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Bulletin No. 246 - Food Habits of Rural School Children in Relation to Their Physical Well-Being

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FOOD HABITS OF RURAL SCHOOL CHILDREN IN RELATION TO THEIR PHYSICAL WELL-BEING

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SUMMARY

A study of school children's diet and of their physical status was made in six rural Utah communities, similar in size, and in social, economic, and physical characteristics.

Food records of 891 children showed their average diet to be 53.6 per cent of optimum, measured by a score based on 100.

Foods most responsible for low scores were milk, vegetables (green and leafy), raw vegetables and fruits, and whole-grain products.

Similarity of food records from the six communities indicate that the sample is representative for the type of community studied.

Among the established food habits reported were the following: Life-long habit of drinking milk, 82 per cent; eating raw garden vegetables in the growing season, 73.2 per cent; eating fruit between meals, 57.6 per cent; and eating bread and butter or jam between meals, 48.2 per cent.

Food preferences showed no marked tendencies corresponding to age. Boys showed a preference for milk, cooked vegetables, and whole-grain products; girls showed a preference for green and raw vegetables and for fruit.

With increase in age there was a tendency to lower food scores.

The dental examination showed a high incidence of dental caries, inflamed gums, abscesses, and fistulas in connection with decayed and neglected baby teeth. A few cases of pyorrhea were encountered.

Thirty per cent of the cavities in permanent teeth had been filled, showing some appreciation of the importance of proper care for these teeth.

Physicians' examinations showed a wide range of defects, among them faulty vision, diseased tonsils, enlarged thyroid glands, spinal curvatures, and faulty skeletal development. Each child examined had one defect or more.

Age appeared to be an important factor in distribution of some specific physical defects.

Both boys and girls were below average weight for age and height (Baldwin-Wood tables). The girls were farther below average than were the boys.

Sickness during the period of study was responsible for the loss of 3269.5 school days; common colds alone caused loss of 811.5 days.

A variety of communicable diseases had been experienced by children prior to the year of study. Those most frequently reported were: Measles, experienced by 79.7 per cent of the group; chicken pox, experienced by 68.6 per cent; and whooping cough, by 58.8 per cent.

The greatest number of immunizations was for smallpox, 45.1 per cent of the children having been vaccinated. Diphtheria immunization had been received by 35.8 per cent of the children under study.

Established health habits and health-promoting activities included: Daily outdoor play, 89.6 per cent; outdoor chores performed daily, 69 per cent; and sleeping with windows open all year, 52.8 per cent. Average number of hours' sleep varied little with age; the smallest average, 9.5 hours, was for summer sleep of children over 10 years of age.

Sixteen children of families included in a former study were found to fall below their family standard in use of milk; all except the children of two families were below family standard in use of fruit and vegetables. Compared with the larger group (891), these children had diet scores slightly higher. Their differences in physical status in most cases were accountable to differences in age.

For the large group the following relationships between diet and physical status were noted:

A. Physical status of children having low-diet scores is comparable with that of children having high scores. Most apparent advantages or disadvantages are explainable on the basis of age differences.

B. Children in the "normal-weight range" (10 per cent below weight to 15 per cent above) have a slightly better diet than those 10 per cent or more below average. This is shown by a greater proportionate number of high diet-scores.

C. Children without thyroid enlargements have a diet superior, except in use of milk and eggs, to the diet of children having thyroid enlargements.

D. Diet scores of children having a high incidence of dental caries are similar to those of children having few or none.

E. There is a tendency for fewer cavities in permanent teeth among children using a pint of milk daily than when the quantity is more or less.

F. Use of a pint of milk daily is accompanied by a tendency to greater use of fruit and vegetables. The probability is thus suggested that the occurrence of fewer cavities is attributable to presence of all dietary essentials in amounts more nearly approaching optimal.

The average diet of these children is believed adequate in fuel value since in addition to foods on which they were scored, all had generous portions of white bread, butter, and sweets.

The adequacy of the diet in vitamins and mineral content is questioned because of scant use of vegetables, raw foods, and whole-grain products.

Assuming the present diet to be typical of what the child has always eaten, it is suggested that the high incidence of physical defects may have resulted, in part at least, from long-continued ingestion of a partially deficient diet.

The need is clearly indicated for more refined methods for the tracing of relationships between specific dietary deficiencies and specific physical defects.

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FOOD HABITS OF RURAL SCHOOL CHILDREN IN RELATION TO THEIR PHYSICAL WELL-BEING[1]

Almeda Perry Brown[2]

PURPOSE OF THE STUDY

This study was undertaken with the following objectives:

1. Investigation of the quality of the rural school child's diet at the time of the study and the nature of his food habits.

2. Investigation of the rural school child's physical status at the time of the study, as shown by

   a. Physical and dental examination.
   b. Sicknesses which interrupt school attendance during the period of study.
   c. Height-weight-age relationship.

3. The tracing of possible relationships between diet and physical status.

TIME AND PLACE

Collection of data extended over two periods corresponding to two school yars. In 1929-30 the study was started in two communities in Cache County; the following year, 1930-31, it was continued in four new communities—two in Boxelder County and two in Utah County. The nature of information obtained did not vary in the two periods; there were, however, slight variations in method.

The public school offered the best means of reaching a representative group of children at a minimum expense; hence, the investigator is indebted to the cooperation of district superintendents in the three counties (Boxelder, Cache and Utah) and to principals and teaching staffs of the six schools for the opportunity of making contacts with children and parents. Hereafter, in this discussion the schools in which the study was conducted

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Acknowledgments: Grateful acknowledgment is made to the following persons who contributed to accomplishment of the purposes of this study: Mrs. Bertha Chase Peterson, former Health Director, Cache County Schools, for examination of vision and hearing as well as for making possible and assisting in dental and physical examinations; to members of the dental and medical profession who made these examinations, particularly to Dr. W. B. Preston, Medical Director, Utah State Agricultural College, who made examinations of children in Boxelder County; to Mrs. Evelina Reed, former Public Health Nurse of Utah County, for examining vision of children in Utah and Boxelder Counties, for making possible dental and physical examinations in Utah County, and for assisting in examinations made in Utah and Boxelder Counties; to those school superintendents who so graciously permitted the study to be made in their respective districts; to various principals and teachers for their valued assistance in securing data; to parents and children who contributed information; and to Miss Edith Hayball, Mrs. Beth Merrill Fillmore, and Miss Lydia Jennings for assistance in tabulation and analysis of data.

[1]Contribution from Department of Home Economics, Utah Agricultural Experiment Station.

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will be designated as Nos. 1 to 6, inclusive; No. 7 will apply to totals or averages for all.

Each school included grades 1 to 8 and one school had a small ninth grade. The age range, therefore, was from six to fourteen years, with twenty-five eighth and ninth grade students above fourteen years. The total enrollment was 1012, although but 891 children finished the study. Sixteen to twenty more children participated in some of the activities; for example, the examinations were made near the beginning of the year, and all children who presented themselves were examined. Some forms of information, collected only once during the study, were also furnished by these extra students. In one school were seventeen Japanese children whose food habits appeared to be in a state of transition from Japanese to American; hence, they were not included in the study. In another school were three Mexican children; these also were excluded, even though their diet records were among the best.

Sixteen children from seven of the forty-three families whose food records supplied material for a former publication of the Utah Agricultural Experiment Station (6) have been included in this investigation but are discussed by themselves.

The six communities are comparable in size, each having a population of approximately 600. They are located in irrigated farm areas where it is possible to produce all varieties of fruits and vegetables common to the region. Considerable attention is given in all communities to dairy and poultry-raising; hence, there is every reason for expecting the school child's diet to be varied and adequate. Most of the homes are in the village, or town, with farms outside, and the family income is derived mainly from the farm. Each community has its local store and garage whose proprietors in some cases combine their businesses with farming. In each community there is also a sprinkling of families depending for income upon the orchard and garden of the town lot, supplemented by earnings from odd jobs. No attempt has been made to differentiate between the children of these groups since farmers are so largely in the majority.

MEANS OF SECURING DATA

In general, the procedure was the same in all six communities; such differences as occurred will be noted as the discussion progresses.

Cooperation of school officials was solicited and obtained. Contacts were made with parents by means of explanatory talks in parent-teacher or other community meetings; where this was not feasible, circular letters were sent out.

The teachers accepted responsibility for securing the following types of information:

1. Monthly weights of children; heights at beginning and at close of school term (Form 6, Appendix).

2. Dietary information for two days in each month during the school year. This information was obtained by having children use the first period after the opening of school to fill out prepared forms (Form No. 1, Appendix), giving menus of the previous evening meal and of the morning's

breakfast. After the noon recess the luncheon menu was included on the form provided. To avoid any tendency to unusual menus on days of study no notice was given children or parents of days when records were to be taken.

3. Statement of food habits (Form 2, Appendix), of food likes and dislikes (Form No. 3, Appendix), of health habits (Form 7, Appendix), and of communicable diseases (Form 8, Appendix). Each of these was obtained once during the study.

4. Record of kinds of sicknesses which interfered with school attendance and the number of days lost through the sickness (Form 6, Appendix). The information, however, was not completed by two schools cooperating in the study.

Exceptions to this procedure were:

1. Dietary information by means of menu sheets (No. 2 above) was obtained from the two Cache County schools studied in 1929-30 but three times: A 3-day period in November, in January, and in April.

2. Dietary information by means of menu sheets was not obtained in October, 1930, from any of the schools studied because during this month the school program was interrupted by the annual "beet vacation," which occurs in some rural sections of the state to allow children, particularly of the upper grades, to assist in sugar-beet fields at the peak of the harvest. In some of the schools, children in the upper grades were noticeably irregular in attendance throughout the month of October.

Parents assisted in the collection of required data by filling all forms for children in the first three grades. They also checked forms filled in by children at school on their food habits, health habits, and histories of communicable diseases, affixing their signatures to indicate that the information was correct.

The value of such dietary information recorded on these menu sheets by the children themselves depends upon the accuracy with which they remembered and upon their honesty in recording. However, in no more than half a dozen cases were records discarded because of discernible inaccuracies.

At the time this study was made, Cache County was the only one of the three having regular school health service. Here an efficient school nurse regularly tested the vision of children by means of the Snellen chart and the hearing by means of the "whisper" test (12). On an average of once in two years, a complete physical examination was given all school children through cooperative service of the Cache County Medical Association. The County Dental Association cooperated in annual dental examinations. For these services neither doctors nor dentists were remunerated in any way. It was through the efforts of the school nurse that medical and dental examinations in the schools selected for study came at a time best suited to requirements of this investigation.

Utah County had an efficient public health nurse connected with the county health unit organization. Although her usual work was confined to care of pre-school children and the training of mothers, she cooperated enthusiastically in other public health work. It was through her acquaintance and influence that the services of local physicians and dentists were secured in making examination of children in the two Utah County schools.

In Boxelder County members of the County Dental Association willingly made examination of the teeth and conditions of oral hygiene in the two schools of that county. Examinations of physical status were made by the medical director of the Utah State Agricultural College.

In all cases examinations were made at the schools themselves, necessary equipment being taken to the schools.

The vision of school children both in Utah and in Boxelder Counties was examined by the Utah County Public Health Nurse with the aid of the Snellen chart. An audiometer for testing hearing was not available and it was impossible to secure the services of anyone practiced in use of other tests; hence, this phase of the examination was given only in Cache County.

WHAT THE DATA SHOW ABOUT THE SCHOOL CHILD'S DIET

Menus and Diet Scores

The dietary information obtained by means of menu sheets (Form 1, Appendix), being purely qualitative in nature, does not lend itself to measurement by means of fixed dietary standards. A number of score cards are in use for evaluating dietary information of this kind and, while they vary in detail, all emphasize the importance of milk, vegetables, fruits, and whole grain by placing relatively high numerical values on these food groups.

Table 1 shows the card selected for use in this study. It was evolved by the late Esther Davies and used by her in a similar study in Massachusetts (7).

TABLE 1. Davies' Score Card for scoring school children's diet.

Food	Standard	Optimum Score
Milk	1 quart daily	24
Vegetables		
Potatoes	Once daily	5
Green or Leafy	Four times a week	8
Cooked Vegetables (other than potatoes or greens)	Once daily	10
Fruit		
Cooked	Once daily	7
Raw Fruit, Raw Vegetables, or Canned Tomatoes	Twice daily	14
Bread or Cereals—Whole Grain	Twice daily	14
Eggs	Three times a week	9
Meat or Fish	Once daily	9
	Total Score	100

Note: 10 points is deducted for use of tea or coffee.

By this method of scoring, no additional credit is allowed for any food eaten in excess of the standard.

In addition to the foods for which scores are given, all children had bread and butter each day. As noted in a former study at the Utah Agricultural Experiment Station (6), so in this study, use of whole-grain bread was the exception rather than the rule; most of the whole-grain reported was in the form of breakfast cereals. Almost every day children had desserts or sweets of some kind; jams, jellies, and preserves are in-

cluded in this group. Cooked fruit other than these (canned and stewed fruits, baked apples, etc.) constitutes the group referred to in this study as "cooked fruit."

None of the 891 diet records reached the optimum score of 100 provided in the score card, the highest being 88. Seventy-seven scores reached 70 and above; two were as low as 21. The mean diet score for the 891 diet records was 53.6, with a standard deviation of 11.6 and a probable error of 0.26.

