

A Study of the Status of Health Knowledge,
Health Education, and Health of Students
in Certain Rural Schools of Kansas.

by

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A STUDY OF THE STATUS OF HEALTH KNOWLEDGE, HEALTH
EDUCATION, AND HEALTH OF STUDENTS IN
CERTAIN RURAL SCHOOLS OF KANSAS

Problem Indicated

Health is necessary to efficient and happy living. Though this be true, health education is provided for only to a limited degree in the school curriculum, and little scientific study has been made of the health problems of school groups. Rural schools have been studied less than urban schools with reference to health; and rural children show a higher percentage of defects which admit of correction than do urban children.

The general purpose of this study is to determine the nature and extent of the health knowledge of a fairly representative group of rural school children, to ascertain the extent to which the children observe the principles of health with which they are familiar, and to discern the degree to which the physical condition of the various school plants influences the health and health knowledge of the children.

Justification

Every youth owes to himself, his parents and all who are associated with him the obligation of making the most of his life. Recently (1) the Federated American Engineering Society appointed a committee to determine the causes of waste in industry. First among these causes of waste, the commission named sickness. Each of forty two million workers loses more than eight days every year because of illness. Five hundred thousand workers, many in the prime of their productive period, die each year. Much of this illness is preventable, and in many instances death can be postponed and productivity prolonged.

Obvious also is the fact that numerous individuals are functioning far below their maximum physical efficiency. Remedial work is needed. To be most effective, however, such remedial work must be preceded by an accounting of the present status of health and health knowledge. This study aims to reveal the status of the health and the health knowledge of a special group, rural school children. Such a study is of value as a preliminary move toward effective remedial endeavor.

Furthermore, the adult population of this country

1. Rural Sociology - Gillette. P. 131 ff.

assumes that it knows what is best for its children to learn and practice. Adults build school houses, hire teachers, prescribe courses of study, and require school attendance of every child. School attendance occupies many of the waking hours of the child during the formative period of his life. Left to his own resources, the child would spend his hours out of doors. This activity seems much more conducive to health than the school regime. Considering these facts, it appears reasonable to expect school authorities to make school conditions as healthful as possible. One may go further and say that upon the school and community rest the burden of effecting the maximum development of every child. Such responsibility justifies a study of the health of school children.

The findings of the National School Service Committee, appointed in 1919 by the National Council of Education, give further justification for a study of this nature. Data were collected from the entire country and a comparison between city and country children in regard to fourteen of the most frequently observed physical defects was made. City children were defined as those living in communities of more than 10,000 population; country children as those living in communities of 10,000 or less population. In regard to every one of the fourteen physical traits, country children showed greater deficiency than

city children.

It is therefore the purpose of the writer to obtain accurate and precise information regarding the status of health and health knowledge of children in certain rural schools of Kansas,

Related Studies

Several pertinent studies of the health status of rural people have been reported. While these do not deal singly with the health of rural school children, they offer considerable indirect evidence on the subject. In 1919, the Indiana State Board of Health made an exhaustive study of living conditions in rural homes of four Indiana counties. ⁽³⁾ Every rural home in these counties was visited, and features affecting the health of individuals or communities were observed. In spite of the unusual opportunities for hygienic living afforded by the open country, the majority of people were living in dark, crowded, unsanitary rooms. Usually the house was adequate in size, but, for the greater part of the year, the family lived in the kitchen and a bed room or two adjoining it. Parlor, dining room and the entire upstairs remained unheated and uninhabited for the greater part of each year. Windows were locked and shades drawn. The farmers saved their carpets

3. Health Education in Rural Schools - Andreas

from the fading action of the sunlight, and economized on the labor of cutting fire wood. Significant is the fact that the deaths from consumption were higher by 25.5 to the thousand among rural people than among people selected at random in the state. The committee reported that among the rural people they found a general and very positive aversion to fresh air and sunshine.

One would not expect to find the schools of the state exhibiting any greater conformity to recognized standards of health than do the homes. A survey of rural schools of Porter County, Indiana, made by the United States Public Health Service revealed conditions for seventy five buildings as shown in Table I.

Questions as to the health habits of children in these schools revealed conditions as shown in Table II.

Table III displays the results of a more extensive investigation made by a joint committee of the American Medical Association and the National Educational Association, covering nineteen states.

Table No. I

FINDINGS RELATING TO SANITATION OF SEVENTY FIVE RURAL
SCHOOL BUILDINGS IN PORTER COUNTY, INDIANA

More than 20 years old	57%
No cloak rooms	38%
Drinking water from shallow wells distributed from common dipper	75%
Common wash basins, not often used	75%
Fire fighting apparatus	None
Inadequate ventilation	All

Table No. II.

FINDINGS IN REGARD TO HEALTH HABITS OF CHILDREN IN
PORTER COUNTY, INDIANA RURAL SCHOOLS

Children who drank milk for breakfast	15%
Girls who used tooth brush daily	40%
Boys who used tooth brush daily	13%
Children who drank coffee for breakfast	37%
Girls who had dental defects	50%
Boys who had dental defects	60%

Table No. III.

