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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN No. 58
AUGUST, 1919.

OPEN AIR SCHOOLS FOR THE
PREVENTION AND CURE OF TUBERCULOSIS
AMONG CHILDREN

BY

B. S. WARREN
Passed Assistant Surgeon

PREPARED BY DIRECTION OF THE SURGEON GENERAL



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OPEN-AIR SCHOOLS FOR THE PREVENTION AND CURE OF TUBERCULOSIS AMONG CHILDREN.

By B. S. WARREN, Passed Assistant Surgeon, United States Public Health Service.¹

The subject of outdoor schools for tuberculous children or those predisposed to this disease is not a new one. The first experiment with them was made in Germany as early as 1904. The expression "predisposed to tuberculosis" refers to that group of children who by reason of inheritance or environment furnish so many cases of the disease.

From the very beginning these schools have proven to be of great value, not only in benefiting the children in these schools, but also by demonstrating clearly some of the defects in the public schools. A study of the measures directed toward the prevention of tuberculosis shows that the problem is largely an economic one, and until economic conditions are adjusted all measures are at best only remedies which may improve existing conditions. The sanitarian, however, can not afford to wait on the adjustment of economic conditions, but must use every remedy at hand.

In the outdoor school is found one of the cheapest, simplest, and most efficient remedies for the cure and prevention of tuberculosis among children. It is beyond the stage of experiment, and is recognized as one of the standard remedies.

As in all antituberculosis work the problem is most acute in the congested districts of the large cities and among the people who are on the border land of poverty. The mill and factory towns with a large population who earn just enough to live from week to week, furnish some of the most difficult situations. In these homes where poor hygienic conditions are the rule, when the breadwinner or other member of the family is stricken with tuberculosis, the protection of the children in the home becomes very difficult; if not impossible. The patient has usually reached the advanced stage of the disease before he is located and when located probably refuses to go to the hospital.

¹ This article is based on experience obtained and observations made while acting as medical director of the Society for the Relief and Prevention of Tuberculosis, St. Louis, Mo., during a tour of duty in command of the United States marine hospital in that city. The work was done in connection with other duties as an officer of the United States Public Health Service and in cooperation with the local society. Acknowledgment is here made of reports received from many principals of open-air schools in different sections of the United States.

The strain of supporting the family under ordinary conditions has taxed the earning capacity of all the workers. This additional expense of an invalid in the family is too great, and the breaking point is reached. Through it all the children, on account of greater susceptibility to tuberculosis and greater dependence, are the greater sufferers.

A careful examination of the children in homes where there is or has been an advanced case of tuberculosis will show that a large percentage have the disease in some stage. If not actually tuberculous, these children are so frequently reduced physically that they readily acquire the disease. Many of them will be found below weight, undernourished, anaemic, frequently absent from school, backward, or in other subnormal condition. This group of children are referred to as pretubercular by the antituberculosis workers.

The remedy in some instances may be to take such children from the home and place them in institutions. This procedure is practicable, however, in but few cases, and could not often be enforced without a law for compulsory removal. The advisability of breaking up homes for such reasons, even though the necessary laws existed for doing so, is seriously questioned. Social workers are advising against it and doing all they can to hold the family together even under adverse conditions. Leaving the home intact, the remedy would be to take these children for as many hours in the day as practicable, place them under as nearly ideal hygienic conditions as possible to restore them to the normal, and at the same time prevent them from forming habits of idleness, and return them to the public school without the loss of a grade.

In addition, the children would be taught lessons of hygiene by actual practice, and returned to the insanitary homes as missionaries of sanitation, who will soon improve the conditions of the home. This can be done without further laws and without radical changes. In fact, most parents are found willing to let the children go to these schools.

The question of pauperizing the family hardly enters into consideration, because it may be properly looked upon as one form of a public school and not a charity.

The principles of the open-air school are those of personal hygiene, fresh air, cleanliness, proper clothing, proper diet, rest, and recreation.

THE SITE.

The location of a site is not one of the least difficulties. Accessibility as well as the hygienic surroundings must be considered. At times, to avoid the smoke and dust of the city, a suburban site must be sought.

The top of a tall building centrally located as to the majority of the prospective pupils may, in some cases, prove more practicable than the suburbs. In many instances central location may be impossible, and no matter how accessible a site may be it will be found that a number of children will have to ride long distances. In Chicago, for example, while most of the children lived in the 1-mile zone, many lived beyond it, and some 4 miles or more away. Other things being equal, a suburban location in the woods is to be preferred.

Much may be said in favor of a wooded suburb on account of the nearer approach to natural conditions, with all that this means from a hygienic standpoint; and, further, the benefits of such a change in environment mean much to the child who has never known anything but a tenement home among tall brick buildings.

Accessibility and hygienic environment are the two main points to be considered, and both should be had if possible. If one must be sacrificed, accessibility may be given up with better results, as the exhaustion of a long ride is offset by the benefits of the change of scene and open-air conditions in a wooded suburb. Opposition may be met with among the neighboring residents, but this is readily overcome by a full explanation as to the nature and harmless character of such schools from a sanitary standpoint.

BUILDING.

At present two types of open-air schools are recognized—one in which the school and rest room is open on all sides with canvas drop curtains for protection against severe cold winds; the other in which some available building is converted by removing only one side wall and replacing it with hinged window sash.

No possible objection can be raised to the first plan, as the free sweep of the air makes ventilation complete at all times; whereas, in the second, when the sash in the open side is closed for protection the room becomes a closed one. Then, too, in warm weather the breezes may be often shut off by the closed-in sides, and such a room can hardly be as comfortable as the one open on all sides. The first type with all sides open is therefore recommended whenever practicable.

The first type, or the real out door school, may be constructed on a substantial flat-top roof with very little more expense than on the ground. It may be cheaper if a kitchen in the building below is available for use by the school.

