the development of a health program, and of a tradition of health within the school. Under such influence the facts of daily environment and routine deliver their true message, and are raised to their true dignity.

So far as the experiences offered by advantageous factors lead on to wider fields of interest, an educational program of very special value may be developed, although it may have little increased significance as a health program. The more modern types of school curricula where subject matter is definitely organized about the child's natural interest in food, shelter, and clothing, thus present special possibilities for supplementing the health program and will in turn be reinforced by it.†

* See Appendix D—where an experiment of the kind is outlined.

† For illustration see Goodlander, Mabel R., *Education through Experience*, Bul. No. X, Bureau of Educational Experiments, 1921—where a number of class projects in food study (fourth grade) are described.

This will be especially true of those age periods chosen for the more intensive health programs. Food experiences offered by the school can probably be provided to the best advantage in connection with such programs. When necessary adjustments can be made to permit such first-hand experiences as the selection, purchase, preparation and serving of food by the children themselves, the informational content incidental to such activities will greatly enrich the experience and the children's coöperation will be easily enlisted. Such activities should be organized from a viewpoint somewhat different from that usually held by the Domestic Science Department, in that the specific object should be, not so much the technique of cookery, as the study of foods, their values and place in the dietary.

The content of such a series of lessons should be determined principally by the recognized need for broadening the dietary of the young child, and therefore the emphasis should be placed chiefly on fresh vegetables, cereals, milk dishes and eggs, as the types of foods with which the home generally experiences the greatest difficulty in establishing satisfactory dietary habits. Simple equipment and simple methods of preparation are all that should be considered in such a course of instruction for elementary grade children. A most important factor however is the provision of opportunity for the class to serve and eat their dishes, and thus secure the effects of the group appeal in acquiring a taste for new foods. In connection with such experiences we must appreciate that *the program that educates to the importance of caloric intake, without special em-*

phasis on conceptions of balanced feeding and vitamine intake, is inadequate.

Our initial program for diet and school feeding especially emphasized the importance of caloric intake and in this followed the general lines prescribed by Dr. Emerson. Insistence on the elimination of tea and coffee, and on milk as an essential of the child's dietary, however, adds to his program some additional elements of importance, and the emphasis on cereal foods is a particularly practical method of supplementing the dietary with inexpensive carbohydrate foods, with the least possible danger to interference with the family budget and customary menu. Our experience seems to indicate the insufficiency of this simple program, for a community of the kind in which we were working. Acquaintance with the dietaries of the homes shows lack of knowledge as to balanced diet, lack of knowledge as to vitamines, their place and importance, as to fats and the ability of young children to digest them, as to the peculiar properties of milk, and as to the undesirability of condiments especially in the diet of the child. Incomplete as present knowledge in regard to food properties must be admitted to be, very considerable progress in this field of science has been made in recent years, and any program of health undertaken in the school must take cognizance at least of the best authenticated facts of recent laboratory experiment.

THE CORRECTIVE PROGRAM

While the true starting point for an educational procedure is the development of the general health program with prevention as its aim, the school cannot ignore those children whose physical condition indicates the need of corrective measures and special care. For them a corrective program supplementary to the general program must be arranged, but many of its details and provisions will of necessity vary with the varying conditions offered by the homes of the school community, and the adequacy of the health provisions incorporated by the school in its preventive program. In general we must anticipate that *special provisions affording advantageous factors will be a necessary part of the corrective program inversely to the proportion in which the home and school environments afford them.* There are still many questions to be answered, however, as to the relative value of differing provisions especially those relating to food intake and air, before our use of advantageous factors can become scientific and correspondingly efficient. Further experiment is needed to establish the place and character of the school lunch in the corrective program, and special research as to the effect of varying conditions of temperature and ventilation on the nutritional processes and growth, must determine the place of the open-air class and the open-window room.*

Whatever the special needs of a given community, *the essential provisions of the corrective program must concern the extension of the school medical service* to provide special examination, diagnosis, and observation, for children whose nutritional status is in question, as well as for those presenting obvious defects or symptoms of infections and diseases. In

* See Appendix D.

addition to underweight for height and age, overweight for height and underheight for age must be included in our conception of defective nutritional status if the program is to be in any sense complete. The first function of the school medical staff, then, will be to determine cases needing special physical care, improved régime or medical treatment, and to inform the home of its findings. Where the home cannot supply the necessary medical care, the school medical staff must be prepared to assume the responsibility for arrangements with the various hospital and other agencies in the community, as was so generally done at P. S. 64. Here again the character of the community must largely determine the actual relationships to be established.

THE STAFF

When we review the foregoing implications for school procedure with the necessary members and personnel of an adequate staff in mind, the following conclusions force themselves to attention:

> The positive health program demands a considerably increased school staff.
>
> Its success must depend on a personnel capable of coördinating the requisite knowledge and techniques from several professional fields.
>
> The relative importance of special types of technical training will not be the same for the preventive as for the corrective program.

Numbers.—It will be realized that at P. S. 64 our staff were entirely concerned with problems of corrective work, and our experiment amply testifies to the size of the corrective program in that school community. The work, as reported, including physical examinations, weekly measurements, individual and class instruction, home visiting and parents' meetings, and arrangements for cases needing special consultations, examinations or treatment of defects, with, in addition, the measurements of the control groups, constituted a really arduous program for our nutrition workers, who were able to care for an average of but 40 children each, and who felt keenly the need of more extensive provisions for medical care throughout the experiment. Moreover, the demands on the physician's time were relatively increased. Because of the diversity and importance of the causal factors underlying malnutrition, diagnosis of the condition requires care and experience on the physician's part. Thus, in any adequate plan for a corrective procedure, physical examinations arranged for the children found to be underweight must be given a longer time allowance than is customarily provided in schools, and the number of underweights that can profitably be examined in succession is limited by the tendency for the procedure to become a mere routine, where one child after another presents no clearly defined symptoms beyond those of poor general condition. Six or eight underweights probably represent as many cases of this kind as one physician can profitably undertake to diagnose in succession. Beyond the mere statement that an increased personnel is required, however, it is hard to draw just inferences as to the probable number of workers needed in a different administrative situation, where the corrective program is in the hands of the regular school medical staff and is supplementary to an adequate preventive program. It will be evident, too, that the initiation of any health program will inevitably demand more time and effort than should be necessary subsequently. After physical defects have been largely corrected, parental coöperation established, and community understanding secured, the proportions of the program will be correspondingly reduced.

