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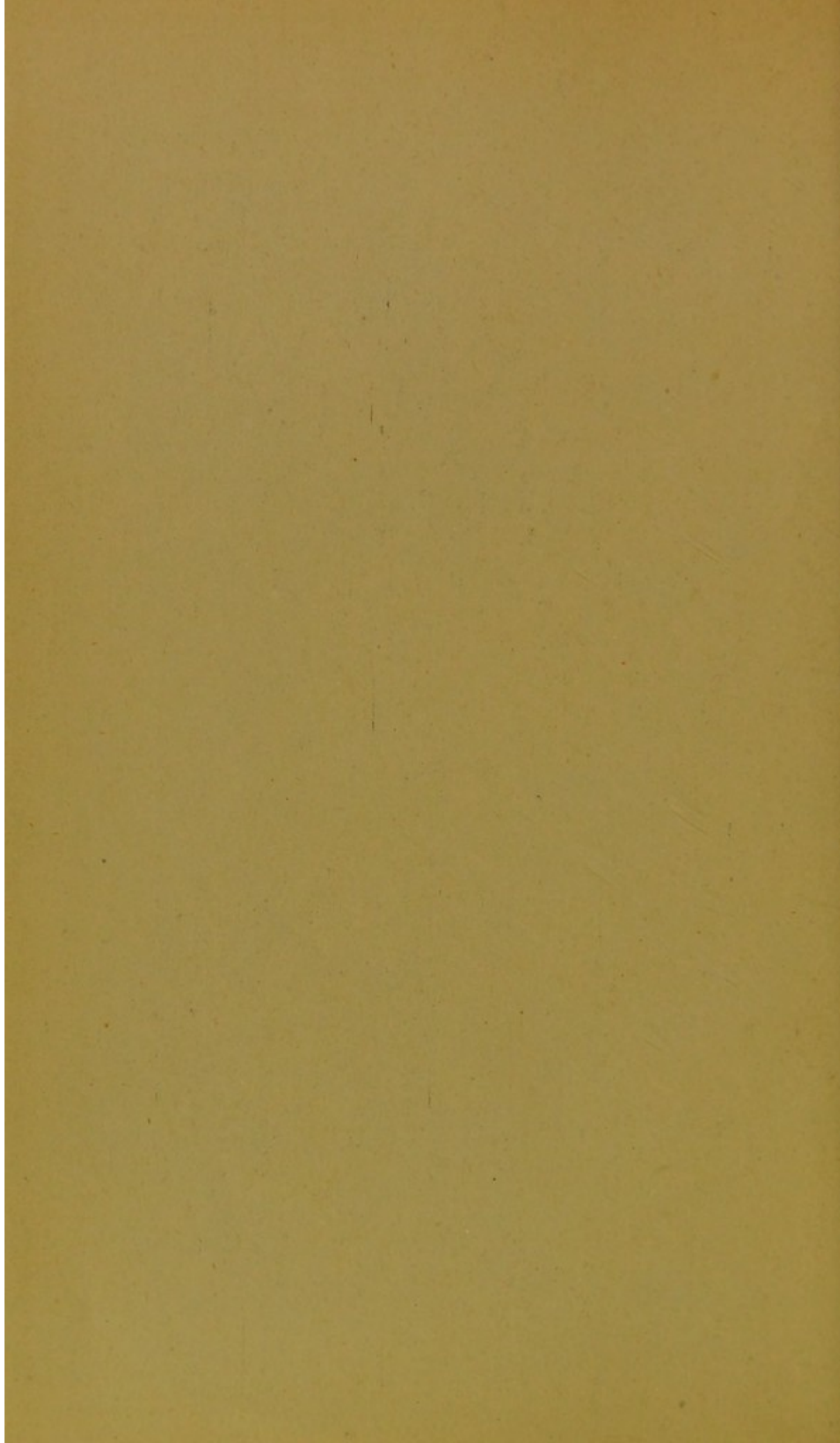
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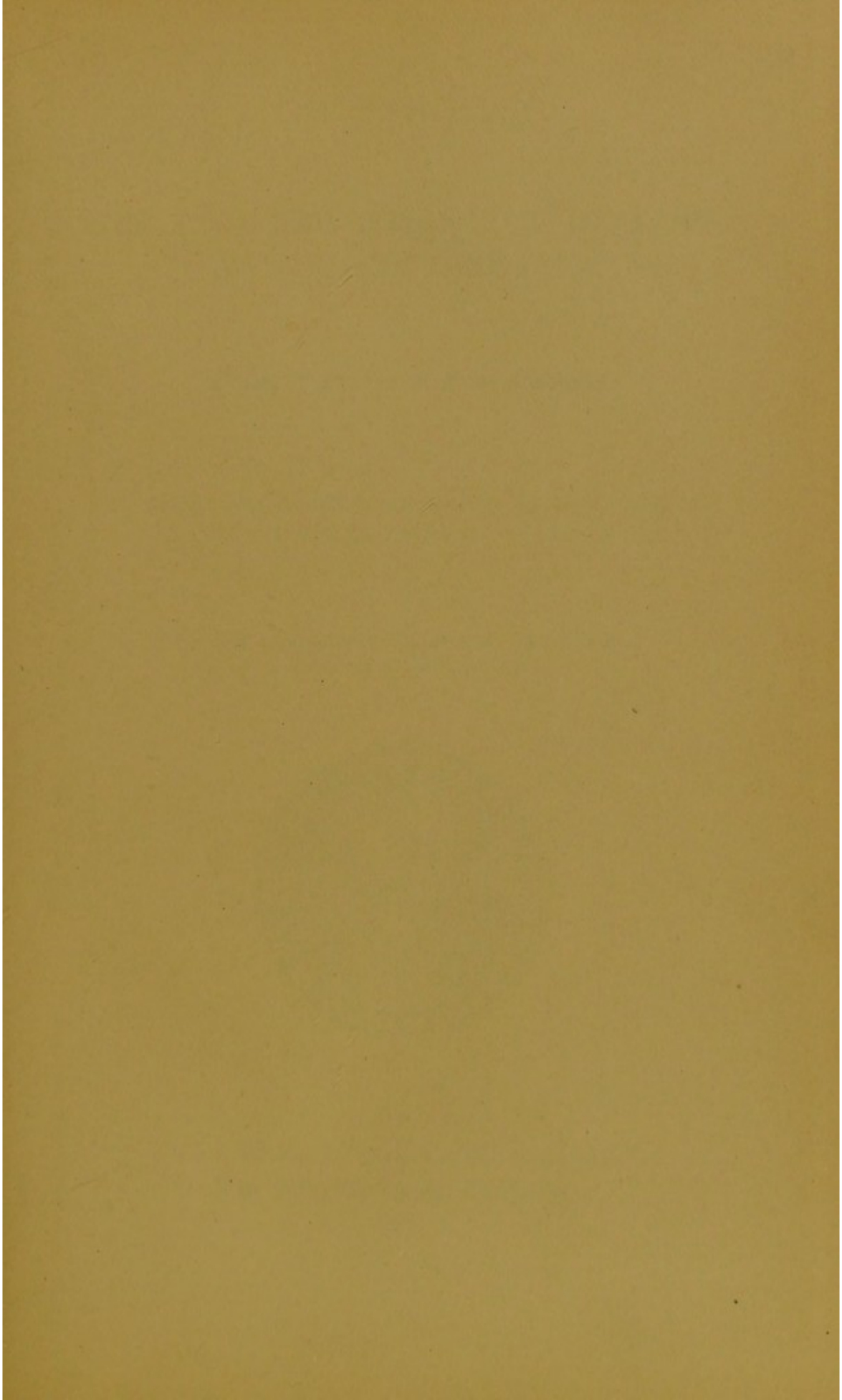




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THE SANITARY
CARE AND TREATMENT OF CHILDREN
AND THEIR DISEASES.

Being a Series of five Essays

BY

DRS. ELIZABETH GARRETT-ANDERSON, SAMUEL C. BUSEY,
A. JACOBI, J. FORSYTH MEIGS, AND J. LEWIS SMITH.

*Prepared by request of the Trustees of the Thomas Wilson
Sanitarium of Baltimore, Md.*



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The Riverside Press, Cambridge.

1881.

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PREFACE.

THE accompanying letter, addressed to the authors of the essays, will sufficiently explain the motives which led to the publication of this volume.

The trustees acknowledge with gratitude their appreciation of the valuable suggestions embodied in these essays, and the interest which the writers manifest in the successful establishment of the sanitarium. They trust that the spirit of philanthropy and science thus shown may stimulate other public-spirited men and women to aid in enlarging the work of the sanitarium, and to become the founders of like charities for the little sufferers in other cities.

The public may also be interested in knowing that the trustees have purchased a farm of 150 acres, for the sanitarium, on the Western Maryland Railroad, nine miles northwest of Baltimore, in a neighborhood long known for its salubrious air, highly cultivated land, and intelligent population. Adjacent to it on the north is the fine estate of the McDonough School, of 850 acres. Gwynns Falls, a stream with a daily flow of 2,000,000 gallons of water, passes through the entire length of the farm, and a never-failing supply of pure water, from two large springs upon the place, can be forced to all parts of the property by the use of the power of the main stream.

At that part of the grounds which lies along the railroad, where the station will be located, and through which the

stream flows, are thirty acres of meadow and ten acres of wood land, admirably adapted for day excursions. The land then rises rather rapidly to a plateau of about forty acres, on the north, northwest, and northeast of which is a natural forest. This table land has a gentle slope towards the south, the views from it are very extensive, and it affords fine sites for the permanent buildings; the elevation above tide water is 573 feet.

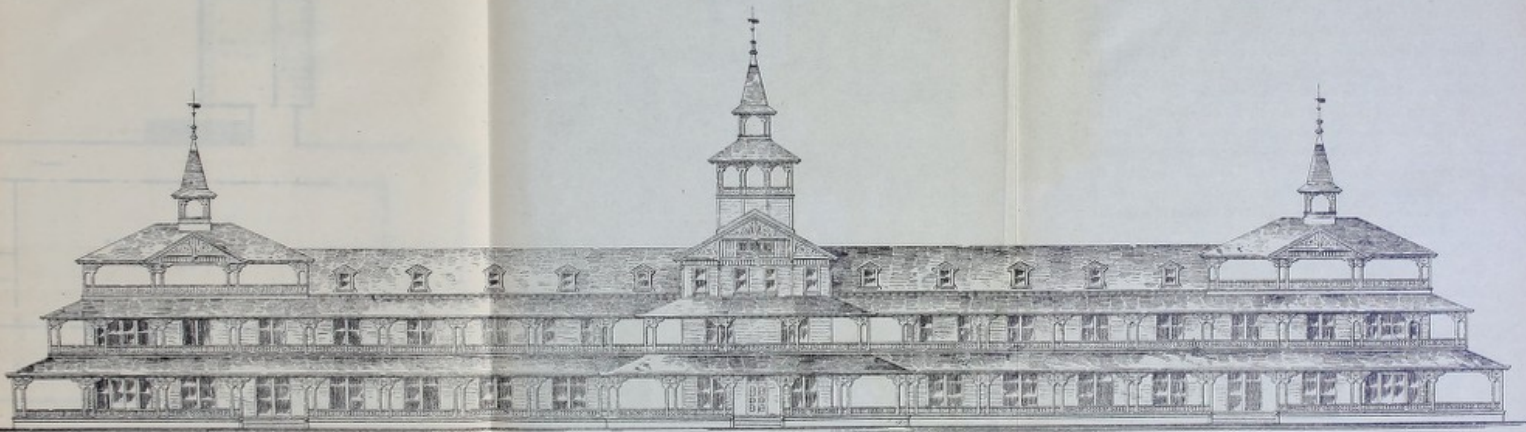
All trains will stop at the station, which is distant from Baltimore, in time, twenty to thirty minutes. The four city stations of the railroad will greatly facilitate the transportation of the children to and from their homes.

While the trustees believe that they have secured a site for the sanitarium which will, to a great extent, meet the needs of sick infants and their mothers during the heat of summer, they are not unmindful of the fact that they also have the opportunity of contributing largely to the advancement of medical science, and to the instruction of mothers in the care of their children.

The building plan proposed by Dr. J. Lewis Smith, in his essay, and that of Mr. J. B. Robinson, architect, New York, prepared by request, are worthy of careful and intelligent study. It is probable, however, that the trustees will begin their work in very simple and inexpensive houses, and decide upon permanent buildings after they have had the experience of several years in the management of their trust.

BALTIMORE, MD., *April*, 1881.

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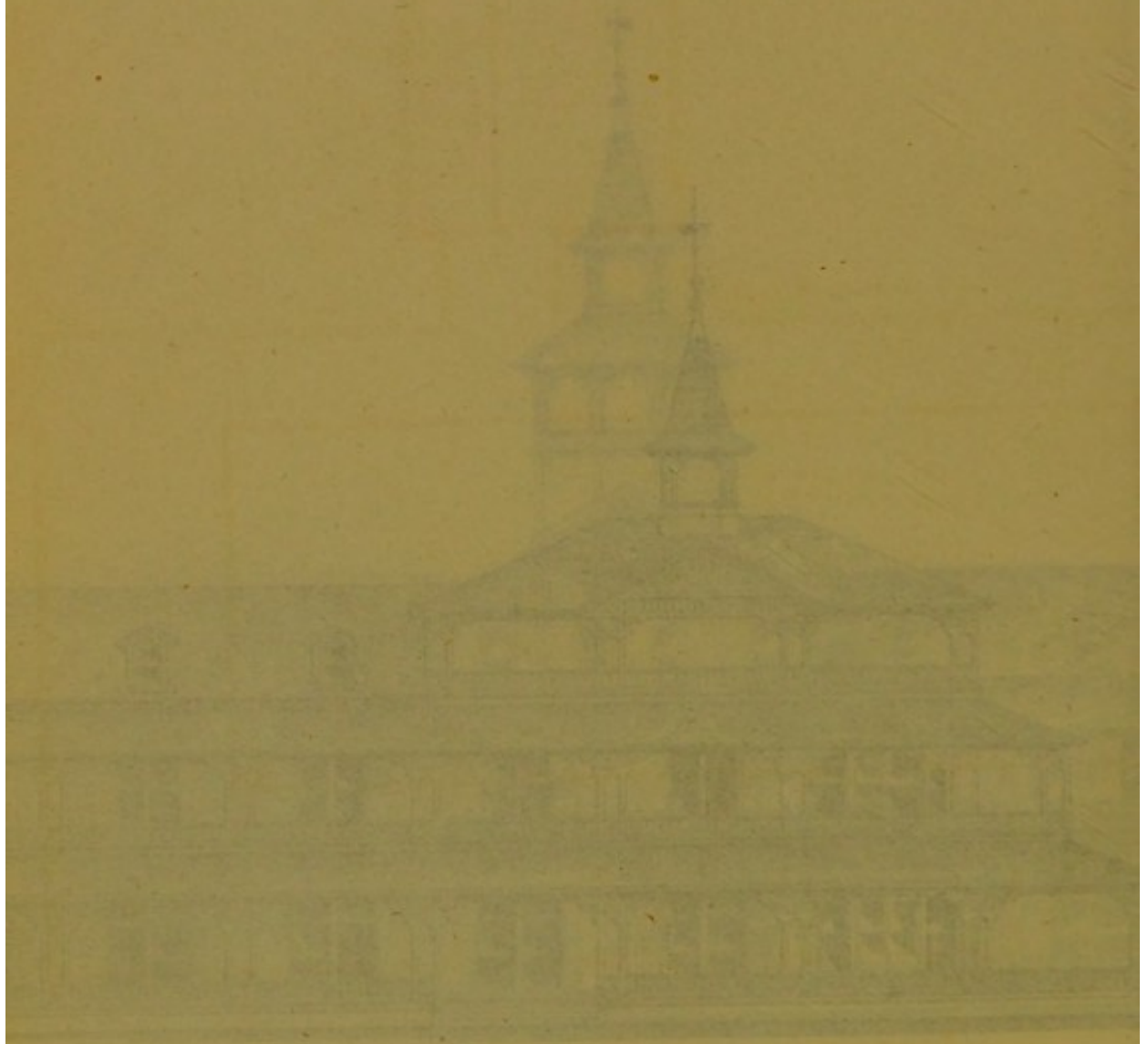


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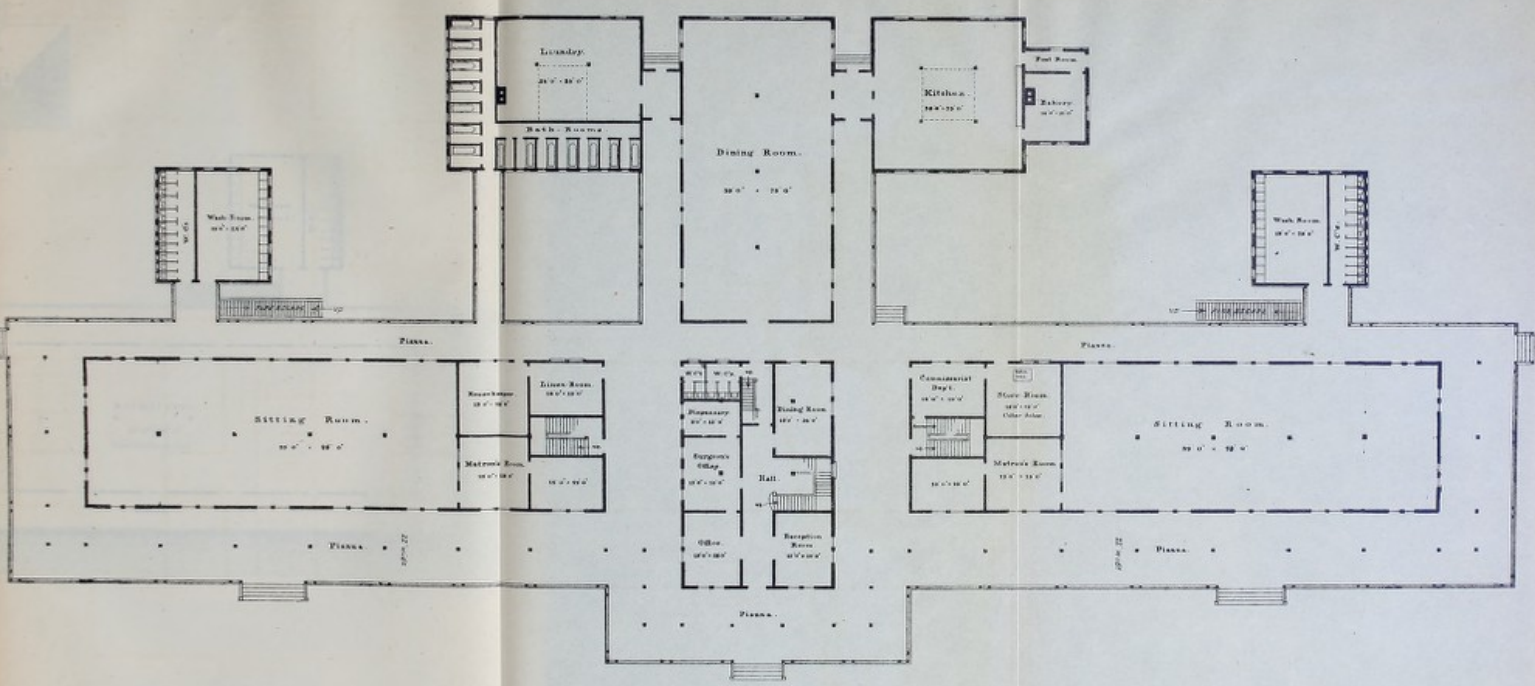
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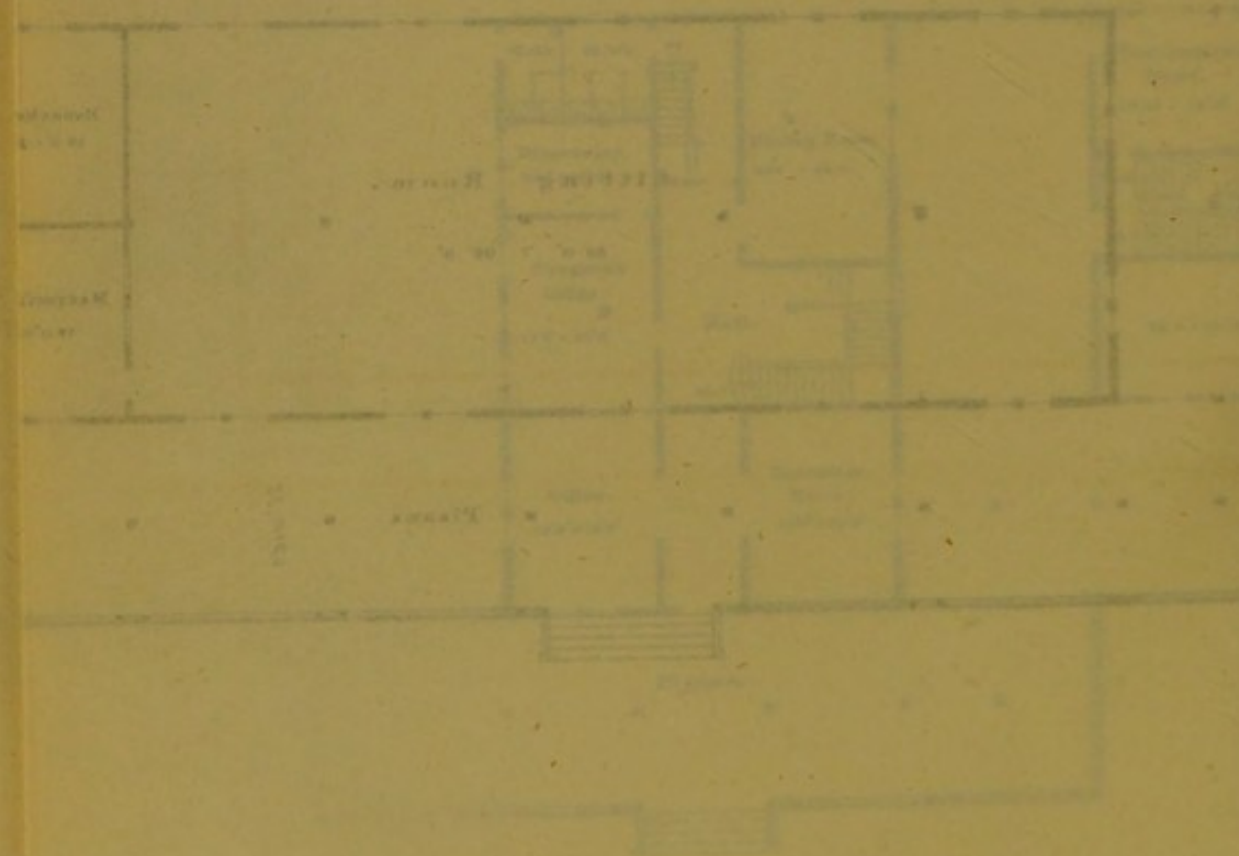
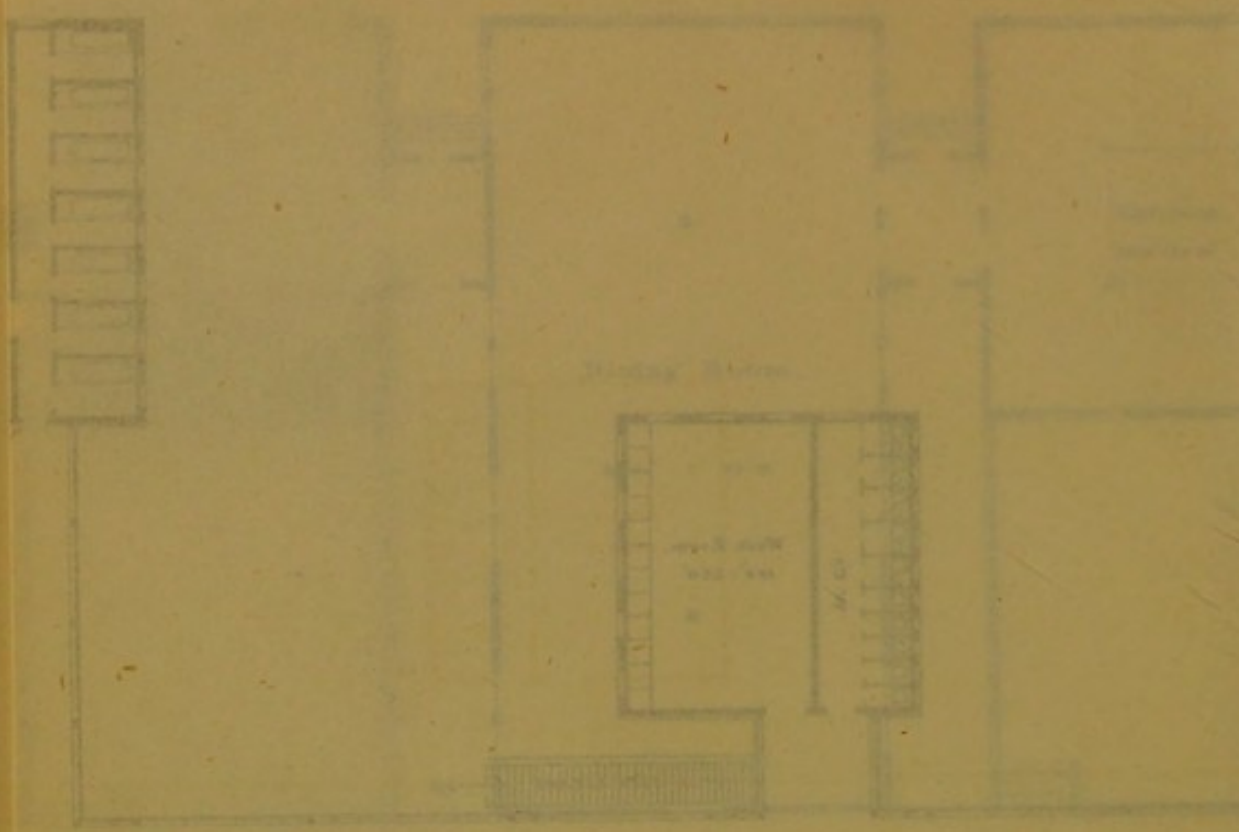


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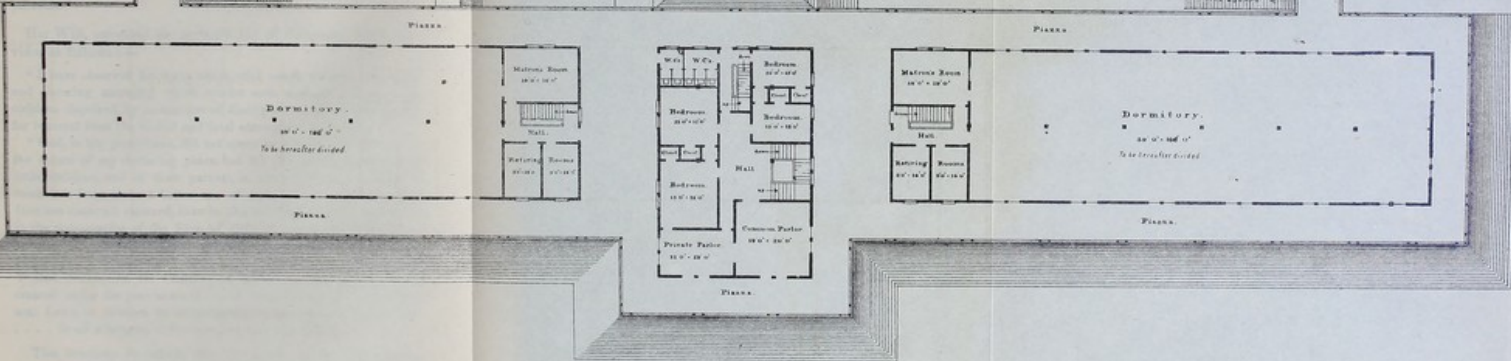
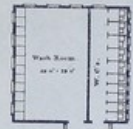
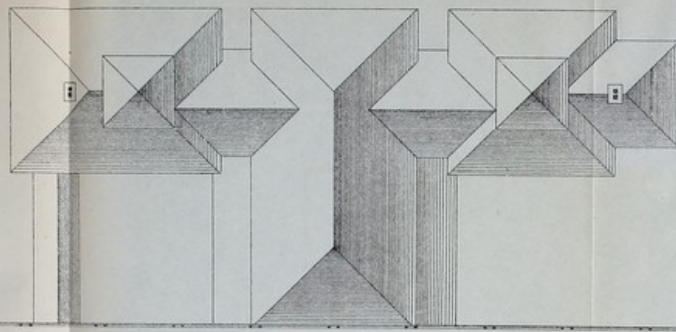


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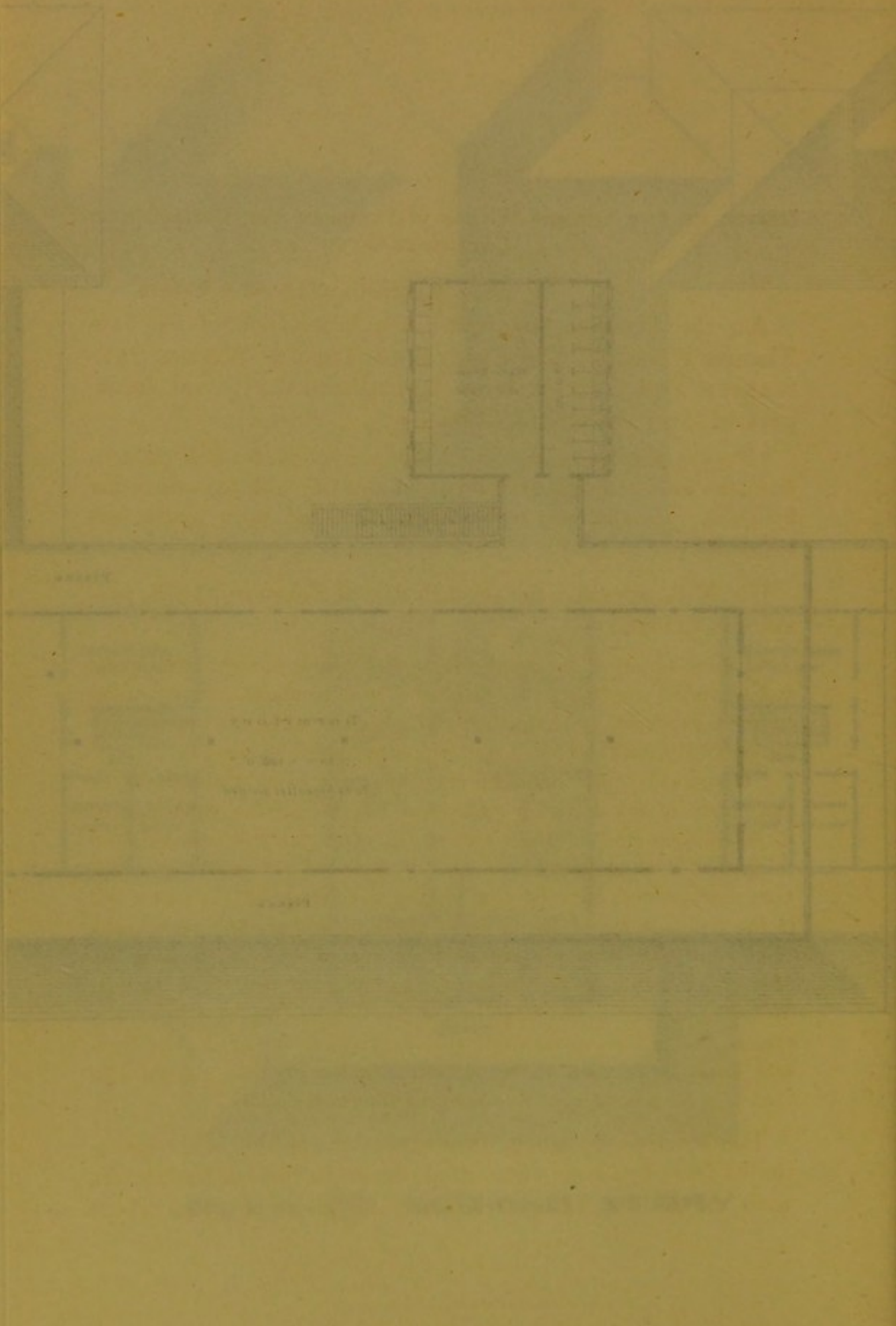


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OFFICE OF THE THOMAS WILSON SANITARIUM FOR CHILDREN OF
BALTIMORE CITY.

BALTIMORE, *December 8, 1879.*

AT the instance and under the supervision of the late Thomas Wilson, of this city, "THE THOMAS WILSON SANITARIUM FOR CHILDREN OF BALTIMORE CITY," was incorporated, July the second, 1875, —

"For the purpose of securing a summer retreat for sick children from the heat and unhealthfulness of the city, and for such other kindred purposes as may be hereafter determined upon by the corporation."

His Will, executed the seventh day of February, 1879, provides as follows : —

"I have observed for many years, with much concern, the great and alarming mortality which occurs each summer among young children deprived, by misfortune of their parents, of all opportunity for removal from the heated and fatal atmosphere of the city.

"God, in his providence, did not spare to me my children, to be the solace of my declining years, but my pity for the sufferings of little children, and of their parents, is none the less, and I do not think that I can make a better use of some of the means of which God has made me steward, than in the alleviation of the pains, and in the prolongation of the lives, of those of whom our Saviour said, 'Suffer little children to come unto me, for of such is the kingdom of heaven.' I therefore give, devise, and bequeath unto 'The Thomas Wilson Sanitarium for Children of Baltimore City,' a corporation created under the provisions of the Maryland Code of Public General Laws, in relation to corporations, under my own supervision, in all a bequest of five hundred thousand dollars."

The trustees to whom the execution of the above-mentioned trust has been committed, desire to furnish themselves with the results of the experience and views of those whose

attention and studies have been devoted to the sanitary care and treatment of children and their diseases. The trustees therefore at their first meeting, preliminary to the formation of any definite plan of procedure, determined, —

“To correspond with a few persons at home and abroad, who are eminent for their experience and success in the treatment and care of sick children, and to obtain essays from them, to be published for the benefit of this and similar institutions.”

In asking such a contribution from you, the trustees have in mind the consideration of the best method of establishing a sanitarium (not a hospital, but a summer retreat) for sick children, under the most favorable hygienic and local conditions that the neighborhood of Baltimore may afford.

The land lying north and west of the city is high and picturesque, and elevations of four hundred feet above tide are reached by steam railways in thirty minutes, and those of six hundred to eight hundred feet in one hour. These districts have always been healthy; the water is pure, and food of all kinds is plenty and cheap. The ocean is not within available distance, and the shores of the Chesapeake Bay are malarial.

The trustees also desire your opinion regarding the regulations suitable for receiving and administering medically and otherwise to those who shall be the proper objects of their care, with such suggestions as may occur to you in reference to the character of the buildings that may be requisite — their grouping or isolation — how best to provide for mothers or nurses accompanying their children, and generally such incidental recommendations as your experience or reflection may commend as valuable and useful.

The trustees wish your suggestions in reference to the most practicable means of lessening the risks and dangers incident to children exposed to the heated and impure atmosphere of a large city during the summer months; also your views as to the best methods of extending a general knowledge of simple hygienic rules for the treatment of children at home among the poorer classes. In the fulfillment of their duties they

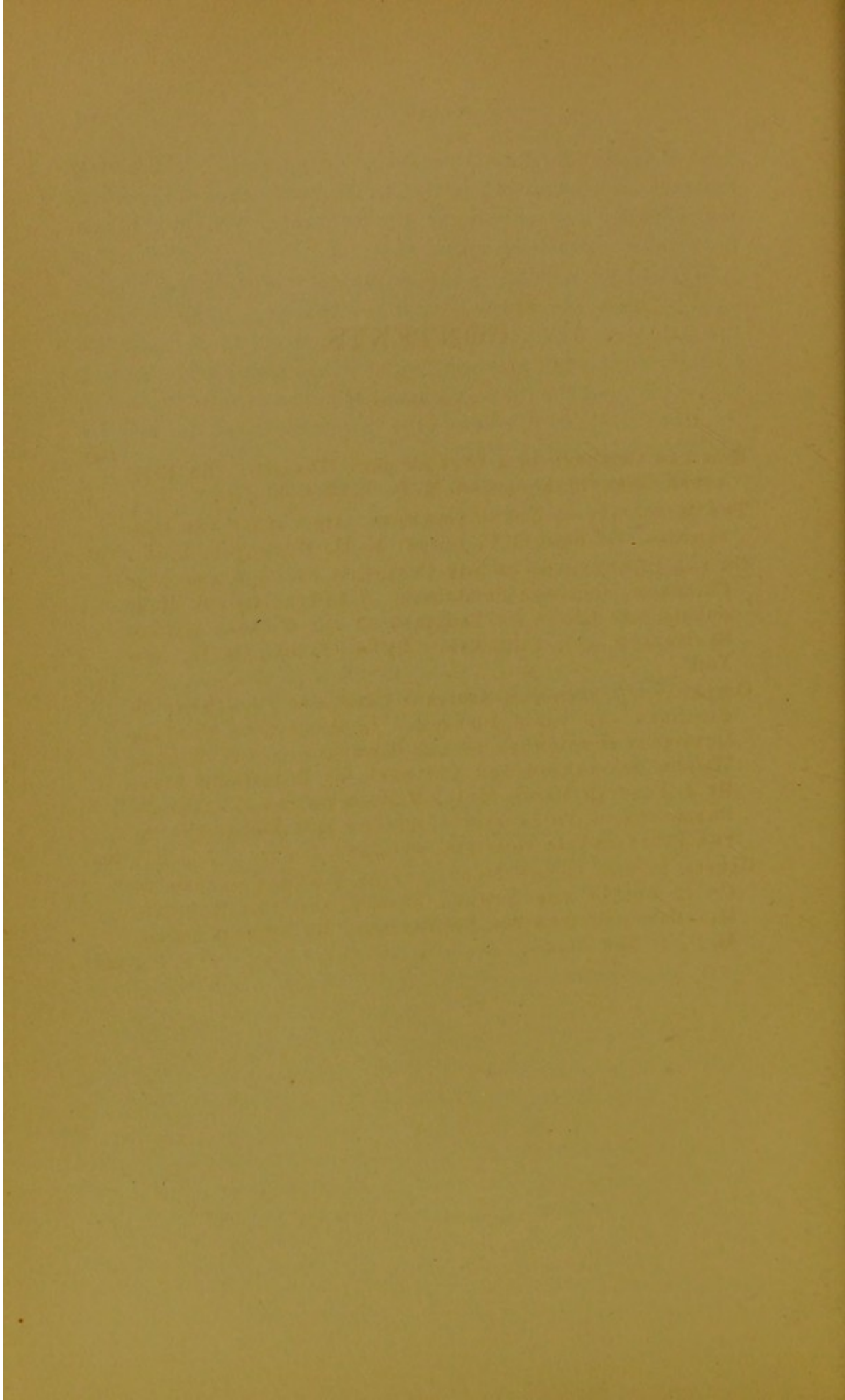
hope at least "to show a model of experiment," which may prove of value as a contribution to the best means of lessening the mortality and promoting the welfare of young children here and in other large cities.

Whilst thus indicating the nature of the information desired by them, the trustees wish you to give your thoughts in the method and manner which you will deem most conducive to their successful presentation. Should you kindly consent to serve us and the cause of humanity in the manner indicated, the trustees desire to receive the paper prepared by you, by the 1st of September, 1880.

We are, very respectfully, your friends,

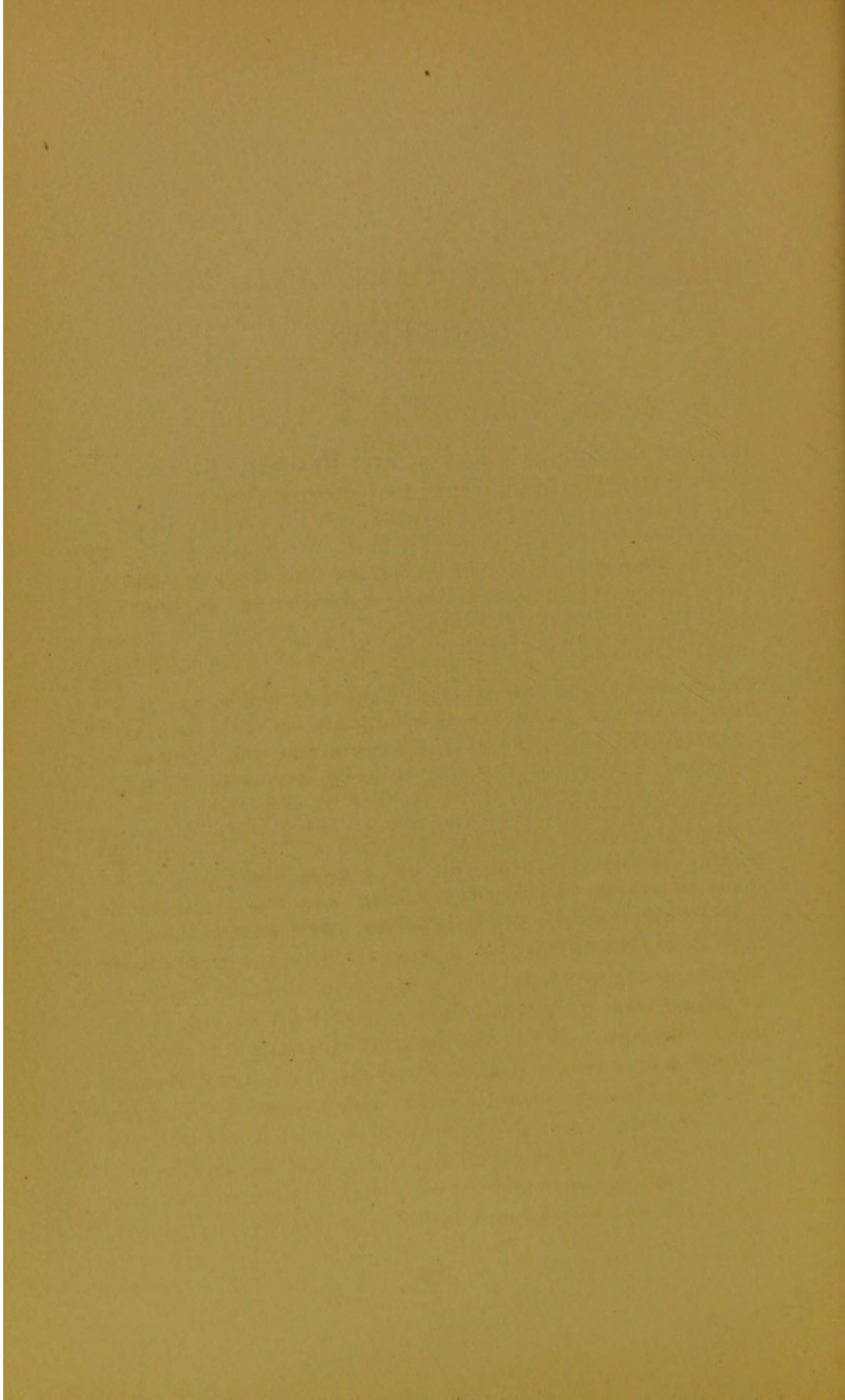
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Trustees of the Thomas Wilson Sanitarium of Baltimore City.



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THE SANITARY CARE AND TREATMENT OF CHILDREN.

HOW CAN CHILDREN IN A CITY BE KEPT HEALTHY?

BY ELIZABETH GARRETT ANDERSON, M. D.,
London, England.

It is plain that this question is a very much more complex one than any which concerns itself only with the study of the conditions which are ideally best for the production of health in children or in adults. Town life is not what suits children, and the problem of how far and by what methods we can get them to submit to unnatural conditions without being seriously injured is a much more intricate one than that which seeks only to determine what it is which would be absolutely best suited to them.

But Arcadia is a long way off, behind, or possibly in front of us. We have to deal with life as it is, and this includes many thousands of children dwelling in a city, with all its dangers and difficulties. It is of no use to lament this; we must accept the fact and see how far the evils of such a life can be corrected or avoided. The first step in the inquiry is taken by asking what it is that children most want in order to be in sound health. We know that the essentials are fresh air, suitable and abundant food, to have come of a healthy stock, to be guarded from accidental contact with sources of contagion, to be protected from all the influences which would interfere with the normal development and stability of the nervous system, — such as undue and too early toil, anxiety, want of adequate rest and recreation, unsuitable or excessive excitement,

—and in early infancy, at any rate, to be the objects of a minute and all-watchful care. We shall have occasion to study these essentials at length further on ; all that is necessary now is to notice them in a passing way, having the conditions of town-bred children in our minds as we do so. It may be well here to suggest the thought that these essentials, though rightly so-called, are not all and everywhere of equal value. Pure air, for instance, is of such paramount importance that where it can be had children live and thrive upon poor food, in squalor and dirt, and with the minimum of care ; whereas without pure air, or in air distinctly impure, very few children can thrive, however well they are supplied with all the other essentials of health ; and no doubt the superlative importance of fresh air in children's hygiene partly works by the influence its presence has in diminishing the importance of food, cleanliness, and care. With it children can bear neglect and the complete absence of minute care in a way which would be impossible to those breathing an air even but moderately impure. They can do without wisdom in their mothers with a comparative immunity from harm which no town-bred child can imitate. If the commonly received essentials of health were classified according to their relative importance, fresh and pure air would, for children at any rate, take the first place, and cleanliness the last. Even in towns, where the skin seems to be more neglected than in the country, or where perhaps the dirt is more enamelling in character, and therefore more injurious, it is surprising how little harm seems to result from dirt, and how little mere skin cleanliness seems to benefit the health. In London we should be disposed to say that as a rule, among the lowest classes, the dirty are more vigorous than the clean, and to explain it by noticing that the dirtiest are those whose trades are carried on out-of-doors. The moral influence of dirt is probably much more serious and damaging than its physical effect.

When we begin to consider in detail those conditions which we have called hygienic essentials, the difficulties which beset town-bred children become very evident. Let us take pure

air first in the list, as it indeed well deserves to be taken. By the term "pure air" we mean an air containing no appreciable admixture of the exhalations of men or animals, free from malaria and sewer gases, from the products of combustion, especially when this is imperfect; free from the products of decomposition of either animal or vegetable matter, from the organic germs which result from a rank vegetation; an air, finally, which can move, and which is not shut off from the influence of the sun. Such conditions are best fulfilled in sea or mountain air, but by no means invariably even in these.

For children, sea air has qualities which apparently none other can rival; but whether these are the result of the small amount of contained iodine, or of a higher degree of purity than that of ordinarily good mountain air, or of its more powerfully stimulating effect upon the functions of nutrition and assimilation, is still undetermined. It is at once apparent that to children in towns pure air, as now described, is an impossible luxury. Rich and poor alike must do without it, and the only practical points worth prolonged consideration are, how can the air be made as little impure as is possible under the conditions, and how can the children get as much as possible of this only moderately impure air? In dealing with the first of these two points, let us think of the air first as it is in the town, and then as it is in the children's homes. Outside the houses the air will of course be greatly influenced by the position of the town, its elevation, its exposure, the presence or absence of marshes or other sources of malaria, the greater or less closeness of the houses, the width and aspect of the streets; whether these are for the most part properly laid out and open to a through current of air or not, the system of drainage adopted, the amount of fall provided in the main drains, the abundance of the water supply for flushing the sewers, the total annual rainfall and its distribution through the various seasons, the state of the streets as to cleanliness, that is, the rate of removal of refuse, of dust, etc.; the presence or absence of noxious trades, more especially manufactories which produce poisonous vapors and dense smoke, the

sanitary condition of slaughter-houses, mews, stables, and markets, and the presence or absence of grave-yards. All these and similar influences must greatly affect the degree of impurity of town air. Assuming that a town is efficiently drained and cleansed, and free from malarial or miasmatic influences, the point of chief importance of all those just enumerated is the density of the population. Where the streets are narrow, the houses high and crowded, and the open spaces few, there must the air be most laden with impurities, there must it be the farthest removed from that aseptic condition which young life especially needs.

Passing from the air of the street to that in the children's homes, we see that at the best it cannot be better than the outside air, and is almost certain to be very much worse. It must contain all the impurities of the outer air, and it can scarcely avoid having a good many of its own. In the first place, there are but few houses which are not liable to the invasions of sewer gas, either by direct communication with the drains, by the absence of adequate sewer ventilation, by the leakage of pipes, by drains being riddled with rat-holes, or having an insufficient fall, or getting their outlets blocked. Even in good houses, where the occupier would not hesitate a moment to spend any necessary sum to insure the absence of these defects, if suspected, they are frequently present for months before they are discovered, and are as often the source of illness, or of debility and languor. It is easy to understand that they must be still more often present when the house is sub-let to many families of tenants, and when the owner desires to spend as little upon it as is possible. The second great source of the added impurity of house air over and above the impurity outside, is found in the crowding which prevails in the poorer quarters of every large city. Adequate ventilation is simply impossible wherever a whole family occupies one small room. Even in the summer time, with open windows, the air does not move with sufficient rapidity; it becomes gradually saturated with exhalations; and at night and in the winter it is still worse. The

immense importance of this point, especially to children, is at once seen when we think of the number of hours passed in sleep. Well-cared-for children are glad to sleep eleven or twelve hours out of the twenty-four till they are seven years old, unless they are exceptionally vigorous; and though poor children do not as a rule get a chance of such long nights as this, they are probably in bed nine or ten hours daily. Nothing can make up to them for the evil of breathing fetid and impure air uninterruptedly for so large a part of each day. In the day-time the injurious influence of crowding appears to be most felt by the more respectable sections of the town poor. Especially is this true of the children. It is very striking in London to notice how much more robust the children of the careless class of mothers are when past early infancy than those of the careful. Roaming the streets all day, playing marbles, dancing to the hurdy-gurdies, or watching Punch and Judy, may be bad training for the morals, but it suits the children's health much better than careful guarding and keeping at home. Imperfect as the air of the streets is, it is better than that of the houses; and where, as in London, there is no malaria to fear and guard against, the best remedy for the indifferent *quality* of town air is to take a great deal of it in *quantity*. Nothing can exceed the value of open spaces in cities to all classes, but more particularly to young children, and to the poor generally. In London, though we are better off for parks and large open areas than they are in most of the cities in Europe, we yet sadly need the multiplication of small and handy spaces within two or three minutes' run of the children's homes. Probably no single act would confer half so much benefit upon the London poor as buying up the private rights to the squares in the poorer and more crowded quarters, and throwing them open to the public. But even where everything possible is done to improve the purity of city air, and to increase the quantity available for respiration, it cannot either in quality or quantity compare with pure country air, and children cannot be induced to ignore its inferiority. Even to the classes inhab-

iting large and airy houses in the best quarters of a town, it is almost a *sine qua non*, if the children are to grow up strong and healthy, to take them into the country once a year. How much more necessary must such a change be to children living in narrow, closely-packed streets and courts, in houses where every room is as full as it can be packed with human beings!

It must moreover not be forgotten, that the imperative necessity for occasional escape from city air which exists for all children is indefinitely more urgent wherever the average temperature of the three summer months amounts to 70° F., or above it. In this case it is no longer a question of keeping children healthy, but of keeping them from dying. In London, the moment the average daily temperature exceeds 70° F., children die in numbers every week from diseases which seem to depend intimately upon the combination of a moderately high temperature and city air.

How it is, exactly, that summer diarrhoea so frequently accompanies a temperature not in itself trying to most healthy adults, we do not yet know. Its precise causation is still, no doubt, a matter of dispute; it is impossible to explain it simply by the presence of a certain degree of summer temperature. Leicester, for instance, is not hotter than many other towns in England in July and August, though its diarrhoea mortality is often greatly in excess of theirs. Everything points to the conclusion that the ætiology of infantile diarrhoea is complex, and that high temperature is but one of its important factors, while impurity of air is another. Probably the two combined induce subtle changes in milk and other staples of children's food. Certainly, no one can observe the swiftness and certainty with which, among hand-fed and ill-tended children, this class of disease follows a rise of temperature, without suspecting it to be due to the direct introduction into their bodies of actively developing germs which the high temperature has supplied with one of their necessary conditions of activity. The fact that children who still depend mainly upon cows' milk are the chief sufferers seems to

point to the milk as the probable vehicle by which the infective particles obtain an entry into the child's digestive tract. Whether this hypothesis be true or not, it is certain that infantile summer diarrhœa, though not unknown in the country, is indefinitely less of a danger there to well-fed and well-cared-for children than it is in cities, and that the principal weapon with which the ravages of the disease can be combated is moving children of the most susceptible age, that is from eight months to two and a half or three years, into the country during the dangerous months of each year. Among the classes where this is as a rule impossible, and where no extraordinary caution as to the quality and storage of the milk supply is likely to be shown, summer diarrhœa will probably continue to be an ever-present danger if not altogether the scourge it is at present, so that to the question, "How could it be prevented?" we are obliged to answer that, so far as we know now, it cannot absolutely be prevented, and that the utmost that sanitary science can do at present is to show communities where the danger lies, and individuals the only known protective agency. A minute and laborious study of the influence of heat on milk and other common articles of nursery food would certainly be worth making. Now that fresh meat can be carried across the tropics and up the Red Sea from Australia to England, absolutely free from putrefactive change, and at a very moderate cost, it ought not to be impossible to supply young children in cities with their necessary food quite unaffected by an outside temperature of 72° F. or upwards. The subject is one which might well engage the attention of men of practical science in those towns where the average summer heat is recognized as one of the most serious enemies to infant life. In this country, though we are almost every year reminded for a very short time of the dangers of heat, a temperature of 72° F. or upwards is seldom maintained for more than a few days at a time, and often for not more than two or three weeks in all throughout the year. Diarrhœa is therefore not the grave and ever-present danger in our minds that it is in those of people living in semi-tropical towns.

On the other hand, the damp and cold of England and the choking oppressive fogs of London bring a train of evils of their own in the direction of catarrhs, bronchitis, and asthma, evils which, important in themselves, are aggravated by the length of time to which we are exposed to them. Happily, however, they admit of being considerably diminished by careful management, and, in the comfortable classes at any rate, children in London can be kept well through a winter lasting five or six months very much more easily than they can be through even two months of high summer temperature. The immediate evils resulting from the cold and damp and fog of a London winter, though by no means unfelt by children, press with their greatest heaviness on the old and infirm, a fact which was exemplified during the past winter, when in one week in February, 1880, characterized by severe cold and peculiarly irritating fogs, the death-rate in London amounted at once from twenty-seven to forty-eight per one thousand, mainly from the greatly increased number of deaths among old people. A general diffusion of sanitary knowledge, increased temperance on the part of the parents, and a heightened standard of comfort, may be expected to diminish very appreciably that proportion of the infant mortality which is directly due to the conditions of the London winters. As a rule, indeed, children who are well fed, well clothed, and well housed, keep particularly well in London during the winter. What the poor chiefly want to learn with regard to the winter management of their children is the immense value of warm clothing, and if the mothers had more money to spend they would soon learn this. The children often wear too little flannel because the father drinks too much beer.

Next in importance to fresh air and the influence of temperature comes the question of food. Children urgently need both a suitable and abundant food supply, and we have to ask how their chance of getting this is affected by city life as compared with life in the country. If we are careful to contrast the condition of parallel classes, and to avoid the mis-

take of supposing that every one in the country has a cow and a farm-yard of his own, we shall probably come to the conclusion that only a small part of the extra difficulty of keeping town children in health can fairly be attributed to the inferiority of their food supply. In many cases suitable food for children is even more difficult to get in the country than in large towns. Milk, for instance, is to the poor an impossible luxury in many country districts in England, and eggs and butter are scarcely less so. In London these are all within every one's reach, and though perhaps of but indifferent quality, they are of great importance in the children's dietary. Variety of animal food, of vegetables and fruit, is also much more within the reach of the poor in towns than in the country. What the country gives in this direction to the children of the poor which the town does not give them is the appetite to eat abundantly, and vigorous powers of digestion and assimilation. Nutrition advances more rapidly in the country, not because to the poorest classes the food supply is better, but because the power to use it is larger and less fastidious. So that even from the stand-point of nutrition we come back to the far-reaching influence of fresh air. If we inquire how sanitary science in its application to town life could favorably affect the food supplies of children, it is easy to see that, though they do not as a rule die from any impossibility of getting fairly wholesome food, there are many ways in which it could be improved. In London the adulteration of milk, butter, bread, and everything else which can be adulterated, is a grievous injury both to children and to adults. Children, however, suffer more seriously from their parents' want of knowledge and judgment in the choice of food than from its quality, and more especially from the indolence which leads to feeding infants on food only suited to adults. Much has been done in this country to awaken the attention of mothers to the evils of such indolence, especially by very simple popular lectures at mothers' meetings, and to the elder children in schools; and it may be anticipated that, in time, agencies of this kind will do a good deal towards diminishing the evil. In

a large city money could with great advantage be spent in supplying sanitary lecturers specially trained to deal with poor mothers, and to teach them, both by theory and practice, how to adapt the dietary of young children to their special needs, and how to improve the dietary of the adults of their family. The object would probably best be attained by employing people of the class of Bible-women, or district or parish nurses, and giving them a simple and practical training specially addressed to this subject. No machinery is likely to be of much value which cannot be carried into the very homes where the teaching is wanted, and only women can so carry it.

The first eighteen or twenty months of life is the time when suitability of food is of greatest importance, and even of this time the earliest months are of far more moment than the later ones. Nothing can make up to an infant for the want of its natural food during the first year of life, and wherever the mothers are to any considerable extent engaged in manufactories, or in work which separates them from their infants, the effect is sure, in a large majority of the cases, to appear in the debility or death of the children. It is no doubt true that many children of a higher social class are successfully reared upon artificial food, but every mother or nurse who has succeeded in doing this knows the amount of minute and incessant care it requires — care of a kind, indeed, which it is unreasonable to expect from mothers who have the entire work of a household to perform. Even where this vigilant and skilled care is given, and where in addition the infant is helped by every hygienic resource, the attempt to do without its natural food often results in failure. Some advance, however, has been made in recent years in the study of substitutes for the mother's milk, and there seems no good reason why a still greater measure of success may not ultimately be reached.

One main element in the difficulty of artificial feeding no doubt lies in the great liability to change, characteristic of human, as well as of other milk. Probably organic fluids exposed to air at ordinary temperatures are always changing

more or less rapidly, and, apart from its easily recognized chemical difference, much of the peculiar virtue of human milk as food for infants may be in its freshness, in its perfect freedom from infective particles, nay, even in its *nascent* character. Mothers at any rate agree in thinking that infants neither like nor digest so well milk which has remained an hour or more in the breasts as they do that which is, as it were, manufactured expressly for them the moment it is wanted. It is difficult to anticipate that organic chemistry will ever so completely yield up its secrets as to enable us to understand how this subtle change is effected, or to produce a food at all comparable to that provided by nature. Probably to the end of time the real thing will be much better than any imitation, and some children will always refuse to thrive, or even to live, upon anything but their dietetic birthright. For those, however, who cannot avoid the risk involved in artificial feeding, and also for young infants when partially or wholly weaned, carefully prepared diet rules are, in careful hands, of great practical value. They need to be plain, minute, and dogmatic. Any attempt at physiological or chemical explanation is sure to be misunderstood, and the rule itself is more likely to be remembered if presented in a dogmatic form. The rules should state the degree of dilution cow's milk requires at each age, how to prevent the formation of heavy curds in the process of its digestion, when to add an alkali, its form and quantity, when to begin the addition of farinaceous and animal food, and which of such kinds of food is best for children of each age. These are points so familiar to medical authorities that it would be superfluous to insert such rules in this paper. They can be found at once in the writings of Dr. Eustace Smith, Dr. J. Lewis Smith, Dr. West, and many others.

A further important part of the question of the food supply is that which relates to the drinking water. Young children should no doubt not be large water drinkers. Milk is their natural and proper drink till they are almost out of childhood. But to poor people milk is, as a rule, too costly to be

used in this liberal fashion, and the drinking water becomes to them as important for their children as it is or ought to be for themselves. The first thing that strikes one in thinking about the drinking water in connection with the special difficulties of city life is, that here we touch a point upon which town-bred children ought to have an advantage over their country cousins. And even with the many shortcomings (some of them scandalous ones) of our London system, it is probably true that London water is, as a rule, a less dangerous drink than that at the service of the English agricultural population. Whether this is so or not, it cannot be doubted that a community is in a far better position for getting wholesome water than single scattered families of poor and ignorant people ever can be, and that it is a grave blot upon their civic organization if they have not succeeded in getting it. A laborer's country cottage must have its water supply close at hand, and it must be the cheapest possible; therefore it is a surface spring, and close to all the obvious sources of impurity round the house. As a rule, in England, the well and the cesspool, or the pig-sty, are within a few yards or feet of each other. In large towns there can be no real difficulty in carrying water of almost absolute purity to every house; it is simply a question of expense. In London, the system breaks down mainly on the point of the storage of the water in the houses. In houses for the richer people there are cisterns, often dirty, and often in direct connection with the drains of the house. Many of the houses for the poor have no cisterns, but only water-casks or butts, often not covered, and rarely if ever cleansed. Even if the water so stored is not very poisonous, it is most unattractive. It is scarcely possible under these circumstances to urge water drinking with much zeal. Bearing in mind all the temptations to intemperance which surround the toiling inhabitants of the poorer parts of our crowded cities, the sense of exhaustion which results from indoor labor, from the absence of pure air and bright light, it is impossible to regret too deeply the way in which, even from childhood, the poor are forced into drinking stimulants by the

want of wholesome and pleasant water. This, however, is a fault not inherent in city life, but one which results only from indolence, ignorance, and supineness, and will, it may be hoped, in time disappear. It is at any rate certain that a town-bred child ought to be better provided with pure water than poor country children are likely to be, and that the absence of wholesome water in a city is a misfortune which need not and ought not to be present, and one to which we should not allow ourselves to become reconciled.