CONDITIONS TYPICAL OF RURAL SCHOOL HOUSES IN
NINETEEN STATES

Buildings old, inadequate sanitation	63%
Buildings new, inadequate sanitation	37%
Nonadjustable seats	75%
No water supply on school grounds	66%
Inadequate lights or cross lights	All

In schools which have no water, the custom is to permit two favored boys to carry a bucket to a neighboring farm house and bring back water for the school. This is usually done during school hours, because the boys are not willing to take time for this purpose from their play. When the water arrives, another favored student is permitted to pass it to the thirsty children. A single dipper is used by all, and rarely, if ever, is the dipper washed. This bucket-dipper-system exists commonly in schools which have their own water supply. In most of the buildings heat is supplied by a huge unjacketed stove situated in the geographical center of the room. The buildings are cold in the mornings, hot in the afternoons, and always poorly ventilated. (5)

Summing the findings of this investigation, Thomas D. Wood says: "The rural school, from the standpoint of health and general fitness for its important use, is the worst type of building in the whole country. . . . Rural schools are on the average, less adequate for their use than prisons, asylums, almshouses, stables, dairy barns, chicken houses or dog kennels are for their uses."

Conditions such as described above vitally affect the health of rural school children. The 1917-18 draft showed that city boys excel country boys in symmetry of body, in quickness and sureness of action, and in resist-

ance to fatigue. They are mentally more alert. (5) The National Council of Education in 1919 reported decidedly better health conditions among city than among country school children. (6)

Gillette assigns three causes for the marked deficiencies among rural school children: 1. Intermarriage, 2. poverty, 3. ignorance and indifference. Mitigation of the first and second of the evils does not lie within the immediate province of the school. Accepting conditions as they are, a school can accomplish an unbelievable amount of improvement in a community by disseminating health knowledge and creating public sentiment in favor of observing health rules. This fact has been demonstrated in one instance, which is here reviewed in some detail.

About seven years ago, Mrs. Steven V. Harkness of New York City established a fund "to do something for Mankind." This is termed the Commonwealth Fund; and it is administered by the Child Health Demonstration Committee composed of medical men, public health nursing authorities, and lay workers. This committee chose four widely separated communities in which to make five year demonstrations of what could be accomplished in the improvement of public health, especially of child health. Fargo, North Dakota was one of these communities.

5. The World tomorrow - August 1927, P. 330
6. Rural School Administration - Butterworth

In 1923 the American Child Health Association prepared a measuring scale which rated health service rendered by a city or county on basis of a possible thousand points. The makers of this scale state: "The idea was to measure the immediate results obtained, such as statistics properly analyzed, vaccinations performed, infants in attendance at instructive clinics, physical defects of school children discovered and corrected, tuberculosis cases hospitalized, laboratory tests performed -- with the confidence that such immediate results would inevitably lead to the ultimate end of all public health work, the conservation of human life and efficiency."

Eighty six cities were studied with reference to their activities along ten lines of public health service, as shown in Table IV. Norms were established by averaging the efforts of the 86 cities. The demonstration workers enlisted the cooperation of regularly appointed health authorities, medical and dental societies, local demonstration groups, parent-teacher associations, and the numerous organizations of the town. It was believed that such cooperation, intelligently directed, was sure to produce improvement.

Before the demonstration was begun, Fargo was below the average for the 86 cities in nearly all lines. During the demonstration the score which indicated the

prevention of communicable diseases was doubled. In a population of more than 25,000 people there were but 13 deaths from diphtheria during the five year period. The number of school children with poor nutrition ratings decreased from 7.4% to 3.8%.

Table No. IV.

SCORES MADE BY FARGO IN THE COMMONWEALTH

FUND HEALTH DEMONSTRATION

	Points Norm 86		Fargo's Scores				
	possible	cities	1922	1923	1924	1925	1926
Vital statistics	60	34	22	50	54	55	55
Prevention commu- nicable diseases	175	75	69	91	126	138	148
Prevention tuberculosis	150		20	37	45	66	66
Prenatal care	75	29	19	57	73	75	75
Care of infants	75		8	34	69	74	68
Preschool service	50	16	26	50	50	50	50
School health	150	66	24	74	119	139	140
Sanitation	175	117	90	102	116	121	131
Laboratory service	70	42	48	64	64	64	70
Health instruction	20	4	0	3	8	8	11

To show that a health program such as the one used in Fargo will similarly benefit a strictly rural community, part of a paragraph is here quoted from the bulletin, "Demonstrating Child Health." This is a report of one of the Commonwealth Fund Demonstrations carried on in Marion County, Oregon. "The Westerners have responded spiritedly to the tactful demonstration..... Two years' work has borne fruit in the establishment of twelve local health councils, each organized to perform a round of useful duties and necessary volunteer services. Each of them is equipped to open a permanent health center of its own to which the demonstration doctor and nurses can come for examining babies and children. The men and women on these local councils arrange appointments for the health center; keep a loan closet full of surgical dressings, layettes and other supplies; take patients to and from the doctors and hospitals in their own cars; wrestle with social problems; keep a record of accomplishments; and in general act as go-betweens to bring the skilled workers of the demonstration and their own neighbors into useful contact."

Another demonstration is in progress in Athens, Georgia. A visitor here asked some children for what the city of Athens was famous, and almost with one voice they answered, "One hundred percent dental corrections."

Studies of the health of rural people thruout the country point to three facts:

1. In rural districts even more than in cities, people lack a knowledge of the principles of health, and do not realize that observance of health principles is important.

2. When the importance of health is demonstrated rural people are very responsive, and are willing to do whatever is necessary to improve health conditions.

3. The restricted financial ability of the communities and the cost of putting a health program into effect have little to do with the inauguration of such a program. Public sentiment appears to be a factor of vastly greater importance.

Questions to be Answered

Such information and data as recorded above suggest the following questions with reference to certain rural pupils selected for this study:

1. What do these children know of the principles of health?
2. What is the health status of the group?
3. What is the relationship between health knowledge and health in the group?
4. To what degree does the physical condition of the school plant influence the health and health knowledge of the children?