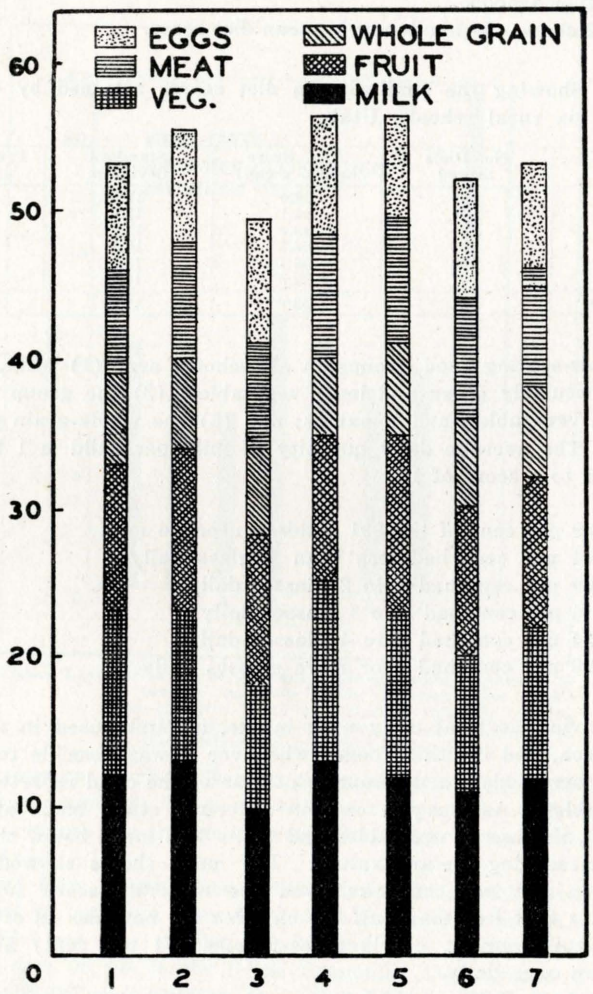

Figure 1.—Distribution of different foods in the average diet of the Utah rural school child. Nos. 1 to 6, inclusive, indicate the six schools included in the study, No. 7 being the average.

Figure 1 is designed to show graphically the distribution of different food groups in the average diet: Nos. 1 to 6, inclusive, refer to schools;

No. 7 is the average for the six schools. School No. 3, it will be observed, has the lowest average, the reason for which is not apparent in the data collected since living conditions seem as favorable as in any of the other communities. Schools Nos. 2 and 4 make the best showing in use of milk, although this difference is slight.

Indeed, in the different communities, there is but little variation, either in total diet score or in scores for different food groups. Even the 9-day records from schools Nos. 1 and 2 are similar to the 14-day records from the other schools.

Table 2 shows the similarity in mean diet score.

TABLE 2. Showing the similarity in diet scores attained by children in six rural schools, Utah.

School No.	No. Diets Scored	Avg. Score (arith. mean)	Standard Deviation	Probable Error of the Mean
1	168	53.6	11.5	0.59
2	150	54.1	12.2	0.67
3	181	49.3	11.2	0.56
4	125	56.5	10.1	0.61
5	160	56.1	11.8	0.26
6	107	52.5	10.4	0.67
All Schools	891	53.6	11.6	0.62

The low-scoring food groups in all schools are: (1) Milk, (2) vegetables, particularly green and leafy vegetables; (3) the group comprising raw fruits, vegetables, and tomatoes; and (4) the whole-grain products.

Milk. The average daily quantity of milk per child is 1 pint, which corresponds to a score of 12.

0.9 per cent of the 891 children used no milk
15.4 per cent had less than 1 glass daily
34.9 per cent had 1 to 2 glasses daily
31.4 per cent had 2 to 3 glasses daily
12.4 per cent had 3 to 4 glasses daily
5.0 per cent had 4 or more glasses daily

In arriving at total daily milk intake, amounts used in milk soups, in milk cocoa, and in other foods (whenever it was possible to determine amounts), were added to the number of glasses the child reported drinking.

Vegetables. As was the case in a former study made at the Utah Station (6), the use of vegetables and fruits was much below the standard used for measuring dietary values. The menu sheets showed that only 399 children (45 per cent) achieved the optimum score for potatoes, which means that less than half the children ate potatoes as often as once a day; of this number, nearly three-fourths (71 per cent) ate potatoes oftener than once daily.

Ninety-four children (10.5 per cent) reached an optimum score for cooked vegetables other than potatoes or green and leafy vegetables. This corresponds to the use of one such vegetable a day; more than half this group (62 per cent) had more than one cooked vegetable daily.

Almost half the group (47.4 per cent) had no green or leafy vegetables on any of the days for which menus were secured. Only nine children

(1 per cent) attained the optimum score, corresponding to use of this type of vegetable four times a week. The fact that the period of dietary information extends from fall to spring instead of including the growing season may account in part for this situation. With one exception, however, all of these communities are within a half hour's drive of cities where green and other vegetables can be bought throughout the year; each community, with this one exception, is also connected to nearby cities by interurban electric trains.

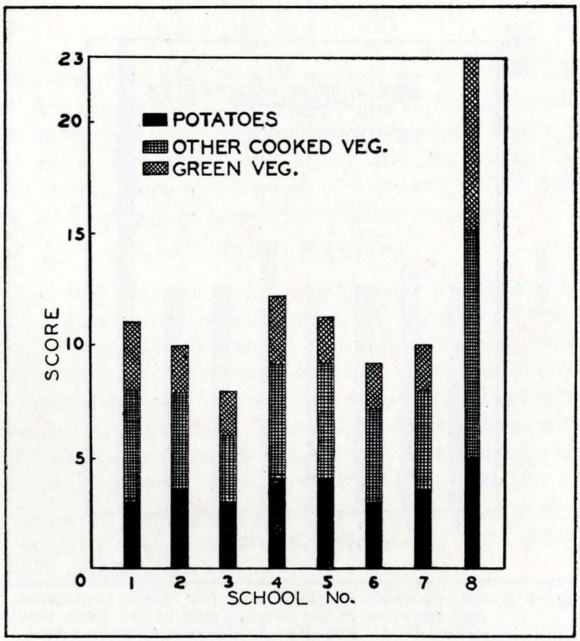

Figure 2.—Distribution of different kinds of cooked vegetables in the average vegetable intake of Utah rural school children. Nos. 1 to 6, inclusive, refer to schools, No. 7 showing the average for the six schools. No. 8 is the optimum (Score Card, Table 1).

The proportion of the different kinds of cooked vegetables, making up the average vegetable intake, is shown in Figure 2. Column 7 shows the general average for the six schools; Column 8 indicates the optimum vegetable intake.

Fruit and Raw Foods. Four hundred and fifteen children (46.6 per cent) attained an optimum score for cooked fruit, which means one portion daily; 360 (86.7 per cent) of this number had more than one portion daily. Unpublished data on file in the Home Economics Department of the Utah Agricultural Experiment Station show that canning fruit for winter use is a common practice in rural Utah homes. This fact doubtless accounts for a more nearly satisfactory use of fruit than of vegetables, since the practice of canning the latter is less common. These unpublished data also indicate a higher consumption of fruit in winter than during any other season, doubtless also due to the practice of home fruit-canning.

The goal of two raw foods (fruit or vegetable) or of tomatoes twice daily seemed difficult of attainment, since only 40 children (4.5 per cent) attained the optimum score. Apples, grapes, and other raw fruits eaten after school and at other times were included in the scores. Twenty-nine (72.5 per cent) of the forty children had more than two raw foods daily.

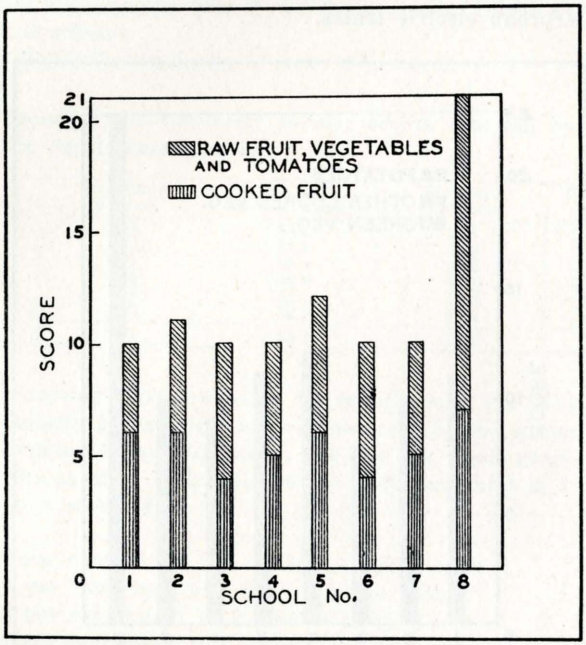

Figure 3.—Distribution of cooked and raw fruits, vegetables, and tomatoes in the average diet of the Utah rural school child. Nos. 1 to 6, inclusive, refer to schools; No. 7 is the average for the six schools; and No. 8 is the optimum.

In Figure 3 is shown the relative proportion of cooked fruit and raw foods (fruits and vegetables) making up this dietary group.

Whole-Grain Products. Only 17 children (1.9 per cent) reached the optimum score for whole grain products, corresponding to two portions a day. Ten of this number had more than two portions daily. Almost one-third of the entire group (30.1 per cent) had a whole-grain product once daily, usually a breakfast cereal.

Meat and Eggs. Those foods in which the greatest numbers of children attained optimum scores were meat and eggs. Four hundred and eighty-eight (54.8 per cent) had optimum scores for meat, corresponding to one portion a day; of these, 408 (83.6 per cent) had meat more than once daily. Five hundred fifty-five (62.3 per cent) had optimum scores for eggs, corresponding to one egg three times a week; of these, 487 (87.7 per cent) had eggs oftener. These relationships are shown in Table 3.

TABLE 3. Number and percentage of children attaining optimum scores for various foods; also number and percentage exceeding optimum.

Food	Attaining Optimum Score		Exceeding Optimum	
	No.	Percentage	No.	Percentage
Milk	45	5.1	45	100
Vegetables				
Potatoes	399	44.8	284	71.2
Green and Leafy	9	1.0	7	77.8
Other	94	10.5	58	61.7
Fruit (cooked)	415	46.6	360	86.7
Raw Fruit, Vegetables, or Tomatoes	40	4.5	29	72.5
Whole Grain	17	1.9	10	58.8
Meat	488	54.9	408	83.6
Eggs	555	62.3	487	87.7

In all food groups, zero scores as well as optimum scores occurred. Fortunately for the children, zero scores were few in number except in the case of green and leafy vegetables where zero scores predominated. In the food group comprising raw fruits and vegetables the zero scores and optimum scores were about equal in number. There was considerable variation in all food group scores between these limits.

FOOD HABITS

A total of 910 children was in attendance at the six schools on the day the food-habits record was obtained. The forms (Form 2, Appendix) provided for estimates of frequency with which various foods were eaten. In the case of milk the children's estimate was surprisingly close to the record obtained on the menu sheets, the former being 2.5 glasses per child per day, the latter, 2 glasses. Estimation of frequency with which some other foods were eaten exceeded the record on the menu sheets; in a few cases it was slightly lower. These relationships are shown in Table 4.

TABLE 4. Showing comparison of children's estimates with actual records of daily use of milk and of frequency with which other foods are served.

Foods	Frequency	Estimates of 910 Children		Atcual Record of 891 Children	
		Glasses per Child			
Milk	Daily	2.55		2	
		No. Using	Prentg.	No. Using	Prentg.
Potatoes	Once daily	646	71.0	399	44.8
	More than once	235	25.8	284	31.9
Cooked Vegetables (other than potatoes or greens)	Once daily	568	62.4	94	10.5
	More than once daily	233	25.6	58	6.5
Cooked Fruit	Once daily	462	50.8	415	46.6
	More than once daily	338	37.1	360	40.4
Meat	Once daily	359	39.5	488	54.8
	More than once daily	49	5.4	408	45.8
Eggs	As often as three times weekly	283	31.1	555	62.3
	More often	416	45.7	487	54.7

Perhaps the chief value of the food-habits record lies in the picture it gives of habits extending over a period of time. For example, the menus show that 99 per cent of the children take some milk daily; the food-habits record shows that nearly as many (82 per cent) have had the milk-drinking habit all their lives.

As previously noted, the period over which menus were obtained may in a measure account for low vegetable scores; the food-habits record shows that in the summer almost three-fourths of the entire group (73.2 per cent) had a habit of going into the vegetable garden and eating raw peas, carrots, and turnips. Hence, the actual vegetable consumption during a full year is doubtless better than the scores would indicate.

Another factor which affected the vegetable score adversely is the fact that half the children (52 per cent) reporting food habits had cold noon luncheons, consisting usually of meat, eggs, cheese, or jelly sandwiches, with sometimes an apple, or other fresh fruit, but no vegetables. In cases where the cooked dinner for the family was served at noon the children had usually another cold lunch at night, consisting of bread, milk, jelly or preserves. Thus, the only warm meal many children had during the entire day was the breakfast, at which time vegetables, other than fried potatoes, were seldom served. A regular hot evening meal was reported by only 39 per cent of the children.

Lunching between meals was shown by both food-habits records and menu sheets to be a common practice. The usual time for these extra meals was late afternoon when the children returned from school. A number of mothers sent in notes explaining that children needed these lunches because of the long walk home from school. Fruit and bread and butter or jam usually made up the between-meals lunch; quite a number had sweets; occasionally milk formed a part of the lunch.

Little use of coffee and tea is shown; on the food-habits record less than 2 per cent reported regular use of either and only 13 per cent reported occasional use. The menu sheets did not bear out this estimate, as no deductions as provided for in the score card were found necessary. In Table 5 is summarized the miscellaneous food habits reported in the food-habits record; Table 6 shows the nature of the between-meals lunch.

TABLE 5. Miscellaneous eating habits as reported by 910 children in six rural schools, Utah.

Habit	No. Having Habit	Percentage
Eating Vegetables		
Entire Life	801	88.0
Raw Vegetables in Garden	667	73.2
Eating Apples (fall and winter)	517	56.8
Drinking Milk (entire life)	750	82.4
Cold Noon-day Meal	472	51.8
Hot Evening Meal (always)	350	38.5
Slow Eating	545	60.0
Eating all Food Served (always)	437	48.0
Coffee or Tea		
Regularly	15	1.6
Irregularly	122	13.4
Eating between Meals	797	87.6

TABLE 6. Kinds of foods making up between-meal lunches—estimated and actual records on 910 and 891 children, respectively.