The third essential condition of health in children is that they should have come of a healthy stock. This supplies, no doubt, one important factor in the comparative difficulty of rearing healthy children in cities. In many cases the influences of town-life before the children were born have deteriorated the health of their parents. In every crowded community intemperance, tuberculosis, and syphilis undermine the health of thousands of parents at a comparatively early age, and the children born of such parents cannot be healthy. Not, of course, that either vice or constitutional disease is rare in the country; probably morals are much the same in a given grade of education and intelligence everywhere, but the influences of town life tend to increase the temptations to vice and to aggravate its physical results. In some cases moreover, country life, with its fresh air and the stimulus this affords to all the nutritive functions, may just supply the child of moderately unhealthy parents with what it needs to enable it to revert to a higher standard of health. For it is necessary to bear in mind that powerful as are the laws of heredity, like to their parents as children are and must always be, there is yet in human beings under favorable circumstances an uncontrollable set towards health and against the perpetuation of disease. If it were not so, if the force of heredity were strong enough to be able to brand the children through many generations with the results of the intemperance, the vice, and the recklessness of their forefathers, who among us would be sane, or wholesome, or healthy? Probably no one could show a clean bill of health, with regard

even to the worst diseases, for even so short a time back as ten or twelve generations, and what are these in the life of the race? There is, for instance, no disease more truly constitutional in character, and therefore more ready to pass from parents to children than gout, and yet we constantly see people who though coming of a gouty stock, by leading strictly temperate and active lives have almost completely freed themselves from their hereditary enemy, and who do not transmit it to their children so long as they also lead healthy lives. So that but a few generations, two, or three, or four, may suffice to do away with this otherwise most powerful hereditary taint. But no doubt it is true that the regenerating process, by which the race casts off gradually its acquired imperfections and tends to revert to the normal condition of health, requires both time and favoring conditions. Children are too close to their parents in point of time not to be very like them, flaws and all, and unless their inherited flaws can be met and counteracted by wholesome influences, the process of regeneration must be delayed, or even in the worse case, as is so often exemplified in the gradual intensification of nervous diseases, a downward course may be taken, and the constitutional type, instead of improving, will progressively degenerate. City life as lived by poor children is certainly not that which would enable them even to begin to throw off inherited imperfection; and practically we find, and probably always shall find, a vast amount of disease or imperfect health due to hereditary influences which no perfection of hygiene, so far as it can be applied to the town life of the poor, can tend greatly to diminish.

The next important element in the question of how to keep city children healthy is that which relates to the prevention of the spread of infectious or zymotic disease. Diseases of this class are gravely important, not only from the very large number of deaths they directly cause, but also by the chronic debility or disease which too often results from them. This is a part of our subject which would amply repay the careful consideration of all who desire to benefit the children of a

town, for it is one in which much good may be done, though the parents themselves are not in a position to do it. The chief hindrance, indeed, to the most important measures in this direction will be found in the ignorance and unenlightened affection of the parents. It is of course vain to talk of disinfection or of precautions against the spread of disease while children suffering from measles, scarlet fever, small-pox, or whooping-cough, remain in their crowded homes. The only measure worth discussing is that of removing and isolating them. If the hearty coöperation of the parents could be won, every child taken ill with any of these diseases in a crowded house ought at once to be removed to a special hospital, and adequate precautions there taken against communicating the infection. The art of disinfection is gradually becoming so much better understood by professional advisers than it was even a short time ago, that it is not now utopian to believe that were the sufferer once in skilled hands and isolated, the spread of these diseases from each separate case might be completely checked, and that by repeatedly stamping out infectious disease in isolated cases epidemics might be prevented. Such a scheme as this supposes a separate hospital, or at least a completely separate block of wards for each of the important zymotic diseases, each having a separate staff of nurses, and, if possible, separate and resident medical attendants and separate administrators. It seems plain, from the history of the epidemics of the Middle Ages, silent traces of which still remain in the vast lazarettos of Milan and other continental towns, that diseases which were then not less serious scourges than scarlet fever is now, have been practically stamped out by a general improvement in the sanitary condition of towns once decimated by them, combined with a rigid process of isolation whenever the diseases in question appeared in the community. We have become alive, within the last few years, to the danger of infection being spread wholesale, as it were, in several ways hitherto unsuspected. Epidemics of scarlet fever have now in several well-investigated cases been proved with almost mathematical precision

to have been due to the milk supply having been contaminated with the scarlatinal poison. An instance of this, hitherto unrecorded, occurred in Scotland three or four years ago. A large boys' school at Aberdeen had part of its milk supply from a particular farm near by. A girl old enough to be of use in the dairy fell ill, and was shortly pronounced to be suffering from scarlatina. With commendable honesty the farmer sent down to the school, as soon as the girl's illness was recognized, to ask if the milk should still be sent. It was stopped, but the supply of the day before and of the same morning had already been used, and within thirty-six hours eighteen persons in the school-house were ill with scarlet fever, as well as several other persons in neighboring houses who had had milk from the same farm.

This case was further remarkable from the fact that, so far as could be ascertained, the girl at the farm was the first person who had been ill there, and if so, the contagion from her must have been very active, even in the earlier and acute stage of the disease. Possibly, as suggested in reference to summer diarrhœa, the germs upon which contagion depend may find a very suitable environment in milk, and therefore may develop in it with unusual rapidity. A curious and unexplained fact about the epidemics caused or conveyed by milk is that the type of scarlet fever so conveyed has hitherto appeared always to be mild in character. Further observation of similar cases may serve to show that this has been merely accidental, but it is a point worth noting for future observation to confirm or disprove. No one knows yet why some epidemics of scarlet fever are so immensely more dangerous than others, and anything which could help to a clearing up of this point might prove to be of enormous practical value. If we knew the conditions, whether individual or general, which lead to the occasional development of malignancy in the scarlatinal poison, those conditions could probably be influenced favorably and the malignancy prevented or diminished.

Whilst waiting for the time when the general good sense

of the community shall make it possible to isolate rigidly every case of infectious disease, it would be well that the sanitary lecturers employed among the poor in a town should be taught practically a few of the more efficient and available processes for disinfecting clothes and bedding, such as that which depends upon the liberation of a large quantity of chlorine gas. It cannot, however, be too clearly insisted upon that disinfection in any sense which implies safety to the community is an impossibility in crowded houses, and among poor people who cannot afford to destroy their clothes and other property. Only as the handmaid to isolation is disinfection of substantial value. An exception to this assertion might, however, perhaps be made where the disinfection can be applied assiduously and skilfully to the centre of contagion, that is to the sick person himself. Even in a disease so eminently contagious as scarlatina, cases have occurred in which, without attempting any isolation of the patient, no infection has been conveyed, the result having apparently been due to the frequent inunction of the invalid with carbolized oil. Among the poor, however, precautions of this class are sure to be very imperfectly carried out, and the real check to epidemics of zymotic disease must be sought in isolating every case as soon as possible after it has declared itself. Even apart from their crowded homes, the ordinary conditions of life to children of the poor lend themselves with unhappy facility to the spread of infectious disease. From early infancy large numbers of children are grouped together, in day and Sunday schools, in church and chapel, in playgrounds and in the streets. Poor children know, as a rule, no solitude. They are always in society, and usually in a very crowded society. Objections are occasionally urged against infant and other primary schools on the ground of their being centres of infection, and no doubt it is true that every school must occasionally be open to such an accusation. It appears, however, to be useless to grumble at the school before making an attempt to isolate the contagion in the home. So long as cases of scarlatina and other infectious disease are allowed

to remain in houses of which, perhaps, every room contains a family, it would be beginning at the wrong end to exercise any very zealous supervision over the schools.

In addition to the prevention of epidemic disease, an intelligent guardianship of the health of town-bred children ought to consider to what extent it can aid in the prevention of various other familiar forms of disease, such as tuberculosis, rickets, syphilis, and nervous disease in its many forms. The inevitable conditions of city life — crowding, intemperance, vice, poverty, and struggle — render it all but certain that these diseases will continue common in cities, and that philanthropic efforts will not, except indirectly, greatly diminish the number of children injured or destroyed by them. We know, for instance, that the most potent weapon against the development of tuberculosis is abundance of open-air exercise and of good food. But we know also that to hundreds of the dwellers in cities abundance of either of these is out of the question. They have to struggle on upon the minimum rather than the maximum allowance of fresh air and food, and tuberculosis results.

Rickets ought no doubt to be capable of being materially diminished wherever the general standard of intelligence and comfort is tolerably high among the working people of a city. It is a rare disease when mothers are themselves well fed, when they know the importance of milk in their infant's diet, and when they can afford to act upon their knowledge.

The important social and political question of how to preserve children as far as possible from the terrible blight of hereditary syphilis is one which, though coming strictly within the limits of our subject, cannot well be satisfactorily dealt with in this place. It is enough to record its grave importance, and the responsibility which attaches itself to any one who does what he can to prevent legislative interference with the diffusion of syphilitic disease among the adult population.

Very little attention has been paid hitherto to the important subject of the prevention of nervous disease in chil-

dren and young adults. Many of the more familiar of the so-called nervous diseases belong mainly to the stage of decline, and as for the most part people wear out at a rate roughly proportioned to their years, they are seen most commonly after the age of fifty. But these "old age" nervous diseases, as they may be called, often only very accidentally belong to the nervous system. The real fault is, as a rule, in the nutrition of the small arteries, in the condition of the valves of the heart, in the undue development of connective tissue everywhere, or in the kidneys and other leading organs. Faults of these various kinds manifest themselves through the nervous system by the injury they inflict upon it; for example, the rupture or the embolic closure of a vessel interferes with the nutrition, or destroys the integrity of certain cells or fibres of nervous tissue, and thus indirectly interferes with nervous function. Similarly, syphilitic nervous disease (so-called) rarely starts from true nerve-tissue, though it makes itself manifest by its influence on this tissue. It is not the fault of the nervous cells and fibres that they cease to work when starved by the blocking of their nutritive blood-vessel, or when ripped up by a clot of blood, or when squeezed out of life by a syphilitic deposit. Nor is it these indirect results of disease elsewhere to which preventive medicine should chiefly turn its attention, but to those conditions of faulty working of the nervous system itself to which the name of nervous disease properly and strictly belongs. Many of these conditions are common in childhood and young adult life, and are capable of being influenced for good, or of being deepened and intensified by external influences.

What is meant, or implied, exactly by the term "functional nervous disease," can only be fully understood by those who are in possession of a clear and adequate conception of the position and purposes of the nervous system in the human organization. It is necessary to realize that this system controls not only all mental processes and sensation and voluntary motion, but also the functions of organic life, the action of every organ, the formation of every secretion, and the size

of every blood-vessel. All these purposes are accomplished by the aid of a something which we call "nervous force," and which we know is developed or made in the nerve ganglia and distributed by the nerve fibres, very much as the force which we call "electricity" is made in a battery and carried by the conductors. The ideal of nervous health is found in a well sustained and stable equilibrium between the work which the organism, as a whole and in all its several parts, has to perform, and in the equable production and diffusion of the force by which the work is performed. Wherever either the demand for nervous force is in excess of the power of manufacturing it in the nervous ganglia, or where the production of the force is naturally greatly in excess of the outlet provided for it, or where the several nervous centres work irregularly and inharmoniously, or upon too slight a stimulus, there we have departure from the ideal, and we are in the presence of nervous disorder. What we want is, that the work to be done and the force to do it should balance each other, and that the production and distribution of force should go on smoothly and evenly, and in response only to the normal stimuli. A very large part of the total amount of functional nervous disease is due to a fatal want of proportion between the demand for force and the power of producing it. People either want more force than they are able easily to make, and thus are stimulated or urged into efforts beyond their powers, or they have more than they can employ, and they are allowed to fret their hearts out for the want of something upon which to spend it. It is as if a battery of small size and few cells were expected to produce as much electricity as one twice its size, or, on the other hand, as if the current generated were stored under a condition of continually increasing tension.

It is too often overlooked that people differ from each other as much in their physiological as in their material wealth. While one has an income so assured and so large that his only duty in relation to it is to spend wisely and liberally, and to invest usefully, another has to struggle daily and

weekly to meet the necessities of the moment; his power of earning being small, he has to minimize expenditure and even to descend to the most petty economies to make his scanty pittance of an income supply the barest necessities of life. In the same way there are people who seem to possess almost unlimited stores of nervous force; let them spend their strength as they will (and some of them spend it with prodigal lavishness in several ways at once), they cannot come to an end of their resources, and even when, for the moment, they are worn out and weary, they can count upon picking up again with extraordinary rapidity. On the other hand, there are people whose life is a long struggle against absolute physiological bankruptcy. They seem never to have quite enough nervous force, even for a routine life, and any unusual demand does for them entirely. Effort is not impossible to them; sometimes, under the stimulus of emulation or anxiety, they can even sustain an effort for some little time, but presently, when the stimulus ceases, they drop exhausted, and then take months or years to recuperate.

Happily, it is exceptional to see this condition in a marked degree persist through mature life, but it is by no means very rare to see it while growth and development are imposing their special taxes on the constitutional powers. Assuredly it is most unsafe to assume that all young people may, without danger, be urged to make the utmost effort in their power, or that stimulants of various kinds, emulation, prizes, even alcohol, may be used in order to elicit all the force they have without hesitation and without risk. The true remedy for insolvency is retrenchment, and what physiological paupers need is not stimulus, but rest and the least possible demand for such strength as they have. It is especially in towns, where children and young people are surrounded by influences at once debilitating and stimulating, that the danger of overtaxing and therefore exhausting the centres which manufacture nervous force needs to be remembered. In the country the opposite risk, that of supplying no adequate outlet for the nervous force when developed, is perhaps more frequently

present, but even there this is a danger which belongs properly to a later age. In considering how the special drawbacks of city life can best be dealt with, we have to ask, from the point of view of the people badly off for nervous force, how all the recreative and recuperating influences can be increased and the stimulating influences be diminished. The first part of the question is answered by improving the general hygienic condition, providing good air, open spaces, easy access to the country, simple nutritious food, and facilities for plenty of bathing, etc. The second part of the question, however, is a more complex matter. It is not easy to see how the life of a great city can ever be made unstimulating, or how the interests of the weak can, in city life, be specially considered. For it must be borne in mind that the stimulus of competition, of rival effort, and of constant variety, which belongs to town life, just suits the strong, and that it is they and not the weak ones who, in a community, will always rule. Therefore, so far as the adult population goes, there would seem to be but little possibility of materially modifying city life to suit the people of feeble nervous power. It must always be too keen and rapid to be really suitable for them. But for children, the difficulty is not quite equally great. Wise parents can do something, even among the poor, in the direction of promoting rest and long hours of sleep, of discouraging violent and unusual efforts, of avoiding all forms of stimulation, and especially by not placing the child in a position involving anxious effort and strain. The emulation of school life is often blamed for nervous and other weakness in children, and it seems impossible to doubt that to some it must inevitably be injurious. Here again, however, we have to accept the fact that in a community arrangements have to be made mainly to suit the fairly strong and vigorous, and not the exceptionally weak. Emulation and the stimulus it provides are great advantages to vigorous people, and in strict moderation they do no harm, even to the young, when they are strong. Primary education in public schools needs the help of some amount of emulation and competition, but even for the strong the danger of over-

stimulation should be recognized. All that can be done in the way of specially protecting the exceptionally weak is that parents and heads of schools should recognize that there is an important minority of both boys and girls who are not equal to making any severe and continuous effort, to whom the stimulus of competition is positively injurious, and who require all, or almost all, the nervous force they can supply to meet the requirements of growth and development. It is, perhaps, too much the fashion to think of children, boys and girls, as if they were physically almost exactly like adults, only a few sizes smaller and proportionally less strong. From the point of view of the nervous system, at any rate, this view is certainly unsound. It overlooks the fact that during growth and development the nervous centres are themselves in a developing condition, learning to work together in response to certain stimuli, and in a certain subordination one to another. The machine is still in process of construction instead of being ready for use. It is not merely not so strong as a larger machine, it is not yet out of the workshop in which it is being made.

We meet with this fact again under a slightly different aspect when we turn to the consideration of the last of the essentials of health for children already enumerated, namely, a watchful care during their infancy and early childhood. It becomes very plain to any one who is able to consider and duly weigh familiar facts that by the very nature of their organization, children, even when healthy, are indefinitely more delicate, that is, more easily upset, than ordinarily healthy adults. They are more mobile, their physiological equilibrium is more unstable, and they suffer more quickly for any violation of physiological or hygienic laws. The processes of growth and development are making enormous demands upon their nutritive powers; they want for immediate use all the blood and nervous force that their blood-making organs and their nervous ganglia can supply them with, and the least check in either process threatens them with bankruptcy. To live from hand to mouth, as it were, each day by the help of good food, fresh

air, and good digestion, just contriving to meet the demands made upon their vital powers, is with them the rule, and not, as with adults, the condition of the exceptionally feeble.

It is not surprising, therefore, that slight departures from health, and especially those which interfere with the due performance of the nutritive processes, tell immediately upon a child's health and vigor. Observant eyes can see at once that the manufacture of good red corpuscles has been checked with every slight disturbance of a child's digestive or assimilative powers. Moreover, besides resenting hindrances to nutrition more than adults, they are far more prone to the occurrence of such hindrances. For instance, every mucous tract in a child is more liable to catarrh than the corresponding mucous membrane in adults. Notice how children suffer at once, and certainly, in their nasal and respiratory mucous membranes on coming from fresh pure air to the air of towns. It is a matter of common nursery observation that children on returning from a stay in the country always have pretty bad catarrhs within a week or so of their beginning to breathe the less pure air. Mothers are too well alive to this risk to forget it, and it certainly cannot in most cases be explained by "taking cold on the journey" or by want of care in any other direction. It is most unusual to see children take cold when they go from the city to the country, even at a colder season. The "coming home cold" is almost certainly due to the irritation of delicate mucous membranes by an air laden with smoke and other products of imperfect combustion. A corresponding susceptibility exists in the intestinal mucous tract. If, then, children are peculiarly prone both to disturbance of function and to the evil resulting from such disturbance, it is not to be wondered at that minute care is wanted to keep them in health till they acquire greater stability and more vigorous powers of resistance. When in addition to the delicacy common to all children there is superadded the immense drawback involved in trying to rear them from early infancy without their natural food, it becomes impossible to exaggerate the amount of care required if a successful result is de-

sired. The only thing which can at all make it possible to minimize the care needed is fresh country air, and with it one does occasionally see thriving vigorous children, to whom almost every other advantage has been wanting. But for town-bred infants care is an indispensable condition of health, and care of a kind far more minute and constant than can be given in any *crèche* or public nursery, or to any child put out to nurse for a few shillings a week. Where from any cause this minute and personal mother's care cannot be given, a large proportion of the children are bound to die, in spite of anything which may be done for them by outside agencies.

It is evident, from all that has been said in considering the difficulties town-bred children have to contend with, that the labor involved in any considerable attempt to improve their condition must be great, and also that it is impossible, whatever may be done in this direction, ever to make town children as healthy as country ones. Much that may be attempted to diminish the dangers of city life has already been hinted at; as, for example, the multiplication of open spaces in towns, a proper system of drainage, and an abundant supply of good water. For young children, however, the most important remedy is that of encouraging their parents to get out of the town, or at any rate into the suburbs. Every facility that can be given to the poor to live a little distance from the most densely populated part of a town is of the greatest value to the children. Where land is abundant and cheap, the possession of a small garden even without a house, out of the town, would, by supplying out-door employment, be most valuable to both parents and children, especially to people above the poorest class, as, for instance, artisans and small traders.

Passing to the subject of a summer sanitarium for city children, a great many important practical questions at once arise. Any one familiar with children cannot think with entire satisfaction of any plan which involves separating them from their parents, and massing large numbers of them together. It may be feared that such a plan must be fraught with

danger to both health and morals: to health, if the children are intended to be very young, that is under four or five; and to morals, if they are intended to range between five and fourteen. The ideal summer outing for children is that each family should move from the city, but should preserve the continuity of its family life. This is impossible of attainment among the poor, but possibly some nearer approach to it might be reached than by massing together several hundred young children in any way which would preclude the possibility of giving them individual care. The boarding-out principle, which, so far at least as the children are concerned, works so well in England for the pauper children, might perhaps be adopted with modifications in the place of having one large building and grouping the children together. If a considerable number of people living in healthy country localities were registered as being each willing to receive during the summer one or two town children as boarders at a fixed rate, and a system of supervision were organized, such a plan would certainly be more natural and home-like, and therefore more acceptable to both parents and children, than a large central sanitarium could ever be. Children thus placed would also be much more easily provided with employment and amusement than they would be in an institution containing a very large number. They would enter into the duties and pleasures of the family with whom they boarded, and would feel themselves to be in surroundings not too unlike those in their own homes.

Where such a plan as this might, from the scanty country population or the bad sanitary condition of the country cottages, be impracticable, it might be possible to arrange the sanitarium upon the plan of a number of detached houses, each to contain eight or ten children, and each to be under the direct care of one nurse or matron. By either of these methods the children would be secured an amount of personal and individual care and watching which it is impossible to get from the hard-worked staff of an immense institution. The routine, the formality, and even the noise, which are necessary parts of a

large assemblage of children, are in themselves for a time trying to the health of those used to a free home life; and among American children, where by climatic and hereditary influences the tendency is towards undue restlessness and irritability of nerves, they would be more likely to do harm than in a more phlegmatic or stolid community. Town children everywhere, and perhaps American town children more than any others, are as a rule much more precocious than country children; mentally and physically they develop more rapidly, and what they need to make a change from city life of the greatest use to them is not the stimulation that goes with numbers, but the quietness and repose which belongs to country life as seen in a small family. Fresh air, the absence of noise, and comparative solitude, form the basis of such a life; and the combination of the three is probably as wholesome and recuperative to children as it is to adults. By many the stress of town life is felt more in the nervous system than in any other part of the organization; and to them especially one most important part of the value of a change to the country lies in the comparative quietness and solitude which it is possible to have there, but which would be practically destroyed for the inmates of a large sanitarium. If now in conclusion we turn back to the question with which we started, and ask ourselves again how can town children be kept healthy, we are obliged regretfully to admit, that after public and domestic hygiene has done its best, city life will always be full of special risks to the children of the poor, and that philanthropic effort cannot do very much directly towards diminishing those risks. It can do something, but it must be mainly through the parents, by improving their knowledge of what the children need, by raising their standard of comfort, and by deepening their sense of responsibility.

THE MORTALITY OF YOUNG CHILDREN: ITS CAUSES AND PREVENTION.

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GENTLEMEN OF THE BOARD OF TRUSTEES, —The letter of Mr. Francis T. King, of December 20, 1879, requests my advice in regard to the best method of executing the trust committed to the management and supervision of himself and others by the late Thomas Wilson, of the city of Baltimore.

In 1875 Mr. Wilson founded, under the provisions of the Maryland Code of Public General Laws, an institution known as "The Thomas Wilson Sanitarium for Children of Baltimore City, for the purpose of securing a summer retreat for sick children from the heat and unhealthfulness of the city, and for such other kindred purposes as may be hereafter determined upon by the corporation."

In his will, executed in February, 1879, the testator declares his purpose in making the bequest of five hundred thousand dollars to the institution to be "the alleviation of the pains, and the prolongation of the lives, of children." In the same sentence of this last will and testament occurs the expression of his pity "for the suffering of little children and their parents," and of his deep concern and sorrow "at the great and alarming mortality which occurs each summer among young children."

How best to execute such a trust is a grave and complex question. A final and satisfactory conclusion can only be reached after a careful and mature consideration of the causes and means of prevention of the diseases and mortality of early life. Those who are to become the beneficiaries of this char-

ity are denominated by its founder "young children, deprived, by misfortune of their parents, of all opportunity for removal from the heated and fatal atmosphere of the city," and by the charter title of the institution "children of Baltimore city." Hence to fully grasp the proposition thus distinctly and succinctly set forth, the various agencies and elements of causes conducive to the mortality of early life, must be considered with special reference to the density, ignorance, poverty, and indigence of the population of Baltimore, together with their hygienic and domiciliary surroundings.

Age is the first and essential factor in this complex assemblage of causes. Childhood properly comprises the period of human life from birth to puberty, but for convenience of scientific study, and to secure accuracy of the statistics of the comparative morbidity and mortality of the successive stages of growth, it has been subdivided into four periods which are characterized by developmental processes. The first period extends from birth to the appearance of the first tooth (fifth to tenth month); the second from the beginning to the completion of the first dentition (twenty-fourth to thirtieth month); the third from the termination of the first to the completion of the second dentition (sixth to seventh year); and the fourth from the second dentition to puberty (twelfth to fifteenth year). These successive periods must be studied with reference to the probability of sickness, their comparative mortality, and their liability to special morbid conditions.

In view of the clearly defined purpose of the founder to afford opportunity for the removal of young children from the "heated and fatal atmosphere of the city," and of the fact that even with such a liberal endowment it will be impossible for the institution to supply accommodations, care, and food for all of the young children of the needy and squalid in a city of three hundred and thirty thousand inhabitants, and increasing in population as rapidly as the city of Baltimore, the management will be compelled at the beginning, or very early in the history of the institution, to determine the admissions

by limitation of age, or to regulate them by some well-defined system of individual selection. The first will prove to be the more practicable and efficient method, though it may be wise to reserve the privilege of selection to meet occasional instances of exceptional need. The completion and occupancy of the Johns Hopkins Hospital will probably limit the number of applications of sick children beyond five years of age to the very few who may be unfit subjects for hospital treatment, and yet require the invigorating and healthful influences of a salubrious atmosphere. A few years of experience in conducting the institution and the determination of the actual daily average cost per capita for maintenance will furnish the requisite data for the final adjustment of the later age of admission, but the earlier age should be fixed before the acceptance of any plan for the construction of the necessary buildings.

The determination of the age of exclusion must, however, be considered with special reference to the two classes into which the beneficiaries will be divided. For convenience these may be denominated the visiting and domiciliary classes. The first and larger class will be composed of those children who will be offered a refuge from the city during the day, returning again at night-fall. Even if permissible, it would be unwise to extend this privilege to all the needy and indigent children under the age of puberty. A limitation of age will be imperatively demanded, because of the inadequacy of the endowment fund to meet such an extraordinary outlay, and the impracticability, if not impossibility, of conducting an institution to which would resort daily such a concourse of juvenile excursionists, including the invalid, sick, hungry, idle, vicious, abandoned, truant, and mendicant, of both sexes, of all colors and nationalities, and all ages under the prescribed limit, together with the mothers or necessary attendants of the younger children.¹ A system of daily excursions during

¹ The Floating Hospital of St. John's Guild, of the city of New York, made thirty-five excursions, "between the 9th of July and 6th of Septem-

the summer months, if properly organized and managed, might prove of great advantage, both in its lessons of moral training and opportunities for physical development. The advantages of this department should be offered to the largest number compatible with good order and the welfare of the young. Transportation, accommodations, food, water, shelter, shade, amusement, and protection must be adequate to the exigencies of the excursions, the number and *personnel* of which would vary daily, according to the popularity of the institution and the necessities of the children who might be entitled to the benefits of the sanitarium.

But even with all such necessary facilities and with proper appurtenances as a place of daily resort for children, the organization of a system of excursions as a means of promoting health will fail of success unless the confidence of the community is assured by efficient and expert management. Safety, security, and positive benefit must be made apparent to that class of parents and guardians with whom theoretical assertions and predictions of possible advantages will have but little weight in diverting them from their long accustomed routine of life. Their habits, education, poverty, family history, superstition, and proverbial indifference to the welfare of children, lead them into obstinate antagonism towards every so-called encroachment upon their long conceded ownership of the body and control of the life of the child. The evidences under their immediate observation that neighboring children have grown to vigorous maturity without such extraneous aids as charitable excursions to country play houses and grounds may offer are, in the absence of proof of positive personal gain, arguments far more conclusive than any fact deduced from mortality statistics. They accept the occurrences of life as they see them, soon forgetting the past and incredulous of evils to come. Life is completed with each

ber, 1879, and carried 27,818 children and mothers, being an average of 794½ on each excursion, in the proportion of about 2½ children for each adult." (Extract from report of 1880.)

day's existence. To-morrow may be but the repetition of to-day, and each successive day's life deepens the oblivion of things gone before, and fastens more firmly upon the life of the future the errors of the past. The false interpretation of one's own observation of matters concerning the preservation of health and the cause, prevention, and cure of disease is a fruitful source of error common to all classes of laymen, and is a special characteristic of the ignorant, indigent, idle and laboring classes. They resist, and often resent with threatening ferocity, every innovation upon the established customs, habits, and conditions of their life and domicile.

Considerations of domestic economy and convenience will also enter largely into the antagonisms of these communal classes. The ownership of the body will assert its prerogative on the pretence of valuable assistance of the child in the trivial concerns of the family household. An idle and debauched father will not willingly relinquish, even for a day, the enslavement of a helpless son or daughter, and an inconsiderate mother will cherish the authority which commands the little girl to sit or go, watch or work, while she either fritters away time in idle discontent, or slovenly performs some of the duties of the day. The older must care for the younger child, or run on errands. The pretence of authority, assistance of a child, tender affection of a mother, parental care, or fear of harm, will be interposed as an obstacle to the absence of the child from parental observation and control. The pleasures and pastimes of a health resort offer no inducements to parents so stolidly indifferent to the comfort and well-being of children.

Another class of parents, whilst professing deep concern for the health and welfare of the little ones, will clandestinely connive at means which will relieve them of their burdens under the guise of disease. They are mostly husbandless mothers who are compelled or wish to engage in employment away from their homes, or who follow vicious habits, and whose inclinations are too frequently interrupted by, or whose

scanty earnings are too heavily encumbered with, the proper support of the child. They will offer many and divers excuses for their cruel neglect, and refusal to surrender the control of the sick and suffering child to competent and intelligent management, but will gladly accept the brutal care of the keepers of the iniquitous dens where "farmed out" children are slowly but certainly starved to death. Many of the "at service" mothers are compelled either to farm out the infant at the breast or abandon all hope of obtaining decent employment, because so many housekeepers will not permit a child to accompany the cook or housemaid. The responsibility for such cruelty to helpless children cannot be charged solely to the unfortunate mothers. Either this custom, which inflicts such punishment upon a dependent class, must be reformed, or some other provision must be made for the betterment of their condition. The sanitarium will offer, in its visiting or domiciliary department, the additional option of a refuge during the summer months, and thus save to many good but destitute mothers the "well-spring of pleasure."

The prejudices of caste will offer formidable obstacles to the early and general acceptance of the benefits of the visiting department. Pauperism and vice draw sharp lines of distinction between their various grades. Misery loves company, and crime seeks coadjutors; but shop-lifting and burglary are as widely apart in their social relations as industry is from insolent mendicancy. The largest portion of the poorer classes of every municipality are far removed in social and moral standing and interests from the pauper and vicious classes, and very many of the most destitute maintain the dignity of exclusive associations. Poverty and pride are not infrequently united and hereditary, and are as obdurate in adherence to the prestige of name and family as they are pronounced in their contempt for their neighbors of plebeian origin. The different creeds and trades often organize among the laboring and "hand to mouth" classes fraternities even

more austere in their companionships than the aristocracy of descent or the more pretentious caste of wealth.

In all grades of society, but especially in the lower walks of life, there are very many otherwise good and well meaning people who are practical fatalists, honestly believing or affecting to believe that the ailments of little children come independent of human or material agencies, and as the just retribution of an inscrutable Providence. The facts are always before them that the number of living children increases year by year; that many, for years puny and sickly, and many times sick nigh unto death, have grown, without unusual care or extraneous aids, to vigorous childhood; and that in a neighboring habitation, in no manner superior to their own, there is a corporal's guard or baker's dozen of healthy, robust ragamuffins, whilst other more fortunate families have lost one by one all their children. They point with exultation to the inevitable truth that sickness and death invade the palaces of the affluent as well as the humble tenements of their less fortunate neighbors. In the grief of the sick chamber and sorrow at the bier they seek consolation in the exculpating wail, "It is God's will."

It is not, however, just to charge all of these antagonisms exclusively to the wilful derelictions of parents and guardians. Their objections and excuses are not always mere imaginary pretexts, suggested by their morbid sensibilities or class distinctions. Neither are they offered by all to exculpate themselves from the suspicion or consciousness of wrongdoing. In the lower grades of society there are very many deserving people, as good as they know how to be, who strive to earn an honest and decent livelihood and supply their little ones with all the comforts their meagre resources will allow. They would accept with alacrity the privileges and benefits of a gratuitous daily health picnic for them but for the unavoidable sacrifice of time and the interruption of their accustomed employment. The rigorous demands of task-masters and the employing classes will not tolerate the tardy performance of allotted work. The widowed mother,

whose hard-earned daily pittance are barely sufficient to supply food, shelter, and clothing for her dependent family, cannot remit a day from the routine of poorly paid labor; nor can the wife, whose husband must strike the anvil or drive the jack-plane at the tap of the bell, absent herself from her inexorable duties. Such people cannot defer the work of the hour without loss of time and money. The prospective advantages of the sanitarium will not liquidate their current expenses. Time and ability to labor constitute their only capital. The additional expense, trifling as it may seem, of getting the children ready for the excursions and going to and from the places of departure, will prove a burden too onerous for them to bear.

Cleanliness and decent protection of the person of each excursionist must be required. To huddle together in conveyances half nude and filthy children gathered indiscriminately from the beneficiary classes, and transport them to a pleasure ground for the benefit of health and physical improvement, would be a waste of means and effort, and an idle pretence and show of charity. To commingle the clean and the dirty would be repugnant to the instincts of humanity, and detrimental to the welfare of the better portion. The common sayings that water is as cheap as dirt, and air is free to all, are not universally true. To the dwellers in the filthy, over-crowded, and ill-ventilated tenements of many localities in populous cities, pure and fresh air is unknown, and water is insufficiently supplied even for the most necessary use. Among the indigent families there are some so destitute of the ordinary and necessary implements of housewifery that even an abundant supply brought to their doors would be unavailable. Some are too poor to be clean, and others too ignorant to know the uses of water beyond the demands of a brutal instinct.

The enforcement of the requirement of personal cleanliness and decency would not only deny to many well-meaning and meritorious parents the privileges of the institution, but would exclude very many children most in need of the moral

restraints and salutary influences of the health resort. Its omission would be culpable negligence. Filth, dirty rags, and foul exhalations from unclean bodies are carriers and propagators of disease. With such disgusting accompaniments the daily concourse of visitors would be an excursion of fomites and animal parasites.

A large percentage of the mortality of early life is due to the contagious diseases which comparatively few children escape. These diseases owe their origin to specific poisons which are the same to-day they were when first recognized as separate and distinct entities, each being capable of reproducing itself in every susceptible person. The recurring epidemics usually owe their wide-spread prevalence in towns and cities to the assembling together children from infected localities or dwelling with those from other parts which would otherwise have escaped. The virulence of the disease always bears a relation to the amount and intensity of the poison absorbed, and the power of resistance possessed by the subject, but may be greatly increased by accessory agencies, or diminished by efficient sanitation and personal care. Long experience and observation have demonstrated that every new case of any one of these diseases is the same disease reproduced in another person, to whom the specific poison has been conveyed either by contact or by atmospheric communication. By dilution of the poisons, isolation of the sick and convalescent, and disinfection of clothing, bedding, and dwellings these diseases are greatly lessened in prevalence and intensity. In fact if the same interest and concern which are exhibited in the monetary and business affairs of every-day life were wisely and intelligently employed, these diseases might be eradicated, and the lives of thousands and tens of thousands of children be annually saved.

The children of no class, condition of life, or locality are exempt from these contagions; nevertheless the prevalence of the diseases, the dangers of complications and consequences, and the mortality therefrom may be greatly lessened by good hygiene, sparseness of population, isolation, disinfection, proper

and well ventilated apartments, personal and domiciliary cleanliness, suitable diet, and intelligent nursing. In view of these facts it will become the duty of the sanitarium, which seeks to prevent disease, promote health, and prolong life, to ascertain that the children which it may assemble together in its daily excursions are free from infection. Fortunately the young children not exceeding two years of age, who will compose the large number of the beneficiaries, are less susceptible to these diseases than those between two and five years old, and the season of the year during which the institution will be in operation includes those months during which these infectious maladies are less prevalent and usually less virulent. This latter fact is an instructive and practical corroboration of the previous statement, that the intensity of these poisons is diminished by their dilution, and by the improved ventilation of the dwellings and apartments incident to the warmer temperature, lesser crowding, and less constant occupancy. The relatively undeveloped susceptibility of infants must not, however, be accepted as an absolute protection from possible dissemination of the poisons when infants from infected dwellings are brought into close association with others from uninfected localities, for the clothing, especially when made of woollen fabrics, is perhaps as often the carrier of the germs of disease as the person of the wearer.

The foregoing are some of the more common and serious hindrances which will embarrass the establishment and successful working of a visiting department. Will its utility as a health-preserving and life-saving charity compensate for the disappointments, vexations, and expense? The theoretical humanitarian would insist that such considerations should not interpose insurmountable obstacles, but that a good intention, when persistently pursued, will always open a way to success. In a practical age like the present, philanthropy, like the business affairs of life, will be measured by the balance between the credit and debit sides of the account. Even if the management should not recognize a failure and should blindly and persistently follow the hope of success, those who would claim

an interest in its practical benefits would soon clamor for these benefits. To offer its privileges to every claimant, with daily changes of *personnel*, would result in an evanescent popularity, soon followed by discontent. For a time the excursions would be popular festivals, but pleasure without vice, profit, or some good or bad motive, does not seek frequent repetition. Soon the elements of antagonism would begin to develop, and discreditable confusion and turmoil ensue. The argument in its favor which will appeal with most force to the parents and custodians of the little children will be the proof of actual gain. As a method of preventing or a means of curing disease, has a monthly, a weekly, or a daily excursion to a health resort any money value? If so, will it compensate for the loss of time, and the inconveniences and sacrifices imposed? These considerations will present themselves as soon as the novelty and excitement of the gala days have ceased to interest and attract a class of people rudely practical in matters of stern necessity, but soon tiring of the æsthetic and more formal digressions from the habitual course of life. As a rule, the inappreciable benefit of a single excursion, or one a month for each of the three, or at most four months, to a sick or invalid child, will not be observably increased by two or three a month or one a week, during the same period. Yet it must be admitted that in occasional cases of the summer diseases of young children the turning point of the disease dates from a day or night of cooler temperature, a drive in the open air during the cool and shadowy evening or early morning, a day's sojourn in a salubrious locality, or a voyage by steam or sail. In fact, other circumstances far less important, but involving some trivial change in a day's sick report, such as more efficient nursing or more careful feeding have seemed, at times, to have enabled an ebbing life to elude the chase of death. No observant physician will deny the health-preserving and health-restoring influence of tri-weekly, much less of daily excursions of little children exposed to the causes of, or sick from the intestinal diseases so prevalent in cities during the summer months. Few children die of these diseases be-

fore they are consumed. Life feeds as long as there remains food to supply its demands. Inanition and exhaustion are the ominous harbingers of death. Waste must be supplied; assimilable aliment must be furnished, nutrition must be restored. Instead of bringing the milk skimmed, jostled, churned, watered, or otherwise injured, to the child, carry the patient to the cow, to the country; not to the scantily supplied and crowd-poisoned village or roadside boarding-house, but to the farm where milk, pure and fresh, and air rich in oxygen and free from putrid exhalations, can be obtained. Even the air of the streets and of the open and shady parks is preferable to the atmosphere of the foul and stinking lodging-room. The writer has thought, not without some show of reason, that carrying the child through the streets, washed and dressed for exhibition, to a dispensary building, is not wholly without curative power, and that the cleanly and properly clothed were more amenable to remedial agencies. To express in a few words both the method of prevention and surest plan of cure is to say, Remove the child away from the city, away from the immediate and accessory causes; restore and maintain nutrition; and supply suitable food.

Whilst conceding in occasional cases the possible good of several, and even a single excursion, with the necessary adjuncts of personal cleanliness, suitable diet, proper care, and skilled supervision, there cannot remain a doubt of the sanative and curative value of successive daily excursions for children who have not completed the first dentition, which comprises the periods¹ of childhood to which the summer intestinal and alimentary disturbances are mostly confined and from which the largest percentage of mortality annually results. In a large and populous city there will occur many cases of bowel and wasting diseases among older children, which will

¹ Of 297 cases of the "summer complaints" of children treated in the out-door department of the Children's Hospital of the District of Columbia, 127 were under one year of age; 83 between one and two years; 53 between two and three; 22 between three and four; and 12 between four and five years of age.

appeal for succor, and to whom a day's or week's good sanitation and wholesome diet ought not to be denied. To this department,¹ which will be the first attempt to organize an intelligent and proper system of health excursions as a method of prevention and treatment of certain infantile maladies, the good or bad results of which will so much depend upon its wise or unwise management, it will not, at least in the beginning, be conducive to its success to limit the admission by any rule of age which will exclude any child to whom it might prove to be the essential and otherwise inaccessible remedy. The character of the charity, the nature of the diseases incident to the season during which it will be in operation, and the circumstances of life of its beneficiaries, suggest the rule of arbitrary selection by skilled and experienced discretion, preference being given to those whose condition demands immediate amelioration, and the privilege to continue as long as the same supervision may deem it needful and beneficial. Then, to secure a success commensurate with the most commendable effort, the visitors should be divided into daily, tri-weekly and occasional classes. Experience and practical observation will soon determine the relative remedial and sanative value of these subdivisions. Seven or more days in the life of any number of the same sick children passed in the salubrious atmosphere of a properly conducted health resort, with experienced and efficient nursing, proper feeding, cleanliness, and suitable clothing, must yield more speedy, decisive, and satisfactory results than would an equal number of days extended over a longer period of time by the omission of every second, third, fifth, or seventh day. And if the daily expense per capita of each class should be the same (and

¹ For several years past the St. John's Guild of the city of New York has had in operation a system of occasional excursions on a Floating Hospital, which is a most commendable charity. In the report of 1880, it is stated that all medical and sanitary experts who have given any attention to the subject concur in indorsing the value of the summer excursions in preserving the lives of infants. In several other cities a system somewhat similar has been inaugurated. But these charities are not identical with this institution.

there is no reason why it should not), it must follow that the continuous system will be the most economical use of both money and time, and by reason of its more positive results it will save the greater number of lives, whilst at the same time increasing the number of admissions because of the less number of days each patient will remain on the invalid roll. But the saving of money must not be the main consideration in the management of this department. The aim should be to accomplish the greatest good to the greatest number. Whatever may be the daily capacity of this department, the tri-weekly system would double the number of beneficiaries, but there are as good reasons why it should not be the only one, as there are why it should be a part of the general plan. To it may be transferred the convalescents from the daily class, and may be admitted those only slightly sick, the cases of relapse, and children of parents who cannot incur the inconveniences and increased current expenditure of a daily excursion.

To popularize the institution and establish it in the affections of the people, the most intelligent and thoughtful discretion will be required successfully to combat the various elements of antagonism. These antagonisms grow out of ignorance, vice, poverty, or destitution, or some combination of these factors. The ignorance is not so much an incapacity to learn as it is the absence of instructive example and proof of certain benefit. These will be presented in every case of sickness cured, and every ill child restored to vigorous health will become a teacher of a school of loving parents, who will picture with graphic enthusiasm the good results, and exhibit the proof in the sturdy health of the infant. Unfortunately, however, deaths will occur; and though such an event is oftentimes soon forgotten by such people, because another supplies the place, or the after-coming baby soon solaces all sorrow; nevertheless, every death will be an instance and proof of failure held in remembrance by the croakers and malcontents to be found in all grades of society and in every circle of acquaintance. It cannot be expected that the institution

will ever be free from such unjust criticism, but as the life roll will so far exceed the death roll, and each recovery will continuously multiply itself in an increasing ratio of recruits, whilst the grave will hide from view and time will efface the memory of each successive death, the mass of people will eventually, and very soon under proper management, accept the visible evidence of the value of the summer sanitarium.

As a practical instructor in personal and domiciliary hygiene, and the selection and preparation of aliment for and feeding of young children, this department should occupy a field hitherto neglected. Its method of teaching by the exhibition of good results and the constantly increasing number of children restored to health will accomplish more, and in less time, in the direction of preventive medicine than could otherwise be attained. This educational influence will not be limited to the beneficiary classes or confined to the city of Baltimore, but will be widely disseminated. As a pioneer institution in an enterprise so important and so closely concerning the health interests of large and densely populated communities, it cannot take the hazard of failure by intrusting the performance of its simplest duties to incompetent agents. It will probably never be possible altogether to prevent the summer intestinal ailments of young children, and it will be equally impossible to restore every case to health; but the education of the masses in the causes, methods of prevention, and proper management and treatment in the early stages will diminish their frequency and vastly lessen their mortality. It may indeed be surmised, even before the selection of the location or the determination of the plan of the necessary structures, that its most valuable contribution to the welfare of society and to the wealth and power of the city and nation will be in the instruction of the general public in the art of preserving the health and prolonging the lives of little children.

The obstacles which poverty and destitution may interpose will, in a measure, be beyond the reach of any educational influence. Undoubtedly the general diffusion of a knowledge

of the laws of health and disease will tend to diminish suffering, want, and poverty, and in time to come the agency of this institution will be recognized as an important instrumentality in effecting the betterment of the condition of the pauper classes. But at present it is not so much the incapacity and unwillingness of the poor and destitute to be taught, as it is their inability to accept even a gratuitous benefit at the expense of a trivial loss of time, or a penny's addition to current expenses. It so happens, however, that in every civilized community there are individuals, organizations, and societies whose sympathies are keenly alive to the wants and sufferings of little children, to whom it will be necessary only to make known their indigence to obtain for them abundant supplies. The goodness of a woman's heart and the innate love of the sex for children will always find the ways and means to meet all such demands.¹ It may be accomplished by some organized system of discovery which will send its agents into the homes, alleys, and hovels where want, hunger, and disease are to be found, and the establishment in connection therewith of depositaries in different parts of the city where can be collected cast-off garments and donated fabrics suitable for the manufacture of clothing, and other articles of daily use; and where also needy mothers, without work, may find employment, at even better wages than could be obtained from dealers, in making and repairing such necessary wearing apparel as might be dispensed to those in need. In this manner the scraps and remnants of unused fabrics and abandoned clothing, not unfrequently sold by pilfering servants to the rag-gatherer, at the alley-gate, might be utilized in

¹ The St. John's Guild, of New York, has established, in connection with its other charitable operations, a sewing department, in which women and girls are taught to do "shop work," and which gives them such employment as it can during the winter. "Lady volunteers are brought into immediate association with the poor and hungry sisters who are unable to earn a livelihood, and those who are blessed with culture, intelligence, and influence give the helping hand which puts the less fortunate in the way of comfort and independence." (Report of 1880.)

securing the privilege of the health excursions to many little children to whom it would otherwise be inaccessible.

It may not be any part of the duty of this institution to clothe naked and feed hungry children, but clothing, cleanliness, and food¹ are the essential adjuncts of a health excursion, and very many will be excluded unless some plan is devised by which assistance in these particulars can be rendered. If not incumbent upon the management, it will be none the less the part of wisdom to secure through auxiliary organizations the coöperation of the benevolent in promoting the health interest of the destitute class. In almsgiving, as in matters pertaining to health, the general public needs instruction. System and organization in such activities are far more effective and economical than individual effort. Thoughtless and indiscriminate almsgiving is a prevailing and reprehensible practice. It encourages vice and idleness, degrades honest poverty, and invites the infliction of cruelties upon defenceless children. In every populous city children are driven, hungry and half naked, by wicked and debauched parents, to walk the streets in sunshine and in storm, and beg with outstretched hands and lying lips of every passer-by a penny's worth of bounty ; and woe betide the thriftless beggar-child who, having through many weary hours, in tutored cadences, sung and re-sung the Miserere of the sick and starving little ones at home, returns to the wretched lodging with an empty pocket. The aggregate amount of money thus contributed annually, and worse than wasted, can never be ascertained, but in all probability it far exceeds the sum which could be diverted, even if the custom was abandoned, to proper and charitable objects, for there are very many persons, who will dismiss a beggar from their presence, with a liberal dole before the story of his suffering is half completed, who would higggle half an hour rather than give a half dime to any benev-

¹ On each excursion of St. John's Guild "every woman and child received an abundance of substantial and well-cooked food, consisting of fresh meat, vegetables, bread, butter, milk and (when recommended by the doctor) tea."

olent purpose. No argument will convince such people of the indubitable fact that mendicancy will continue and increase so long as it commands a premium and can subsist on the bounties of the thoughtless. If half the money and material wasted by injudicious individual giving could be disbursed through a well-directed, systematic, and organized agency, destitution, suffering, and disease would be greatly lessened, and the condition of many paupers be so much improved that they would become not only self-supporting, but contributors to the wealth and power of the state. It has been truly said that "a large and healthy population is the life and strength of a nation, and the source of its success in science, art, agriculture, and commerce." The laboring classes are the instruments for the creation of wealth, and all the comforts and luxuries which it brings. Surely, then, it is the duty as well as the interest of every one to save the little children of this class from the preventable diseases which cost so many lives and such an immense loss of treasure. The densely inhabited courts and alleys of every populous city are so many gold mines, which properly and intelligently worked would yield more wealth than the fabled Eldorado. There is no lack of good intention or willing hands, but for want of systematic, concerted, and harmonious effort the sum total of good accomplished is far less than it should be.

There is also a class of over-zealous humanitarians whose good intentions are without a balance wheel and who are as profligate in disbursement as they are assiduous in the solicitation of alms. Upon a few petted and pampered favorites means and effort are lavishly bestowed, and luxuries are supplied, of the value and use of which the recipients know no more than a brute does of a holy-day or sacerdotal ceremony; and, fortunately, it is so in many cases, for the waste of such largess is less detrimental than the uses to which they might be applied. It is the repetition of the old story of casting "pearls before swine." Health, nutritious food, decent protection of the person, and proper shelter are what poor children most need.

Among the affluent and society people there are very many whose good resolves, benevolent impulses, generous intentions, and liberal proposals are frittered away in harmless dissensions, weary formalities, individual rivalries, sectarian and denominational prejudices, or some other more frivolous and equally unfortunate exhibition of the weakness of human nature, or are permitted to languish and die out because of lack of force, indirectness of purpose, and absence of united effort. If the laity could be educated to a full realization of the facts that nearly one half of all children born die under five years of age, and that the larger part of this mortality results from preventable diseases, the better elements of nature, and the instinctive love of mankind for children, would dominate personal bickering and factious discord, and unite the mass of the better-to-do class in a common struggle to alleviate the sufferings and prolong the lives of little children. Who with these facts before him is exempt from responsibility, or would refuse to contribute his mite to such an activity? The medical profession has, especially during the present century, labored to combat the ravages of the maladies of early life, and has succeeded, through diligent research, skilled observation, discovery of new remedies, and more scientific treatment, in reducing the ratio of mortality under five years of age. Much more remains to be done by curative, but far more may be accomplished by preventive measures. In this, as in the study of the nature and treatment of disease, the science of medicine must assume the leadership. The art of preserving health is not, however, the exclusive prerogative of physicians; unsupported by public opinion and unaided by the civil authorities the profession can do little more than point out the evils of bad hygiene and suggest the methods of correction; and, perhaps, here and there impress a discreet mother with the folly or wrong of a blind adherence to the customs of a grandmother, or to the dicta of a venerable fossil who boasts that she has reared a dozen or more sons by stuffing them with the masticated pulp from her own morsel. The average man will listen to the doctor only when he fears

the devil awaits at his door to conduct his craven spirit to eternal perdition, and so soon as assured that the evil demon awaits in vain or has departed, his gratitude, generosity, and sometimes his sense of justice, ekes out in mere words of slaver. But then, it would be manifest injustice to charge all this extraordinary mortality to the derelictions of the laity. There are dunderheads in the medical as well as shysters in the legal profession ; and no other avocation in which man can engage affords such opportunities to conceal error, practice fraud, or misrepresent the truth. In the seclusion of the sick chamber and privacy of the consultation room, audacious and culpable ignorance oftentimes hides its venality and malpractice in the verbiage of a language unknown to ordinary people and unintelligible to the learned ; and sickness and sorrow are laden with the requisitions of misapplied and pernicious agencies, administered under the garb of a special skill in the treatment of the particular complaint, it matters not what that may be. Little children, whose remonstrances can be expressed only in the language of suffering and disease, are thus frequently victimized to the credulity of unsuspecting parents.

The summer sanitarium, with its liberal endowment and independent authority, possesses facilities and advantages never before equaled in this country for the education of the masses in the art of preserving health. It is charged with the special duty of alleviating the sufferings and prolonging the lives of little children. In this special department of sanitary science it must assume the leadership, and the good and bad results of its operations should be made known throughout the civilized world, that the good may be culled from the bad, and that other less fortunate communities may be educated by its example in the methods of saving life by preventing disease. To fully discharge this duty, as imperative as it is important, it must invoke the assistance and good will of all classes, high and low, rich and poor, learned and unlearned. To confine its operations within the limited sphere of simply furnishing, and providing conveyance to, a

country resort and play-ground, to which children may go at pleasure during the heated months of the summer, and to lose sight of the higher aim as an educator with unrivalled resources for the practical instruction of parent and the general public in personal and domestic hygiene and alimentation of young children, would be a sad commentary on the philanthropy of its founder.

It must necessarily seek through good report to inculcate its lessons of wisdom, rather than enforce them through the majesty of law. It is not probable that in a country where the sovereignty of the individual citizen is the unit of power that the salutary influence of law will ever be available to force acceptance upon those for whose benefit charitable institutions are established, but very much may be accomplished in matters pertaining to health by the enactment and impartial execution of health ordinances. The State of Maryland will never sanction, nor will the municipality of Baltimore ever enact a law to compel any class of its citizens to accept the gratuitous privileges of the Thomas Wilson Sanitarium, but the time is not far distant when public opinion will demand legislation in the interest of health far in advance of any that has heretofore been tolerated. The cupidity and self-interest of every citizen, if there were no higher incentives, will insist upon additional and more exacting legislation in sanitary matters. When the representatives of the whole people of the United States in Congress assembled can enact a law authorizing and directing policemen to enter any dwelling in the District of Columbia on suspicion that water is being wasted, and of his own volition cut off the supply, and arrest and drag to trial the head of the family, the time ought not to be far distant when the same authority will declare domiciliary and personal filth, bad air, over-crowding, spoiled food, malaria and infection nuisances detrimental to health and decency; and neglect, bad nursing of and cruelties to little children, and bad cooking misdemeanors punishable by fine or imprisonment. Such authority may be irresponsible, but nevertheless a system of house-to-house inspection under

the direction and management of a properly organized health department must sooner or later become a part of the municipal code of every populous city. It will be dictated by a sense of self-security, and protection from the preventable causes of disease, and by considerations of gain and economy. As an aid to the success of the sanitarium a municipal health department will be an important if not a necessary adjunct.

THE DOMICILIARY OR HOSPITAL DEPARTMENT.

To this department will be admitted those children who will need constant and continuous care, nursing, and feeding, for a shorter or longer time, under the immediate supervision and direction of skilled management. The determination of the earlier age of admission must therefore be made before the construction of the necessary buildings, and involves many important considerations.

The reception of nurslings from the date of birth will concede the right of the mothers to accompany their infants, and incur the additional expense of providing proper accommodations, and the maintenance of a number of mothers. The capacity of the institution as a place of temporary domicile must be limited by some definite relation of the size and plan of the buildings to the number of patients and area of territory, otherwise it might cease to be a sanitarium supplying fresh and invigorating air to its occupants. The admission and support of such mothers would diminish the number of children at any particular period at least equally with the number of the women, nevertheless the educational advantages which such women might derive by even a single summer's sojourn in such an institution may more than compensate in its remoter results for the diminution in the number of its beneficiaries.

It is a lamentable fact that much disease and suffering among infants and a very large percentage of the mortality is directly traceable to the ignorance and mismanagement of mothers. Most young mothers are entirely ignorant of their duties, and of the dangers which beset infantile life. They

eagerly accept any information volunteered by a nurse, or the officious suggestions of a maiden aunt or of the neighbor, "so good in sickness," and learn when it is too late that the skill and experience of a well-educated physician is far more valuable than the advice of any casual observer, however intelligent.

The time has come when many otherwise well-meaning persons, who assume to direct the medical management of sick children, should recognize the responsibility incurred by attempting to do that which only those skilled in the science of medicine can hope to do successfully. No one will submit the delicate machinery of a watch to the rough usage of a blacksmith, yet the disorders of infancy, oftentimes trivial in the beginning, are frequently made worse by dosing with unsuitable medicaments, because a neighbor's child happened to get well in spite of similar bad treatment. It is only the educated eye, touch, and judgment which can properly detect and value symptoms and their slight differences. Amateur doctoring may occasionally (Annie M. Hale, M. D.) do well, but it is an unsafe dependence.

The teaching of mothers how best to nurse and to feed those needing artificial alimentation, either because of insufficient supply or inferior quality of breast milk, or who may have reached the age when additional food is necessary, is an important and indispensable requirement of any systematic effort to prevent sickness and to lessen the mortality of early life. The only efficient method of accomplishing this, especially among the poor and ignorant classes, is practically to instruct them by making them, under the immediate observation of competent superintendents, perform every necessary act in selecting, properly preparing, and preserving suitable articles of diet, and in the time, quantity, and manner of feeding. Verbal directions are too often forgotten, and when written the language is frequently misunderstood. Many infants are sacrificed through inattention to or omission of some apparently trivial matter, not because of neglect or unwillingness to do, but because of incapacity, ignorance, or want of

method. Milk, which is so universally employed as an article of diet, is frequently supplied in sufficient quantity and of good quality, but is spoiled either by some improper mode of preservation or preparation, and thus is not only rendered unfit as an aliment, but the cause of serious and often fatal illness. Even when not otherwise injured it may be fed from an unclean vessel, or sucked through a dirty mouth-piece.

The education of such mothers is not free from difficulty, and many will, after their discharge from the institution, relapse into their former habits; but some, thus thoroughly trained, will become instructors, each in her respective circle of acquaintance. The proverbial fondness of women for imparting to others what they think they know of the management of children may be thus utilized as a channel through which useful information may be disseminated, many errors corrected, much sickness prevented, and many lives saved. To a limited extent at least, dependent upon the capacity and intelligence of the women, each will acquire by observation and association some knowledge of the causes of disease and how to avoid them, of its course, and of favorable and unfavorable symptoms; but, perhaps more important than all things else, she will be taught to know that the summer infantile ailments are preventable and curable. The education of mothers to this single conviction, coupled as it must necessarily be with the realization of personal responsibility for the welfare of her nursling, will effect vast improvement in infant hygiene, and strike at the root of parental indifference and neglect.

If, however, the advantages of the sanitarium are accorded to infants whose mothers (poor and needy though they be) are animated by the tender sensibilities and affectionate care known only to a mother, and who supply the natural and necessary aliment to the child, can it be denied to foundlings and other nurslings who may have been deprived, through the accidents of labor and by disease, of maternal care and sustenance? The admission of the abandoned and motherless classes of nurslings would impose additional cares, incur grave

responsibilities, and probably augment the current expenditures; but mere considerations of policy, which do not present insurmountable obstacles, should not determine their exclusion. It is true that most large cities are provided with hospitals and asylums for the reception and care of foundlings, but there always will remain a number of these, and very many motherless infants who find refuge among kindred, and in poor and needy families, who will not relinquish to any institution permanent possession of their wards, to whom the privileges of a summer's retreat from the heated air of the city and the baneful influences of squalid habitations will prove a boon of inestimable value.

During the first or nursing period the probability of sickness and mortality are disproportionately larger than during the subsequent periods of childhood. The greatest mortality occurs during the first month,¹ and though it gradually lessens during each succeeding month, it aggregates at the termination of the first year one fourth of all the births.

The causes which conduce to this mortality include the unavoidable diseases inherited from one or both parents, the congenital diseases and defects of formation, and the numerous preventable disorders specially incident to infantile life. Many of the congenital diseases and malformations are incurable and, perhaps fortunately, terminate life during the earlier months; but some of the transmitted vices of constitution are remediable. The syphilitic infection submits, as a rule, to early medication and suitable regimen; and the scrofulous and phthisical predispositions, if not entirely eradicated, are

¹ Quetelet says: "There die during the first month after birth, four times as many children as during the second month after birth, and almost as many as during the entirety of the two years that follow the first year, although even then the mortality is high. The tables of mortality prove, in fact, that one tenth of children born die before the first month has been completed."

In the city of Baltimore there died during the years 1875-78, 8,549 children under one year of age; 3,563 between one and two years of age; and 1,868 between two and five years of age.

frequently so modified and improved by timely and appropriate hygienic and dietary regulations as to insure comparative good health throughout a long and useful life. But it is the preventable causes of disease which demand special attention in an institution of this character. And, notwithstanding the marvelous advances in the treatment and prevention of the diseases of early life during the past decade, the opportunities for further improvement are limited only by the constantly increasing population of the habitable world. The perfection of life and happiness cannot be attained while such a large proportion of children die under five years of age from avoidable diseases.

The post-natal causes of the morbidity and mortality of the nursing age find their origin in the condition of the body as well as in the circumstances of life. With the completion of birth, important changes take place in the organism. The function of respiration begins, and the lungs, previously only passive and non-essential adjuncts of intra-uterine life, are suddenly and violently transformed into organs, without which an independent existence cannot be sustained. The circulatory system becomes self-sustaining, receiving oxygen and eliminating carbonic acid through the lungs; the alimentary tract, which previous to birth was only the receptacle of *débris*, now assumes the important functions of digestion and depuration; the skin, which had been bathed in the high temperature of an innocuous fluid and protected by the more or less thick coating of a fatty secretion, is suddenly exposed to the detrimental influences of a medium of greatly lowered temperature, and subjected to the cruel formalities of superstition, ignorance, and destitution; and the brain, which at birth is a semi-diffuent mass of material, begins a rapid growth, with increased blood supply and organization of nerve and intellectual organs. To these must be added the delicacy and softness of the anatomical structures, and the helplessness common to all and the feeble vitality of many.