Selection of Subjects

Ten one-teacher, rural schools were used in this study. These schools were all in Douglas County, in the vicinity of Lawrence, Kansas. No effort was made to select schools of a given type; some were standard schools, housed in new, well-located buildings. Others were poorly located, and the buildings were old and out of repair. All the schools were found within fifteen miles of the State University. This might be thought to affect their general character favorably; however, the schools were found to be very much like other rural schools. It was concluded therefore, that the schools studied were fairly representative of Kansas rural schools in matters which would affect the health of the children in attendance.

Method of Securing Data - Measuring Instruments

Health knowledge tests and physical examinations were given to all members of the fifth, sixth, seventh, and eighth grades of these schools. Forty two girls and sixty five boys were tested and examined. The health knowledge tests were given by the writer; the physical examinations were made by Miss Mary Mc Auliffe, County Health Nurse of Douglas County, Kansas.

The Gates-Strang Health Knowledge Test was devised by Dr. Arthur I. Gates and Miss Ruth Strang, both of Columbia University. It was published in its present form in 1925. The material in this test was chosen by analyzing twenty courses of health study and fourteen widely used text books. From the facts most frequently emphasized in these sources, a multiple choice test was made. Five conclusions, only one of which was correct, were formulated for each statement.

Sixty four questions purporting to cover the field of health education, constitute the test. The pupil responds simply by putting an X before his choice of answers. Guessing is made difficult by the number of choices offered. The test is one which the children seem really to enjoy.

In scoring the test, the questions are assumed to have equal value. Sixty four is a perfect score, one is subtracted for every wrong answer, and the result constitutes the pupil's score in the test. A copy of the test is included at this point, that it may be available for ready reference.

Results

In this division the presentation of facts and interpretation of data will be given in the following order:

I. Health knowledge of the group

1. Table of scores
2. Summary of familiar and unfamiliar topics
3. Analysis of questions missed

II. Status of health

1. Table of scores
2. Table of physical defects
3. Discussion of findings

III. Comparison of health knowledge and health

1. Table comparing questions missed and defects found
2. Graph comparing health knowledge and health
3. Discussion of findings

IV. Comparisons within the group

1. Health knowledge and health of group
2. Health knowledge and health of grades
3. Comparison of girls and boys in health and health knowledge
4. Comparison of girls and boys by grades in health and health knowledge

Table No. V.

RANGE OF HEALTH KNOWLEDGE SCORES

The highest possible score is 64.

School	9-13	14-18	19-23	24-28	29-33	34-38	39-43	44-48	49-53	54-58
A		1	2				2	1	1	1
B					1		5	3	3	
C					1	1	1	2	1	1
D	1	1			1	1	5	6	1	
E			1	2	2			4	1	
F					2	1	1	1	1	
G			1	3	2	1	3	4	1	1
H				1			1	5	3	1
I			1	1	2	4	1			
J		1	1		1	2	1	8	3	1

Of the 112 children in the group, none made a perfect health knowledge score. Five only made scores above 53. The highest score was 56. Four pupils made scores below 18. The lowest score was 12.

The test was purposely arranged so that even the brightest pupils could not answer all the questions. The low scores may have been due to indifference rather than to a lack of knowledge, for on the four papers receiving the lowest scores many of the questions were left unmarked.

Analysis of wrong answers according to the number of times each question was missed gave some illuminating data on what these children know and do not know. On page 28 and following the questions are rearranged beginning with the questions missed the least number of times and proceeding to the questions missed the greatest number of times. Analysis of this rearrangement reveals that 24% of the errors were made in the first half of the test, and 76% in the latter half. This suggests the possibility that certain topics are relatively familiar to the average school child, and that other topics are relatively quite unfamiliar. Effort was made to arrange those topics so that the contrast of familiar and unfamiliar items may be readily noted. (See page 27) Following this contrast appears the rearranged health knowledge test showing each question and the number of times it was missed.

Relatively Familiar Topics
in First Half of Test.

24% of all errors

Time and manner of eating.
Manner and amount of sleep.
Selection of wholesome food
and drink. Milk and water.
Prevention of accidents--
playing, on water.
Spread of diseases-- flies,
coughs, colds.
Suitable clothing.
Fitting of glasses.
Harm of smoking.
Attitude toward school work.
Sanitation-- location of well,
mosquitoes, washing dishes,
handling foods.
Dentistry.
Lime in bones.
Outdoor air, play.

Relatively Unfamiliar Topics
in Last Half of Test.

76% of all errors

Long and thorough chewing of
food. Amount of food.
Selection of food-- beef, vege-
tables. Sources of starch,
protein, iron.
Tying up a cut, sterile bandage.
Mouth breathing.
Optimum room temperature.
Proper lighting.
Harm of alcohol, patent medicine,
habit forming drugs.
Sanitation-- storing manure,
dusting.
Relation of food to decay of
teeth.
Exercise. Preventing constipation.
Changing status of scientific
knowledge.
Size of stomach
Pasteur's germ theory of disease.
Food calories.