We may conclude from our experience, however, that unless an adequate staff is provided for the corrective program, its demands will absorb the attention of the workers, and overshadow the claims of the preventive program. Thus, although our provisions for health should start with those for preventive work, practically, the existing need for corrective work must always be supplied before the time and thought of the workers engaged can be given to very much else, and our personnel therefore must be definitely planned to cover the corrective work in addition to the general program.

Personnel.—The principal techniques employed in the nutrition class are those of the physician and nurse, of the social case worker, and of the teacher. While the contributions of other technically trained workers are also essential, success in the main depends on provisions for the combined medical, sociological and educational attack, and the organization of the work to permit the most effective contribution from workers in each of these fields. If we analyze the chief provisions of both the corrective and preventive programs, we will find these techniques represented with somewhat differing emphasis.

The preventive program must provide for (1) organization of the school's resources for health; in respect to physical examinations and record-keeping; environmental conditions and equipment; effective coöperation of the class teachers and of special teachers, especially in the departments of physical training, of home economics, and science; (2) enlistment of the community and coöperation of the homes, through publicity, adult education, parent-teacher programs, and organization of the forces influencing public opinion.

The corrective program must provide for (1) special examination, observation and diagnosis, with individual instruction and advice, for children whose physical examination indicates specific problems or lowered general condition; (2) individual follow-up to secure special provisions for care from the family physician or hospital agency, in the homes and at school.

That is, the preventive program is primarily a teacher's program, dependent on physiological knowledge and the physician's advice to be sure, but essentially concerned with problems of school organization and teaching techniques, and with a supplementary program of adult education that calls for community social work rather than for social case work. It is evident that professional and technical qualifications for corrective work will not in themselves constitute the necessary qualifications for the personnel of the school's general health program, and the subtle differences of temperament, interests, and attitudes that characterize the worker in the medical field, in sociology, and in education, must be considered in addition to any practicum for training. The starting point of interest for the physician and nurse is, in the great majority of cases, ill-health. Pathology rather than hygiene absorbs their attention, and similarly, the interest of the sociologist is, for the most part, centered on poverty and its problems. At the same time the physician, the nurse, the case worker, as a rule, have but little understanding of recent developments in educational techniques, and, like most of the community, base their conceptions of acceptable procedures on the experiences of their own school days, 15, 20, 30 years ago as the case may be. The modern teacher has some very good grounds for instinctive reservations toward the "educational programs" suggested by outside enthusiasts, whose ideas of teaching in nine cases out of ten will be found to consist in the didactic presentation of additional subject matter. Physicians in particular seem, as a profession, to lack the necessary attitude for teaching children, possibly because their consciousness of the great body of subject matter incident to their own professional training renders them especially susceptible to the temptations of didacticism as a "short cut" to knowledge. Our nutrition class for the first term clearly showed the educational limitations and fallacies incident to a school procedure in the hands of specialists untrained in educational techniques.

It seems evident that our positive health program must be entrusted to a new type of worker who shall be at once a hygienist and a teacher, who shall as such coöperate with the teaching staff on the one hand, and with the medical staff on the other, supplementing each without superseding either. The advisability of freeing such a worker entirely from responsibility for corrective measures, and thus ensuring individual effort and attention for the development of a constructive health program will be evident. The organization of the school's total resources for health, and the resulting modifications in the experiences afforded to all children, should relieve the corrective program from the necessity for class instruction, and modify the requisite qualifications for its personnel accordingly.

If the preventive program is primarily a teacher's program, the corrective program, on the other hand, is primarily the physician's and should be directed by him. The great variety of the causal factors involved and the serious nature of many of them argue the importance of the physician's services here, and the danger of entrusting the responsibility for diagnosis, or advice as to remedial measures, to any worker of narrower experience or less thorough training.

It will be evident that the services of the visiting case worker are necessary, to supplement the work of the physician and school nurse, and that the demands of the situation offer a distinct status for a medical social worker. In a community like that of P. S. 64, a dietitian's training is of undoubted advantage for the home visitor. Success, however, is primarily dependent on the case worker's attitude and technique, and in such a community the dietitian without these can hardly be expected to succeed. The place of the case worker and dietitian in school communities where better economic conditions obtain has yet to be defined, but development of the school health program in such communities will probably modify our present conceptions as to the scope of such work, and the necessary qualifications and training of the worker.

Summary

The health program that shapes itself from the foregoing interpretations must not discourage by reason of its proportions. It should lead rather to a new realization that "public health is purchasable," and that the purchase price must include as always initiative, ability, and continued conscientious effort. So far as the experiment at P. S. 64 has broken ground by uncovering problems and possibilities, we believe its record will prove serviceable to the cause of public health and public education. The chief points in our thinking to-day as we bring this study to a close may be briefly summarized as follows:

The efficient program of health education must recognize the primary importance of nutritional status as a basis for estimating general physical condition among children. Such recognition involves a considerable program of scientific research, community enlightenment and school adjustment.

Results of the health program should be evaluated currently through individual records of growth increment and nutritional status. Not merely prevention of lowered physical condition and approximation to currently accepted "norms" should be the aim, but physical vigor and height and weight increase in excess of our present standards for race and stock.