These developmental changes are the physiological attributes of infantile individuality; nevertheless, the new duties thus imposed upon the organs involved entail a tendency to

special diseases, which is vastly increased by the improprieties of infant hygiene and the circumstances of life. The death-rate is higher among the first born than among subsequent births; higher in cities, more especially in the densely populated parts, than in the country; higher among the needy poor than among the affluent and well-to-do; higher in localities where those employed in manufacturing industries reside, than in agricultural regions; higher during the prevalence of epidemics than during seasons exempt from such deleterious influences; and higher among the illegitimate than among those born in wedlock. All these contingencies of life are more or less favorably impressed by the life, dwelling, habits, and education of the family. This mortality is not, however, confined to the children of the poor, or of those living in narrow and foul alleys, or of the dwellers in the ill-ventilated and stinking tenements of populous cities, nor to the improperly fed, to the early weaned, the harshly treated, or the imprudently exposed, for all these causes are, presumably, of as frequent and constant occurrence during the winter as during the summer months; yet it is during June, July, August, and September that the greatest mortality annually occurs. It is during these months that the highest mean monthly temperature prevails. This general relation of mortality to a high average temperature is exhibited by the appended tabulated statements,¹ and is no less true of the city of Baltimore than

¹ TABLE I.

[Prevailing direction of winds in summer months, S., S. E., S. W. In report of deaths under one year of age, still-born not included.]

	TEMPERATURE.							
	Highest and Lowest.				Mean Monthly.			
	1875	1876	1877	1878	1875	1876	1877	1878
January.....	52- 1	71-17	54- 1	57- 6	30.1	41.5	32.1	35.7
February.....	59- 3	65-12	63-18	63-20	29.3	37.8	40.5	47.6
Mar. h.....	63-19	69-12	65- 9	72-21	39.5	39.8	41.4	49.3
April.....	74-23	75-30	80-32	79-42	49.4	52.1	53.6	58.7
May.....	88-42	88-34	92-41	85-43	64.1	64.2	62.7	63.5
June.....	97-54	95-51	95-55	92-51	73.7	75.9	73.7	70.1
July.....	96-61	99-59	93-64	98-65	78.0	80.4	78.7	80.8
August.....	88-58	90-55	94-63	92-59	73.4	75.9	77.6	76.9
September.....	92-43	88-45	88-48	87-47	65.9	65.6	67.9	69.3
October.....	77-34	77-30	80-41	80-35	55.5	52.4	59.7	58.7
November.....	65-16	76-25	68-25	61-33	42.9	47.1	48.4	47.3
December.....	67-12	56- 1	67-22	61-15	38.3	28.7	43.5	35.4

of other large manufacturing cities. It is less in sparsely populated localities, less still in elevated regions, and least when to these conditions is added aridity. Then to the baneful influences of bad air, improprieties of diet, injudicious feeding, malnutrition, elevated temperature, personal neglect, and destitution must be added the conditions of moist atmosphere, lowness of situation, and the congregation of a number of individuals within a limited area to complete the catalogue of causes and fill the measure of endemic requirements.

METEOROLOGICAL INFLUENCES.

The fact that very many young children die annually of the summer complaints¹ who are free from the detrimental

TABLE I. *Continued.*

	DEATHS.											
	1875.			1876.			1877.			1878.		
	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.
January...	133	39	78	116	74	35	121	85	41	104	58	29
February...	153	66	70	131	62	45	122	112	35	120	44	32
March.....	141	54	54	152	99	45	144	155	65	151	63	41
April.....	113	42	38	101	56	41	135	109	42	103	44	32
May.....	119	29	53	105	63	28	121	88	44	161	43	33
June.....	238	43	36	549	88	20	382	176	43	270	58	37
July.....	489	66	49	418	105	20	423	140	34	257	53	34
August....	259	91	25	261	119	31	248	133	35	203	65	35
September..	174	90	28	154	70	34	167	109	44	125	67	34
October....	165	71	22	104	49	22	98	59	57	117	42	33
November..	101	46	25	89	45	25	96	63	35	116	34	46
December..	133	68	30	137	95	52	125	80	43	107	33	53
Total....	2,216	705	508	2,317	925	398	2,182	1,329	518	1,834	604	444

¹ "To determine the precise extent of their prevalence in any community is impossible, so inaccurately are the diseases of infancy and childhood everywhere registered. Cases of fatal diarrhœal diseases are recorded under a great variety of designations, among which the following may be enumerated, as being the least equivocal: diarrhœa, cholera infantum, cholera morbus, enteritis, gastritis, gastro-enteritis, entero-colitis, inflammation of the bowels, dysentery, etc." (Curtis, Hygiene and Public Health, vol. ii., p. 281.)

influences of foul air, privation, uncleanness, over-crowding, and improper alimentation, points to some general agency, probably atmospheric, which affects alike all classes and conditions of life. When to this is added the further fact that these diarrhœal diseases are almost exclusively confined to the heated months of the year, and are more prevalent in low and damp localities and during seasons of excessive rainfall, the conclusion seems manifest that continuous high temperature and a humid atmosphere are essential elements of causation; yet that these two climatic elements are not the only necessary considerations is equally evident from the fact that these disorders are much less frequent in the Gulf cities and those on the Pacific coast, where the temperature is more uniform during the entire year, than in the cities of the Middle and Northern States, which are subjected to very wide excursions of temperature between the extremes of heat and cold. Professor N. S. Davis,¹ of Chicago, who has studied the relation of bowel complaints, both in children and adults, to temperature and geographical region submits the following conclusions:—

(1.) They are far more destructive to infants than to adults.

(2.) They prevail almost exclusively during the warmest months of the year.

(3.) They are most prevalent in the region of this country north of the north line of the Gulf States, and east of the Rocky Mountains.

He asserts two additional facts, not previously recognized, which are of great importance: First, that these diseases occur in groups when the cases rapidly multiply during successive days for a week or fortnight, followed by an interval during which few or no cases occur; and, secondly, that these groups correspond with the waves of continuous high temperature during day and night, which spread, at shorter or longer intervals during the summer months, over the northern climatic belt of this country, lasting from three to fourteen

¹ Trans. Amer. Med. Ass., vol. xxx., 1879, p. 145.

days, and varying in intensity at different times and in different years. The first of these tropical waves usually occurs during the latter half of June, two or more occur in July, and one or two in August.

To ascertain, with probable accuracy, the time of occurrence and duration of these periods of continuous high temperature at different localities in the climatic belt of the country in which they annually recur, together with the additional information set forth, the following inquiries were addressed to General Albert J. Myer, Chief Signal Officer of the Army:—

(1.) The date of beginning and duration of the periods of continuous high temperature for the cities of Washington, Baltimore, New York, and Chicago, for the years 1876, 1877, 1878, and 1879; and the mean daily temperature of each period. No period of less than three days to be considered.

(2.) Amount of rainfall at same places during each period or at their termination.

(3.) Relative humidity of the air at each place during each period.

The accompanying tabulated statement (Table II.), courteously supplied by that distinguished officer, fully answers these inquiries.¹

The cities named were selected without any previous examination of the data to be supplied, or knowledge of the information to be derived therefrom. If a lower standard than that of the normal for July at each locality with the addition of ten degrees had been adopted in the preparation of the statement, the periods of continuous high temperature would have been more numerous and of longer duration than

¹ The writer takes pleasure in acknowledging the polite and valuable assistance, which Lieutenant Craig and Professor Abbe have, with the permission of General Myer, rendered him in his effort to study the relation of the meteorological phenomena to the causation of infantile diarrhœas. He has been supplied, upon request, with data from the official records of the bureau which have enabled him to consummate the results set forth in these pages.

TABLE II. — *Statement showing the Periods, in the Months of May, during which the Temperature of the Air rose Ten Degrees or more City, N. Y., and Washington, D. C.; also, showing the Mean Temperature during the specified Periods. Compiled from the Records on file at*

1. The normal for July, with ten degrees added, is as follows:
2. The dash (—) in the columns for the rainfall indicates that the

BALTIMORE, MD.					CHICAGO, ILL.				
DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.	DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.
	Max.	Mean Daily.				Max.	Mean ally.		
1876.					1876.				
June 24	90°	80.7°	59.7	0	June 24	85°	78°	70.7	0
25	90	81.7	57	0	25	85	79.2	72.3	0
26	94	84.	58.7	0	26	87	80.5	72.7	.04
27	95	85.	57.3	—	July 6	90	80.2	77.3	0
28	93	80.7	66	.59	7	93	84.7	66.3	0
July 2	94	85.2	68.7	0	8	93	85.7	61.3	0
3	93	84.7	54.3	0	9	93	83.7	64.7	.02
4	95	80.7	61.7	.22	Aug. 22	85	77	62.3	0
5	92	82.7	67.7	.15	23	92	83.2	64.7	0
6	90	81.2	61	.01	24	85	79.2	75.7	.88
8	97	88	59.7	0	1877.				
9	99	90.2	53.3	0	July 7	86	77.7	67	0
10	97	88.2	60.7	0	8	91	80.2	72.3	.01
11	96	84	70.3	.21	9	89	78.5	82.3	0
12	96	82.7	68.3	.05	26	88	80	72.7	.02
13	95	83.2	68.7	.25	27	86	78.7	72	.01
14	91	83.2	65.3	.90	28	84	76	87.7	.54
15	91	81.7	63	.01	Aug. 26	84	74	63	0
16	90	81.2	51.3	0	27	89	77	78.7	.04
17	90	82	61.3	0	28	84	74.2	83.3	.46
18	93	83.7	60	.15	1878.				
19	92	85.5	67	0	July 7	85	78.7	72.7	0
20	97	87.7	64.3	.19	8	86	78.5	76.7	—
1877.					9	87	79	73.7	.11
July 25	92	81.5	59.3	.01	14	87	81	77.3	0
26	92	84.2	62.3	0	15	88	82.5	71	0
27	93	84	72	.50	16	97	88.2	61.7	0
28	92	79.5	76	.02	17	95	89.2	61.3	0
1878.					18	88	75.7	74	0
July 4	92	81.5	67	0	1	89	80.2	55.7	.01
5	92	83.7	61.3	0	Aug. 1	87	78.5	56	.09
6	92	83.7	48.7	0	2	84	77.2	66.3	0
7	90	81	54.7	0	3	84	77.7	67	0
8	92.5	81.2	71.3	.02	4	85	78.5	65.7	.12
9	91	82.2	73	.32	5	87	77.7	71	0
10	94.5	84.7	62	.26	1879.				
11	91	84.2	60	0	June 23	86	78.7	58.7	0
17	91	82.2	73.7	0	24	87	79.7	61.7	0
18	98	88	62.3	0	25	85	79.7	59.7	0

June, July, and August, of the Years 1876, 1877, 1878, and 1879, above the July Normal at Baltimore, Md., Chicago, Ill., New York perature, Mean Relative Humidity, and Total Rainfall for each Day the Office of the Chief Signal Officer, U. S. A., Washington, D. C.

Baltimore, 89.6°; Chicago, 84.4°; New York, 84.9°; Washington, 89.3°. amount of precipitation collected in the rain gauge was too small to measure.

NEW YORK CITY, N. Y.					WASHINGTON, D. C.				
DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.	DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.
	Max.	Mean Daily.				Max.	Mean Daily.		
1876.					1876.				
June 24	88°	77.7°	69	0	June 25	91°	80.6°	58	0
25	87	78.2	53.7	0	26	93.5	83.7	61	0
26	92	80.5	61	0	27	96	84.2	58	.02
27	90	79.5	67.3	.03	28	95	80.2	68.3	.84
28	89	79.5	62.7	0	29	91.5	80.7	72.7	.03
29	85	77	56.7	0	July 1	91	82.4	69	—
30	87	78.7	58.3	0	2	94.5	86.1	64.3	0
July 2	94	85	61	0	3	91	86.2	53.3	—
3	88	80	58.3	0	4	96	81.5	63.3	.31
4	90	81.2	57.7	0	5	94	84	66.3	.01
5	86	80.7	64	0	7	92	83.1	65	0
6	85	77.5	50.7	0	8	95	86.7	63.7	0
7	88	77	51.3	0	9	97	87.7	60.7	0
8	98	83	65.7	0	10	97	83.7	79.7	.10
9	99	84.5	61.3	0	11	98.5	87.1	59.3	—
11	90	80.2	68.3	1.97	12	98	85.7	61.3	—
12	91	80.5	75.3	0	13	93	82	70.7	.30
13	97	84.5	54.3	0	14	91	81	74.3	.03
14	89	79.2	68.7	.01	17	91	82.7	64	0
15	93	81.7	53.7	0	18	93	85	59	0
16	87	77.	54	0	19	95	86.7	63.3	—
18	88	80.5	69.7	.38	20	98.5	87.2	66	0
19	95	81.7	64.7	.05	Aug. 15	91.5	80.4	73.7	0
20	93	83	71.3	.03	16	93	82.2	66	0
21	88	79.7	50	.10	17	90.5	80.2	73.3	0
Aug. 6	87	77.5	71.3	0	1877.				
7	90	79.5	74	.60	July 25	90.5	81.2	65.7	0
8	89	80.7	52.3	0	26	96	87	62.3	0
9	86	76.2	58.3	0	27	98	83.2	70.7	.39
1877.					28	95	79.7	79.7	1.30
June 1	85	75.7	45.3	0	Aug. 27	91	80	66.3	0
2	88	76	53.3	0	28	92.5	81.7	71.7	0
3	85	73.5	61	.18	29	94	83.2	62.3	0
July 24	87	79.5	58.7	0	30	89.5	80.5	64.3	0
25	90	80.5	59.7	0	31	91.5	80.5	63	0
26	93	84.5	50.7	0	1878.				
Aug. 26	85	79.5	73.3	0	July 2	89.5	79	75.3	—
27	90	78.2	57	0	3	91	81.7	69.7	0
28	88	79	63	0	4	94	83	67	0

TABLE II., *Periods of High*

BALTIMORE, Md., <i>Continued.</i>					CHICAGO, ILL., <i>Continued.</i>				
DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.	DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.
	Max.	Mean Daily.				Max.	Mean Daily.		
1878.					1879.				
July 19	95.5	84.7°	62.7	.17	July 13	86°	82.2°	64.7	0
20	92	84.7	63.7	0	14	91	86.2	58.7	0
21	95	85	62.3	.05	15	93	88.7	64.3	0
1879.					16	90	75.5	56.3	0
July 15	94	84	55	—	Aug. 1	88	82.2	48.3	0
16	99	90	49.3	0	2	91	84.7	53.7	0
17	91	82.5	39.7	0	3	85	77.7	72.3	.01
Aug. 2	92	83.2	58.7	0	20	85	77.7	59.3	0
3	92	82.7	63.7	—	21	88	79.5	62	0
4	90	80.2	72.3	.26	22	87	81.2	55.7	0
5	90	82.7	68	0					
6	90	84.5	57.3	0					

Temperature, Continued.

NEW YORK CITY, N. Y., Continued.					WASHINGTON, D. C., Continued.				
DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.	DATES.	Temperature.		Mean Daily Humidity.	Rain. Inches.
	Max.	Mean Daily				Max.	Mean Daily.		
1877.					1878.				
Aug. 29	89°	77.2°	67	.13	July 5	91.5°	82°	70	0
1878.					6	93	83.5	58	0
June 27	87	78.2	62	0	7	91	80.5	52	0
28	88	80	57.3	0	8	96.5	83.7	66.3	0
29	86	77.5	62	0	9	93.5	82.2	71.7	.21
July 1	86	76	69.3	0	10	96	80.7	73.3	.10
2	87	76.7	72	0	11	93	84	65	—
3	88	77.5	76	0	12	93.5	80.7	79.3	.83
4	88	76.5	75.3	—	17	94.5	83.2	73	0
5	92	82.	58	0	18	98	89	63.3	0
6	85	77	38.3	0	19	96.5	83	74.3	1.10
8	88	77	73.7	.13	20	91	82.6	74.3	0
9	88	76.2	83.3	1.26	21	95.5	84.2	69.7	0
10	86	77	72.7	.02	31	91	80	68.3	—
18	93	83	74	.41	Aug. 1	93	81.5	75.3	.64
19	94	84.7	68.3	.01	2	89.5	80.6	61.7	—
20	87	78	59.3	0	3	92	80.5	63	0
Aug. 2	85	74.2	74.7	1.46	4	92	80.5	69.7	0
3	88	77.2	62.3	0	5	90	77.2	77.7	2.15
4	85	75.5	68.3	.12	1879.				
1879.					May 31	94	82.2	65.3	0
May 31	86	76.2	71	0	June 1	95	82.5	57.3	0
June 1	89	79.7	64.7	0	2	90	77	67	.45
2	86	75	70.7	.24	26	91.5	80	63.7	0
July 14	85	76.7	57.3	0	27	94.5	83.2	59.7	0
15	92	82.2	58	0	28	95	82.2	63	.09
16	94	78.7	70.7	.42	July 2	90	79.5	50.3	0
27	86	77.2	70	.06	3	95.5	83	50.3	0
28	85	76.5	75	0	4	99	84.7	50.3	.02
29	85	77.7	68.3	.01	14	91	79.2	55.7	0
31	89	77.5	54	0	15	98.5	86.7	52.3	0
Aug. 1	86	76.5	80.7	0	16	102	88.7	51.7	0
2	90	80.5	74.3	0	17	90	80.7	45	0
3	89	79.5	70.7	—	22	93	81.2	59	0
					23	93	83.7	53.7	.02
					24	91.5	81.2	64	.02
					Aug. 1	90	79.2	74.3	0
					5	94	81.7	63	0
					3	94	84	61.7	0
					4	92	80.5	73.3	.32
					5	93	83.2	71.3	—

are shown in the tabulated arrangement, but they would have been less distinctive as exacerbations of temperature, and consequently less valuable in exhibiting the relation of such periods to the prevalence of the infantile intestinal diseases. If the July normal at each of the four localities had been adopted as the basis, a more uniform temperature would have been shown for the months named at each of the places selected, and very many days would have exhibited a daily mean and minimum too low to be regarded as a heat factor in causing bowel complaints. In fact it would have transferred the question from the study of the exacerbations of temperature as a causal element to the consideration of the duration of summer heat as the essential and important agency.

The periods are of shorter duration in Chicago and New York, and occur quite as early as in Washington and Baltimore. The earliest stated began May 31, at New York, in 1879, and the latest terminated at Washington, August 31, 1877. The first usually begins during the latter half of June and either extends into July, or is succeeded, after a brief interval, by the second period, which most frequently begins during the first seven days of July. In 1876, a period began almost simultaneously in the four cities in June. Two or more periods usually occur in July, and the average maximum and mean daily temperature of the periods are uniformly higher in July than in either of the other months.

The normal for July is highest at Baltimore, but the highest average maximum temperature of the corresponding periods is at Washington. (See Table XII.)

A comparison of the four cities according to the average, for four years, of the maximum and mean daily temperature, and average relative humidity for the same period, will arrange the cities as follows:—

TABLE III.

	Washing- ton.	Balti- more.	New York.	Chicago.
Average maximum temperature . . .	93.9	92.9	88.5	87.4
Average mean daily temperature . . .	82.4	83.2	78.5	79.2
Average percentage relative humidity .	63.8	61.4	63	67.3

The atmosphere is never absolutely free from moisture. It is called dry when it contains less moisture than it might at the existing temperature; saturated, when it can contain no more; and damp, when its saturation is high relative to heat. The capacity of the air for moisture increases with the elevation of its temperature, but the relative saturation of a given volume of air diminishes with the rise of its temperature. As a rule, the body loses more water through the skin and lungs when the air is dry than when it is damp. A warm and damp air diminishes the radiation of body heat, exhausts the muscular and nervous system, lessens the appetite, impedes digestion, and obstructs the respiration. So that an average mean daily temperature of 79.2°, with an average mean daily humidity of 67.3 per cent., as is shown to be the condition of the atmosphere of Chicago, is more oppressive than the higher average mean daily temperature of Baltimore, with a lesser average relative humidity of 61.4 per cent. Applying this rule to the four cities, they may be arranged according to the data for the heated periods of the four years named; Baltimore possessing the most endurable temperature during those periods, and, successively, Washington, New York, and Chicago. Other things being equal, these meteorological observations would indicate that the city of Baltimore,¹ or its vi-

¹ The temperature differences between Baltimore and Washington are hardly appreciable, but the relative excess of moisture in the air of Washington favors the former city as the preferable locality of the two; assuming that the hygrometric observations are sufficiently accurate to distinguish between such slight differences of relative humidity.

cinity, would be the most favorable of the four localities for the establishment of a summer sanitarium for the prevention and cure of the bowel complaints of young children. The meteorological data are, however, as yet insufficient to determine the comparative healthfulness of different cities. Endemic influences, condition of soil, drainage, sewerage, local sanitary supervision, the character, pursuit, density, and privation of the population, altitude, food supply, and dwelling accommodations must enter largely into the consideration of the question.

The temperature of the air diminishes, approximately, in the ratio of one degree to every three hundred feet of elevation above the level of the sea; the probability of more frequent and stronger currents of air increases with the altitude, and the relative humidity of the atmosphere at any given point ought to increase with ascent above the sea level. The movements of the air bear important relations to its temperature and humidity. A calm, especially when the air is very warm, is detrimental to health, because the products of animal and vegetable decomposition, and the exhalations from living bodies, are not diffused and dispersed. Ventilation is inadequate for the demands of health. Upon the direction of the currents depends, in a great measure, the heat and moisture of the atmosphere. By the movements of the air the ventilation of dwellings is promoted, and the air is dried. The influence of winds upon the production of disease is not very well understood. Cold, damp northerly and easterly winds provoke catarrhal and pulmonary diseases. Hot, dry south winds are enervating, and are supposed to exercise a peculiar evil influence upon very young children. The relation of the winds to the prevalence of special diseases varies with the season of the year. A current that would mitigate suffering during July and August might greatly augment it during the months of December and January, or even in the balmy months of spring. The relation of elevation to the temperature, humidity, and movements of the air is an important consideration in directing the selection of a suitable location

for a summer sanitarium for sick children. Diminished heat, agreeable relative humidity, freer ventilation, a purer and more salubrious air, are curative and preventive agencies essential to the clinical success of such an institution. These can be secured by the choice of some of the elevated plateaux in accessible proximity to the city of Baltimore.

The data furnished by the Chief Signal Officer of the Army, previously summarized, lead also to very important and definite suggestions in regard to the time when an institution of this character should annually begin active operations. Preventive measures should commence before the time when the earliest period of continuous high temperature annually recurs, and continue sufficiently long to escape the probable time of the occurrence of the latest period. To cover the earliest date at which such high temperatures have occurred at Baltimore and Washington, the institution should be in readiness on or before the middle of June, and not close until the latter part of September or first of October. The latest period noted in the memoranda terminated on August 31, 1877, at Washington, with a mean daily temperature of 80.5° , and mean daily humidity of 64.3 per cent. Even though there might be few or no cases of disease after this date, the convalescent could not be safely returned to the city and to their lodgings before the temperature had fallen sufficiently to insure them against relapses. This is not likely to occur before the autumnal equinox.

The first period, usually occurring during the latter half of June, is quickly followed by another of longer duration, with higher mean daily temperature and mean daily humidity, which envelops the entire middle and northern parts of the country east of the Rocky Mountains, beginning in some localities as early as the first of July, in others usually not later than the fourth.¹ This exacerbation is followed by the greatest

¹ The average of the aggregate maximum temperatures of the fourth day of July for the cities of Baltimore, New York, and Washington, for the years 1876, 1878, and 1879, was 95.25° .

outbreak of bowel diseases among children.¹ Previous cases are made worse or suffer relapses, and a large number of new cases occur. Usually, two other but shorter periods follow this in the month of July.

As a rule the largest monthly mortality of children under five years of age occurs annually in July. The following tabulated statements (Tables IV. and V.) show that the total mortality of children under five years, and the death-rate from cholera infantum, dysentery, and diarrhœa for a period of seven years in Philadelphia, 1862-68, (excepting 1863) and in New York, 1871-77, were, for each year in either city, higher in July than in June, August, or September. The same is true of Boston.

If the mortality excess during July is due to the circumstance that very many children, taken sick during the tropical period of June, die during the succeeding month, then it ought to follow that the number of deaths should be greater in August than in July, because there are two or more exacerbations of temperature, and very many more children are taken sick in July than in June. Undoubtedly, a large percentage of the August mortality results from cases of sickness beginning in the preceding month. This fact, (as do the clinical and mortality statistics of July) indicates that the atmospheric condition peculiar to the summer months which seems to exert a specially detrimental influence upon children under five years of age is much more constant and intense in July than in either of the other months. What is this agency? It is not the heat of a single day, as has been shown to be usual with the Fourth of July, nor the heat of several consecutive days, each followed by cool nights, for

¹ In this connection it is proper to invite attention to the greater prevalence of disturbances of the alimentary tract in young children during the week following Christmas Day, the Fourth of July, and other gala days, due manifestly to the improper indulgences of the appetite. Parents and kindhearted friends are very often responsible for cases of serious and, unfortunately, sometimes fatal illness, which would not have occurred if they had adhered on such occasions to the simple and proper dietary to which the children had been accustomed.

TABLE IV. — Showing the Mortality for June, July, August, and September, in the City of Philadelphia for Seven Years, from Cholera Infantum, Dysentery, and Diarrhœa, during the First Five Years of Life, Compared with the Total Monthly Mortality from all Causes, and the Mean Monthly Temperature.

(Extracted from a Table by Meigs and Pepper.)

MONTH.	1862.			1863.			1864.			1865.			1866.			1867.			1868.					
	Mortality.	Total.	Mean Temperature.	Mortality.	Total.	Mean Temperature.	Mortality.	Total.	Mean Temperature.	Mortality.	Total.	Mean Temperature.	Mortality.	Total.	Mean Temperature.	Mortality.	Total.	Mean Temperature.	Mean Mortality for Seven Years from Cholera Infantum, Dysentery, and Diarrhœa.	Mean Total Mortality for Seven Years.	Mean Temperature for Seven Years.			
June . . .	31	1,002	69.14°	21	961	68.67°	99	1,245	72°	214	1,690	76.73°	80	1,168	73.04°	49	980	72.19°	86	1,201	71.99°	82½	1,178½	71.97°
July . . .	352	1,767	75.23°	368	1,859	77.07°	315	1,643	76.08°	457	1,868	77.82°	482	2,047	80.37°	477	1,795	76.48°	469	1,900	80.94°	417½	1,887	77.71°
August . .	258	1,755	76.70°	517	2,044	79.46°	308	1,956	79.40°	310	1,759	74.74°	443	2,401	72.5°	316	1,294	75.10°	380	1,570	78.42°	361½	1,828½	76.62°
September	73	1,087	69.36°	129	1,453	64.73°	54	1,251	65°	65	1,040	72.68°	117	1,362	69.42°	110	1,012	68.21°	160	1,353	68.80°	102	1,215½	68.31°

such periods of wide range of temperature between day and night frequently occur during the summer months, and even before and after, without any observable effect upon the health of infants. Continuous high temperature may be a constant factor, for the tables (IV. and V.) exhibit the correspondence of high monthly mortality with a high mean monthly temperature. Even the exceptional instance of the August mortality (1863) exceeding that in July corresponds with a higher mean monthly temperature for August of that year. And the same fact is shown by Table VI.

TABLE V.—*Showing the Mean Monthly and Annual Number of Deaths at New York, from Diarrhœal Diseases, of Children under Five Years, and at Different Ages under Five, for the Seven Years from 1871–77, and the Mean Monthly Temperature, Humidity, Rainfall, and Atmospheric Pressure for the same Years.*

[Compiled from data published by Dr. John T. Nagle, Deputy Registrar of Records, in the "New York City Record," March, 1878, vol. vi.]

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Diarrhœal Diseases under 5 Years.	44.4	40.4	50.6	67.6	86.9	295.4	1,383.4	843.6	447.0	170.6	63.1	41.7	3,434.7
Ages, One and under.	519.4	513.0	568.0	556.3	559.9	694.6	1,714.3	1,104.3	744.6	518.2	437.1	480.0	8,409.7
Between One and Two.	215.0	204.1	216.7	215.1	197.1	308.0	414.9	376.1	293.9	207.7	164.4	184.0	2,902.0
Between Two and Five.	267.0	253.6	279.4	248.3	244.0	212.6	230.1	188.4	186.0	199.1	223.3	249.0	2,760.8
<i>Meteorology.</i>													
Mean Temperature.	29.6°	30.7°	36.0°	46.7°	59.9°	70.4°	75.4°	73.6°	64.9°	54.2°	41.3°	31.8°	51.2°
Relative Humidity.	79	76	75	64	62	66	67	68	69	69	74	78	71
Rainfall, in inches.	3.05	2.65	4.47	3.88	2.57	3.17	5.33	5.41	3.60	3.96	3.90	3.96	44.35
Atmospheric Pressure.	1.029	.954	.897	.867	.883	.876	.868	.914	.952	.941	.934	.983	29.923

The following table, constructed by Dr. Curtis, shows the same relation of summer-heat to the diarrhœal mortality in the city of Boston.

TABLE VI.

Years.	Temperature at Cambridge Observatory.		Diarrhoeal Diseases.	
	Mean Temp. Fahr. July and August.	Mean Temp. during hottest Month.	Death rate per One Thousand Living.	Percentage to all Deaths.
1867	69.8°	70.4°	2.55	9.70
1868	71.6	73.6	3.10	13.20
1869	69.2	70.8	2.69	11.44
1870	72.3	77.9	3.63	14.92
1871	70.8	70.9		11.29
1872	71.9	73.1	4.10	13.41
1873	69.4	71.6	3.29	11.71
1874	68.6	71.5	2.70	11.32
1875	70.8	71.3	3.36	13.80

If the years 1867, 1869 and 1874, during which the death-rate from diarrhoeal diseases varied from 2.55 to 2.70 per 1,000 living, be compared with the other years, it will be seen that the larger number of deaths corresponds with the higher range of the temperature. Especially was this true with the year 1872, when the rate reached 4.10 per 1,000 living. In Massachusetts, the deaths attributed to cholera infantum alone amounted during ten years (1866-1875) to 18.6 per cent. of all deaths under five; in 1872, the percentage reached 24. During the same year the mean temperature of July, at New York, was 79.57°, being 3.43° higher than that of the corresponding month during the previous ten years. During the summer quarter of that year the deaths under one year in the city of New York amounted to 59.33 per cent. of all deaths, and of the total mortality under one for the whole year, as much as 40.8 per cent. took place during the three summer months. Of all the deaths in the year 15.9 per cent. were due to diarrhoeal diseases. Of these deaths 3,542 occurred under one year of age, making over 10 per cent. of the entire mortality of the year.¹ From these facts Dr. Curtis concludes that excessive heat is the most destructive influence, and is

¹ These facts have been collated from the article on Infant Mortality by Dr. Thomas B. Curtis, of Boston, whose accuracy as a statistician is universally recognized.

more acutely felt by children under one year of age than by the older. The Registrar of Vital Statistics¹ of the city of New York, however, ascribes the great excess of mortality in July and August of 1872 to the "extremes of solar heat and an almost saturated condition of the atmosphere."

Continuous high temperature may be a constant but cannot be the only meteorological influence, for the mean temperature of June is greater than that of September, yet the mortality of the latter month is usually much larger than that of the former. The duration of summer heat and the lateness of the August exacerbation, are additional agencies which may aid in accounting for the excess of the September mortality over that of June, but it is, probably, mainly due to cases of disease contracted during July and August, which have assumed a chronic form, many even running into October. The early days of September are usually hot enough to protract recovery and augment the danger, but the nights are cool, and the monthly mean for any series of years (58.30° in Philadelphia and 64.9° in New York for a series of seven years) is too low to be considered a heat factor in the causation of diarrhoeal diseases. A continuous high temperature, represented by high daily maxima, high monthly mean and duration, does not offer a satisfactory explanation. For during some years, at some localities, the highest mortality occurs in June with a mean temperature less than either July or August. Dr. Harris says² "the month of June, like the month of November, in New York, is conspicuously the most healthy month of the half-year to which it pertains. Mean temperatures of from 68° to 70° F. in June, and of 42° to 44° in November, seem to be almost equally favorable to life and health, so far as immediate results are concerned among the inhabitants of this city." The following comparison (see Table VII.) of the mortality under five years of age in the city of Baltimore, with the mean monthly temperature for the years 1875, 1876, 1877, and 1878, exhibits a very differ-

¹ Report of Board of Health, New York, 1873, page 238.

² Report of Board of Health, New York, 1873, page 160.

ent condition in that city from that which is shown to be the case in the cities of Philadelphia, New York, and Boston.

TABLE VII.—*Comparing the Mortality of the Months of June, July, August, and September, of Children under Five Years of Age, in the City of Baltimore, and the Mean Monthly Temperature, for the Years 1875, 1876, 1877, and 1878.*

MONTH.	1875.		1876.		1877.		1878.	
	Mortal-ity.	Mean Temper-ature.	Mortal-ity.	Mean Temper-ature.	Mortal-ity.	Mean Temper-ature.	Mortal-ity.	Mean Temper-ature.
June	415	73.7°	657	75.9°	501	73.7°	365	70.1°
July	614	78	523	80.4	597	78.7	344	80.8
August	375	73.41	411	75.9	436	77.6	313	76
September	292	65.9	258	65.6	310	67.9	226	69.3

If continuous high temperature and duration of summer heat were the predominant and constantly prevailing agencies, the maximum mortality should have occurred in August, whereas it is less in each of the four years for that month than in either June or July. And if heat alone was the acutely active influence, then the July mortality should have uniformly exceeded that of either of the other months; yet with a higher monthly mean temperature for each of the four years than the other months, its mortality in 1876 and 1878 was even less than that of June of the corresponding years. During the series of four years the mortality of June exceeded annually that of August, notwithstanding the mean temperature was less. A careful examination of the table (VII.) shows the constancy of the heat factors, but there must be some additional relation of solar heat, other than those previously named, which exercises a potential influence at Baltimore, in the month of June. In 1875, a heated term began at Baltimore on the 24th of June with a maximum temperature of 96°, and continued into the month of July. Practically it may

be said to have lasted through the entire month of July, which for that year exhibits a mean of 78°. In 1876 a period began on June 24th, with a temperature of 90°, which extended into, and was followed by a second one, in July; in 1877 the temperature rose suddenly on the 29th of May, and continued high throughout June, but there was no exacerbation according to the standard (in Table II.) adopted by the Signal Office, and but a short one in July, occurring as late as the 25th. June, 1878, was a temperate month with a mean of 70.1°, followed by two exacerbations in July. These data, compared with the mortality records, lead to the conclusion that sudden elevations of the temperature above the normal for July, at any locality, are specially detrimental to infantile life. Every fact connected with these meteorological observations corroborates this conclusion. This sudden elevation seems to be the potential agency which characterizes July at Philadelphia, New York, Boston, and other populous cities of the northern and western climatic zones, as the most fatal month of the year to children, and the most conducive to bowel diseases.

During the year 1872 the mortality of children under five was extraordinary during the months of June, July, and August in the cities of Philadelphia, New York, and Boston. To ascertain if this high death-rate could bear any relation to the exacerbations of temperature, the following data (Table VIII.) were obtained from the Signal Service Bureau. An examination of the statement exhibits the fact that in each of the three cities there occurred two exacerbations during the month of June of that year, the last one of which, extending into the month of July, was followed by one or more during the latter month, and three during the month of August at each locality. It thus appears that, at these cities, during this year, the periods were unusually frequent and severe, recurred at short intervals, and continued with unabated intensity until their cessation near the close of the month of August. So far, then, as the data are at command, the opinion previously expressed, in regard to the detrimental influence

of the periods of unusual high temperature, is fully confirmed.

TABLE VIII. — *Statement showing the Periods in the Months of June, July, and August, of the Year 1872, during which the Temperature of the Air rose Ten Degrees, or more, above the Normal for July, at Boston, Mass., New York City, N. Y., and Philadelphia, Penn., as recorded at the Stations of Observation of the Signal Service, U. S. A., at those Places.*

[Compiled from the Records on file at the Office of the Chief Signal Officer, U. S. A., Washington, D. C.]

BOSTON, MASS.			NEW YORK CITY, N. Y.			PHILADELPHIA, PENN.		
The Normal for July, with ten degrees added, is 81.8°.			The Normal for July, with ten degrees added, is 84.3°.			The Normal for July, with ten degrees added, is 86.3°.		
Date.	Highest Temp.		Date.	Highest Temp.		Date.	Highest Temp.	
June	12	93°	June	20	86°	June	21	*86°
	13	84		21	86		22	*91
	14	88		22	87		23	*86
	28	91		28	88		27	*87
	29	93		29	88		28	*87
	30	93.5		30	94		29	*89
							30	*92
July	1	98	July	1	95	July	1	*94
	2	92		2	*94		2	*96
	3	91		3	90		3	*96
	4	98.5		4	90		4	*92
	5	92		5	90		5	*89
	6	89		6	86		6	*87
	7	91		7	85			
	8	82					9	*86
	9	89		13	89		10	*89
	10	90		14	86		11	*86
	11	90		15	86			
	12	92		16	85		16	*89
	13	82		17	87		17	*88
	14	87					18	*92
	15	92	August	11	86			
	16	92		12	88	August	9	87
	17	86		13	85		10	88
				14	90		11	90
	19	88]		15	89		12	91
	20	87					13	92
	21	87		17	85		14	91
August	6	87		18	85		15	89
				19	89			

* Record of the highest exposed thermometer, there being no maximum in use.

TABLE VIII., *Continued.*

BOSTON, MASS. (Continued.)		NEW YORK CITY, N. Y. (Continued.)		PHILADELPHIA, PENN. (Continued.)	
The Normal for July, with ten degrees added, is 81.8°.		The Normal for July, with ten degrees added, is 84.3°.		The Normal for July, with ten degrees added, is 86.3°.	
Date.	Highest Temp.	Date.	Highest Temp.	Date.	Highest Temp.
August 7	89°	August 22	91°	August 21	86.5°
8	94	23	85	22	92.5
9	95	24	84	23	86.5
10	90.5				
11	86				
13	89				
14	83				
15	92				
17	86				
18	87				
19	91				
22	85				
23	87				
24	84				
25	87				
26	85				

The greater prevalence and higher mortality of diarrhœal diseases in July, which are always studied in connection with the uniformly higher mean temperature of the month, has led to the common error that a continuous high temperature, which is popularly and erroneously believed to be expressed by a high monthly mean, is the predominant and distinctive influence in the causation of the summer diarrhœas of infants. As yet no one but Professor Davis¹ has ventured to question the correctness of this almost universally accepted opinion. Any conclusion in regard to the causal relation of heat to disease, deduced from the comparison of high monthly mean temperatures with high mortalities, must necessarily be fallacious. Very different temperature curves may be represented by the same monthly mean. A month of high day maxima and low night minima, or one with nearly uniform day and night tem-

¹ See paper on Climate and Disease, by Professor Abbe, published in Nat. Bd. Health Bull., vol. ii., No. 3, July, 1880.

peratures, or one with acute exacerbation lasting for several days and nights and recurring several times, with intervals of greatly reduced temperature, might exhibit the same mean. If such months should show corresponding high means and high mortalities, still the relation of uniform high temperatures as the cause and excessive mortality as the effect would not be established, as is the general interpretation, for in fact the mortality occurred on days or was grouped in periods, corresponding at one time with a sudden ascent and at another with even a more marked fall of the temperature. The same mean may represent the same month at one locality with a very slight and at another locality with a very wide range of temperature, yet the mortalities will differ very greatly at the different localities; and at the same locality the corresponding months of different years, even though the mean may be the same, will furnish very different percentages of deaths from the bowel diseases. If a climate represented by a mean monthly temperature varying from 70.4° to 73.6° for the hottest month during a series of seven years, 1867-1875, is so conducive to bowel diseases and detrimental to infantile life at Boston, why should the same range of mean be a less potential agency at Philadelphia, or afford comparative exemption from those diseases at New Orleans? Similar comparison may be made between different cities with corresponding monthly means with like unequal mortality results. A careful analysis of the foregoing temperature and mortality statistics of the several cities absolutely invalidates the prevalent belief that a temperature uniformly above the July normal at any locality is the meteorological influence most conducive to intestinal disorders or detrimental to infants. If there was no other circumstance, the fact, admitted by all, that those diseases are less prevalent and less fatal in the cities bordering on the Gulf of Mexico,¹ should be conclusive, as in these

¹ According to the statistics of Dr. Gibbons, Jr., Health Officer for San Francisco, in 1873, the ratio of death from cholera infantum in children under two years of age was in San Francisco only 5 in every 10,000 of the population, and in New Orleans only 7; while it was 24 in Boston, 25 in Brooklyn, 34 in Chicago, and 21 in Omaha.

cities the season of high temperature begins earlier and lasts longer, and the temperature is more continuously above the July normal, with less daily range and fewer violent fluctuations, either of ascent or descent. In corroboration may be cited the following additional facts: the lesser liability to and mortality from those diseases in the sparsely populated rural districts than in the city adjacent, which must be subject to the same meteorological conditions; the same relative infrequency of sickness and death among the well-to-do-class, who, as the indigent and laboring classes of the same city, suffer like influence of the solar heat; and the marked increase of the diseases and mortality among the negro race in the Southern cities since the emancipation, who now, as before the war, live in a region of continuous high temperature. To prove the utter fallacy of the opinion that continuous high temperature is the predominant and potential influence causing these diseases, the following data (Table IX.) have been collected

TABLE IX. — *Showing the Ratio of Mortality from Cholera Infantum to every 10,000 of the Population for 1873, in the Cities named, and the Monthly Mean Temperature and Range for the Months named in the same Year at the same Places; and also showing the Latitude, Elevation, and Rainfall.*

	San Francisco.	New Orleans.	Boston.	Brooklyn. ¹	Chicago.	Omaha.
Ratio of Death in every 10,000 of population	5	7	24	25	34	21
Mean temperature of May	53.6°	73.7°	56.8°	57.6°	53.9°	59°
Range of temperature for May	27°	23°	35°	44°	52°	49°
Mean temperature for June	57.8°	80.1°	67.2°	68.9°	70.2°	74.4°
Range of temperature for June	17°	15°	46°	41°	48°	42°
Mean temperature for July	57.9°	82.4°	72.9	73.9°	71.2°	75.7°
Range of temperature for July	22°	20°	41°	39°	43°	43°
Mean temperature for August	59.1°	81.2°	68.8°	71.4°	71.7°	77.1°
Range of temperate for August	18°	18°	46°	34°	39°	45°
Mean temperature for September	57.8°	78.8°	61.7°	65.4°	62.4°	60.6
Range of temperature for September	16°	21°	47.5°	34°	47°	61°
Latitude	38°47'	29°58'	42°21'	40°42'	41°52'	41°16'
Elevation of barometer above sea level, in feet	60	55.81	77.4	165.60	65.7°	1,045.69
Annual rainfall, in inches, for year ending September, 1873	15.66	72.81	46.76	42.45	28.73	28.98°

¹ The data relating to temperature could not be obtained, and those of New York City have been substituted.

from Dr. Gibbons's report, and the annual report for 1873 of the Signal Service Bureau.

The ratios of mortality in the cities of San Francisco and New Orleans do not differ much. The former exhibits a uniform low mean and moderate range, representing a mild and equable climate; the latter exhibits a uniform high mean with a moderate range, representing a hot and equable climate. Compare these climates, which seem, because of their constancy and equability, specially exempt from intestinal disorders, with the climates of the four other cities, in which the ratio of mortality varies from three to five times as great as in the hottest of the six cities. In each of the four cities, Boston, Brooklyn, Chicago, and Omaha, the range of temperature is high, and the monthly means rise rapidly, the elevation varying from 8.4° at Boston to 17.3° at Chicago, from May to June, again ascending in July, though less, and in August descending moderately at Boston and Brooklyn, remaining about the same at Chicago, but continuing to rise at Omaha. In September the descent is marked at all stations, and most at Omaha. This examination suggests that the equable climates, either temperate or hot, are far less favorable to the production of the summer diarrhoeas of infants than the climates subject to violent changes and sudden high elevations of temperature; and conversely that a variable climate, subject to acute exacerbations of temperature during a brief summer season, which characterizes the belt or climatic zone described by Professor Davis, is the meteorological condition most conducive to these diseases. In this connection, Professor Abbe, in discussing the relation of hot weather to cholera infantum, says: "For instance, examine the unprecedented mortality from cholera infantum as given in the Philadelphia Report of 1872. . . . The first feature that strikes the student, is the maximum mortality of July 6th to 13th. Next comes the fact that the equally hot or hotter periods in May 6-12, June 6-14, August 7-15, and 17-27, and September 6-10, were not attended by any special increase, but rather a very decided decrease or absence of cholera infantum, whence we can infal-

libly conclude that high temperature has, in itself, very little direct influence on the disease, and this becomes clearer when we reflect that the actual mortality occurs always some time after the disease has taken hold upon the child, and that the maximum mortality of July 6th occurred two weeks after the remarkably sudden fall of temperature that is shown to have occurred on June 22d and 24th." The conclusion reached by Professor Abbe, who has studied the relation of climate to disease as a meteorologist, is the logical deduction from the premises stated, and is important, especially in so far as it points to the variations of temperature as the ætiological factor. The precise statement that the beginning of a large proportion of the cases is coincident with the sudden fall of the temperature of a heated period, is not entirely new. The observation is quite common among physicians that the accession of new cases occurs quite frequently in groups coincident with the sudden termination of such a period. The writer, as early as 1873,¹ advanced that view, which he believes has

¹ In 1873 he wrote as follows: "The disturbance of the normal relation subsisting between the skin and intestinal mucous membrane is another important element of causation. This fact has been universally conceded by writers upon the diarrhœal complaints of adults, but among pædiatricars it is only casually enumerated in their multitudinous array of influences. The physiological antagonism between the cutaneous and intestinal secretions is so manifest that it is not difficult to understand why the suppression of the former should determine an alvine flux. It may not only impose additional functional activity upon the intestinal mucous membrane, to relieve the system of accumulated fluid, but also to effect the elimination of effete matters, and thus local irritation, hypersecretion, increased peristaltic action, and alvine flux may find their immediate and direct cause. The manifest effect of the sudden arrest of the cutaneous transudation, as the most frequent cause of the cases occurring during the autumn, winter, and spring months, is apparent, even to the most casual observer, and I apprehend that it is far more frequently the immediate influence during hot weather, especially in moist localities and during rainy seasons, than is generally believed. I have uniformly observed an accession of disease and frequent relapses following the sudden and violent lessening of temperature which so frequently terminates our brief heated terms, and more especially so if accompanied with moist and rainy weather." (Columbia Hospital Report, 1873, page 346.)

been confirmed by a more extensive and careful observation, and by a more recent study of the causal relations of temperature. This opinion is in entire accord with the general effects of temperature. An endurable temperature deranges health either by its long continuance, or by sudden variations.¹ In climates of uniform extremes of temperature, the greatest mortality, from all causes and of all ages, usually occurs in the coldest, and the least in the warmest months. The number and nature of diseases produced by the varying conditions of the temperature differ in various localities, but nowhere does the maximum occur in winter. The organism suffers more often and more severely from the sudden changes than from the long continuance of either extreme heat or cold. The phenomenon is called "catching cold." The effect is severe in proportion to the rapidity of the motion of the differently heated airs, or as it may strike upon portions of the body exposed or insufficiently protected, or when perspiring. No one doubts the influence of refrigeration, or "catching cold," in producing catarrhs of the mucous membrane, most frequently of the respiratory organ in the winter season, and, perhaps, quite as often of the intestinal tract in the summer season. The relation of the chilled surface to the organs is also important. Chilling of the neck causes catarrh of the windpipe; of the chest, bronchitis; and of the abdomen, diarrhœa. But more important in this connection, is the well recognized principle in ætiology, that in every organism the tender part will become diseased, no matter where the chilling may have acted. Whatever, then, may be the morbid tendency or liability to a special disease, the sudden refrigeration of the body or any part of it is conducive to its development. The complex conditions of alimentation and digestion, which so constantly imperil the life of infants at all seasons of the year, exposes the alimentary tract especially to the detrimental influence of the rapid fluctuations of day and night, or of winter and summer. In the colder season, infants are pro-

¹ Manual of General Pathology, Wagner, page 60, from which these general observations have been condensed.

tected from the changes of the weather ; the colder, the more careful the protection, especially of the trunk and limbs ; but it is not always possible so to temper the air as to protect the respiratory apparatus. Hence the greater prevalence of diseases of these organs in winter, even if there were no cases of neglect, improper exposure, or insufficient clothing. Sudden refrigeration of the surface by rapid fall of the temperature will affect infants more often and quite as seriously during the season of summer heat. A temperature which is delightful in summer is oppressive in winter, and one which would make winter agreeable would be cold in summer. The body, by continued exposure to an endurable temperature, acquires a habit which is disturbed by a sudden variation. The winter and summer seasons, as they occur in this country, are not unfavorable to the performance of all the functions, because the organism accommodates itself to such ordinary changes as are not excessive. Heat production is lessened in summer and increased in winter, so that the body heat is uniform during the different seasons. An elevated temperature warms and moistens the skin, quickens the respiration, and accelerates the heart. The perspiration varies according to external temperature and exercise. A draught of air, striking upon a moist surface, produces greater refrigeration of the part, and its influence upon the tissues of the skin, and nerves in particular, must be more intense than if it had been passed over a dry surface. Then, too, the chilling of the surface may arrest the cutaneous exhalation, and may, also, through reflex action, extend its perturbations to internal organs. A sudden fall of the temperature during an epidemic of yellow fever will surely arrest the spread of the disease, and will, with almost equal certainty, prove injurious and even fatal to many suffering from the disease at the time ; and chilling will frequently reproduce an intermittent fever in one who has been long removed from the influence of the miasm. In cholera seasons many persons are attacked after sudden chilling of the body. The catching of cold is an undoubted ætiological fact, of the truth of which everybody ought to be convinced,

but that the fall of the temperature is more potential than the exacerbations of heat in the causation of the diarrhœal diseases of infants has not been clearly established. It is true that in those cities throughout the climatic region of this country where infantile diarrhœas are most prevalent and fatal, the fluctuations of the temperature during the brief summer season are most acute and intense, and there seems to be a correspondence in the percentages of mortality and the frequency and violence of these temperature variations.

Most authors maintain the predominance of the heat factors ; and Professor Davis, as previously stated, insists that the clinical records at his command show a correspondence between the initial symptoms of the bowel affections and the groups of days and nights of excessive heat, and "that the degree of prevalence and fatality of such diseases will be in direct ratio to the intensity and duration of the heat waves occurring between the middle of June and the middle of August." Of the deleterious influence of the heated periods upon infantile life there cannot be a doubt. The assertion that acute elevation of the temperature, lasting for several days, and rapid fall are agencies operating alike upon infantile life, which are both conducive to the development of diarrhœal diseases, seems absurd, yet it may be true. Unfortunately, the data which might determine the causal relation of the two elements, the sudden increase and the sudden diminution of heat, are not accessible. Professor Davis has made an effort to supply the deficiency by collecting statistics from Davenport, Omaha, Cairo, Dunkirk, and Chicago, which show a correspondence between the beginning of the cases of disease and the periods of excessive heat. This is the only correct way of studying this question. Until it is generally practised by physicians the decision will remain unsettled.

Two grave errors pervade every attempt to study the relation of cause and effect between meteorological phenomena and infantile diarrhœas. The first consists in the comparison of mortality statistics with the prevailing condition of the at-

mosphere, when the comparison should properly be made between such conditions and the actual number of cases of sickness beginning coincident with, and their course and progress during the continuance of, such conditions. In short, the meteorological influences should be studied in connection with the clinical histories, and not exclusively with the fatal results. Until this is done the prevailing doubts and diversities of opinion will continue to obstruct the acquisition of reliable information. The second error relates to the improper and careless record of the precise nature of the disease. The deaths of infants from bowel affections are usually recorded under the classifications of cholera infantum, diarrhœa, enterocolitis, and dysentery, which excludes a great number of deaths which should be included; but the improper application of these names is the more serious mistake. Cholera infantum is a diarrhœa; but a simple inflammatory or non-inflammatory diarrhœa is not a cholera infantum. All authors and careful diagnosticians recognize the very marked clinical distinction between the choleraic and diarrhœal affections of infants, and very properly so, for the history, progress, treatment, and mortality differ very widely. Nevertheless, the mortality statistics, as reported by the health officers of the various cities, either classify every form of bowel complaint under the head of cholera infantum, or else the number of the cases is so magnified by the misapplication of names as to convey the impression that this one disease is the scourge which annually decimates the infantile population of large cities; yet every observing and qualified physician knows that the choleraic forms, though more fatal, are far less in number than the simple non-inflammatory diarrhœas. The sanitarium will contribute materially to the study of these clinically different diseases, by requiring the record of the precise character of the initial symptoms, as well as the course, progress, and treatment of each case both before and during its residence in the domiciliary department. By such means facts may be reached which will determine the relation of meteorological influences to the causation and mortality of the several forms

of infantile bowel complaints. Especially important is it to ascertain the predominant influence, if there be any, and the relation it may bear to the clinically distinct forms of diarrhœa. This information is of paramount importance, for the methods of prevention, to be successful, must comprehend a full knowledge of the cause. Very different means, appliances, and perhaps, differently arranged buildings will be required, according as the heat exacerbations or chilling may be the immediate or acute agency producing one or all of the several forms of disease. For it is probable that the varying atmospheric conditions of excessive heat and sudden cooling may bear definite relations to the causation of the different forms. Overheating of the body produces effects unlike those following chilling. A high temperature interferes with the radiation of body heat, and the nearer the external heat approaches that of the body the more heat is retained, unless the heat-wasting functions become more active. The organism, especially of infants, which may have become habituated to the ordinary diurnal changes of summer heat at any given locality, can neither accommodate itself to the rapid loss of heat when the temperature suddenly falls, nor to the arrest of heat radiation when the sudden exacerbations occur and continue for two or more days. In either case injury follows, but it would be contrary to the general law of causation, that the resultant diseases should be identical. It may be, as would seem to be the natural order of events, that the choleraic forms, in a measure at least, owe their origin to the overheating, and the catarrhal forms to the chilling processes. The sanitarium will possess opportunities and facilities, never before offered, to settle this important question.

To recur to the statement that daily mortalities from infantile bowel affections bear no constant relation to the days of excessive high temperature, but vary from day to day during the season of summer heat and violent fluctuations of temperature, and more fully to exhibit the fallacy of studying cause by comparison of mortalities with the prevailing meteor-

ological conditions the following data (Table X.) have been supplied by the Health Officer of the District of Columbia.¹

The comparison should be made between the daily mortalities as shown in Table X. and the corresponding days of the periods of excessive heat, as shown for Washington in Table No. II.; and also between the days on which sudden falls of temperature occurred, as shown in the annual reports of the chief signal officer and the daily mortalities. The examination will show that mortalities, large for Washington, will sometimes occur simultaneously with hot days and hot periods, and sometimes with cool days and cool periods, and then run along quite evenly for days without regard to the temperature changes; but there is more frequent correspondence between high mortalities and hot periods than with other conditions. The same is true of New York, and perhaps of other cities. These facts reassert the predominant influence of excessive heat, and suggest the possible hypothesis that the succeeding exacerbation is specially detrimental to the cases commencing during the immediately preceding period of greatly lessened heat; and this coincides with the clinical fact, that infants moderately sick with simple diarrhœa frequently grow suddenly and rapidly ill, with profuse liquid stools, during a day of excessive heat.

¹ More properly the data should have been obtained from Baltimore city, but the application was refused, because of insufficient clerical force and inadequate means. Washington was then selected, because it was the nearest large city, and did not differ materially in temperature and other meteorological conditions. Dr. Mead, under the direction of his superior, very promptly and courteously complied with the request. An opportunity is thus offered to show to the country that this city, so unjustly assailed for the insalubrity of its climate, is the most favorable summer residence for young children of any city of equal or greater population north of the Potomac River. The mortality data are absolutely correct and include several diseases usually omitted from the death-rates from infantile bowel affections. The comparatively small mortality in a population of 177,638 (of which 59,402 are negroes) must bear a definite ratio to the number of cases, or else the treatment is unusually successful. Its wide and clean streets and numerous parks contribute both to its healthfulness, and to the successful management of the cases of sickness. The excess of mortality under one year is, however, as conspicuous here as elsewhere.

TABLE X. — (Continued.)

	Day of the month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
June, 1877.	Number of deaths under 1 year	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	1	1	4	4	5	2	1	4	5	8	9	6	4	6	-		
	Number of deaths 1 to 2 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	2	1	1	-	-	-	-	-	-	-			
	Number of deaths 2 to 3 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total deaths of children under 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	9	2	5	8	12	10	7	4	7	14	14	7	9	11	-	-	
July, 1877.	Number of deaths under 1 year	8	6	3	4	5	4	2	6	3	4	3	4	3	1	3	10	5	2	3	1	1	8	7	6	2	1	5	2	3	4	3		
	Number of deaths 1 to 2 years	2	2	-	1	1	-	2	-	-	1	1	2	-	5	-	-	-	1	1	2	-	5	1	1	2	-	-	5	1	3	2		
	Number of deaths 2 to 3 years	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total deaths of children under 5 years	14	15	9	7	8	10	6	9	9	12	7	11	7	3	12	13	7	4	6	10	4	15	15	12	9	8	16	14	6	10	8	-	
Aug. 1877.	Number of deaths under 1 year	1	4	1	5	-	3	5	1	1	3	4	2	1	4	2	3	1	1	2	1	1	1	1	1	5	1	-	-	-	-	-	-	
	Number of deaths 1 to 2 years	1	1	1	2	1	2	3	2	1	-	1	1	1	1	2	1	1	1	2	1	5	1	-	2	3	1	1	2	2	-	-	-	
	Number of deaths 2 to 3 years	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total deaths of children under 5 years	5	6	4	10	6	10	11	7	5	5	7	4	6	8	9	6	6	5	9	2	10	3	4	15	6	5	8	4	6	6	6	6	-
Sept. 1877.	Number of deaths under 1 year	1	1	3	1	-	1	-	1	1	1	-	1	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Number of deaths 1 to 2 years	1	1	-	1	-	-	-	-	-	-	2	-	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of deaths 2 to 3 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total deaths of children under 5 years	7	2	5	6	4	5	2	7	5	6	3	3	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June, 1878.	Number of deaths under 1 year	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	3	1	2	6	1	2	5	5	1	1	2	3	3	-	-	
	Number of deaths 1 to 2 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	
	Number of deaths 2 to 3 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total deaths of children under 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8	7	7	6	4	8	7	5	10	11	4	12	3	9	8	-	-	
July, 1878.	Number of deaths under 1 year	2	6	4	4	4	3	4	2	3	5	4	4	4	-	3	2	3	3	1	4	1	2	1	2	1	1	2	1	3	2	1	-	
	Number of deaths 1 to 2 years	-	-	1	1	-	1	-	1	1	2	-	-	1	2	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of deaths 2 to 3 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of deaths 3 to 5 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total deaths of children under 5 years	5	14	8	11	9	10	8	6	11	10	8	7	8	4	10	4	13	13	12	7	7	6	5	12	9	9	12	5	10	9	7	-	-

The foregoing analysis leads to several important and definite conclusions : —

(1.) The month of July is the hottest and sickliest month of the year, most conducive to bowel affections, and most fatal to children under five years of age.

(2.) The epidemics of bowel affections of children, incident to the summer season, have their beginning nearly simultaneously with the first exacerbation of heat, which usually occurs in the latter half of June ; and the maximum daily mortalities more frequently correspond with the maximum temperatures, which occur in periods of three or more days, at longer or shorter intervals during the summer months.

(3.) With the usual lowering of temperature and absence of excessive heat periods, which occur after the middle of August, the daily mortality declines.

(4.) The detrimental influence of summer temperature is intensified by sudden and acute elevations and falls.

(5.) Children under one year of age are most numerous and seriously affected by the temperature influences.

If these conclusions are correct, the effort to diminish mortality among children must direct itself mainly to the prevention of the diarrhœal complaints of infants under one year of age. To accomplish this it becomes of paramount importance to protect them from the influences of excessive heat, and from the violent fluctuations of temperature, which occur so suddenly during the summer season in the geographical region where these diseases are so prevalent. In the neighborhood of the city of Baltimore there are elevated localities which will have a temperature two or three degrees below that of the city, and where, in properly constructed and arranged buildings, freer ventilation, purer air, and less crowding may be secured, and from these latter as much advantage may result as from the former. When necessary, artificial means may be employed to promote and increase the movement, and diminish the temperature of the surrounding air ; and where, in special cases, remedial agents and a variety of measures pertaining to personal and domiciliary hygiene may

be used to lessen body heat. A sanitarium properly located, with suitable buildings, supplied with the necessary appointments and under expert management, may accomplish much towards modifying the deleterious influence of temperature conditions, hitherto regarded as an irremediable cause of infantile diarrhœas.

Heat exhibits its deleterious influence in another and very important relation. It is one of the many conditions which in conjunction make up a season. The change from winter to summer is characterized by increased solar heat; the successive stages of growth, maturity, and decay in the vegetable kingdom; the generation of spores; the reproduction of myriads of animalcular insects and parasites, and the rehabilitation of torpid life; the setting up of putrefactive processes; the generation of noxious effluvia and their diffusion in the air; the changed condition of animal life; the more constant exposure of human beings to the air; the altered habits and mode of life of all classes of people; the introduction of new foods into the dietary which undergo rapid change and decay; and the greater carelessness in personal protection and hygiene. All these coöperating elements must influence the organism, especially of the nursing infant and fostering mother.

An examination and comparison of the statistics of the weekly mortality from diarrhœal diseases, in the cities grouped according to latitude, as shown in the table below (Table XI.), will exhibit the gradual increase of these diseases with the gradual advance of the summer solstice northward until it reaches its maximum during the period when all the elements which complete the season of summer are in their fullest activity; again gradually to decline with the return to the winter season, the period of rest, hibernation, or death of the lower organisms, and of suspension of vegetable growth and of decay and putrefaction, — the period when the diet is more uniform and consistent, and life is, in a measure, freed from the evanescent irregularities incident to the discomfort of high temperature, and from the indiscretions of diet which are so

prolific of mischief during the season of abundant supply and rapid deterioration of fruits and vegetables.