Food	Estimated (910)		Actual Record (891)	
	No.	%	No.	%
Milk	241	26.5	55	6.2
Apples and Other Fruit	470	51.6	401	45.0
Bread and Butter (or jam)	438	48.2	275	30.8
Candy and Other Sweets	337	37.0	235	26.4

Food Preferences

The menu sheet (Form 1, Appendix) was designed to show differences between the child's diet and that of the family; the purpose was to determine to what extent the child's dietary deficiencies were a matter of choice. However, data concerning family diet were so meagre on most of the records as to give no worthwhile information on this point. It was thought, therefore, that the same goal might be attained by getting the child's reaction to foods, particularly to those types responsible for low scores. This record was obtained from all schools except from School No. 1.

Table 7 summarizes the percentage of 313 boys and of 321 girls who reported their likes and dislikes (Form 3, Appendix).[3]

Comparison of Table 7 with Table 3 shows that in all cases the percentage of children liking the various types of foods is much higher than the percentage attaining the optimum score; for example, 70 per cent of the 13-year-old boys like green and leafy vegetables; this is the lowest percentage for both boys and girls of all ages (Table 7, Column 5), yet only 1 per cent (Table 3, Column 3), of the entire group of children made the maximum score for this type of food.

This situation, considered in connection with the fact that about half (52 per cent) of the group had cold noon-day luncheons and more than half (61 per cent) had cold suppers at night, suggests the probability that in many cases lack of opportunity rather than choice on the part of children may be responsible for low scores.

TABLE 7. Percentage of 313 boys and of 321 girls "liking" types of foods in which scores were low.

Age (Years)	Sex	Percentage liking Various Foods					
			Vegetables (No. kinds)				
		Milk	Cooked[1] 7	Green and Leafy[2] 5	Raw[3] 6	Fruit[4] 20	Whole-grain Bread (Wheat and Corn)
6	Boys	100	87	88	96	95	76
	Girls	100	86	86	96	97	76
7	Boys	100	83	77	87	93	63
	Girls	97	83	88	96	96	74
8	Boys	97	82	82	91	90	77
	Girls	94	77	81	91	91	62
9	Boys	100	77	76	94	91	69
	Girls	86	76	73	88	91	58
10	Boys	100	79	77	90	84	76
	Girls	97	83	78	94	93	70
11	Boys	92	79	74	89	90	77
	Girls	97	78	79	92	85	59
12	Boys	94	84	79	91	89	71
	Girls	92	77	76	95	93	71
13	Boys	89	77	70	92	89	85
	Girls	87	78	76	96	89	84
14	Boys	96	84	82	90	89	64
	Girls	95	80	85	94	91	72
Above 14	Boys	100	88	77	95	77	72
	Girls	100	86	88	100	93	100

[1]Carrots, squash, parsnips, cauliflower, corn, onions, turnips.
[2]Greens (several kinds), peas, string beans, asparagus.
[3]Celery, lettuce, tomatoes, watercress, cucumbers, radishes.
[4]Apples, apricots, bananas, cherries, raspberries, strawberries, peaches, pears, oranges, lemons, grapes, grapefruit, prunes, plums, cantaloupes, watermelons, pineapple, dewberries, cranberries, rhubarb.

[3]This form is adapted from one originated by Jessie Whitacre, Ph. D., Chief of the Division of Rural Home Research, Texas Agricultural and Mechanical College, whose permission was secured for its use in the Utah Station study.

Age Factor in Diet

Having examined the diet of the entire group it was thought desirable to inquire whether the nature of the diet varied with age.

The method of Baldwin and Wood (2) was used in dividing the children into age groups; that is, children from 5½ years to 6½ years were designated as 6 years old; those from 6½ to 7½ were designated as 7 years old, etc. In Table 8 is given the distribution by age groups, showing the 12-year-old group to be the largest (131).

TABLE 8. Age distribution of 891 children in six rural schools, Utah.

Age Group	No. in Age Group	Percentage of Total
6	62	7.0
7	88	9.9
8	101	11.3
9	117	13.1
10	99	11.1
11	105	11.8
12	131	14.7
13	91	10.2
14	72	8.1
Above 14	25	2.8

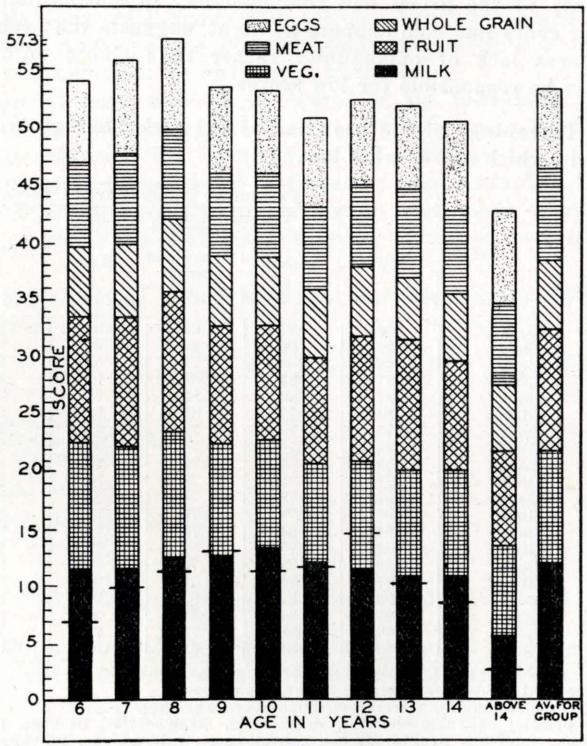

Figure 4.—Average diet of Utah rural school children at different ages from 6 to 14, with the proportionate amount of various foods making up the average diet. The heavy line indicates the percentage of children at each age.

In Figure 4 is shown graphically the nature of the diet at different ages; the length of bar indicates average diet score, the heavy line through each bar shows percentage of children whose diet is represented by the bar.

It will be observed that there is a tendency for the diet score to decrease as age increases, with a noticeable downward dip at 11 years.

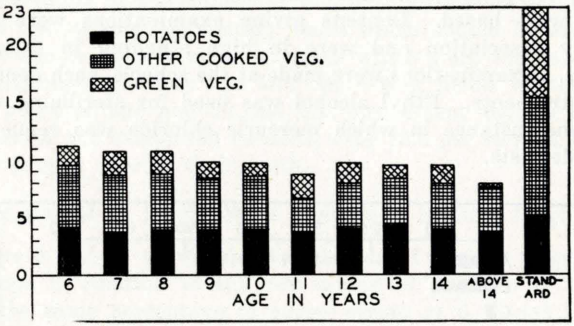

Figure 5.—Average vegetable scores at different ages, showing the proportionate amount of various cooked vegetables.

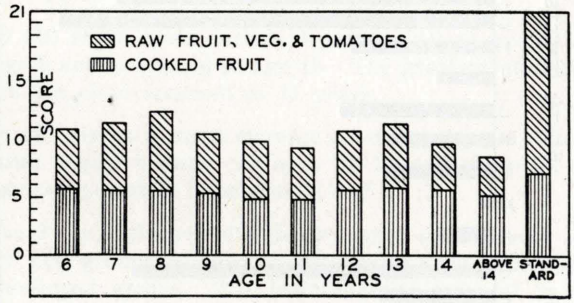

Figure 6.—Mean scores at different ages for raw and cooked fruits, vegetables, and tomatoes, showing the proportionate amount of each.

Figure 5 is an analysis of the vegetable portion of the diet at various ages; Figure 6 represents a like analysis of the fruit portion. There is noticeable in consumption of these foods the same tendency to decrease as age increases that was noted in diet scores (Fig. 4).

While these differences are not great, the menus showed that as children grow older there is an apparent tendency to be more selective in their diet. The menus of boys in the 13-year-old group and above showed a tendency toward a diet made up of white bread, potatoes, meat, eggs, and cooked fruit. The menus of girls at these ages did not show this tendency; missing meals (usually lunch and sometimes breakfast) reduced their scores.

That neither age nor sex is important in food likes is seen by the percentages in Table 7. Boys apparently like milk, cooked vegetables, and whole-grain products a little better than girls do, while the tendency is reversed in green and raw vegetables and in fruits. Food-preference records show no traceable trend corresponding to changes in age.

WHAT THE DATA SHOW ABOUT THE PHYSICAL STATUS OF SCHOOL CHILDREN

Teeth and Oral Hygiene

Form 4 (Appendix) indicates the various points on which dental examinations were based. Dentists giving examinations were members of their county association and were in high standing in their respective communities. Examinations were made at the schools, each dentist bringing his own instruments. Ethyl alcohol was used for sterilizing instruments, except in one instance in which mercuric chloride was requested by the examining dentists.

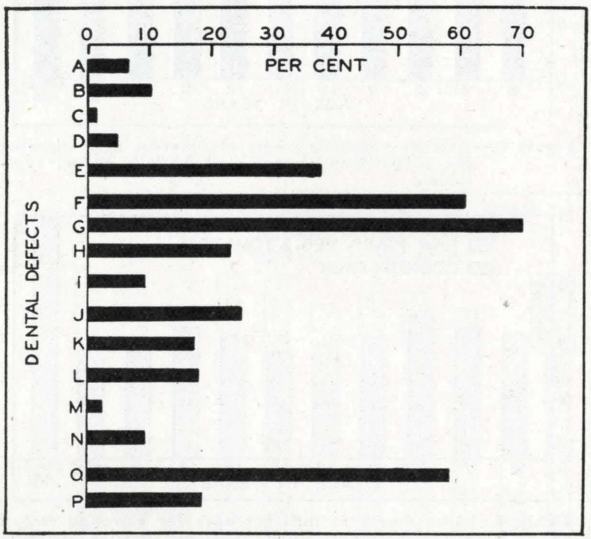

Figure 7.—Percentage distribution of dental defects found in examination of 892 Utah rural school children.—**A**: Tardy 6-year molars; **B**: Tardy other permanent teeth; **C**: Early 6-year molars; **D**: Early other permanent teeth; **E**: Enamel "fair" or "poor" in quality; **F**: Carious temporary teeth; **G**: Carious 6-year molars; **H**: Carious other permanent teeth; **I**: Lost 6-year molars; **J**: Faulty occlusion; **K**: Defective arch development; **L**: Gums inflamed, soft, spongy, etc.; **M**: Pyorrhea; **N**: Abscesses, fistulas; **O**: Teeth given fair care; and **P**: Teeth given poor or very poor care.

Figure 7 summarizes the findings for the entire group examined (892 children).

The cases in which eruption of permanent teeth was delayed beyond the age at which they ordinarily appear were usually associated with other defects: A large number of cavities inflamed or otherwise subnormal gums, and in some cases narrow arches. "Chalkiness" was the most common defect in enamel. Breaks in enamel which threatened decay, as well as those cases in which actual decay had set in, were classed as caries.

In judging care of teeth, evidences of dental attention as well as

brushing and other home care were considered. Some of the group had never been to a dentist's office. Of the 2464 cavities in baby teeth, 321 (or 13 per cent) had been filled; 30 per cent of the cavities in permanent teeth had been filled, all of which showed a degree of appreciation for the importance of preserving permanent teeth.

In the judgment of the examining dentists, there were 298 cases where children had two or more temporary teeth which should be drawn and 38 children had one or more permanent teeth which were too far gone to be saved. Eighty-three children had lost one 6-year molar by the time they reached 10 years of age and 33 had lost two 6-year molars at this age. In the opinion of the examining dentists, only 23.6 per cent of the children were giving proper care to their teeth.

Age Factor in Condition of Teeth and in Oral Hygiene

In Figure 8 (A) is shown the distribution of carious temporary teeth by age groups in relation to the percentage of children in each group. Practically the same percentage of caries occurs at 6, 7, and 8 years, but since there are more children in the 7-year group, the 6-year-olds have a larger number of cavities per child. After age 8 there is a rapid decline in number of carious temporary teeth.

Figure 8 (B) shows some carious 6-year molars at age 6; the increase is rapid to age 8 and less rapid to age 12. The greatest number of carious 6-year molars per child occurred at 11 years.

Figure 8 (C) shows a rapid increase after age 8 in carious permanent teeth other than 6-year molars. At ages 13, 14, and above 14, the average number of cavities per child is between 3 and 4.

In Figure 9 the incidence of defective arch development and of malocclusions by age groups is shown. The main arch defect consisted of narrow, undeveloped arches. The malocclusions were of various types: cross bites, retrusions, protrusions, and crowded teeth.

Dark green and dark brown stains on teeth of a number of children in the 8-, 9-, 10-, and 11-year groups occurred in connection with other unsatisfactory conditions of oral hygiene.

In Figure 10 the line showing percentage distribution of inflamed and otherwise defective gums is noticeably irregular, showing no relation to age. Much gum irritation was found in connection with decayed temporary teeth in the 6- and 7-year groups. It was also in these groups that many abscesses and fistulas occurred. The greatest number of defective gums was found in the 10-year group. This did not include the pyorrhea cases, which began at 8 years and gradually increased to age 12. The greatest number of cases in proportion to number of children was found in the small group above 14 years of age.