The resources of the school for supplying the chief provisions essential to the success of an educational health program are greatly superior to those at the command of any other agency. Great as the initial task may be, the school can eventually transmit the necessary conceptions to the community and enlist the coöperation of both child and home, and it is the only agency organized to reach every child and every home. It is the only agency, therefore, that can advantageously secure the data necessary for research from all sections of the community, and present a true cross-section of child development from every type of home, and from adequate numbers of well children, of differing racial strains and differing economic levels.

The preventive program of health education must be basic, an integral part of the school's general thinking, administration and equipment. It cannot be successfully developed merely as a procedure to supplement the corrective program.

The school can greatly strengthen its educational practice by making the adjustments in its equipment and procedure demanded by the health program. On analysis these will be found consistent with successful educational experience. Indeed our health program well exemplifies what has been called "the normal estate of effective learning, namely that knowledge-getting be an outgrowth of activities having their own end."*

* Dewey, John, *Democracy and Education,* The Macmillan Co., 1916, p. 229.

APPENDIX A

Distribution Table of Percentages Over and Underweight

This distribution table was compiled from the results of measurements taken in February 1918. It therefore reflects the comparative status of children in the several grades represented at a season when the period of maximal weight increase is over and before effects from the period of minimal weight increase have become appreciable.

Distribution Table of 894 Children According to Percentage Over- and Underweight *

Percentage	Grade VII	Grade VI	Grade V	Grade I	Terman	Open Air
67	....	....	....	1		
49–44	1	....	1			
44–39						
39–34	2	1				
34–29	....	1	....	1	1	
29–24	....	4				
24–19	3	2	....	1	1	
19–17	1	....	2			
17–15	4	2	1	1		
15–13	3	8	3	2		
13–11	7	5	3	2	2	
11–9	3	8	4	6	2	
9–7	14	9	7	13	1	1
7–5	8	11	9	24	2	2
5–3	17	19	11	24	12	
3–1	13	23	13	27	3	3
1–1	16	31	6	35	9	2
−1–3	23	28	13	24	8	1
−3–5	22	24	16	29	3	4
−5–7	11	30	11	22	6	5
−7–9	8	12	10	14	11	1
−9–11	6	10	4	13	2	2
−11–13	7	6	5	11	2	2
−13–15	3	2	2	....	2	
−15–17	1	5	1	3	2	1
−17–19	....	4	3	2		
−19–24	....	....	....	....	....	1
−24–29	....	....	1			
−29–34	....	....	1			
Total...	173	245	127	255	69	25

* Computations for this table were made by Dr. David Mitchell and the figures originally published in his article, *Malnutrition and Health Education,* Pedagogical Seminary, March, 1919. They are reproduced here by permission of the Pedagogical Seminary.

APPENDIX B

Individual Record Sheet

The record form used by us at P. S. 64 is a single sheet, 8″×14½″, folded twice to make a six page folder of 5″×8″ filing size. It may thus be used to hold supplementary sheets or correspondence relevant to the case history but is definitely planned to cover the essential facts of the physical history and examination, social history and class record on a single form and thereby avoid as far as possible the necessity for additional records. While further experience has suggested a few changes of detail in this record, space for some additional notations, as for stool and urine examinations, and elimination of some non-essential details, it has been found fairly satisfactory for our purpose and of particularly convenient size for filing.

The fascimile of page 1 shows at the right the items for identification, name, address, etc., printed on page 5 but appearing at the top when the record is folded and filed. Page 1 contains the final summary and weekly record for 19 successive weeks and this is extended to include 44 weeks, the spacing for the last 25 weeks covering page 6 when the record is folded.

P.S.	Grade	Address	Child's Name	Case
Visitor	Room		Father's "	No.

SUMMARY

Birth Date	Date of Entr.	Height	Weight	Underweight lbs.	Underweight %	Date of Dismissal	Weeks in Clinic	Final Weight	Gain	Loss	Normal Gain	Excess Gain lbs.	Excess Gain %	Present Ht.	Present % Underweight	Calories Ave. 1st 3	Calories Ave. last 3
5.5.05 Present Age 13 5/05	10.18.18	62	95	8	8	5.23.19	31	100	5		6.2	-1.2	.19	64.3	12		

WEEKLY RECORD

	Weight	Gain	Loss	Rest Periods	Lunches	No. Hrs. Sleep	Calories of Food (100)	Coffee or Tea	Water at Meals	Windows Open	No Breakfast	Rapid Eating	Excessive Fatigue	Colds	Clothing	Other Facts	Treatment Recommended	Treatment Carried out
2nd Weighing	75	—	—	6	4	11	23	—	No	✓	—	—	—	—	—	2 M. daily 1 cocoa ?	Carious teeth	Ext. Dec. 12 '18
3rd "	95.5	0.5	—	7.	7	11½	23	—	—	✓	—	—	—	—	—		Nas. Ph. obs.	T. & A. Operation
4th "	95	—	0.5	4	7	10½	21	—	—	✓	—	—	—	—	—	Late hours		
5th "	96.5	0.5		6	7	10½	22	—	—	✓	—	—	—	—	—			Hahne-
6th "	96.5	—	—	7	7	10½	27	—	—	✓	—	—	—	—	—	Late hours after Thanks-giving		mann
7th "	96	—	0.5	6	7	10½		—	—	✓	—	—	—	—	—			Hosp.
8th "	96	—	—	7	7	10½		—	—	✓	—	—	—	—	—			5.27.19.
9th "	98	2	—	6	7	11½	30	—	—	✓	—	—	—	—	—			
10th "	95.5	—	2.5	6	7	11½	24	—	—	✓	—	—	No sleep last night		—	Tooth extracted yesterday - painful		
11th " 12.20.18	96	0.5	—	6	7	11	29	—	—	✓	—	—	—	—	—			
12th " 1.6.19	96.0	0.5	—		7									6 rest periods		Xmas 1.6.19		
13th " 1.10.19	97.5	1.	—	6	7	11½	27	—	—	✓	—	—	—	—	—			
14th "	97	—	0.5	7	7	10½	25	—	—	✓	—	—	—	—	—	Late hours		
15th "	97	—	—	6	7	10½	25	—	—	✓	—	—	—	—	—			
16th "	96.5	—	0.5	6	7	11	25	—	—	✓	—	—	—	—	—	Promotion		
17th "	98.5	2.	—	7	7	11.5	24	—	—	✓	—	—	—	—	—			
18th "	98.5	—	—	6	7	10.5	26	—	—	✓	—	—	—	—	—			
19th "	99	0.5	—	6	7	10.5	27	—	—	✓	—	—	—	—	—			
20th "	99	—	—	6	7	11	28	—	—	✓	—	—	—	—	—	Auto trip Sunday		
21st "	101	2	—	7	7	11	25	—	—	✓	—	—	—	—	—			
— "																		