The accompanying illustration made of the St. Louis Open Air School will be found so simple that any ordinary contractor can build one like it without further help from an architect. At the same time it is so very inexpensive to build that it would be difficult to find

a building which could be converted at a less cost. As is apparent from the drawings, it is nothing more than a long shed substantially built with the north end inclosed for bathrooms, kitchen, and store-rooms. (Figs. 1 and 2.)

The dining room is made so that it can be inclosed in winter, but all sash and panels are fastened in by screws so that they can be removed after the coldest weather is over. The bathrooms, kitchen, and dining room are heated by a steam plant located in a small cellar under the kitchen.

The dining room can not be heated above 60° in cold weather, whereas the kitchen and bathrooms can be heated to 72° in zero weather. The roof is covered with tar paper and gravel, with an open space of about 2 or 3 feet between it and the ceiling. The ceiling is made necessary to protect against summer heat. The uninclosed space is for the school and rest room. It is protected by 16-mesh screen wire, with canvas drop curtains, made so that they can be lowered or raised from the inside. They are never lowered except for protection from cold winds and rain or snow. Except in the coldest weather, the dining room is open; in fact, forms part of the same space as the school and rest room when the sash and panels are removed.

The bathrooms are provided with toilets and shower baths with hot and cold water. Leading into the bathrooms are dressing rooms provided with individual lockers for each child. The bathrooms are built out from the main shed so as not to cut the flooring and at the same time provide a cement floor. The small cellar is made necessary in order to accommodate the steam heating plant and to get the proper circulation of the steam. It also saves some in the fuel bill by being protected in the cellar. A tent is provided outside for the night watchman.

The dimensions (24 by 64 feet) were found to be the least possible to accommodate 25 children. By extending the building 5 feet longer 30 children could be accommodated. To provide for more than this number in one plant would hardly be advisable, since many would have to travel long distances. Also a greater number would tax the capacity of the teacher so that she would not be able to give to each child that individual care and attention which contributes so much to the success of the school.

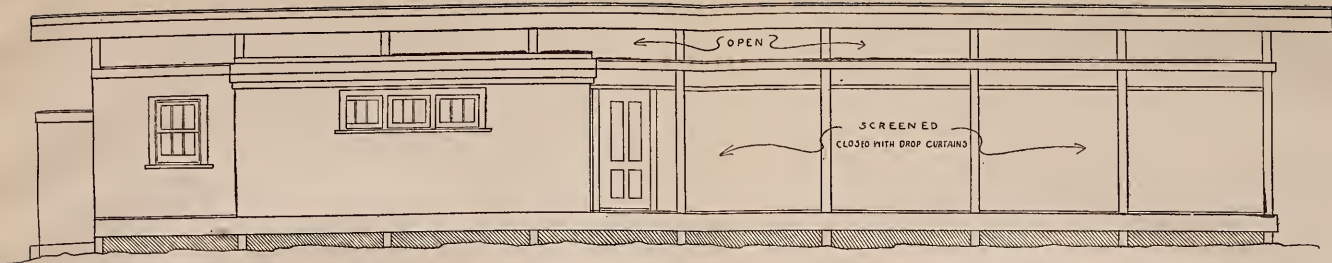
SELECTION OF CHILDREN.

The selection of the children is not a very difficult task. Often the necessary data are at hand in the files of the school board. If the data are not available, the children may be best located through the visiting nurse of the antituberculosis society or the records of the



St. James' Protestant School

1882



WEST ELEVATION

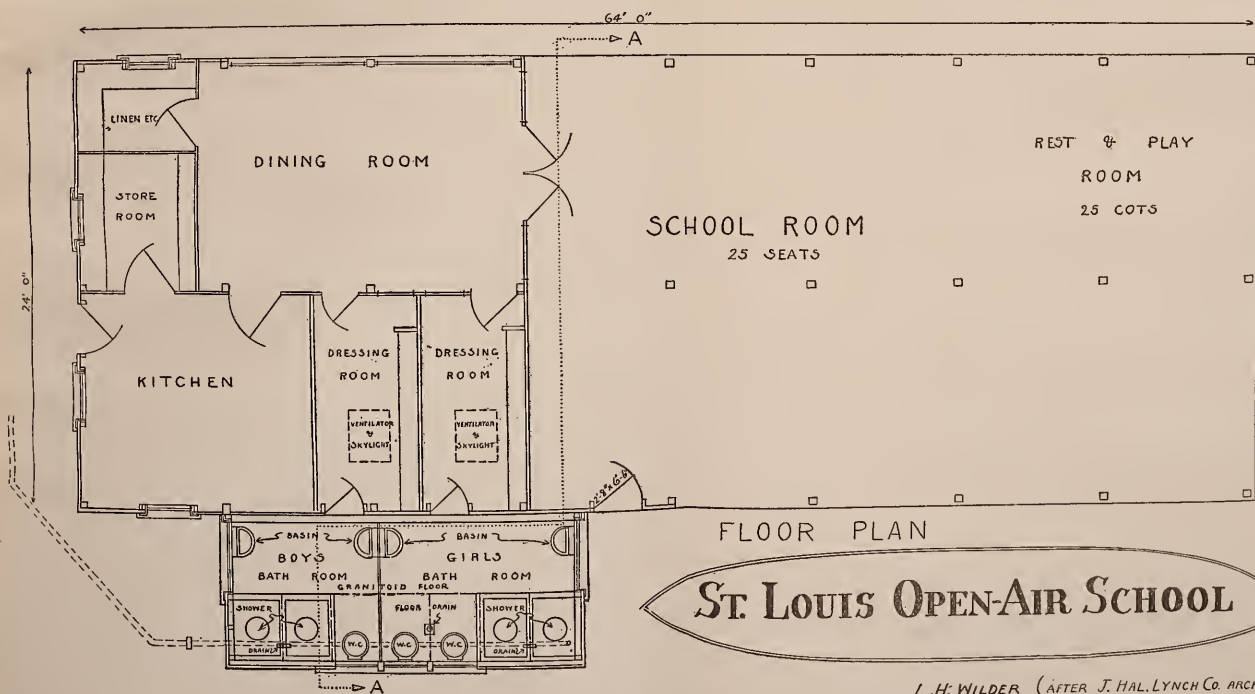


FIG. 1.—SHOWING FLOOR PLAN AND WEST ELEVATION OF ST. LOUIS OPEN-AIR SCHOOL.