REARRANGEMENT OF HEALTH FACTS INCLUDED IN THE GATES-STRANG
 HEALTH KNOWLEDGE TEST ON BASIS OF NUMBER OF TIMES
 EACH FACT WAS MISSED

Question number	Question	Number of times missed
2.	At meal times we should sit down at the table and eat slowly.	3
1.	It is best for children to eat at regular times each day.	5
22.	We help to keep from having accidents on the water when we learn to swim to save a drowning person.	6
5.	Flies should be kept away from food because they carry germs.	7
26.	Of the following five foods, the most important one for children is milk.	7
23.	If the organs of our bodies could talk they would say, "Wear loose clothes".	9
7.	A person who has trouble with his eyes should have glasses fitted to his eyes by an eye-doctor.	10
30.	We get the best air to breath by being outdoors in the sunshine.	10
33.	While eating it is a good thing to feel comfortable and happy.	13
6.	There is less danger of giving a cold to some one else if you cover your face when coughing and sneezing.	14
18.	The best way to sleep is with light warm covers and windows open at top and bottom.	14
21.	If you should get a low mark in school work, it will help matters to ask the teacher's advice and follow it.	14
10.	One reason why people should not smoke is that it often harms the lining of nose and throat.	16

4. Alice is thin and pale. Besides rest and some outdoor exercise she should probably have more milk, bread, butter, and spinach. 19
27. Everyone should start killing flies as soon as the first fly appears in the spring. 19
34. A good way to learn to sit well is use chairs and desks at school that are just the right size and shape. 19
3. Cooked meat and vegetables should be kept in a cool place covered. 20
9. Boys and girls who wish to be healthy should choose for lunch at school, hot soup, baked potatoes and milk. 20
19. Long and regular hours of sleep help keep children well. 20
14. Safety in games means watching out so as not to trip or hit other people. 21
25. In choosing what clothes to put on in the morning you should think whether or not they are suited to the weather. 23
28. Of the following the most healthful drink for children is orange juice. 24
11. In washing and drying dishes very hot water and soap are needed every time. 25
18. We should visit the dentist regularly twice a year. 28
35. When a child gets a cinder in his eye one good thing to do is to have some one who knows how get it out. 29
49. Lime is needed in the largest amounts in building bones. 29
15. The best way to spend the time right after school is to play outdoors in the sunshine. 32
41. Every day a child should drink 4 to 8 cups of water. 32

32.	One way tuberculosis is spread is by our coughing and spitting.	35
45.	A good place for mosquitoes to be born is in tin cans half full of water.	37
42.	One reason why milk is important is because it aids growth.	40
53.	The best location for a well is on much higher ground than the barn or water closet.	40
<u>End of first half - 24% of total errors.</u>		
39.	On a farm manure should be kept in covered bins.	42
20.	A growing boy should eat roast beef or other meat not more than once a day.	45
38.	Constantly breathing thru the mouth is harmful because it carries cold, uncleaned air into the lungs.	45
8.	Of these foods, the best one to choose for breakfast is hot cereal.	46
43.	One reason why foods should be well chewed is because the saliva begins to digest starchy foods.	46
37.	Iron is found in the largest amounts in green vegetables and egg yolk.	47
52.	In dusting wood work the housekeeper should use a damp or oiled cloth.	47
55.	A good American citizen buys and drinks no alcoholic beverages.	47
46.	The players on champion athletic teams do not touch drinks with alcohol in them because alcohol decreases accuracy and efficiency.	49
40.	When studying we should have a shaded light from above and behind us, without shadows on our book.	50
31.	Of the following the most healthful meal for a growing girl is one of milk, bread, butter, spinach and dates.	51
56.	School children should carry their book straps	

- or brief cases by changing hands every few minutes. 51
48. If no germless bandages are at hand for tying up a cut, the best thing to do is to use a piece of boiled cloth that is allowed to touch nothing but the cut. 51
36. Vitamins are especially necessary for increasing health and growth. 54
24. One reason why green leafy vegetables are healthful is that they contain iron and vitamins. 56
17. For eating a good noonday meal, children should plan to use about one half hour. 57
29. Of the following the best reason why patent medicine should be avoided is they often contain drugs which are bad for us. 57
54. People who take habit-forming drugs are usually those who are unsuccessful. 58
44. One good simple rule for preventing constipation is to drink one or two glasses of water on rising in the morning. 61
47. In general the best exercise for 4th grade boys and girls is active outdoor play. 64
57. The amount of food we ought to eat depends mostly on our size and what we do. 66
60. The largest amount of protein is to be found in milk, fish and eggs. 68
13. One of the chief causes of decayed teeth is having food lacking in some elements while the teeth are growing. 76
51. Vaccination for typhoid, smallpox and other diseases is used to make new substances grow in the blood that destroy germs. 81
61. The best temperature for a room in which one is sitting reading is between 65 and 68 degrees. 82

58.	The best source of starch is cereals and bread.	84
12.	The facts about keeping well which we learn now may change as new discoveries are made.	85
50.	A child in the sixth grade should keep his book 14 to 20 inches in front of his eyes.	85
59.	The average amount which the stomach of a grown person can hold is 2 to 3 pints.	87
63.	The man who did most to establish the germ theory of disease was Pasteur.	98
64.	The average number of calories in a half pint glass of milk is 150.	108
62.	A good average number of calories for lunch for an average boy 13 years old is 700 to 900 calories.	113

Second half, 76% of the errors

The comparisons cited above show that most of the children know that meals should be eaten slowly, while sitting at the table. Few of them recognize that about half an hour should be consumed in eating a meal, or that the amount of food depends upon the size, weight, and occupation of the individual. Many children know that milk, spinach, and orange juice are healthful, but the majority seem not to know that meat in the diet must be limited. They do not know the sources of starch, protein and iron, if indeed, they recognize these food elements at all. They have been taught the desirability of precaution to prevent accidents; they know little of bandaging a wound with sterile cloth. They know that flies carry germs, and that colds are spread by coughing; they do not know that mouth breathing is harmful. They feel that they must dress to suit the weather; but know little of optimum room temperature. They agree that glasses must be fitted by a specialist; but they have only the vaguest notions regarding the proper lighting of a room.