Facsimile of page 1—Individual Record Sheet.

PHYSICAL EXAMINATION

INSPECTION: Bright dull nervous phlegmatic apathetic

DEVELOPMENT: Good fair poor MUSCLES: Firm flabby

GENERAL CONDITION: Good fair poor

HEAD: Normal Bosses prominent Pediculi

EYES: Pupils equal React to light—distance Motions: nor. abnor. Blepharitis

NARES: Clear crusted Mucous discharge Spur Deviated septum

MOUTH: Normal open Cough Herpes Mucous Memb. normal pale cyanotic

TONGUE: Normal moist dry sl. white coat brownish coat

THROAT: Normal congested granular Sl. mucous

TONSILS: Normal large buried cryptic Sl. inflamed absent

GLANDS: Normal enlarged Ant-cervical ++ Post-cerv. + Epitrochlear

TEETH: Good No. decayed Approximation good poor Stained

EARS: Right drum: Normal dull retracted bulging Cerumen

Left drum: Normal dull retracted bulging Cerumen

HEART: Area dullness 6.5 c. m. left mid-sternal line

1.5 c. m. right " "

Apex 4th 5th 6th space in nipple line

c. m. outside " "

c. m. inside " "

Action: regular irregular Sounds: clear impure

Thrill: present none A2 P2

Murmurs: none

soft sys.	apex	not	ant. axillary line
loud sys. at	pulmonic	tr. to	mid. " "
diastolic	aortic		angle of scapula

LUNGS: Resonance good throughout D'Espine to / dor. vertebra

Respiration " "

ABDOMEN: Normal large lax distended tympanitic tender

Hernia

Liver: dullness 6 space rib to costal border nipple line

Spleen: felt not felt

GENITALS: Normal Prepuce: long adherent circumcised

EXTREMITIES: K. J.: present and equal absent

Edema " "

SKIN: Smooth Gray rough clear Scars Vaccination: present absent

Facsimile of page 2—Individual Record Sheet.—Notations on Physical Examinations.

PHYSICAL EXAMINATION (Continued)

SPINE: Normal ✓ Lateral curvature—right left

Rotation Round shoulders ✓ Winged Scapulae ✓

CHEST: Normal ✓ barrel flat funnel pigeon H's groove

FEET: Arches: good ✓ pronated Station: good ✓ poor

Gait: ✓

DIAGNOSIS: Round shoulders Pediculosis Winged Scap.
Soft. sys. murmur
Nas. ph. obs. { Throat granular Ant. cer. ++
Tonsils cryptic Post. " +
Sinus dull

RECOMMENDATIONS:
Removal Nas. ph. obs.

Note: Check ✓ indicates defect present. Line drawn through word indicates examined and norm
Indicate degree by + sign.

SUPPLEMENTARY INFORMATION

5:27:19 T & A. operation Hahnemann Hospital — attention of Dr. Foster. Parents paying 6.00 for operating room and $2.25 per day for bed in ward.

EXAMINED BY Dr. H. F. Schreiber DATE 4.23.18
DICTATED TO B. S. B.

Facsimile of page 3—Individual Record Sheet.—This page continues the notations made during the physical examinations and affords space for supplementary notes on physical condition.

SOCIAL FACTS

INFORMATION REGARDING MEMBERS OF FAMILY

NAMES*	Relationship to Child	Age	Health	Defects	Dead	Nationality	Use of English	REMARKS
Sam	F.	46				Russian		In U.S. 14 yrs.
Ida	M.	35				"	Speaks	Father a
John	+	13				b. N.Y.C.		locksmith
Max	B.	12				" " "		

*Include still-born and miscarriages in order.

INFORMATION REGARDING BIRTH AND INFANCY

Born at full term ✓ Labor N Condition at birth N.

" " mos. Doctor Weight " " Big baby Heavy until 6 yrs.

Breast-fed 11 mos. Bottle Mixed 1st Tooth at 7 mos. cut 3 at same time Walked at 13 mos. Spoke at 14 mos.

PREVIOUS DISEASES (WITH DATES)

Measles 18 mos.	Chicken-pox —	Tonsilitis —
Mumps —	Rheumatism —	Convulsions —
Scarlet-fever —	Meningitis —	Chorea —
Diphtheria —	Pneumonia —	Operations —
Whooping-cough —	Bronchitis —	

GENERAL HEALTH AND HABITS

Appetite (especially for breakfast) Fickle likes cake	Nail-biting —
Regularity of meals Reg.	Bed-wetting —
Stimulants Taste of whiskey before supper.	Sleep
	Restless —
Bowels Reg	No. in room. 2
Headache —	" " bed 2
Earache —	Usual no. hours 10 — 8.30
Frequent colds —	

CONDITION OF FLAT RENT 15.50 No. Rooms 3

Clean ✓ Inside rooms 2 court

Furnishings Comfortable

S.S. Ex. No. Record 19.18

Facsimile of page 4—Individual Record Sheet.—Social facts and health habits are recorded on this page.