At first glance this table (XI.) would seem to show that there is a belt of territory, located between latitudes 38° and 41° north, in which, during the months of June, July, August, and September, there is a very high mortality from diarrhœal diseases. But when the weekly mortality returns of the cities situated between these latitudes are compared with similar data from the cities of Boston and Chicago, the two largest cities north of this belt, it becomes manifest that the density of the population is a more potential factor than latitude. The influence of longitude must be inconsiderable, or else it exhibits an inconstant agency, for the mortalities of cities located in or near the same longitude, but in distant latitudes, bear no uniform relation under other like conditions.

The influence of climate is also shown. New Orleans, which is situated in latitude $29^{\circ} 59'$, exhibits a slightly higher mortality rate than San Francisco. The former is the most southerly of the Gulf cities, and the latter is far removed, in latitude $37^{\circ} 47'$, towards the west, on the Pacific coast. Both of these cities are located in equable climates, but the higher mean temperature of New Orleans corresponds with the higher (see Table IX.) mortality of that city. The slightly different and low mortality rates of these two cities, are, however, in marked contrast with the very high death-rates of cities subject to very wide ranges and sudden fluctuations of temperature.

The total movement of the wind is, perhaps, a more important influence than is generally believed. Data supplied from the Signal Office for each month of the years 1875, 1876, 1877, 1878, 1879, and 1880, show that the monthly movement of the wind, in miles, at the cities named in Table XI. (excepting San Francisco), is less during the months of June, July, August, and September, for each of the years enumerated, than during any other four consecutive months, and with an occasional exception, is less during either of these months than during any of the other months of the year. New

Orleans represents a station in an equable temperature with high range, and medium movement of wind, and San Francisco a locality with lesser range of temperature but much larger movement of wind. These uniform climates, though differing in ranges of temperature and total monthly movement of wind, exhibit low death-rates from the summer diarrhœas, the lower rate corresponding with the more moderate temperature and larger movement of wind. San Francisco is, however, an exceptional locality, due probably to meteorological conditions common to the Pacific coast. East of the Rocky Mountains the relation of the movement of the wind to the summer mortalities is very different. A comparison of the mortality data in Table XI. with the records of the monthly movement of the wind for the years previously named shows:—

(1.) July to be the month of greatest mortality and least movement of wind.

(2.) The nearer the monthly movements of wind approach uniformity, the less the mortality from summer diarrhœas.

(3.) Equability of climate corresponds with uniformity and moderate or small monthly movements of wind and small mortalities.

(4.) Wide ranges of temperature correspond with large movements of wind and high mortalities from summer diarrhœas.

(5.) Weekly mortalities from diarrhœal diseases increase correspondingly with advance of the summer solstice northward, increasing and greater range of temperature, and larger and more fluctuating movements of wind.

The table exhibits also the influence of race characteristics. The death-rates of the negro race, as reported, are in many localities phenomenal and read like a fiction of the Munchausen style. That the mortality is generally greater than of the white race is an indisputable fact. This fact may account for the high death-rates in Baltimore, Charleston, Savannah, District of Columbia, and most Southern cities, but it is inexplicable why the death-rate of the negro race in some cities

should be much less than that of the white, and double and treble in other cities.

The table exhibits furthermore the insalubrity of locality. The special endemic influence is not shown. It seems probable that density of the population, mode of life, and occupancy of tenement houses, are the deleterious agencies.

In this connection the element of acclimation deserves consideration. A climate may be defined to be (Wagner) the sum total of all influences derived from the soil and atmosphere. Acclimation diseases are, apart from those which are endemic and infectious, nearly always gastric and intestinal catarrhal affections. It is a law of general ætiology that continuous residence of sufficient duration usually affords immunity from the climatic maladies. The comparative infrequency of infantile diarrhoeas in the Southern cities of this country, where the general atmospheric conditions believed to be so conducive to their production so constantly prevail, suggests that acclimation is a protective influence, constantly operative in diminishing the tendency in infants to bowel maladies; whereas, in the Northern cities, where the range of temperature between the extremes of winter and summer is so great, this immunity cannot be acquired by infants except through the perils of disease, to which thousands succumb. The prevalent liability to bowel affections and the excess of mortality of infants under one year of age in the Southern as well as in the Northern cities, at all seasons of the year, may find an additional factor of causation in the unacclimation to the surrounding medium, the temperature of which is so much lower than that to which intra-uterine life had become accustomed. The extraordinary susceptibility of the newly born to the variations of the temperature of the surrounding air is probably the most fruitful source of many of the preventable maladies of early life.¹ To this circum-

¹ "Infants have but feeble power of generating heat, and are absolutely dependent upon communicated warmth. And here I must enter my earnest protest against the custom of carrying newborn children from room to room, and even from house to house, for exhibition. I have no doubt that

stance, perhaps more than to any other, is due the terrible mortality among those born out of wedlock, where motives of concealment interdict the necessary protection; among the first-born, where the ignorance of attendants plays such an important part; and among the poor, where destitution robs the babe of the needed wrappings and artificial warmth. In the domiciliary department the influence of this element may be satisfactorily studied, and mothers can be taught the value of prevention and the method of accomplishing the best results. If these suggestions have any foundation in fact, the methods of prevention, to be effective, must begin in the lying-in chamber during the puerperal period, and be persistently carried out during the early months of life.

HUMIDITY.

The study of the relation of the humidity of the air to the causation of these diseases is attended with contradictions not unlike those which embarrass the study of the heat factors, and grow out of the mistake of comparing mortalities with the daily mean percentages of moisture. It is generally believed that a high temperature with high relative humidity, low and damp localities, and damp dwellings, predispose to these diseases. This is partially true, but the statement that a high temperature and high humidity, independent of other accessory influences, bear any constant or uniform relation to the prevalence of these affections, cannot be maintained. The following analysis of the heated periods (Table XII.) will show that high humidity is not always coincident with high maximum and high daily mean temperature. Mortalities do not show any constant correspondence with high maxima, high daily mean temperatures, and high percentages of relative humidity. During the heated periods of 1876-79 (see

many of the obscure as well as familiar diseases of infants have their origin in this reprehensible practice. Nothing is more easy than for the sensitive surface to become chilled, and various congestive disorders to be thus induced." (Annie M. Hale, M. D., *Management of Children*, 1880, page 16.)

TABLE XII. — Showing the Averages of the Maximum and Mean Daily Temperatures, and of the Mean Daily Humidity of the Air, during each of the Periods, at the Cities, and for the Years named.

	Baltimore.			Chicago.			New York.			Washington.		
	Max.	M. D.	M. H.	Max.	M. D.	M. H.	Max.	M. D.	M. H.	Max.	M. D.	M. H.
1876.												
June . . .	92.4°	82.5°	59.74	85.66°	79.23°	71.9	88.28°	78.72°	61.24	93.4°	81.88°	63.6
July . . .	92.8	82.9	62.68	92.25	83.57	67.4	91	81.11	58.75	93.3	81.04	63.24
July . . .	94.23	84.71	62.55	-	-	-	91.16	80.55	62.38	95.18	84.62	66.83
July . . .	-	-	-	-	-	-	91	81.22	63.92	94.37	85.4	63.07
August . .	-	-	-	87.33	79.8	67.56	88	78.47	63.97	91.66	80.93	71
1877.												
June . . .	-	-	-	-	-	-	86	75.06	53.02	-	-	-
July . . .	92.25	82.3	67.4	88.66	78.8	70.52	90	81.05	56.03	94.87	82.77	69.6
July . . .	-	-	-	86	78.23	77.46	-	-	-	-	-	-
August . .	-	-	-	85.66	75.06	75	88	78.47	65.07	91.9	81.18	65.52
1878.												
June . . .	-	-	-	-	-	-	87	78.56	60.76	-	-	-
July . . .	92.25	82.77	62.25	86	78.73	74.03	87.66	77.65	64.81	99.95	81.90	67.96
July . . .	94.3	84.92	64.94	90.6	83.32	69.06	87.33	76.73	76.56	95.1	84.4	70.92
July . . .	-	-	-	-	-	-	91.33	81.9	67.2	-	-	-
August . .	-	-	-	86	74.96	63.61	86	75.63	63.43	91.25	80.05	69.41
1879.												
June . . .	-	-	-	86	79.36	60.03	87	76.96	68.8	93	80.56	63.2
June . . .	-	-	-	-	-	-	-	-	-	93.66	81.8	62.13
July . . .	94.66	85.5	48	90	83.15	61	90.33	79.2	62	94.83	82.4	50.3
July . . .	-	-	-	-	-	-	85.33	77.13	71.1	95.37	83.82	51.17
July . . .	-	-	-	-	-	-	-	-	-	92.5	82.03	58.9
August . .	90.8	82.66	64	88	85.53	58.1	88.66	78.66	52.42	92.6	81.72	68.72
August . .	-	-	-	86.66	79.46	59	-	-	-	-	-	-

Table II.) the maximum and daily mean temperatures were higher in Washington than in New York, but the percentages of relative humidity were nearly the same. If the combination of excessive heat factors with high relative humidity were the special atmospheric condition so conducive to diarrhœal diseases, then the death-rate in Washington should have exceeded that in New York. The latter city, with an average maximum temperature 5° less, exhibits an average percentage of relative humidity nearly equal to that of Washington. The percentage of humidity represents the ratio of moisture in a given volume of air, but the dampness of the air is the expression of the relative saturation to the amount it would hold if saturated. Air at 93° Fahr. is not so damp as air at a lower temperature but holding the same amount of moisture, because the higher the temperature the greater is

its capacity for moisture. Excess of humidity with relation to heat is the condition so detrimental to the organism, and the more so when the temperature suddenly falls, as is illustrated in the disturbance of important functions of the organism and the chilling processes, to which reference has been previously made. It will be seen by examination of Tables II. and XII. that the relative saturation is greater in Chicago than in either of the four cities ; and least in Baltimore. But high temperature with high relative saturation cannot be accepted as a universal factor. In the cities bordering on the Gulf the relative saturation is uniformly higher than in the cities of the northern climatic zone, yet the prevalence and mortality of bowel affections are vastly less. So it is in the rural districts and along the sea-coasts, yet these are favorite health resorts for children suffering with these maladies. There must be some condition of the air, not present in the farming regions or along the sea-coast, and only to a limited extent in the Gulf region, which is common to most of the densely populated cities, and to localities inhabited by the poor and destitute, which in combination with heat and moisture will complete the atmospheric environment. The various circumstances of life in a city, considered in reference to the prevalence of bowel affections, point clearly to the conclusion that moisture in relative excess to the heat of an impure and stagnant atmosphere is the condition which supplies the most satisfactory explanation of its detrimental influence. This conclusion becomes the more important in view of the fact that it is in entire accord with the accepted opinions concerning the deleterious influence of over-crowding ; the diffusion of noxious effluvia in the air ; imperfect ventilation of dwellings, sleeping apartments, and cities ; the general unhygienic condition of the homes ; and the personal uncleanliness of that class of the population of the city among which the summer diarrhoeas are so fatal. It is furthermore corroborated by the prevalent opinion that low and damp situations, imperfectly drained localities, and damp dwellings, where the air is stagnant and foul, are conducive to these diseases. And still

more important is it that it directs attention to the necessity, as a means of prevention, of pure air, clean streets, clean and well-ventilated dwellings and sleeping apartments, personal cleanliness, less crowding in unfit dwellings, and diminished density of population. The proper construction of tenement houses and the proper adjustment of the number of residents to the area, together with the rigorous enforcement of sanitary regulations, would greatly lessen the prevalence and mortality of the infantile summer diseases in cities, especially in those parts where over-crowding and filth prevail, and the air is laden with emanations from the soil saturated with human excrement. The nearer the surface the more damp, foul, and stagnant the air, the fewer the currents, and the greater the necessity for freer ventilation.

The construction of one-story dwellings, and the occupancy of the ground and under-ground floors as sleeping apartments, especially in the densely populated districts of cities, should be prohibited by municipal ordinance. By compelling those who are prompted by their cupidity to provide the poorest accommodations at the highest rental, for those who cannot help themselves, to conform to definite plans of constructing tenement houses,¹ and a definite occupancy of space, the evil effects of over-crowding, bad air, and personal uncleanness might be greatly lessened. In fact, law and force must be invoked before the full measure of prevention can be obtained. It would be an act of wise economy, conducive to the wealth and growth of every municipality, and to the health and welfare of its citizens, if their governments assumed and enforced such authority.

DENSITY OF POPULATION.

The bad effects of density of population and over-crowding of habitations, together with the various contingencies of life in large cities, are so obviously manifest, and so universally

¹ Of the children under five years of age who have died during the week ending July 3, 1880, in New York, 66.85 per cent. were taken from tenement houses. (N. Y. Herald, July 8, 1880.)

acknowledged, that any attempt at demonstration would be simply a work of supererogation. It is not, however, so generally known that with the increase of the number of persons to the square mile the death-rate under five years increases in greater ratio than the death-rate at all ages. The following statement, constructed by Dr. Farr, shows the relation between the death-rates at all ages and under five, and the density of population in a series of English districts:—

TABLE XIII.

Death-rate at All Ages.	Death-rate under Five.	Persons to One Square Mile.
16	37.80	166
19	47.53	186
22	63.06	379
25	82.10	1,718
28.5	95.04	4,419
32	111.90	12,357
39	139.50	65,823

The same is true of this country, as is shown by the census of 1860, 1870, and 1880. When to a superabundant and unclean population are added the effects of an inadequate provision for the removal of the various excreta, "the result is (Curtis) that the air is permanently laden with foul matters, comprising effluvia from the skin and lungs of the inhabitants, and noxious vapors and gases from sinks, gutters, and soil pipes, and, worse still, excrementitial molecules from choked up privies, drains, and sewers. Air reeking with these filthy matters requires only the ripening action of the mid-summer heat to be kindled, as it were, into a blaze of poisonous putridity. When all these conditions are fulfilled, miasmata are generated, which seem to concentrate their noxious influence upon very young infants." In the rural districts, where the population is sparse, the air is not permanently contaminated by the constantly increasing production of these noxious elements, and by reason of the more constant agita-

tion of the air, and freer ventilation, there is less danger of infection, even though there may be present local unhygienic conditions.

POVERTY AND IGNORANCE.

“Illiteracy and foreign born nationality,” says Curtis, “go hand in hand as causes of infantile diarrhoeal diseases.” For the reason, most apparently, that it is the combination of ignorance and poverty. These misfortunes underlie a great variety of unsanitary conditions. Poverty deprives the infant of proper care and needful sustenance, and imposes hardships and cruelties which its tender age and feeble vitality cannot bear. Ignorance expresses itself in wanton neglect and wicked inattention to the simplest and most necessary duties of the nursery; in very many grave errors of omission and commission; and in lack of consciousness of parental responsibility for the welfare of defenseless infants. All the vices and circumstances of life, so common in large cities, which impose hardship and privation upon nursing mothers and child-bearing women are so many indirect agencies conducive to disease among infants.

ALIMENTATION.

Notwithstanding the detrimental influences of the meteorological and atmospheric conditions, a large number of those most exposed to these coincident and predisposing agencies escape, and very many succumb to the summer diarrhœas who are free from the deleterious influence of foul and stagnant air, unsuitable dwellings, congregation of persons, privation, and uncleanness. With all the care and vigilance of the health department, and the lavish expenditure of the accumulated wealth of the millionaire, they cannot be shut out of the nurseries of populous cities, however cleanly, comfortable, and luxurious the apartments may be. These results may, in some measure at least, find their explanation in the intimate and constant relationship between these diseases and the physiological and anatomical characteristics of infancy.

The infantile maladies which furnish the largest quota of deaths during the heated summer season are the disorders of the digestive¹ and nervous systems, which hold, the one with the other, intimate physiological and pathological relations. The frequency of bowel affections, bearing, apparently, a direct relation to a like frequency of the disorders of the nervous system, and their rapid diminution, corresponding with a like rapid diminution of nervous disorders, point with unmistakable significance to the important factor age, or the physiological and anatomical peculiarities of infancy. If statistics prove anything, they establish, at least by inference, an intimate physiological connection between the disorders of these two systems. They act and react upon each other as cause and effect. It is during the nursing and succeeding age that these two systems exhibit the greatest tendency to disease. This is the period of most rapid growth of the tissues and development of organic life, when the machinery runs with delicate precision and amazing celerity, assimilating nutriment for the storehouse of growth. The infant, like the swift growing and succulent plant, exhibits in the softness and delicacy of its tissues, in the looseness and tenderness of the more stable structures, in its sensitiveness to impressions, and in its morbid tendencies the hasty appropriation of the elements of nutrition, and feeble powers of resistance to the accidents and improprieties of life and to the ever-varying changes of the atmosphere. It is during this period that the first dentition begins its successive series of somewhat singular events, strangely commingling developmental and morbid phenomena. Then, too, the nervous system manifests, with peculiar force and energy, its perturbing influences. Feeble development with marked nervous irritability invites intestinal disorders. Enervation and nerv-

¹ Jacobi estimates the deaths from diseases of the digestive system during the first year of life at 40.89 per cent. of all the deaths; and 21.01 per cent. from respiratory diseases. During the second year 9.06 per cent. from diseases of the digestive, and 36.54 per cent. of the respiratory organs. (*Infant Hygiene, Hygiene and Public Health, vol. i., p. 89.*)

ous prostration, so frequently the result of continuous exposure to a high temperature, find their sequences in digestive and nervous troubles. Residence in the city is a prolific cause of nervous as well as of intestinal disorders, attributable as much, perhaps, to the constantly recurring scenes of excitement and the demands of society as to filthy streets, foul exhalations, and a densely populated area. How marked the contrast! In the sparsely populated and elevated regions these disorders are rare visitors to the family nurseries, yet growth and development go on. The sedation of the pure and invigorating country air, of the quiet life of the farming regions, is the great preventive of the nervous, as it is the great curative of the digestive, diseases of infancy.

The digestive diseases of infancy include a great variety of derangements of digestion and nutrition, resulting from an inadequate and unsuitable diet. Professor Parrot attempts to reduce the incoherent assortment of morbid entities, under which the manifold disturbances and alterations are registered, to a single nosological conception, for which he proposes the name of *athrepsia*, signifying denutrition. This he claims is always the same disease, having for its distinguishing feature progressive wasting of the entire organism, and is always characterized by the initial symptom of diarrhœa. This diarrhœa may be the beginning and the end, or may be succeeded by various organic disturbances, with resulting manifestations and complications.

By this broad generalization a great variety of nosological terms may be dismissed from the nomenclature of infantile diseases, and a closer connection of a common cause with recognized results be thereby established. Many terms, now in common use to indicate the cause of death, express the special manifestation, organic disturbance, or resulting complication, of a common cause. This common cause is denutrition, resulting from inadequate or unsuitable diet. From the standpoint of a common ætiology the term *athrepsia* would comprehend *cholera infantum*, *entero-colitis*, inflammatory and non-inflammatory diarrhœas, rickets, innutrition, and mal-nutri-

tion ; many of the fatal cases of thrush and trismus nascentium ; many cases of erythema, inflammations of the skin, mucous membranes and internal ear, and of coma and convulsions ; together with cases of debility, premature birth, imperfect development, meningitis, hydrocephalus, paralysis, scrofula, and consumption, terms not infrequently employed either to indicate the final condition of the patient, or to cover an indefinite diagnosis.

Such a classification would always set forth the primary cause, to which should be added the term most appropriate to indicate the special manifestation or organic disturbance. Then the relation of cause and effect could be correctly ascertained, and registrars of vital statistics could eliminate much useless verbiage, and many vague terms, which mislead the public and deceive themselves. The relation of many infantile maladies to alimentation would be definitely defined. Preventive medicine would occupy a wider field of operation, thereby lessening suffering and mortality. The natural history of these affections could be more thoroughly studied, and the responsibility of parents would be more prominently set forth.¹

The probability of life increases with the addition of every day to infantile life. More infants die during the first than during the second day ; more during the first than during the second month ; and more during the first year than during any subsequent year of life.²

The lessening morbidity and mortality of the advancing life of the newly born establishes the important fact, that to diminish this early mortality the preventive measures must begin with birth.

The foregoing presentation of the various causes of this ex-

¹ The reader will find a liberal synopsis of the views of Professor Parrot, by Dr. Curtis, in the contribution of the latter to Buck's Hygiene and Public Health, vol. ii., p. 281. See, also, Amer. Jour. Med. Sci., vol. xxii., 1876, p. 268.

² "More than one half (Jacobi) of those dead before the end of the first twelve months perish in the first two months." And more than one

cessive mortality predicates the no less important conclusion, that this mortality results, for the most part, from preventable maladies. It is still further shown by observation, and proven by statistics, that the disorders of alimentation contribute the largest quota to this death-rate. It must then follow that the sanitarium, to execute the purpose and fulfil the requirements of the bequest, must admit and provide for the proper care and management of infants from birth.

Conceding, then, the reception and protection of nurslings as the primary and paramount duty of the institution, and proper alimentation as the most important and essential means of preventing the great mortality, how best can these objects be attained?

Milk is the natural aliment of all young animals, and nursing at the breast of the mother is the preferable method of supplying it to the young. The sooner after the termination of labor and the completion of the requisite attention to both mother and child the latter is put to the breast, the less will

half of those dying under five years of age, die during the first year of life.

The following table, constructed by Dr. William L. Richardson from data relating to the city of Boston in the year 1875, shows the mortality from all causes, among infants and children, during the first months and years of life.

TABLE XIV. *A Table of Ages at which the Deaths of those of Five Years of Age and under occurred.*

[Paper on Infant Mortality, Report of Boston Board of Health, 1876, page 53.]

Ages.	No. of living Children.	No. of Deaths.	Death-rate per 1,000.
One month and under	799	633	792.24
One to two months and under	783	273	346.69
Two to three months and under	886	192	216.70
Three to four months and under	760	150	197.36
Four to five months and under	712	163	228.93
Five to six months and under	876	154	175.79
Six to seven months and under	760	143	188.94
Seven to eight months and under	753	129	171.31
Eight to twelve months and under	7,657	514	67.12
One year to two years	8,498	835	98.25
Two years to three years	7,626	429	56.25
Three years to four years	6,941	330	47.54
Four years to five years	6,885	222	32.22
Five years and under	43,936	4,167	94.84

be the loss in weight ¹ and muscular vigor of the infant. Immediate nursing saves and prolongs many lives. Especially is this true in regard to the small and feeble infant whose ebbing life demands immediate sustenance. Even at this early period nature usually provides an imperfect milk in the form of colostrum, which is the food best adapted to the beginning of the new life. Maternal lactation furnishes fewer victims than either wet-nursing or artificial feeding, yet the death-rate of mother-nursed babies is far too high. The causes of this mortality are, to a limited extent, attributable to the constitutional vices and physical defects of the mother, but for the most part to the condition of life, neglect, over-work, ignorance, destitution, and bad domiciliary surroundings.

The vices of constitution are comparatively few, and refer especially to rheumatic diathesis, syphilitic contamination, strumous and tuberculous tendencies, and general anæmia and feebleness.² These obstacles to lactation, if not entirely removable, may be greatly modified by prophylactic medication and management, but such treatment should precede the birth of the child. Syphilis of the mother should not, however, always prohibit the nursing of the infant, for it is more than probable that both mother and child will be affected alike, and specific medication of the mother may accomplish the cure of both. The milk of a rheumatic mother will probably contain an excess of lactic acid, which will surely induce indigestion in the nursling. This may be corrected by appropriate alkaline medication. Those mothers who may be the victims of scrofulous or tuberculous affections cannot either properly or safely discharge the duty of suckling. Not only may the milk be contaminated and deficient in the necessary nutritive constituents, but, as a rule, the drain is too

¹ Haake estimates the average loss in the first twenty-four hours at four ounces; Winckel between three and four and one fourth ounces. Boys lose less than girls; the larger less than the smaller. The first-born more than those born afterwards.

² According to the tables of Meret and Whitehead, 46.6 per cent. of the mothers in feeble health supply an insufficient amount of breast-milk.

much for her enfeebled constitution. Such a woman may, says Jacobi, "raise at her breast sickly, bloated, rachitic children, until at last one is born which she is quite unable to nurse, and then for the first time appears in the family a noisy, ruddy, muscular baby." It not unfrequently occurs that women far advanced in tuberculous disease become pregnant, and complete the period of gestation without any apparent detriment, sometimes, indeed, with seeming improvement in general health, but from the moment of birth and the beginning of lactation decline rapidly to the fatal end. If such women, or even those with hereditary tendencies or pronounced tuberculous diathesis, will marry, provision should be made to protect their offspring from the transmitted disease, so far as it can be accomplished, by a careful and suitable diet, free from such contamination.

There is another class of mothers who are free from any transmissible disease, but whose anæmic and feeble condition renders them incompetent fully to discharge the duties of the nurse. Their blood is so impoverished that their milk is inadequate in quantity and quality. Improved hygiene, proper diet, and necessary medical treatment will restore many to the full enjoyment of robust health, and fit them for the highest duty of mothers. During the interval it will be necessary either to supplement maternal lactation, or to substitute for it some more suitable aliment. In all such cases, as in those child-bearing women who may be strumous or tuberculous, the new-born baby will probably be feeble and of low vitality, rendering resort to artificial alimentation imperative from birth.

Defective lactation from physical causes is not an uncommon occurrence. Fortunately, a majority of women are capable of performing their duty as mothers. They are usually healthy women, in good fleshy condition, with large breasts mainly composed of glandular structure, and not mere accumulations of fat. The surfaces of the mammæ are well marked with veins, the nipples are properly shaped and protruding, and each is surrounded by a well-developed colored

circle. The secretion of milk is abundant and rich. There are, however, many who from various defects of organization are not good nurses. Some are weak and sickly, with large and flabby breasts, which furnish milk in excess, but watery in character, and their children are pallid, and sicken easily. Others supply milk in sufficient quantity, but at the expense of their own weight and strength; soon the exhaustion and waste become so great that the secretion of milk ceases, and compulsory weaning results. A third class, mostly weak and impressible women, suffer from incontinence of milk, which is greatly and suddenly increased by emotion, and during the act of suckling the watery fluid pours so abundantly into the mouth of the infant that it cannot be swallowed fast enough, and is wasted.

The causes of these disorders of the milk-flow are obscure. Routh ascribes them to peculiarities of temperament, profuse menstrual discharges, mammary irritation during catamenial periods, suppression of habitual excessive urinary and cutaneous excretions, uterine and ovarian disorders, over-suckling, and excessive development of the glandular structure of the breast. The medical treatment of these somewhat intractable affections varies with the nature of the cause, but all may be improved by a suitable regimen and good hygiene.

Physical defects are, however, more frequently exhibited in the inferior quality and scantiness than in the manner of the flow. Advanced or too early age at first birth, omission of nursing previous infants, insufficient lactation of present children, unusual fright, mental disturbances, diseases of the sexual organs, malformation, partial or complete absence or waste of the secretory glands, excessive deposition of fat in or about the mammæ, or a tendency thereto, may lessen the food supply below the standard requisite for infantile health and the maintenance of growth. Routh estimates the number of mothers suffering from these disabilities at thirty per cent. of all the cases of defective lactation. Some of these, as the too early and too late marriages, defects of formation, and perhaps some of the mental disorders, are beyond the reach of

science or art; nevertheless the influence of good example and proper training will go far towards obviating the sufferings of the infants of such mothers.

Scantiness and inferior quality of milk are not exclusively confined to those who may be incapacitated by such obvious hindrances to lactation as those previously enumerated. There are not a few mothers in whom the milk-producing function is at fault. Donn ¹ has shown that the character and quantity of the secretion of the mammary gland at a more or less advanced period of pregnancy furnishes evidence of the quality of the milk after delivery. There is prepared in the gland during gestation a "viscous yellowish matter," — an imperfect milk which varies in different women. In those in whom it is so scanty that not more than a drop can be obtained by the most careful pressure, the quantity and quality of the milk will be insufficient for the nourishment of the child. Another class supply abundant colostrum, "but thin, watery, flowing easily, resembling gum water," and exhibiting under the microscope a "few small and illy-formed milk globules." Such mothers furnish milk in sufficient quantity, but containing little nutriment. When the secretion of this imperfect milk is abundant, thick, and yellowish, the supply of milk will be ample and rich in the essential elements of nutrition. Such functional defects are dissociated from the ordinary ailments of nursing women and the causes of defective lactation, and consequently escape recognition until the life of the nursling is in jeopardy. Supplemental alimentation in such cases, may be the only method of rescuing the infant from death by starvation, but unfortunately the innutrition dates from birth, without the true cause being discovered, and treatment is therefore often misapplied to the child, whilst the starving goes on, with perhaps daily abatement of food supply, either because the milk producing capacity of the mother diminishes from day to day, or, as more frequently occurs, improper and unnecessary medication of the infant adds its deleterious influence to the already enfeebled digestion.

¹ Mothers and Infants, page 30.

Milk consists of a colorless fluid, oil globules, milk globules, granulated corpuscles, a volatile principle not yet isolated, and extractive matters of which nothing is known. Devergie concluded from his observations that milk might be divided into three varieties: (1) milk with large globules; (2) milk with small globules; and (3) milk with medium-sized globules. The more numerous the large globules the richer the milk. "Out of 100 (Routh) women, seventeen had the first variety, and in ten of the seventeen, lactation increased their number. Twenty-two had the second variety, and of these seventeen had the richness of their milk increased by lactation."

The omission of nursing previous infants and insufficient lactation of present children are reprehensible practices, inexcusable except for such causes as may physically incapacitate the mother for the performance of a duty which is the birth-right of her baby. They belong, however, to two entirely different classes of women. The vice of omission is usually the wicked act of an indolent, luxurious, and licentious woman, whose devotion to the frivolities of society and the æsthetic attractions of life override the instincts as well as the obligations of a mother. The second class are mostly mothers without means of support, who are compelled to labor for a livelihood, and can give the baby the breast only during a hurried visit morning and evening. During the interval the infant is often insufficiently and improperly fed. Numerous such instances have fallen under the observation of the writer, and Bouchut calls attention to the fact that, in Paris, non-inflammatory diarrhœa is very prevalent among the infants of mothers who, "obliged to work in order to sustain their existence, quit their infants in the morning, return at several moments of the day to give them the breast." Apart from any consideration of the constituent alterations which may be produced in the milk by the mental disquietude growing out of the conviction of moral turpitude or the privations of poverty, the "disagreement" of the milk with the baby, so frequently the alleged cause of the early weaning generally practised by those "at service mothers," finds its explanation in the watery

condition of the milk, which has been shown by M. Peligot to be proportionate to the length of time it has been retained in the breast. A mother who improperly prolongs the interval not only punishes the baby with hunger, but compels it to take food which her neglect has unfitted for its delicate digestion. And if, as sometimes happens, the baby continues to fret and cry, its little mouth is again stuffed with the nipple, but after a moment's pause the shrieks are more frantic than before, and then the other breast is tried, but the cries grow worse and worse, and now mother and father, if the latter can be aroused from a quiet sleep in some apartment far removed from the nursery, join in the frantic jubilee of walking the floor to and fro, jostling the baby up and down in their arms, and humming in the doleful tone of unutterable despair "*by-zee by-zee baby,*" until all, too exhausted longer to continue to outrage nature, fall asleep, and when the morning comes the wearied parents wonder why their baby is so nervous, either not knowing or affecting not to know that the baby's health is being injured and its temper made irritable through their neglect, or because they are unwilling to forego pleasure inconsistent with the duties of nursing mothers. Whether wilful or unavoidable, insufficient lactation is alike injurious to the nursling. The former cannot be remedied except through the restraints of moral responsibility; the latter demands the assistance of the charitable and the good. The sanitarium can, at least during the summer season, offer to many deserving but poor mothers shelter and home, and instruct them how best to obviate the danger to the baby, which such manner of nursing incurs. In some cases a residence in the institution, for a shorter or longer time, will conduct the baby through the critical period of its life, and place it beyond the impending peril resulting from the poverty of its mother.

Early recurrence of menstruation and pregnancy and excessive sexual indulgence during the period of lactation seriously deteriorate the nutritive qualities of the milk. In a majority of women the reproductive function is in abeyance during the

normal period of lactation, which varies in duration from birth to the ninth or fifteenth month, but usually should not exceed one year. No mother can adequately nourish at the same time herself, a fœtus, and a child at the breast. In such cases three beings suffer more or less, and not seldom the unborn is lost either by abortion or other accident, while more frequently the infant begins a separate existence with vitality insufficient to maintain life beyond a few hours or days; and if, perchance, it should be saved from such immediate peril, the subsequent life will be, to a more or less extent, characterized by feebleness of constitution and diminished resistance to morbid agencies. Many succumb to the maladies of early life. Chemical analyses of the milk of pregnant women as well as clinical observation of their nurslings affirm the incompatibility of pregnancy and lactation. Professor Davis¹ ascribes the deleterious changes mainly to the loss of fat, salts, and casein, and retrogression to the nature of colostrum. Milk, says Jacobi,² is not the product of cell action, but the transformed cells of the gland, and when this change is incomplete the secretion is imperfect, resembling that usually found in the breasts before delivery. When then the generative activities are diverted into another channel to meet the extraordinary demands of an impregnated womb and the development of a new being, it is not strange that the process of milk elaboration should be interrupted. The earlier during the period of lactation the pregnancy begins, the more serious the changes produced in the milk, and the more detrimental such alteration to the nursling. It so happens that the larger number of such recurring pregnancies take place about or subsequent to the fifth month of the infant's life, during the period when the first dentition is running its course of nervous disturbances, febrile exacerbations, and local irritations, and oftentimes the ailments of the child, previously healthy and vigorous, are ascribed to the cutting of the teeth, when in fact the cause lies concealed in the cavity

¹ Trans Amer. Med. Ass., 1855, page 537.

² Infant Hygiene; also Amer. Jour. Obst., vol. x., page 353.

of the mother's womb. It is fortunate that the age in most of the cases is far enough advanced to admit of supplemental alimentation, or artificial feeding, with a greatly increased probability of life than during the earlier months of infancy.

The qualitative changes produced in the milk by menstruation¹ are analogous, but less marked than those occasioned by pregnancy. The proportion of sugar is diminished, but the amount of butter is not so much lessened. Perhaps the most important changes consist in the altered condition of the milk corpuscles, and the increase of the albuminates. Menstruation recurs in a majority of women before the expiration of the time of nursing, and when delayed to the ninth or tenth month, the infant does not often suffer, because at that age it is usually capable of maintaining an independent subsistence. Hence there is very great diversity of opinion in regard to the influence upon infantile life of the menstrual return during lactation. No one will assert the conclusion that every child must be weaned at the moment of the reappearance of the menses. The safest guide is the continued growth and good health of the nursling. If it loses weight, and its health becomes impaired, especially if the digestive disorders, however trivial, are consentaneous with the menstrual periods, the relation of cause and effect is sufficiently established.² But the season of the year and locality of habitation must not be disregarded. Maternal nursing, even when the milk is deteriorated, is often preferable to artificial feeding. Clinical observation and intelligent experience must determine the proper course to pursue, both as regards weaning and artificial feeding. Pregnancy produces changes

¹ Davis, Marchand, Vernois and Becquerel, and Fleischmann.

² "Morbid conditions of the mammæ are frequently due to diseases of the womb; in some cases it has excited tumors in the mammæ; in other instances it has disordered their secretion, and ultimately proved the cause of derangement of the health of the infant. A familiar example of this occurs in those mothers who have begun to menstruate before they have ceased from suckling: at each return of the catamenia the child is in many instances, distinctly disordered in health." (Marshall Hall.)

more uniformly dangerous to the nursling than the return of the monthly flow, but it is not always delayed till the latter occurrence. Some women will conceive during the continued suspension of the catamenia, especially during the later months of lactation. Its reappearance is nature's most significant admonition of the coming event, which is the more probable the sooner and the more regular the return of the periodic "show" after delivery.¹

Notwithstanding the diversity of opinion in regard to any constant deleterious influence of menstruation upon the lacteal secretion and consequent effect upon the nursling, individual experience is of great value in determining the causal relation of such qualitative deterioration to special infantile maladies. This is most conclusively shown in that nutritional disorder, known as the "English disease" or rickets, which so often, because of its insidious approach, escapes observation, until it is too late to prevent structural alterations and deformities. This disorder, at first believed to be confined to the children of luxurious and dissipated parents, is now known to be common to all classes of society, but is most common among the children of the poor, because of the more general prevalence among them of the causes which disturb the nutrition and development of early life. It is the result of blood impoverishment, with consequent imperfect structural evolution, most strikingly exhibited in arrest of the process of ossification, rendering the bones soft, flexible, easily distorted, and causing deformities always interfering, more or less, with a healthy and vigorous life, and very often terminating it at an early age. Its first symptom is not infrequently habitual constipation, which the unsuspecting mother ascribes to inheritance. It may be occasional acid vomiting, or trivial looseness of the bowels, occurring and recurring without manifest cause, is attributed to high temperature, insalubrious habitation, teething, or some other accessory and equally remote

¹ Of 685 pregnancies recurring during lactation observed by L. Mayer, menstruation began after six weeks in 99; after twelve weeks in 46; and after four months in 41.

agency, and which yield for the time to treatment, harmless in so far as it may calm the current alarm and defer a more serious attack, but baneful in that it adds the deception of a transient and mistaken cure to the concealment and misunderstanding of cause, and transfers the responsibility for the misfortune from the nurse to the infant. During this period of misapplied remedies the baby may even increase in weight and grow fat, but its flesh is flabby, its blood poor and thin, its color white, and its temper uneven if not irritable. The further progress and insidious course of the disease will be exhibited in the copious sweatings about the head, rolling of the head on the pillow, wearing off of the hair from the back of the head, inability to hold the head up, beading of the anterior extremities of the ribs, grooving of the ribs near their front ends, flattening of the lateral chest walls, chicken-breast-like projection forward of the breast bone, enlargement of the wrists and ankles, teething delayed beyond the tenth month, increase in the "mole" (or opening at the top of the head) beyond the sixth month, and closure delayed beyond the fifteenth or sixteenth month, delayed walking, bending of the legs below the knees, and other successive and more disastrous deformities of the bony frame, which may so compress, distort, and displace the internal organs that not a single vital function can be performed in a proper manner, and life will become the profitless pursuit of a disqualified existence. A number of those who may survive, with apparent restored health, will succumb finally to wasting phthisical affections, and if, perchance, offspring should be born unto them, such children may inherit rickets.

Sir William Jenner was the first to suggest that anæmia and general feebleness of the mother were important factors determining the development of rickets in the nursling. Cazaux advanced a step farther and suggested a "relation of causality between rickets of the infant and the frequent occurrence of the menses during the greater part of lactation;" but Tilbury Fox¹ was the first to assert and prove the direct

¹ *Obstetrical Transactions*, London, vol. iv., p. 260.

relation of cause and effect. From numerous observations carefully recorded he deduced the important conclusion that when rickets attacks a "child entirely dependent upon the mother's milk, the mother will be found to have menstruated during lactation regularly for several months, and the degree of rickets will be in direct ratio to the frequency, duration, and amount of menstrual flow." The experience and observation of the writer fully corroborates the testimony of Fox. The clinical records of the Children's Hospital of Washington will not only supply numerous illustrations of this relation of cause and effect, but will also go far towards establishing a connection between rickets and final strumous and consumptive maladies. *Tabes mesenterica*, or "consumption of the bowels," is the usual form of the latter, and a common termination of rickets.

Rickets has been cited as an example of those nutritional disorders, classed as distinct morbid entities, which, except the few isolated hereditary instances, is always traceable to the inadequate and unsuitable alimentation of the infant, and the proper treatment of which is so constantly delayed until the structural alterations have so far advanced that restoration is impossible. Its early recognition and the removal of the cause would not only save very many lives, but would greatly diminish the number of chicken-breasted, flat-sided, hump-backed, knocked-kneed, pigeon-toed, and otherwise deformed men and women, who are so much more numerous among those born and reared in the cities than among an equal number of people who were born and have passed their childhood in the country.

The influence of sexual excess in deteriorating the lacteal secretion has not been definitely determined. The delicacy of the subject and the innate modesty of women interdict any positive investigation. The lust of the grosser sex will invariably hide behind an equivocation or a falsehood, and human judgment will always differ as to what constitutes an excess. It is only by parity of reasoning that any conclusion can be reached. Conjugal excess is perhaps as common, and,

certainly, no less a vice than masturbation. Woman is the highest type of the breeding female, yet she is the only one not exempted from the approach of the male by a natural periodic interval of æstus. Surely, if natural functions are to be studied by the examples which nature furnishes, it ought not to be difficult to determine, in the human female, the relation of the normal gratification of the generative desire to its abuse by excessive indulgence. It is a law of the physical economy that excessive indulgence of any animal passion, or the over-work of any function or organ, is detrimental to the whole organism. The obvious effects of marital excess are not infrequently shown in the pallid, wan, and careworn physiognomy; in the nervous irregularities and perturbations which make life miserable; in the various digestive disturbances which so seriously interfere with nutrition and blood making; and in the emotional exultations, as well as mental obliquities, which so often mar the symmetry of a happy wedded life. Excess begets excess, and premature decay, old age, and death result. Any excess which will produce such disastrous consequences must seriously disturb the mammary secretion. The unwholesome and sometimes pernicious changes produced in the mother's milk by sudden bursts of passion, by a nervous temperament, emotion, mental anxiety, and sorrow, by menstruation, pregnancy, and excessive sexual indulgence, are too well established by clinical observation, if not by chemical analysis, to be considered mere coincidences unworthy of the attention and careful scrutiny of the scientific physician.

Mental anxiety and sorrow are the most powerful of all causes (Routh) in producing defective lactation. A sudden burst of passion, fright, or violent agitation, will often produce in the baby violent diarrhœa, vomiting, convulsions, and sometimes death. "No secretion," says Carpenter, "so evidently exhibits the influence of depressing passions as that of the mammæ." "A fretful temper," says Cooper, "lessens the quantity of milk, makes it thin and serous, and causes it to disturb the child's bowels, producing intestinal fever and much griping. Fits of anger produce a very irritating milk, fol-

lowed by griping in the infant, with green stools. Anxiety of mind diminishes its quantity, as in the case of a mother anxious for a sick child. Her milk, under these circumstances, will often produce green spotty motions with tormina. Terror is more powerful." "Those passions which are generally sources of pleasure in health, when carried to excess, alter and even check the secretion of milk. The case is related of a mother who in an effort to protect her husband, became violently excited, and after becoming quiet, gave the breast to the child, which in a few moments ceased nursing, became restless, panted, and died upon its mother's bosom. Mr. Wardrop records two similar instances: in one the child died in convulsions after nursing its mother, who had been in a violent passion; in the other, the fatal convulsions followed taking the breast of a nurse who had been severely reprimanded. Burdach records three cases; in one the child was seized with convulsions, immediately after its mother had met with some distressing occurrence. Carpenter records two cases; in one the child nursed its mother, who was fretting because of absence from friends; in the other the mother was in great grief because of having lost a child in convulsions. Simon¹ examined the milk of a recently delivered woman, whose child was seized with vomiting, diarrhœa, and convulsions, after nursing during a fit of passion. The milk was alkaline, and when boiled had a strong animal odor. After twelve hours it developed a large quantity of sulphuretted hydrogen; and yet the casein, sugar, and butter had not undergone any change in quantity or quality. Deyeux² found that the milk of a woman who was liable to frequent nervous attacks became, *simultaneously with such attacks, transparent* and viscid, like albumen, and did not resume its normal condition till some time afterwards. The analysis of the milk of a woman in a state of nervous excitement showed the diminution of the solid constituents to ninety-one parts in one thousand; only five parts of butter.

Many of the causes, previously mentioned, which interfere

¹ Routh.

² Routh.

with the suitable alimentation of young infants are unremovable, because they originate in incurable defects of the female organism; but there is another class of causes equally disastrous to nursing babies, which are avoidable and, in some respects, inexcusable. The most common of this class relates to the diet of the mother. It is undoubtedly true that among the unfortunate class the food supply is frequently insufficient as well as unfit. Decaisne has shown¹ that insufficient food may occasion very serious and varied disturbances in the quality of the milk. In his report to the Académie des Sciences of the results of his observations of women who nursed their infants during the siege of Paris, he deduced the conclusions that some women may, upon insufficient diet, produce abundant and rich milk, and their children will thrive, while they themselves will emaciate; another class will produce but little milk, and that very poor, and their children will suffer for want of nutriment, and sicken with choleraic diarrhœa, and a third class will produce scarcely any, and their children will die. Insufficient food is a frequent cause of chronic infantile diarrhœa, but it much more frequently results from the improper than from the inadequate diet of the mother. A meagre diet affects the quantity of butter and casein; a bad diet imparts deleterious qualities.

That the quantity and quality of milk are dependent upon the food and the vigor and healthfulness of the digestion is beyond dispute, but so variable is the function of lacteal secretion in women that no general law can be asserted. Every one is familiar with the facts that garlic, the onion, cabbage, turnip, and even green clover impart a distinctive aroma to the milk of the cow. Lettuce opium, or lactucarium, has been detected in the milk of animals. Coloring materials pervade all the tissues and secretions. Mosler has witnessed the yellow coloration of milk from the eating of saffron, rhubarb, and cowslips; and red from cochineal, madder, and rhubarb. Schauenstein and Späth have observed it colored blue by myosotis palustris, bistort root, bugloss, and horse-tail. Ethereal

¹ London Lancet, September, 1872.

oils are sometimes eliminated through the mammary secretion, but their presence has not been detected by any chemical tests. Poisons have undoubtedly been conveyed through the milk. An epidemic of severe sickness occurred in the neighborhood of Rome, Italy, from the use of the milk of goats pastured where a variety of poisonous plants grew. The active principle of some of these plants was detected in the masses vomited by the patients. Poisoning of infants by alcohol, opium, and morphia has no doubt frequently occurred, yet they cannot be positively detected in the milk. The investigations in regard to inorganic substances has been very much more satisfactory. Bismuth, iodide of potassium, arsenic, lead, oxide of zinc, antimony, mercury, the carbonate and bicarbonate of potassium, and the sulphates of sodium and magnesium have been detected in milk. It is true the results of the experiments have varied, but it seems generally admitted that the younger the milk the greater the probability of the elimination of these substances, when taken, through the mammary secretion, and this conclusion is in entire accord with the clinical observation that the younger the infant the more certainly it may be affected by drugs administered to the mother. It has grown to be a proverb among nurses that the routine dose of castor-oil on the third day after confinement gripes the baby. In explanation of the constantly varying results, both experimental and clinical, Jacobi says, milk which contains admixtures of transuded serum is apt to become impregnated with foreign materials circulating in the blood, and milk secreted from an insufficient mamma, by a woman not in full health, by an old or very young woman, by an anæmic, convalescent, or neurotic woman, and by one soon after delivery, is more like a transudation than a glandular secretion.

The foregoing facts and considerations establish the conclusion that certain mineral and poisonous substances, reaching the blood through the digestive organs, may be eliminated through the milk, and be thus conveyed to the nursling, and that the probability of such a result is greater the sooner after

birth such material may be ingested, and is greatly increased by certain conditions of the mother. That the same rule holds good in regard to articles of diet is a matter of daily observation. This is conclusively shown by the observations and experiments of competent investigators on the modifications produced in the milk of animals by diet. Mayer of Berlin (as stated by Routh) examined the milk from a number of cows, with the following results : —

“Of cows fed with brewers’ lees, red potatoes, rye bran, and wild hay, in five instances the milk was slightly acid ; in one very much so.

“Of forty cows fed with potato mash, barley husk, and clover and barley straw, in ten which were examined the milk was acid ; in three very acid. From among fifty cows fed on potato husks, barley husks, and wild hay, the milk of five was examined and found acid.

“From forty-two cows fed on potato mash, husks, wild hay, and rye-straw, the milk of twelve selected was acid.

“The milk of six cows fed on beet root, red potatoes, bran mash, and hay, was greatly acid.” Playfair relates (Routh) an example of a cow fed on nitrogenous food, with marked increase in the quantity of nitrogenous matter, casein, and butter. Parmentier and Deyeux found the milk of cows fed on the leaves and stalks of maize sweeter and more abundant than when fed on ordinary fodder ; and that from cows fed on common grass and potatoes was watery and insipid. When fed on cabbage the taste was disagreeable. Hermanstadt says, fresh aliments produce a larger quantity of sugar in the milk than dry food. Curwin found coleseed more productive of milk, when fed to cows, than either Swedish cabbage or Kohl-rabbi. Anderson asserts that cows fed upon grass in addition to trefoil yield butter superior to that when fed upon the latter only. Sehmann says, the milk of bitches “fed on a vegetable diet is richer in butter and sugar, while the solid constituents are augmented when a sufficient quantity of mixed food is given.” Peligot found (Smith) the amount of casein increased in the milk of an ass when fed upon beet root, and the butter in-

creased when the food consisted of oats and lucerne. Bous-singault says, the milk of the cow is richest in casein when fed upon potatoes. Reiset and Playfair differ in regard to the effect of stall-feeding of cows on the quantity of fat in the milk, the former asserting that the quantity is greater when they are grazed. A commission (Routh) of the medical faculty of Paris, in 1771, reported "the potato to be particularly useful in increasing the quality and the flow of the milk; also when eaten by the mothers of thin, weakly children, a rapid improvement of the latter followed." The milk of stall-fed cows, unless they are fed exclusively on grass, is always acid, especially so when (Mayer) fed on potato mash and refuse, cabbage or turnips. The worst is that supplied by cows fed on potato refuse from brandy distilleries; and the best is that from cows fed on hay and grass in stalls. These observations show that the milk of animals varies according to the kind of food, especially in regard to its alkalinity. The milk of women should always be alkaline, but it is well known that indigestible and acescent food make the milk disagree with the baby, because of its influence on the alkalinity of the milk. The prevalence of this element of causation of infantile bowel diseases cannot be ascertained, and its importance, in view of its easy prevention, should not be underestimated. The diet of poor mothers residing in cities is a matter of necessity and not one of taste or indulgence. They seek to satisfy hunger, rather than to supply the wants of the organism. They eat because nature demands food, and necessarily use that which they have, or can get. Their necessitous condition will neither admit of over indulgence nor the gratification of tastes or fancies. Many will even deny themselves the allotted part of the family dietary¹ because the other

¹ "Simon made the analysis of the milk of a poor woman. She was suddenly, during the period of lactation, deprived of the means of support, so that her food was insufficient in quantity and of poor quality. The amount of her milk was not diminished by privation, but the solid constituents were reduced to 86 in 1000 parts. After this, for a time, her diet was nutritious and abundant, the quantity of milk increased, and the solid

members are inadequately supplied, or abstain from certain articles because of the disagreement of the milk with the baby, or confine themselves to innutritious foods because they "go to milk." Such mothers are objects of pity and commiseration, and the suffering and starving babies appeal to the noblest impulses of a charitable community for succor. Not so, however, with those mothers whose wicked indulgences of appetite are persistently adhered to in the face of the fact that the little one is being cruelly punished with gripes and colic. The "nine days" and "three months' colic" of nurslings more often find their cause in faulty alimentation than in physical defects or constitutional peculiarities. The continuance of the undiscovered cause undoubtedly impairs the feeble digestion, and what at first may be simply nature's remonstrance against the dietary outrages, eventually becomes a superadded ailment, which augments the perils of its dependent condition. There is no universal law governing the diet of nursing mothers. The health and growth of the child, living exclusively upon its mother's milk, are the most important evidences of the adequacy of the sustenance, and the special morbid manifestations constitute the only indications of its insufficiency. The results are usually obvious enough, but the discovery of the exact cause, especially when it relates to the diet of the mother, is not always an easy task, because the unsuitable quality of the milk may be due to some unknown and undiscoverable physical defect, either appertaining to the secretory function of the mammary gland, or to some one of the complex functions of assimilation and nutrition, or may lie concealed in some vicious habit of the constitution or disposition.

The quality of the milk is influenced by the condition of the weather and by the season. The adult organism is not

constituents amounted to 119 parts in 1000. Her diet was again reduced, with a reduction of the solid element to 98 in 1000, and, at a later period, the diet was again nutritious, with an increase of the solid elements to 126. The chief variation in the milk of this woman was in the amount of butter." Smith, *Diseases of Children*, page 58.

exempt from the effects of the variations of temperature. Poor mothers can neither protect themselves from cold, nor avoid the sweltering heat of the summer exacerbations; and it is not improbable that the qualitative alterations of the glandular secretion caused by excessive and continuous high temperature is a constant agency, coöperating with the same detrimental influences upon the infantile organism, in producing disturbances of digestion. But the quality of the milk is more constantly and effectively influenced through the changed conditions of life incident to the seasons. In the summer season the pollution and stagnation of the heated atmosphere, the general unsanitary condition of cities and habitations, the character of the food, and more frequent indiscretions of diet and indulgences of fancied cravings for beverages must, in very many cases, injuriously influence the quality and quantity of the lacteal secretion. It may be a coincidence, yet it is nevertheless true, that the larger percentage of intestinal diseases and deaths occurs among nurslings during the season of the year when vegetables and fruits are most abundant and deterioration most rapid; that they are proportionately far more frequent in communities of consumers, who can only obtain supplies by purchase; and that they are largest among the infants of the poor and squalid, the class necessarily the most indiscreet consumers of cheap and deteriorated fruits and vegetables. As yet, the food supply of poor nursing women is an unascertained factor in the causation of infantile diseases. The few known facts are corroborated by clinical experience and observation. Reasoning by induction the conclusion is inevitable that it is a more common and potential element than has been generally believed. It will come within the province of the sanitarium to thoroughly investigate this question, for in its domiciliary department it can as definitely regulate the diet of the mother as it can that of the infant, and can ascertain as well the qualitative and quantitative changes produced in the milk by different foods as it can the effects of such alterations upon the health and nutrition of the child. Should it be, through the operations of this in-

stitution, affirmatively settled, new and wider opportunities will be opened to sanitary science; and health officers will at least give a portion of their time to the inspection of foods, and not devote it wholly to the search for the fetid and subtle emanations which hygienists have striven so long to define and circumscribe. One fact should long since have demonstrated itself to every intelligent person, that the hauling through the streets and offering for sale of the refuse fruits and vegetables from the city markets, rotten and rotting under a blazing sun, — a perambulating auction of brawling attendants, starving beasts, stale and rotten fruits and vegetables, and noxious effluvia, — is a nuisance as discreditable to the government of a civilized community as it is detrimental to the poor but unsuspecting patrons.

The secretion of the mammary gland is also influenced by the habits and vices of women.¹ Alcoholism and opium eating are familiar vices; over-crowding and over-work are more prevalent but not less detrimental. Sedentary habits, personal uncleanliness, and personal neglect and abuses, not infrequently deteriorate the milk. Dyspepsia, chronic discharges, and habitual constipation are quite common causes of indigestion among nursing babies. Chronic constipation seems to be one of the habits of the female constitution frequently transmitted to the offspring, for the coincident relation of cause and effect is so constantly repeating itself, that the "sucking of costiveness from its mother and grandmother before," has become a proverb among nurses and grandmothers. Be that as it may, the fact is that the babies of women who habitually neglect the evacuation of their bowels are

¹ "Among the ancients, especially among the Romans, the moral qualities were considered of more consequence than the physical capacity of a nurse; and by them consequences of such moment and extent were attributed to them as, at the present day, at least, we should not expect to realize. The habit of intoxication, to which Nero so immoderately yielded, was said to be owing to the influence of a drunken nurse; and the blood-thirsty disposition of Caligula was attributed to the nipple being smeared with blood, to invite him to take it with more certainty, by his savage foster parent."

often victims of constipation, wind colic, and "crying spells," satisfactory evidences usually of an unsuitable diet. But, then, every such case is not the result either of constitutional habit, inheritance, or improper diet. More frequently it is the result of the criminal administration of laudanum. This drug is as regularly carried by nurses, and some mothers, as their scissors or thimble, and is considered much more indispensable to their comfort. If the child does not go to sleep at the exact moment of their convenience, or if it cries at inopportune times, laudanum is given to make "assurance double sure." The dosing of infants with narcotics and alcoholic stimulants, when not necessary in the treatment of disease, is a more reprehensible practice than amateur doctoring, and usually leads to more serious consequences.

Protracted and irregular lactation are fruitful causes of disease among infants. The former is frequently practised to prevent pregnancy; the latter is often caused by the necessitous condition of the mother, but more frequently it is from neglect. In the cases of protracted lactation the child is inadequately fed on a watery fluid drained from the gland after its functional activity has ceased, and the condition of the mother is such that even if the secretory function remained in normal physiological vigor, the blood supply would be wholly inadequate. The breasts are flabby, and hang like loose, pendulous sacs of ill-used integument. Irregular lactation produces scantiness of milk, and unfits even what is secreted for use by rendering it more watery. The first that flows from the breast was first secreted and is the poorest; and that which flows last was the last secreted and is richest; the solid constituents being more readily absorbed than the fluid. Advanced age, and too early age at first birth, are common causes of scantiness of milk; in the former from accumulation of fat, commencing atrophy of the secretory structure, and long disuse; in the latter because of immature development of the glandular structures.

Over-feeding and over-lactation are also causes of defective lactation. The former, says Routh, is the rarest variety and

by far the most remediable. Over-fed mothers become gross, plethoric; their faces become covered with pimples and blotches; their breasts enlarge from accumulation of fat, the veins on the surface become less distinct, the secretion of milk gradually diminishes, and finally ceases altogether. Over-lactation may be due to defects of organization or temperament, which induce too abundant flow, but more frequently it is the result of too constant and too long continued nursing, and is most frequent among inexperienced and poor mothers, who are insufficiently supplied with nutritious food. The symptoms of hyperlactation are well marked. Such women have a haggard, starved look, are weak and anæmic; their eyes are sunken, with dark lines under them; they suffer with pains in the back, leucorrhœa, breathlessness, and exhaustion. Sight and memory are occasionally impaired. Ashwell has witnessed cases of epilepsy and insanity caused by over suckling of infants. Fruitless sucking is not free from danger to the child. Billard has shown that it is often a cause of infantile diarrhœa and convulsions.

From the foregoing consideration of the causes of defective lactation two conclusions may be deduced: First, that the secretion of the mammary gland is an unstable product, varying in composition and quantity from a great variety of conditions; and, second, that many cases of defective lactation are curable, and the mothers, under proper treatment and supervision, may not only be enabled to fulfil their duties without injury to themselves, but to the great advantage of their children. Many of the causes need further investigation, and the sanitarium will offer unusual opportunities for the prosecution of experiment and investigation which may result in important additions to the methods of treating such cases.

SUPPLEMENTAL ALIMENTATION.

For the present the primary object is the prevention of the injurious effects of defective lactation upon nursing infants. The chief obstacle to the successful management of these cases is the difficulty of an early recognition of the precise nature

of the cause. This difficulty in most instances grows out of the trivial character of the initial symptoms, and ignorance of the fact on the part of the mother, or unwillingness to believe that the cause is attributable to any physical defect of her organism, or any impropriety in her conduct, or her method and manner of nursing. Generally the innocent but ill-used infant is charged with various disabilities or flagrant exhibitions of connate perversities, and dosed with medicines until some serious organic change has taken place.

In all cases of defective lactation the infant must be protected : either by weaning and artificial lactation ; by removal of the cause of defective lactation ; or by supplementing the natural aliment of the child. When the defect is a natural scantiness due to advanced age, atrophy, absence, torpor, or imperfect development of the glandular structure, or obesity of the breast, the giving of additional aliment to the infant will, probably, be the only recourse ; but in those cases in which the defect is attributable to habit, diet, occupation, want, constitutional debility, the improprieties and circumstances of life, over-work, and insufficient, irregular, and over-lactation, the removal of such cause, not always easily accomplished, will usually restore the mother to the full performance of her duty as nurse. When the defect consists in a qualitative deterioration of the milk, which not only renders it inadequate and unsuitable as an aliment, but endangers the life of the child, improvement is not within the resources of art or science, and weaning is the only remedy. It frequently happens, however, that the qualitative changes are only temporary, due to some well-known fault on the part of the mother. In such instances it may be necessary to withhold the breast from the child until the cause has been removed, but permanent weaning should not be advised or permitted.

The wonderful preservative influence of breast milk, and the baneful effects of the want of good breast milk, are shown by the following results of the observations of Drs. Merei and Whitehead of 1,041 children.

1. "Children having had breast milk alone to ninth month or longer."	{	Well developed . 62.6 per cent.
		Medium developed 23.3 per cent.
		Badly developed . 14 per cent.
2. "Children who have had breast milk up to sixth, eighth, and ninth month; after which they were partially weaned, and received other food."	{	Well developed . 58 per cent.
		Medium developed 26 per cent.
		Badly developed . 16 per cent.
3. "Those having had breast milk moderately abundant and bread food along with it from birth or early age."	{	Well developed . 51 per cent.
		Medium developed 25 per cent.
		Badly developed . 24 per cent.
4. "Children from birth or the age of two or three months, besides an abundance of breast milk, had received boiled bread and milk; or merely water, sugar, and arrow root."	{	Well developed . 52 per cent.
		Medium developed 28 per cent.
		Badly developed . 20 per cent.
5. "Children having had from earliest infancy a moderate or small supply of breast milk; some for a few months only, others for much longer times, with other food from birth."	{	Well developed . 26.5 per cent.
		Medium developed 26.3 per cent.
		Badly developed . 47.9 per cent.
6. "Children fed entirely by hand, and with no breast milk at all."	{	Well developed . 10 per cent.
		Medium developed 26 per cent.
		Badly developed . 64 per cent.