A Good Illustration of Type of Real Out-Door School.

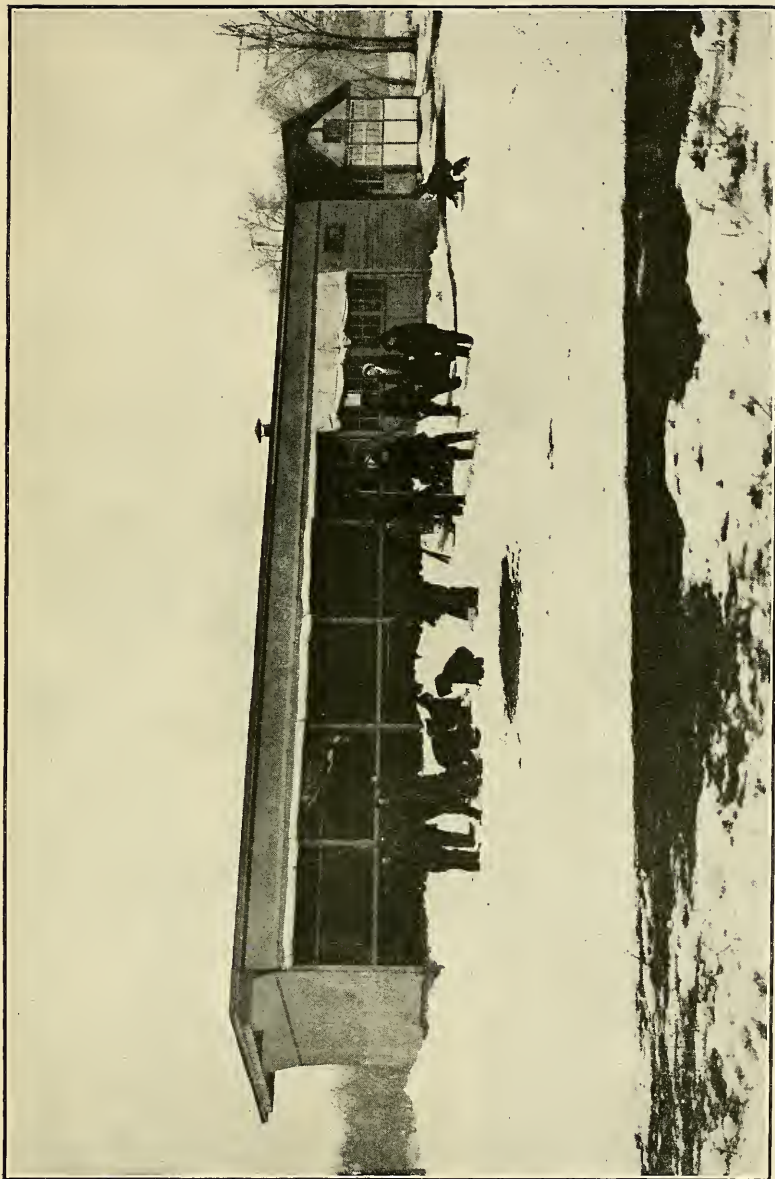


FIG. 2.—PHOTOGRAPH OF BUILDING CONSTRUCTED FROM PLANS SHOWN IN FIGURE 1.

Open-Air School Operated and Maintained by the Board of Education and Society for the Relief and Prevention of Tuberculosis, St. Louis, Mo.

dispensary if there be one. In families where one or more members have been found to have the disease in moderately advanced or advanced state, a high percentage of the children will be found to have it in the incipient stage, or to be in such subnormal state that they would soon contract the disease. The children in this stage will be found to respond promptly to the open-air school treatment.

Provision should always be made for separate schools for two classes of children: (1) The open cases are found to have tubercle bacilli in their sputum or other discharges. (2) The closed cases who do not show the bacilli in sputum or other discharges, but who are in the incipient or pretubercular stage.

In St. Louis the visiting nurses had no trouble in locating 25 children simply by inducing children from the tubercular infected home to go to the dispensary for physical examination and von Pirquet tuberculin test. Those selected from these homes by the nurses seldom failed to prove to be incipient cases upon examination at the dispensary.

In the course of a few weeks they found they had more than 25 and a waiting list was soon on file. A card was made out for each child containing all the necessary data as to physical condition, family history, social condition, standing in school, etc.

Suitable forms were provided for continuation of the history so that the cards would contain a complete record of each child until discharged. The record should be kept up in so far as possible by following up the child until it is grown. In most cases the parents will be found willing to allow their children to attend the school. If a proper explanation is made to the parents by a tactful nurse, social worker, or physician, they rarely refuse to allow their children to attend. After it becomes known that there is such a school in operation many applications will come in through family physicians.

It may be advisable to select the children for the first school from the closed cases, so as to forestall possible adverse criticism.

EQUIPMENT.

The teacher and teaching equipment should be furnished by the school board. Of 51 schools reporting on this subject, 15 were wholly supported by the board of education and 34 in part. The nurse, cook, watchman, subsistence, clothing, etc., should best be furnished by the board of health.

The health department may not be in a position to do so at first, but if some volunteer society will begin and demonstrate the results, the proper authorities will seldom hesitate to take over the work. The subsistence and clothing may not be furnished by the authorities for some time. The supplying of these must then depend on the

efforts of societies interested. These are very essential to the success of the enterprise, and no outdoor school should be attempted unless proper food and clothing can be provided.