SUPPLEMENTARY INFORMATION

No. 64 | Visitor B.G.B. | Grade A. 1 Open Air | Room 414 | Address 407 E 9th St. | 2 Floor | Child's Name Gordon, John | Father's " 11. Same | No. | Case

Family united—home life pleasant—
Boys Dad and John plays violin.
John likes cheese and milk—"is crazy
for cake". Does not take butter, eats
chicken because others do. Likes steak
but no other meat. Evidently eats
sweets between meals. Sleeps in pleasant
room, southern exposure. Is not a
mouth breather. Brother a husky
looking lad, overweight. Mother
gives thoughtful care to home
but boys do not go to bed early.
She is troubled over J's school
reports which are poor this term.
Family physician does not approve
tonsil operation.
1.20.19—M. willing for tonsil operation,
John not.
3.3.19—Parents not willing for operation—will consult family physician.
M. claims John is well, never has a
sore throat.
3.17.19—Mother came to class.
5.26.19—Mother at class. J. has
decided to go to hospital tomorrow
for tonsil operation
5.27.19—Has been sick and sleepless
through the night—vomited twice—
parents much agitated, brother also,
Father going to hospital, cannot
work. J. operated on 2 P.M.
5.28.19—J. home 5 P.M. Father
will return to work tomorrow.
Mother has not slept for two days.
Family much pleased with hospital.

Facsimile of page 5—Individual Record Sheet.—Supplementary information recorded on this page covers social facts and miscellaneous details.

APPENDIX C

Specimen weight charts with adaptations made during the course of the experiment.

The weight charts used at P. S. 64 were of heavy white paper 24″×19″. Charts Xa and Xb * show the original form used during the first school term. The name of the child is placed in large letters across the top and dates of the weekly class meetings are recorded just below in the first two rows. Stars appearing in the third and fourth rows following the words "Lunches" and "Rest" indicate that the child has followed his prescribed régime in regard to lunches and rest on each day of the week so marked. Figures in the left-hand column indicate pounds and are determined by placing at the bottom of the column a number two or three pounds below the actual weight of the child at the time of enrollment. Figures in the last row following the word "calories" indicate the number of hundred calories averaged per day as estimated from the 48 hour record taken weekly. The heavy irregular line running across the chart is the record of the weekly weight taking showing the successive increments and losses of the individual for whom the chart is kept. Dotted lines indicate holiday periods and absences. The heavy straight line above is the "Line of Normal Expected Gain" and repre-

* Reproduced by permission of the Pedagogical Seminary.

sents the week to week weight increment for a child of normal weight and of the same height and age. (For computation of this line see footnote p. 51).

Xa shows a satisfactory record. The child in question was 8 pounds, 9%, underweight when enrolled and in 13 weeks gained 9½ pounds, bringing him within 2% of normal. It will be readily appreciated that where the individual makes this kind of response, the line of normal expected gain acts as an incentive to effort, and it will be equally clear that for the child Xb the effect of the line of normal expected gain is discouraging to effort. This child was 13½ pounds, 17%, underweight when enrolled and at the end of 19 weeks had gained but 3 pounds and was still 13½ pounds, 16%, underweight.

Charts Ya and Yb * show the form used for the fifth grade and open-air classes during the second winter and have the line of normal expected gain paralleled by a line of "Individual Expected Gain" that starts from the point indicated by the child's actual weight at enrollment and progresses by the same weekly increments. The two lines thus form a zone within which progress may be considered achievement. Ya is a low percentile case showing satisfactory progress: He was 5 pounds, 8%, underweight when enrolled, gained 8 pounds in 30 weeks and was then within 1% of normal. Yb on the other hand, is a high percentile case, whose response is unsatisfactory. He was 12 pounds, 17%, underweight when enrolled and after 30 weeks was 14 pounds or 18% underweight. It will be appar-

* Reproduced by permission of the Pedagogical Seminary.

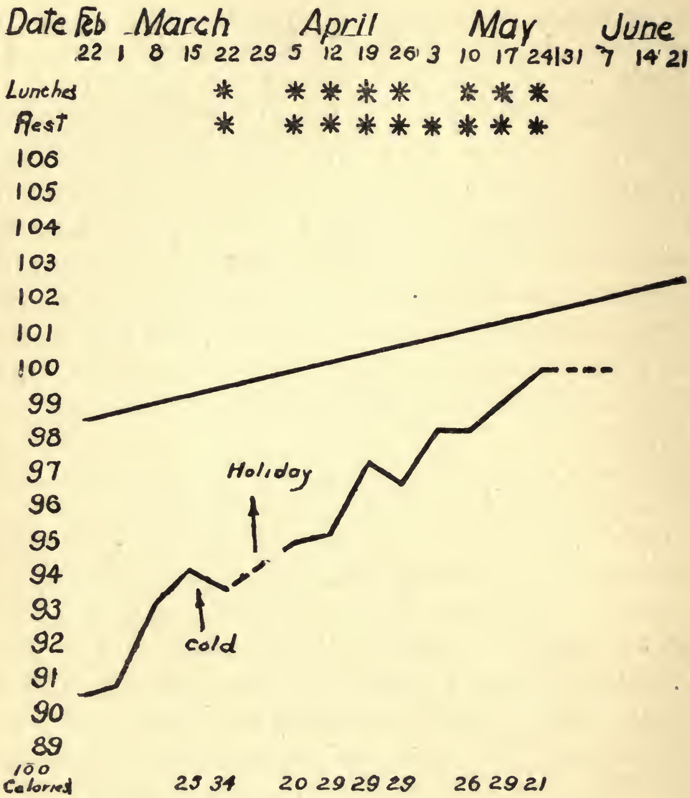


CHART Xa.