General Health and Physical Development

The physical examination of each child, as based on Form 5 (Appendix), was made in 2 to 5 minutes, depending upon the speed with which the examining physician worked. Delays between examinations were avoided

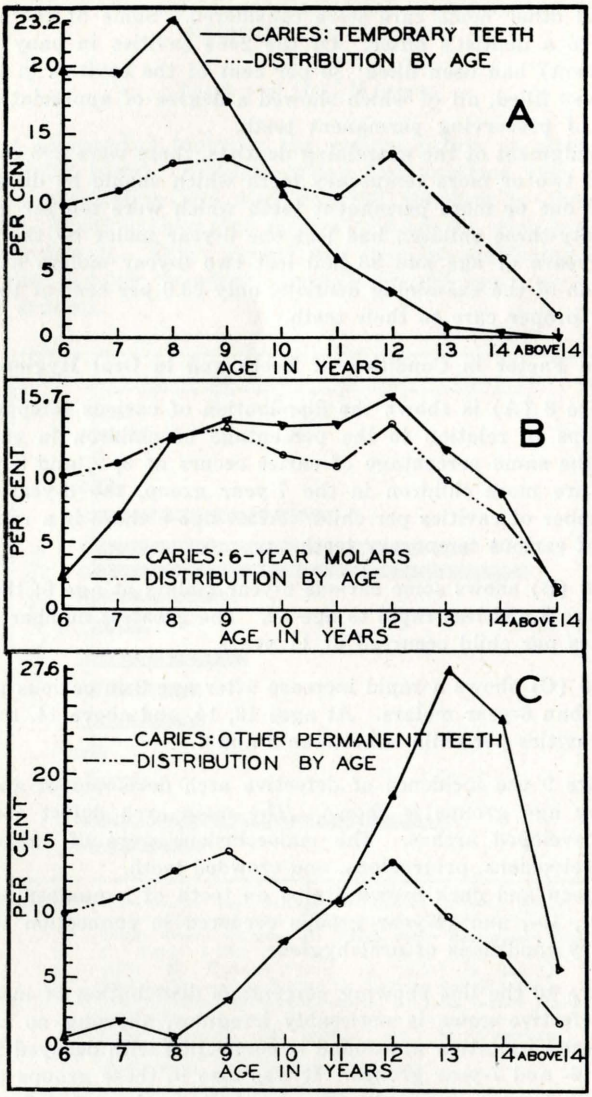

Figure 8.—Distribution of carious teeth.—**A**: Temporary teeth; **B**: 6-year molars; and **C**: Other permanent teeth.

by the efficient work of the nurses[4] who prepared the children for examination, keeping always two or three ahead of the physician. For these examinations children were stripped to the waist and had their shoes and stockings removed.

Physicians examined eyes for defects other than subnormal vision and

[4]In Cache County the school nurse assisted with examinations. The Utah County public health nurse assisted in Utah and Boxelder Counties.

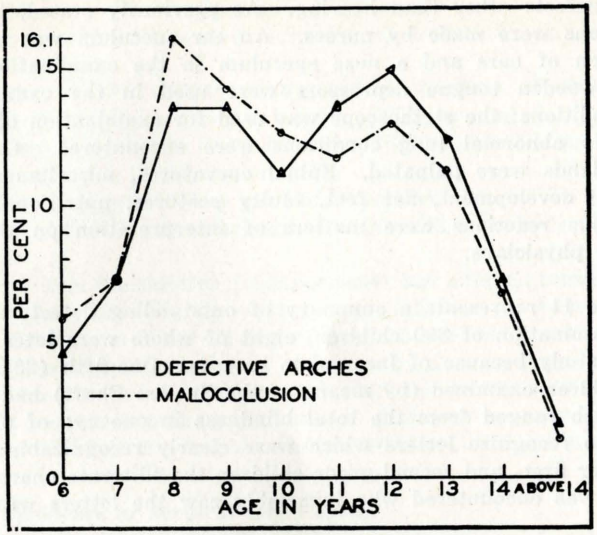

Figure 9.—Distribution, by age groups, of defective arch development and of malocclusions.

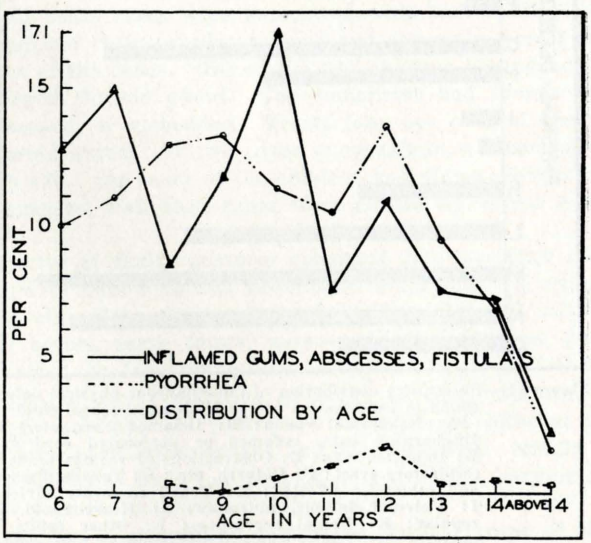

Figure 10.—Distribution by age groups of defective gums and of pyorrhea.

ears for defects other than hearing. As previously stated, these latter examinations were made by nurses. An ear speculum was used in the examination of ears and a nose speculum in the examination of nasal cavities; wooden tongue depressors were used in the examination of throat conditions; the stethoscope was used for examination of heart and lungs. No abnormal lung conditions were encountered. Cervical and thyroid glands were palpated. Spinal curvatures, miscellaneous defects in skeletal development, flat feet, faulty postures, nutritional condition, and nervous reactions were matters of interpretation on the part of examining physicians.

Figure 11 represents a summary of outstanding defects encountered in the examination of 899 children, eight of whom were later eliminated from the study because of incomplete records. One-fifth (20.5 per cent) of the children examined (by means of the Snellen Chart) had subnormal vision which ranged from the total blindness in one eye of one child to inability to recognize letters which were clearly recognizable by normal vision. For first- and second-grade children the illiterate chart was used; one child was encountered who invariably saw the letters wrong side to

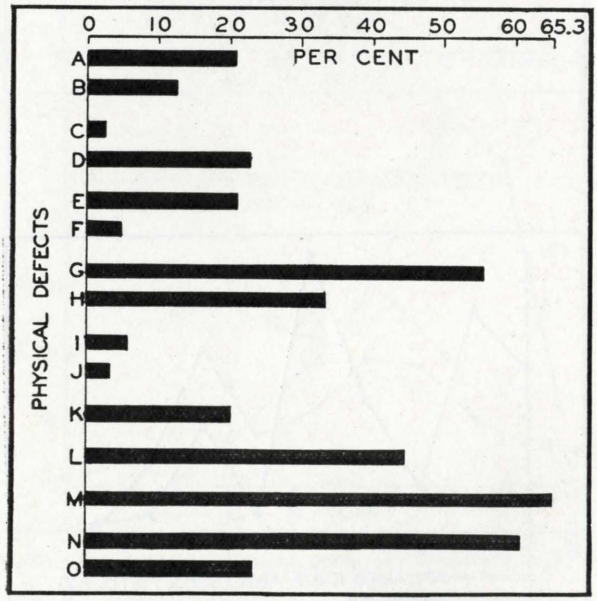

Figure 11.—Percentage distribution of miscellaneous physical defects found in examination of 899 Utah rural school children. —**A**: Subnormal vision; **B**: Inflamed eyes, etc.; **C**: Discharging ears, inflamed or perforated eardrums; **D**: Impacted wax; **E**: Obstructions of various kinds in respiratory tract; **F**: Catarrh, etc.; **G**: Tonsils diseased and otherwise affected; **H**: Tonsil removals advised; **I**: Valvular lesions, murmurs; **J**: Heart rapid, irregular; **K**: Spinal curvatures; **L**: Other faults in posture; **M**: Faulty skeletal development and related defects; **N**: Enlarged cervical glands; and **O**: Enlarged thyroid glands.

or bottom side up. Discharging ears were in all cases accompanied by bad tonsils or could be traced to some recent infectious disease, usually measles.

In the two Cache County schools where hearing of children was examined the percentage of normal hearing (90.9 per cent) is above the 85 per cent average reported in the publication, "The Hard-of-Hearing Child," issued by the Bureau of Education (12).

Among the younger children most of the obstructions in the respiratory tract were adenoids, though enlarged turbinates and deflected septums were encountered.

More than half the children (55.9 per cent) had affected tonsils, ranging in degree from those slightly enlarged or inflamed to those seriously diseased. Almost one-third (31.3 per cent) had tonsil conditions serious enough to rate a recommendation of operation by the examining physicians.

Previous to the years of study, 312 (34.7 per cent) children had had their tonsils removed, making a total of 65.9 per cent surgical tonsil cases. Table 9 shows the number and distribution of these cases.

TABLE 9. Incidence of surgical tonsil cases.

School (No.)	No. Examined	No. Tonsil-echtomies Advised	Percentage of Total	No. Tonsil-echtomies Previously Performed	Percentage of Total	Total Percentage Surgical Tonsil Cases
1	167	24	14.4	61	36.5	50.8
2	141	98	69.5	33	23.4	92.9
3	178	41	23.0	51	28.6	51.6
4	123	43	34.9	34	27.6	62.6
5	163	47	28.8	65	39.8	68.7
6	127	28	22.0	68	53.5	75.6
All Schools	899	281	31.3	312	34.7	65.9

Forty-two children (4.7 per cent) had affected hearts. With two exceptions, all heart cases were associated with bad tonsils; one-third of the group had had their tonsils removed and removals were recommended in 44 per cent of the cases. One of the two children having normal tonsils had an enlarged thyroid gland. The remainder had tonsils which were enlarged, diseased, or embedded. Thirty-four per cent of the group had enlarged thyroid glands; in two cases exopthalmia was suspected.

One-fifth (20.1 per cent) of the children had spinal curvatures of more or less seriousness; two such cases were caused by spinal meningitis in early life.

The majority of faulty postures consisted of a slumping of shoulders, which resulted in hollow chests, prominent abdomens, and wing scapulae. In the group classed as faulty skeletal development and related defects, were cranial bosses, large joints, narrow chests, bow legs, knock knees, flat feet, everted or inverted ankles. Approximately two-thirds of the children (65.3 per cent) had one or more of these defects. Enlarged cervical glands accompanied practically all cases of affected tonsils and persisted in some cases after tonsils had been removed. Nearly one-fourth of the group (23.3 per cent) had thyroid enlargements, varying from those just palpable to most noticeable enlargements.

In the opinion of examining physicians, 71.9 per cent of the children were in good nutritional condition; about the same number had good

muscle tonus; 83.5 had normal skin. In all schools, cases of rough, dry skin were apparent as well as a few cases of scabies.

Age Factor in Physical Defects

Figures 12 to 18, inclusive, indicate the percentage distribution of physical defects among various age groups as well as the relation of this distribution to the percentage of children at each age level.

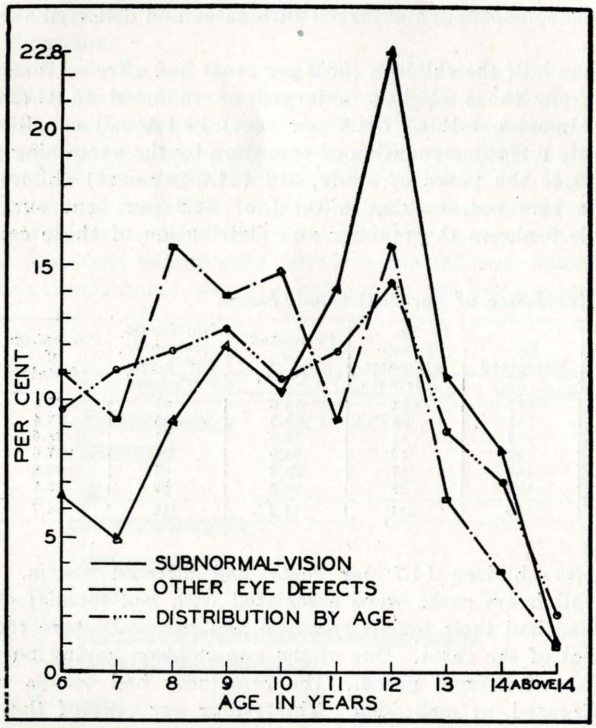

Figure 12.—Distribution, by age groups, of subnormal vision and other eye defects.

In Figure 12 the line representing percentage distribution of subnormal vision indicates little trouble of that nature in the 6-year group and less in the 7-year group. At the 12-year point almost one-fourth (22.8 per cent) of all cases of subnormal vision are concentrated, although this age group comprises only 14.3 per cent of the children in the study. Apparently, the child enters school with fairly good vision; after this through a combination of unfamiliar conditions (probably faulty lighting, glare on blackboards, close work to which he is unaccustomed and does not know how to adjust), his vision gradually becomes impaired. After the age of 12 (either through better adjustment or through medical attention, or a combination of both), his vision improves. In reporting faulty vision, those children who had satisfactory corrections were not included. Inflammations and other eye defects apparently had no relationship to age; they were more prevalent in the 8- to 10-year period than at any other age.

The high incidence of obstructions in the respiratory tract (Fig. 13) among the younger children is due to the fact that many of them had adenoids; in later years, however, most obstructions were caused by enlarged turbinates, deflected septums, and spurs.

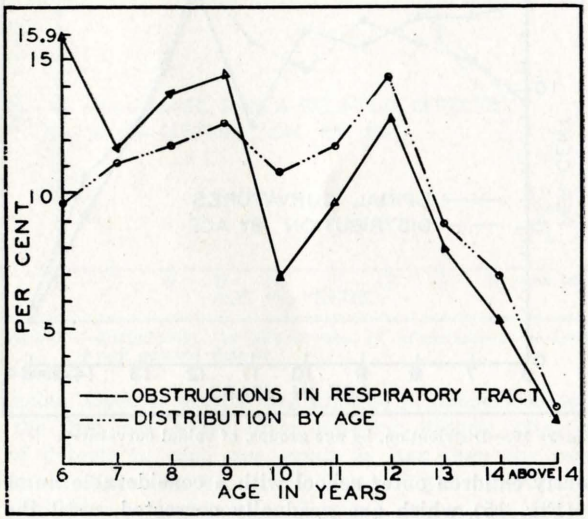

Figure 13.—Distribution, by age groups, of respiratory tract obstructions.