The pernicious influences and extraordinary mortality produced by the want of breast milk is more fully exhibited in the reports of foundling hospitals. In the hospitals of Lyons and Parthenay, France, where the children (Routh) are suckled at the breast, the mortality is respectively 53.7 and 35; whereas in Paris, Rheims and ———, where artificial feeding is very generally employed, the mortality is respectively 50.3, 63.9, and 80 per cent. The observations of Drs. Merei and Whitehead show that the percentages of the medium and badly developed increase with the diminution of the breast milk and shortening of the period of lactation, until it reaches respectively 26 and 64 among those dry-nursed from birth. They show the equally important fact that additional food, when the mother is healthy and has an

abundance of milk (compare classes 1 and 4), reduces the percentage of the "well developed" from 62.6 to 52. These are the results among living children. The number of deaths from similar causes may be estimated upon the basis of the mortality in foundling hospitals.

The foregoing data demonstrate the importance of preserving to the nursling the breast of the mother. It is best when sufficient for its sustenance, but better even when insufficient than none at all. "The worst," says Routh, "that can be done under ordinary circumstances for a child, is to bring it up exclusively by hand; at least, in the way in which it is usually done." He asserts, furthermore, that "the mere substitution of a hired wet-nurse increases the mortality" and cites in proof, in addition to others, the circumstances that in Switzerland and Holland, where the smallest number die, the mothers nurse their own children; and "of one hundred children suckled by their mothers, in Paris, eighteen die in the first year; of the same number at nurse, twenty-nine die." In the department of the Gironde are two communes, under similar hygienic conditions. In one the mothers suckle their own children; in the other a number of mercenary wet-nurses take in children from Bordeaux in large numbers to nurse. In the first the mortality is 13 per cent. in the last it is 89 per cent.

In view of these considerations the preservation of the function of the mammary gland, and its restoration when impaired, becomes a duty of paramount importance. The more general diffusion among women of information concerning the causes of defective lactation, and the importance of early recognition of and attention to the evil effects, will accomplish much towards modifying or obviating the dangers.

The general management of cases of defective lactation consists in local or mechanical, hygienic, dietetic, and medical treatment. A discussion of the details of these several methods would involve an elaborate and unprofitable review of the literature of a subject concerning which a vast amount of nonsense has been written, and for the treatment of which

many remedies have been recommended, both by physicians and laymen, with which the writer has had no experience, and of the value of which there is no confirmatory evidence. Nevertheless, the subject is too important to be passed without comment.

The local treatment involves the management of the gland and nipples before and after labor. Any disease of the gland, or irregularity in shape or position of the nipple, should receive the necessary attention before or during pregnancy. Sore nipples and sore breasts are quite common, and sometimes unavoidable, occurrences after confinement; but with proper care and timely treatment they are usually manageable affections, and do not necessarily permanently disturb the function of the gland.

Various local and mechanical means have been employed to provoke and increase the flow of milk. Suction, titillation of the nipple in imitation of the process of milking animals, pressure, kneading, gentle friction, electricity, fomentations, and the application of various stimulating substances have been employed, with more or less success. Of these, suction and electricity have yielded the most favorable results. Suction is the most certain and powerful means of promoting, increasing, and preserving the lacteal secretion. This is illustrated by the numerous instances of maidens and barren women, and of the few cases of males, who have by this means established a copious secretion of milk; by the cases reported by Livingstone, Dunglison, Thorwarth, Waddy, and others, of old women, who had long before ceased to menstruate and bear children, who had reproduced the secretion, and nursed their grandchildren; and by the very common occurrence, — the gradual, sometimes rapid, loss of the milk after the death of the child, notwithstanding the efforts made to preserve the breast for mercenary considerations. The preferable mode of suction is by the child. There are sundry contrivances for this purpose, but unless handled by experts they are more often productive of harm than good. Regular and methodical nursing of the baby will often, especially in

the cases of natural scantiness of flow and torpor of function, promote the secretion, and in those cases of defective lactation due to insufficient, irregular, or over-nursing it will frequently completely restore the gland to its normal condition.

Electricity has not been so extensively employed; but in the hands of those who have given it a fair trial the results have been encouraging. It is a valuable adjuvant to suction. It stimulates the nerve distribution and circulation, and promotes the nutrition of the gland.

The local treatment of the gland by the application of plasters, ointments, oils, embrocations, and poultices, for the cure of any form of defective lactation, is, so far as is known to the writer, useless.

The hygienic treatment refers to personal and domiciliary cleanliness; healthy exercise in the open air; proper sleeping apartments; sufficient and refreshing sleep; fresh and pure air; protection from the debilitating influence of a continuous high temperature, and from the equally injurious effects of severe cold; and sufficient and proper clothing. The change of residence from town to country, or to sea-shore, sometimes promotes an abundant flow of good milk. In short, the hygienic rules and regulations which are so conducive to the health of nurslings are equally important for the mother.

The dietetic treatment is the most important of the several methods, and yields most satisfactory results. This is so generally recognized, both by laymen and physicians, that it is almost exclusively employed. There is, however, no universal diet suitable to every mother, no continuous regimen of specified foods which can be relied upon in every case with a uniformity and constancy of results. The general law governing the dietetic management is to supply such foods as are simple, nutritious, easily digested, and easily assimilable, and to avoid such as may be injurious to the nursling. It is worse than useless to attempt to sustain life, and at the same time nurse a baby, upon crude articles, knickknacks, candies, preserves, pickles, and bonbons, together with teas, ptisans, and potations. The watery constituent may be increased, but the nu-

tritive quality of the milk will be deteriorated. A judicious combination of animal and vegetable foods is always desirable. Strong salt foods and indigestible and acescent fruits and vegetables should be avoided. Potatoes and other vegetables, in which oxygen and hydrogen exist in the proportion to form water, such as the starchy, saccharine, gummy, and ligneous varieties, should be used in moderation. Neither should the diet be exclusively albuminous. Fats in moderation are beneficial. Oatmeal and barley are generally admissible. Fish, tender birds, crabs, and oysters are considered specially efficacious. Routh commends whiting soup and conger-eel soup as milk-producing foods. Among the vegetable aliments many varieties have from time to time been extolled as valuable agents to improve the flow and richness of the milk, but most of them have been relegated to the usual disuse of over-estimated specifics. Among this class, Routh regards the lentil, pea and bean soup, and among the edible fungi, the deer balls, as the most efficacious promoters of the secretion of milk. The influence of turnips is familiar to every one accustomed to use milk; but no one prefers the milk of cows fed on turnips, nor do puny babies thrive on the milk of mothers fed on any of the brassica species of vegetables.

The proper dietary management of puerperal women, especially during the earlier days of the month, will influence favorably the lacteal secretion. The practice in times past, and one too common now, of limiting the diet of a recently confined woman, during the first week, to tea and toast, or some other equally innutritious aliment, has given way to a more generous system of feeding women who have to live themselves and feed others. The process of making milk in the laboratory of one's own person must consume a large amount of force, which can only be replenished by food.

There is great diversity of opinion in regard to the value of drinks. Perhaps the rule which governs most persons is the special fondness for a particular beverage. Good, pure, wholesome drinking water, in requisite quantities, is certainly unexceptionable and harmless; and perhaps equally as effi-

acious as the more valued and palatable compounds and mixtures of alcohol. Stimulating and appetizing drinks are sometimes very efficient promoters of digestion ; but no healthy nursling needs alcohol, and, when sick and needing it, it had better be fed from the spoon than nursed from an intoxicated mother.

To even enumerate the medicines, disgusting compounds, and nauseous mixtures which have been suggested, employed, and extolled as galactopoëtics¹ by their inventors and discoverers would be a waste of time and space. No one but themselves has ever witnessed the benefits which their enthusiasm has so lavishly bestowed. The simple rule of guidance in the medical management of cases of defective lactation is to address the remedies to the improvement of the health of the mother. If her digestion is impaired, blood impoverished, or bowels sluggish, meet the indications with the appropriate remedies. Heal old sores ; cure chronic discharges ; arrest hemorrhage. Restore her, if possible, to the condition of a vigorous and healthful woman in the prime of life. So far as this is accomplished, so far will all be done that can be to restore the sufficiency and richness of the milk.

The removal of the cause of insufficient and unfit mother's milk and the restoration of the function of the organ constitute the most conservative and certain method of supplementing the natural aliment of the infant. In this aspect of the question the sanitarium can accomplish a vast amount of good. The improved hygiene and regimen, together with the salutary influences of change of residence, and freedom from the cares and sorrows of want and destitution, with such medical advice and medicines as a careful and skilled expert may deem needful, will prove successful in very many cases.

Supplemental alimentation must necessarily be considered in two other and very different aspects ; one relates to the supply of additional food which most children need after the appearance of the eight front teeth ; the other to those cases

¹ Substances to which has been attributed the property of favoring the secretion of milk and augmenting its quantity.

in which the mother, from some one or more of the unremovable causes previously enumerated, has failed to furnish adequate sustenance, either from birth or during the earlier months of lactation. It is demonstrated that not only does the composition of the milk change materially as the period of lactation advances (see Table XV.), but the infantile organism usually demands, after that age, more nutriment than most women can supply. How best supply the deficiency is an important question. Common sense would reply, with the milk of another woman; but common experience teaches that this method is not only inexpedient and impracticable, but is pregnant with untold evils to the defenseless nursling. The mercenary wretch who sells her breast and thus robs her own child of its birth-right, leaving it to suffer, or perhaps starve, and often abandoning or destroying it, is not fit either morally or physically to properly nourish any other child.

The model wet-nurse should be a woman of suitable age who has lost her own child at about the same age as the foster child. She should have a breast of good and abundant milk; be free from actual or hereditary predisposition to disease, possess a kindly disposition and even temperament; have no vicious, gluttonous, lazy, or uncleanly habits; and finally, be animated by a love of children rather than the money value of her services. When such an one can be had, she will measurably fill the mother's place. In the sanitarium, to which will be admitted a number of mothers with nursing babies, it may happen that some will possess a superabundant flow of good milk, which can, with great propriety (barring always the objections just stated), be used in aid of those insufficiently nourished, but the institution cannot engage in the immoral and criminal business of making wet-nurses, or hold out inducements for them to make themselves. Wet-nursing will then, practically, be limited to the mothers possessing a superabundance of milk, who may temporarily reside in the institution, and who will furnish a wholly inadequate supply. The deficiency must be mainly supplied by artificial lactation.

ARTIFICIAL LACTATION.

Artificial lactation means the substitution of animal milk for that of the mother, and is applicable to three very different classes of young children :—

(1.) The motherless, the abandoned, and those whose mothers are wholly incapacitated for nursing.

(2.) Those who are insufficiently nourished by their mothers from birth or during the earlier months of life.

(3.) Those who are insufficiently fed because of their advanced age and rapid growth.

As milk is the only natural, it should be the exclusive, diet of infants until after the appearance of the eight incisor teeth. The milk of an animal is the only suitable substitute for, or addition to, breast-milk which is generally applicable to the artificial lactation of classes one and two. There may occasionally occur an exception to this general law, due to some digestive idiosyncrasy of the infant ; but most frequently the exception is only apparent and properly attributable to some impropriety in the management of the baby, or some mistake in the preparation or preservation of the milk. After the cutting of the front teeth the three classes become practically one, designated as the third in the above classification, for which milk should be the chief, but need not be the exclusive, aliment.

Cow's and goat's milk have been almost exclusively employed as substitutes for that of the woman. Cow's milk is preferable, because it is more abundant, more easily obtained, and is free from any disagreeable odor. The proportion of water and solid ingredients in the milk of the goat (see Table XVI.) differs less from that of woman than does that of any other animal. The milk of all, excepting the ass, contains a larger quantity of solid constituents, the cow's containing more casein, butter, and salts, but less sugar, than that of woman. To adapt the milk of the cow to the purposes of artificial lactation, the proportions of the solids and water must be approximated to the percentages found in human milk.

TABLE XVI. — *Moleschot's Analyses of Milk.*

	Woman's.	Cow's.	Goat's.	Sheep's.	Ass's.	Mare's.
Water	889.08	857.05	863.58	839.89	910.24	828.37
Solid ingredients . .	110.92	142.95	136.42	160.11	89.76	171.63
Casein	39.24	48.28	33.60	53.42	20.18	16.41
Albumen	—	5.76	12.99	53.42	20.18	16.41
Butter	26.66	43.05	43.57	58.90	12.56	68.72
Sugar	43.64	40.37	40.04	40.98	57.02	86.50
Salts	1.38	5.48	6.22	6.81	57.02	0.29

This is done by adding water and sugar, and should be, as a rule, according to the age of the nursling, and the corresponding changes which take place in woman's milk from month to month, as shown by the analysis (see Table XV.) of Vernois and Becquerel. This law cannot, however, be followed in every case, for infants differ very much in digestive and assimilating capacities. Most frequently too little water and too much sugar are added. It often happens that the quantities of sugar and water added must be varied from day to day until the proper proportions are ascertained by the evidences of relief and subsidence of digestive disturbance.

Human milk is alkaline; cow's milk is acid, but least so when the animal is pasture fed. Zahan, Stohmann, and Kerl believe the acidity is due to some change occurring in the udder of the cow. Be that as it may, the practical fact is that it is generally, if not always, acid, and that the acidity increases continuously from the time of milking. Consequently the addition of antacids is a necessary part of its proper preparation as a suitable aliment for children; and this is the more necessary because of the constant tendency of milk sugar to transformation into lactic acid, and the danger of excessive formation of acids in the stomach.

The casein of cow's milk coagulates in firm and dense masses, that of woman's in loose and flocculent ones; hence

the latter is more easily digested. The more stale and acid the milk, the quicker and firmer the coagulation. Skimmed milk when taken into the stomach coagulates sooner than the same before the separation of the cream, because of loss of fat and other consequent changes. Various suggestions have been made for obviating these objections, but none have fulfilled the object. Perhaps, as remarks Jacobi, there is no way of making the casein of cow's milk any more digestible than it is as found in the natural condition.

Cow's milk contains more butter than woman's, hence the greater tendency to the formation of the fat-acids, which are so frequently the cause of digestive disturbances in bottle-fed infants. Many unsuccessful experiments have been made to equalize the percentages of casein and butter found in the milk of the cow with those existing in human milk. The addition of cream has proven detrimental. Fats are not digested in the stomach, but in the intestines, where they meet the bile, intestinal and pancreatic secretions. The formation of fat acids in the stomach and their admixture with the pancreatic fluid neutralizes its property of emulsifying and preparing the fats for absorption, producing intestinal indigestion. Intestinal digestion, at best, is feeble in infants, especially so in very young nurslings. Wegscheider has shown that the fat of the mother's milk is never completely absorbed, a part passing through the intestinal tract as fat, a part being saponified, and a third part escaping in the form of fat acids. The writer believes that he has quite frequently successfully treated intestinal indigestion, both in infants and adults, by the addition of Dobell's pancreatic emulsion¹ to the milk. When the excessive formation of fat acids cannot be successfully arrested by alterations of the proportions of water and sugar, and the addition of alkalies, it may become necessary to withhold the milk, and substitute rice or barley water, for several days. It will frequently be judicious to add to the milk a fluid prepared from barley or oatmeal; the former

¹ A saline essence of pancreatine has been recently introduced by Savory and Moore of London, which promises favorable results.

when diarrhœa is present, the latter when constipation exists; but when the addition of either is made the quantity of milk should be diminished.

Butter, which is present in so much larger proportion in cow's than in human milk, seems, both from experimental investigation and clinical observation, to be the constituent most productive of digestive disturbances. Notwithstanding the diligent efforts that have been made, this difficulty has not been overcome. The addition of a sufficient amount of water, better too much than not enough, is so far the only practicable method suggested. As a rule milk is the only fluid a young baby ever gets, and generally, especially in hot weather, this furnishes an insufficient supply of water for the purposes of the animal economy. Water is as necessary as food; in fact digestion cannot be carried on, nor can health be maintained, or life sustained, without it. But it is not necessary to convert a child's alimentary tract into a common funnel, through which all the liquids and slops at a housekeeper's command are to be poured.

How much milk should be given a child, and how best to feed it, are very important questions. The statistics of Meret and Whitehead show conclusively that over-feeding is detrimental, and clinical experience proves as conclusively that over-feeding diminishes the expectancy of life. The quantity must of course bear some relation to the vigor of development, and, therefore, a general rule can only be approximately accurate. The prevailing error, especially among the better-to-do classes, is to over-feed.

Authors do not agree in regard to the quantity required by a healthy baby. Dr. W. H. Cumming¹ has estimated the amount ordinarily furnished by a healthy woman to be from one and a half to two quarts daily. He thinks that an infant three months old will consume from forty-eight to sixty-four ounces daily, in six or eight half pint doses. Routh² thinks this estimate too high. He asserts that a child three months

¹ Routh, *Infant Feeding*, page 101.

² *Amer. Journ. Med. Sci.*, vol. xxxvi., page 25. 1858.

old will generally thrive on five meals a day, the quantity taken at each meal not exceeding eight ounces. A younger child would nurse oftener, but the quantity would not exceed three ounces at each meal, so that from birth to the completion of the third month the amount would vary from thirty-two to forty ounces daily. After that age the child may take forty-eight ounces daily. MM. Guilliot and Lamperière (Routh) have shown that infants can absorb in twenty-four hours from forty-eight to sixty-four ounces; and Hervieux insists that they thrive best when they take all they can appropriate, which he believes is a larger quantity than generally supposed. Boussingault's experiments on animals lead to the conclusion that infants require proportionately more food than older children or adults.

The proportion of strong and healthy mothers who will yield an abundant supply of milk may be approximately conjectured from the calculations of Meret and Whitehead. See Table XVII.

TABLE XVII. — *Supply of Breast-milk in 952 Women.*

	Actual number.	Had abundant milk six months and upwards, some two years.	Proportion per cent.	Had medium quantity of milk.	Had scanty quantity of milk for a few months.
Strong and healthy .	629	420	66.7	114	95
Delicate and sick . .	323	88	27.2	69	166
Total	952	508	—	183	261

Thus it appears that 66 per cent. of mothers are strong and healthy; of these 66.7 per cent. furnish milk in abundance, and 46.6 per cent. of all mothers supply inadequate sustenance.

Artificial lactation may be performed with the spoon, mug, or nursing bottle; the last is the preferable method. The bottle should be one with a smooth and even internal surface, without shoulder, angles, corners, or inverted bottom, to which should be adjusted, by means of the stopper, a flexible tube, with a soft mouth-piece, and attached at the distal end to a glass tube within the bottle.¹ When the child has been fed, any remaining portion of the prepared milk should be thrown away, the different parts of the nursing apparatus separated, thoroughly cleansed, and laid aside in an alkaline solution. Many artificially nursed babies are annually sacrificed through omission of these apparently trivial matters. Coagula of milk attached to any part rapidly undergo such changes as will spoil the milk at subsequent feedings. When the child ceases to suck at the mouth-piece the bottle should be removed, and the child should not be urged to continue taking food when it has enough; nor should it be allowed to hold the bottle any longer than is necessary, or dally and play with it, sucking and quitting, or sleeping and waking, with the mouth-piece held between its lips. The warmth of the body and hand, and the lapse of time, favor and hasten the deteriorating changes which are so liable to occur in the milk.

Deweese² insists that "the child should not receive its nourishment while lying; it should be raised, which will not only become a pleasanter position, but it also diminishes the risk of strangulation." Routh³ asserts that the semi-erect position, which is that occupied when nursing at the breast, is not only the most convenient, but, for anatomical reasons, the best. After having been fed the child should be allowed to rest, sleep, if it will, and not be jostled up and down as if one desired to convert its stomach into a churn. The practice is injurious and productive of much mischief. No less reprehensible is the familiar habit of rudely and quickly tossing, or

¹ The bottle sold by Reynders & Co., and described by Jacobi, in his essay on Infant Hygiene, is perhaps the best.

² Dewees on Children, paragraph 575.

³ Infant Feeding, page 97.



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swinging by its shoulders, a child high in the air. It is gratifying, however, to know that the stomach sometimes retaliates by pouring out its contents upon the chief performer in such acrobatic sports.

Dewees says milk should never be boiled, and Jacobi is opposed to its being given raw. The former asserts that the formation of the pellicle by boiling deprives it of a part "of one of its most valuable constituents." Parmentier and Deyeux concluded from their experiments that the loss of the volatile principle by boiling was disadvantageous; others hold the opposite opinion. No one doubts that boiling will diminish the tendency to decomposition and acidity, and will sometimes restore alkalinity. Gas is also disengaged, and the tendency to the formation of lactic acid is thereby diminished. Boiling also diminishes the absorbing power of milk, and destroys mold and germs. The absorption power of milk is very remarkable. If raw milk is placed in closed apartments with highly flavored fruits and vegetables, as for instance the orange or cantaloupe, it will rapidly absorb the flavor. How far this property of absorption may prove detrimental has not been determined. These considerations lead manifestly to the conclusion that heating the milk, especially in warm weather, is essential to its preservation. The writer has not adopted either of the extreme opinions, but has preferred a medium course. As soon as the milk is received (and there should always be at least a morning and evening supply of fresh milk), it should be prepared by the addition of hot water, in quantity sufficient together with the alkali for the proper dilution. It should then be placed, in a covered vessel, in a refrigerator, and as needed the required quantity is warmed and sweetened with white (not brown) sugar. This process of scalding the milk has appeared to secure all the benefits of heat, and when the other necessary attentions — perfect cleanliness and purification of every utensil employed, and of the place of keeping — were carefully carried out, has usually proved satisfactory as a method of preservation. Many healthy children from eight to twelve months old, and older,

will take milk without any dilution, and thrive. In such cases it is best to add a very small quantity of boiling water, or to simply boil it.

CONDENSED MILK.

Condensed milk has been very extensively employed as a substitute for breast-milk, and there exists a great contrariety of opinion in regard to its value. Daly and Jacobi, perhaps, represent the two extremes of opinion: the former believes that all children fed upon it are weakly, and possess a feeble power of resistance to disease; the latter holds, that when mixed in proper proportions with barley water or oatmeal gruel, according as diarrhœa or constipation may be present, it is quite as good "as ordinary city milk" prepared in a similar manner. The writer's experience differs somewhat from that of either of these gentlemen, and this difference relates to the peculiarities of infants. When prepared as recommended by Jacobi and largely diluted, it has, in very many cases, proved sufficient, but in a larger number of cases it has proved unsuitable. It has seemed, at times, to cause thrush and diarrhœa; and it is undoubtedly true that some infants fed exclusively upon it manifest a feeble resistance to morbid agencies, but this is very far from being the general rule.

OTHER SUBSTITUTES.

As a matter of fact there is no such substance as a substitute for milk. It is true that many children have been reared without ever having tasted breast-milk. The statistics of Meret and Whitehead, before cited, show that of those fed exclusively on breast-milk to the ninth month or longer, 14 per cent. were badly developed; and in 23.3 per cent. the development was only medium; while of those "fed entirely by hand and with no breast-milk at all," only 10 per cent. were well developed. The conclusion is thus quite apparent that feeding exclusively on breast-milk does not always produce the best results, but it is even more apparent that the exclusion of breast-milk from birth yields the worst results.

The substitution of animal for human milk is the alternative best adapted to the artificial feeding of classes one and two (see page 135), but it is alleged there are occasional instances when infants cannot be nourished with milk. Such cases are so rare that the writer cannot recall a single instance occurring in his own practice. The cases in which milk should be withheld for a time, especially during the hot summer months, are numerous among those infants who have not passed the period of the appearance of the incisor teeth. How best to nourish such infants is a problem that has not yet been solved. Arrow-root, tapioca, sago, and many other farinaceous substances have been very generally abandoned. The "sugar-teat," corn-starch, and "cracker-victuals" ought to be universally condemned. The various manufactured and patented "Infant Foods" are mere articles of traffic, as unsuitable as they are unreliable. Occasionally an infant in vigorous health is exhibited as an illustration of the remarkable nutritive virtues of some one of these unknown compounds; but it is more probably the exhibition of a development attained in spite of them. When the cause is an evanescent one, it should not be forgotten that total abstinence from food, and sometimes from drink, — stomachal rest for a period, — will prove sufficient to restore the function of digestion; and when to this can be added rectal alimentation, the period of stomachal rest may be prolonged. In such cases the decoction of barley and oatmeal gruel, of the farinaceous substances, have been generally preferred, because of their large percentage in protein compounds, and (Jacobi) richness in salts. But, notwithstanding the protest of Jacobi against the use of rice water, the experience of the writer coincides with that of Trousseau in regard to its value. He has too often witnessed its beneficial effects in cases of diarrhœa with uncontrollable vomiting in young infants, to abandon its employment on mere theoretical grounds. The *eau albumineuse*¹ of Trousseau; the gel-

¹ Prepared by diluting the whites of four eggs with a quart of water; sweetened to taste by adding sugar, and aromatized with orange-flower water.

atine food of Meigs;¹ and Liebig's Infant Food will serve a good purpose as temporary expedients in many cases. But, as previously stated, a diligent and persistent effort to adapt good fresh milk in some form, either by varying the dilution or the preparation of some compound of which it is the basis, will in a vast majority of such cases be crowned with success.

Animal food is rarely, if ever, admissible to the dietary of infants under six or eight months. Healthy children are very frequently supplied with animal food before the cutting of the teeth begins, in fact during the earlier months, without detriment, but it is always a hazardous experiment. In cases of sickness, especially in that class of diseases usually comprehended under the designation of "summer complaint," animal food is more often a cause than a preventive of death. When necessary or admissible, broths, teas, essences or extracts prepared from beef are to be preferred.

The supplemental and artificial alimentation of young infants constitute one of the most important problems which must engage the attention of the sanitarium. No such opportunity has ever before been presented for the study of this subject. To execute the trust confided to the management, the whole subject of infant diet must be reopened and reëxamined in the interest of preventive medicine. Speculations and suggestions are simply the result of individual observation and experience, which are only valuable in so far as they may present a reasonable hypothesis upon which more extended and scientific experiment and investigation can be conducted. The field is not less inviting than it is rich in results which will contribute to the diminution of the mortality and alleviation of the suffering of young children.

DENTITION.

The preceding sections on supplemental alimentation and artificial lactation have been devoted mainly to the discussion of alimentation of infants classed in the first and second subdivisions (see page 135), and for the period of life termi-

¹ Diseases of Children, Meigs and Pepper, page 304, ed. 1870.

nating with the beginning of dentition. The second period is characterized by the eruption of the twenty deciduous teeth, and extends to the twenty-fourth or thirtieth month of age. During this period all children, sooner or later, should be weaned, and will require additional and different food. Previous, therefore, to the consideration of the influence upon mortality of weaning and feeding, it is proper to consider the relation of dental evolution to the progress of growth and development in infantile life. These teeth appear in successive groups. The period of appearance of these groups has been variously stated. The writer's observations coincide with the results obtained by Drs. Meri¹ and Whitehead, which Routh also accepts. There are, however, very many exceptions to this general law both in the time and order of the appearance of the members of the separate groups. The beginning and progress of the eruption of the teeth is very generally accepted as the index of progressive, and delayed dentition as the evidence of retarded, development. Meri and Whitehead state that in 79 per cent. of the well developed, the first teeth appeared before the eighth month had passed; while in 60 per cent. of those with unfavorable development "the first were cut at eight months and upwards." As it is the almost universally accepted belief that the appearance of the first tooth is the proof that vegetable foods can be allowed, it appears from these data that in a large majority of infants the eighth month is the earliest period at which such food would be a suitable addition to the diet. At that time the progressive development of the organs of digestion has sufficiently advanced. The salivary and pancreatic secretions, and the gastric and intestinal fluids, are capable of digesting some vegetable aliments. The inference is equally apparent also that even trivial indiscretions in diet may at this period induce grave disturbances of the alimentary tract; for it does not follow that because nature by such posi-

¹ Anterior incisors, seventh month; lateral incisors, ninth month; anterior molars, twelfth month; canine, eighteenth month; posterior molars, two years.

tive evidence has indicated that the child is maturing, that therefore it can be fed indiscriminately with vegetable foods. As the several groups of teeth appear at distinct and successive periods, and at intervals varying from two to six (stated approximately) months, what relation, if any, do these alternating periods of time in the child's life bear to the digestive disturbances which are so common during the age of dental eruption? The process of dental evolution is a physiological one beginning during intra-uterine life, and should be progressive until completed. Yet it is the common belief that with the appearance of the first tooth begins the era of disaster, and that the acme of danger is coincident with the eruption of the several groups. This does not seem to be a rational conclusion. The sacs of both the milk and permanent teeth are formed during intra-uterine life, the ossification of the former dating back as early as the fifth month of that period. By continuously increasing growth upwards, the crowns of the front incisors appear above the alveolar borders of the jaw at or about the seventh month, and are followed at somewhat regular periods by the others in successive order. The evolution is a continuous process from the beginning of the formation of the dental sac and papilla, and progresses *pari passu* with the development of the entire digestive apparatus. Why should the periods which mark the completion of each part of a continually progressive physiological process be periods of greater danger than the intervals of equal activity in the development of these incompleting parts? The fact is that all children are teething from the moment of birth until they have cut their last posterior molar; and it is not true that the periods of eruption are any more conducive to bowel disturbances than the intervals. The statistics of mortality show conclusively that alimentary disorders are far more frequent and more fatal during the months preceding the eruption of the teeth than during any period of an equal number of subsequent months. Dental evolution and eruption are not any more frequently the cause of disease than the simultaneous and consecutive evolution of the other and more important parts

of the digestive apparatus. It so happens that the appearance of a tooth is an object of distinct observation fixing a period of time, whereas the changes that are taking place in the glands and alimentary tract progress in an uneventful succession. Again, if this natural process is so destructive of infantile life, it should be equally so in winter as in summer; in the farming regions as in populous cities; among the well-to-do as among the destitute; in an equable as in a variable climate, during the periods of dental eruption which occur during the other months as during those which occur in July; and in Philadelphia as in the neighboring cities of New York and Brooklyn. Why should it be so destructive at a given locality during one season and so much less so the succeeding summer? Why more disastrous to children, at a given age, weaned, than to those nursed, at the same age; to the wet-nursed than to those nursed by their mothers; to those partially or wholly fed artificially than to those fed exclusively on breast-milk; to the abandoned and motherless, who are carefully and tenderly nursed in well arranged and appropriately constructed asylums, than to those rudely managed at home, but supplied with abundant and good breast-milk? All these circumstances, which are but the restatement of facts previously narrated, go to show the fallacy of the prevalent opinion that the eruptive periods are times of unusual danger. Nevertheless, authors of very high repute continue to reassert the doctrine. Meigs and Pepper assert that they "have rarely observed cholera infantum before the beginning of the process of dentition, and very rarely after its completion." J. Lewis Smith says, "it usually occurs under the age of two years." In 282 cases in which the observations were made, 47 had no teeth, and 28 had all the teeth. The statistics of Dr. Emerson show that it is more fatal in the first year than in the second, thus contrasting the causal influence of the very rapid growth of the first year with the more active eruption of the teeth during the second. In 138 children at the Necker Hospital, during the first dentition, Bouchut says, 26 were free from all indisposition, 38 had transient diar-

rhœa, and 46 had abundant diarrhœa; in 19 it appeared at the time of swelling of the gums and ceased with it, to reappear with the subsequent eruption of teeth. Vogel, who confounds entero-colitis with cholera infantum, under the designation of intestinal catarrh, says, "in children over one year of age the process of dentition is the most frequent cause," and "that the ordinary looseness of the bowels, which usually accompanies dental evolution, may become cholera-like, and prove fatal in twenty-four hours." West deduces the general conclusion "that the greatest prevalence of diarrhœa and dysentery coincides exactly with that time during which the process of dentition is going on most actively," and asserts that half of his cases occurred between the ages of six months and two years. Bouchut says, "the influence of dental evolution upon the diseases of the alimentary canal is completely established." So constant and active an influence does Trousseau consider dentition that he insists that weaning should not be completed prior to the eruption of the fourth group, and that it should never be terminated suddenly. Eustace Smith says the bowels are, during dentition, "ripe for diarrhœa," because of the augmented irritability growing out of the increased development of the follicular apparatus; "but, without the presence of the ordinary exciting causes, diarrhœa is by no means a necessary result of such a condition of the alimentary canal." No one will deny the occurrence of fever, and, occasionally, of convulsions, in cases of difficult dentition, and that the congested condition of the gums and inflammatory state of the buccal mucous membrane may extend to the intestinal mucous membrane and set up increased peristaltic action for all parts of the alimentary canal, and of its dependencies, which are undergoing active evolution to fit them for the proper assimilation of the varied food on which the young being will soon have to subsist. All these considerations point to the conclusion that it is the relation subsisting between alimentation and the physiological evolution of the digestive organs and their dependencies which is so easily disturbed during the period of life when nature is preparing the organism for an independent and self-sustaining existence.

WEANING AND FEEDING.

It matters not whether the conclusion reached in the preceding section, or its converse, that dentition is the constantly prevailing factor, be the correct one, the accommodation of the diet to the changing condition of the organism must be equally important. The cutting of the teeth marks the stage of development at which the supply of additional aliment is usually required, and during which the gradual preparation of the digestive apparatus for the duties of self-support should be completed. The deprivation of breast-milk and the additional feeding should both be gradually accomplished. Weaning, unless rendered imperatively necessary by some condition either of the mother or child, should not be completed before the eruption of the fourth group of teeth, from the twelfth to the sixteenth month of age. It is best, as a rule, that it should not be done during the heated months of the year. Many intercurring circumstances and conditions, some of which have been previously referred to, may determine an early or a late weaning. When practicable, and it is practicable with the greater number of infants, the digestive function should be accustomed to some form of farinaceous food before the beginning of weaning. Milk made into a pap with wheaten bread, or thickened with wheaten flour, barley, or oatmeal gruel, will usually prove sufficient in the beginning, to be followed, when the anterior molars have appeared, by oatmeal porridge, or cornmeal mush, and milk, with the occasional allowance of good wheaten bread, the juice of fresh beef, meat gravies mixed with bread, or well cooked, ripe and mealy potatoes, and finally by a larger allowance of solid food, a moderate supply of tender meat, not over-done, scraped or finely minced; but milk, or some composition of which it is the basis, must constitute the main reliance until the first dentition has been completed.

The feeding of weaned children is second only in importance to the alimentation of nurslings. The mere enumeration of suitable substances which may be allowed in successive

order is often objectionable and will accomplish but very little good. Parents should, so far as may be possible, be made to understand the principles of alimentation. It is not probable that very many, especially among the ignorant classes, can be taught the minute anatomy of the various parts of the digestive apparatus and the correlation of the functions of the several parts; but most people are sufficiently intelligent to learn more than they now know. Example, observation, and practice are wise and efficient instructors. Very many persons who know nothing of the principles of mechanics can be taught to work and handle certain machines with consummate skill. The chief obstacle to the proper instruction of parents in the principles governing the alimentation of children consists in the fact that these principles have not as yet been definitely ascertained and formulated. The whole subject is obscured by hypotheses, individual speculation, and unsatisfactory laboratory experiments. Very many interesting and important facts seem to be definitely established, but they are of little value to the general public because they have not been reduced to the practical methods of every-day uses.

The first and most important lesson in the art of feeding children is to teach parents that they can learn all that it is absolutely necessary to know; and the second is to disabuse their minds of the errors which ignorance, superstition, and bad example have inculcated. Every mother knows that milk is the natural aliment of babies, and that hand-feeding is always attended with more or less danger. They know equally well that the milk of an animal is the best substitute for breast-milk; but they are generally ignorant of the most simple methods for the preservation and preparation of it. Over-feeding and feeding with unsuitable substances are the most frequent and gravest errors committed by parents. Merei and Whitehead have shown that over-feeding from birth reduces the percentage of well developed from 62 to 51 per cent., and increases the percentage of the badly developed from 14 to 24 per cent. It is equally disastrous if commenced at a later period, and is far more frequent after the

eruption of the incisor teeth. The over-fed are those most frequently fed on improper food. The commission of the first error leads to the second and more serious mistake. There is no such thing as an indifferent or negative aliment for young children. That which they do not need is detrimental. They need suitable and sufficient food, but do not seek savory dishes and unfit substances until their natural tastes and instincts have been perverted by the constantly repeated temptations of indiscreet parents. It is a prevailing error to allow young children to come to, or rather to force them to, the family table, and tempt them with bits of first one thing and then another, until they fret and cry for everything within reach or sight; and when sickness follows, the parents are as reluctant to acknowledge the cause of the bowel trouble as most adults are to confess that anything they eat ever makes them sick.

The circumstances which should govern weaning relate first to the mother, second to the child, and third to the season of the year.

In addition to the various conditions of defective lactation previously discussed, the mother is sometimes rendered ineligible from acute diseases either of a general or local character. Febrile and exhausting diseases, and acute inflammatory and chronic local affections of the mammæ and generative organs, unfit women for the duties of nursing, either temporarily or permanently. Instances are also reported of women whose milk contained blood, pus, and other extraneous and poisonous matters. Whenever anything injurious to the mother is increased by suckling, or her milk becomes unfit, weaning is justifiable.

On the part of the child, the state of the teeth and the state of its health must determine the period of weaning. The first has been considered in a previous section. It is never judicious to take the breast from a child while it is sick, or during convalescence, unless it is manifest that the milk of the mother is injurious. Even an inadequate supply will often be all-important for the nourishment of a child exhausted by sickness.

The season of the year should be that in which the temperature is most equable, and which is most free from the bowel disturbances so prevalent in the summer months. The spring and autumn are the preferable seasons.

In view of the relation subsisting between the evolution of the teeth and the digestive apparatus, the following conclusions may be stated : —

(1.) There is no fixed age at which all infants ought to be weaned ; and only in exceptional cases should it be permitted previous to the appearance of the eye and stomach teeth.

(2.) There is no routine diet suitable to all weaned infants, but the food must be adapted to the progress of development and the condition of the infant.

(3.) The most effective preventive of the ill effects of improper and unsuitable alimentation of weaned infants will be the education of parents in the art and science of nursing and feeding.

(4.) The age of exclusion from the domiciliary department of the sanitarium cannot be under the thirtieth month.

THE MILK SUPPLY.

The supply of milk must be obtained either by purchase, production, or a combination of both methods. The last will be the most desirable and expedient.

That portion obtained by purchase must come from dairies at convenient distances from the institution, to avoid the injuries of transportation, lapse of time before delivery, and exposure to the air. The dairy or dairies, (and it is best that the herds of animals should not be too large), should be conducted according to the most approved methods of feeding, pasturage, stabling, care, and milking of the animals. The dairymen and other necessary attendants should be scrupulously neat and clean. The vessels employed in milking, straining, and transportation should be inspected daily. Care should be taken to avoid every source of contamination from imperfectly cleansed vessels, careless attendants, filthy stables, unsuitable food, unfit or contaminated drinking water, disease

among the cattle, and other extraneous sources of impregnation with the germs of disease peculiar to the human being, which have so frequently, of late years, been conveyed to large numbers of consumers of milk. The milk of every animal should be examined microscopically and chemically by a competent person, at times, if possible, unknown to the proprietor, and at the dairy before it is mixed with any other, that the good may not be contaminated by the bad. Each morning and evening supply should be carefully examined after delivery.

The adulteration of milk is the common practice of dealers and dairymen. Becquerel and Vernois have discovered the following substances in the milk supplied to Paris: water, glucose, flour, starch, dextrine, infusion of rice, barley, and bran, yolk of egg and white of egg, sugar, gelatine, liquorice, boiled carrots, broken down calves' brains, serum of blood, bicarbonate of soda, chalk, turmeric, emulsion of hemp or almond seeds, and other substances. In England Hassall found eleven out of twenty-six samples adulterated with water in the proportion of from 10 to 50 per cent. Sanderson found in all but one sample examined, excess of water. Hillier found the quantity of water added varied from 25 to 50 per cent. Thompson, Salter, and Hunt ascertained that the quantity of water usually added was one gallon to two of milk. The addition of water has proven even more detrimental than the mere dilution. The poison of infectious diseases has, in a number of instances, been added by its pollution with contaminated water. Recent observation seems to show that epidemics of disease originating through the milk are very virulent.

Parmentier and Deyeux maintain that "nothing¹ contributes more to maintain the good quality and quantity of cow's milk than scrupulous cleanliness in the sheds. If the refuse matters are left about and removed only at long intervals, the cows lying amid all this mess are always weak; the udders are hot, and the milk, so susceptible of acquiring a

¹ Routh.

bad odor, soon contracts a bad taste, of which it is with difficulty again deprived." Dr. Normandy found a herd of "thirty or forty cows in a most disgusting condition, full of ulcers, their teats diseased, and their legs full of tumors and abscesses; in fact, quite horrible to look at; and a fellow was milking them despite of all these abominations." Hillier examined a number of cow-sheds, none of which did he find suitably located, properly ventilated, properly drained, or of sufficient capacity. Some were under inhabited dwellings, some with insufficient water supply, and some the common receptacle for every form of filth. In many the animals were too long confined, poorly fed, and otherwise ill used.

Country milk differs from town milk; summer from winter milk; and morning from evening milk. In the country the animals are less crowded, have more exercise, and are not fed so exclusively on dry food. Winter milk contains less water, and evening milk is richer in cream.

Milk is deteriorated by transportation, more so when the distance is long and the conveyance rough. Agitation causes separation into butter and butter-milk. This change is promoted by dilution. Exposure to the air sets up lactic acid fermentation. The sooner the delivery after milking the better the condition of the milk.

The difficulties which may embarrass the purchase of milk are not insurmountable, but they will require all the care and vigilance of the officers in charge to detect and avoid. It will be wisest to suspect the cupidity of the dealer rather than rely upon his honesty.

There are many other and equally important reasons why the institution should produce at least a portion of the necessary supply. Many of the questions which refer to the influence of different food, amount of drinking water, weather, season, care, and attention of the animals, upon the quality and quantity of milk, need further investigation. The relation of the condition, care, and food of the animal to the health and nutrition of the beneficiaries must also be carefully studied. The alterations of the milk occasioned by the

time and frequency of milking, by stall-feeding and pasturage, and by rest and exercise require examination. Experiments should be made to ascertain the kinds of food that will most closely approximate the milk of the animal to that of the woman. The advantages or disadvantages of a single cow's milk as the exclusive aliment of a child; of feeding it directly from the animal, either by putting the child to the udder or as soon as convenient after it has been drawn from the animal, are questions as yet unsettled. Should the milk be protected from exposure to the air and carried, with least possible agitation, to the place of keeping, and there preserved by such means as may be best; or should the children, at regular intervals, be carried to the place of milking and there be fed with the fresh and raw milk, before it has lost its natural aroma and warmth? If the milk of an animal is the only proper and suitable substitute for breast-milk, may it not be as important to imitate as near as possible the manner and process of nursing as it is to approximate the constitution of the milk of the animal to that of the woman? Routh says, "the newer the milk is the better it is for the child," and expresses the belief that "immense advantage would accrue by allowing all infants to take the milk directly from the nipple of the animal." When practicable, he recommends that the animal "be brought to the door and then and there milked, and the milk in its fresh state at once given to the child." "Children will thrive under this mode of procedure when other means have failed."

These investigations and experiments should not be confined to the milk of the cow. The milk of the goat more closely resembles that of woman than that of any other animal, and is believed by many to be preferable for the purposes of artificial lactation. Routh¹ relates the circumstance that "the foundlings of Dublin were very many years ago sent to the mountains of Wicklow, to feed upon the goats' milk. As the children grew older the goats came to know them, and became very tame; so that the infant could go to

¹ Infant Feeding, page 311.

the goat to be suckled by it, as it would to a human wet-nurse." The children throve remarkably well. A similar result is said to have been observed in Malta.

To put in operation the suggestions in regard to the home production an immediate outlay will be required and the current expenses will be increased. Necessary stabling and other convenience must be provided, and competent and trustworthy employees must be secured. Proper food must be purchased, or produced on the farm. A portion ought to be produced, and the pasturage should be supplied, at home. The herd need not be large, five or ten cows, and perhaps half that number of goats, will be sufficient for experimental purposes. The additional outlay in the beginning, and the increased current expenditure, is a small consideration in view of the immense advantages which may result. The management cannot neglect such an opportunity of contributing "to the best means of lessening the mortality and promoting the welfare of young children."

LOCATION.

The vastly greater prevalence of disease among infants, and the larger percentage of mortality in towns than in the country, are sufficient to show that the institution must be located in the country. The remoteness of the city of Baltimore from the sea-coast, and the insalubrity of the shores of the Chesapeake Bay, are decisive in favor of an inland locality. The high and picturesque region lying north and west of the city indicate the direction in which a location of sufficient elevation must be sought. The schedule of railway elevations running north and west show elevations varying from 400 to 800 feet at accessible distances from the centre of the city. The requirements of the site, as suggested in the circular of the trustees, may be stated as follows:—

1. It must be on a steam railway, within one hour of the city, and the building site not over five minutes' walk from a station.

2. The quantity of land should not be less than 100 acres,

facing south and southwest, with no stagnant water, marshes, or mill ponds in the vicinity; and a portion of it must be in a natural forest.

3. The elevation must not be less than 600 feet above tide-water.

4. A stream of water of sufficient capacity, in the driest season of the year, must be within available distance.

5. The building site should possess the advantages of natural drainage; the soil should be porous.

6. A portion should be good agricultural land, at least sufficient for pasturage and a kitchen garden.

7. It should be in a healthy region, where the water is pure, and food of all kinds is abundant and cheap.

TRANSPORTATION.

Transportation must be by steam railway cars. The running and general management of the trains must be left to the officers and employees of the road, but must be conducted in the interests of the institution, and in the manner most conducive to the comfort and welfare of its beneficiaries. Sick and invalid children ought not to be huddled pell-mell into an unfit coach, and dumped out at the place of destination in the hurry of ordinary railway travelling. The accommodations should be comfortable and ample; the cars should be clean and well ventilated; order should be maintained; and all risk of danger should be avoided. Suitable and ample accommodations for their reception must be provided at the stations of departure and destination.

The institution must provide for each train a prudent and competent agent, whose duties must be definitely prescribed. Discipline should be impartially but gently enforced from the reception to the discharge of the patient.

Drinking water must be supplied at the place of reception and on the trains. Food must be supplied to the very young infants needing it. The inspection of the children should be thorough at the place of reception. Their bodies and clothing should be clean, and every care should be taken to avoid

the dissemination of contagious diseases. No child or attendant should be permitted to carry with them anything of the nature of food, beverage, or medicine. The control and management of the beneficiaries must be absolute from their reception until their discharge.

ORGANIZATION AND GENERAL PLAN OF MANAGEMENT.

The supreme authority and direction should reside in the Board of Trustees, which should prescribe all rules and regulations relative to the discipline and internal management of the institution. It should issue all its orders through its chief executive officer, who should be an experienced and competent medical man, and known as the physician-in-charge.

The physician-in-charge should have the general superintendence of the active operations of the sanitarium. He should be the head and only one, and should receive his directions from the trustees, and be responsible directly to them. All assistants, clerks, nurses, servants, and employees should be subordinate to him. He should be provided with a suitable dwelling, paid an ample salary, and hold his office during good behavior, but be removable by the Board of Trustees for incompetency or neglect of duty.

There should be one permanent medical assistant, who should be a competent microscopist and chemist. He should, under the direction of the physician-in-charge, conduct all chemical analyses and microscopic examinations, and perform such other duties as may from time to time be assigned to him. He should reside in and devote his entire time to the institution. His salary should be commensurate with his duties.

There should be such temporary assistants as may be necessary, employed only for the time during which the sanitarium is in active operation. They may, as experience will dictate, be either graduates in medicine or under-graduates. They should receive only such compensation as may be required to meet their necessary current expenses.

There should be one clerk to the physician-in-charge, em-

ployed temporarily or permanently as may be found necessary.

There should be employed permanently one head cook, and one head female nurse. The number of additional cooks and nurses must be determined by the number of beneficiaries. It will probably be found most expedient to permanently retain more than one efficient and thoroughly trained nurse, as it may be difficult to secure trained nurses for temporary service during the summer season, and the duties will be too important to be intrusted to incompetent and untrustworthy women.

The number and selection of servants and employees should be left to the discretion of the physician-in-charge. Economy should be observed and efficiency should be required in every branch of the service.

There should be appointed a board of consulting physicians, to serve without remuneration. This board should visit the institution at stated periods, and record, in writing, the results of their observation and inspection, with such suggestions as may be deemed proper and judicious for the better management of the institution.

There should also be appointed annually a committee of visiting physicians, to be selected from the most distinguished physicians in different parts of the country, whose duty it should be to visit the institution at some stated time during the summer months, and thoroughly examine and inspect every branch of the sanitarium. This committee should report in writing to the Board of Trustees. This duty should be performed at a trifling cost, certainly not more than the actual travelling expenses of the members of the committee. One or more of this committee should be female physicians.

The records of the institution should be full and complete. The age, sex, color, nativity, residence, and clinical and family history of every beneficiary should be accurately recorded.

PROVISIONAL SUGGESTIONS.

In view of the fact that the sanitarium will be in active operation for only a portion of each year, some provision must

be made for the employment of the permanent officers and employees during the greater part of the year.

The permanent medical officers will find ample occupation in study, investigation, and original research, for the advancement and improvement of the institution, and in the preparation of the annual reports. The institution owes something to the advancement of science, and it will be mainly, if not exclusively, through the efforts of these two officers that such contributions can be made valuable. The character and nature of these investigations have been very definitely indicated in the foregoing pages.

How best to utilize the services of the permanent cook and nurses is not so easily answered. It occurs to the writer that the management will find it proper and necessary to establish in the city of Baltimore a depot or salesroom, where suitable articles of diet for young children may be sold at actual cost to the poorer class. In such case the services of these employees in instructing those poor persons in the proper manner of preparing the food, and in feeding their infants, may contribute much towards lessening sickness and mortality.

THE ADMISSION OF BENEFICIARIES.

It may not be wise to exclude any invalid child under five years of age from the benefits of the visiting department. None older should be admitted. Asylums, hospitals, and convalescent establishments are the proper places for such children.

To the domiciliary department, preference should be given in the order following: —

1. To sick infants under thirty months of age.
2. To those between thirty months and three years of age suffering from bowel diseases.
3. To well children under thirty months.

No child suffering from any contagious or infectious disease should be admitted.

No mother suffering from any contagious or infectious disease should be allowed to accompany her child.

No mother who will refuse compliance with the regulations should be permitted to remain in the institution.

No mother admitted to the institution should be permitted to pass her time in idleness. When able, and not engaged in the proper and necessary attention to herself, infant, and sleeping apartment, she should be required to perform such other work as may be conducive to her health. Sewing, knitting, washing, and ironing, will always be necessary.

The management should carefully avoid the encouragement of pauperism, — an error which many benevolent institutions constantly commit. Those parents who are able to defray the expense of their maintenance, or a part thereof, should be required to do so. A schedule of very moderate charges should be established for the information of the public and guidance of the officers.

CLOTHING.

Clothing must be provided for the sick children admitted to the domiciliary department. Before admission to their proper apartment their clothing should be removed, and, as soon as practicable, washed, disinfected, and put away, to be restored when discharged. The children should be washed and dressed, according to the regulations, before being conveyed to the ward or sleeping-room. Great care is necessary with children confined to their beds, to protect them from the deleterious influences of their discharges.

MEDICAL MANAGEMENT AND TREATMENT.

The medical care and treatment of the sick must be left to the judgment and discretion of the physician-in-charge and his assistants. It must be assumed that these officers will be competent in every respect to discharge all such duties. None others should be selected or retained.

If the duties of the physician-in-charge and the professorship of the diseases of children in the medical department of the Johns Hopkins University could be united in the same person, both institutions would thus be enabled to command

the services of a man of the highest order of ability and professional acquirements. Such an arrangement would contribute to the success of both institutions, and to the advancement of knowledge concerning the causes and treatment of those diseases from which such an alarming mortality annually occurs.

The medicines needed will be few and simple. It may, however, be important that one of the temporary assistants should have sufficient knowledge of pharmacy to fit him for the compounding and preparation of prescriptions.

BUILDINGS.

As the sanitarium proper will be open only during the warmer months of the year, the buildings intended exclusively for occupancy by the beneficiaries, and by the officers and employees, should be constructed solely with reference to use during the summer season. They should be plain, simple, comfortable, and inexpensive wooden structures, as follows:—

Two private dwellings, one each for the physician-in-charge and the permanent assistant physician.

An administration¹ building, with two wards arranged as wings for the accommodation of those infants who may not be accompanied by their mothers.

“The plan of the first floor, the designation and dimensions of rooms, and the positions of doors, chimneys, windows, and beds, are shown on Plate A; the plan and dimensions of the second floor on Plate B; the front and side elevations of the building on Plate C; the sections are shown on Plate D.”

The first floor should be raised several feet above the surface of the ground, on piers or open arches. The spaces between these piers or arches should be filled with lattice-work.

“A good cistern of suitable capacity should be constructed and connected with the gutters and eave spouts.

¹ For the details of description and specifications of this plan, see Circular No. X., Surgeon General's Office, War Department. It is the plan of the present Army Post Hospital.

“ The windows should be furnished with outside shutters.

“ The privy and dead-house should be removed one hundred feet from the building.

“ All the doors should have transoms.”

There should be a number of cottages for occupancy by the mothers accompanied by their infants. These may be constructed with two, four, six, or eight rooms on the same floor. They should be one story, and elevated above the ground. The rooms may be arranged in a single row, the doors opening upon a wide veranda, or in double rows, with doors opening into a wide covered hallway open at both ends. All the doors should have a transom ; all the windows outside slat shutters ; and all the rooms a fireplace. They need not be plastered, but should be constructed in a substantial and workman-like manner. They should be sufficiently removed from each other to afford ample space, and abundant fresh air and sunlight. Too much shade should be avoided. The water-closet and sink arrangements should be entirely disconnected.

At a convenient distance from these cottages the general kitchen should be erected, where all the food for the mothers and their children, and for the excursion parties, should be prepared. A dining-room should be directly connected with the kitchen, but no child should be allowed to enter it at the meal-times of the mothers, nor should the mothers be permitted to carry to their rooms any article of food prepared for themselves, or give it to their children. The children needing it should be fed at regular intervals, under the supervision of a nurse, either in the dining-room or at their lodgings.

The buildings for the visiting class should be convenient to the general kitchen, but should be entirely distinct and separated from the cottages by an inclosure sufficient to prevent the two classes from commingling. These buildings should be constructed on the pavilion style, with benches and other necessary appurtenances pertaining to a picnic resort, such as are usually provided by the German associations on the grounds where their annual festivals are held.

At a convenient distance from the cottages and festival buildings, the bath-house should be erected and provided with all necessary conveniences for hot and cold bathing, both for adults and children.

The laundry should be remote from all inhabitable buildings.

The ice-house should be of ample capacity.

On another part of the grounds should be erected a number of single cottages, each with sufficient accommodations for a small private family, for occupancy by such persons as are able and willing to defray their own expenses, and who may wish to avail themselves of the salutary influences of a country health-resort. It is not improbable that many parents, with young children, may prefer, if suitable accommodations are provided, a health-resort which will supply all that is essential to the proper care and treatment of young children during the season when a residence in the city is so hazardous to infants.

ON THE IMPROVEMENT OF THE CONDITION
OF THE POOR AND SICK CHILDREN: GEN-
ERAL PRINCIPLES.

*A Letter to the Honorable the Board of Trustees of the Thomas
Wilson Sanitarium for Children.*

BY A. JACOBI, M. D.,
New York.

GENTLEMEN, — You favored me with a note dated Baltimore, December 8, 1879, in which you honored me with the request to write an essay on the best method of establishing a sanitarium (not a hospital, but a summer retreat) for sick children. At the same time you also desired my opinion regarding the regulations suitable for receiving and administering medically and otherwise to those who would be the proper objects of your care, with such suggestions as might occur to me in reference to the character of the buildings that might be requisite, their grouping, or isolation; how best to provide for mothers or nurses accompanying their children; and generally such incidental recommendations as experience and reflection might commend as valuable and useful.

You also wish my suggestions in reference to the most practicable means of lessening the risks and changes incident to children exposed to the heated and impure atmosphere of a large city during the summer months; also my views as to the best methods of extending a general knowledge of simple hygienic rules for the treatment of children at home among the poorer classes. And while you express your hope, "at least, to show a model of experiment," which may prove of value as a contribution to the best means of lessening the mortality and promoting the welfare of young children in Baltimore, and in other large cities, you direct me to give my

thoughts in the method and manner which I shall deem most conducive to their successful presentation.

All these questions and demands I look upon as in perfect harmony with the objects of your corporation, when first established. For though a summer retreat was mainly contemplated by the originator of your vast plan of benevolence, the general object was to "alleviate pains and to prolong life." And while a summer retreat for sick children was mentioned as the one prominent end to be reached, other kindred purposes, as might be hereafter determined upon by the corporation, were included in the points to be gained.

Thus, the original intention of Thomas Wilson, and your specifications, questions, and demands, comprehend a vast amount of important matter. Not only do you ask for the best means of extending the knowledge of simple hygienic rules for the nursing and treatment of children, — which are the same for those of the rich and the poor, white and black, Christian, Gentile, and Infidel, — but you desire to provide for those who are well, so as to protect them from sickness; for the sick, to cure them; for those, in particular, who suffer from impure air and heat, so as to save them; and also ask for plans and specifications. While I express my fear that I may not be able to say anything new, and my doubt whether I can do justice to the subject as understood by you, I am gratified, at least, by the fact that you do not expect to correct a great universal evil by a single remedy or by a single method. Benevolent efforts avail but little, as a general thing, because they are directed against special evils, which are either the outgrowth of a false system or but a link in a chain. The breadth of your views includes the desire to benefit the poor children, be they well or sick, — as they are almost certain to be, because they are young; and more so because they are poor. The latitude, however, extended by you to the expression of my views, renders my task very difficult; because, to do it justice, extensive discussions upon the hygiene and diet of infants and children, the physiology of their digestive and other systems, the influence of heat on

their nerves and blood, and upon the condition of their food, the essential points in their diseases, and the rates and reasons of their mortality, might be expected. Fortunately, the main principles of many of these points are settled; and therefore my remarks can, in part, be fragmentary. There are a number of truths which, by this time, are considered self-evident; and strictly scientific questions, which are still undecided, do not belong here.

The class of people to be benefited by your corporation are the poor and sick children. The main attention is to be paid, however, to the children threatened by, or suffering from, the heat of the summer and impure air, both of which not only affect the nervous system directly, but destroy life by acute or chronic affections of the alimentary canal.

To what class and age do they belong? And is it mainly the heat, or mainly the impure air, or mainly the food, which destroys them? Which of these factors is most objectionable and preventable? And are there no other factors of excessive infant mortality which can be obviated?

Of 100 newly-born babies, 16 or 18 will die before they are a year old in most countries. In England, of 100 born to the gentry, there lived after a year, 90; tradesmen, 79; working class, 68.

Of 1,000 dead in the first families in Germany, 57 were under five years of age; amongst the poor of the capital there were 345.

In the starvation years of 1841 to 1851, the population of Ireland decreased by 19.8 per cent., the number of children under five years by 37 per cent.

The average mortality of the new-born in France up to the completion of their first twelve months is 16 per cent.; in four of the districts to which infants of Paris are sent for nursing purposes, it was 25.63, 30.28, 27.62, 51.33 per cent., while the mortality of babies born in these very same districts, and less neglected by the women, was less frightful.

Of Paris babies sent to the country for nursing and rearing purposes, and strictly superintended by the proper au-

thorities, 17 per cent. died before the end of the first year, — that is, but one per cent. beyond the average mortality of that age in France. Of the babies sent out by private societies, with the same pay and regulations, not officially watched, however, 42 per cent. died. The foundlings of the Département Eure et Loire, who were bottle fed, and in many instances a number of them in charge of a single woman, from 60 to 75 per cent. were destroyed before they reached the end of their first year; many of them never had their faces lit by a smile. Of 1,000 children in France, an average of 554 reached their tenth year; of 1,000 French “assisted children,” but 271. That babies at the breast suffer less, and fewer die, than those raised on artificial food, is a commonplace experience and statistical fact which need not be insisted upon any further. That the nature of the artificial food, — a single meal of sour milk, or indigestible farinacea, — swells the lists of deaths, is well known.

It was mainly the injurious feeding which, with the overcrowding, resulted in the heart-sickening rates of mortality amongst the population of the Prague foundling asylum. It was 82.97 per cent. in 1857; 90.46 in 1858; 87.07 in 1859; 86.95 in 1860; 89.71 in 1861; 88.79 in 1862; 93.19 in 1863; 72.52 in 1864; 62.46 in 1865; 60.14 in 1866; 54.07 in 1867; 46.68 in 1868; 46.08 in 1869.¹

Lessened mortality of the infant under a year depends to a great extent on favorable external circumstances, sufficient food and its appropriate selection. When Ménier insists upon the rate of mortality depending upon the intellectual culture of the people, he forgets, in behalf of his bright saying, that intellectual culture and abject poverty do not go hand in hand, but that the former requires the foundation of physical comfort and ease.

Of 100 deaths taking place in the total population of Europe, 26.5 per cent. were under a year; 5.6 from 1 to 2; 2.6 from 2 to 3; 1.8 from 3 to 4; and 1.35 from 4 to 5 years old.

Such is the average of all classes in all seasons.

¹ A. Jacobi, “On Foundlings and Foundling Institutions,” *Med. Record*, N. Y., Nov. 15, 1872.

Of 2,216 infants who died under a year in Baltimore during 1875, the number of those who died in June, July, and August was 984, equal to 44.5 per cent., instead of 25. Of 705 who died between their first and the end of the second year, there were in the same months 200, equal to 29 per cent., instead of 25. Of 508 between the second and fifth years, 110. Thus the months of June, July, and August proved very murderous to the population of infants under a year, to a certain extent so for those between the first and second years. Those between the second and fifth years were rather safe from the influences which destroyed the very young infants. *Their* main mortality was in the first quarter of the year 202 out of 508, a fact the repetition of which in almost every year directs the attention of every student to those causes of sickness and death which are apt to develop in the colder season, — that is the period of closed doors and windows, and epidemic influences.