Showing Line of Normal Expected Gain—a Satisfactory Record.

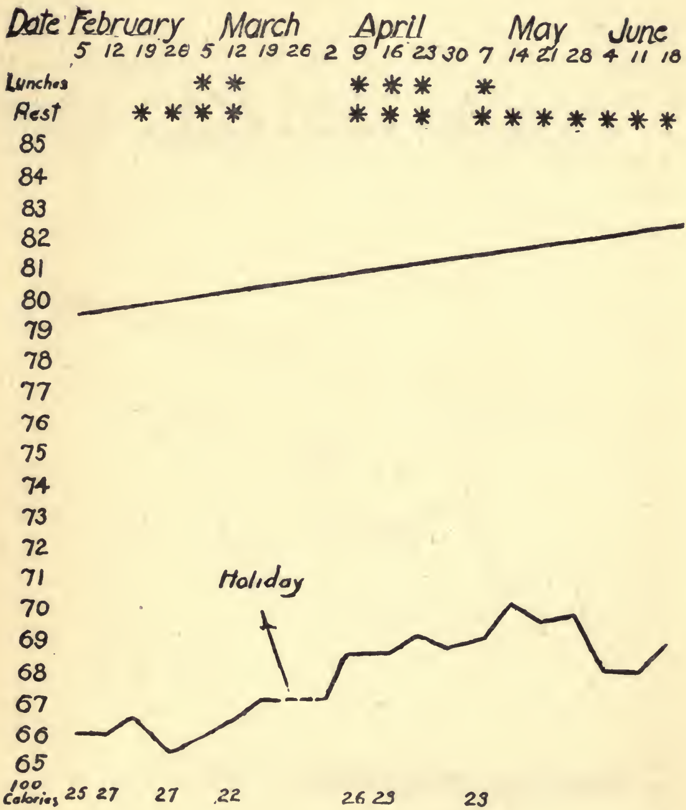


CHART Xb.

Showing Line of Normal Expected Gain—an Unsatisfactory Record.

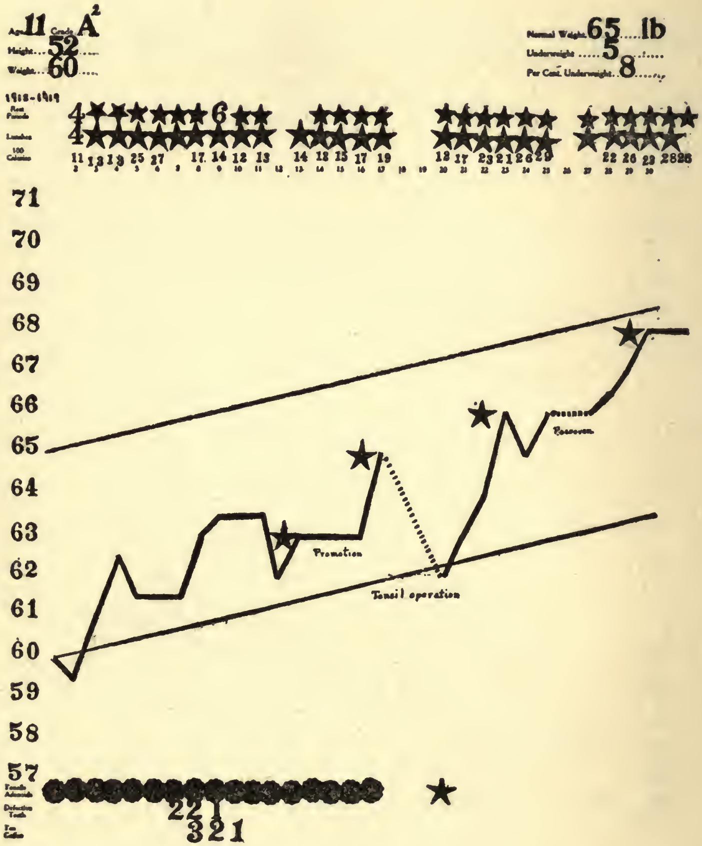


CHART Ya.

Showing Zone Formed by Line of Normal Expected Gain and Line of Individual Expected Gain—a Satisfactory Record.

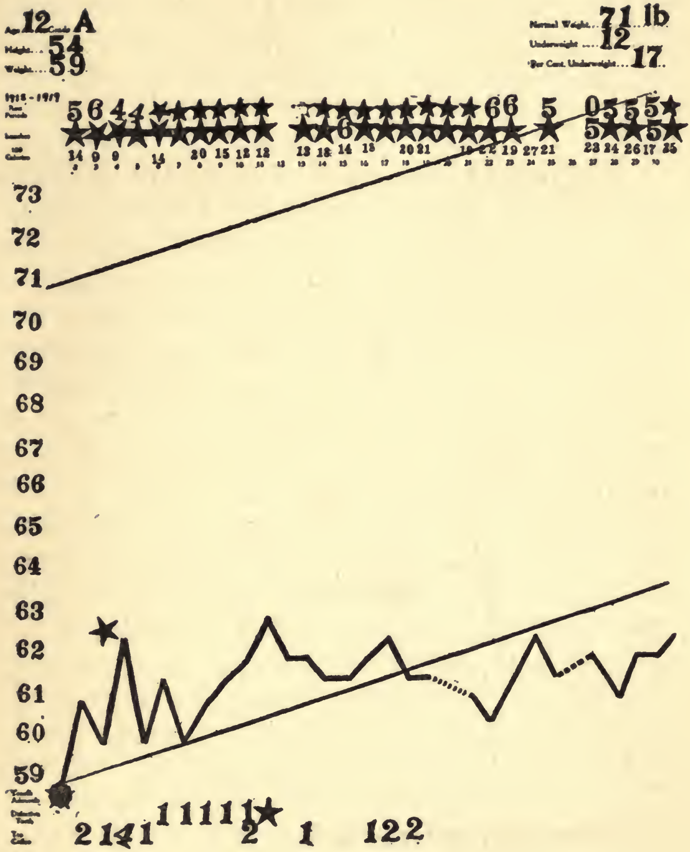


CHART Yb.