Certain undesirable results assumed to come from smoking are familiar to these children; the harm from the use of alcohol is less well known. Most of them seem not to know what patent medicines and habit forming drugs are. The children agree that they should visit the dentist twice a year, but miss entirely the fact that diet may contribute to or may hinder the decay of teeth. The changing status

of scientific knowledge, Pasteur's great contribution to the theory of disease, and the calory content of foods are practically unknown to the children of this group.

The question may well arise at this point whether the health facts that the children know are the facts which are necessary for an individual to know in order to guard his health properly.

Table No. VI

RANGE OF HEALTH SCORES

The highest possible score is 64.

School	19-23	24-28	29-33	34-38	39-43	44-48	49-53	54-58	59-64
A					4	2	2		
B			1	1	1	7		1	1
C		1		1		2	2	1	
D					2	4	3	5	2
E			2	2	1	2	1		2
F		1		2			1	1	
G				6	2	3	3	2	
H	1	1		3	2	1	2	1	
I			1		1	3	2	2	
J		1	1	6	6	2	1	1	

By referring to Table VI, it will be observed that there are five very high health scores in the group. These were all made by boys, two of whom scored 64. Three scored 62. Two of these boys were brothers. It would be most interesting in this connection to study the home life and health habits of these boys. This the writer has not done.

There were five low health scores, 28 or below. Four of these were made by girls. These cases, too, should be made the subjects of further study. One might well investigate whether boys as a rule have better health than girls, and wherein the health habits of the boy making a low score differ from those of the boys who earn high scores.

Table No. VII

ANALYSIS OF PHYSICAL DEFECTS FOUND IN CHILDREN
OF THIS STUDY

Percentage Distribution

Underweight	26.8%
Overweight	7.1%
Defective vision	17.9%
Decayed teeth	38.3%
Defective tonsils and adenoids	40.6%
Enlarged glands	64.3%
Contagious diseases	93.0%
Biting nails	7.1%
Poor posture	16.0%

Thirty seven

Table VII shows that 23.8% of the children are underweight according to the Baldwin-Wood Standards. Most of the children admit that they drink coffee rather than milk, that they do not like vegetables, or eat them regularly. Many of them are heavy meat eaters. The condition of underweight is often accompanied by defective vision, decayed teeth, infected tonsils, adenoids, enlarged glands, and generally greater number of physical defects than are found with persons of normal weight. This accords with the findings of the Oak Park Demonstration. (8)

Had better testing facilities been available, it is quite possible that a greater percentage of defective vision would have been found. The percentages of defective tonsils, adenoids, and of decayed teeth are in accord with the findings of other studies. The percentage of enlarged glands is almost unbelievably high. However, if enlargement of glands is caused by infection, some of these cases can be accounted for when it is noted that 93% of the children have had from one to six contagious diseases. Probably the percentage of nail biting and faulty posture is higher than that stated in this report.

Histories of contagious diseases stand first as a cause of poor health, according to the health evaluation scheme used in this study. Following in order are enlarged

glands, defective tonsils and adenoids, decayed teeth, underweightness, defective vision, poor posture, overweightness, and biting nails.

RESULTS OF HEALTH KNOWLEDGE TEST

Since 112 children answered 64 questions in the health knowledge test, 7168 answers were given. Of these answers, 2648 were incorrect and 4520 were correct.

For purposes of comparison, the health score card was arranged so that there were 7168 points. Physical defects totalling 2171 points were found for the group studied. The total health score was 4997 points.

Table VIII shows these figures arranged in comparable form, and indicates the comparison of right and wrong answers by percentages. There is a greater number of wrong answers than of points indicating defects. The total health score is higher than the number of right answers. According to the measures here used, the health of this group seems to be somewhat better than its health knowledge.