Of 2,317 infants, of less than a year, who died in Baltimore in 1876, the same quarter, namely, June, July, and August, took off 53 per cent. of the whole number, instead of 25. Of 2,182 in 1877, 48.3 per cent.; of 1,834 in 1878, 40 per cent.

Of 925 children of more than a year and less than two years, who died in 1876, the same quarter took off 33 per cent. of that number; in 1877, 35.3 per cent. of 1,329; in 1878, 29 per cent. of 604, instead of 25 per cent.

Of 398 children of more than two and less than five years, who died in Baltimore in the whole year 1876, the same quarter of the year destroyed 18 per cent.; in 1877, 23.6 per cent. out of 578; in 1878, 24 per cent. of 444.

The months of June, July, and August, with their high temperatures and diarrhœal diseases, with all their consequences, destroy large percentages of the babies under two years of age, mainly those of less than one year, while the greatest mortality of the children of from two to five years depends on other causes, and takes place in other seasons.

Of a total mortality of 4,070 in the city of New York, in

the four weeks ending on July 17, 1880, there were 1,962 infants under one year; under two years, 2,451 (1st to 2d years, 489); under five years, 2,641 (2d to 5th years, 190). In these four summer weeks the mortality of infants under a year amounted to 48.2 per cent.; under two years 60 per cent.; under five, 64 per cent. of the total mortality. The mortality of babies under a year was about equal to the total average mortality for the whole year of all diseases under ten years.

The statistical proofs, which might be accumulated indefinitely, show only what we know too well, that the heat of the summer destroys life in uncommon numbers, and mostly where the air is not only hot, but also impure. And they prove also that it is mainly the infants under two years who suffer from the effects of the season, through its influence on the alimentary canal. It is mainly those in their first year who are liable to be affected by digestive disorders, while those in the second are more decimated by respiratory diseases; this is contrary to the prevailing impression, which attributes the majority of digestive disorders to the second year, and mainly the second summer. This belief is an incorrect one, and not founded on facts. The second summer is in itself not more dangerous than the first, on the contrary; for morbidity and mortality decrease from day to day after birth. The youngest is the most liable to fall sick and die, and mortality decreases with every day, week, and month. It is not the second summer which kills the baby, it is after the child has been weaned, the sour cow's milk, the ice-water, the candy, the green apple, the short socks, the partaking of all, as mothers will proudly state, "that is on the table."

The mistakes in the diet of young children and its injurious effects are the results of both the ignorance on the part of the mothers as to what constitutes a proper nourishment, and the difficulty of obtaining it either fresh or unadulterated. Ignorance cannot be cured at once; in regard, however, to the feasibility of supplying the poor infants of a large community with wholesome, fresh, and unadulterated food, I desire to make a practical proposition.

Again I insist upon the fact that the part of the population which is subject more than any other to acute disease and chronic ailment, consequent upon improper feeding, is below two years of age; that at that age mortality is greatest, and depends mainly upon diseases of the alimentary canal. It is therefore the food required for the first two or three years for which my suggestions are meant. Now, infants' and children's food has a peculiarity which renders a sufficient and wholesome supply very easy to obtain. They require no variation, no stimulants, under ordinary circumstances, and with the exceptions to which I shall have to allude, no spice, no mixture. Day after day, month after month, the baby takes the breast, sucks the bottle; the child takes his plain food, the same every morning, noon, and night, without longing for a change, refusing it, even, and, thriving, gains weight and spirits. Thus the bill of fare for babies and children is a very simple and short one, easily obtainable, and, as a rule, easily procured but for the heartlessness of trade. And this very heartlessness of trade, the recklessness with which the consequences of deception, as far as the health of the community in general, and of the little children in particular, is concerned, are disregarded, is the reason why I desire that some means should be found through which an adequate supply of wholesome food could be placed within reach of every infant and young child of the poor classes.

The safest food for an infant is the breast milk of either its mother or wet-nurse. The latter is out of the question amongst the babies of the poor. Where no breast milk can be had, or the supply is insufficient, substitutes must take its place. As soon as weaning becomes a necessity, that is, under ordinary circumstances, after a few teeth have made their appearance, artificial feeding has to take the place of the natural supply. The articles of food remain the same for a long time, no change being required except as far as a gradual increase in the consistency of the meal is concerned.

What this nourishment should be I have mentioned in my work on "Infant Diet,"¹ and in my essay on "Infant Hy-

¹ First ed., 1872; Second ed., 1875.

giene," in the first volume of the "Handbook of Hygiene," edited by Dr. A. H. Buck.¹ The rules I laid down in these publications are the result of no mere theoretical combinations, but the outgrowth of my experience through a quarter of a century, and are borne out by chemical facts and the teachings of infant physiology. In the hands of the Board of Health of the city of New York, by whom they have been extensively published and distributed in the beginning of every summer, for the last seven years, they are known to have done much good; they have certainly done so in my practice.

They read as follows, with the judicious official additions mainly under III. : —

RULES FOR CARE OF INFANTS.

HEALTH DEPARTMENT, }
No 301 Mott Street, New York. }

At a meeting of the Board of Health, held June 3, 1873, the following series of rules (approved by many physicians) for the management of children during the hot season, with a view to prevent the large annual mortality of this class, was submitted by the Sanitary Committee, and ordered to be printed : —

I. NURSING OF INFANTS.

Over-feeding does more harm than anything else; nurse an infant a month or two old, every two or three hours.

Nurse an infant of six months and over, five times in twenty-four hours, and no more.

If an infant is thirsty, give it pure water, or barley water, no sugar.

On the hottest days a few drops of whiskey may be added to either water or food; the whiskey not to exceed a teaspoonful in twenty-four hours.

II. FEEDING OF INFANTS.

Boil a teaspoonful of powdered barley (ground in coffee-grinder) and a gill of water, with a little salt, for fifteen minutes; strain, then

¹ New York, 1879.

mix it with half as much boiled milk, add a lump of sugar, size of a walnut, and give it lukewarm, from a nursing bottle. Keep the bottle and mouth-piece in a bowl of water when not in use, to which a little soda may be added.

For infants five or six months old, give half barley-water and half boiled milk, with salt and a lump of sugar.

For older infants, give more milk than barley-water.

For infants very costive, give oatmeal instead of barley. Cook and strain as before. When your breast-milk is only half enough, change off between the breast-milk and this prepared food.

In hot weather if blue litmus-paper, applied to the food, turns red, the food is too acid, and you must make a fresh mess, or add a small pinch of baking-soda. Infants of six months may have beef-tea or beef-soup once a day, by itself, or mixed with other food; and when ten or twelve months old, a crust of bread and a piece of rare beef to suck.

No child under two years of age ought to eat at your table.

Give no candies, in fact nothing that is not contained in these rules, without a doctor's orders.

III. SUMMER COMPLAINT.

It comes from over-feeding and hot and foul air. Keep doors and windows open.

Wash your well children with cool water twice a day, or oftener in the hot season.

Never neglect looseness of the bowels in an infant; consult the family or dispensary physician at once, and he will give you rules about what it should take and how it should be nursed. Keep your rooms as cool as possible, have them well ventilated, and do not allow any bad smell to come from sinks, privies, garbage boxes, or gutters about the house where you live. See that your own apartments are right, and complain to the Board of Health, 301 Mott Street, if the neighborhood is offensive. Where an infant is cross and irritable in the hot weather, a trip on the water will do it a great deal of good (ferry-boat or steamboat), and may prevent cholera infantum.

By order of the Board,

CHAS. F. CHANDLER, *President.*

EMMONS CLARK, *Secretary.*

The object then, is to place a full supply of infant food within the reach of every infant or young child. The articles are : —

Powdered barley, or powdered oatmeal, sugar, milk, eggs (for children of about a year and over), in about the following quantities : —

Powdered barley, a package of a half pound for a child under a year, every week. Two such packages for a child from one to two years of age. When oatmeal is required, the latter in place of barley.

Eggs, seven a week for a baby a year old, or less ; fourteen a week for a child over a year old.

Sugar, a half-pound a week.

Milk, twelve ounces to a baby under a year, twice a day ; twenty ounces to those over a year, twice a day.

In regard to milk only, there is a difficulty ; adulterations can be avoided by watching and examining, but the influence of heat on cow's milk is such that it is hard to avoid ; during the hot days there is danger of acidity and fermentation. Cow's milk, when leaving the udder, is but rarely alkaline at the best ; the transformation of its milk sugar into lactic acid takes place very rapidly, and a single failure in procuring sweet and proper milk may be the cause of disease and death.

As this is so, while the frightful mortality from improper food is explained easily enough, the efforts to avoid it must be permanent and persistent.

I propose that your body should have and superintend a place or places in the city of Baltimore, where the infants and young children of the poor class can purchase the simple, though sufficient and ample, articles of food. If there be an expense to be risked for your fund at all, it would be for rent and saleswomen. But this expense may as well be borne by the purchaser, for I do not propose that the whole population should be a receiver of alms. From a humane and an economical point of view only, I insist that the poor should be enabled to buy, in absolutely good quality and at a fair price, the necessaries of life and health. It is they who are more

liable to be deceived as to quality and price in all they buy, therefore they ought to be protected. Thus, whatever the infant requires in the way of food ought to be bought by those who are responsible for it, at a fair price, — be the responsible party the working man who supplies his family, or society who sustains its members not provided with family support.

Your stock of cow's milk during the summer must be large enough for your summer sanitarium. One good cow will supply the milk for five babies and five children over a year old. It can, however, be kept at any figure high enough to yield a full supply of good milk transported to the city twice daily, for all those infants and children coming under the provisions of this arrangement. If all the milk you sell to the infants and children in Baltimore comes from your own farm, you are sure of the article you sell, provided you know that your cans are always cleaned and washed out with soda solution, and your help always trustworthy. In case you have to purchase milk, you require additional watching. While admixture of water alone does not harm milk except by diminishing its relative value both as merchandise and nutriment, it is still a deception to be guarded against, and admixtures and adulterations will always require the application of proper tests.

Though I expect that fresh milk would be supplied twice daily, souring may take place so rapidly that I think proper to guard against it, at all events in the hot summer months. I recommend that the milk be not sold in its raw condition, but boiled at once. Without going into the chemical and physical reasons for that step, I simply refer to the unmistakable fact that boiled milk keeps better than raw milk. Yet another step may be taken in the same direction. I propose that an addition of bicarbonate of sodium be made to the milk sold by you for infant food in the proportion of one in a thousand. This small quantity will retard the souring of milk somewhat, and the addition of the sodium salt to cow's milk, and its farinaceous admixture (with its superior amount of potassium) renders the milk sold by you a little more similar to mother's milk in regard to the chemical constituents of its salts.

IMPROVEMENT OF THE CONDITION OF CHILDREN.

Barley, oatmeal, and sugar are to be sold in ready made packages.

This sale of food ought to be a permanent affair, and not limited to the summer months only; for though the influence of summer heat is certainly most detrimental, in connection with improper feeding, this alone, at any time, is the main injury to infants and young children, endangering their whole future life. Mortality is great from diseases of the alimentary canal in winter as well; and though they are not fatal to the same extent or number, the amount of permanent harm done to the digestive organs, lymphatic glands, and powers of assimilation after apparent or partial recoveries can be judged only from the large class of dyspeptics and prematurely decrepit persons, both physically and mentally, who owe their ailments to chronic or acute abdominal disorders of their early years.

The persons to whom the sale could be trusted would be best selected from such help in your summer sanitarium as you would care to give permanent employment to, because of their intelligence and usefulness. The localities would be either a small store or stores, rented for the purpose, or a part of a store in a convenient part or parts of the city, be they groceries, or apothecary shops, or a part of, or a place adjacent to, a dispensary building.

Persons applying and being regularly supplied from your stores ought to be known as deserving the privilege. Those who have been inmates of the sanitarium during a season would be recognized at once as entitled to being served. The poor, who are attended in dispensaries, can easily prove it. Such, however, as have not required medical treatment for some time can soon prove their claim by a note from some neighbor, or a physician. At all events, care should be taken lest that part of the population who, under the present arrangements of society, must be expected to pay a certain legitimate percentage of profit to the class of traders, should not avail themselves of undue advantages by crowding your legitimate customers out of their rights and privileges. The well-to-do and rich have more facilities in guarding against being

deceived and overreached, than those in whose favor you are called upon to interfere. At all events, the well-to-do and the rich will gather an advantage from your efforts which every one will have a reason to rejoice over. It depends upon the certainty that a public sale of the simplest food for infants and young children, which at the same time is the very best, will always constitute a powerful admonition and instruction to the whole community. The facts that infants and children do not only bear, but that they require, absolutely plain, simple, wholesome, digestible, nutrient food only, only, only! cannot be repeated too often. Let your practical teaching be a warning and a blessing by the information extended to the public at large; that the few articles you sell to the poor are those which are also best adapted to the rich, and the only ones you recommend for the food of the infant and the young child of both poor and rich. Nature is too republican in spirit, too democratic in character, to bow to differences of social standing.

In this connection I again insist upon a fact which appears to be so self-evident as not to deserve mention. And still with the utmost pertinacity the public insist upon giving their children, as soon as weaning time arrives, or before that period, such articles of food as they know nothing about. When an adult sits down to a table, he or she will inquire about a strange article of food with which he was not acquainted before. The baby, however, is credulously fed upon things which neither baby, nor father or mother, nor doctor is in the least informed about. I speak of the baby foods in the market, and in general use. Most of these foods, which are sold in large quantities, have compositions which are not known. When the manufacturer deigns to say anything about his merchandise, he assures you that it is the best in the market; that it is the proper thing, the only proper thing, for children and invalids of all ages; that the relation of albuminous substances to carbon hydrates is exactly correct, and that a package costs a certain amount of money. In regard to this subject the public appear to be smitten with absolute

blindness. They insist upon forgetting that the man who offers for sale, and advertises at a heavy expense, any article of merchandise, does so — as society is constituted — for his pecuniary advantage solely. To say that when his article is not good it will find no market is deceiving yourself, experimenting on your baby, relying on the character of a single man, or a corporation, on the honesty or intelligence of his chemist, or his superintendent, or his workmen, on the nature and condition of the elements offered for sale, and on a great many influences, which can be at work before the manufactured articles get into the hands of the consumer. Why the sellers and advertisers of unknown compounds should be trusted more than those who raise and sell a simple article of food, such as milk, which is constantly adulterated, can hardly be perceived. Is it necessary to say that the factory furnace works more in the interest of the proprietor than for the benefit of the public, and that the examination of many of the foods for sale in different packages and in different years yielded different chemical and physical results?

Meanwhile, it is a fact that no better food can be procured than what nature offers with a willing hand, for little work, at a trifling expense. There is no food on which infants and children of all classes thrive better, thrive so well, as the few articles the sale of which, in the manner described, is recommended to you. In this respect at least, and at this early age, there is equality amongst members of society.

Therefore, no patented article of food should ever be sold by you. If, in the Summer Home of the Brooklyn (L. I.) Children's Aid Society, they allow every child to continue, and every outside practitioner to indicate, its artificial food, it is simply a grave mistake, which will certainly be remedied as soon as understood to exist.

Nor do I see that anything could be added to your stock, with the exception of brandy. The influence of the summer heat is not only destructive by the influence it has on food, but also, and mainly, by its debilitating effect on the nervous system. It is a physiological fact, always observed and firmly

founded on experimental science, that the nervous system of little babies is easily overthrown by two entirely different conditions, both of which are equally dangerous. The nervous system of the newly-born is rather torpid and dull in its action, there is very little nervous function; particularly the sensitive portion is but poorly developed. This condition depends on the crude and undeveloped state of the brain and nervous system, from an anatomical point of view. The nervous system of the baby is not yet fully differentiated into its later constituents; it is not mature. Thus a slight influence from outside may blow out the light which is burning but dimly. On the contrary, after a number of months, the sensitiveness of the rapidly developing baby's brain and nervous system is so great, while the equilibrium between the several constituents is not yet established, that a slight disturbance will result in irregular reflexes, convulsive movements, and death.

The influence of heat exhausts not only the action of the great nerve centres, but also the peripheral nerves, mainly of the digestive organs, as well. There are days in which a stimulant may safely, and ought to be, given to an apparently healthy child. When the baby can be taken from a stifling room to a gentle breeze, from the rear of his tenement with the exhalations of the sewer and privy to sea-air, or the mountain, it is not required. But when the hot season is at its height, and the baby suffering from it, without an opportunity to escape it, a few drops of brandy are required. Then it is simply a preventive remedy. The clamor of a few temperance papers and fanatics over the teaspoonful of brandy or whiskey, recommended in the rules distributed by the New York Board of Health, has not prevailed upon that authority to withdraw the advice, and has not prevented that advice from rendering good service.

I propose therefore that an ounce of either brandy or whiskey, per week, be added to the list of your foods for sale, during the four months from the 15th of May to the 15th of September, provided the weather is as dangerous as it must al-

ways be expected at that time. Whether you will conclude that the sale of the above article in the afore-mentioned quantity ought to be controlled by the advice or direction of a physician, may perhaps depend on local or personal considerations, and must be left to your wisdom.

The furnishing of proper articles of food, in the manner proposed above, will prove health protecting and life saving. Still, proper food is but one of the sources of health and life. The heat and the atmosphere of a large city destroy many infants and children, in spite of appropriate food and tender care. Therefore the removal from both is urgently indicated. To prevent those who are still well from falling sick, and to restore to health those who have been stricken down by the heat of the summer, is of equal importance. An attempt to fulfill both indications has been made in New York city by the steamboat excursions made under the auspices of the St John's Guild, for a number of children. Hundreds of children with their mothers are received in the morning on board a vessel, on which they are carried into fresh air, and fed on wholesome articles of food for some hours. For it is only a few hours that the excursion can last. The children have to be carried to the landing in the morning through the stifling streets, and back through the same in the evening to their stifling homes, and must wait on crowded docks before they can be admitted on board. It is far from me to detract from the good intentions of the guild which surpervises, and the societies and individuals who pay for, these attempts at entertaining and saving, but it has always appeared to me that the possible good results are disproportionate to the labor and expense connected with the excursions.

There are in the neighborhood of New York two institutions which may be considered as the types of the attempts made up to the present time at either preventing or curing the diseases generated by the heat of the large cities. A reference to both may be found instructive when the plan of establishing a summer sanitarium on a large scale is being contemplated.

The Summer Home of the New York Children's Aid Society at Bath, Long Island, is established for the purpose of affording a temporary recreation of one week, or one day, to the children mainly of some mission schools. Nothing, indeed, is amiss that is done for the children of any age. But the question is permissible whether, — as so little can be done at the best by private exertions, and much must be left undone, — the large expense incurred for the recreation and pleasure of school children of, at an average, ten or twelve years, is justifiable, when the same amount of money, and the same good will spent on the instantaneous saving from imminent death of the many babies who die for want of just such a day or week, would be needed more and could be more profitably employed. When little can be done, that which is absolutely required should be done first. This is not meant to include a reproach, however, for a society which, with large means, is known to do a great deal of good. Still it is worth while to learn what is, and can be, done with the means at one's disposal.

The Annual Report of the Summer Home for 1879 yields the following facts: ¹ —

In the Summer Home —

915 girls spent each 1 week = 6,405 days.

268 girls spent each 1 day = 268 days.

734 boys spent each 1 day = 734 days.

1,917	Total,	7,407 days, or 1,060 weeks.
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The expenses amounted to \$6,387.18

Of which there were for construction

and repairs \$1,000.00

For rent, 1878 350.00 1,350.00

\$5,037.18

No other expenses besides railroad fare are accounted for, thus the sustenance of every child for one day costs seventy

¹ Twenty-seventh Annual Report of the Children's Aid Society, New York, November, 1879.

cents in food exclusively, plus railroad fare. The expense for railroad fares amounts to \$739.20, that is ten cents for every child every day (leaving nearly sixty cents for food, etc., alone) during the whole period, or, calculated for every week, eighty cents. This appears enormous, and again the question arises, whether the result, a single day's recreation for a girl or boy of ten or twelve years, where so very much has to be left undone, is not paid — I dare not say *too* dearly, but — dearly for, when the average amount of railroad fare is added to the cost of sustenance.¹ And it cannot be proven that a single life has been directly saved by either the exertion or the expense.

In this respect the aims and results of the Seaside Home of the Brooklyn Children's Aid Society, at Coney Island,² are quite different. It is no pleasure ground for school children, but a home for sick babies, struck down by the heat of the summer, and suffering from diseases of the alimentary canal. According to the rules, the babies are received on Monday morning and remain until Saturday night. Admission is granted to sick children of early age, very few being admitted over a few years of age, and then only when a sick baby requires the presence of its mother, who has no other home for the rest of her children, upon the certificate of any respectable physician of the town, or directly by the superintendent. Very few remain over Sunday, but admission is not restricted to Monday; any sick baby may be admitted any day. Thus it is that the average time a patient remains in the institution may be set down at four days, a period amply sufficient in most cases to restore the exhausted and dying tenement house unfortunates to a possibility of living. Then, too, one cannot assert that four days are sufficient in every case, but surely they are in the majority.

¹ In a circular directed to the public for the purpose of obtaining contributions, the number of children "brought down to this resort" from the 9th of June to the 15th of September is pronounced to have been 2,912, and the weekly expense "some two dollars." I have preferred to be guided by the figures of the official report, which, however, appears over the name of the same gentleman who signs the circular.

² Fourteenth Annual Report, November, 1879.

And at what expense? In 1879, the number of admissions amounted, during thirteen weeks, to

2,423 children, and
 805 mothers.

 3,228 \times 4 days = 12,912 days.

The expenses amounted to	\$8,331 22
Of which there were for alterations	
to buildings and furniture	\$3,748 20
Building fund	571 04
	4,339 24
	\$3,991 98

These \$3,991.98 were the expenses for provisions, milk, ice, coal, drugs and medicines, horse, wagon, harness, and care, express, rent (\$125), railroad fares (but \$12.34), printing, insurance, salaries and labor (\$1,018.15), and sundries, — that is thirty-one cents, daily, per head, — well spent on dying babies, most of whom would have succumbed but for these thirty-one cents, daily spent both humanely and intelligently.

Is it possible that a human being should have to perish because of the want of thirty-one cents?

The influence of heat on disease and mortality is felt mainly by children under two years. It is these to whom a summer sanitarium which has but limited accommodations must mainly be opened. When there is room, older children ought to be admitted, up to the age of ten, but the direct life-saving influence is principally felt by the children under two. The younger they are the more will they be benefited. As soon as a mother can leave the bed in which she was confined, she may transfer the baby to the sanitarium. When she has older children, who cannot be left behind, they must be admitted. No delay must be allowed in the cases of those sick with diarrhœa. Another night, a few hours in the stifled atmosphere of a hot city, will destroy a life, which may, and often is, saved by removal from its danger. In these cases the

removal alone is the remedy. Where it is expected to act as a preventive, a few hours, a day, even, may be allowed to pass by. Those suffering from chronic ailments of nutrition, such as scrofula and rachitis, and those affected with chronic respiratory diseases, also convalescents from diseases gone through at home, ought to be counted amongst those worthy of prime consideration. In all of these cases whose sickness is the cause of admission, whether it be diarrhœa, chronic bronchitis, or scrofula, age is no longer a consideration, unless the patient is beyond or near the limits of childhood. In certain classes it is dangerous to allow older children, of twelve or more, to mix too freely with their equals of either sex. Sexual consciousness is developed so early in very many that the responsibility in accumulating many, without very strict supervision, is too great.

Those who are poor have a good claim to be admitted; those who are poor and sick have the best, no matter whether the little human being happens to be the offspring of white or colored; Gentile, Jew, or Christian; wedlock, crime, or love; church-goers or agnostics. A human child not relieved or saved where there was a possibility ought to weigh heavily on the conscience of society. It is advisable, though, that the sanitarium should be large enough to admit such, although they may not be absolutely poor, as are entitled to consideration simply because they are young, and to be preserved and saved. The babies of the workingmen who are willing and capable of paying must find a better place than a boarding house, the prices of which are usually higher than the laboring man or small storekeeper can afford to pay. The babies of these ought to be admitted on paying the expense of their keeping, under the rules and regulations of the general institutions. They may be admitted for just the length of time which is allowed to the poor, whether the term be three, four, or five weeks.

To benefit a large number, I propose that an admission in every case be valid for four weeks. If advisable, a prolongation may be granted, or a new admission given. If the child

be sick at the end of its term, no discharge must take place. Removals against the advice of the institution are out of the question. Parents must bind themselves not to remove their young without the permission of the officers in charge. This rule must be enforced as much as the law of the land allows. It permits too much ignorance and cruelty at the best. I have seen low-bred, brutal, drunken people, tearing their children from their beds in a hospital ward, take them to what they call "home," and deliver them, who had every chance to live and get well, to a certain death. These are actual cases; the law permits the innocents to be slaughtered as family property, and the sanitarium must try to counteract the lawlessness of inhuman laws by enforcing a certain restriction in the indiscriminate and careless removal of their charges before the stipulated time.

The adult accompanying the admitted baby has, besides, some office to fill. The mother who comes with the baby or babies is naturally bound to perform a certain amount of work for them. At home she takes care of the household, cooking, washing, sweeping, and attending to the children. In the institution she is expected to do the same. While her main services belong to her children, these services must be superintended and directed by the large household of which she happens to be a temporary member. She has to share in the general housework, washing, cooking, and sewing. It is expected that cheerful obedience to simple rules and not onerous duties will be considered as but a slight recompense for the boon conferred upon her and her child.

The case may occur, though rarely, that a person prove so disobedient and unruly as to necessitate her removal. Such a case is certainly rare, for those so inclined behave quite well when they are in the hands of an orderly community, deprived of the injurious influences of coarse example, loose talk, and bad drink; in such a case, when the mother is to be refused or expelled, the present laws will permit of the retaining of the baby.

I can hardly conceive of any other reason for removing a

child from the sanitarium before the time has elapsed. For sickness must be cared for, as it must be expected to happen. There will be occasional attacks of diarrhœa, of bronchitis, and pneumonia. There will be whooping cough, there may be diphtheria, scarlatina, measles, ophthalmia, varicella, even variola or varioloid. For the time being, that is, until the institution in some future time will be prepared to take charge of those already sick, such as are known to be affected with any of the above infectious or contagious diseases must not be admitted before their complete recovery. But those who are taken sick while inmates must find proper care and treatment in the institution. There must be a separate portion, of the same construction and material as the other buildings, at safe distances, for whooping-cough, for diphtheria, for measles, for scarlatina, for varicella, for varioloid, for ophthalmia. There must be rooms for the temporary accommodation of those who come in with fever or any other sudden symptoms of a sickness not yet fully developed, but of a suspicious character. To return them to the city may be required in institutions crippled by narrow means and space, but the welfare of the patients demands that they should remain where they have an infinitely better chance for complete recovery.

What sort of buildings should be erected for the use of the admitted children and their attendants, — brick or wood, large or small dormitories, large buildings with small rooms, or large dormitories? One or more stories?

It is a mistake to believe that brick buildings are more proof against destruction by fire. I have taken some trouble to ascertain, as far as the reports were accessible, whether more public brick, or wooden, buildings were destroyed by fires. It so happens that the larger majority of those so destroyed were built of brick. For it is not claimed, nor expected, that they should be fireproof.

Nor can it be claimed that plain wooden buildings are apt to be easily destroyed by age and wear to such an extent as to render their erection and use objectionable. As the sanitarium is not expected to be opened for any but the

summer season, wooden buildings, to live in, are certainly preferable. With but little expense they can be made rain-proof and wind-proof, and their proper and complete ventilation for the purposes for which they are erected offers no difficulties, and requires no architectural ingenuity or pecuniary outlay. Large and solid brick walls, covered with plastering and wall paper, or oil, or cement, necessitate both; a wooden structure need only be left alone to secure good air and sufficient ventilation. Simple clap-boarding, plainly painted, does not destroy the necessary spontaneous ventilation; large windows and doors admit sufficient light and air. Moderately high ceilings, from ten to thirteen feet, according to the size of the rooms, permit the rising of warm and foul air, if ever there be any, to a sufficient extent. Plain roof ventilation, or a ventilating apparatus near the ceiling, is all that I should advise or permit. Open windows, open doors, and the spontaneous and constant exchange of air through the wooden inclosures are fully satisfactory. As I have lived many a year, from four to eight weeks in succession, during July and August, in a small frame house, clap-boarded outside, and with a plain vertical boarding inside, without any inconveniences, and with great advantage to myself and mine, I know that plain and cheap buildings will be eminently adapted for your purposes.

The question as to the general size of dormitories is an important one. Large dormitories have the advantage of easy superintendence, and some reduction in expense. Thus in orphan asylums, and similar institutions for children of advanced age, the use of dormitories large enough for a number of children has been found appropriate. But the wants of very young infants differ from those of the above mentioned class. Very few babies, though ever so well, will sleep a whole night. Babies will wake up once or twice, and cry. They will require the lighting up of the room to have their wants attended to. Their attendants will have to get up, walk about, and disturb their neighbors, or the whole ward. When there are but twenty, or even less, babies in one dormitory

there is some disturbance all the time, in the way of noise or light. If that be so where all the babies are perfectly well, how much more will it be the case when one or more are not in perfect health. Amongst a dozen or two babies there are always some who are sufficiently disturbed by intestinal catarrh, flatulency, or even lesser ailments, although there may be no actual disease. Thus the night's rest for all the babies and their attendants is more or less interrupted, not to speak of the exhalations of excrements, which annoy the neighbors as well as the individual baby and attendant. This is more than a theoretical speculation; it is the result of actual observation in hospital wards and other institutions. Thus I cannot advise the erection of large dormitories for the class of infants and children you propose to benefit. The houses, large or small, ought to be divided up into small rooms. These ought to be large enough to accommodate a mother, with all her children, when you will now and then find yourself under the necessity of admitting a whole family at once. It is perhaps not necessary to allow a separate room for a baby and its attendant; but two, or at the utmost, three such parties ought to be the limit. Whether small houses be built with a few apartments, or large houses with corresponding broad and well lighted corridors to allow of freer ventilation and access of light, may appear to be of no moment. But as it is not proposed to employ deafening, it appears to be more appropriate to build a number of smaller houses in preference to a limited number of larger ones. The great number of rooms and walls in the latter requires so much more material than would large dormitories that the difference in the expense will not be very great. If it were, the advantage of separating the inmates, and by separation affording them better chances for rest, is so eminent that the moderate increase in expense is not worth noticing. The advisability, however, of separating the babies during the night, and in their sleeping hours during the day, does not exclude the usefulness and necessity of procuring large halls as a common meeting and play-ground for the better part of the day.

There, noise and crying or any other mode of their enjoying themselves or expressing their wants is rather desirable than otherwise. Besides, the presence of all in common rooms secures the only possibility of close superintendence, as far as the cleanliness of the babies, and regularity of feeding hours is concerned. This close supervision is necessary both in the interest of the little ones, and as a means of discipline for the adults, part of whom will always endeavor to benefit their individual children, by breaking the rules laid down for the whole community, as long as a wholesome habit has not been inculcated into them.

For the reasons given above, I think houses with but one story preferable, when the space is sufficient for erecting a number of them, with the allowance of enough space between each, to secure the free access of air. As, however, the houses are but low, the distance between them need not be great. In fact, if I allow a surface of one hundred and fifty square feet for a baby with its attendant as the size of a bedroom, a dozen such collected under one roof would form a house of thirty-six by fifty feet, or about two thousand square feet. A distance of ten or fifteen feet between two such houses, low as they will be, ought to be ample. A row of them ought to be connected on one side, with a continuous veranda for increasing the facility of communication, mainly for the use of the superintending nurses and officers.

The medical service of the sanitarium is of vast importance. There will be sickness, and good medical advice ought to be procured. It is possible, but not probable, that a superior man, and well informed in the physiology and pathology of childhood, will or can give four months of every year gratuitously. Such a contingency may be hoped for now and then, but cannot be expected. Thus, the physician-in-charge ought to be paid for his services. His duty will be to convince himself that the diet of infants and children and adults is just what it is meant to be; to see every room, dormitory, or house, and privy once daily, enforce sanitary regulations, and attend to every case of sickness. That is serious work, but it can be

accomplished with the aid of assistants. These latter must be selected from the young physicians, or advanced students, who declare their readiness to serve continuously, for board and lodging, at least two months — better four. The facility for learning in your sanitarium will be so extensive that the places will be eagerly sought for. Eight or twelve such assistants may be required, double the number ought to be bidden welcome ; for the institution, while it is meant to benefit the infants, can be made serviceable to the improvement of young medical men, and through them, again, to those whom they will have in charge in future. It will be easy to regulate the duties of the assistants ; the number of infants, children, adults, houses, bedrooms, closets and grounds under their charge must be determined by their superior officer ; meanwhile, though the studies of each man are left to his own selection, a well posted physician will do well to treat his assistants as a professor would his students, collect them in a class, discuss general topics connected with the service, and the class of the well and sick under their charge, direct their studies in infant pathology and therapeutics, see the cases with them at certain hours in either a Socratic or didactic manner, and thus prepare in every season, better than any of our colleges or clinics ever yet succeeded in doing, a number of young men for the knowledge of, and practice upon, a class of diseases which are very frequent, but like sealed books to the young, and many an old, practitioner.

The infants and children remain a number of weeks in the institution. The benefits to be derived therefrom are expected to be very great for every individual, through the immediate effect of the sojourn there. I expect, however, a lasting effect also from the sojourn of their attendants and mothers. When they leave they ought to be wiser and better. Their weeks of staying in the sanitarium must be like a school to them, and a source of information. They will gather some information simply from being told what they are to do for the little one in the way of dressing, cleaning, and airing, and from learning the manner of feeding and the articles of food appro-

prate. But more can be done, and easily ; they can be taught theoretically besides. I propose that ten or fifteen minutes every day should be given to a sort of simple lecture on just such topics as are connected with the diet and bringing up of children. A woman who stays in the institution a month or two ought to take with her, when she leaves it, a stock of very plain knowledge on a number of points connected with the health and sickness of babies : How many passages from the bowels are normal, how they ought to look, and what their consistency is to be ; how to bathe a child, how to dress it, how to keep its feet warm and head cool ; the danger of short socks, feather pillows, and woolen head-gear ; how to prepare an enema, and apply it ; how to observe the voice of the crying child, and judge of the frequency or difficulty of breathing ; what to look for in the growing child, — accumulations of filth and dead skin on the head, growing mother's marks, increasing baldness on the occiput, softening of the cranial bones, thickening of the long bones ; what to think of the presence of, or danger from, worms ; how not to believe in the old superstition of dentition being an almost unavoidable danger ; and that she is culpably neglectful when not trying to relieve, by medical aid, a diarrhœa, or fever, when her child is sick, only because her neighbor tells her the child is teething. All of these things are very simple, and can be told in simple words. Any woman of average intelligence, and with no previous schooling, will comprehend and remember them. I know that I succeeded in private and dispensary practice in a great many instances, and the task will be found very much easier when the teaching comes to them in an official manner and clad with authority.

I admit, however, that not every advanced student, or even every young practitioner, is conversant with all of the above topics to such an extent as to be able to teach them ; but their superior medical officer is so, or must be. He can supply the knowledge, and when no *viva voce* teaching is possible or advisable, short directions, or lectures, can be provided. The purpose in view must be obtained, at all events. If

there were none in the whole medical staff who would feel capable of teaching the above subjects to the by no means unsophisticated, but mostly slow and plain intellects before them, — and there is nothing more difficult than a popular lecture, or popular teaching, — a good book ought to be procured and read aloud ; if there be none adapted to the purpose, it ought to be made. A great deal of common sense and judicious knowledge can be condensed in forty or fifty pages, and a single page read every day, and discussed ten or fifteen minutes, may be able to change the condition of the poor little ones of a large city in a few years by removing ignorance and superstition, and breaking the force of bad habits in their mothers. When these leave the institution, the babies must have laid in a stock of health, and they themselves one of good will and some improved knowledge on children and nursing.

The information gathered by the mothers during their stay in the sanitarium I look upon as highly important. They will not only be told what to do, but made to do it. The class of people from whom your beneficiaries are recruited never learn by theory alone, it must be accompanied by practice ; still that theory is a necessity for them also, and a blessing, provided it be in the right shape : therefore the teaching ought to be plain, — what they listen to, intelligible ; what they read, clear and brief. It cannot be expected that extensive treatises on hygiene, or hygienic measures, should be read and digested by the men and women of the working classes, but brief rules will be read and heeded. The effect of the very brief rules for feeding babies usually distributed by the New York Board of Health goes to prove it. A short tract of a page or two, or better one large page, several times a year, ought to be carefully worded and widely distributed ; every mother ought to be supplied with two or three when she leaves the sanitarium. At regular intervals the infant food depots, or some other public place, might be made the distributing centre of another such tract. One or two topics might be treated of at the same time, such, for instance, as have been mentioned above. A lithograph, or cheap print of a sub-

ject connected with baby life, could be distributed every Christmas, with the main rules concerning feeding, washing, airing, and dressing, underneath, on a strong pasteboard, so as to secure its indestructibility, and its forming a part of the wall ornaments in the residence.

Such rules, tracts, and pictures could be copied indefinitely. They may be kept for sale in the interest of benevolent individuals and societies of other cities. It may be that Baltimore can thus be made the centre from which every large or small city can be induced to obtain its supply of useful, plain knowledge on diet, health, and sickness of the young. No other city, it appears to me, will have the opportunity of Baltimore, with the magnificent occasion offered by your undertaking. The publicity of your work, and its details, and of the facilities offered by you, will not be wanting; for the newspapers and journals will have no more interesting or more important topic to discuss for a long time. They will also contribute to diffusing the knowledge you intend to spread, by copying your publications, and though but a limited number of readers will cut out — as I have seen them doing — just such items of domestic and hygienic importance, the notoriety given to your plans, and their execution, will create a constant demand for the supply of your communications, papers, or tracts. Again, they must be brief, not one in a hundred working men or women will read an essay, but every one will read a page of clear print with home truths.

Lectures are out of the question; poor people cannot go, and will not. Clergyman, as a class, have no special familiarity with the topics alluded to, nor would many of them be disposed to take an active interest in matters involving merely the health of the body. There are, however, some who would aid in the development and progress of such a trust as this, and appreciate the necessity of now and then giving a thought and word to the well being of the future citizen of this world.

Lectures, however, to another part of the community, which may be printed or not, will be found of great service. The

educated and better situated classes of society will listen, and read. Your efforts are mostly directed to benefit the children of the poor; but, even if you meant to, you cannot prevent the seed you sow from spreading beyond your own acre. The knowledge you spread, the habits you inculcate, the success you obtain, will tell their own story. The talk of the people, and the discourse of the newspapers, will spread healthy opinion all over. There is no better teaching than by example, which is not only good, but has proved profitable and successful. But the indirect influence of your efforts need not be all; a few lectures every season on subjects connected with the questions so dear to you must be delivered in Baltimore, by persons whose position and reputation is such that their assertions carry weight. These lectures, or some of them, ought to be printed and kept for sale. The book trade and the news agencies would distribute them by the thousand, by the ten thousand; and while most advantage would be derived from them by the publisher, your funds may be benefited by the profits obtained. Even though it would be necessary to pay the lecturer a fee, it is more than probable in my mind that a considerable pecuniary result might be accomplished.

Thus far I have proposed that what is known to the best of the medical profession should, in its results, be communicated to the public by teaching, tracts, and lectures; your corporation may go further, and contribute to the improvement of the science of the subject. I advise that a subject be selected by you, or by a committee of yours, annually or biennially, belonging to the domain of diet, physiology, and pathology of infancy or childhood, and that a prize should be established for the best competing paper on the subject. No money ought to be paid for the best effort. A medal gained for scientific honors from your body will fully pay the crowned winner. It is not at all necessary, or advisable, that the question proposed should be taken from the domain of diet alone; on the contrary, it is rather advisable to select a problem out of the many which are still waiting for their solution. America has not contributed very much to pædiatric science.

I hope it is you who will succeed in creating the taste for it, and usher in a most needed progress.

To provide the poor infants and children of a large city with wholesome food, and to establish a summer sanitarium for the prevention and cure of the diseases depending on heated and contaminated air is an undertaking of vast importance, and in itself a great blessing, such as no other corporation in any community ever had an opportunity of conveying to the same extent. The thoughtful benevolence of Thomas Wilson, however, and the careful preparations being made by your board for the execution of his will and the administration of his bequest, encourage me in putting in a further plea in behalf of the poor and sick infants and children. It is true that even large means do not suffice for all purposes, but these purposes must be first stated to be generally understood, and aims must be pointed out first before the efforts can be made to reach them. It has often appeared to me that misery is so great and universal only to enlist greater and more universal sympathy, pity, and humane efforts to relieve and remove it. The historical development of mankind which led to poverty, sickness, and sin has also evolved wealth, knowledge, and humanitarian enthusiasm. The race of the Hopkinses and Wilsons cannot be, and is not, extinct. If the means at your disposal be not sufficient to accomplish all that is required, I trust that they will be increased by well-directed benevolence of citizens equally blessed with great riches and great souls.

My plea is for the establishment of children's hospitals. It is true that there is hardly a general hospital in which sick children are not met with. They are mostly chronic cases, bone diseases, malformations, and disorders of nutrition. For reasons connected with the general discipline of a hospital, and the difficulty of procuring fresh air to a sufficient extent, the latter class are seldom benefited. The first class, also, are but rarely benefited, unless they be of recent origin. If there be any class of diseases dangerous to other patients, and not improved themselves, and which requires special accommodations of their own, it is that of chronic bone diseases. All of

these children are, as a rule, kept in the wards of adults, there to be cared for partly by the nurses, and partly by the convalescent patients. This usage is of little advantage to the sick, while it may prove an annoyance, and detrimental to the class of legitimate inmates. Besides, the association of older children with most of the inmates of a hospital is not an advisable one. The moral tone of the wards is mostly not very elevated, and it is a wrong to expose the children — subject already to so much doubtful home and street influences — to moral contamination in order to obtain a rather uncertain physical benefit.

Infants, who are so much more liable to be taken with acute and life-endangering maladies than the class we generally meet with in hospitals, are not admitted. Thus, those who require most aid receive none.

To obviate the incongruities and disadvantages of placing infants and children in the same wards with adults, in some hospitals a special ward has been reserved for children; but by so doing, the administration of an institution being of necessity, uniform, no justice is done to the wards of the young, as I shall say later. The classes of diseases are so various, the number of contagious affections so great, the propagation and multiplication of disease in a single ward or two, with no possibility of removal or isolation, so palpable, that this arrangement has been found to be dangerous in many cases, though in a number of instances it proves serviceable. Contagious eye and eruptive diseases are often multiplied in a child's ward.

One of the reasons why the number of children's hospitals is still so limited in most countries, and mainly in ours, may be found in the fact that the needs and wants of an institution designed for the care of sick infants and children are very much more complicated than of those for the reception of adults. The difficulties alluded to are so serious that there are so-called children's hospitals which will receive no patients at less than five years. On the other hand, those who understand their duty, and mean to do it, take the responsibility

when it offers itself. Thus the child's hospitals of St. Petersburg, Vienna, Stettin, Basle, Berne, and Frankfort have a percentage of from eight to twenty-seven per cent. of inmates under a year, and of from thirty to fifty per cent. under three years. The children's ward of the Mount Sinai Hospital, New York, never asks for the age of the patient before deciding on the propriety of admission.

Amongst the difficulties to overcome in a child's hospital is the necessity of procuring an increased number of nurses. The mortality of children is greater than that of adults, their diseases mostly more changeable, their personal wants must all be attended to by others. Thus the number of nurses is to be larger than for the same number of beds in a general hospital for adults; and the training of the nurses, if anything, more careful. The wards must be smaller, for the patients are more apt to disturb each other; therefore not too large a number must be congregated in one ward. The largest ward of a large child's hospital ought not to have more than from fourteen to twenty beds, part of which ought to contain convalescents. The number of smaller rooms must be greater; they must be so arranged as to be capable of complete isolation, when this is required, along a light and airy hall. The cubic space reserved for each child must be at least as great as that for adults, for their respiration is very active; their evacuations are in part passed into the beds or linen, or at all events inside the sick-room, and a larger staff of attendants and nurses is present in addition to the patients themselves. Not only a sufficient cubic space, perhaps of 1,500 cubic feet, is required; it is perhaps of still greater importance that the distance of the beds from each other, and from the walls and windows, be made ample, in the interest of comfort, and of nursing and attending. More of these minutiae, however, come into consideration when the building of a hospital is actually contemplated. My object was only to show that the difficulties in the way of a child's hospital are rather greater than those met in general hospitals, and thereby, certainly not to discourage the undertaking, but to secure com-

plete and perfect preparations. We have done but little in our country for the benefit of sick children, as far as hospitals are concerned. In fact, there scarcely are any, if those institutions are excepted, which, under the name of nurseries, succeed in so keeping and nursing their little inmates, that those admitted in health are soon taken sick, and those taken sick die; this is by no means an exaggeration. If there were a close superintendence on the part of the authorities over the many so-called private institutions for which cities and states pay largely with the understanding that they never look into the manner in which their money is spent, they would be surprised at the death-rate of the inmates. When ten years ago I proved that a large institution in New York city spared almost none, literally, of its many babies, I was requested to resign my position, and, when I insisted upon publicity, expelled, and the very next annual report exhibited the fact, that the admissions of children not born in the institution were almost exclusively of those near or over two years, when both danger and mortality are naturally lessened.

Many countries have done more than ourselves; none, however, enough; still there are a few European cities which have accomplished a certain result in procuring accommodations for their sick babies and children.

The following table has been taken from Rauchfuss, in Gerhardt's *Handbuch der Kinder Krankheiten*, i. p. 419.

	a. Beds.	b. Patients annually.	c. Patients in Dispensaries.	For every 10,000 Inhabitants at the rate of		
				a.	b.	c.
London	510	2,500	60,000	1.4	7	170
Liverpool	80	484	8,000	1.5	9	150
Vienna	300	2,000	25,000	3.5	23	300
Manchester	210	—	14,250	4	—	300
Prague	92	1,180	7,220	5	60	360
Moscow	280	—	—	7	—	—
Paris	1,100	7,100	35,000	6.5	38	200
St. Petersburg	470	3,000	30,000	7	42	420
Lisbon	160	—	—	7	—	—
Stettin	56	280	1,000	7.3	37	130
Basle	60	230	232	12	50	50

It contains the number of beds in children's hospitals, the annual number of patients, and patients of dispensaries.

In Dr. Rauchfuss' opinion the highest above figures are still to be considered as minima; ten beds with seventy annual patients, and five hundred dispensary patients to ten thousand inhabitants, will not be found to surpass the needs of the community.

Dispensaries for the children of the poor are a necessity as well as hospitals. Many cases of sickness require no hospital treatment, and no superior knowledge of nursing, such as a well-kept hospital can alone supply. Slight ailments which, when either not understood or neglected, become great evils; malformations which can be remedied by an occasional dressing, or manipulation, or operation, at longer or shorter intervals; chronic ailments which require the same or similar medicinal treatment, besides advice in regard to diet and nursing; many an acute case even which will run a favorable and smoother course, when once guided and directed,—all these numerous cases are sufficiently benefited by dispensary treatment.

The opportunities of a dispensary are two fold: it acts as a healing institution, and prevents, by its easy accessibility, many a trifling complaint from becoming a serious malady. It affords medical advice and medicine. In some Paris dispensaries baths are given besides. The out-door department of the Prince Oldenburg Child's Hospital in St. Petersburg has moreover a room to rest in for those who come from great distances. Its second great opportunity consists in its ability to prevent disease by sound advice given. It is a fit place to teach simple lessons, to distribute brief tracts on hygienic subjects.

There is a serious drawback, however: the child needing advice and going to obtain it, in a dispensary, is necessarily exposed to the air; many a sickness may be, and has been, rendered severe by such exposure to all kinds of weather. The time spent in waiting before the individual patient's turn comes is a serious infliction upon its comfort, temper, and some-

times health. It is, while waiting, exposed to the possibly contagious diseases, wittingly or unwittingly brought to the same place, for this is a possibility which cannot be altogether avoided, though some large dispensaries in Europe have a place in which a cursory preliminary examination concerning contagious diseases is made before the patient is admitted to the general waiting room.

It is, however, not only the sick child who may be injured by being taken to a dispensary ; as it is liable to be endangered by others, so are others by it. The danger of spreading contagious diseases is enhanced by the indiscriminate transport in public vehicles, which cannot be prevented. Thus, whatever is done, is not always for the best — as in all human things. Nor can such danger always be avoided. Possibly the establishment of several small dispensaries in place of a single large one, and greater facilities for the treatment of sick children at home, and the procuring of more extensive hospital arrangements, are amongst the improvements and blessings to be wished for.

At all events, as the danger of communicating diseases is so very great, it is advisable not to have the dispensary department, although it may be connected in its administration with a hospital, under the same roof. If barely possible it ought to be in a separate building, and care taken that no communication takes place between the two. No nurse of one ought to attend in the other.

There can be but one connection, which is this : the outdoor department is necessarily the feeder of a hospital ; cases too severe to be treated at home under unfavorable circumstances or such as would be injured by letting them return home, must be admitted to the hospital immediately.

Both hospitals and dispensaries wield a wider influence, however, than through their immediate effect only upon those whom they directly influence. Their mediate blessings are at least as great, perhaps greater, for the greatest boon to infants and children is the increased number of physicians who are intimately acquainted with their nature and ailments. The

field of observation in large institutions is so great, and the opportunities for learning so extensive, that the medical men connected with special establishments of the kind cannot but progress rapidly in the knowledge of the topics connected with that special branch of practice. It is only the half educated, or poorly gifted of them, who would be induced to look upon the practice in children as a specialty. In fact, the tendency of running off into unjustifiable specialties to such a degree as is done in our country and in a few centres of Europe, for instance in Vienna, is but the outgrowth of insufficient general education or mercenary motives. The really educated and intellectual physicians would avail themselves of their opportunities for the benefit of their charges and their peers; for it is to them that the profession would, and has to look for further instruction and progress. Their assistants and clinical pupils — for I take it for granted that the advantages of observation would not be lost, no matter whether the hospital and dispensary were closely connected with Hopkins University or not — would learn directly, participate in their observations, study their method, and go out well prepared for the strife with disease. Their clinical lectures, their papers in medical journals, their publications in the annual reports would not only contribute directly to the stock of knowledge of medical men, but — and that is of vastly greater importance yet — create a widespread interest in the physiology and pathology of childhood. That it is necessary to still create such an interest is a remarkably sad fact, but such it is. Not one of the colleges of the United States twenty years ago but had a “chair for obstetrics and the diseases of women and children,” — not one, not a single one of them, which ever taught diseases of children either theoretically or practically. The first clinic for diseases of children — a poor single hour every week — was established in the New York Medical College. When this closed its doors, the clinic was transferred to the University Medical College, it still being the only one in existence. During the last ten years, a few of the larger colleges of the country have imitated that example, but with-

out admitting the teacher of diseases of children to the acknowledged position of a member of the faculty ; and without making the study of the diseases of children compulsory on the part of the students, without subjecting them to an examination on that subject before they are given a diploma, which gives them a right to go out into the world to destroy or spare — as fate wills it — their neighbors' young offspring. And all the time the teacher of obstetrics calls himself also the professor of the diseases of women, and the professor of obstetrics and diseases of women calls himself, also, professor of the diseases of children. Thus it is not only that the study of the diseases of children has been neglected, but that a young student is led to think of it as a rather superfluous task. Besides, babies and children in practice are easy to deal with, for they cannot resent ill treatment, claim damages, or impair the good doctor's reputation by complaining.

All that may be changed by you, in Baltimore, and beyond the city's limits. For while a bad example is contagious, a good one is fortunately, at least, just as much so. I feel that a single earnest attempt is all that is required. When it is made at Baltimore, with its just expectation of becoming the centre of learning, and particularly medical learning, in the United States, it will be doubly effective.

The hospitals for sick children, and hospitals in general, are necessarily limited in their means, the space they occupy, and the accommodations for beds which they offer. A large city ought to have, therefore, in proportion to its population, several institutions for rather different purposes. An institution for the relief of acute inflammatory diseases, while located as healthily as possible, must necessarily be at no unreasonable distance from the homes of the sick ; for transport to a distance is, of necessity, attended with dangerous consequences ; many a patient dies of it.

On the other hand, places destined for the relief and cure of chronic ailments, such as rhachitis, scrofula, bone diseases, ought to be established at a greater distance from the cities, on mountains, or the sea-shore ; chronic pulmonary diseases

require plateaus protected from changing winds and temperatures.

Professor G. Barellaj, of Florence, Italy, founded the first sea-shore hospital for chronic ailments in Viareggio; and in 1873 as many as eighteen existed in Italy, that were founded on the same plan. Count Ricardi de Nastro established, in Turin, a hospital for rhachitic children in 1872. Within a year, two additional ones were called into existence. Moral contagion is not always detrimental in character. In Milan, Dr. Pini founded a similar institution. The hospital for scrofulous, rhachitic, and anæmic children, in Berck-sur-Mer, admitted, between the years 1861 and 1865, 380 children, of whom 234 recovered, 93 were improved, 35 were not improved, and 18 died. The stations at Venice, Rimini, Seotri, and Fano, had 1,359 recoveries, and 758 partial recoveries, out of 2,283 admissions. The establishment of Oranienbaum, near St. Petersburg, Russia, admitted 217 children at an average age of nine years, of whom 96 are reported as recovered, 95 as improved, 20 as not improved, 5 as worse, and 1 dead. These percentages of entire recoveries in a class of cases which, under ordinary circumstances, give rise to protracted illness and lingering are so satisfactory, that the very mentioning of them ought to be enough to enlist the warmest sympathy in behalf of a class of children who, while suffering from the curse of inherited poverty and acquired ill health, might be readily aided by the benevolent efforts of wealthy individuals, — or the collective means of society. They are the very class who, when they grow up with their ailments and incapability to produce, will, through the course of their lives, consume the marrow of the land in hospitals, refuges, almshouses, and penitentiaries.

A large number of children, and very often healthy and vigorous ones, are destroyed yearly by infectious and contagious diseases. Municipal consciences have been awakened sometimes to the knowledge of that fact, and endeavored to guard against it by closing school rooms in the faces of children coming from infected houses. This is a necessity from the point

of view of protection to the well. From that point of view it is even explainable and justifiable that the whole population of a tenement house, in which a single case of communicable disease happens to exist, is driven back to its dens; all of this is just and proper on the part of those who do not yet suffer, but is it just and humane when considered in the interest of those locked up in their pestiferous atmosphere? Or does this very process of locking up yield any favorable results?

By no means; for the fact is undoubted that from one or more such infected localities the epidemic will spread; it is apt to spread in the same degree that the population is densely concentrated around the infected locality. That is natural enough, for the disease will spread where it took hold, the number of cases will increase, the character of the epidemic become graver. If the first case could have been removed, isolated, and taken care of, the malady might have been stopped, lives and means been saved, and the community effectually protected.

Now, general hospitals do not admit contagious diseases, though some of them, for instance, the Victoria Hospital, London, England, have fever wards for the admission of that class of cases; there is always one or the other communicable affection which is not allowed to enter; thus, for instance, small-pox. The majority of hospitals remove from their wards even such as are taken with contagious diseases while inmates of the same. There are but few, and particularly but few children's hospitals in existence which have the opportunity of isolating those who are taken sick so as to require separation. Such are the St. Wladimir of Moscow; Nicolai, Elisabeth, and Peter Von Oldenburg, of St. Petersburg, or the Child's Hospital of Basle (Switzerland), or Lisbon, the Evelina Hospital of London, and also some others, to a certain extent Vienna, Prague, and Stettin.

If there were hospitals enough with sufficient accommodations for the isolation of those who are taken with a contagious disease after having been admitted for other reasons, and other hospitals established for the acknowledged purpose of

receiving at once those taken with communicable affections in their residences, these homes crowded with children and adults would be protected and saved, and many a fatal epidemic stamped out at the beginning. The unnecessary and preventable waste of life is fearful, and if the waste of property annihilated by preventable disease and death was counted, or could be estimated, — with the loss in material, money, labor, time, health, and comfort, — the political economist would be surprised.

It is not too early, then, to emphasize the necessity of establishing hospitals for the reception and treatment of contagious diseases. They are required in the interest of those taken, and those who are still well and almost certain to be taken. In regard to small-pox, some communities enforce the rule of isolation even against those who are unwilling, in the interest of the whole community. Small-pox, however, as we meet it, in both sporadic cases and epidemics, and modified by vaccination, is by no means the most dangerous scourge; many an epidemic of diphtheria and scarlet fever has proved more fatal than varioloid. Special hospitals are a necessity, and public opinion will not always be satisfied with halfway measures. The progress of human development will insist upon the necessity of greater protection for the community, and better accommodations for those who suffer from the most dangerous forms of sickness. Besides, humane thought and sympathy will readily be enlisted in behalf of those who, while suffering most seriously and most frequently, are most helpless; for childhood is the harvest-field for the murderous epidemics. The man who, in any town of the globe, will sacrifice part of his wealth for the erection of a hospital destined for the exclusive reception of children suffering from contagious diseases, is sure to make his name a blessed household word, and crown his head with immortal glory.

OBSERVATIONS UPON THE SANITARY CARE
AND TREATMENT OF CHILDREN AND THEIR
DISEASES.

*In Answer to certain Questions propounded by the Trustees of The
Thomas Wilson Sanitarium for Children of Baltimore City.*

BY J. FORSYTH MEIGS, M. D.,

*Member of the College of Physicians of Philadelphia, one of the Physicians
to the Pennsylvania Hospital, etc., etc.*

THE trustees of "The Thomas Wilson Sanitarium for Children of Baltimore City" having requested me to prepare an essay on certain matters connected with the establishment of this institution, I proceed to fulfil this request to the best of my ability. The trustees desire information, first, as to "the best method of establishing a Sanitarium (not a hospital but a summer retreat) for sick children, under the most favorable hygienic and local conditions that the neighborhood of Baltimore may afford." They state that "the land lying north and west of the city is high and picturesque, and elevations of four hundred feet above tide are reached by steam railway in thirty minutes, and those of six hundred to eight hundred feet in an hour. These districts have always been healthy — the water is pure, and food of all kinds is plenty and cheap. The ocean is not within available distance, and the shores of the Chesapeake Bay are malarial."

In regard to the choice of the site for the institution, I may say that my experience in the diseases of children in Philadelphia has led me to think on the whole, that an interior region of some altitude above the sea is preferable to the sea-side. The healthiest localities near Philadelphia are those situated from four hundred to five hundred feet above tide and away from the lower river-valleys. Sites which drain rapidly into swiftly

running streams, so that the surface shall be dry, are the best. A rolling country is for the same reason better than a flat one. The soil ought to be gravelly or porous, and at the same time reasonably fertile, in order that it may yield good grazing fields for the animals which must supply one of the main foods, milk, for the inmates of the establishment. There ought to be some large and open woods on the grounds, to afford shade in hot weather, both for the children and for the animals, and, if possible, the soil should be of such character as to afford a rich soft grass beneath the trees.

For the site of the buildings, I recommend the highest point on the ground selected for the farm, in order that these may be exposed to all the summer breezes. As the institution is intended for use in the hot months of the year, an exposure of this kind will be altogether advantageous. Were they to be used in the winter season, also, such a situation might be objectionable, but, as the summer diseases of young children are largely the result of high temperatures, it should seem that the cooler the buildings can be kept in the heated term of the year, the better for the inmates.

The trustees state that elevations of four hundred feet above tide can be reached by railway from Baltimore in thirty minutes, and those of six hundred to eight hundred feet in one hour. It appears to me that the elevations of six hundred to eight hundred feet would be greatly preferable to those of four hundred feet. If, therefore, the distance does not raise the cost of transportation too high for the funds of the sanitarium, the higher altitudes are those I should recommend. The temperature falls decidedly as the elevation rises, and this single consideration ought to decide the trustees to select the higher points if they are at all attainable.

In order to assist the trustees in their choice of the site for the institution, I will quote a few of the rules laid down by Dr. Edmund A. Parkes, in his "Manual of Practical Hygiene intended especially for Medical Officers of the Army [of England] and for Civil Medical Officers of Health," fourth edition, London, 1873, upon the relative value of localities and soils

for military encampments. He states that "as a rule, it is considered that loose porous soils are healthy, because they are dry, and with the qualification that the soil shall not furnish noxious effluvia from animal or vegetable impregnation, the rule appears to be correct." He also states that "gravels of any depth are always healthy, except when they are much below the general surface, and water rises through them; gravel hillocks are the healthiest of all sites, and the water, which often flows out in springs near the base, being held up by underlying clay, is very pure."

He remarks that "among hills, the unhealthy spots are inclosed valleys, punchbowls, any spot where the air must stagnate, ravines, or places at the head or entrance of ravines." . . . "A saddle-back is usually healthy, if not too much exposed; so are positions near the top of a slope." — On plains the most dangerous points are generally at the foot of hills, especially in the tropics, where the water, stored up in the hills, and flowing to the plain, causes an exuberant vegetation at the border of the hills." "Herbage is always healthy. In the tropics it cools the ground, both by obstructing the sun's rays, and by aiding evaporation; and nothing is more desirable than to cover, if it be possible, the sandy plains of the tropics with close-cut grass." Speaking of trees, he says, "Trees should be removed with judgment. In cold countries they shelter from cold winds; in hot, they cool the ground; in both, they may protect from malarial currents. A decided and pernicious interference with the movement of the air should be almost the only reason for removing them. In some of the hottest countries of the world, as in Southern Burmah, the inhabitants place their houses under trees with the best effects; and it was a rule with the Romans to encamp their men under trees in all hot countries."

In his directions for the preparation of a site for military purposes, he gives the following summary of rules for improving the healthiness of a site.

- "(1.) Drain subsoil, and lower the level of the ground water.
- "(2.) Pave under houses, so as to prevent the air from rising from the ground.

“(3.) Pave or cover with short grass all the ground near buildings in malarial districts.

“(4.) Keep the soil from the penetration of impurities of all kinds by proper arrangements for carrying away rain, surface and house-water, and house impurities.”