Especially is this true of the clothing, because the parents are seldom able to furnish suitable clothing in the winter or in the other seasons. Ordinary clothing will do until the days begin to grow cold in the fall, when heavy underwear and sweaters will have to be provided. As the winter comes on the Eskimo suits, gloves, and felt top boots will be required, and the dining room will have to be inclosed and heated. The Eskimo suits are made out of woollen blankets, cut just like pajamas and large enough to fit loosely over the other clothing. When made with a rather long jacket the girls do not object to wearing the trousers. (Fig. 3.)

It is well to have foot-warmers in stock for use when necessary, but they will seldom be required.

Shoes and stockings will be found necessary because the majority of the children, though they may have good ones, will come to school with them soaking wet, if there is any chance of wetting them on the way.

OPERATION.

The following program will usually be found practicable:

- Arrival, 8-8.30 a. m.
- Shower bath.
- Putting on school clothing.
- Light lunch.
- School work.
- Recess.
- School work.
- Dinner.
- Rest for one hour.
- School work.
- Light lunch.
- Dismissal 4 p. m., winter; 6 p. m., summer.

The teacher should have control of the educational matters, and the nurse, under the direction of the visiting physician, should have control of all matters affecting the health.

The children will be able to reach the school by 8.30 even in the winter. In the summer it may be advisable to fix an earlier hour for the arrival.

Under direction of the nurse the shower bath should be given each morning. The bath in the beginning may have to be tempered to suit the individual child, and if they show signs of poor reaction they should be wrapped in a warm blanket and given a cup of hot milk. Soon all will be able to stand the cold shower. After the bath, the school clothing is put on.



FIG. 3.—SHOWS ESKIMO SUITS WORN BY CHILDREN AT OPEN-AIR SCHOOL, ST. LOUIS, MO.
Report of Society for the Relief and Prevention of Tuberculosis, St. Louis, Mo.

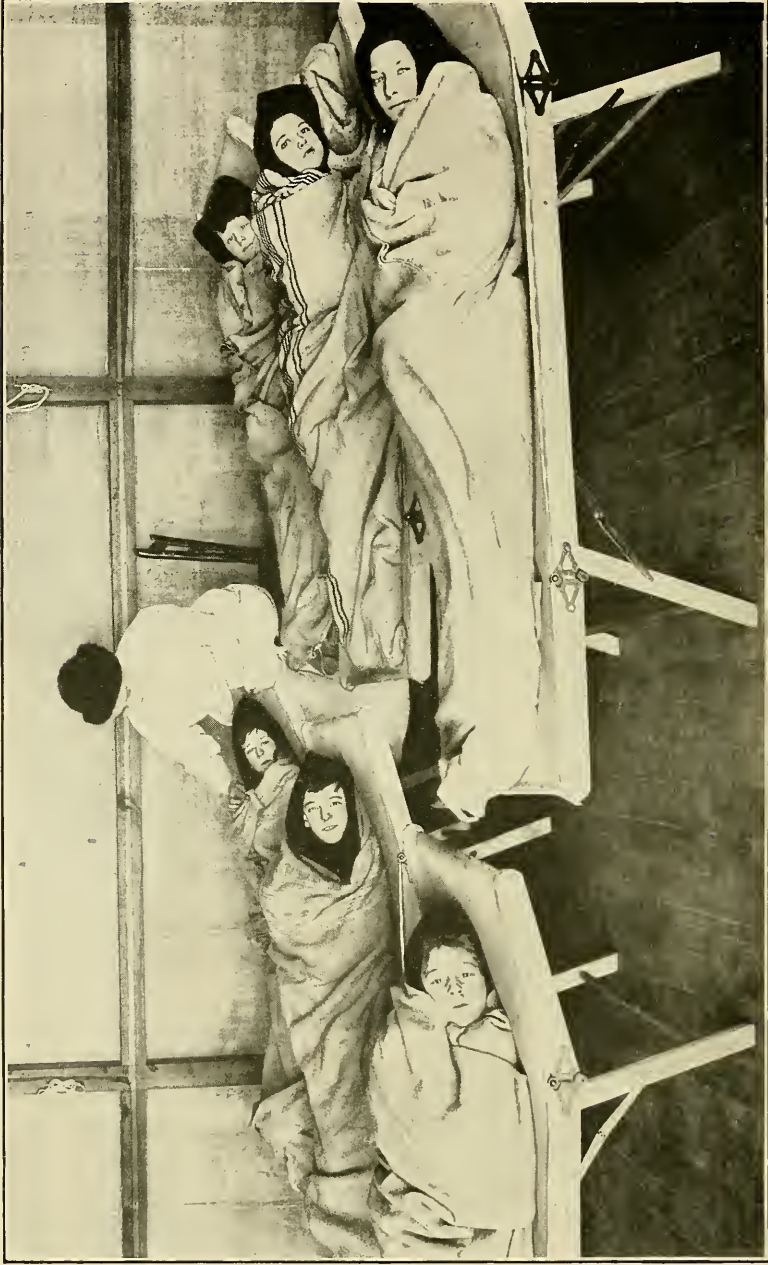


FIG. 5.—COTS USED IN OPEN-AIR SCHOOL, ST. LOUIS, MO. SHOWS FREEDOM OF POSITION ON FOLDING COT NOT OBTAINABLE IN RECLINING CHAIR. RAISED HEADPIECE ADDS TO COMFORT.

Report of Society for Relief and Prevention of Tuberculosis, St. Louis, Mo.

The school clothing is a necessity; few, if any, of the children being found to have suitable clothing, which is one of the essentials. The personal clothing can then be dried and cared for by the nurse.

A light lunch should be served before the school duties begin. Ordinarily a light lunch will answer, but some of the children may require more because they have had little or no breakfast before leaving home. None should begin their lessons hungry.