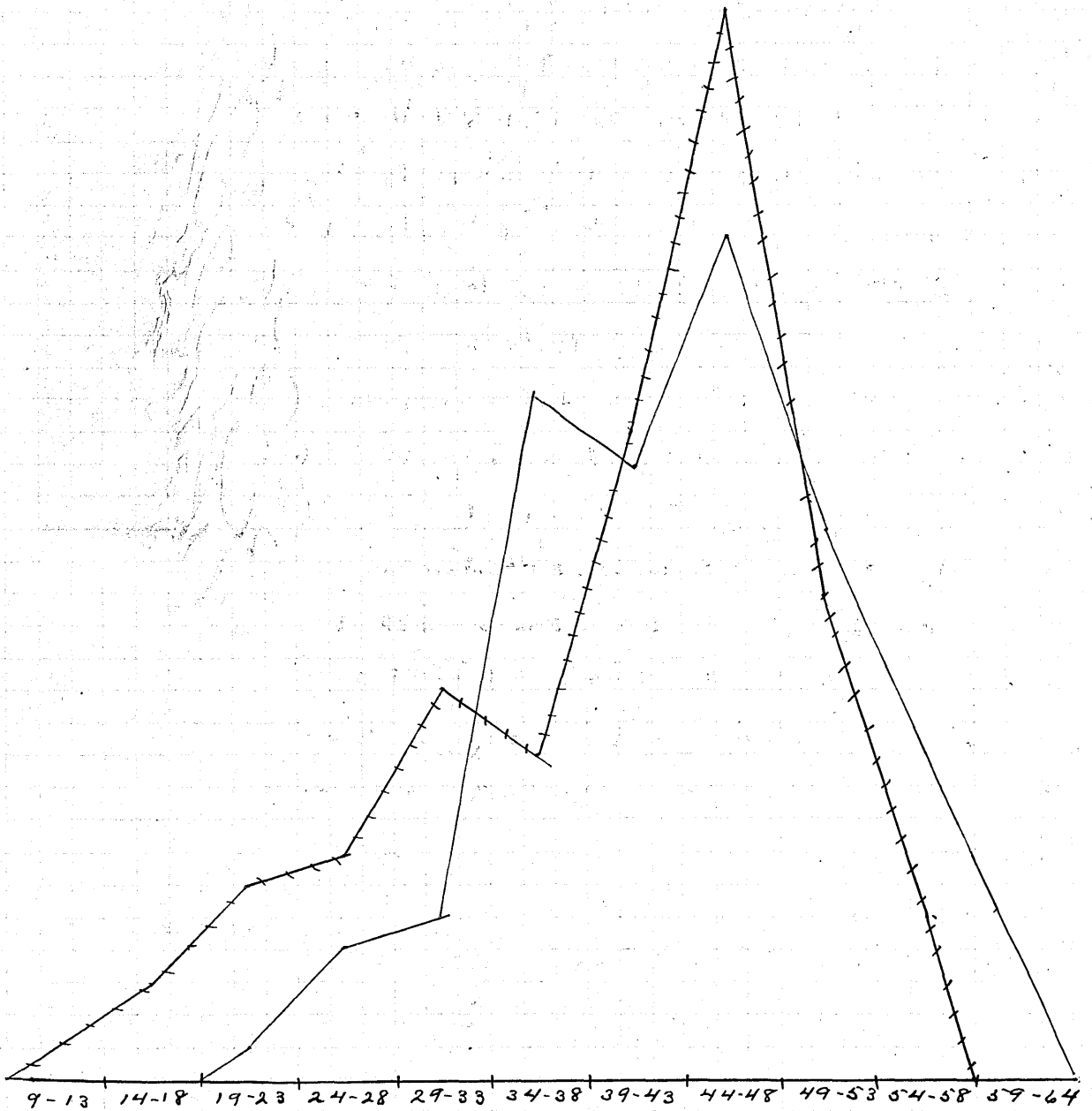
Following Table VIII a graphic distribution of the health knowledge and the health scores of the group is presented. It will be noted that while the group shows a higher score in health than in health knowledge, the two curves are very similar, and the central tendencies of the two measures are almost identical.

Table No. VIII

COMPARISON OF QUESTIONS MISSED AND PHYSICAL DEFECTS

Percentage nistribution

Answers wrong	2648	37%
Defects - points	2171	30.3%
Answers right	4520	63%
Total health points	4997	69.7%



GRAPHIC COMPARISON OF HEALTH KNOWLEDGE AND HEALTH SCORES

Table No. IX

COMPARISON OF SCORES IN HEALTH KNOWLEDGE

WITH SCORES IN HEALTH

Upper line - health knowledge scores

Lower line - health scores

School	9-13	14-18	19-23	24-28	29-33	34-38	39-43	44-48	49-53	54-58	59-64
A		1	2				2 4	1 2	1 2	1	
B					1 1	1	5 1	3 7	3	1	1
C				1	1	1 1	1	2 2	1 2	1 1	
D	1	1			1	1	5 2	6 4	1 3	5	2
E			1	2	2 2	2	1	4 2	1 1		2
F				1	2	1 2	1		1 1	1	
G			1	3	2	1 6	3 2	4 3	1 3	1 2	
H			1	1 1		3	1 2	5 1	3 2	1 1	
I			1	1	2 1	4	1 1	3	2	2	
J		1	1	1	1 1	2 6	1 6	8 2	3 1	1 1	

It might easily be assumed that a school which merited a high health score would also have a high health knowledge score. Table IX shows that this is not the condition. Schools "D" and "I" rank conspicuously high in health and low in health knowledge. School "H" has somewhat better score in health knowledge than in health. The most conspicuous feature of the table, however, is the lack of correspondence in health and health knowledge scores in the schools.

This raises the questions: Is a knowledge of the principles of health essential to the possession of good health? If so, what principles of health should be taught to school children?

Table No. X

PERCENTAGE COMPARISON OF SCORES IN HEALTH KNOWLEDGE
WITH SCORES IN HEALTH

School	Percentage of children	Percentage health knowledge score	Percentage health score
A	7.1	6.4	7.1
B	10.7	11.7	11.0
C	6.2	6.7	6.3
D	14.2	13.9	16.6
E	8.9	8.1	8.8
F	4.4	4.2	4.1
G	14.3	13.6	14.1
H	9.8	11.1	8.8
I	8.0	7.1	8.5
J	16.0	16.6	14.3

Table X compares the number of children in each school with the total number of children in the study, the number of correct answers indicating health knowledge with the total number of correct answers, and the health score of each school with the total health score of the group. The health knowledge and health of the different schools appear to be very similar. A school which has 10% of the children has about 10% of the right answers in the health knowledge test, and 10% of the total points indicating physical health. Only one school varies more than 2% from this tendency. These small differences might have been still smaller if the number of cases in each school had been greater.

The similarity of scores in the different schools raises the question: Is health teaching uniform throughout the schools, or is the uniformity due to a lack of health teaching?