Showing Zone Formed by Line of Normal Expected Gain and Line of Individual Expected Gain—an Unsatisfactory Record.

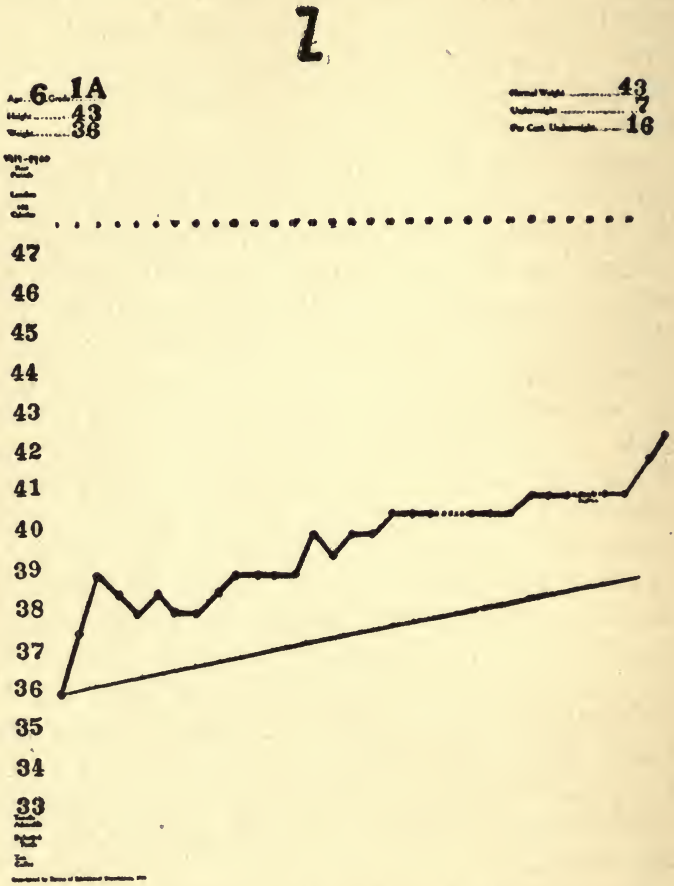
ent that for this boy the struggle to approximate his individual line of expected gain was unsuccessful during the season of minimal increase, and the presence of the line of normal expected gain could have had no significance for him except as a discouragement.

Some changes in addition to the line of individual expected gain will be noted on these charts (Ya and Yb). Actual dates of the class meetings have been replaced by their numbers, 1, 2, 3, 4, etc., indicated by the figures in the fourth row from the top. Rest periods and lunches are recorded in the first and second rows and the stars used are supplemented by figures indicating the number of days during the week that the régime was followed, the star signifying that the régime was observed every day of the school week. The records of caloric intake follow in the third row. The three last rows are used to indicate the presence of defects needing correction and the taking of tea and coffee. A black sticker placed in the row opposite the words "Tonsils, Adenoids" shows operation has been recommended and is repeated every week until removal, when a gold star is used. (See chart Ya where operation was performed in the eighteenth week and is followed by a loss of 3 pounds in weight and rapid gain after 3 weeks absence.) A gold star was also used to record the greatest gain in pounds made in each class during each week. For this Ya receives three gold stars at different points in his progress, and Yb in spite of his poor record later, receives one the third week after his enrollment.

Dental defects are indicated in the row below by figures showing the number of defective teeth found. As these are treated the figures are reduced. Figures in the last row, following the words, "Tea, Coffee," indicate the number of times these stimulants were taken during the week.

Chart Z shows the form used for the first grade children during the last winter of the experiment. Only the line of individual expected gain is used for comparison with the week to week increments and all gains in excess of that appear as achievement. Thus the efforts of the children are directed to "beating their own record" and the greater apparent success attending their attempts serves to stimulate further endeavor. Z is a high percentile case, being 7 pounds or 16% underweight when enrolled. After an initial gain of 3 pounds in the first three weeks he averages from 3½ to 1¼ pounds in excess of his expected gain at each weight taking for 32 weeks when he is 3½ pounds, 7.5%, underweight for height. One other feature added to the chart in this last year was the red crayon dot by which the child himself recorded the result of the weight taking under the nutrition worker's supervision. He placed the dot in the proper square and the weight line was filled in by the nutrition worker afterwards.

In the light of subsequent experience, some further modification of the weight chart, or at least of the line of expected gain to reflect seasonal variation suggests itself. It will be evident that these lines as computed on all charts, whether for



SHOWING ADAPTATION FINALLY MADE USING ONLY LINE OF INDIVIDUAL EXPECTED GAIN.

Normal Expected Gain or for the Individual Expected Gain represent a rate of increase too low for the season of maximal increment and too high for the season of minimal increment.

APPENDIX D

Relative efficiency of differing provisions affording advantageous factors in the school environment.

Before our provisions for health education can be placed on the most efficient basis, a considerable program of experiment remains to be undertaken. The relative value of various provisions for supplying advantageous factors in the school environment has yet to be determined, and experiment is especially needed in respect to provisions for school feeding and ventilation. This can only be accomplished by consistently following such a program as was attempted in the first year of our work, that of establishing parallel groups of children on a basis as nearly equal as possible, but with different variables as points of comparison.