The school duties can be given according to the condition of each child, and the teacher should advise with the doctor on this subject, always being careful not to overtax any child. The studies should be interrupted by exercises, folk dances, or play, as may be deemed best by the teacher. For this reason it is not wise to lay down any fixed rule for these hours, leaving this to the judgment of the teacher in charge. The teacher should be trained to some extent in hygiene and physical culture, that she may be alive to the value of this in school work, and will know what exercises are needed to develop poorly developed chests, extremities, etc. (Fig. 4.)

The advantage of breaks in the studies is obvious. During the midday hour a wholesome hot dinner should be served.

The diet should be well balanced as to proteids, carbohydrates, and fats, but until more is known as to the needs of the diet of a growing child a common-sense plan should be followed and under most circumstances be mindful of the appetites of the children, supplying at first those articles which they have been accustomed to eat with a relish and gradually train them to the things which are the best in the judgment of recognized dietitians. Habits of life of the child should not be suddenly changed. Many children must be trained before they can eat enough of strange dishes to maintain their body weight and growth, and if forced at once into a recognized standard, would lose in weight. When a child fails to gain in weight he should be carefully studied by the doctor and a thorough investigation made of his home life as well as his physical condition. As an example of the importance of this, in the St. Louis school, one of the boys failed to gain in weight as he should; upon investigation the nurse found he had to get up at 4 a. m. to deliver papers; the money earned, \$2 per week, was absolutely needed for the family support; the only remedy was for the society to pay the mother the \$2 per week, provided the boy was allowed to sleep until a reasonable hour in the morning.

The rest hour should be considered one of the important features.

Cots are much better than reclining chairs; they are more comfortable and allow an easy natural position of the body instead of the cramped one necessary in a reclining chair. Cots with a raised head-piece are cheap, and are worth the difference in price. (Fig. 5.) At first the children will not sleep, but if kept quiet each day for the

rest hour, in a few days all will go to sleep promptly and have to be waked when the hour is ended. With this rest the children will be found fresh and ready for any school work without the driving usually necessary in the afternoon hours, even for bright healthy children. Before dismissal a light lunch should be served and the school clothing changed for the personal clothing, which should be dry and warm by this time. The duties of the nurse should be so arranged that she will have time to investigate the home conditions of each child, taking up the special cases first. She should have sanitary supervision of the school under direction of the doctor, but always cooperate with the teacher to obtain best results. The teacher should have all the equipment necessary according to the grades represented by the children. A piano will be found very useful on account of the exercises and dances. The teacher will soon find that following the outdoor life has made her feel brighter and more efficient and not subject to the fag attendant upon indoor teaching. If she will rest with the children during the rest hour, she will do even better work.

The cook should be in charge of the kitchen under the direction of the nurse, who should arrange for the daily diet.

All children should be examined before admission, as stated above, and monthly or oftener thereafter. As soon as permission of parents can be obtained, all defects of eyes, nose, throat, and mouth should be looked after in the proper manner.

RECORDS.

The records should be kept by nurse and teacher according to the division into which it falls.

The card of each child should be kept carefully up to date. (Forms 1 and 2.)

FORM 1.—As most children come from homes where there is a tuberculous patient, this card, if kept for each child, will be found useful. (Slightly changed from one used by Society for Relief and Prevention of Tuberculosis, St. Louis, Mo.)

No.....	Date.....
Name.....	Address.....
	Front } Floor.
	Rear. }

White.....	Col.....	Sex male-female.....	Age.....	Referred by.....
In care of doctor.....		Clinic.....		

THE HOME.	Ten.	P. H.	F. R.	B. H.	No. of rooms.....	Ventilation.....
	Light-dark.		Clean-dirty.			
Is any occupant of home suffering from tuberculosis?.....						
Does patient sleep alone?.....						
	Separate bed.....	Separate room.....				
	Light.	Dark.	On porch.....	In tent.....	Roof.....	
Condition of house, suggestions as to improvement of home conditions.....						

ECONOMIC CONDITIONS.	Income for support of family.....	Rent.....
How many to support?.....	Circumstances.....	Sick benefits.....
Insurance.....	Church aid.....	Aid from societies.....

THE PATIENT. Conscientious..... Careless.....
 Intelligent..... Ignorant..... Illiterate..... Temperate.....
 Hours in home..... Hours out of doors.....
 Baths..... Disposal of sputum.....
 THE FAMILY. No. in family..... Adults..... Children..... Boarders.....
 Neat..... Untidy..... Dirty.....
 Other cases in family..... Adults..... Children.....
 Anyone who should go to clinic.....
 Recommendations:

Nurse.....

FORM 2.—Card for personal record of each child. (Adopted by Society for Relief and Prevention of Tuberculosis, St. Louis, Mo.)

No.
 Name.....
 Address..... Floor.....
 (F. B.) (C. O.)
 Age..... Sex..... Color..... Nationality.....
 Date of birth. Male—Female. White—Black. (Nativity of parents.)

	On admission (date).	Normal.	On discharge (date).	Gain or loss.
Grade.....				
Height.....				
Weight.....				
Per cent below weight for height.....				
Haemoglobin.....				
Physical condition.....				
Mental condition.....				
Physical defects.....				
Chest.....				
Scholarship.....				

NOTES:

[Reverse side.]

Previous illness.....
 How was child selected?.....
 Diagnosis..... Tuberculin test.....
 Is it a clinic case?.....
 Are parents at clinic?..... Which?.....

NOTES:

Weekly weight record.

Date.....													
Weight.....													
Date.....													
Weight.....													
Date.....													
Weight.....													

Chest measurement.

Date..... Admission..... Discharge.....
 Chest at nipple line:
 Inspiration..... inches..... inches.....
 Expiration..... inches..... inches.....
 At rest..... inches..... inches.....

Temperatures should be taken when there is the slightest indication for it, always giving the child the benefit of the doubt. A convenient form should be adopted which will show clearly what progress, if any, the child is making physically and mentally.

VACATIONS AND HOLIDAYS.