It would seem reasonable to assume that the attitude of the adult members of a community would be reflected in the health of the children, in their health knowledge, and in the general condition of the school plant. If this were true, a progressive and intelligent community should have a school plant which conforms to recognized standards of utility; the children should have a relatively low percentage of correctable physical deficiencies, and should have a high score in health knowledge.

School "E" is a standard school. It has a new building, a furnace, indoor toilets, a play room, and the light comes from the left and rear in the assembly room. The community is one of the most progressive; most of the citizens are interested in the school; several families entered the Fitter Families Contest at the State Fair, and at least one took a prize. Yet, strangely enough, this school registers neither ^{high} nor low on the comparative table of scores; and on the percentage comparison shows neither better nor worse than the average.

School "I" is the extreme opposite of School "E". It is situated in a low, muddy place at the foot of two almost impassible rock hills. The building is old. The neighborhood has little communication with the outside world, and takes little cognizance of progressive movements. This school, though scoring low in health knowledge, registered high in health.

Table No. XI

AVERAGE SCORES FOR EACH GRADE

HEALTH KNOWLEDGE AND

HEALTH

	Number of pupils	Health knowledge	Health
Eighth Grade	29	49.13	39.74
Seventh Grade	23	45.80	45.43
Sixth Grade	37	36.07	45.73
Fifth Grade	23	30.30	44.66

Evidently there are determining factors in the matter of health of school children which the tests do not reveal, and it appears quite likely that other factors are more important than the physical equipment of buildings in determining the health of children. An investigation of such factors is much needed at this time.

Table XI indicates still further the lack of correlation between health and health knowledge. Health knowledge increases progressively from the fifth to the eighth grade. This fact might be interpreted to mean that the school teaches certain items of health knowledge in each grade, so that the student's total health knowledge increases as progress is made to the higher grades. The health score of the group apparently decreases from the fifth to the eighth grade. If the school takes credit for the pupil's increase in health knowledge, shall it not be charged with his decrease in health? If physical equipment of the school plant has little to do with health of school children, what causes the decrease in health score?

Table XII re-emphasizes the fact that health knowledge increases and health decreases with the progress of chronological age. It shows also that the girls of each grade score higher in health knowledge than do the boys, and the boys of each grade score higher in health than do the girls.

Table No. XII

AVERAGE SCORES FOR BOYS AND GIRLS IN EACH GRADE

HEALTH KNOWLEDGE AND HEALTH

	Health knowledge	Health
Eighth Grade Girls	49.44	36.27
Eighth Grade Boys	48.83	43.22
Seventh Grade Girls	47.60	40.44
Seventh Grade Boys	44.00	50.43
Sixth Grade Girls	38.27	41.68
Sixth Grade Boys	33.88	49.77
Fifth Grade Girls	29.75	44.00
Fifth Grade Boys	33.13	45.33

Table No. XIII

HEALTH KNOWLEDGE SCORES FOR KANSAS CHILDREN
AND CORRESPONDING SCORES FOR NEW YORK CITY

CHILDREN

	Kansas rural children	New York City children
Eighth grade	49.13	48
Seventh grade	45.80	43
Sixth grade	36.07	38
Fifth grade	30.30	31

Table XIII shows that the Kansas rural school children make health knowledge scores that correspond closely with scores made by New York City children of the same grade. This correspondence in scores would lead one to question whether the teaching of health knowledge thruout the country is uniform, or whether the uniformity of scores is due to a universal and conspicuous absence of health education.

Table No. XIV

COMPARISON OF DEFECTS OF BOYS AND GIRLS

Percentage Distribution

	Girls		Boys	
	Number	Percentage	Number	Percentage
Number of cases	47	42	65	58
Underweight	20	66 $\frac{2}{3}$	30	33 $\frac{1}{3}$
Defective vision	14	64.5	6	35.5
Decayed teeth	22	51	21	49
Defective tonsils	19	37.2	32	62.8
Enlarged glands	32	44.4	40	55.6
Contagious diseases	123	48	132	52
Faulty posture	3	16.6	15	83.3

Attention is called to the fact that the figures in Table XIV cannot be compared as they stand, because the number of boys and girls is not equal. The table is included, however, because valid comparisons of physical defects can be made on a percentage basis. The girls constitute but 42% of the number in the entire group, yet in regard to weight, vision and teeth, they have more defects than boys. In glandular functioning they are slightly more defective than boys. In defects of posture, the boys exceed the girls by a large percentage.

Possible explanations for these differences are not difficult to obtain. Boys live more out of doors than girls, take more exercise, have better appetites; hence they are heavier than girls. They read less, and it may be because of this they have better vision. Their normal appetites call for wholesome diet which tends to better preservation of their teeth. The play activities of girls are much more restricted than are those of boys. Their favorite recreations are largely carried on indoors. (9)

The boys' excess of tonsil difficulty is probably due to careless mouth hygiene and faulty diet. The girls also offend somewhat in this regard. The high percentage of enlarged glands among both boys and girls may be expected when the relatively large proportion of tonsil infection

and prevalence of contagious diseases are considered. The boys' greater frequency of faulty posture as compared with the girls may be due in part to more rapid growth, heavy farm work, and indifference on the part of the boy. However, school authorities should not overlook the fact that few rural school rooms are fitted with seats large enough for the tall boy.

Table No. XV.