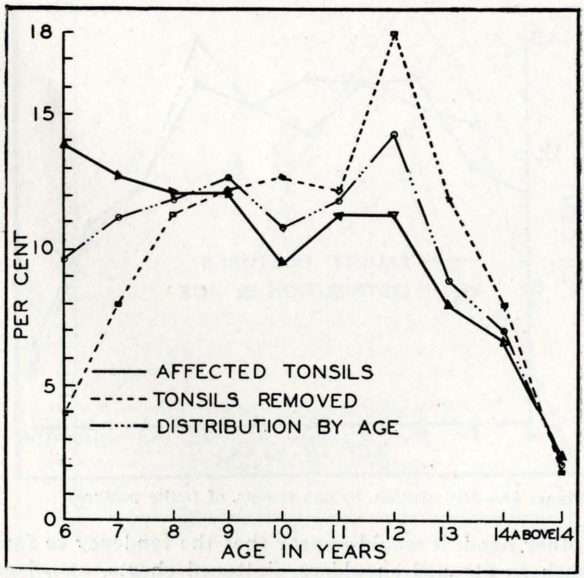

Figure 14.—Distribution, by age groups, of affected tonsils and of removed tonsils.

Children in the lower grades had a large number of affected tonsils (Fig. 14) with few removals, while in the upper grades the situation was reversed.

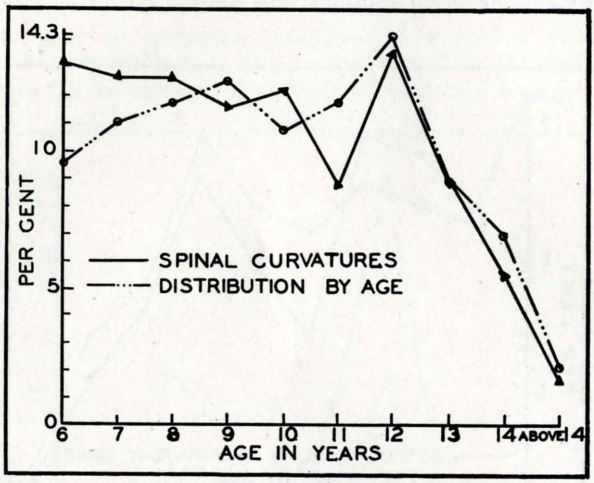

Figure 15.—Distribution, by age groups, of spinal curvatures.

Apparently children enter school with a considerable number of spinal curvatures (Fig. 15) which are gradually corrected, until the percentage of curved spines beginning with the 11-year group is definitely below the percentage of children in each group.

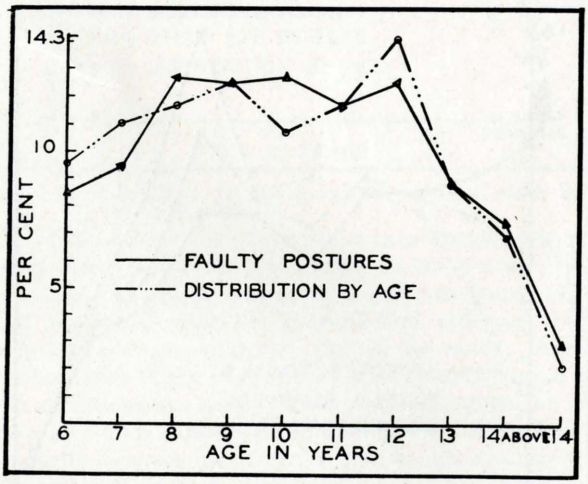

Figure 16.—Distribution, by age groups, of faulty postures.

On the other hand, it would appear that the tendency to faulty posture (Fig. 16), such as stooped shoulders, flattened chests, etc., increase after entrance at school.

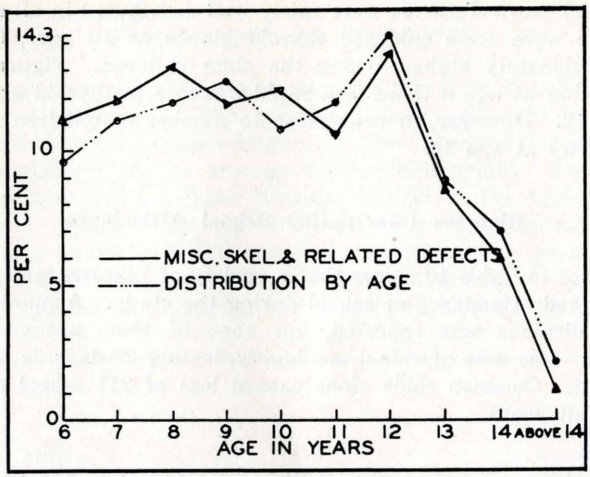

Figure 17.—Distribution, by age groups, of miscellaneous skeletal and related defects.

Miscellaneous skeletal defects are highest in proportion to number of children in the first few years after entering school; after age 10 the percentage of defects in each age group is less than the percentage of children (Fig. 17). In the 8-, 9-, 10-, and 11-year groups there is an interesting similarity in percentage of spinal curvatures, faulty postures, and miscellaneous skeletal defects.

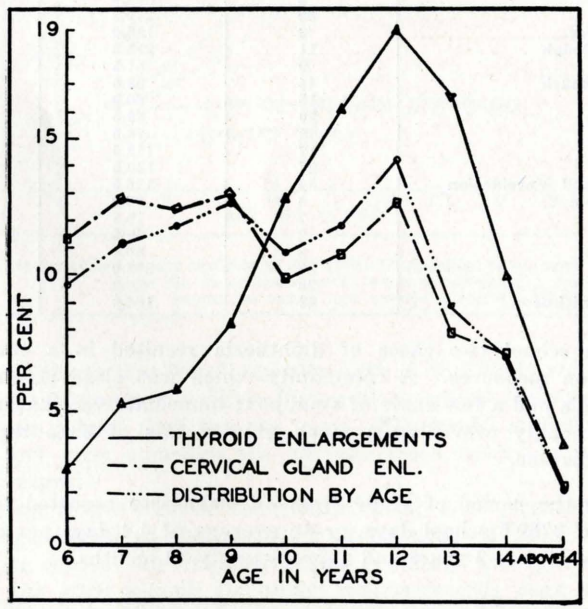

Figure 18.—Distribution, by age groups, of cervical and of thyroid gland enlargements.

Enlarged cervical glands were fairly well distributed in all age groups. While there were some enlarged thyroid glands at all ages, the number was proportionately higher among the older children. Figure 18 shows that beginning at age 8 there is a rapid increase in thyroid enlargements up to age 12. However, in proportion to number of children the largest number occurs at age 13.

Illnesses Interrupting School Attendance

Reference to Table 10 shows that a variety of illnesses was responsible for interrupted attendance at school during the study. A number of communicable diseases was reported, but none of them assumed epidemic proportions. One case of spinal meningitis, lasting 26 days, is not included in this table. Common colds alone caused loss of 811 school days—more than two full years.

TABLE 10. Kinds and duration of illnesses which interfered with school attendance of 657 children in four[1] rural schools during one school year.

Illnesses	No. Children Having Illnesses	No. School Days Lost	Average No. Days per Child
Blood Poison	2	20.0	10.0
Colds	265	811.5	3.1
Communicable Diseases			
Chicken Pox	23	200.0	8.7
Diphtheria	2	44.0	22.0
Measles	3	28.0	9.3
Mumps	39	279.5	7.2
Scarlet Fever	6	126.0	21.0
Whooping Cough	11	215.0	19.5
Croup	9	51.5	5.7
Disturbed Stomach	44	63.0	1.4
Earache	15	60.0	4.0
Headache	29	39.5	1.4
Heart Attack	3	76.0	25.3
Influenza	17	112.0	6.6
Injuries	27	130.5	4.8
Inoculations and Vaccination	53	126.5	2.4
Kidney Trouble	3	96.0	32.0
La Grippe	7	19.5	2.8
Operations	2	28.5	14.3
Skin Diseases	8	80.0	10.0
Sore Throat	87	335.0	3.8
Toothache	20	26.5	1.3
Unclassified Sickness	67	184.0	2.7

In one school two cases of diphtheria resulted in a campaign for immunization measures. A community which was close neighbor to one of the schools had a few cases of smallpox; immediate vaccination of school children probably prevented a much greater loss of time through communicable disease.

During the period of study from all sicknesses reported there was a total loss of 3269.5 school days, or an average of 4.4 days per child. This loss is equivalent to 8 years and approximately 10 months.

[1]Records from two schools were incomplete.

Height-Weight-Age Relationship

All comparisons of weight and height made have been based on the Baldwin-Wood tables (2). The heights of boys and girls in this study are compared with the medium heights for the corresponding age and sex, and their weights with the average for medium height. The seventeen Japanese children and the three Mexican children in the schools surveyed were excluded. While no attempt was made to learn the nationality of the other children, no marked national characteristics were apparent. It is assumed, therefore, that the group is typically American. The names, as a rule, were suggestive of English and northern European ancestry.

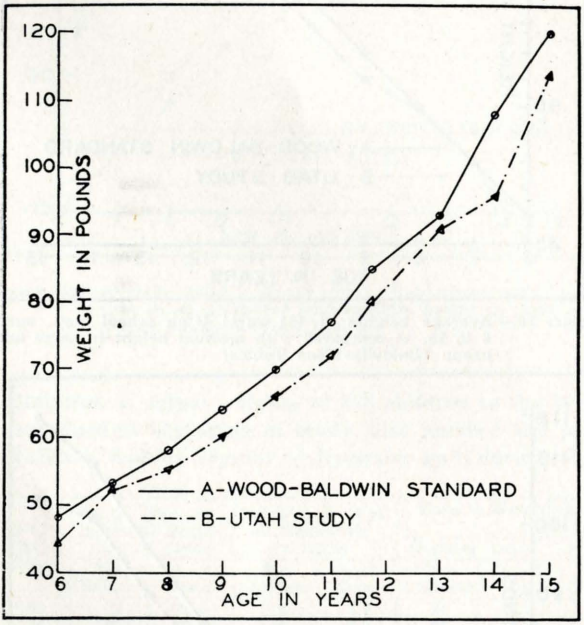

Figure 19.—Average weights of 451 rural Utah school boys, aged 6 to 15, as compared with average weight for medium height in same age groups (Baldwin-Wood Tables).

Figure 19 shows that for all ages the boys of this study were below the Baldwin-Wood averages in weight; Figure 21 shows the girls to be farther below average weight than are the boys. Figures 20 and 22 show that both boys and girls approach the average more nearly in height than they do in weight.

More than 70 per cent of the children in all schools except one were below average weight at the beginning of the study (Table 11). In one school 43 per cent of the children gained regularly throughout the year. In each of the other schools for which weight records were available at the end of the period less than one-third had made regular gains. Seventeen children sustained net losses in weight.

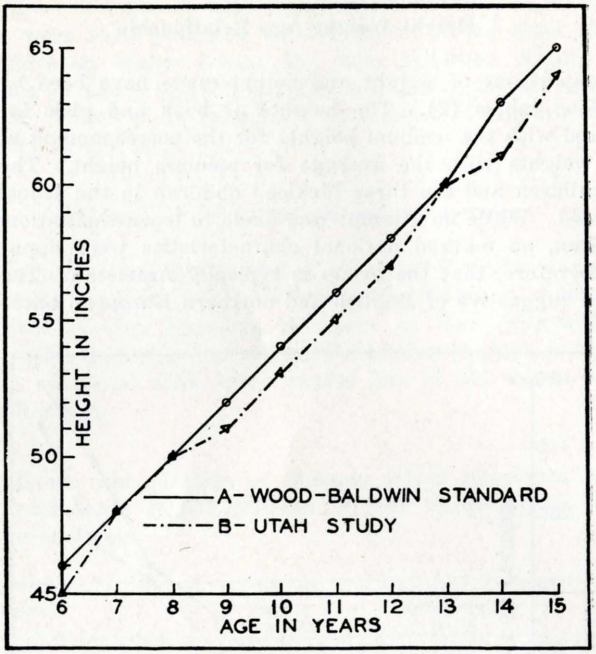

Figure 20.—Average heights of 451 rural Utah school boys, aged 6 to 15, as compared with medium height in same age group (Baldwin-Wood Tables).

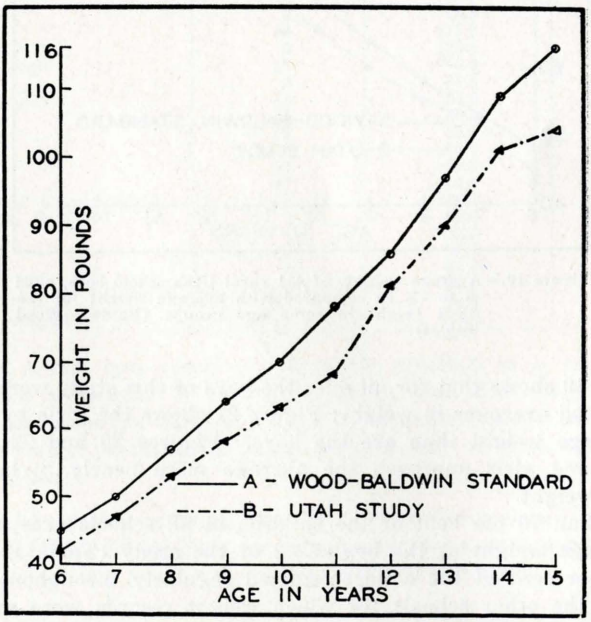

Figure 21.—Average weights of 442 rural Utah school girls, aged 6 to 15, as compared with average weights for medium height in same age group (Baldwin-Wood Tables).