The supply of water at the Baltimore sanitarium will constitute one of the points most important to be considered in the choice of a site. To secure, if possible, one or more springs of pure water within the grounds would be a great desideratum. A stream of pure, good water running swiftly through the farm would be invaluable, whether for the supply of drinking-water, water for cooking, washing, and bathing, or for the coolness it imparts to the air. The amount of water ought to be large, in order that it may be supplied by water-wheels, windmills, or rams, to all parts of the buildings. Whether such a stream could be used, after all the water needed for the buildings had been taken from it, for the purposes of drainage, would depend upon its volume and force, and upon the distance from the buildings at which the drain or sewer might be led into it.

The trustees request suggestions as to the “character of the buildings that may be requisite; their grouping or isolation; how best to provide for mothers or nurses accompanying their children.”

I know little myself in regard to the details of buildings intended for these purposes. I applied therefore to Dr. F. W. Lewis, of this city, for information on these points. Dr. Lewis has been one of the managers of the Children's Hospital of Philadelphia since its foundation, and has always taken an active interest in it. He was also one of the original managers of the “Sea-Shore House for Invalid Children” at Atlantic City. His experience has been large and recent, and he allows me to lay before the trustees some of the opinions he has formed upon these points.

He says, “in the first place I would, for various reasons (but especially for the difficulty in the way of proper supervision, etc.) object to the system of small detached buildings

(cottage hospitals so called), except in the case of nursing infants, whose mothers also require change, and of children affected with loathsome or offensive discharges; and even for these it would seem preferable to have small (*crèche*) wards immediately adjoining the nurses' quarters in a large hospital building." He proposes a centre building with a long ward on either side. In the centre building he would place the rooms for the administrative offices, and at the point where the wings spring from the centre, the nurses' quarters. In the same building, and next to the nurses' quarters, he proposes two small wards, that on one side for nursing women and their children, and that on the other for cases of loathsome or offensive discharges. The two small wards, for these purposes, should communicate with the nurses' quarters, but should be separated by the nurses' rooms from the long wards. In the rear of the centre building he proposes to place the kitchen, laundry, etc., communicating by a covered passageway. There should be additional small rooms, he thinks, adjoining the wards, with arrangements for cooking broths, etc. At the outer ends of the two long wards should be placed the water-closets and bath-rooms, separately ventilated.

This arrangement can be made for either one or two stories, and, in either case, the roof is simply an ornamented air-chamber aiding in the ventilation. Piazzas should, of course, surround the wards, on the lower story at least. "The details," he adds, "could be infinitely varied to suit the nature of cases received."

At the House for Invalid Children at Atlantic City, they have adopted a system for nursing children whose mothers are obliged to accompany their infants, or who themselves need change of air, of small, detached, one-story cottages (without cellars of course), built of wood, with one window and door. Each cottage cost about \$150. About twelve have been erected between the main building and the sea-beach. Mothers and infants are received for a fortnight or more. Dr. Bennett, the physician in charge, informs Dr. Lewis that the plan has worked admirably, although, at first

sight, these structures might seem difficult to keep dry in wet or stormy weather.

Dr. Lewis further suggests, that for an "institution to remain open for the summer months *only*, and designed as a convalescent hospital, the following seem to me to be the officers and help required, say for ninety children:—

"(1.) A resident physician.

"(2.) A steward.

"(3.) A matron.

"(4.) Fifteen nurses, or one to every six children. This is about the proportion at the Children's Hospital, and, where infants and very young children are received, it is none too large. A *night* nurse is included in the number.

"(5.) Two cooks (head and assistant). Three laundry maids, and such male help as the hospital grounds may require (say three).

"This, I must admit, appears a very large force of officers and help for only ninety children (twenty-six officers, that is, in all), but I do not see how the number could be lessened without prejudice to the efficiency and completeness of the hospital."

"I roughly figure," he goes on to say, "the entire cost of such an establishment, with such a corps of officers, nurses, etc., at about \$16,000 per annum. This estimate is based on the following figures, derived from the annual reports of the Children's Hospital for the year 1877 and for 1879:—

1877.

Cost of a child per day, including food, wages, fuel, and medicines	38 $\frac{2}{10}$ cents.
Cost of a child per day, for food only	25 $\frac{1}{8}$ cents.
Cost of a child per day, including all expenditures	54 cents.

1879.

Cost of a child per day, including food, wages, fuel, and medicines	38 $\frac{1}{17}$ cents.
Cost of a child per day, for food only	18 $\frac{2}{17}$ cents.
Cost of a child per day, including total expenditure	54 $\frac{1}{17}$ cents.

He adds that the Children's Hospital total expenditure includes a *large dispensary*, providing *free* advice and medicines (some surgical instruments, appliances, also) for nearly eight thousand cases (not visits) annually, so that the estimate should be relatively less in a hospital not having this adjunct. Making a reasonable deduction for this, the cost would perhaps be about fifty cents, or even less, per child in the total expenditure.

The trustees, again, desire information as to "regulations for receiving and administering medically and otherwise to the proper object of their care."

Upon this point I will remark that I have been informed, by a gentleman connected with the dispensary attached to the Children's Hospital of Philadelphia, that the women who bring their young children to the dispensary for treatment are very unwilling, as a rule, to place their children in the hospital. When advised to do so by the prescriber they not only refuse, but often do not return for further advice. How this difficulty is to be met by the Baltimore sanitarium I do not see, unless arrangements can be made for taking, in some cases at least, the mothers with the children.

The institution will be obliged, in the instance of nursing children, to provide accommodations for both mother and child, since to wean a child at such a period would greatly increase the danger to life. Another difficulty in such cases, connected with the removal of the mother from the city with her ill child, will be the question, what is to become of her other children, if she have any; who is to take care of them, should she have no relation nor friend to take her place in the family during her absence? I will suggest that the sanitarium have in its employment several elderly, respectable women, or nurses, stationed in the city, who might, for moderate compensation in urgent cases requiring immediate removal from the city, take the place of the mother in the care of the household during her absence. Of course such a system would need great care in the selection of the agents, but I do not think of any other plan to meet this difficulty. It

would be expensive, but it would solve what otherwise appears to me a great obstacle to the full success of the sanitarium.

The sanitarium ought to have attached to its central office in Baltimore one or more competent physicians, whose duty it would be to see at the office, or visit at the houses of the applicants, the children for whom relief is sought. The physician or physicians selected for this duty ought to be men of some considerable experience, in order that they may be skilled to detect contagious diseases in the proposed patient. In doubtful cases, the authorities at the sanitarium should be informed of the possible existence of contagious diseases, in order that the patient may be secluded from the general family, in some part of the main building intended for such cases, or in a detached building, until the true nature of the doubtful case shall be determined. A child with a contagious disease of the skin, with whooping-cough, or some eruptive fever, or even with syphilis, may be the victim of exhaustion from heat, diarrhœa, cholera infantum, or dysentery, and may need the advantages of country air as much, or more, than one who has no such complication.

In connection with the request of the trustees for information in regard to "regulations for receiving and administering medicines, and otherwise, to the proper object of their care," I propose to consider briefly the frequency and causes of summer disease in young children in large cities. By showing the frequency of such diseases in large cities the wisdom of the charity established by Mr. Thomas Wilson will be demonstrated. By a study of the causes of this frequency, we shall learn much as to the proper treatment of the several diseases, both preventive and therapeutic, and we shall find that one of the most important objects for the trustees to examine and arrange for is the character of the food to be supplied to the inmates.

In the circular sent me by the trustees of the sanitarium is a table of mortality in Baltimore during the first five years of life in the four years 1875, 1876, 1877, and 1878. I find,

from this table, that 8,549 children died in the first year of life in these four years. Of this total, 3,930 of the deaths, or 46 per cent. occurred during the three hot months of summer, June, July, and August. In the second year of life 3,563 died, of which number 1,157, or nearly 32 per cent. died during the three months of June, July, and August. Of the whole mortality under one year, therefore, nearly one half, and in the second year almost one third, occurred in the three hot months. Nothing could show more clearly the great danger to life in the first two years of age than these simple facts.

In Philadelphia, of the total annual mortality at all ages, about one fourth (25.16 per cent.) occurs in the first year of life. Over two fifths (40.49 per cent.) of the total mortality occurs in the first five years of life. (Report of the Board of Health of the City and Port of Philadelphia, to the Mayor, for the Year 1874, page 134.) In the same report it is stated that, in the fourteen years, 1861 to 1874, of the whole number of deaths 23.97 per cent. were in infants under one year of age, and 41.51 per cent. in children under five years of age. It is also stated, that over one third of the deaths at these specified ages occurred in the hot months of the year. "These proportions," it is added, "great as they appear, are considerably less than those in most of the large cities of the country, and compare very favorably with statistics for the whole United States."

Dr. Thomas B. Curtis, of Boston, in the article on Infant Mortality in Buck's Treatise on Hygiene and Public Health, New York, 1879, vol. ii. p. 286, says: "In the cities of North America, the effect of the invasion of high temperatures in each year is the same, the mortality varying, however, in proportion to the intensity of the heat. In moderately hot summers (1867, 1871, 1873,) the mortality under one year in Boston is doubled or tripled during the hottest month, while the mortality from one to five years is increased by half, or at most doubled. In a very hot summer month, on the other hand (July, 1872), deaths under one are sud-

denly almost quadrupled, the deaths from one to five being barely doubled. Thus, we see that the distinctive influence of excessive heat is felt much more acutely during the first year of life than subsequently, while the reverse is noticeable with regard to the influence of winter cold, which tells severely upon children who have passed one year of age."

One of the primary objects of the trustees of the Thomas Wilson Sanitarium must be, therefore, the selection of the site for the institution in as cool a region of country as can be found near Baltimore.

Another powerful influence in determining the mortality at all ages, and especially in early life, is the density of the population. In the Fortieth Annual Report of the Registrar General of England for 1877, at page 236, may be found the following curious and instructive statements as to the relative mortality according to the density of the population. The density is calculated upon the proximity of the population in yards. The proximity is given for five hundred and ninety-three districts of England and Wales, arranged in seven groups in the order of mortality. The districts of London are excluded. In Liverpool, the proximity being seven yards, the number of living out of which one will die annually is twenty-six, and the mean duration of life is twenty-six years. In Manchester, the proximity being seventeen yards, the number of living out of which one will die annually is thirty-one, and the mean duration of life twenty-nine years. At the other end of the scale, of three hundred and forty-five districts, in which the proximity is one hundred and thirty-nine yards, the number of living out of which one will die annually is fifty-three, and the mean duration of life is forty-five years. The smallest rate of mortality given is in fifty-three districts, in which, the proximity in yards being one hundred and forty-seven, the number of living out of which one will die annually is sixty, and the mean duration of life fifty-one years.

Another cause which influences largely the mortality in early life is food. Children who are supplied with their natural aliment, nursed by their own mothers, or suckled by a

good wet-nurse, are much less seriously influenced by the summer heats, and by the other unfavorable hygienic conditions of large cities, as density of population, than those who are deprived of this aliment. My experience in Philadelphia convinced me long since that hand-fed children were vastly more apt to die of the summer diseases than those brought up at the breast. In the early part of my professional life it was one of the traditions of the nursery that, if a child could but be nursed through its second summer, its chances of escaping the dangers of the hot season were greatly increased, and women of all classes were disposed to prolong the period of lactation through this age; of late years this habit or rule seems to be going out of fashion. Few children of the upper classes of society, it seems to me, are now nursed beyond the end of the first year. Many are weaned at the eighth and tenth months.

I am of opinion that the system referred to is a wise one, and that it is well for women to follow it, when they can do so. The objection made is that it exhausts the mother. When this is the case, there is no alternative but to wean the child, since not only the mother, but the child as well, would suffer from such exhaustion. For a number of years past, as I shall state at greater length further on, I have advised nursing women to begin to feed their children at the age of from three to five months, and to persevere until they are taught the habit. By doing this in the mode I shall recommend, the mother's strength is greatly husbanded, the child is brought gradually and with more safety to the period of weaning, and the flow of breast-milk is maintained to a moderate extent as a precious resource, should the child be attacked by any of the summer diseases.

To show the mortality of hand-fed as compared with that of children nursed at the breast, I will cite a statement to be found in Professor Kehrer's excellent lecture on the Food of Infants (*German Clinical Lectures, Second Series, Syd. Soc. Ed. p. 347*). Professor Kehrer quotes C. Meyer as having found that of 8,329 children, six months and under, who died

in Munich from 1868 to 1870, 1,231 (that is, 14 per cent.) had been suckled, and 7,098 (that is, 84 per cent.) brought up by hand.

It is nevertheless true that a great many children must be, and are, brought up on artificial food. It is important, therefore, to discover, if possible, the causes of the great mortality in hand-fed children. The main cause is, of course, the loss of the natural aliment, and the impossibility thus far in the history of medicine of discovering any perfect substitute for it. The best substitute yet discovered is the milk of some one of the mammal class of animals. That of the ass, the goat, or cow is generally employed. The best is probably that of the ass, and it may be not difficult for the managers of the Baltimore Sanitarium to keep on the farm of the institution some of these animals to serve this purpose. But as cow's milk is the form of milk almost altogether employed in this country, I shall confine the remarks I have to make upon this subject to it alone.

I shall not attempt to discuss the chemical qualities of cow's milk, or to trace minutely the causes of its occasional indigestibility, but shall confine myself to a consideration of facts so far as we know them.

There are two points connected with the use of cow's milk for children which especially deserve consideration, and which I have learned to deem of the highest importance in practice. On these two points, I propose to dwell in some detail. One is the growing belief among practical men that the degree of freshness of the milk, and its preservation from all contamination with foreign matters, and specially with filth matters, have a great deal to do with its fitness or unfitness to serve as a food for the human infant. The second is the question as to whether it is best to use it pure for young children, or diluted, and if diluted, in what proportions at different ages.

It has long been known that cow's milk which has been kept too long, or which, having been preserved in unclean vessels, has undergone some change of a putrescent nature, is extremely apt to disagree with the infant and to be the cause

of indigestion or diarrhœa at any season, and to incite attacks of summer disease in hot weather. Of late years several observers have suggested, as one chief and potential cause of summer disease in children fed on cow's milk, the remarkable tendency of this fluid to undergo, when kept for some time after being drawn from the cow, putrescent changes. As this fact, if true, must be one of great importance to the officers of the sanitarium, and as it is one capable in large measure of prevention, I need not hesitate to quote in this essay the opinions entertained upon the subject.

Dr. Thomas B. Curtis (*Buck's Hygiene and Public Health*, vol. ii. p. 290) says: "Milk, when exposed to atmospheric air, is known to be excessively putrescible. So liable is it to become contaminated by the development of various ferments, that Professor Lister used it as a substitute for Pasteur's solution in his experimental investigations into the subjects of fermentation and putrefaction. 'Milk,' he says, 'is a pabulum for all kinds of organisms; nearly all kinds of bacteria (and there are indeed very many varieties) will live in milk; whereas only a small proportion of such organisms will live in Pasteur's solution.' Not only is milk very prone to decomposition, but it is exceedingly difficult to disinfect it when once it has begun to undergo fermentation or putrefactive changes, in consequence of the access of organisms."

Dr. Curtis (*loc. cit.* page 291) quotes some instructive facts observed by Dr. Baginsky during an investigation undertaken to ascertain the causes of the prevalence of infantile diarrhœa in Berlin. He came to the conclusion that the disease was chiefly due to the use of improper food. "He made a series of comparative experiments for the purpose of ascertaining the degrees of putrescibility of various articles of infant food, comprising woman's milk, cow's milk, Swiss milk, and two kinds of farinaceous food. These, having been previously boiled, were exposed to a continuous temperature of 37° C. (98.6° F.)." "After twenty-eight hours' exposure to this temperature the woman's milk and cow's milk remained almost unchanged; but the Swiss milk, although appearing

fresh, and the two farinaceous foods, exhibited bacteria in active motion. The woman's milk was alkaline, the cow's milk slightly acid, and the farinaceous foods strongly acid. After a further exposure of eighteen hours, the cow's milk and the Swiss milk were coagulated, and the farinaceous foods in a high state of putrefaction; the woman's milk remaining still alkaline and almost unchanged. The experiments were repeated many times, and always with the same results. They were also varied, and it was found that by careful manipulations and the use of distilled water, these changes might be delayed; but for all practical conclusions the first experiments hold good. The preëminence of woman's milk is acknowledged; then comes cow's milk and the Swiss milk; and only at a far-off distance the farinaceous foods experimented upon can be admitted, not as substitutes, but as merely supplementary substances, which are rendered less mischievous by the addition of milk."

Meissner is quoted by Dr. Curtis as asserting that cholera infantum never attacks children raised wholly upon breast-milk, and as being a determined advocate of the bacterial theory of diarrhœal infection. "He expresses his conviction that the agency which, in midsummer, in densely populated districts occasions fatal diarrhœa does not reside in animal milk *per se*. The pernicious agent, he says, must be sought solely in the drawn milk resulting from the access of atmospheric air, and from the imperfect cleansing of the vessels in which the milk is kept and transported, and of the bottles, tubes, and mouth-pieces through which it is administered to infants."

I will state at this point, that my own experience does not agree with Meissner's that nursing children never have cholera infantum. They certainly do have it in Philadelphia, but much more rarely in comparison with hand-fed children, nor do they have it so severely, nor in so dangerous or fatal a form.

These experiments of Baginsky tend to confirm the opinion expressed by Mr. Simon, in 1858, to the General Board of

Health of London, to the effect that "diarrhœal infection owes its prevalence to *infection by filth.*" See article by Dr. Curtis, in Buck's Hygiene and Public Health, vol. ii. p. 290.

These views, which seem to be consonant with both theory and practice, may be of great service in guiding the officers of the sanitarium to a more successful use of cow's milk for the children who are to become the inmates of the institution. They show how important it may be in the economy of the institution to have the supply of milk drawn from the cow twice, or even three times a day. The proper care of the dairy, and a rigid inspection of all the vessels, utensils, cups, or bottles, intended for the younger children in particular, whose almost sole food must be milk, becomes a matter of singular importance.

It would be well, too, it seems to me, to discard, as far as possible, in this institution the use of sucking bottles, with their tubes and mouth-pieces. It is very difficult to keep these instruments perfectly sweet and clean, even in private families, where each young child has a mother or nurse, whose whole time and care are given for it alone. How much more difficult in an institution where each nurse must have the care of five or six or more children.

They can, I think, be safely dispensed with at the age of three or four months. Prior to that time, a common four or six ounce bottle, with a rubber mouth-piece or nipple slipped over the mouth of the phial answers every necessary purpose. This simple contrivance has the inestimable advantage of being easily kept clean, or, at least, much more easily than any of the more elaborate apparatus. Even this mouth-piece will soon become foul unless kept soaking in water between the periods of use. The bottle itself ought to be carefully cleansed after being used. In my own family I always used for the purpose of feeding, at the ages mentioned, a small glass or silver cup with a handle. I advise the use, at the sanitarium, of glass cups or small tumblers. There is no other material so readily kept clean, and none which can be more easily inspected by the proper officer.

In a foot-note at page 427 of M. Parrot's work on Athrepsia it is stated that in the foundling hospital of Moscow the children are half fed and half nursed, and that the only feeding vessels employed are made of glass, and have no nipple.

I will mention that I have, for many years past, been in the habit of advising my patients to begin to feed their children on artificial food at the age of three or four months. I did this in my own family and had no cause to regret it. I have followed this system for several reasons. In the first place, the child is taught to feed from an open vessel, instead of sucking from a bottle with its mouth-piece or tubes, which are so prone to become offensive that only the vigilant eye of a sensible mother or trained nurse can prevent it. The mere habit of taking food from a cup prepares the child to undergo weaning with much less trouble than when it is weaned abruptly from the breast, and, lastly, the digestive organs become habituated by degrees to the reception and digestion of the new food. In advising this course I am careful to order only one feeding a day for the first two or three months. Afterwards, as the child strengthens, it is fed two or three times, and, in the second year, if the mother is able to nurse the second summer, I prescribe enough food to make it necessary for the mother to nurse only three or four times a day.

I pass on now, under the request of the trustees for information as to "regulations for receiving and administering medically and otherwise to the proper object of their care," to the subject of the food to be supplied to the young children who are to be the inmates of the institution. There are few practical subjects within the domain of the medical art more difficult to deal with, about which more confusion and uncertainty prevails, than the simple one of the food for young children.

My remarks will be confined almost exclusively to cow's milk. Should the officers of the sanitarium see fit, and find it possible, to have a few wet-nurses at the institution, for very young hand-fed infants who may arrive at the establishment dangerously ill, whether from heat, the malaria of the

city, or improper food, and whose lives might, perchance, be saved by nursing for a few days or weeks, it would be well. They might also, perhaps, as was suggested before, have a few asses on the farm attached to the sanitarium, for the reason that the milk of this animal resembles human milk more nearly than does that of any other animal. But cow's milk will undoubtedly constitute almost the sole supply of food for children under one year of age, the chief supply for those in the second year of life, and a large proportion of what will be required for those over the last mentioned age.

In seeking to determine how we are to feed children who have been deprived of the breast, I can conceive of no method so likely to lead to correct results as the very simple one of taking nature for our guide. By ascertaining the quantity of milk a healthy nursing woman furnishes at different periods of lactation, we determine the amount of liquid food we must administer to the hand-fed child, always bearing in mind that the food we choose shall resemble the natural aliment as nearly as possible. By careful comparison of the proportions of the constituents of cow's milk with those of woman's milk, we are enabled to bring the former, by the addition of water, sugar, and sometimes of cream, to a physical constitution much more like the latter than it is in its natural state. At least this is my opinion. We have, besides the comparison of the physical qualities of the two kinds of milk, long experience to assist us in determining the relative value of cow's milk variously prepared.

I have found very few statements by medical writers as to the quantity of milk furnished by nursing women, and the few that I have found differ so much from each other that I deem them of very moderate value. In the recent very able work by M. Parrot, of Paris, on *Athrepsia*, the author quotes Dr. N. Guillot as assuming from his observations that a child two days old takes from the breast twenty-one ounces of milk; one of five days, seventy-eight ounces; and one of eighteen days, ninety-one ounces. These amounts are, according to M. Parrot, entirely too large. He quotes, with

strong approval, some observations made by Dr. Bouchard, at the Maternity Hospital at Paris. Dr. Bouchard concluded that a child one day old takes one ounce of milk per day ; one of two days five ounces ; at four days seventeen ounces ; after the first month, twenty ounces ; after the third month, twenty-three ounces ; after the fourth, twenty-seven ounces ; and from six to nine months, thirty ounces. M. Parrot says of these results of Dr. Bouchard : "I accept them entirely, after having determined their correctness by observations of my own." I may add that Guillot's results were obtained by weighing the child before and after the act of nursing. But this was done only for one nursing. He then assumed that the child nursed no less than twenty-five times in the twenty-four hours, and multiplied this number by the weight gained at the one nursing. Dr. Bouchard, on the contrary, weighed the children observed by him before and after the act of nursing, and each time in the day that the act was performed. He found the average number of nursings in one day to be from eight to ten.

My own observations amount to only three in number, but the mode of determination of the amount of milk yielded in each case was so necessarily exact, that I have entire faith in their accuracy so far as they go. The milk was drawn from the breasts by a breast-pump in each case, and then accurately measured.

The first observation was made some thirty years since. A healthy woman, whose mother was a monthly nurse, was confined of a still-born child. The flow of milk was kept up by means of a young puppy. At the end of six weeks, she obtained a place as wet-nurse, and the day before she went to her place, I had all the milk her breasts furnished for twenty-four hours, drawn by a good breast-pump. It measured exactly a quart. I measured it myself. Is it not reasonable to suppose that, had the breast-glands been stimulated in this woman in the natural method, to wit, by the maternal instinct and by the suction of a healthy child, the amount would have been larger — say three pints. Since that period, I have

had two admirable opportunities for determining exactly the amount of milk supplied by a healthy woman. In one case, a child four months old, suddenly, owing to a long illness from a chronic suppuration, weaned itself from its mother. It was fed for a time on cow's milk, with Mellin's food, but becoming very ill, I sent for a wet-nurse. The child could not be induced to take the breast, and the milk was therefore drawn by a breast-pump, and fed to the child from an ordinary nursing-bottle. The wet-nurse's child was at this time two months old. At first only small quantities, one and two ounces, were retained ; but after several days the child took daily of this milk as much as 36 ounces. Besides this quantity, which was drawn regularly by the breast-pump, the nurse suckled her own child in part. Assuming that she gave her own child a pint, we find that the amount supplied by her was fully three pints, or 48 ounces daily.

In the second case, a child born of a very healthy young woman was unable to nurse because of a congenital defect of the mouth. The milk was drawn by a breast-pump, and administered from a sucking-bottle. When the child was five and six weeks old, it was taking 18 and 23 ounces per day. But, at the same time, the quantity drawn each day from the breasts, accurately measured, was $39\frac{3}{4}$, 41, $33\frac{1}{4}$, 39, $39\frac{1}{4}$, $39\frac{1}{4}$, $31\frac{1}{4}$, $41\frac{1}{2}$, $44\frac{1}{2}$, 35, 40, and $39\frac{1}{4}$ ounces. The largest amount any one day, in this case, was therefore $44\frac{1}{2}$, and the smallest $31\frac{1}{4}$ ounces. Is it not probable that, had the breasts been stimulated in the natural way in this woman, the quantity would have been greater rather than less ?

The difference in the estimates given by M. Parrot and myself are certainly curious. He supposes that a child receives from its mother in the second month, 20 ounces of milk per day ; after the third month, 23 ounces ; and from the sixth to the ninth month, 30 ounces. My observations show that one woman supplied at the end of the sixth week 32 ounces ; another, in the second month, 36 measured ounces drawn from the breast, and some given to her own child by nursing ; the whole amounting probably to 48 ounces ; and

a third who gave in the fifth and sixth week of lactation, from $31\frac{1}{4}$ to $44\frac{1}{4}$ ounces each day.

I feel so sure of the correctness of these observations that I shall take them as the guide for determining the amount of liquid food that children in good health ought to take at the ages mentioned.

I proceed next to set down in detail what I conceive to be the best method of feeding children deprived of the breast. I shall, with a special view to the needs of the Baltimore Sanitarium, refer first to the diet for healthy children and those convalescent from disease, and second, to that which may be proper for those who arrive at the institution suffering from indigestions, diarrhœas, cholera infantum, dysentery, and general debility, induced by the summer heat of the city.

In a large institution, such as the sanitarium is probably destined to be, the more simply the food can be prepared, the better for all concerned. I advise therefore that, as a general rule, the milk should be used diluted with simple water in the proper proportions. Milk containing fifteen per cent. of cream is the kind I prefer, when it can be had; but as eight and ten per cent. of cream are considered a fair average, I assume in the rules I mention that the cream is ten per cent.

If the child be young, one to three months old or younger, I advise the addition at first, until the degree of digestive force of the particular child may have been determined by observation, of two parts of water. To each pint of this mixture should be added half an ounce of sugar of milk, or half the quantity (two drachms) of cane sugar. After it has been ascertained that food of this strength is well borne, the patient may be put upon the proportion generally to be employed at the age of the child, whatever that may be.

From birth to the end of the first month, and often in the second month, the proportion of two parts water to one of milk is the one I deem the safest and best. In the second month, and up to five or six months, the proportion ought to be half and half in healthy children. After this period it may be

made two parts milk and one water until the end of the first year.

In children in the second year of life the milk may often be given pure, though even at this age I have met with many cases in which the permanent addition of a fourth or a third of water renders the food more digestible, and productive of better results. So long as the child thrives well on diluted milk, there can be no valid objection, especially during the hot season, to a continuance of its use. It is certainly true that nature does not increase materially the richness of the breast-milk in the second year of nursing.

The exact quantity of food required by different children varies according to their constitutional peculiarities. The proper amount in each instance can be determined only by the careful observation of an intelligent and experienced physician or nurse. Still, there ought to be, and there must be, some general standard for the guidance of the officers of the sanitarium, and especially for the nurses on whom will devolve the task of supplying to the various patients what they may need.

I have already stated, as the result of my own observations, that nature supplies to the child, in the second month, as much as a quart per day, and in the third and fourth months three pints. These amounts accord closely with the quantities of diluted cow's milk that healthy children of good appetite and digestion generally take at those ages. I believe that the amount is not much increased between the sixth month and the end of the first year. Some large and healthy children are very hearty feeders. Some few such take as much as two quarts after the eighth or ninth month.

I do not venture to lay down these standards as invariably right, but I do venture to say that when a child of three or four months old is taking only a pint of food a day, it is taking quite too little, and it is proper and necessary for those having it in charge to use every cautious endeavor to increase the sum.

It is important, also, to establish some general rules as to

the number of feedings per day. In very early life, the first and second months, food should be given every two hours, so much at each feeding as to make the pint, pint and a half, or quart per day required at the different ages. From the third to the sixth month, the feedings may be repeated every three hours. If this be done from six or seven A. M. to eight or nine P. M. there would be six in the day. From six to eight ounces should be given at a time, according to the vigor and natural appetite of the subject, making in all from thirty-six to forty-eight ounces, or from a little over a quart to three pints. After eight months most hearty children will take the eight ounces and some even more, or they may require now and then a extra meal, making up the total to nearly two quarts.

I believe it is unnecessary, as a rule, to feed children in good health in the night after the age of eight months. If the last meal be given at nine or ten P. M., the child may usually go to six A. M. of the following day. Should it be uneasy in the night, a drink of plain or sweetened water ought to suffice.

If the child does not thrive well on simple milk and water, it will be proper to add some farinaceous substance to the diet, and to give once or twice a day beef or chicken tea. The best farinaceous materials are barley, oatmeal, or arrowroot, the choice in each case being determined by the taste or fancy of the child, and by its tendency towards constipation or diarrhœa. In the former case oatmeal, in the latter barley or arrowroot, are the best. When barley or oatmeal is used, two teaspoonfuls of either substance should be boiled for fifteen minutes in a pint of water, and the fluid strained and added to the milk in place of simple water. Of arrowroot a teaspoonful and a half to the pint of water is sufficient. When the barley is used, it is best to procure whole barley, grind it in a spice-mill, and employ the ground substance.

When beef-tea is to be used, I think the best mode of preparing it is that recommended by Dr. Letheby of London. Equal weights of lean beef and cold water (a pound to the pint) are to be infused together for an hour. The beef and

water are then put into a pipkin, placed near the fire, and allowed to heat gradually, so that they shall reach the boiling point in fifteen minutes. They are allowed to boil only a few minutes; I direct two minutes, in order to avoid a hard and tough coagulation of the albuminoid juices by more prolonged boiling. The water is decanted off the meat, the beef squeezed to obtain all the fluid, and the tea used with the small and soft sediment which it contains. Salt, of course, is to be added.

To make chicken tea for young children, I direct the half of a small chicken, or the leg and thigh of a large one, to be deprived of the skin, the bones to be broken, and the chicken put into a quart of water, which is to be simmered down to a pint. To this sufficient salt is added. Children often take this thin tea with great avidity.

I pass on, now, to the second portion of this subject, — the kind of food to be employed for children who arrive at the sanitarium suffering under the forms of disease induced by the heat of the city.

In acute cholera infantum, one of the dangerous and distressing features of the disease is the vomiting which often attends it. I have often seen children with this disease go to the breast, nurse eagerly, and vomit as though under the influence of a powerful emetic. If this happen several times, the child ought to be allowed to nurse for one or two minutes only, when it should be removed from the breast. If this plan succeed, the nursing may be repeated every hour or two, and cool water, with half a teaspoonful of brandy to the half-pint, in the quantity of one or two tablespoonfuls at first, ought to be offered the child between the acts of nursing. Should even these small quantities of milk be rejected, the child must be withdrawn from the breast for twenty-four hours, and the brandy and water given frequently, in such amounts as the child can retain. Small doses, one or two tablespoonfuls, or even teaspoonfuls, of beef tea, and especially of the chicken tea, may be tried every two hours, and they will often be retained. At the end of twenty-four hours, if the vomit-

ing have ceased, the child may again go to the breast, being allowed to nurse at first for only one or two minutes at a time.

As to the amount of water to be used on these occasions, my own practice is to give one or two tablespoonfuls every ten or fifteen minutes, until I find that it is well borne. When this proves to be the case, I give all the child will take of with pleasure and avidity.

When the patient with cholera infantum is weaned, and on artificial food, it is necessary to dilute the milk largely (half or even three fourths) for a day or two, and give only two or three tablespoonfuls every two hours, and to allow cold water, or brandy and water between, as directed above. In obstinate vomiting, the milk ought to be withheld entirely for twenty-four or forty-eight hours, and the small doses, two to four tablespoonfuls, of beef or chicken tea given instead, once in two or three hours. If this quantity is not retained, a single tablespoonful may be given every hour, or teaspoonfuls may be tried every fifteen minutes.

It is a curious fact that a young child, one of three or four months to one and two years old, will often take eagerly brandy and water, and retain it, when all food, so-called, is rejected. I saw a child this past winter, four months old, reject, by vomiting, breast-milk drawn from the breast by a pump, when more than two and three tablespoonfuls were given at a time, who could and did take with great avidity, and retain, considerable draughts of cold water containing a teaspoonful of brandy in each half-pint. This patient drank in this way two and three half-pints of water in the twenty-four hours. After three days the appetite for the brandy and water passed away, and the child turned from it with loathing. Some days later the desire returned, and the fluid was again taken for some time, with the same eager appetite. The patient recovered completely in a month, and was able to return to the diet of cow's milk and water. A month after this, again, the child was taking each day two quarts of the gelatine, milk, and cream food, to be referred to presently.

When the vomiting has ceased and diarrhœa alone remains, and when the disease has been simply diarrhœal from the first, the regulation of the food is the most essential part of the treatment. If the ordinary simple milk and water is not well borne, and if the stools contain masses of undigested casein, the food recommended in the work on Diseases of Children by Meigs and Pepper, consisting of milk and thin arrowroot water, with the addition of a little gelatine and cream, often succeeds extremely well, particularly in very young children.

There is another preparation I have used in teething children, with severe summer diarrhœa and occasional vomiting, with excellent results. It consists of equal parts of thin arrowroot water, lime-water, cream, and ordinary milk. The arrowroot water is made of a small teaspoonful of that substance to the half-pint of water. One tablespoonful of each of the ingredients, making two ounces, is given every two hours at first. In a day or two, three ounces, and afterwards four ounces, are allowed every two hours. If the diarrhœa improve, and the appetite increase, the proportions of the ingredients may be changed. The milk may be increased and the cream diminished, and the patient restored gradually to its ordinary food.

I am well aware of the fact that some writers of authority oppose the addition of cream to ordinary cow's milk, on the ground that any excess of cream is injurious rather than beneficial. The objection, however, seems to me to be based upon theoretical rather than upon practical reasons. I have employed the food referred to above, made of arrowroot water, gelatine, milk, and a small additional amount of cream, with sugar, for many years with much success, and I know that it has been used a good deal by others. Moreover, the second preparation mentioned above, consisting of milk, cream, lime-water, and arrowroot water, in equal proportions, in cases of acute summer diarrhœa, has answered admirably well in my hands in a good many cases. It is twenty-three years since, in a case of severe typhoid fever in a boy ten months of age, who had

been recently weaned, and whose digestive powers were at a very low ebb, I asked my father, Prof. Charles D. Meigs, what diet I should give the child. He advised me to have a thin arrowroot water made, and to add two tablespoonfuls of pure cream to six ounces of water, with a little sugar. The child took this food freely, lived on it for a number of days, recovered, and is now a vigorous and healthy man. In another boy, in the second year of life, I found it impossible for him to digest ordinary cow's milk, either pure or diluted. It invariably brought on diarrhœa, and I was compelled, after a number of trials, to use cream alone, diluted with water. He took a pint of the cream daily, with small quantities of beef or chicken tea and some bread. He was pale and weak-looking during all this time, but got safely through his dentition and is now a healthy, active boy of twelve years of age.

I am acquainted with the history of a family in this city, in which the mother (not under my advice) has brought up three children, chiefly on cream. Two were fed from birth on it; at first, they had a gill a day, then half a pint, and afterwards a pint a day. Two parts of water, and sugar, were added to the cream. In the second year, milk was added to the cream until a quart of each was taken daily. The last child, now eleven months old, a healthy-looking and well-grown child, is partly nursed, but takes a pint of cream mixed with water daily. None of those three children, the mother assures me, have ever had cholera infantum. I do not mention these facts as an advocate of the use of cream, saving in exceptional cases, but as showing how true it is that children have their idiosyncrasies. Children, like adults, are a law to themselves, and he is the successful physician who discovers the law of each patient, and so is enabled to carry him through some special crisis of his life.

When diarrhœa in teething children becomes chronic, in addition to the catarrhal state of the bowel a serious dyspeptic condition is set up, and the child often loses all appetite, refuses ordinary food, emaciates, and is in great danger of sinking

from a slow inanition. In this state I have known life saved by a resort to articles of food which would not, and ought not, to be thought of in ordinary cases. This form or stage of digestive disorder seldom occurs except in teething children. I have seen it at the ages usually of eight or ten months to the close of the second year. The child, like some dyspeptic adults, comes to loathe its accustomed food. Under these circumstances, I have learned to study what Dr. Joseph Parrish of this city often called the language of the stomach, — to offer new and unusual articles of food, until I find something which is taken eagerly or at least willingly. Pieces of stale bread cut thin, and spread with a little currant-jelly, are often very acceptable, and they very seldom disagree with the child. Slices of bread, lightly toasted, with beef-tea, or pure beef-juice squeezed from rare or raw beef with a lemon-squeezer, poured over them, and salted, are frequently relished. I have used the yelk of an egg, hard-boiled, broken into a powder, with salt, or finely minced rare beef, or mutton-chop; or, what used to be famous in the nursery, a bit of fried ham, of which the fatty portion is often sucked with great pleasure, may be tried. Stale and crisp sponge-cake, in the form called finger-cakes, or ginger-bread made light and moderately hard, and not too highly spiced, are useful. In one case, I saw a child take the roe of herring sprinkled over bread, from time to time, and then begin to recover appetite. Lumps of white sugar, or small portions of good mint-candy, may be allowed. The preparation of chocolate called Rackabout, or very thin chocolate, made partly of milk, is sometimes liked, when all ordinary food is refused. In such cases great danger arises from the slow inanition going on; and if we can prolong life for a few days, and at the same time rouse the dead appetite, and stimulate the salivary and gastric glands to renewed action, life may be saved. If this plan be followed carefully, and the various articles named tried in succession, we shall often be able to find something that will be taken willingly.

The trustees ask for “your suggestions in regard to the most practicable means of lessening the risks and dangers in.

cident to children exposed to the heated and impure atmosphere of a large city, during the summer months."

These "risks and dangers" can be lessened only by the removal, when removable, or by the lessening, when irremovable, of the causes which give rise to them. The chief causes of danger are heat, uncleanness, density of population, and improper or unwholesome food. The heat is greater in the cities than in the rural districts, and it is more fatal. One cause of the greater heat is the diminished movement, and the stagnant condition of the air in the streets, and these conditions are most marked, of course, in the narrower streets, and especially in the blind courts and alleys, where the poor and unfortunate are often compelled to live. Our large cities cannot unbuild themselves, but they might, by municipal authority, determine that, in the future, the main streets should be made wide avenues, and that no streets shall be opened of less than a certain width, and no blind alleys nor courts whatever. Let each city insist on a plan, hereafter, which shall secure a free and unimpeded movement of the air, and she will soon lessen the mortality of the population, and especially of her young children. The refusal of permission to open any more streets below a certain width, or of any blind courts or alleys whatever, would have another most useful result. It would diminish the density of the population, which, as has been shown, is a large factor in the determination of the death-rate, and of the expectation of life, in the population.

The establishment in a city of as many open squares or parks as possible tends to diminish heat by increasing the ventilation, and by the effect of trees and grass, and to improve the purity of the atmosphere. The gift of such open spaces by munificent citizens, their retention in the original plans of the town, or their purchase by the municipality, would diminish the intensity of two causes which act so fatally on children, — heat, and density of population.

To diminish the injurious effects of heat in summer, the houses ought to be built with considerable window-space. It might be enacted as a law that no house shall be erected in

future with less than a certain amount of window-space. Nor should any house be erected without windows opening on two sides, front and back, if possible, so as to secure a free ventilation through the main body of the house.

The windows of the upper rooms of the house, at least, ought to be hung with shutters of the Venetian pattern, so that currents of air may pass freely, while the brilliant light of midday may be excluded.

The houses should be built with an open fireplace in each room, to promote thorough ventilation in summer. And when this cannot be done, and the house is warmed by a furnace alone, ventilating flues should be run through the walls.

Besides heat and density of population, one of the chief causes of infant mortality is unwholesome food, and especially, as would seem from modern investigations, stale and impure milk. To lessen this cause, each city ought to have a legalized inspector of milk, who, after a certain standard quality of milk shall have been agreed upon, ought to make frequent inspection and occasional analysis of the milk, to see that the provisions of the law are carried out. One part of his duty ought to be to see that the vessels in which the milk is carried to and transported about the cities are kept pure and clean. Any milkman whose vessels are unclean and foul ought to be suppressed as a public nuisance.

Uncleanliness in the household being another cause of disease, and one especially rife among the poor, the supply of water ought to be large and its cost as moderate as possible.

In the ninth Report of the Registrar General of England, for 1846, it is stated, page 27, speaking of Manchester: "The house and the children of a laboring man can only be kept clean and healthy by the assiduous labor of a well-trained, industrious wife, as any one who has paid the least attention to the subject is well aware."

Dr. Curtis¹ goes so far as to say: "It appears probable, then, that the poisonous miasmata, which are evolved from urban filth under the influence of high temperatures, do not

¹ Buck's Hygiene and Public Health, vol. ii. page 293.

exert their universally recognized noxious action upon the infant directly by inhalation, but indirectly through the intermediate instrumentality of putrescible articles of diet. The injurious agent by which this particular form of filth infection takes place is rotten food taken into the stomach rather than foul air taken into the lungs." If the city could allow one faucet to each house, free of cost, or at a very low rate, it would be a great boon to the poor. Possibly, if the poor housewife could afford, like the rich, to have a faucet on each story of her house, instead of running to the hydrant in the yard for all her water, she might learn to be more liberal in its use, and thereby keep her house, herself, and her children cleaner and fresher. The husband, too, when he returns from his day's labor, reeking with sweat and begrimed with the dust of his necessary toil, might then purify himself from all these sources of unwholesome odors, which assist to poison the air of his small rooms.

The trustees desire, moreover, "your views as to the best methods of extending a general knowledge of simple hygienic rules for the treatment of children at home among the poorer classes."

I can think of but two modes in which the poorer and more illiterate classes of society can be taught better hygienic rules for the treatment of children at home. One is by gratuitous distribution of a proper tract or tracts on the subject, and the other (this would apply only to Baltimore) would be for the Baltimore Sanitarium to make it one of the duties of its officers (not medical alone) to endeavor, in their intercourse with the poor, to teach them such simple rules as may be necessary. I suggested, in the early part of this essay, that the institution should have in its employment, in Baltimore, a few elderly, respectable women or nurses, who might, when the mother of an ill child is compelled to leave other children helpless at home, take her place in the household during her enforced absence. If this plan were adopted, these women, with a very little previous training, might do more to promote correct views of hygiene amongst the poor than many tracts.

If it is determined to publish a tract on this subject, I suggest something like the following.

SHORT HINTS TO THE POOR FOR THE CARE OF YOUNG CHILDREN DETAINED IN LARGE CITIES DURING HOT WEATHER.

There is no one thing so essential to the safety and health of a young infant as breast-milk.

Let the mother therefore use every care to keep the supply of this food which nature gives her. To attain this end, the father of the house should be willing and anxious to toil for the income necessary to enable the mother to remain at home, taking care of the household, and nursing her child, for the first year or year and a half. Let her suckle her child, if possible, through its second summer, feeding it in part, large part, if she will, but keeping the flow of the milk in the breasts to fall back upon, should the baby be taken ill.

The father, to enable his wife to do this, must avoid intemperance. The money spent in drink by the intemperate man would supply food for the mother, and, when necessary, milk for the child.

Let the mother see to it that the house is kept clean and sweet. To effect this, she must not be afraid of using water freely to keep the floors and culinary vessels, and, above all, the vessels for holding milk or broths, clean.

Carpets, especially old ones, must be taken up, beaten, and hung in the open air, to rid them of the dust and filth-particles, which will cling to them when not thus treated. An old, soiled carpet gives out, when kept long on the floor, a most foul and musty odor, which is a sure sign that it needs a good ventilating.

When the hot days of summer arrive, when the temperature rises to 80° and 90° in the shade, let the mother beware. One or two such days will often double the mortality amongst young children. The house must be well ventilated. There is much more danger from a close, musty, and stagnant atmosphere in the house than from any currents or draughts neces-

sary to change the air constantly. Chimney-places should be kept permanently open. Windows must be opened, and in hot weather kept open day and night. If the temperature rise in the rooms at night (and every mother ought to have a thermometer and learn to read and use it) above 90° , not only should windows be opened but doors as well. It is impossible to have too much air in the house in such weather, unless it is blowing a gale from a thunder-gust, and then the thermometer will soon fall below 90° .

During these spells of extreme heat everything should be done to keep children cool. They should be bathed in water from which the chill has been taken, or washed in cool water morning and evening. All heavy clothing must be removed. The thinnest possible flannel or merino shirt on the body, with a muslin frock, are all that the child needs. He should sleep on a firm mattress or a *paillasse*, dressed in a thin flannel or merino undershirt, and a muslin night-dress. He needs no flannel petticoat, and should be covered only with a sheet. No blankets, and above all no old family shawls, ought to be wrapped about a young child on a hot night. The danger from over-heating at such times is far greater than any that will arise from light covering and abundance of fresh air through open windows.

Children who are hand-fed entirely, or in part, must have the simplest food. In the first year no other food than one of which milk is the base, with sometimes a little beef or chicken tea, ought to be allowed. The milk of the cow, goat, or ass may be used. In this country cow's milk is nearly always employed. To be sure that this is fresh and pure when it reaches the house must be one of the mother's chief anxieties. She ought to know her milkman personally, in order to judge whether he be honest and painstaking or not. If she can discover one who brings his milk from a farm of his own, it is best to do so. The milk must be taken, of course, once a day, and in very hot weather, if a fresh supply could be obtained in the afternoon, it would be a great safeguard against illness. When the milk is taken but once a day, it

should be boiled directly upon being received, in hot weather. Boiled milk keeps sweet longer than unboiled. In very hot weather the addition of ten to twelve grains of carbonate or bicarbonate of soda to each pint of milk assists greatly in keeping it from becoming acid. But however good and perfect the milk may be when received, it will not continue so long unless the mother take good care of it after it has come into her hands. If put into unclean or partially foul vessels, if set down near half-spoiled meats, or old decaying vegetables, or in an unclean, stinking cellar, with a filthy atmosphere round about it, it will soon itself become more or less putrescent, and when given to a child in this state it becomes one of the most potent excitants of summer disease that can be found.

When the child is over four or five months, let it be taught to drink from a small glass tumbler or china cup instead of from sucking-bottles. Such vessels are much more easily, and therefore certainly, kept clean and sweet than any sucking-bottle. When the child is younger than this, and when it must be fed from a bottle, the simpler the one used the better. An ordinary medicine-bottle of four, six, or eight ounces, according to the age of the child, with a common India-rubber nipple or mouthpiece, makes the best apparatus. Between the feedings the bottle must be carefully cleansed with boiling water, and both it and the rubber nipple kept in water.

Give the child no anodynes, no medicines, no stimulus, unless it be ill. Then send for a physician. Take care at all seasons, but take care especially in hot weather, to offer children who cannot yet indicate their wants, cool water frequently through the day. In very hot weather, a child of a few months old needs more water than it gets in its mother's milk or in cow's milk. Let it drink all the water it wants. It ought to want a wineglassful, or more, several times a day.

CAUSES OF THE GREAT MORTALITY OF YOUNG
CHILDREN IN CITIES DURING THE SUMMER
SEASON, AND THE HYGIENIC MEASURES RE-
QUIRED FOR PREVENTION.

BY J. LEWIS SMITH, M. D.,
Of New York.

PREFATORY NOTE.

“THE Thomas Wilson Sanitarium for Children of Baltimore City,” was incorporated “for the purpose of securing a summer retreat for sick children from the heat and unhealthfulness of the city, and for such other kindred purposes as may be hereafter determined upon by the corporation.” Mr. Wilson gives the following reason for making the bequest: “I have observed for many years, with much concern, the great and alarming mortality which occurs each summer among young children deprived by misfortune of their parents of all opportunity for removal from the heated and fatal atmosphere of the city.” In executing the trust committed to their care, the trustees secured a tract of land, consisting of one hundred and fifty acres, about six hundred feet elevation above sea-level, and distant from the city one half-hour by railroad. The information which the trustees seek from essayists may be presented in the following propositions embodied in their circular of December 3, 1879:—

I. The best methods of extending a general knowledge of simple hygienic rules for the treatment of children at home among the poorer classes.

II. The most practicable means of lessening the risks and dangers incident to children exposed to the heated and impure atmosphere of a large city during the summer months.

III. The regulations suitable for receiving and administer-

ing, medically or otherwise, to those who shall be the proper objects of their care, special reference being made to the character, isolation, and grouping of the requisite buildings and provision for mothers or nurses accompanying their children.

The trustees add: "In the fulfillment of their duties they hope," at least, "to show a model of experiment, which may prove of value as a contribution to the best means of lessening the mortality and promoting the welfare of young children here and in other large cities." It is apparent, from these quotations, that while Mr. Wilson especially contemplated making provision for the care of sick children in a summer retreat during the summer months, he still empowered his executors to devote his bequest to "such other kindred purposes" as they might determine upon. The trustees evidently regard a sanitarium as the main feature of the scheme to be carried out, and have accordingly given due prominence to that part of the plan by purchasing the site and specifying some of the details of arrangement. They have, however, somewhat extended their inquiries beyond the sanitarium, and in general language invite the discussion of the proper care of sick children of the poor, as to the hygiene of their homes, and the prevention of sickness during the heated months, in the following language: "The trustees wish your suggestions in reference to the most practicable means of lessening the risks and dangers incident to children exposed to the heated and impure atmosphere of a large city during the summer months, also your views as to the best methods of extending a general knowledge of simple hygienic rules for the treatment of children at home among the poorer classes." It is in this larger sense that this paper is written.

The following essay will consist of three parts. In the first we will explain in what way the summer season is so fatal to children; in the second what remedies should be employed, and how the sanitarium should be constructed and conducted; while the third part will be devoted to the consideration of the hygienic care of the children in the sanitarium or elsewhere. The first and third parts will furnish information

upon such subjects as family visitors in Baltimore, who may be employed by the Association, should fully understand, and such information also as it would be proper to impart to poor families of the city, by tracts or other cheap publications.

PART I.

TEMPERATURE AND MORTALITY; DISEASES.

Baltimore city, in latitude $39^{\circ} 17'$, has a summer temperature which varies between 50° and 99° Fahrenheit. Its mean temperature in the three summer months in four consecutive years was as follows: In 1875, 74.6° ; in 1876, 76.6° ; in 1877, 76° ; and in 1878, 75.3° . The following thermometric statistics of these four years — those of last year I do not possess — correspond, as will be seen, with the statement made in the "Encyclopædia Britannica" in reference to Baltimore, to wit: "Its mean annual temperature is 56° Fahrenheit; the mean summer and winter temperatures 76° and 36° respectively."

Temperature of Baltimore.

MONTHS.	Highest and Lowest.				Mean Monthly.			
	1875	1876	1877	1878	1875	1876	1877	1878
January	52- 1	71-17	54- 1	57- 6	30.1	41.5	32.1	35.7
February	59- 3	65-12	63-18	63-20	29.3	37.8	40.5	47.6
March	63-19	69-12	65- 9	72-21	39.5	39.8	41.4	49.3
April	74-23	75-30	80-32	79-42	49.4	52.1	53.6	58.7
May	88-42	88-34	92-41	85-43	64.1	64.2	62.7	63.5
June	97-54	95-51	95-55	92-51	73.7	75.9	73.7	70.1
July	96-61	99-59	93-64	98-65	78.0	80.4	78.7	80.8
August	88-58	90-55	94-63	92-59	73.4	75.9	77.6	76.0
September	92-43	88-45	88-48	87-47	65.9	65.6	67.9	69.3
October	77-34	77-30	80-41	80-35	55.5	52.4	59.7	58.7
November	65-16	76-25	68-25	61-33	42.9	47.1	48.4	47.3
December	67-12	56- 1	67-22	61-15	38.3	28.7	43.5	35.4

Baltimore "is pleasantly situated on slightly undulating ground," and is much less densely populated than many of the large cities of the United States. According to the census of 1870 there were, in the average, only twenty-seven in-

dividuals to each acre within the city limits. Nevertheless, with apparent sanitary advantages, there is a large mortality of the infantile population during June, July, and August, as will be seen by the following table:—

Deaths of Children under Five Years of Age.

MONTHS.	1875.			1876.			1877.			1878.						
	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.	Under One Year.	Between One and Two Years.	Between Two and Five Years.				
January . . .	133	39	78	116	74	35	121	85	41	104	58	29				
February . . .	153	66	70	131	62	45	122	112	35	120	44	32				
March . . .	141	54	54	152	99	45	144	155	65	151	63	41				
April . . .	113	42	38	101	56	41	135	109	42	103	44	32				
May . . .	119	29	53	105	63	28	121	88	44	161	43	38				
{ June . . .	984 {	235	43	36	1,228 {	549	88	20	1,053 {	382	176	43	780 {			
{ July . . .		489	66	49		418	105	20		423	140	34		270	58	37
{ August . . .		259	91	25		261	119	31		248	153	35		203	65	35
September . . .	174	90	28	154	70	34	167	109	44	125	67	34				
October . . .	165	71	22	104	49	22	98	59	57	117	42	33				
November . . .	101	46	25	89	45	25	96	63	35	116	34	46				
December . . .	133	68	30	137	95	52	125	80	43	107	33	53				
Total . . .	2,216	705	508	2,317	925	398	2,182	1,329	518	1,834	604	444				

The above table is instructive. It shows that the children in Baltimore who suffer most from the heat and insanitary conditions of summer are chiefly under the age of one year. Therefore special regard must be had for such infants in the measures to be employed for the purpose of reducing the mortality of children. The table shows that the average monthly mortality in the first year of life during the four summers was 332.9, while that of the remaining months of the same years was only 126.5. In other words, the mortality of the summer months was nearly threefold the average mortality of the spring, autumn, and winter months, as regards infants under the age of one year. If the mortality of infants of this age had averaged the same during the three hot months that it did during the remaining nine months, there would have survived 573 infants in 1875, 865 in 1876, 928 in 1877, and 608 in 1878, making an annual average saving of 743 lives.

IN WHAT WAY THE SUMMER SEASON IS SO FATAL TO CHILDREN.

We purpose, in this part of the essay, to consider briefly the nature of the diseases, to which the increase of mortality among children, during the summer months, in Baltimore, as well as other large cities of the Union, is chiefly due. If we obtain a clear and accurate idea of these diseases we will better understand what measures to employ for the purpose of preventing them, or rendering them milder, and more tractable. We hope to be able to show why the summer weather is so fatal to children.

1. General Depressing Effect of the Summer Weather.

It is the common belief among people, derived from experience and observation, that the prolonged elevation of temperature of the summer months impairs the appetite and digestion, produces languor, and diminishes the vitality and recuperative powers, so that one under its influence is less able to endure disease of whatever kind than in cool and bracing weather. There is, no doubt, truth in this, especially as regards infants, for they badly tolerate a high elevation of atmospheric heat. Perspiring less than adults, they suffer more from the heat. It has not been unusual in my practice to see infants, after a very hot day, thirsty and fretful, sleeping little, with a temperature, one, two, or three degrees above the normal, which state I could attribute to nothing except the hot weather. It is not unusual also that infants remaining in the city gain nothing in weight and strength, or lose in both during the three summer months. Now exhaustion is the immediate cause of a large majority of the deaths in infancy and childhood, and anything therefore which lowers the tone of the system, increases just in that proportion the gravity and danger of most diseases. The injurious effects of the summer season upon the system are only partially due to the heat, as we shall see hereafter, but are largely attributable to the noxious gases which are engendered by the heat where there is a large popu-

lation, and therefore children of the city suffer more than those in the country from this cause.

It is known to physicians that many constitutional and local maladies to which children in the summer season are liable, are more apt to occur when the tone of the system is lowered than in the state of robust health, for one who is vigorous, with full and active circulation, more quickly and completely reacts under noxious agencies, and so to speak throws off the disease. This is notably true of the inflammations, and the numerous forms of scrofulous ailments, which are so common in the families of the poor, and which are apt to end in tuberculosis. Therefore the condition of the general health which hot weather is apt to produce in young children of the city may properly be regarded as a predisposing cause of the sickness and mortality of the summer.

It is customary with nosologists to classify diseases in two divisions, the constitutional, and local; and to group the local, according to the part or system which they affect, namely, into diseases of the cutaneous, nervous, respiratory, digestive systems, etc. There are no serious diseases of the cutaneous and respiratory systems, which are due to the summer weather. The nervous system is more frequently involved, but the most frequent and fatal of the summer diseases, and therefore the one which demands most attention, pertains primarily and chiefly to the digestive system.

2. *Nervous System.*

We shall see hereafter that the brain occasionally becomes seriously involved in the course of the diarrhœal maladies of young children, and that this complication is common during the hot months. This constitutes, indeed, one of the chief dangers of the summer diarrhœas in infancy, and will be fully described in the appropriate place. Children as well as adults are occasionally overcome by heat, having a genuine *coup de soleil*. It is attended by great heat of head, drowsiness, jactitation, and perhaps convulsions. The ordinary form of convulsions in children, occurring suddenly in a very hot day, has

so many causes, that it is often assigned to something else than the heat; but although there may be other causes, the high atmospheric temperature must, in my opinion, be regarded as a coöperating cause in not a few cases, and sometimes as the chief cause. Young and nervous or susceptible children, who have been taken out in the sun, or have exercised or been excited in a hot room, are especially liable to these convulsive seizures.

I have sometimes attributed, I think correctly, that very formidable disease meningitis, or inflammation of the membranes which cover the brain, to either direct exposure to the sun's rays, or to excessive and protracted atmospheric heat. Infants, whose heads are scantily covered with hair, and in consequence cooler, and are ordinarily in the shade, seem to me less frequently affected in this way than children of two to three years and older, whose heads are more covered, and who, beginning to go about, are more apt to be exposed to the sun, or to suffer from the heat. I may cite the following cases, which I have published elsewhere, as an example: July, 1876, in New York city, was characterized by excessive and long-continued atmospheric heat, the temperature in the Central Park Observatory, in the shade, never falling below 61° , though never above 98° , and having a mean of 82.9° . There was also unusual dryness of the atmosphere, since during the entire month prior to July 30 there were only fourteen hours of rain, with a rain fall of .77 of an inch, and the average atmospheric humidity was represented by 65, saturation being denoted by 100. During this month I treated in private practice four fatal cases, all between the ages of two and seven years, which I diagnosed meningitis, none of them presenting any symptoms of otitis or tuberculosis. It would seem that the atmospheric heat had much to do with the development of the disease in these cases. One died in two days, but in the others there was the usual duration. Meningitis, however, occurring independently of inflammation of the ear or of tubercles at the base of the brain, is not common, and it cannot be said to increase materially the death-rate of the summer season.

3. Digestive System.

THE SUMMER DIARRHŒA (the summer complaint). It is to this disease that the increased mortality of the summer months is chiefly due. It is the most common and fatal of the summer maladies in all our large cities. The first cases begin to occur as the weather becomes warm in the middle of May, and new cases constantly occur, until the weather becomes cooler in October or November. Its maximum prevalence is in midsummer.

The history of this disease is in the majority of instances as follows: The infant is observed to droop, and be less cheerful, and its alvine discharges are more frequent, and of less consistence than formerly. At first little attention is given to this change in the health by parents or nurse, who often attribute it to teething, and consider the diarrhœa a relief to this physiological process, so that in many instances medical advice is not sought till several days or weeks have passed, and what might in the beginning have been readily checked by hygienic or medicinal treatment becomes by slow increase a formidable malady.

Occasionally the commencement is more abrupt. In consequence of some indigestible food, as unripe vegetables or fruits, pastry, etc., vomiting and purging are excited, which continue till the offending substance is removed. The gastrointestinal surface is irritated, and under the deleterious influence of the hot weather the diarrhœa which has been established continues, having the same symptoms and anatomical characters as when it begins in the ordinary way.

Cholera Infantum. Now and then the initial symptoms are very severe, indicating a form of diarrhœa which is extremely dangerous unless speedily checked or modified. The infant may have endured the hot weather with little impairment of its general health or the digestive function, when suddenly, from the effects of a very warm day or of some error in the feeding, symptoms occur which resemble closely those of Asiatic cholera. Frequent vomiting and the purging

of thin watery stools, which contain little or no solid matter and wet the diaper like urine, produce such rapid prostration, and such pinched and shrunken features, in the course of a single day or night, that the friends do not require to be told of the danger, for they perceive it in the changed physiognomy, and summon the physician early. This form of the disease has been long known by the name cholera infantum, or choleric diarrhœa. Resembling in its symptoms Asiatic cholera, except that it is unattended by cramps, it nevertheless has no kinship with that disease, for it occurs every summer, quite independently of choleraic epidemics. It does not always occur in those whose previous health has been good, but it occasionally supervenes on a milder type of diarrhœa. However commencing, it does not continue long without abatement in its intensity or a fatal ending.