There is no necessity for these and if left to the children they will probably vote to continue in school the year round. It would be better if some arrangement could be made for Sunday exercises so as to have them come seven days in the week.

The Saturday attendance seemed to please the children in St. Louis, and they unanimously voted to come during the Christmas holidays.

The summer vacation should not be given, but a break may be made in the routine by changing the character of the school duties to make it appear like a day camp.

During vacation the children lose much of the gain. Some of this loss may, however, be due to the summer heat.

A loss is noted in the children from Friday to Monday where Saturday is a holiday.

COST.

A plant such as the one described above was built and equipped in St. Louis for \$2,200. This cost may be more or less in different localities, varying with the cost of labor and material. The expense of operation in St. Louis does not exceed \$150 per child per annum, and this includes all expenses of maintenance and operation, viz., food, heating, nurse, cook, watchman, etc., but not the teacher. The ration should never exceed 20 cents per day, per child, where two lunches and dinner are supplied, and in most cases 15 cents will cover this cost.

The following table shows the itemized cost of one day's ration at the Open-Air School, Rochester, N. Y.:¹

Food materials.	Amount.	Cost.	Food materials.	Amount.	Cost.
Oatmeal..... box	$\frac{3}{4}$	\$0.075	Per capita.....		\$0.096
Milk..... quarts	6	.36	Afternoon lunch:		
Sugar..... pounds	1	.07	Milk..... quarts	5	.30
Total (30 children).....		.505	Cocoa..... (can, $\frac{1}{2}$ lb.)	1	.115
Per capita.....		.0166	Sugar..... pound	$\frac{1}{2}$.035
Lunch at 11 o'clock:			Bread..... loaves	2	.10
Milk (30 children)..... quarts	5	.30	Total.....		.55
Per capita.....		.01	Per capita.....		.018
Dinner:			Total per 1 day.....		4.54
Potatoes..... peck	1	.325	Per capita.....		.14
Rump roast beef..... pounds	7	1.12			
Corn..... cans	3	.30			
Apples..... peck	1	.40			
Brown sugar..... pound	1	.066			
Milk..... quarts	8	.48			
Butter..... pound	$\frac{3}{4}$.30			
Bread..... loaves	4	.20			
Total (30 pupils, 3 teachers).....		3.191			

¹ From report of Principal Miss Fichtner, 1912.

The cost per child will be less when the school is operated on a more extensive scale, with a hundred or more children. The fact that it is so easy of application accounts for the rapid increase in the number of such schools. The promptness with which most parents accept the opportunity for their children makes it easier; it requires no campaign of education and, as a rule, no further laws. Most health and school boards find their present laws ample if cooperation is had.

RESULTS.

The results are uniformly good. Few of the children fail to show a gain in weight, color, appetite, attendance, deportment, and scholarship. Of reports received for over 875 children in these schools, only 70 showed a loss in weight. Most of the 70 showing loss in weight were the open advanced cases, who were admitted too late to expect success.

In about 90 per cent of the children the rate of gain was greater than for the normal child, so that at the end of the year children who were on admission 10 to 15 per cent below the normal weight, in proportion to height, showed not only the normal gain in proportion to increase in height, but gained so that there were only 6 to 9 per cent below the normal. (Figs. 6, 7, and 8.)

Where control tests were made, the open-air children showed a greater gain than did the normal children in the rooms of the public schools.

During vacations some loss was almost invariably shown but where records were carefully kept they never showed a loss of all the gain. Tables of weekly weights show slight losses at the beginning of the summer before the vacation. This same loss is shown in the controls of healthy children of the public schools.

Marked improvement was shown in the color of nearly all the children where records were kept of hemoglobin tests. In a large percentage of cases it reached normal, whereas that of the healthy children used as controls on the test showed a decline through the spring months, falling below normal. (Figs. 9 and 10.)

The attendance is greatly improved. During the coldest days in St. Louis, when the thermometer was below zero, 22 of the 25 children were present. The percentage of absentees is much less than in the public schools.

The progress in their grades is remarkable, even though they work little more than half the time. As compared with the children of the public school, they not only keep up in the grades but many (nearly 50 per cent) go ahead. The St. Louis open-air class completed in 8 months' time the usual amount of work done in the public schools and 20 per cent more; in other words, they did in 8 months the work that the normal child in the indoor public school

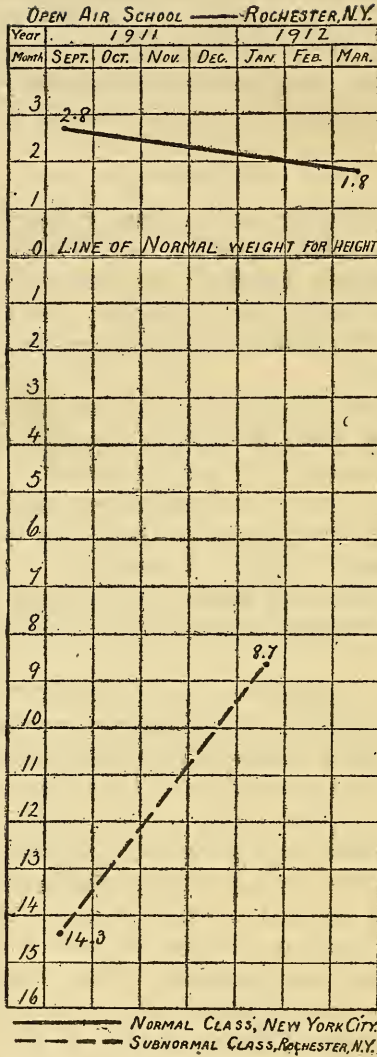


FIG. 6.—CHART SHOWING PERCENTAGE OF INCREASE IN WEIGHT OF TUBERCULOUS CHILDREN OF OPEN-AIR SCHOOL, ROCHESTER, N. Y., COMPARED WITH DECREASE IN WEIGHT OF NORMAL CHILDREN OF INDOOR PUBLIC SCHOOL OF NEW YORK, N. Y.