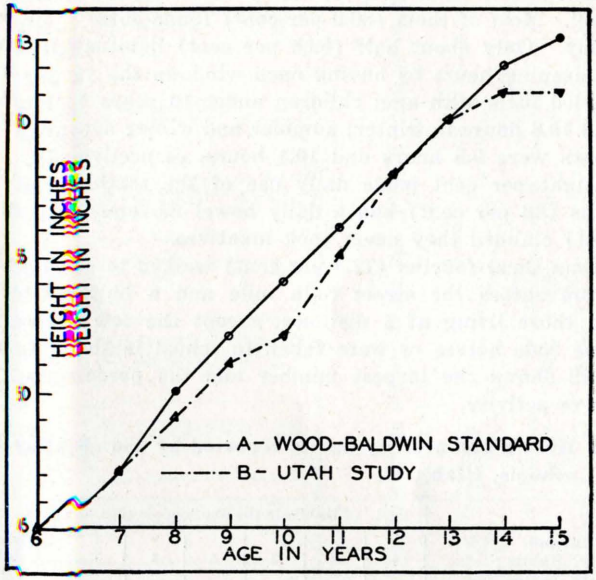

Fig. 22.—Average heights of 442 rural Utah school girls, aged 6 to 15, as compared with medium height in same age groups (Baldwin-Wood Tables).

TABLE 11. Relation of actual weights of 828 children to the Wood-Baldwin standard at beginning of study, also number and percentage of children making regular or irregular gain during eight months.

School No.	No. Children	Avg. Wgt. or Above Avg. at Beginning of Study		Below Avg. Wgt. at Beginning of Study		Gain in Weight during 8 Months' Study			
						Regular Gain		Irregular Gain	
		No. Children	% of Total	No. Children	% of Total	No. Children	% of Total	No. Children	% of Total
1		44	28.0	112	72.0	23	14.7	133	85.3
2		32	22.0	114	78.0	63	43.2	83	56.8
3		35	22.0	126	78.0	42	26.0	119	74.0
4		27	32.0	96	78.0	36	29.3	77	62.6[1]
5		34	26.0	97	74.0	[2]	.....	.....	.....
6		47	42.0	64	58.0	23	20.7	81	73.0[1]
All Schools		219	26.4	609	73.6	187	26.8	493	70.7

[1]Ten children in school No. 4 and seven children in school No. 6 had net losses in weight during the study.

[2]This school was not equipped with scales; hence, the weights taken at the time of the physical examination by means of a portable scale are the only ones available.

PROBABLE FACTORS CONTRIBUTING TO PRESENT PHYSICAL STATUS

Health Habits and Activities

As would be expected of rural children, this group apparently had a great deal of out-door activity. Nearly three-fourths (69 per cent) had

some out-door work after school; many also helped with farm chores before school. Most of them (86.9 per cent) found some time each day for out-door play. Only about half (52.8 per cent) habitually provided fresh air during sleeping hours by having open windows the year round. Hours of sleep varied little with age; children under 10 years slept 10.4 hours in summer and 10.8 hours in winter; summer and winter averages for children over 10 years were 9.5 hours and 10.1 hours, respectively.

Forty-eight per cent made daily use of the toothbrush. More than three-fourths (86 per cent) had a daily bowel movement; about one-third (31 per cent) claimed they never took laxatives.

More than three-fourths (78.3 per cent) walked to school, the distance ranging from across the street to a mile and a half. The school bus transported those living at a distance, except the few living on isolated farms; these rode horses or were taken to school in the family car.

Table 12 shows the largest number and the percentage reporting a single habit or activity.

TABLE 12. Health and activity habits reported by 956 children in six rural schools, Utah.

Health and Activity Habits	Dist.[1] of Habits in the Six Schools (No.)						Total No. Having Habits	% of Total
	1	2	3	4	5	6		
Glass of Water before Breakfast (always)	41	33	26	26	50	12	188	19.7
Sleeping with Windows Open All Year	82	70	90	83	111	69	505	52.8
No. Hours' Sleep at Night								
Summer (Avg.)	10	10	10	10	10	10	10	
Winter (Avg.)	11	11	10.5	11	10.5	11	10.8	
Daily Bowel Movement	156	130	170	106	163	100	825	86.3
Laxatives (never)	92	25	46	34	48	52	297	31.1
Laxatives (sometimes)	80	126	152	95	133	73	659	68.9
Outdoor Work								
Before School	75	64	72	54	64	53	382	39.9
After School	81	83	169	126	116	85	660	69.0
On Saturday	71	63	118	70	81	73	476	49.8
Daily Outdoor Play	167	140	164	119	158	83	831	86.9
Walk to School	167	83	169	126	116	85	749	78.3

[1]Distribution.

Sicknesses Prior to Period of Study

This record was taken at the beginning of the investigation and includes a number of children who were later eliminated because of incomplete records. Of the 964 reporting, 68.6 per cent had had chicken pox; 79.7 had had measles; 40.1 per cent, mumps; and 58.8 per cent, whooping cough. Influenza, recognized as a communicable disease but not "placardable" (10), had been experienced by about one-third (30.5 per cent).

Table 13 lists for the six schools the sicknesses previously experienced, together with number and percentage of children experiencing each.

The only harmful effects traceable to these diseases, based on available data, were about a half dozen running ears following measles and two partially crippled children who had had spinal meningitis.

Immunization to Communicable Disease

Considerable progress in immunization to communicable disease has been made in the three counties (Boxelder, Cache, and Utah) in which

TABLE 13. Sicknesses experienced prior to year of study by 964 children in six rural schools, Utah.

Sickness[1] (Total 964)	Schools and No. Children Reporting from Each												Total No. with Sickness	% of Total
	No. 1 (172)		No. 2 (151)		No. 3 (209)		No. 4 (130)		No. 5 (172)		No. 6 (130)			
	No. with Sickness	% of Total	No. with Sickness	% of Total	No. with Sickness	% of Total	No. with Sickness	% of Total	No. with Sickness	% of Total	No. with Sickness	% of Total		
Chicken Pox	110	64.0	91	60.3	165	78.9	89	68.5	127	73.8	79	60.8	661	68.6
Diphtheria	6	3.5	0	0	7	3.3	0	0	3	1.7	4	3.1	20	2.1
Influenza	33	19.2	22	14.6	84	40.2	43	33.1	67	39.0	45	34.6	294	30.5
Measles	118	68.6	137	90.7	178	85.2	96	73.8	124	72.1	115	88.5	768	79.7
Mumps	54	31.4	99	65.6	83	39.7	29	22.3	55	32.0	67	51.5	387	40.1
Pneumonia	19	11.0	8	5.3	27	12.9	11	8.5	27	15.7	31	23.8	123	12.8
Scarlet Fever	15	8.7	13	8.6	19	9.1	0	0	19	11.0	4	3.1	70	7.3
Smallpox	2	1.2	1	0.7	42	20.1	8	6.2	13	7.6	4	3.1	70	7.3
Tonsilitis	27	15.7	24	15.9	83	39.7	50	38.5	83	48.3	71	54.6	338	35.1
Typhoid Fever	0	0	2	1.3	0	0	0	0	5	2.9	0	0	7	0.1
Whooping Cough	107	62.2	65	43.0	108	51.7	105	80.8	102	59.3	80	61.5	567	58.8
Unclassified	.....	.....	.....	.....	.....	.....	8	6.2	16	9.3	15	11.5	39	4.0

[1]Two children in School No. 3 had spinal meningitis before entering school ; two cases of appendicitis are not included in this table.

TABLE 14. Immunizations to communicable diseases experienced by 964 children in six rural schools, Utah (types of immunization, and number and percentage of children experiencing each type).

Type of Immunization	Schools and No. Children Reporting from Each												Total No. Childrer Immunized	% of Total
	No. 1 (151)		No. 2 (172)		No. 3 (209)		No. 4 (130)		No. 5 (172)		No. 6 (130)			
	No. Children Immunized	% of Total	No. Children Immunized	% of Total	No. Children Immunized	% of Total	No. Children Immunized	% of Total	No. Children Immunized	% of Total	No. Children Immunized	% of Total		
Diphtheria	3	1.9	29	16.8	125	59.8	107	82.3	57	33.2	24	18.6	345	35.8
Scarlet Fever	0	0	0	0	4	1.9	2	1.5	11	6.4	68	52.3	85	8.8
Smallpox	53	35.1	70	40.1	101	48.3	85	65.4	69	40.1	57	43.8	435	45.1
Typhoid Fever	0	0	0	0	0	0	46	35.4	27	15.7	33	25.4	106	11.0
Whooping Cough	1	0.6	0	0	0	0	2	1.5	3	1.7	0	0	6	0.6

this study was made. As already noted, one campaign for vaccination against smallpox and another for administration of toxin-antitoxin were conducted during the investigation. The number of children participating is not included here, since this part of the record was obtained before the campaigns were initiated. Table 14 shows that 53 children lost a total of 126.5 days, or 2.4 days each, due to effects of vaccinations and inoculations, which suggests that a considerable number participated.

Next in number to smallpox and diphtheria immunizations came those for typhoid fever, 106 children reporting this treatment; scarlet fever was next, with 68 having had immunization treatment.

Table 14 lists these immunizations, together with number and percentage of children in each of the six schools experiencing them.

CHILDREN OF FAMILIES INCLUDED IN A FORMER STUDY

Nature of Diet

In the vicinity of the six schools studied were 11 of the 43 families whose records of family diet furnished data for a former publication of the Utah Agricultural Experiment Station (6). It was thought desirable for two purposes to include the children of these families in the present study: (1) To determine whether they made the most of their opportunities in a nutritional way and (2) to compare their diet and physical status with those of the other children in the study. Two of these children in two families did not complete the dietary record. Eight children in two more families did not appear for the dental examinations arranged for them. Hence, this report includes only 16 children from seven families, previously studied.

By means of Table 15 it will be seen that the diet of families Nos. 3, 4, and 7 were inadequate in the protein group of foods, while the diets of children in families Nos. 3 and 4 were complete in this respect. There are two possible explanations for this: (1) All bacon and other fat pork in the family diets were excluded from this group and classed with fats, while there was no means of differentiating between kinds of meat reported by the children on their menu sheets. (2) More than two years elapsed between the two studies, during which time the family diets may have been improved as each family in the earlier study had been informed of its dietary deficiencies. At any rate, Table 15 shows that the children of these families were not neglecting opportunities to make their diets adequate with respect to the protein group of foods, as apparently was the case of children in families Nos. 1 and 6.

None of the children upheld the family standards in use of milk; all children except those in families Nos. 4 and 7 were below the family standards in use of fruits and vegetables.

Compared with the larger group these children have a mean diet score higher by 10 points (54 and 64, respectively); as would be expected from the smaller sample deviation about the mean is greater. The highest score is 90 and the lowest 36, whereas in the larger group the highest is 88 and the lowest 21. The average daily milk consumption is one-half glass more (2.5 glasses and 2 glasses, respectively) than for the larger group.

TABLE 15. Relation to standards of good nutrition of diets of 16 children from a former study and of the families to which they belong.[1]

	Age	Percentage of Standard		
		For meat, eggs, and cheese	For milk and cream	For vegetables and fruit
Family No. 1		100	176	42
Child—E. B.	9	64	70	46
Child—L. B.	12	31	44	26
Family No. 2		134	89	52
Child—G. B.	8	100	19	19
Child—V, B.	11	100	22	19
Family No. 3		64	161	100
Child—R. D.	6	100	66	53
Child—A. D.	9	100	64	56
Child—M. D.	11	100	46	53
Child—L. D.	13	100	40	48
Family No. 4		54	161	71
Child—V. E.	8	100	94	73
Child—M. E.	9	100	100	73
Child—H. E.	11	100	91	88
Family No. 5		130	180	44
Child—E. C.	9	100	33	60
Child—F. C.	12	100	23	60
Family No. 6		158	100	79
Child—G. O.	12	72	10	57
Family No. 7		46	193	66
Child—A. R.	10	82	53	77
Child—J. R.	13	97	54	75

Based on Utah Agricultural Experiment Station Bulletin 213.

[1]Cereals are not included because in this study children are scored on whole-grain products only, while in the family diet all cereal products were included. Children were not scored on use of fats nor sweets; hence, these also are excluded.

Physical Status

Comparison of two groups so different in size even on a percentage basis is unsatisfactory. However, the summary in Table 16 will serve to show that the 16 children as a group are much like the large group in number and kind of physical defects. Such marked differences as noted in connection with carious temporary teeth are probably attributable to the age factor, since with one exception the group of 16 range from 8 to 13 years of age and have already lost most of their temporary teeth. The only difference not attributable to age is the small percentage of enlarged thyroids and the high percentage of respiratory obstructions and of faulty postures. The data offer no explanation for these differences.

TABLE 16. Physical defects of 16 children, included in an earlier study, compared with physical status of the large group of this study.

Physical Defects	Group of 16		Larger Group
	No.	%	%
Carious Temporary Teeth	2	12.5	60.6
Carious 6-year Molars	11	68.8	70.0
Other Permanent Teeth (Carious)	2	12.5	22.8
Gums Inflamed, Abscessed, etc.	8	50.0	18.0
Faulty Occlusion	4	25.0	24.7
Subnormal Vision	8	50.0	20.5
Obstructions in Respiratory Tract	9	56.2	20.9
Enlarged Thyroid Glands	2	12.8	23.3
Affected Tonsils	7	43.8	55.9
Tonsil Removals Advised	6	37.5	31.3
Spinal Curvatures	3	18.7	20.1
Faulty Posture	11	68.8	44.5
Faulty Skeletal Development and Related Defects	14	87.5	65.3

COMPARISON OF DIET AND PHYSICAL STATUS OF UTAH CHILDREN WITH THOSE OF CHILDREN ELSEWHERE

As pointed out earlier in this discussion, the range in dietary scores is from 21 to 88, with a mean of 54 (53.6). This indicates that the diet of the average child is but little more than 50 per cent of what present knowledge concerning children's nutritional needs points out as desirable. Associated with this type of diet is a large number and variety of physical defects.