Comparable groups of children should be studied under varying conditions of ventilation with a view to determining more definitely the influence on growth of optimum conditions in respect to temperature, humidity, and movement of air. The facts of seasonal variation establishing the fall months as the period of maximal weight increase, suggest the favorable influence for nutritional processes of variable, but not extreme temperatures and open windows, in comparison with extreme outdoor cold and the heated indoor atmospheres, with low humidity, and lack of air currents, that characterize our winter conditions in the latitudes of New York and Boston. Comparison of the results secured in the open-air and fifth grade classes during the second winter of our experiment appears to confirm the hypothesis that conditions of ventilation materially influence the nutritional processes, and that week to week observations of growth in children, under conditions calculated to isolate the factors of temperature, air movement and humidity, would result in some definite accessions of knowledge in respect to the importance of these as advantageous factors in the school environment. The numerous experiments previously undertaken in this field have yielded only negative data in respect to the effect of ventilation on health, as in the case of the investigations conducted by the New York Ventilation Commission, or have attempted to draw conclusions from groups not strictly comparable, under conditions not strictly parallel in respect to other advantageous factors. This is true of the numerous comparisons attempted between open-air and indoor classes. Children of anaemic or pre-tubercular condition usually form the major part of the open-air groups, and are given the special provisions characteristic of the open-air class in addition to the modified atmospheric conditions. For years a battle royal has been waged in the schools by and against the advocates of open-air classes. But for the most part investigators have been concerned with comparisons of the learning process, and after reporting on the negative results obtained from these, have been content to confess that they have had no standards by which to evaluate physiological effects.* Physiological effects, however, are precisely what the health program must consider. Especially is this true of a program that seeks to increase physical vigor through improved nutritional status. We must agree with Dr. Burnham† that experiments to date have not been carried far enough. They are inconclusive so far as our problem is concerned. For this reason we suggest an extended study of week to week growth increments under at least four contrasted methods of ventilation found in our schools at the present time. This study should be undertaken with groups of children strictly comparable as to average physical status, age period, mental ability and conditions of class environment.

Since experience has shown that open-window and open-air classes must be provided with mid-session lunches, rest facilities, and frequent brief periods of bodily activity in cold weather, we cannot isolate the influence of atmospheric conditions in an investigation of groups where an open-air class is included, unless we supply these special conditions to all the groups studied. Thus our investigation instead of contrasting standard school conditions with the special environmental conditions found in the

* McCall, Wm. A., Proc. Conference Women Physicians. Vol. III. pp. 46-63, Womans Press, 1920.

† Burnham, Wm. H., *The Optimum Humidity for Mental Work,* Pedagogical Seminary, Dec., 1919, pp. 311-329. "The experiments by the New York Commission strongly suggest that excess of temperature or the bad odors of stale air, or both these together modify the general metabolism since, as we have seen these investigators found that by working in bad air and overheated conditions the appetite of their subjects was diminished. Thus while for the time being no appreciable effect on the working ability was noticed, probably continued work in these conditions would be injurious to the health and decrease efficiency."

open-air class would add the advantageous factors of the open-air class (with the exception of atmospheric conditions) to the usual environment. In this way we might hope to isolate the effects on growth of the varying conditions of atmosphere afforded by the following provisions:

Open-air or open-window class with artificial heat to ensure a temperature of 55 degrees. (The generally accepted provision in latitudes like New York where extreme winter cold prevails.)

Closed-window class with artificial heat and direct ventilation.

Closed-window class with artificial heat and forced air ventilation.

Closed-window class with artificial heat and forced, humidified air.

A parallel series of observations on groups of normal children, low percentile underweights, and high percentile underweights, under these varying conditions of environment, should prove of proportionately greater interest and importance.

Comparable data on parallel experiments in school feeding should determine the character and place of the school lunch in a corrective program. The school lunch for malnourished children had originally but a single purpose, to fill the hungry, and popular thinking on the subject to-day is largely colored by the eleemosynary character of its beginning. Soups and stews have been provided in our public school lunch rooms for many years with a view to satisfying hunger, and such returns in weight increase as have resulted have been accepted without question, because in the minds of those responsible for the menus, relief measures rather than stimulation of growth have been the major consideration. Increasing realization that the function of the school lunch in a corrective program is educational and remedial has not served to alter the character of the menus generally offered to the extent that the newer conceptions of feeding demand. Questions of relative convenience, expense and tradition largely govern the selection of the foods supplied, and so simple a piece of research as the gathering of data on the comparative weight-getting value of the different types of mid-morning lunches, whether of milk, of cocoa, of soup or of cereal and milk, remains to be attempted. We have no statistics by which to gauge the advantages of the mid-day dinner planned as a model balanced meal in comparison with those of a meal planned to supplement particular deficiencies in the home dietaries. Yet every worker responsible for dinner menus in a corrective program is called on to decide between these two methods of attack. The dinners provided by the New York School Lunch Committee during the first term of our work were planned on the second basis, with a view to supplementing home dietaries that were conspicuously lacking in milk and vegetables and for the most part low in caloric value. The greater knowledge of food accessory substances that is rapidly becoming a part of general thinking to-day, suggests the desirability of still further departure from the model balanced meal when stimulation of growth is the specific aim in view. And thus the question arises whether the emphasis placed on milk and vegetables in our best current programs might not profitably be extended to include the liberal use of fruit juices and tomato juice, possibly of yeast, to stimulate appetite and increase vitality.

Experience has pretty clearly shown that whatever lasting results in growth are to be secured from the feeding program, must in the final analysis depend on the modification of the home dietary as a result of tastes cultivated or convictions established through the school experience. Hence the relative efficiency of the school menu cannot be determined in advance merely by considering its constituent food values. Careful evaluation of the actual returns from various programs is the necessary basis for real progress in this field.