(Made from reports of Superintendent of Schools New York City and Principal of Open-Air School, Rochester, N. Y.)

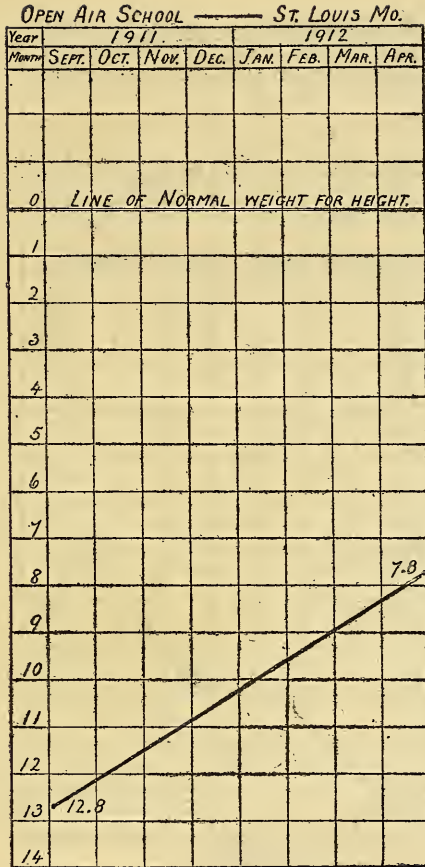


FIG. 7.—CHART SHOWING THE AVERAGE PERCENTAGE BELOW WEIGHT OF THE CHILDREN OF THE OPEN-AIR SCHOOL AT BEGINNING OF YEAR, AND A NET GAIN OF 5 PER CENT IN ADDITION TO NORMAL GAIN DUE TO GROWTH.

(Prepared from Report of the Society for the Relief and Prevention of Tuberculosis, St. Louis, Mo.)

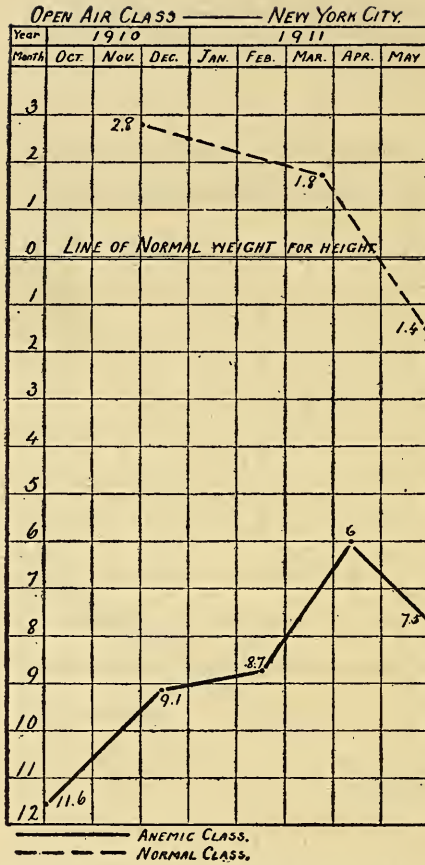


FIG. 8.—CHART SHOWING PERCENTAGE OF GAIN IN WEIGHT OF ANEMIC CLASS IN OPEN-AIR SCHOOL, AND LOSS IN WEIGHT OF NORMAL CLASS IN INDOORS ROOM OF PUBLIC SCHOOL.

(Thirteenth Annual Report of City Superintendent of Schools, New York City, 1910-11.)

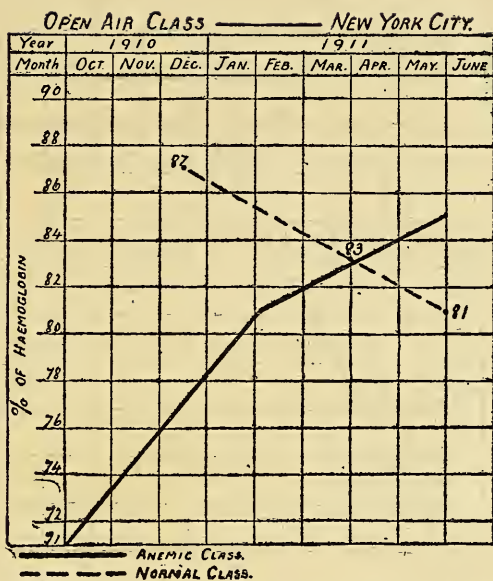


FIG. 9.—CHART SHOWING GAIN IN PERCENTAGE OF HAEMOGLOBIN COLORING OF BLOOD OF ANEMIC CLASS IN OPEN-AIR SCHOOL, AND LOSS IN NORMAL CLASS IN INDOOR ROOM OF PUBLIC SCHOOL.

(Thirteenth Annual Report of City Superintendent of Schools, New York City, 1910-11.)

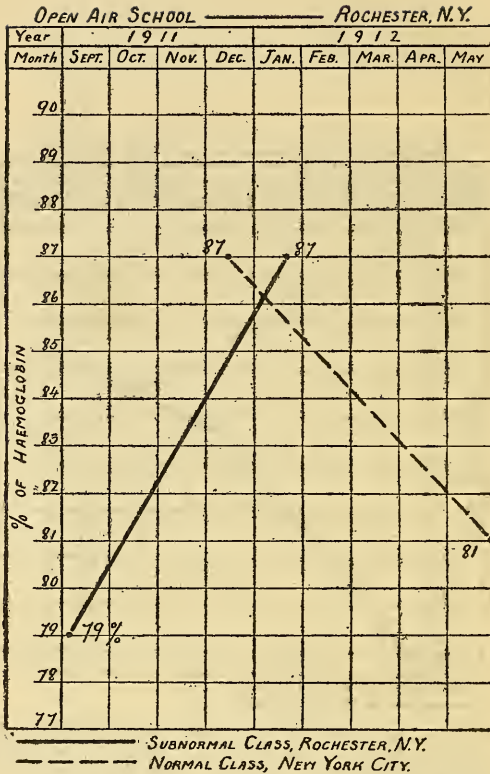


FIG. 10.—CHART SHOWING AVERAGE GAIN IN PERCENTAGE OF HAEMOGLOBIN COLORING OF BLOOD OF THE CHILDREN OF SUBNORMAL CLASS IN OPEN-AIR SCHOOL, ROCHESTER, N. Y., COMPARED WITH THE LOSS SHOWN IN CHILDREN OF NORMAL CLASS IN INDOOR ROOM OF THE PUBLIC SCHOOL OF NEW YORK CITY.