Whether diet or physical status or both rank high or low, when compared with those of school children elsewhere is difficult to determine because there is marked variation in dietary standards used by different investigators and even greater variation in methods of making physical examinations.

The use of the Davies score card in this study makes possible some comparison between the diet of Utah school children and that of children in the Massachusetts study (7). When Figures 1, 2, and 3 are compared with tables on pages 111 to 116 of the report on the Massachusetts study, it will be seen that there is close similarity between the average scores of the Utah group and those of the children in the Carver district in Massachusetts. The children of the other Massachusetts district make better use of milk but poorer use of fruits and vegetables. In the present study, as has been already pointed out, the differences in diet in the various communities were practically negligible. In a study of 462 rural Virginia school children, Reynolds (11) found 28 per cent using a pint or more of milk a day. In South Carolina, Freyser and Moser (8) found 72.7 per cent of 322 rural school children using a pint or more. In the present study of 891 diets, the percentage was 47.

Points practically always stressed in examinations into the physical status of children are condition of teeth and tonsils and normality of vision and of hearing. Though there may be variation in interpretation of what or what does not constitute a dental defect or of what is normal in vision and in hearing the statistics are probably roughly comparable.

In the Utah study only 46 children, 5.8 per cent of those examined, were found free from dental defects of all kinds. In the Virginia study, 15 per cent were found with perfect teeth. In the South Carolina study, 3.7 per cent were free from dental defects. Terman and Almack (13) quote statistics to show that out of more than one million city, village, and rural school children examined since 1921 (data reported 1929), approximately 53 per cent have tooth defects. Their own estimate, which they consider conservative, is that in 70 per cent of all school children one or more defective teeth can be found.

In a study of 317 children in rural Iowa, Baldwin **et al.** (1) found 45 per cent with diseased tonsils. Broadhurst and Lerrigo (5) place the percentage of diseased tonsils among children of New York City schools at 16. Terman and Almack (13) estimate that about one-eighth (12.5 per cent) of the school population is affected with bad tonsils. The percentage in the Utah study is 55.9 per cent; this latter figure includes not only tonsils that are actually diseased but also enlarged and badly inflamed tonsils as well.

Terman and Almack cite statistics involving more than one hundred thousand children in rural, suburban, and city schools to show that from 20 to 30.6 per cent have defective vision. They also report a survey conducted cooperatively by the National Educational Association, the American Medical Association, and the Commission for Prevention of Blindness in which it was shown that poor vision occurred about twice as often among the children in rural sections of Pennsylvania and of Iowa as among children of large cities.

The percentage of subnormal vision among the rural group in this study is 20.5, which approximates the figures for some of the large cities for which Terman and Almack quote statistics.

As has been stated previously, the children of only two of the six schools (308 in number) were examined for normality of hearing. The percentage (90.9) of normal hearing is apparently higher than is usual among school children. The Bureau of Education (12) gives 85 per cent normality; the estimate of Terman and Almack is from 10 to 15 per cent abnormal vision (85 to 90 per cent normality).

From data reviewed, it would appear that the children of the Utah study show no marked departure in diet and in physical status from what is usual among school children. Their teeth appear to be among the poorest; their percentage of affected tonsils is relatively high; their vision is no poorer than is found among children in some of the large cities of the country. The hearing of the group examined appears slightly better than average. If variations in methods and interpretations were eliminated, the apparent differences would probably be much less.

RELATIONSHIPS

Two of the objectives for which this study was organized have been accomplished: The determination of the quality of the school child's present diet and the nature of his physical defects. There remains the tracing of possible relationships between the two.

Diet Score and Physical Defects

Of the 891 children supplying dietary information, 77 achieved diet scores of 70 or more. This was accomplished by inclusion in their diets of nearly optimal amounts of milk, green vegetables, and the food group including raw fruits and vegetables.

It was thought that if this superior diet had resulted in superiority of physical status this would become apparent when comparison was made with the physical status of children having poor diet. There were also in the group 83 children whose diet scores were 40 or less. In Table 17 the physical defects of the two groups are compared. In some points the high-scoring group appears at a disadvantage, in others they seem to excel. However, when the relative ages of the two groups are taken into consideration, the differences become more apparent than real. Nearly half (43 per cent) of the high-scoring children fall in the age group 6 to 8 years, while but 13 per cent of the low-scoring children are in this age range. Reference to Figures 8 (A), 9, 15, and 17, shows that certain

defects in which the high-scoring group appears to disadvantage are most prevalent in the early years in which a large percentage of these children is found. In the same way may be explained the apparent advantages in percentage having carious permanent teeth, in high percentage of normal thyroid glands, also in the relation of weight to standard. However, there is no explanation offered by the data for the higher incidence of defective arch development and for the large relative number of tonsil removals.

TABLE 17. Physical defects of 77 children having diet scores of 70 and above as compared with the same defects of 83 children having scores of 40 and below.

Physical Defects	Group							
	High Diet Scores				Low Diet Scores			
		Having Defects				Having Defects		
	No. Exam.	No.	%	No. per Child	No. Exam.	No.	%	No. per Child
Dental Defects	74				83			
Caries: None		4	5.4			4	4.8	
Temporary Teeth		51	68.9	4.7		41	49.4	3.8
Permanent Teeth		50	67.5	3.5		63	75.9	3.6
Malocclusions		20	27.0			18	21.7	
Defective Arches		17	23.0			10	12.0	
Miscellaneous Skeletal Defects[1]	70	47	67.1	1.7	83	48	57.8	1.8
Spinal Curvatures	70	17	24.3	....	83	11	13.2	....
Tonsils	70				83			
Normal		4	5.7			12	14.5	
Removed		38	54.3	....		28	33.7	....
Removal Advised		19	27.1			23	27.7	
Diseased or Otherwise Affected (no advice)		9	12.9			20	24.1	
Thyroid Glands	70				83			
Normal		60	85.7			56	67.5	
Enlarged		1	1.4	....		8	9.7	....
Slightly Enlarged		9	12.9			19	22.8	
Weight for Height and Age	76				82			
Average		8	10.5			4	4.9	
Above Average		20	26.3	....		18	22.0	....
Below Average		48	63.2			60	73.0	

[1]Flat chests, flat feet, knock-knees, etc.

Assuming these diet scores to be representative of the diet on which these children have grown up, there is seen no superiority in physical status, measurable by the methods of this study, which can be said to result from the superior diet.

Diet Score and Relation of Weight to Standard

Data show that a large part of the children (73.6 per cent) included in this study were below the Baldwin-Wood standard in weight for height. To determine whether those children who approached standard were receiving better diet than those either much below or much above, they were divided into three groups on the basis of relationship of weight to the standard. The first group included 206 children who were 10 per cent or more below average weight for height and age; the second group included 560 children who were from 10 per cent below to 15 per cent above weight; the remainder, 15 in number, were 15 per cent or more above average weight. Total diet scores were taken as a measure of quality of diet. Appendix Table 1 shows the distribution of scores for the three groups. It will be readily seen that the model class is that with a mid-value of

52.5, both in distribution of scores for the children 10 per cent or more below the average weight and for those in the "normal range" or "range of safety" (10 per cent below average weight to 15 per cent above). The mean values are 53.2 and 53.8, respectively; their standard deviations, 10.9 and 11.6; probable errors, 0.51 and 0.33. However, the ratio between the number of diet scores 70 or above in the two distributions (3.5) is greater than the ratio of total number of scores (2.7); this indicates slight superiority in the diet of those children whose weights are in the "normal range." The diet scores of those 15 per cent or more above average weight are too few in number to show any real tendencies.

Diet and Enlarged Thyroid Glands

The six schools included in this study are located in sections where a high incidence of goitre was found by the State Board of Health survey conducted in 1924-25 (3). Among the seven factors listed in the report of this survey as contributory to thyroid enlargement, consideration of one only ("poor food") comes within the scope of the present study.

Table 18 shows the nature of the diet reported by the 205 children found to have thyroid enlargements. This table also shows the comparison between this diet and that of the 868 children not having thyroid enlargements.

TABLE 18. Comparison between diet scores of children having thyroid enlargements and those not having enlargements.

Foods	Food Scores for Children	
	Having Enlarged Thyroids	Not Having Enlarged Thyroids
Total Diet	53.0	54.0
Milk (No. glasses daily)	2.2	2.0
Vegetables		
Potatoes	3.6	4.1
Cooked Green	2.6	2.8
Cooked (other than green)	4.6	5.4
Fruit		
Cooked	5.2	5.4
Raw and Raw Vegetables	5.3	6.0
Whole Grain	5.3	6.1
Meat	7.4	7.6
Eggs	7.7	7.7

In all points except in use of milk and eggs the diet of the non-goitrous group is found to be better than that of the goitrous group. The differences, however, are not sufficiently marked to warrant the assumption that diet is a very potent factor in promoting thyroid enlargements in this group. Correlation of this factor with the other six in the Board of Health survey would probably yield interesting results.

Diet and Condition of Teeth

For the tracing of possible relationships between condition of teeth and type of diet, children were grouped on the basis of number of cavities in all teeth; their diets were studied in detail. Comparisons were made between average milk consumption of children in the various groups and between average scores attained for those foods commonly believed to

influence tooth development—vegetables, fruits, and whole-grain products. The results of this procedure are tabulated in Table 19.

It will be noticed that number of cavities varied from 1 to 22; the largest group of children (106) had four cavities each. Average diet scores varied from 49 to 60. There are no detectable trends in scores for vegetables, fruits, and whole grains; on the contrary, there is noticeable similarity in scores from group to group, except in those where the small number of children makes any sort of average unreliable. Average daily quantity of milk, except in the extremely small groups, ranged from 1.7 to 2.5 glasses; children having a relatively large number of cavities had the latter average. This tabulation then shows no relationship between quality of diet and condition of teeth.

For comparison, Table 19 also includes the average diet scores attained by a small group of 15 children who had neither dental caries nor skeletal defects. By the method of analysis used, no marked differences are discernible between the diet of this group and the diets of children having a large number of cavities.

TABLE 19. Diet scores of children classified on the basis of dental caries.

No.		Avg. No. Glasses Milk Daily	Avg. Scores			
Cavities	Children Having Cavities		Total Diet	Vegetables	Fruit[1]	Whole-grain Products
1	36	1.8	51	9.3	10.4	6.5
2	58	2.1	54	9.5	10.5	6.8
3	73	2.2	54	9.7	10.0	5.8
4	106	1.8	51	9.4	10.0	5.4
5	79	2.1	52	9.9	11.0	6.2
6	82	2.1	54	10.1	11.3	6.2
7	69	2.0	55	11.0	11.0	5.7
8	72	2.1	54	11.1	11.1	6.0
9	39	2.4	55	9.6	11.0	6.0
10	47	1.8	51	10.1	10.0	6.0
11	21	2.5	58	12.7	10.7	5.8
12	20	2.0	56	11.7	11.5	6.3
13	14	1.7	54	12.2	11.8	5.1
14	7	2.5	60	11.1	11.0	6.8
15	5	2.1	52	10.3	8.2	6.5
16	7	1.7	50	8.7	10.9	5.8
17	3	1.6	49	6.2	6.9	8.7
18	3	2.1	52	10.3	10.1	4.8
19	0	0.0	0	0.0	0.0	0.0
20	1	1.9	51	5.0	10.0	9.0
21	0	0.0	0	0.0	0.0	0.0
22	1	0.6	45	12.1	10.0	1.0
No Caries or Skeletal Defects	15	1.7	51	10.4	11.8	7.1

[1]This group includes cooked fruits, raw fruits, raw vegetables, and tomatoes.

It was thought that permanent teeth would be the ones most likely to reveal relationships between quality of diet and condition of teeth. Therefore, the cavities in permanent teeth were correlated with milk scores; the low value of the correlation coefficient (0.39) indicates only slight relationship between use of milk and carious permanent teeth. There was noted, however, a tendency toward fewer cavities when quantity of milk was near the average for the group, that is, about a pint a day (Table 2, Appendix). It was noted also that at this level of milk intake there was a slight but definite tendency to increased use of fruit and

vegetables (Table 3, Appendix). This suggests the probability that presence of all dietary essentials, even if they exist in quantities below optimal, are effective in development and preservation of teeth rather than the existence of any one particular food even though it exist in what is believed to be optimal amount. McCollum and Simmonds (9) concluded that whether or not an amount of any food factor may be called optimum or minimum depends upon the biological value of each of the other factors in the diet. They point out that an amount of any factor which just serves to maintain apparent normalcy will fail if some other factor is altered so as to be unsatisfactory.

Boyd, Drain, and Nelson (4) found in their study of hospital children that with diets designed to give adequate protein and calories they were able to arrest dental caries under divergent conditions of health and environment by the feeding of diets high in mineral and vitamin content.

It is probable that the diet of children in the present study is adequate in fuel value, because in addition to the foods on which they were scored all had liberal amounts of white bread and butter daily and some sweet dessert almost every day.

While 488 of the 891 children had meat once a day and 408 children had meat oftener, the adequacy of the protein portion of the diet is still questionable because a considerable portion of the meat probably was pork, much of it fat pork.[5] The question would still exist even if consumption of milk and eggs had been optimal because the score is so arranged that these protein sources supplement each other. The relatively small amounts of fruit, vegetables, and whole-wheat products in the diet leave little doubt that there is a deficiency in both mineral and vitamin content. Hence, the diet in this study apparently has but one of the qualities—fuel value—found by Boyd **et al.** to be effective in arresting caries.

[5]A former study at the Utah Agricultural Station showed that pork constituted 49.8 per cent of the meat eaten in rural homes (6).