SUMMARY OF THE COMPARISON BETWEEN HEALTH AND
HEALTH KNOWLEDGE IN CLASSIFIED GROUPS

Individuals

High Health Scores

Sex	Health	Health knowledge
Boy	64	27
Boy	64	47
Boy	62	12
Boy	62	27
Boy	62	30

High Health Knowledge Scores

Girl	40	56
Girl	42	56
Girl	38	55
Girl	34	55
Boy	34	55

* * * * *

Sexes

	Boys	Girls
Average Health Score	46.94	40.58
Average Health Knowledge Score	39.96	41.26

* * * * *

Grades

Eighth Grade		
Highest Average Health Knowledge Score		49.13
Lowest Average Health Score		39.74
Fifth Grade		
Lowest Average Health Knowledge Score		30.30
Average Health Score within 1% of highest		44.66

Table XV presents a summary of the comparison between health knowledge and health in the different groups, individuals, sexes and grades. It is to be noted that the five individuals who made the highest health scores made very low health knowledge scores. The individuals who made the highest health knowledge scores made low and medium health scores.

Correlation between health knowledge and health scores in the sixth grade yielded a negative coefficient so low that it is entirely negligible.

The boys had a greater range in health scores and in health knowledge scores than the girls. This is in accord with the general findings which assert that the male displays greater variability than the female in most traits.

Comparison by grades showed that the eighth grade had the highest health knowledge score, and the lowest health score. The fifth grade had the lowest health knowledge score and its health score was within less than 1% of the highest grade average in health.

All of these comparisons indicate negligible relationship between health and health knowledge of the group as measured in this study.

Summary of Data

1. The Health knowledge scores of 113 rural children ranged from 12 to 53. Perfect score is represented by 64.
2. Most of the children know some basic facts regarding health habits, sanitation, and related topics. Many facts thought to be essential to healthful living are unknown to these children.
3. Five boys have perfect or nearly perfect scores in health. Four girls and one boy have health scores below 28. Perfect score is represented by 64.
4. The health of the group somewhat exceeds its health knowledge.
5. The physical and sanitary conditions of the school plant[†] seem to have little effect on the health or health knowledge of the children.
6. The eighth grade made higher scores in health knowledge and lower scores in health than did any other group.
7. The grade averages for 113 rural children correspond closely with the grade norms for New York children as given by Gates.

8. The girls of the group made lower scores in health and higher scores in health knowledge than did the boys.

9. Comparison of girls and boys by grades shows that the girls exceeded the boys in health knowledge, and that their health knowledge score increased progressively from the fifth to the eighth grade.

10. The boys exceeded the girls in health. The poorest health score was in the eighth grade.

Limitations of the Study

In presenting the foregoing data, the writer is conscious of three distinct limitations.

1. The number of cases is too small to permit deduction of valid and representative conclusions. All the schools in one county should be studied before hypotheses can be established for even a small section of the country. A survey of nineteen states such as reported by the National Educational Association in 1912 is much more adequate for deduction of general conclusions. However, these results are indicative of the direction which further study should take.

2. While the health knowledge test used is the best available, it has not been fully standardized. The only norms now available are for children of the New York City schools, and the number of children used in establishing these norms was comparatively small. Much work needs to be done on the test in rewording the questions and adapting them to the needs of the children. Improvement is needed along three lines: (1) Ambiguity exists in such questions as No. 12 and No. 25; (2) questions No. 44 and No. 46 are examples of double negatives which prove difficult for the children to understand; (3) and such questions as No. 44 and No. 48 are faulty because they carry misleading

inferences.

3. The health test has been less carefully worked out than the health knowledge test. As administered the health test indicates only the most outstanding physical deficiencies, and it may be questioned whether even the outstanding defects were included in all cases. One instance comes to mind of a child whose general appearance indicated urgent need of medical attention. Dull eyes, sallow skin, listless manner, disinclination to play, headache, lack of appetite, all indicated serious functional disorder; yet this child's health score was 46. Quite evidently, an adequate measure of the health status of the children was not made.

Work in child health is comparatively new in the educational field. Measuring instruments must be refined and adapted, and many studies must be made before valid conclusions can be drawn.

Answers to questions

After evaluating the information and test data presented in this study, an attempt is here made to answer the questions raised for discussion.

1. What is the health status of the group? All but two of the 112 children have some physical defect which can be measured by the scale used in the study. Many have handicaps in the form of defective teeth, uncorrected aberration of vision, and other serious defects which should be corrected.

2. What do certain rural children know of the principles of health? Some of the most fundamental principles of health are known by a majority of the group. Many major principles of health which are assumed to be necessary to healthful living are unknown to these children.

3. What is the relationship between health and health knowledge in the group? As measured by the instruments used in this study, the relationship between health and health knowledge is negative, and so low as to be entirely negligible.

4. To what degree does the physical condition of the school plant influence the health and health knowledge of the children? The study did not reveal any measurable influence which the condition of the school plant exerts

upon the health of the children. Children in schools which have excellent hygienic features exhibit no better health or greater health knowledge than those in inferior plants.

Other standards of measure and further refinement of those already in use are much needed.

Suggested Questions Growing Out of the Main Problem

The foregoing study has indicated numerous questions which should prove of interest to those who deal with health problems of school children. Some suggestions for further research are here appended for those who desire to contribute much needed information to the cause of human welfare in the field of health education.

1. What are the characteristics of a scale which shall adequately measure the health of school children?
2. What are the characteristics of a scale which shall adequately measure the health knowledge of children?
3. Do boys have better health than girls? If so why?
4. What are the factors which operate to reduce the health of children as they grow older? Especially, does attendance at school affect health unfavorably?
5. In what respects do the health habits of individuals making high scores in health differ from those making low health scores?
6. What steps can the school take to improve the health of children?
7. What type of health knowledge, if any, will show a high positive correlation with health?

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