(Prepared from Reports of Principal of Open-Air School, Rochester, N. Y., and Thirteenth Annual Report of City Superintendent of Schools, New York City, 1910-11.)

would do in $9\frac{1}{2}$ months. One class in New York City which was 19 per cent below grade on admission in October was only 9 per cent below the following June, making the normal progress plus 10 per cent more than the child of the public schools. They never seem to fag, and are as ready to do arithmetic in the afternoon as in the morning and are as fresh and alert when dismissed as on arrival.

In considering these results it is impossible with the present data to say to which of the features these results are due.

The constant factors present in all the schools are fresh air, proper clothing, and proper diet; the other features—rest, recreation, and bathing—are not common to all. The good results are obtained with the first, but results are somewhat better when the latter are added as part of the routine. Another feature which should not be lost sight of in considering the results in scholarship is the teacher. Usually an exceptional teacher is selected, and she has more time with 25 children to make the teaching more individual. The results are so satisfactory in every case that the open-air school can no longer be classed as an experiment, but may now be relied upon as one of the most practical remedies for the mentally and physically subnormal child, and certainly one of the cheapest.

Now that the benefits to the subnormal child are so thoroughly proven and accepted, why not apply the same principle to the normal child? Why not give it the same advantages? The results would probably be just as satisfactory. The plan is even more practicable in the case of the healthy child, since in a great majority of cases its parents are able to supply proper diet and clothing if the school board will supply the open-air rooms and the information as to proper diet and clothing. Wonderful progress has been made in ventilating devices, but as yet none are successful except when operated by expert engineers, and consequently when operated by ordinary janitors fail to ventilate. Until the amount of air and moisture supplied at the proper temperature can be relied on, in spite of the changing weather conditions and lack of technical training on the part of the janitors, all schools should be open-air schools.

It is a simple matter to open the windows, provided the children are properly clothed and fed by the parents when they are able and by the proper authorities when they are not able. Under our present economic conditions no other remedy offers such wonderful possibilities for good as the open-air schools for all children. The truth of such a statement is apparent when we consider the importance of the health of the children of the country and the possibilities of a remedy for maintaining the normal children up to that standard, and surely such results may be expected for the normal child when results show such marked improvement in 90 per cent of subnormal children.

The following table showing average weight, height, and circumference of chest of children from sixth to sixteenth year, prepared from weights and measurements of large numbers of apparently healthy children by Porter, of St. Louis, and Bowditch, of Boston, is published for the convenience of those who may wish to use it for reference in keeping records:

[This table was prepared from tables published in the Diseases of Infancy and Childhood, by L. Emmet Holt, M. D., LL. D., 2d edition, 1904, pp. 19 and 20.]

Age.	Sex.	Porter.		Bowditch.					
		Weight.		Weight.		Height.		Chest.	
		Pounds.	Kilos.	Pounds.	Kilos.	Inches.	Centi- meters.	Inches.	Centi- meters.
6.....	Boy.....	43.2	19.66	45.1	20.48	44.1	112.0	23.2	59.1
	Girl.....	41.3	18.76	43.8	19.87	43.6	110.9	22.8	58.3
7.....	Boy.....	47.7	21.67	45.5	22.44	46.2	117.4	23.7	60.6
	Girl.....	45.8	20.82	48.0	21.78	45.9	116.7	23.3	59.5
8.....	Boy.....	52.6	23.91	54.5	24.70	48.2	122.3	24.4	62.2
	Girl.....	50.0	22.71	52.9	24.01	48.0	122.1	23.8	60.8
9.....	Boy.....	57.4	26.08	60.0	26.58	50.1	127.2	25.1	63.9
	Girl.....	55.1	25.07	57.5	26.10	49.6	126.0	24.5	62.5
10.....	Boy.....	62.7	28.49	66.6	30.22	52.2	132.6	25.8	65.6
	Girl.....	60.3	27.43	64.1	29.07	51.8	131.5	24.7	63.0
11.....	Boy.....	68.8	31.26	72.4	32.83	54.0	137.2	26.4	67.2
	Girl.....	65.8	29.93	70.3	31.87	53.8	136.6	25.8	65.8
12.....	Boy.....	73.6	33.45	79.8	36.21	55.8	141.7	27.0	68.8
	Girl.....	73.0	33.17	81.4	36.90	57.1	145.2	26.8	68.3
13.....	Boy.....	79.1	35.96	88.3	40.04	58.2	147.7	27.7	70.6
	Girl.....	84.2	38.29	91.2	41.36	58.7	149.2	28.0	71.3
14.....	Boy.....	88.7	40.34	99.3	45.03	61.0	155.1	28.8	73.3
	Girl.....	94.9	43.12	100.3	45.50	60.3	153.2	29.2	74.1
15.....	Boy.....	103.9	47.25	110.8	50.26	63.0	159.9	30.0	76.6
	Girl.....	103.2	46.90	108.4	49.17	61.4	155.9	30.3	76.8
16.....	Boy.....	114.6	52.10	123.7	56.09	65.6	166.5	31.2	79.2
	Girl.....	110.1	50.06	113.0	51.24	61.7	156.7	30.8	78.8

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