DISCUSSION

That a problem of faulty diet exists in the rural communities studied can hardly be questioned. While the data do not point to drastic deficiency in any one factor, they do suggest a partial deficiency of several factors believed at present to be essential to the adequate nutrition of children. McCollum and Simmonds (9) point out the effect of faulty diets which fail to meet the nutritive needs of the body even in a minor degree and stress the importance of maintaining a diet in which all components exist in optimal amounts. In the diet of the present study, as has already been pointed out, some foods (potatoes, cooked fruit, meat, and eggs) were found to exist for considerable numbers of children (Table 3) in greater than optimal amounts. This apparent advantage, however, was counterbalanced by marked deficiencies in other foods (green vegetables, raw foods, and whole-grain products).

It is apparent from the data studied that the physical status of the average school child is below optimal. The assumption seems warranted, therefore, that ingestion of a diet partially deficient in a number of factors year after year may have resulted in a reduced growth impulse and in a sub-optimal functioning of some developmental processes. The complete isolation of individual factors producing specific physical defects is manifestly beyond the scope of the present study.

There is need for more refined methods in the collection as well as in the treatment of data. In order that responsibility for physical defects may be rightly placed on specific dietary faults, it is also necessary to consider factors other than diet which could and doubtless do influence the physical welfare of the child. Among such factors are physical inheritance, dental and medical care, incidence of disease, and those environmental factors usually included in the term "sanitation."

When these and other possible factors have been eliminated and a study is made of lifelong nutrition, beginning as far back as the prenatal period, then correlations may be found between specific dietary deficiencies and specific physical defects. However, even the most faulty diets encountered in this study seem to warrant the assumption that there is slight probability of encountering, in Utah, cases in which a particular dietary deficiency exists in such degree as to produce the disease characteristic of the deficiency.

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APPENDIX

Form 1

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

MENU SHEET

Pupil's Name ..... School..... Grade.....

Parent's Name ..... Address.....

Pupil's Age ..... Years. Date of Birth.....
Month Day Year

Food Served to Family	*Quantities of Each Food Eaten by Pupil Whose Name Appears Above.
Breakfast	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
Lunch or Dinner	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
Supper	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
.....	
.....	

Food Eaten by Pupil Between Meals or After School

What Kind?	How Much?	When?
.....	.....	.....
.....	.....	.....

*Express quantities by tablespoonsful; cups; slices, "large", "small", "medium", etc.

Note: Write in food eaten as soon as possible after eating. If nothing is eaten write "nothing" in the proper space.

Form 2

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

FOOD HABITS

School ..... County .....

Pupil's Name .....Age.....Birthday.....Grade.....

Underline the statements that are true for you.

1. Every day I drink milk: For breakfast: How much?.....
   At noon meal: How much?.....
   At night: How much?.....
   Between meals: How much?.....
2. I have drunk milk all my life; a year or more; a little while.
3. Every day I eat potatoes; once; twice; three times.
   Every day I eat one other cooked vegetable.
   Every day I eat two other cooked vegetables.
   I seldom eat any other cooked vegetable.
4. I eat a raw vegetable, or tomatoes, as often as three times a week; oftener; less often.
5. In the summer I go into the garden and eat raw peas; raw carrots; raw turnips.
6. I have eaten vegetables all my life; a year or more; a little while.
7. I eat fresh or bottled fruit at the table once a day; more than once; less often.
8. In the fall and winter I eat apples; one a day; more than one; one every few days.
9. I eat meat once a day; more than once a day; every few days; seldom.
10. I eat an egg every day; more than once a day; every few days; seldom.
11. I eat dark bread every day; often; sometimes.
12. I eat cereal for breakfast; always; usually; sometimes.
13. I eat a hot meal, a cold meal, at home at noon. I carry lunch to school.
14. I eat a hot meal at night always; usually; sometimes.
15. I eat slowly; I hurry through my meals; I eat moderately fast.
16. I eat all food served on my plate, always; usually; sometimes.
17. I "piece" between meals; I eat only at meal time three times a day. I eat when I get home from school; at recess.
18. "When I "piece"; at recess; or when I get home from school I drink milk; eat apples or other fruit; eat bread and butter; eat candy, cake or cookies.
19. I do, do not, drink coffee every day; oftener; less often.
    I do, do not, drink tea every day; oftener; less often.

Will the parent please check over this sheet and sign below as an indication that this information is correct?

.....
Parent's signature

.....
Address

Please use the other side of this sheet for comments or additional information

Form 3

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

RECORD OF FOOD LIKES AND DISLIKES

Pupil's Name ..... School..... Grade.....

FOOD	Appetite for Food			Have Not Tasted
	Very Fond	Like	Dislike	
Tomatoes, fresh or canned				
Cabbage				
Cauliflower				
Watercress				
Cucumbers				
Radishes				
Onions				
Peppers				
Eggplant				
Summer squash				
Other squash				
Pumpkin				
Corn, green, canned or dried				
Beets				
Carrots				
Parsnips				
Potatoes				
Sweet potatoes				
Turnips				
Dried beans				
Cucumber pickles				
Any other pickles				
Olives				
Apples				
Applesauce				
Apricots, fresh or bottled				
Bananas				
Cranberries				
Cherries, fresh or bottled				
Dewberries, fresh or bottled				
Raspberries, fresh or bottled				
Strawberries, fresh or bottled				
Plums, fresh or bottled				
Prunes, fresh or bottled				
Peaches, fresh or bottled				
Pears, fresh or bottled				
Oranges				
Lemons or lemonade				
Grape fruit				
Pineapple				
Grapes				
Grape juice				
Rhubarb or pieplant				
Cantaloupe				
Watermelon				
Dates				
Figs				
Raisins				
Preserves				
Jelly				
Marmalade				
Honey				
Molasses				
Syrup				
Sugar				
Candy				

Form 4

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

DENTAL EXAMINATION

Name ..... Age..... Grade.....
Parent's Name ..... School .....

1. Eruption of teeth.
   A. Temporary: Normal for age; tardy; early.
   B. Six-year molars: Normal for age; tardy; early.
   C. Other permanent teeth: Normal for age; tardy; early.
2. Quality of enamel: Good; fair; poor; very poor.
3. Number of carious teeth.
   Temporary: Filled .....Unfilled.....Extractions indicated.....
   Six-year molars: Filled .....Unfilled.....Extractions indicated.....
   Other permanent: Filled .....Unfilled.....Extractions indicated.....
4. Number six-year molars lost..... At what age.....
5. Number of other permanent teeth lost.....
6. Other defects: Abcesses; fistulas; other.....
7. Occlusion: Normal; abnormal; nature of abnormality.....
8. Development of arch: Normal for type.....
   Abnormal: Nature of abnormality.....
9. Gums: Normal; inflamed; badly inflamed; soft; spongy;
   Pyorrhea: Beginning; advanced.
10. Indications of Vincent's infection: Yes. No.
11. General condition of teeth: good; fair; poor; very poor.
12. Care of teeth: good; fair; poor; very poor.

Form 5

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

PHYSICAL EXAMINATION

Name.....Date of Birth.....Boy: Girl
Name of Parent.....School.....Grade.....
Height..... Weight.....

1. Eyes: Normal; inflamed; infected. Other.....
   Vision: Right..... Left.....
2. Ears: Normal; wax; discharge. Other.....
   Hearing: **Right** Good; fair; poor; very poor
   Hearing: **Left** Good; fair; poor; very poor
3. Nose: Normal; obstructed (adenoids)
   Deflected septum: Enlarged turbinates; Other.....
4. Throat: Tonsils: Normal; removed; fragmented; enlarged; embedded; diseased
   Degree of disease: 1, 2, 3, 4. Advice.....
5. Glands: Cervical: Normal; enlarged; slightly enlarged.
   Thyroid: Normal; enlarged; slightly enlarged.
6. Skin: Normal; rough; dry; affected: Nature of affection.....
7. Muscle Tone: Excellent; good; fair; poor.
8. Skeletal Development:
   Cranium: Normal; box shape; bosses; other.....
   Spine: Straight; curvature.....
   Chest: Normal; flat; pigeon; funnel; grooved; rosary.....
   Feet: Normal; flat; Ankles: everted; enlarged.
   Knees: Normal; enlarged; knock knees; bow legs.
9. Posture: Erect; stoop; wing scapula; fatigue.
10. Heart: Normal; other.....
11. Lungs: Normal; other.....
12. Nutritional condition: Good; fair; poor; very poor.
13. Nervous control: Good; fair; poor; very poor.
14. Any other departures from satisfactory physical condition?.....

Form 6

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

RECORD OF HEALTH AND OF SCHOLASTIC STANDING SCHOOL YEAR, 1930-31

School ..... County.....
Pupil's Name .....Parent's Name.....
Pupil's Grade..... Age When School Opens.....Birthday.....

Period	Height	Weight	Scholastic Standing	Sickness Causing Non-Attendance	
				Kind	Days
First Month					
Second Month					
Third Month					
Fourth Month					
Fifth Month					
Sixth Month					
Seventh Month					
Eighth Month					
Ninth Month					

Notes: Heights are required only at the beginning and at the end of the year.
Weights each month, on the same day, and at the same period of the day.
Both heights and weights are taken with pupils' shoes removed and without wraps or out-door clothing of any kind.
Scholastic standing means the teacher's opinion of the pupil's relative standing at the end of the first month, and at the end of the year. The following letters with accompanying interpretations will be used in designating scholastic standing:

A means 90% to 100%
B means 80% to 89.9%
C means 70% to 79.9%
D means 60% to 69.9%
E means 50% to 59.9%

Form 7

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

HEALTH HABITS AND ACTIVITIES

School ..... County.....
Pupil's Name .....Age..... Birthday .....Grade.....
Underline the statements that are true for you.

1. I drink a glass of water first thing in the morning, always; usually; sometimes.
2. I sleep with windows open; all year; in warm weather only.
3. In summer I go to bed at about.....o'clock, and get up at about.....o'clock.
4. In winter I go to bed at about.....o'clock, and get up at about.....o'clock.
5. I brush my teeth once a day; oftener; less often. I neglect my teeth when out of school.
6. My bowels move every day before I come to school; later in the day; every day or two.
7. I take medicine for this once in awhile; often; nearly every day; never.
8. Before coming to school I help with out-door work; work in the house; take care of children.
9. After school I help with out-door work; work in the house; take care of children.
10. On Saturdays I help with out-door work; work in the house; take care of children.
11. I play out-doors: before school; at recess; at noon; after school; part of Saturday; all day Saturday.
12. I walk to school.....blocks; about a half-mile; about a mile; .....miles.
13. I ride to school in a school bus; in our own car; on a horse.
14. If you come to school in none of these ways how do you come to school?.....

.....

Will parent please check this information and sign below to indicate that information is correct?

.....
Parent's Name

.....
Address

Form 8

Research Project No. 102,
Utah Experiment Station,
Logan, Utah.

Date.....

HISTORY OF COMMUNICABLE DISEASES

Name of Pupil ..... Age..... Birthday.....

Grade..... School..... County.....

1. Underline the diseases you have had:

Whooping Cough	Diphtheria
Scarlet fever	Chickenpox
Mumps	Smallpox
Measles	Influenza
Tonsilitis	Pneumonia

2. Have you had any other serious sickness? What?.....
3. Have you been vaccinated?..... Had toxin-anti-toxin?..... Have you had any other immunizing serums? What?.....

Will parent please check this and sign below as an indication that the above information is correct?

.....
(Parent's Signature)

.....
(Address)

TABLE 1. Distribution of diet scores for children below standard weight, of "normal" weight, and above standard weight.

Diet Scores	Frequencies (by group)		
	10% or More Below Standard	In "Range of Normality"	15% or More Above Standard
20-24	1	3	0
25-29	2	3	0
30-34	7	19	0
35-39	14	42	1
40-44	21	61	4
45-49	33	88	1
50-54	39	101	1
55-59	35	74	3
60-64	24	58	2
65-69	15	60	1
70-74	12	36	1
75-79	3	10	1
80-84	0	4	0
85-89	0	1	0
90-94	0	0	0
95-100	0	0	0
Total	206	560	15

TABLE 2. Distribution of carious permanent teeth in relation to milk scores.

Milk Scores	Frequencies	Cavities	
		In Permanent Teeth	Per Child
0.00- 0.99	13	66	5.07
1.00- 1.99	5	25	5.0
2.00- 2.99	10	50	5.0
3.00- 3.99	27	127	4.7
4.00- 4.99	21	93	4.4
5.00- 5.99	23	104	4.5
6.00- 6.99	40	167	4.17
7.00- 7.99	30	133	4.4
8.00- 8.99	31	115	3.7
9.00- 9.99	35	159	4.5
10.00-10.99	36	163	4.5
11.00-11.99	34	125	3.67
12-00.12.99	43	166	2.86
13.00-13.99	36	123	3.41
14.00-14.99	33	128	3.87
15.00-15.99	36	142	3.94
16.00-16.99	18	73	4.05
17.00-17.99	17	78	4.58
18.00-18.99	21	77	3.66
19.00-19.99	18	71	3.94
20.00-20.99	9	43	4.77
21.00-21.99	11	42	3.81
22.00-22.99	11	43	3.9
23.00-23.99	5	26	5.2
24.00-24.99	33	138	4.19

TABLE 3. Average food scores of groups classified on the basis of number of glasses of milk used daily.

Glasses of Milk Daily by Group	Average Scores					
	Total Diet	Vegetables	Fruit	Whole Grain	Meat	Eggs
458: 0 to 2	47	9.2	10.1	5.7	7.4	8.7
280: 2 to 3	58	10.6	11.1	6.5	7.6	7.9
107: 3 to 4	63	10.2	10.9	6.6	7.4	7.3
44: 4 or more	64	8.8	10.1	6.4	7.8	7.6