Whether the summer diarrhœa begins mildly or with choleric symptoms, whether its course be uniform, or now and then exacerbations occur, it causes progressive weakness, and emaciation as long as it lasts. In a large majority of cases, even when not treated, or improperly treated, it is not speedily fatal. If not controlled by remedies or a favorable turn of circumstances it continues for weeks. Therefore towards the close of warm weather, in addition to the new cases that may arise, there are many protracted cases that had an earlier beginning, presenting an appearance from wasting and weakness like that in advanced consumption. As death may occur within a few days or not till after many weeks, according to the severity of the attack and the strength and endurance of the patient, so the summer diarrhœa may be arrested within a few hours from its commencement, or not till after several weeks. But if it have continued several weeks with the usual emaciation and weakness, convalescence is necessarily very gradual. In no other disease in which recovery may occur do we observe so great loss of flesh and strength as in protracted cases of this malady, and in no fatal disease is it excelled, unless in tuberculosis. The bones become prominent, the cheeks hollow and thin, the eyes sunken, with eyelids open during sleep,

the walls of the chest showing deep grooves between the ribs, the abdomen hollow, the limbs shrunken, and the skin covering them lying in wrinkles; and yet many of these cases have received the best nursing and all the attention which the devotion of a mother is able to supply.

Although this disease affects primarily and chiefly the digestive apparatus, other organs, as might be expected when the general nutrition is so much impaired, suffer also. The brain wastes from lack of nourishment, so that the anterior fontanelle, or open space on the top of the head, is depressed, and the cranial bones, if not firmly united, begin to sink and override each other. In a certain proportion of cases, in consequence of this waste of cerebral substance, and the feeble action of the heart, which propels the blood, passive congestion occurs in the veins and capillaries in depending portions of the brain, and in the cranial sinuses, which contain venous blood, and as a result some of the serum, or watery part of the blood, escapes from the vessels (*hydrocephalus ex vacuo*) into the cranial cavity. When these changes occur in and upon the brain, cerebral symptoms appear, as drowsiness, rolling the head, apathy, tardy action of the pupils, and sometimes irregular respiration, and diminished amount and frequency of the alvine and urinary evacuations, the result of impaired innervation. The London physicians of the first half of the present century particularly called attention to this state of the brain, which they designated *spurious hydrocephalus*, or *hydrocephaloid disease*.

The lungs also are not infrequently involved in protracted and feeble cases. A cough occurs, painless, not frequent, and perhaps overlooked in the presence of graver symptoms. This is due to a state of the pulmonary circulation, similar to that within the cranium, namely, a retarded flow and consequent congestion in depending portions of the lungs, due to the feeble propelling power of the heart, and partly, perhaps, to the altered state of the blood and the blood vessels. The pulmonary congestion thus arising (*hypostasis*) involves only a small portion of the lungs. It does not produce pain, or

accelerate the respiration. It continues till a more vigorous state of the system, and a stronger and more active flow of blood are restored. This retarded encephalic and pulmonary circulation, and the anatomical changes to which they give rise, are therefore to be regarded as complications, and not essential elements. They increase the gravity of the primary malady, and that involving the brain is not infrequently the immediate cause of death.

Obviously, in order to understand the nature of this summer diarrhœa, and the structural and functional changes to which it gives rise, the pathologist must examine carefully and fully the state of the digestive apparatus, since in it, as stated above, the primary and essential lesions occur, and as the prominent symptoms are vomiting and diarrhœa it is evident that the stomach and intestines are chiefly in fault.

This malady is anatomically a catarrh or inflammation of the gastro-intestinal surface. The intestine consists of two portions, namely, an upper or small portion, which extends from the stomach downward, and a lower or large portion which, continuous with the small intestine above, extends to the end of the digestive canal. The designation "small" and "large" refers to the relative diameters of these two divisions of the intestinal tract.

Although there have been frequent vomiting, we usually find at post-mortem examinations nearly the normal color and appearance of the gastric mucous membrane. It may be softer and more easily detached than in those who have died of diseases not implicating the digestive tract, but commonly the redness due to increased vascularity, ordinarily present when a mucous surface is inflamed, is lacking, or it is much less marked in the stomach than in the lower portion of the intestinal tract. The same is true of the upper part of the small intestine, known as the duodenum and jejunum, the surface of which either has the normal color or presents vascular streaks, and arborizations. It is only in exceptional instances, according to my observations, that the stomach and upper part of the small intestines present decided inflam-

matory lesions. Cases of this sort, which I recall to mind, have been chiefly young infants. But when in tracing downward the intestinal tube, we reach the middle portion of the small intestine, more marked evidences of inflammation appear: the redness and thickening are more decided, and inflammatory lesions occur from this point onward, with perhaps occasional interruptions, to near the end of the intestinal tube. From the lesions which it produces, namely, the redness or vascularity and thickening of the mucous membrane, and the occasional small, circular ulcers, like canker sores in the mouth, which are in many cases present in the large intestine, it appears that the inflammation increases from its point of commencement above to its termination below. Projecting from the inflamed surface here and there are little bead-like prominences, which are swollen solitary glands, and the destruction of which has probably caused the ulcers alluded to.

In exceptional instances, I have made post-mortem examinations in protracted cases, as well as in those of short duration, without finding those marked inflammatory lesions which are commonly present, and which I had expected to observe, and it is now admitted by pathologists that a deep injection or vascularity may be present during life and disappear in the cadaver. In some rapidly fatal cases of cholera infantum the redness does not appear, or is less pronounced, on account of the quick extinction of life, when there is reason to think that if life had been prolonged for a few days there would have been marked inflammatory appearances.

Such are the nature and anatomical characters of the malady, which causes so much sickness and mortality among the infants of our cities from May to November. Its ill effects are sometimes far-reaching in those who recover. So great impairment of the nutritive process for three or four months, at a very important time in the development, does not infrequently produce diathetic diseases, as rachitis and scrofula.

In looking for the causes of this disease, we must evidently consider those conditions which are peculiar to the summer, or

are more operative in it than in other seasons. The condition peculiar to the summer which is most apparent is the increase of atmospheric heat, but that this in itself does not cause the summer complaint is evident from the fact that in sparsely settled country towns there is often equal elevation of temperature, for many weeks, but with continued healthiness. The atmospheric conditions which render the summer months so detrimental to young children in the cities must be the noxious products which the heat generates, and which, diffused through the air, contaminate it. In the poor quarters of the cities, more than anywhere else, those conditions occur which render the atmosphere impure and unsuitable for respiration. Hence those diseases which foul air produces occur most and present their severest type in those quarters of the city where the destitute, ignorant, and degraded congregate. One accustomed to the pure air of the country would hardly believe how stifling and poisonous it becomes during the hot summer days and close summer nights, in and around the apartments of the city poor. Among the causes of this foulness of the air, and the consequent sickness which it entails, may be mentioned too dense a population and the occupancy of small rooms by large families, rigid economy, and ceaseless endeavor to make ends meet, so that in the absorbing interest sanitary requirements are sadly neglected. Adults of such families, and children of both sexes, as soon as they are old enough, engage in laborious, and often dirty occupations. They seldom bathe, and often wear for days the same under-garments, foul with perspiration and dirt. The intemperate, vicious, and indolent, who always abound in the quarters of the city poor, are notoriously filthy in their habits. Children old enough to be in the streets, and adults away at their occupations, escape to a great extent the evil effects of impure air produced by such mode of life, but the infantile population always suffer severely.

Families thus living, being habituated to foul air and odors, often do not appear to notice them, and neglect to obtain a purer air by open windows and doors. To add to the insalu-

brity, dirty and worn-out garments, and utensils of various sorts, collect under their beds and in their closets. Waste products of the table and excrementitious substances are allowed to stand for hours in the room occupied by the family, or in the attached bed-room, undergoing fermentative changes.

With such disregard of sanitary requirements in the apartments, as might be expected, the halls, stairways, areas and alleys, within and around the domicils, ordinarily show a similar culpable neglect. They are seldom kept clean, when families in their rooms are so slovenly and dirty, being the receptacle to a greater or less extent of rejected and waste animal and vegetable matter. The fate of the infant compelled to breathe day after day an atmosphere which such uncleanliness produces is evident. It pines away, becomes pallid, perhaps exhibits strumous ailments, and in the hot weather is apt to have diarrhœa. At least, this is a very common result. If it do not suffer in the way mentioned, it is because there are countervailing circumstances, as an unusually robust constitution, or it is kept much of the time in the open air. It is true that in our large cities, Health Boards have done much to mitigate the evil alluded to, producing in families more regard for cleanliness. Still even with vigilant health and police boards, it is impossible to obtain sufficient purity of air so essential to infantile health, when families are totally indifferent to hygienic requirements through ignorance, vice, intemperance, or poverty. No city in the United States has probably experienced so great sacrifice of infantile life in times gone by, from personal and domiciliary uncleanliness, as New York, of which I have been an eye-witness, but the evil which we have experienced in this city, in an aggravated form, exists in all our large cities.

The exact changes which the atmosphere undergoes and the noxious principles diffused in it, which render it unwholesome to man, have been only partially ascertained. We know that the air is the medium of communication of most of the infectious maladies, though the agents by which these maladies are propagated are so subtle that they have for the

most part escaped detection. We know that when our senses can detect nothing wrong, the air frequently contains principles which produce the most violent and fatal diseases; and that impurities in the air arising from animal exhalations and excretions, and from decaying organic matter, are a common and potent cause of diarrhœal maladies is well established. The most violent and fatal disease to which the human race in modern times is liable, namely, Asiatic cholera, belongs to the class of diarrhœas, and it always assumes its worst form and numbers its chief victims where the air is most tainted by effluvia from filthy streets and domiciles. The ravages of this disease chiefly occur where population is most dense and measures to insure personal and domiciliary cleanliness and purity of air are neglected. I might mention striking and pertinent examples which I witnessed in New York during the cholera of 1854, which ravaged chiefly the families living along the dirty streets and in tenement houses, and those whose occupations necessitated the respiration of a foul atmosphere. Moreover, an interesting fact often observed in the dirty sections of the city, and in the crowded tenements where the air was sensibly impure, during the epidemic of that year, and in similar epidemics of cholera, deserves mention, namely, that persons exposed to the anti-hygienic conditions which predispose to cholera were apt to have diarrhœa very similar to the ordinary infantile summer complaint, whether or not they afterwards had a true choleraic attack.

But each summer furnishes abundant direct observations, showing that foul air sustains a causative relation to infantile diarrhœa. Several years ago, while serving as sanitary inspector for the Citizen's Association, my attention was particularly arrested by the state of one of the streets which was not sewerred, though supplied by Croton water, and was densely populated on either side by families mainly of foreign birth. The ashes and garbage were placed in barrels and boxes along the sidewalks, or thrown at random in the street. The Croton water and the house slops flowed into the gutters and mixed with the refuse and excrementitious matters from

the tables and bed-chambers of the houses, while the interior of some of the houses and the spaces around them were in a similar filthy state. There was no Health Board at that time to enforce sanitary regulations, and any attempt to abate the nuisance of a filthy street in the absence of a sewer, and with the presence of a large and ignorant population, could be only partially successful. Consequently this street, with gutters constantly wet and containing decaying organic matter, was, during the hot months, one of the sickliest in the district which was assigned to me. The noxious gases emanating from such a source told fearfully on the general health, and a house-to-house visitation revealed the fact that diarrhœa was extensively prevailing among the infants thus exposed, and was a common cause of death during July and August. In another locality, occupied by tripe dealers and a low class of butchers, who carried on fat and bone boiling at night, the air was so foul after dark that the peculiar impurity which tainted it I could distinctly notice in the taste for a considerable time after a nightly visit. In the street where these nuisances existed, and in adjacent streets, a choleric diarrhœa was most destructive to infantile life.

It is impossible to isolate and determine all the deleterious gases of which the atmosphere of a city is composed, but this we know, that in streets which are not properly cleaned of refuse matter and in and around dwellings occupied by the destitute and degraded who disregard sanitary laws, the air becomes so foul during the hot months, when chemical changes are most active, as to be quite perceptible and offensive to the visitor. The common practice of watering streets which are dirty only adds to their unwholesomeness, for organic matter, whether in masses or triturated to powder by passing vehicles, is comparatively harmless when dry, but yields poisonous gases in abundance when moist and undergoing decomposition.

The amount of carbonic acid present in the air is regarded as a pretty correct test of the degree of its impurity. This gas is always present in the atmosphere, but when it exists

in abnormal quantity it is associated with other poisonous gases, generally in quantities proportionate to its own, but which cannot be so readily isolated. Its quantity is always greater in the city than in the country, and in badly ventilated dwellings and public halls it frequently accumulates so as to be decidedly hurtful to those who respire it. Pure air, it is estimated, contains three to four parts by measure of carbonic acid in 10,000 of air, but Pettenkofer found 72 parts in a school-room two hours after the school was convened, and W. R. Nichols found 32 parts of the gas in 10,000 in a room which had been occupied by a Sunday-school for one and a half hours, while Baring discovered 120 parts in the rooms of a *Volks-schulen*. Now, it is admitted that carbonic acid may be largely increased in an atmosphere otherwise pure without causing serious consequences, but if this increase is from respiration, cutaneous exhalation, and from decomposition of organic matter, the carbonic acid is associated with other gases which are exceedingly poisonous. Pettenkofer remarks, and those who have investigated the subject agree in the general statement, "Air is bad and improper for continuous use when it contains in consequence of respiration and perspiration more than one part of CO^2 in 1,000, and a good air for chambers in which a person may remain for a long time in a state of health and comfort contains no more than seven parts in 10,000." The gases which are found with carbonic acid in occupied rooms have been enumerated by Parkes as follows: carburetted hydrogen, sulphurous acid, sulphuric acid, sulphuretted hydrogen, phosphuretted hydrogen, and ammoniacal vapors.

In addition to these gases, which it will be perceived are very detrimental to animal life, the air contains motes of organic matter, often in considerable quantity, as every one has noticed by viewing a sunbeam in a darkened room. Among these motes in an occupied room, the microscope discovers vegetable debris and various animal substances, as fragments of epidermic cells. Eulenberg discovered many animal and vegetable fragments and forms in the air, which he examined,

some of them evidently having been wafted from long distances. The air of the city contains a vastly greater quantity of these organic particles than the air of the country, as is evident from the dust, which is incessantly settling on furniture, and the dirt which is seen in neglected and unfrequented streets and lanes in the course of a few weeks.

These many impurities, solid and gaseous, in the air of the city, together with the countless monads, vibriones, and bacteria, just visible under high powers of the microscope, which spring into existence wherever decomposition is going on, afford sufficient explanation of the greater insalubrity of the city than of the country. Precisely in what way impurities in the air cause infantile diarrhœa is not known, though there are so many striking examples of the fact. Murchison states that twenty out of twenty-five boys in a school-room were affected with vomiting and purging from inhaling the effluvia from the contents of an old drain near the play-room. Perhaps the gases form certain combinations in the system which are purgative. Sulphuretted hydrogen, one of the most poisonous of these gases, is believed by those who have investigated the subject, to be changed into sulphuric acid in the air, and we know that this acid, if it unite with a potassium or sodium base, forms a purgative salt.

Another important cause of the summer diarrhœa is the diet. A large proportion of those who every year fall victims to this malady would doubtless escape if the feeding were exactly proper. The following facts relating to this subject are substantiated by the experiences of each summer: Infants weaned before the proper time are very liable to the summer diarrhœa, and the younger the infant thus artificially fed, the greater the liability. In New York a large proportion of the infants, under the age of six months, when the warm weather begins, if deprived of the breast milk, take the diarrhœa, and unless removed to the pure air of the country, where also fresher and better cow's milk can be obtained, perish. Aware of these facts, the managers of the infant and foundling asylums employ, so far as possible, wet-nursing for

the young infants in these institutions, although it greatly increases the expense. Before the establishment of the Health Board in New York, when the air in and around the city was much more foul than at present, from the common disregard of sanitary laws, it was seldom that an artificially fed infant under the age of six or even ten months, residing within the city limits, escaped the summer diarrhœa. So fatal was this malady among bottle-fed infants in those days, when both atmospheric and dietetic causes were operative, in a high degree, that when I was appointed physician to the foundlings, about fifteen years since, I found it the common belief among the nurses and others, that all of them would sooner or later die. One was pointed out as a curiosity, since it had been several months in the institution, and was still alive. Such mortality was remarkable, for the foundlings of the city at that time exceeded one thousand annually. They were consigned to the care of the pauper women in the almshouse, who were mostly old, infirm, and filthy in their habits and apparel. Their beds, in which the foundlings were also placed, were seldom clean and properly aired, or washed, and under the beds were various garments and utensils which they had brought with them, as their possessions, from their miserable abodes in the city. With such surroundings the air which these infants breathed night and day was obviously totally unfit, while the diet was not less unsuitable, for it was prepared by these degraded women from such milk and farinaceous food as the Commissioners of Charities furnished the almshouse. The common disease of these foundlings was diarrhœa, and the cause of the frightful loss of life was obviously both dietetic and atmospheric.

Such waste of life was the legitimate result of the conditions; for it occurred under a law of general applicability, that whenever the diet is improper and the air foul, infants pine away and die. What occurred with these foundlings is repeated every summer in the domicils of the city poor, whenever infants are improperly fed, and the air which they breathe is loaded with poisonous gases, produced by over-crowding or

the prolonged action of the atmospheric heat on the decaying organic substances.

Dietetic errors by which diarrhœa is produced, and if they are repeated intestinal catarrh results, are numerous. The reader is referred to the chapter relating to diet, for a statement of the kind and quantity of food which is suitable for different ages in infancy and childhood, departure from which is apt to cause indigestion and diarrhœa, and therefore to act as a potent cause of the malady which we are now considering.

But there is one dietetic cause of infantile diarrhœa operative not only in the hot months, but at other times also, to which I wish to call attention. The late Dr. James Jackson, of Boston, pointed out the fact that too frequent and too prolonged nursing, even when there is no fault in the milk, is a common cause of diarrhœa. Infants sometimes overnurse, and they may or may not vomit the surplus food. If they do not, the portion of the food which is not digested undergoes fermentative changes, becomes an irritant, and causes green and too frequent stools, which contain particles of undigested casein, and other ingredients of milk. If such infants fret, as they often do from indigestion, they are applied still more frequently to the breast. Gases and acids form in the stomach and intestines, and in consequence of the irritation thus produced, intestinal catarrh may result. Too frequent feeding with artificial food often produces the same result.

In these various ways dietetic errors operate as the second factor in the causation of the summer diarrhœa, and they are not infrequently the immediate exciting cause. Having now considered the nature and ætiology of this malady, we are better prepared to consider by what measures its frequency can be diminished and its severity mitigated.

It is evident from the above facts, that measures designed to diminish the severity and frequency of the summer diarrhœa must be two fold: namely, such as provide pure air, and secondly, the use of the best possible diet.

The modes in which pure air can be obtained are various.

Since, in recent times more attention has been given to sanitary requirements, and the large cities have their Health Boards, most of the glaring nuisances which formerly poisoned the air have been removed, and a corresponding decrease in the death-rate has been effected. Still in populous cities, even with vigilant police and Health Boards and strict sanitary regulations, it is difficult to obtain that purity of the air which is required to produce the maximum degree of health and vigor in children during the summer months, and diminish to the minimum the atmospheric cause of the diarrhœal maladies. Children, even young infants unable to walk, realize the benefit obtained from fresh air, and are always more cheerful and contented when out-door during the hot season than within-door, so that nurses have learnt that a quick and sure way to quiet a child made fretful by the heat and the close air of the house is to take it outside. This has the double advantage of giving it purer air, and of allowing the apartments to be thoroughly ventilated during its absence. The common practice in the cities of carrying children to the parks, of taking them on excursions by railway or boat, always has a salutary effect on those who are sick with the summer diarrhœa if they are not too weak, as well as upon those who without actual disease are languid, fretful, and with poor appetite, from the depressing influence of the warm weather. Observing this beneficial effect of pure air upon sick children in the hot months, benevolent people of New York have established a floating hospital, which three times each week, from June to September, carries sick children of the poor, who have no contagious diseases, on long excursions down the bay or up the rivers. The result has been so good that it is probable that this mode of aiding the poor will be continued during future summers.

Now the method which we see practiced each day by mothers who carry their sick children into the shaded streets, or parks, or on excursions, lasting from morning till evening, with excellent results, indicates the way in which pure air should be provided on a more extensive scale, and therefore

with greater result in saving life. If a large number of children, all, indeed, who urgently require purity of air to protect them from the sickness which we have described in the foregoing pages, could remain in the country during the period of greatest atmospheric heat, much good would accrue. Removed entirely from the operation of one of the chief causes of the disease which we have been considering, the effect would be to render the symptoms milder of those already sick, and to lessen the danger of contracting the malady on the part of those who might not yet be affected. The removal of children, even the youngest infants, with their attendants, in the morning and their return in the evening, seems quite feasible, but those sick with diarrhœal maladies will often need longer and more quiet sojourn in the country than could be had by a morning removal to it and an evening return to the city. For such the Sanitarium will be invaluable, where the benefits of country residence can be obtained both night and day as long as may be deemed necessary. The night air of a city is more impure than that of the day-time, for vegetation absorbs and appropriates by day, but not by night, to a great extent those deleterious gases of animal origin, the effects of which have been described in foregoing pages. Hence critical cases of the diarrhœa should be kept entirely away from the city as long as their state involves danger. Those who enter the Sanitarium with infants seriously sick with the summer disease should expect to remain there till cooler weather or abatement of the symptoms occurs. The facilities for obtaining pure and fresh milk at the sanitarium, from its rural location, will also greatly increase its advantages as a place of resort for children whose ailments pertain to the digestive apparatus. Particulars in regard to the proper dietetic treatment of cases will be found in the pages relating to diet.

ACUTE INFECTIOUS DISEASES.

A considerable number of preventable diseases occur, which increase the mortality of infancy and childhood in all seasons

of the year alike, and they must not be overlooked in the adoption of measures designed to diminish the death-rate in the summer. I refer to the acute infectious diseases which children contract from each other, and which are therefore more prevalent and fatal in the cities than in the country, where the population is more scattered.

Small-pox, there is good reason to think, will, at a day not far distant, be eradicated from civilized communities by general vaccination. It is now virtually eradicated from our largest city (New York) through the efficient action of the local authorities, in compelling the vaccination of all children in the schools and tenement houses, but there is no such prevention of scarlet fever, measles, diphtheria, and whooping-cough, and they therefore largely increase the aggregate of deaths in all our cities. The treatment of cases of these maladies must obviously be left for the most part to the family physicians, but much can be done to check their spread by associated action, having the confidence of the community, with the requisite facilities. The one palpable way of effecting this is by strict isolation of the well from the sick as soon as the first symptoms of disease appear. It is difficult to accomplish this, as families are ordinarily situated in the city, without extraneous help, and the physician is compelled to witness the spread of a fatal malady from child to child, which might have been prevented. Families even under the tie of relationship are reluctant to receive in their midst children who have been exposed to an infectious disease and may at any moment sicken with it and communicate it to others. There is need, daily felt in our cities, of a place of resort to which children who are well, and who reside in a house where a contagious disease breaks out, can be removed and kept till the case terminates, and the house by disinfection is rendered safe for their return. But a difficulty arises with any institution or association that has the care of children, in providing for this want, since a child exposed to one of the ordinary infectious maladies, and liable at any moment to have it himself, should not mingle with other chil-

dren, inasmuch as the specific poison may be in his clothing or upon his person, and thus may infect those with whom he comes in contact, or he may himself at any moment exhibit symptoms, and become the source of contagion.

Now in solving this problem, how to prevent the spread of the infectious diseases, it is evident that any child who is to mingle with other children in receiving the benefits of the Thomas Wilson Association should carry with him the certificate of the family physician, stating that he has no contagious malady, as is done in case of the Floating Hospital in New York. To meet the emergencies which will arise in the city, it seems to me that a cottage sufficiently isolated should be provided in or near the city, to which the well children could be immediately taken as soon as an outbreak of an infectious malady occurred; and if any one thus removed showed indubitable signs of having contracted it, he could be immediately returned home. If after two weeks' isolation they exhibit no symptoms they could be removed farther, if thought best, and mingle with other children.

The specific principles of the infectious diseases are so subtle, and spread so insidiously, that it is difficult for any institution where children are received from a city to remain entirely and permanently free from them. With all the precautions which have been employed, the New York institutions are now and then visited by measles, scarlet fever, diphtheria, and whooping-cough. Therefore the Sanitarium would require a cottage conveniently situated, but sufficiently isolated, to which cases that presented suspicious appearances could be at once transferred, and three or four additional cottages, isolated from each other, for those that presented clear and indubitable symptoms of the common infectious maladies. This subject will be more fully considered in Part II.

In this connection it may be well to allude to important facts in reference to the infectious diseases of children, which should not be lost sight of in determining the plan for a quarantine building. They are very contagious to a short distance, and the specific principles of scarlet fever and diphtheria exhibit great tenacity in adhering to a room or furniture.

PART II.

CARE OF THE CHILDREN OF THE POOR IN THEIR HOMES, IN HOSPITAL, AND IN A SANITARIUM.

The conditions under which sick children of the poor of cities may best receive medical care are various. In the first place, by far the larger number should be treated at their homes. Nearly all acute non-infectious diseases should remain at home under the care of the mother and family physician. Such diseases do not bear transportation well at an early stage; nor is it necessary for their proper management that they should have other care and nursing than that which may be obtained at home. Secondly, acute infectious diseases should be treated at home, if they can be properly isolated; but if this is impossible, it may be best sometimes to remove them to a hospital ward. But it should be remembered that it is hazardous to remove the eruptive diseases from one building to another without precautions against taking cold; and their distant removal during the eruptive stage is never proper except under very unusual circumstances. Thirdly, certain cases, as surgical accidents, diseases requiring operations, etc., are ordinarily better treated in the hospital than at home. Fourthly, among the poor, cases of maladies of different kinds will always be found, which, on account of impoverishment of the blood and reduced state of the general health, cannot be so successfully treated at home, on account of the anti-hygienic surroundings, as in the country, either at the sea-shore or in the mountains. For such persons sanatoria are very useful.

It follows, that a scheme for the care of the sick children of the poor of a city, which adequately meets all the requirements of this class, must comprehend suitable provision for them: first, in their homes; second, in hospital; third, in a sanitarium. This Part will, therefore, be devoted to the development of a plan which, in its details, comprises the three-fold conditions under which the children of the poor of a city may best receive hygienic and medical care.

Before entering upon the formal discussion of special topics it is important to consider what form of central organization will be best adapted to give stability, unity, and force to the proposed institution, which is to be the pioneer in a new field of charity.

1st. It should have all the conditions of permanency fully established at the very outset. No great charity can be successful in the highest degree if it have no other palpable existence than that given to it by a will, or by articles of agreement and a board of managers or trustees. It must have a local habitation and a name as a public institution where all its work centres, and from which its influences proceed. But there are other reasons for the establishment of a central office.

2d. There must be a school for training nurses to perform the duties which will be required of them as visitors among the sick poor, or while serving in the hospital, or at the sanitarium. This service will require of the visitor and nurse especial knowledge, which can be satisfactorily obtained only by systematic training. Nowhere can this school be so well and thoroughly managed as at the central building or office.

3d. There must also be a common residence for nurses, where they will be under constant discipline, and this can best be provided for at the main building.

4th. A plan for gratuitous medical relief in a city requires a central office where all of the work is systematized and supervised. This central office will thus give unity to the entire work of the institution, however extended or diversified it may be.

The Home. — The central office should be known as "The Home," or by some other kindred title of equal significance. In its establishment the following points should be considered: —

(1.) The location should be such as to render the Home conveniently accessible to all parts of the poor districts of the city. The site should combine all possible conditions of health, as elevation, good drainage and sewerage, and open spaces around it, as parks.

(2.) The building should be constructed on a plan which will give the largest southwesterly exposure, both on account of the sun, and of the prevailing winds.

Its service should be arranged as follows : —

(1.) The matron should be a skilled nurse, educated to such duties, and trained to their performance, by long experience. She should have the general supervision not only of the Home, but of every branch of the work.

(2.) The training school should be organized for the purpose of giving instruction in the care of the sick, in hygiene, and especially in the relations of domestic life among the poor of cities to the diseases of childhood.

(3.) The nurses, when under training, should be assistants to the other nurses who have completed their education and have received their proper testimonials. Provision must be made for the trained nurses, and for a lecture room. Every nurse should have her own private room with all necessary conveniences. The lecture room would be small, and for this purpose adjoining rooms might be thrown into one on an occasion.

I. *Sanitary Care and Treatment of Children and their Diseases in their Homes.*

Although the care and treatment of sick children in hospital and sanitarium are important, it cannot be denied that, considered as a scheme of benevolence, the largest benefits will result from the efforts put forth to secure the proper provision for their care and treatment at home. For by far the larger number of cases of sickness among the children of the poor must, of necessity, be treated at home. If indeed we exclude surgical accidents, acute infectious diseases, and chronic affections, which require other hygienic conditions than can be secured in the family, the remaining infantile diseases would be better attended at home, provided that suitable provision were made for their care. Again, it may commonly happen that the mother cannot leave home, though her personal attention, as in the case of an infant, is absolutely essential to its proper treatment.

In the second place, the indirect benefits which the parents derive from the care of their own sick children, when aided and advised by a skilled physician and competent nurse, are of the greatest importance. It is therefore in this branch of the subject that we shall consider "the most practicable means of lessening the risks and dangers incident to children exposed to the heated and impure atmosphere of a large city, during the summer months, and also as to the best methods of extending a general knowledge of simple hygienic rules for the treatment of sick children at home among the poorer classes."

In any well matured plan for the care of the sick poor in their homes, two things are requisite, namely: (1.) medical attendance, and (2.) skilled nursing. Neither of these important duties should be left to the discretion of the family to provide. In this plan something more should be contemplated in the functions of both physician and nurse than is ordinarily intended and performed. They should be practical teachers of household hygiene, and should illustrate and enforce their lessons by daily examples. They should not only teach the art of caring for the sick, but should take advantage of their special duties in the family to aid, by advice and personal attention, in improving the condition of the home, and the methods of administering its affairs.

(1.) *The Medical Service.* The method of providing medical attendance for the poor of a city, is through the agency of the dispensary. This institution is organized so as to have a dispensary and district service. The in-door dispensary service is entirely devoted to the sick poor who can leave their homes and visit the dispensary, and who do not require special attention. All of the minor ailments of children may thus be successfully treated. The district service is designed to supply medical attendance to the sick who cannot leave their homes. It is performed by a separate class of physicians, who attend to the sick regularly, as in private practice. The medicines are all obtained at the dispensary.

The dispensary system is now recognized as the best organized method of dispensing medical relief to the poor. But to meet the full requirements of the scheme proposed in this paper, the dispensary system should be organized on the improved plan, which requires that the dispensaries should be self-supporting. To effect this object a small sum is charged for medical attendance and medicines. This small tax, instead of being a burden to the poor, is generously paid, and always proves very useful. It tends to create a feeling of independence in the recipient of medical care and medicines, and thus prevents the pauperizing influence of gratuitous services rendered in the interests of charity.

The general dispensary consists of a building centrally located, as regards the district to be served, with apartments for the classes of diseases to be treated, and for the resident officer and apothecary. The medical attendants are divided into two classes, namely, the attending and visiting physicians. The attending physicians attend daily at the dispensary, at the hours fixed for their individual classes, and prescribe for those who are able to visit the institution.

The visiting or district physicians have certain areas of the general district assigned to them, and they visit those patients who have been registered at the dispensary as unable to leave their homes. In this manner all the sick poor of a city may receive medical care and attendance with but little expenditure of money, and if a small charge is made for medicines and attendance, the dispensary readily becomes self-supporting.

It is quite impossible to organize a system of gratuitous medical care and attendance upon the sick poor of a city more complete in all its details than that furnished by the dispensary. Every person who asks or seeks medical care receives prompt attention from skilled physicians, who, in turn, have ample means of determining their social condition and real necessities.

If a dispensary system exist, as generally happens in large cities, it may be made available for the purposes which we

now contemplate, and thus the expense and care of organizing a new system may be prevented.

If, however, the general dispensary do not exist, or be not available, a system of information and medical care should be organized which will meet as nearly as possible the same conditions. The "Home" may now become the centre of this service. The area to be supplied with relief should be divided into districts, each one being of such size and form as will economize the time and efforts of the district visitor. To each district a physician, living if possible in the district, should be selected, whose duty it shall be to act in the capacity of a district physician. Young men very cheerfully volunteer their services for this work, and, with care, a thoroughly competent class may be secured. The duty of the district physician should be to visit the sick on call, as in the ordinary dispensary. He may also be one of the attending physicians at the other branches of the institution, a position which young physicians seek, and which they regard as a decided step of advancement in their profession. The record of the cases which he is to visit should be daily sent to him at his office, and his returns of visits should be daily made, in writing, in the register.

2. *Skilled Nursing.* To each medical district should be assigned as many women visitors as may be necessary to supply one visitor to every fifty families. The women district visitors should be trained nurses from the "Home." Their duties should be (a.) The prevention of sickness in the families of the poor, (b.) The care of sick children, under the direction of the district physician.

(a.) The prevention of sickness in a family will require more or less frequent personal visits of the district visitor. The frequency of these visits must depend on the intelligence, moral tone, and temper of each individual household. Many families will receive the visitor in the most cordial manner, and quickly respond to every suggestion. Such families will require but little personal attention, for whatever reform in household management is desired and enforced by the visitor

will be commenced and continued without her constant supervision. These families will also make stated reports, if requested, of their condition, and especially of the occurrence of cases of sickness.

A smaller number of families will respond less promptly to the wishes of the visitor, but by more frequent visits at first, and a closer acquaintance of the visitor with the parents, and especially with the mother, confidence is gradually established, and in time these families closely approximate the former. There still remain in every city community certain families closely allied to the vagrant classes. They are, indeed, so nearly on the border line, that any slight disturbing cause breaks the feeble domestic ties which hold them together, and precipitates them into hopeless vagrancy. Sickness, acute and wasting, is never absent from these families, and death is a familiar visitor. Few children, comparatively, attain the fifth year, and if by chance they grow to manhood or womanhood, they find decrepitude at twenty, and death with all the conditions of old age at thirty to forty-five. Hapless and hopeless as these families seem to be, it is in the efforts to elevate and improve them that modern philanthropy has won its greatest victories. As long as the domestic ties are sufficiently strong to maintain the semblance of family individuality, this class of the poor of cities may be reclaimed. More often it will be found that the parents have fallen from a better estate through misfortunes or vices, and it only requires a sympathizing friend with hopeful and encouraging words to awaken old emotions and aspirations for a better condition in life. It is true that the progress which such families make in improvement is often painfully and discouragingly slow ; but that fact should not dampen the ardor or weaken the determination of true philanthropy. One such family raised to a better life by such aid as may be given by the Thomas Wilson Association will prevent more sickness among children, and be more far-reaching in its results, than the care of a score of children of the better class.

The object of the ordinary visit should be to secure such

relations between the visitor and her families that a mutual and permanent interest would be established between the two parties. The district visitor should soon become familiar with the peculiarities of her families. She should silently note at each visit the condition of the apartments as to cleanliness, the orderly arrangement of the furniture, and the condition of the clothes. She should observe the kind of food, and unobtrusively inquire as to the methods of cooking. Gradually, as she becomes more and more ingratiated into the affections of the family, she would learn its secret history, its moral, religious, and social tendencies, and everything that directly or indirectly affected its healthful development. As she acquires this knowledge and wins the confidence of the family, she in turn imparts such instruction on subjects relating to the hygienic management of the children as she sees is needful and timely. Little by little, under this training, the habits of the family change. Improvement occurs in the various branches of its limited yet multifarious duties. Order gradually succeeds to disorder in the arrangement and management of the house; cleanliness appears on the floor and walls, in the clothing and bedding, and in the persons of the parents and children. As a legitimate consequence of the improved hygiene, a better state of health succeeds. Apathy and long disregard of sanitary laws, the result of ignorance and poverty, is replaced, under the sympathy and encouragement of the visitor, by a strong desire for improvement in the mode of life. The children, formerly repulsive from filth and external evidences of disease, are now clean and tidy, and the ruddiness of health appears in the features. This is not an overwrought picture, nor a fancy sketch having little foundation in reality. The mass of people, however low in society, desire improvement, and the strong love of the mother for her offspring will prompt her to make many exertions and sacrifices in the humblest sphere, and with the most limited resources, that her children may have health and comfort, of which she perhaps has been deprived.

That visitors among the poor, actuated by the right mo-

tives, and having the authority of an appointment from a legally constituted board, do have a decided influence in improving the physical condition of families, is abundantly shown by our experiences in New York. For, since the first sanitary inspectors, a body of young physicians, were sent out by the old Citizens' Association some fifteen years ago, to visit all the tenement houses and report their condition, the great mass of poor families are certainly much more cleanly in their habits than formerly. They welcomed this effort made in their behalf, which has been continued under the Health Board, and through the visits of city missionaries. Another fact in the same direction has also often been noticed, namely, that wives and mothers who have been servants in families, and upon whom their old mistresses occasionally call, and in whom they thus manifest an interest, have clean and tidy apartments and apparel, though living on the scantiest income.

Not only would diminution in the amount of sickness, and in the death-rate, result from the visits of conscientious, intelligent, and sympathetic women, in consequence of improvement in the hygienic condition of families, but their labors would be beneficial in another important way. Maladies are more easily controlled, and are rendered milder in a large proportion of instances, if detected in their incipiency, and if the proper remedies are then applied. Now it would be entirely practicable for a trained visitor to anticipate some diseases, and to detect the approach of others, in time to prevent the attack, or make it milder. The ravages of Asiatic cholera have been greatly mitigated by visitors, who went from house to house, and impressed upon the inmates the importance of checking every diarrhœal attack however mild. Very many lives might be saved every summer in our cities, if mothers could be informed that the diarrhœa of their infants is not conservative on account of dentition, and that what they think lightly of is the beginning of a most fatal malady which will inevitably bring desolation to their homes in a few weeks, if it be not checked.

Whenever unusually severe cases occur, requiring superior

nursing, the woman visitor might frequently become the nurse, under the direction of the physician, though it might be quite impossible, as a rule, for the nurse to be in constant attendance on the sick. Her attendance would in general supplement that of the physician.

The effect of such care of the sick, both upon the sick and the family, cannot be fully computed. Experience shows, that among the poor, sick in their homes, receiving the care of a physician, and the nursing of the family, simple diseases not infrequently become severe and complicated, from negligence or other cause, a result which the presence of a skilled nurse might have prevented. But when medical skill is aided by expert nursing in the homes of the poor, the most severe diseases usually run quite as favorable a course as in the homes of the wealthy. Even the aid of diet kitchens, which furnish selected and well prepared food to the sick poor, tends to diminish, it is believed, the mortality among this class, in the dispensary districts of New York.

The influence of the presence and services of the nurse in the homes of the sick poor, during severe sickness, is as, has been intimated, not limited to the welfare of the patient, but is felt by all and impresses itself upon the future life of the family. There is a discipline of the whole household, which under the circumstances, is lasting. Whatever may be the special temperament of the members of the family, all are rendered peculiarly susceptible, by anxiety, to the impressions which the acts of a patient, intelligent, sympathizing nurse will make. Cleanliness and ventilation are now, perhaps, first enforced, disinfection is now practiced, and foods are carefully selected and prepared. In a word, all the simple rules by which the apartments of the sick are rendered healthy, clothing made clean and wholesome, food cooked so as to be digestible, are now silently but effectively taught. It is scarcely too much to say that when sickness among the poor results in the elevation of the family in the scale of healthy living, it is a blessing rather than a curse.

II. *Sanitary Care and Treatment of Children and their Diseases in Hospital.*

The necessity of hospital care of children suffering from surgical accidents and operations, and from chronic suppurative diseases, has been recognized as a part of medical charities devoted to the poor of cities. It is impossible to treat this class of patients efficiently in their homes, though the surgical skill and nursing be of the highest quality. There will always be a want of proper appliances, of requisite floor space, of suitable bed and bedding, and of many other conditions essential to their successful treatment. It is found, therefore, that where hospital care is provided for these cases, lives are saved which would otherwise have been lost, a vast amount of suffering is prevented by the better methods of treatment and the diminished length of time required, and invaliding deformities of limbs cured that would have pauperized the unfortunate subjects of hereditary diseases.

The child's hospital may be a very simple and inexpensive branch of the service. It should be located at the "Home," and, if the surroundings are favorable, should be an independent building, one story in height, with wards properly exposed to the sun and air. The wards should be two or more in number to accommodate the sexes. The general details of construction should make the hospital a model of good ventilation and heating. If it is not practicable to build a new structure, wards may be constructed in the Home which will serve the purpose, though not as suitable as in a well arranged isolated building. The rooms selected should be on the second floor, to avoid dampness, and to secure a free flow of external air, and escape of the emanations of the living rooms. If the building have a southern extension, this portion may be made available. In the arrangement of rooms for wards, all the conditions for the health of the inmates should be even more carefully studied and provided for, than in the separate hospital, because unhealthful conditions are more numerous and difficult to meet.

The matron of the Home becomes the matron of the hospital, and the trained visitors the nurses. The surgical and medical attendance would be gratuitously supplied by appointment from the profession of the city.

III. *Sanitary Care and Treatment of Children and their Diseases in a Sanitarium.*

In the organization of a sanitarium it must be borne in mind that neither the donor nor trustees promise that it shall fulfill the conditions of a hospital. The primary motive of Mr. Wilson in establishing a sanitarium is given in his will as follows: "I have observed for many years with much concern, the great and alarming mortality which occurs each summer among young children deprived by misfortune of their parents of all opportunity for removal from the heated and fatal atmosphere of the city." He therefore gave to the corporation appointed to administer the funds bequeathed, the title of "The Thomas Wilson Sanitarium for Children of Baltimore City." The trustees "at their first meeting, preliminary to the formation of any definite plan of procedure," determined to correspond with persons "eminent for their success and experience in the treatment and care of sick children." In requesting essays or contributions from their correspondents, the trustees stated that they had "in mind the consideration of the best method of establishing a sanitarium (not a hospital but a summer retreat) for sick children." The trustees also desire an "opinion regarding the regulations suitable for receiving and administering medically and otherwise to those who shall be the proper subjects of their care, with suggestions as to the character of the buildings that may be requisite, their grouping or isolation, and how best to provide for mothers and nurses accompanying their children."

From these statements it appears that the sanitarium should have a twofold plan in its organization:—

(1.) "For well children among whom a great mortality occurs each summer, because they are deprived of all oppor-

tunity for removal from the heated and fatal atmosphere of the city.

(2.) "Provision for a summer retreat for sick children from the heat and unhealthfulness of the city."

These two objects are so different, both in regard to the children to be relieved, and their special wants, that it necessitates the division of the sanitarium into two departments, one to be devoted to well and the other to sick children. Before the plan can be projected for care of these two classes of beneficiaries in a sanitarium, an approximate estimate must be made of the number of persons to be provided with homes.

Number of Well Children. It may, we think, be justly estimated that of the annual average of 743 deaths of infants in Baltimore referred to in the prefatory note, at least 60 per cent. belonged to the families unable to remove "from the heated and fatal atmosphere of the city." Accepting this ratio as a basis of calculation, the number of deaths by heat of those who would properly become beneficiaries of this charity is about 450, or to make a more liberal provision we will allow 500.

But this is by no means the actual number of well persons for whom provision must be made. Every child under one year of age, nursing its mother, must be accompanied by its parent and her other children too young to be separated from her care. On an average, it may be stated that one such child must be added to the list for every nursing mother's child. Orphan children and those fed by the bottle, will require only a nurse for two or three children. If we estimate the nurslings at 400, their attendants would be 800, and if the bottle-fed are 100, *their* attendants would be at least thirty. The total number of persons would be 1,200 of the former, and 130 of the latter, or a grand total of 1,330.

But it is not necessary that each well child of the 500 should remain at the retreat during the entire heated term or twelve weeks. On the contrary it may be estimated that an average residence of sixteen days during the hot months for each child will suffice to prevent the fatal effects of heat in

the city. It is true that some children will require more time, but others would require less, and the average may be fixed as above.

From this statement we are able to fix the average population of this branch of the retreat during the three hot months at 100 children, the mothers and nurses at 100, and the additional children at 100, making a total of 300 souls.

Number of Sick Children. The annual average number of cases of sickness among the children of Baltimore, of five years or under, for the four years 1875, 1876, 1877, 1878, may be estimated at about 100,000. The estimate is based upon the calculation of Mr. Playfair that for every death in a community there have been 28 cases of sickness. To be more exact, the annual average death rate of children of that city during the four years mentioned was 3,494, which would give a total annual average of sickness of 97,832. If 90 per cent. of these cases were in part in better families, or not so severe but that convalescence followed without special after-treatment, there would still be not far from 8,000 cases of severe illness, requiring more than ordinary care during convalescence. This number would be a monthly average of 650 cases. It would be a safe estimate that of this number not more than 200 monthly would become beneficiaries of this sanitarium. For the purpose of this computation we will fix the number of sick children to be provided for at 200.

Distribution of Children. In the distribution of the children and their attendants regard must be had to the fact, that the family relation of each group should be as far as possible maintained. In order to do this one hundred domiciles are to be provided, each having the conveniences necessary for domestic privacy and comfort of at least three persons ; namely, the mother and her two children.

The arrangement of the individual homes so as to secure the best conditions for health, with economy in their construction and facility of administration, is not a difficult problem when considered with reference to the objects to be obtained, the large tract of ground to be utilized, and the climate

of the locality. The several questions which are to be determined are as follows :—

The Site and its Preparation. That portion of the grounds especially devoted to the residences of this colony should embrace an area of at least twenty-five acres. It should have an elevation equal to and if practicable greater than the surrounding country, in order to secure the free flow of the air. It should have a south-southwestern surface-inclination in order to be well exposed to the prevailing winds and to the sunlight. If there is an opportunity to select soils, that should be preferred which is least retentive of water and even moisture, such as soils free from compact clay strata near the surface. Alluvial and sand formations are especially dry, and if rendered fertile by proper admixture of loam should be selected. Whatever the soil may be, deep drainage will be a necessary expedient to prevent the soil soakage during protracted rains and even dampness at all times.

The selection of shade trees and their arrangement on the grounds, while largely a subject for the skill and taste of the landscape architect, must still be subordinate to the sanitary conditions to be secured. The trees selected should, in part, be such varieties as have special medicinal properties which are diffusible in the air, as the aromatic trees and shrubs, or which purify the air by absorbing greedily deleterious miasm floating in it, as the linden, the maple. The selection should include trees and shrubs which flower successively during the summer. The shade should not be so dense as to make the ground damp, even in small areas as groves. Nor should the trees be grouped so as to obstruct the south-southwesterly and westerly winds. Arbors should be provided in which hammocks and swings can be suspended; shaded walks should be laid out with hedge rows at intervals so dense as to secure isolation and privacy. Fruit-trees should not be allowed on any grounds devoted to children.

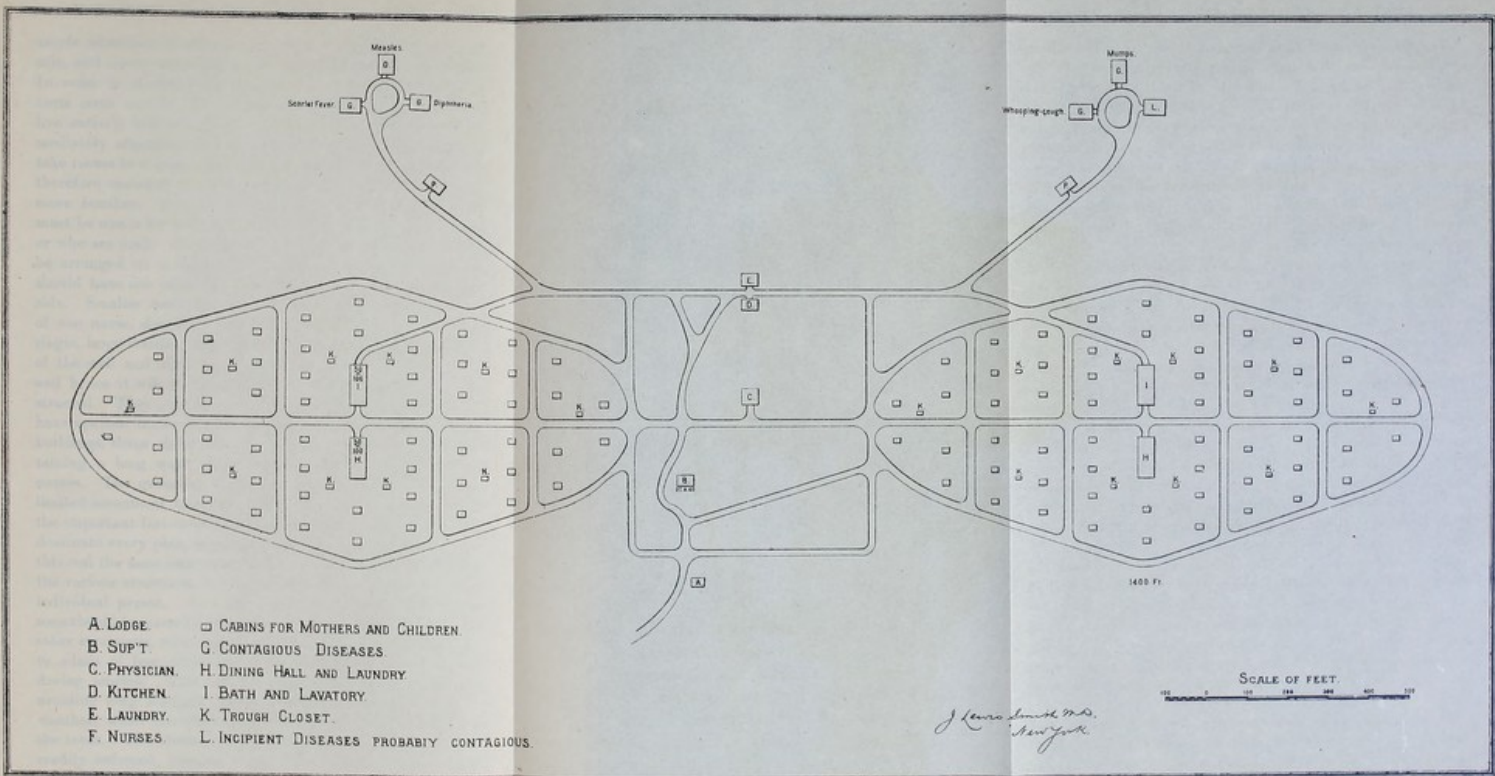
Fountains with spray, ponds through which fresh water constantly flows, and running streams, are desirable features of the landscape both for beauty and healthful purposes.

The Administration Buildings and Domiciles. The administration requires one building for offices, a second for the kitchen and dining halls, and a third for the laundry. The building for offices should be in the front portion of the grounds where it will be of easy access to those who visit the sanitarium, and conveniently located to the several branches of service. This building should be the residence of the superintendent, and should be constructed accordingly. The kitchen should be located on the northern part of the grounds, centrally as to the colonies, but quite beyond the limits of grounds occupied by the residents.

In arranging dining-rooms, and in the distribution of food, it must be borne in mind that there will be two classes of persons to be provided: (1.) The bottle-fed, and those under five years of age accompanying their mothers. (2.) The mothers and nurses. The nursing infant does not enter into the account. The first class are evidently to be chiefly supplied with good milk. This milk may be given out two or three times a day, on tickets issued to the mother or nurse, from the kitchen, or other more convenient depot, where it is kept in proper coolers, — the milk being taken to the domicile, where it is to be consumed. Older children, who require a miscellaneous diet, can accompany the mothers and nurses to the general table. The second class should dine at common tables located in the wings of the kitchen, or in separate dining-rooms adjoining the kitchen.

The laundry should be located at a distance from the kitchen, still farther to the northward of the colonies, and in a wooded ravine, where all its outflowings will be from the occupied grounds, and to the leeward of the residences. If its sewerage is a part of the system provided for the entire grounds, the waters that flow from the laundry should enter the main at such point as will secure its uses for flushing drains containing much excreta.

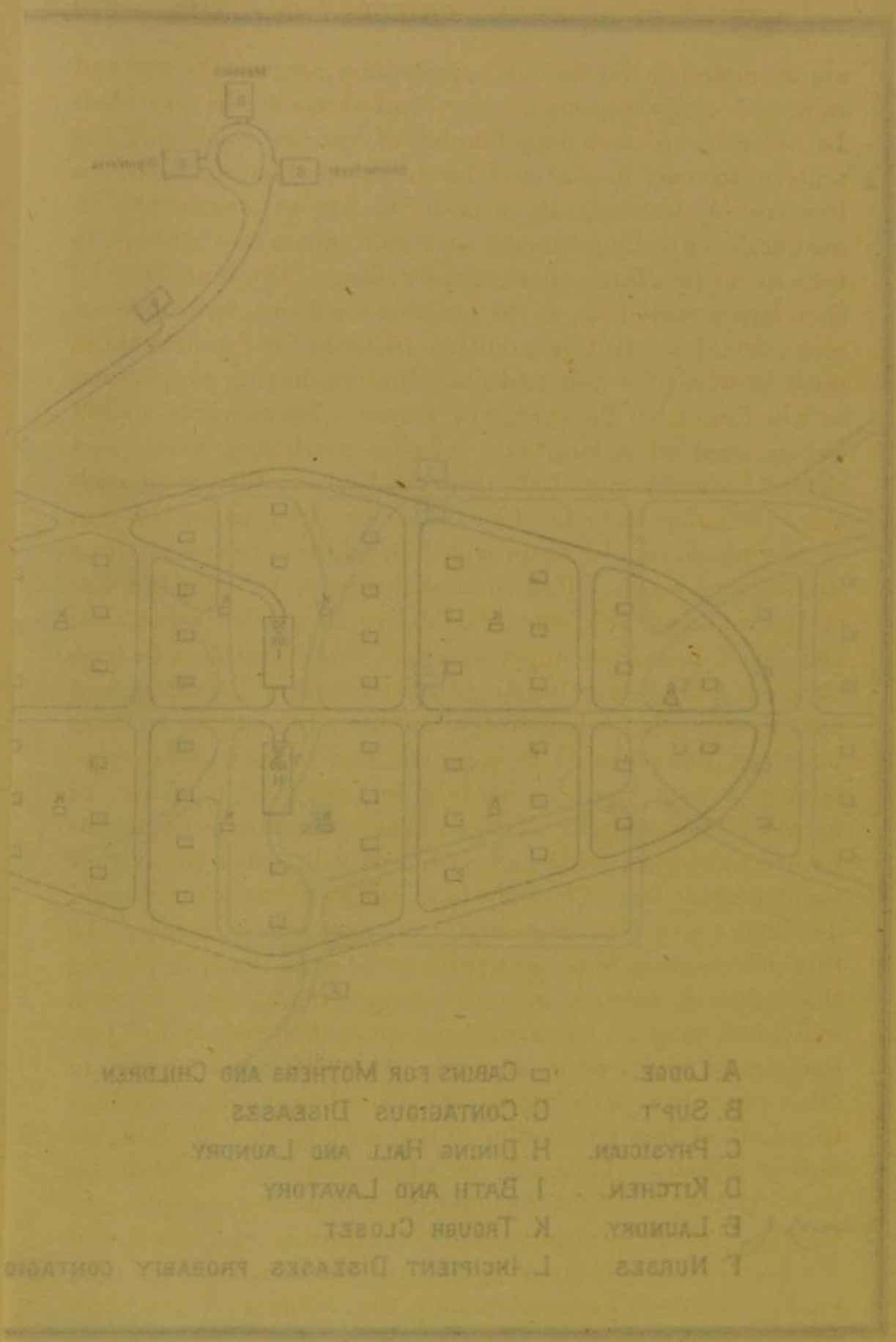
Domiciles and their Arrangement. The domiciles for both branches of the sanitarium should be constructed chiefly of tenting cloth, but with substantial raised wooden floors, and



- A. LODGE
- B. SUPT
- C. PHYSICIAN
- D. KITCHEN
- E. LAUNDRY
- F. NURSES
- CABINS FOR MOTHERS AND CHILDREN
- G. CONTAGIOUS DISEASES
- H. DINING HALL AND LAUNDRY
- I. BATH AND LAVATORY
- K. TROUGH CLOSET
- L. INCIPIENT DISEASES PROBABLY CONTAGIOUS

SCALE OF FEET

*J. Lewis Smith, M.D.
New York*



- A Lodge
- B Supt
- C Physician
- D Kitchen
- E Laundry
- F Nurses
- G Cabins for Mothers and Children
- H Contagious Diseases
- I Dine Hall and Laundry
- J Bath and Lavatory
- K Trough Closet
- L Incipient Diseases probably Contagious

ample materials for flies as a protection against the sun and rain, and every convenience for comfort should be provided. In order to accommodate families of various conditions, the tents must vary in size and form. Some families desire to live entirely isolated, others prefer to live in apartments immediately adjoining friends, and still others are willing to take rooms in a large apartment dwelling. The tents may be therefore assorted so as to accommodate one, two, three or more families. But in addition to tents for families there must be wards for well and sick children, having no parents, or who are under the charge of nurses. These wards should be arranged on a long axis running north and south, and should have not more than thirty beds each, fifteen on each side. Smaller tents for four to ten children, under the care of one nurse, should be provided in addition to two or three single, large wards. But there will always be some families of the well and sick, who should live in wooden structures, and hence it will be important that several cottages be constructed. They may be single or two story buildings, and have apartments for four to ten families. In addition to these buildings, there should be a central one in each group, containing a long ward exclusively for children in charge of nurses. The grouping of these structures admits of an unlimited amount of taste and skill. It will suffice to say that the important fact to be kept in mind, and that which should dominate every plan, is *purity of air for each individual*. To this end the most important point to be considered, in placing the various structures, is to give ample ground space to each individual person. As a rule, not more than twenty-five persons should be placed on an acre. The position of tents, and other structures, with regard to each other should be such as to admit of free circulation of air, without violent draughts during storms. This will be principally accomplished by avoiding long straight avenues, and requiring, in pleasant weather, when the wind is light, the raising of the sides of the tents. The closure of tents during storms is a regulation readily enforced, because thereby the comfort of the occupants is best secured.

Water Supply and Drainage. Among the most important conditions affecting the salubrity of the sanitarium is the supply of pure water, and the rapid and complete removal of all sewage. Although these are questions to be finally determined by the engineer and architect, it is proper to state: 1st, that the supply of pure water should be so abundant as to meet every demand, whether for the uses of the colony, or the administration buildings, or for flushing; and 2d, that the sewage will be most effectually disposed of by employing it as a fertilizer by sub-irrigation. If the flow of water cannot obtain sufficient head by natural means, machinery should be used which will give the requisite pressure upon all of the conduits so as to secure rapid and powerful currents. As a part of the system of sub-irrigation the "trough water-closet" affords the most effectual method of removing the excreta of people aggregated on the grounds of a sanitarium. When they are thoroughly cared for by a competent person, this closet has been found the simplest, cleanest, and most effective method of disposing of excreta, of large populations of poor people, yet devised. The system of sub-irrigation with which the trough-closets should be connected consists of a number of lines of tile-pipe laid at a depth of twelve or more inches below the surface of the ground. Through these pipes the sewage is distributed underground over any desirable area, and becomes a valuable fertilizer, while it is in that process rendered innocuous.

Cottages for the Reception of Acute Infectious Diseases. As stated in Part I., it is very difficult to prevent the outbreak of contagious diseases from time to time, where any considerable number of children congregate. Therefore separate buildings or tents should be provided, at least one eighth of a mile away from the cottages and tents of the sanitarium, and to the leeward of the prevailing winds, to which every case that presents a suspicious appearance can be immediately removed. Frequently the nature of an infectious disease is not apparent until it has continued a day, or a part of a day, and often symptoms from some transient indisposition

simulate closely those of an infectious malady. Several hours or a day or two may be required to ascertain the exact character of the affection; for such cases a cottage for observation seems indispensable. The stay of any one in this building would be transient. Apart from it, and apart from each other, there should be three or four additional cottages for the reception of the contagious maladies, namely, one for cases of scarlet fever, another for cases of measles, a third for those of diphtheria, and, perhaps, a fourth for those of whooping-cough. No intercourse should be allowed between these cottages, when they are occupied, for the eruptive fevers especially are often communicated by the clothing and persons of nurses, and if a child have one of these maladies, he is rendered no less liable to contract another. In these cottages all the precautions should obviously be taken as regards isolation and disinfection, which are recommended and enjoined by boards of health in the care of cases in the cities.

The Gymnasium and Bath. These buildings are readily located, and should be provided with every convenience and appliance.

PART III.

THE SANITARIUM.

Hygienic Rules for the Management of Children in the Sanitarium as well as at their Homes.—Facts with which the Visitors among the Poor should be familiar.

Since, as we have seen, one of the chief causes of the increased death-rate of children in the cities during the summer months is dietetic, it is obvious that the subject of feeding demands careful consideration in every plan or project designed to reduce this mortality; and since in the future management of the sanitarium, and in the wider operations of the Thomas Wilson Association, it seems probable that children of all ages, will, to a certain extent, be cared for, I have thought best to devote a chapter to the consideration of the diet not

only of infants, among whom the mortality from improper feeding is greatest, but also to that of older children. I shall endeavor then to point out the kinds of food and the mode of feeding, which are required for the wants of the system, and are most conducive to the healthy development from birth till the close of childhood; and though I may state facts which do not seem immediately useful or pertinent to the object for which this essay is prepared, I am persuaded that every scientific fact relating to this important subject will in the end have a practical bearing.

DIET.

Obviously, the best food for the infant until it has attained a certain age, is that which is provided naturally, and in consequence of the danger which attends artificial feeding, mothers should always be encouraged to suckle their infants unless they are physically unfit for the task. If they are thus incapacitated and reside within the city limits, healthy wet-nurses should if possible be employed rather than incur the risks of artificial feeding, even if the increased expense require retrenchment and rigid economy in other particulars. The infant of the city artificially fed during the months in which he should be nourished at the breast, is not only the first to suffer from the summer complaint when the hot weather arrives, but is more apt to acquire a faulty constitution, a rachitic or scrofulous diathesis, with its many unpleasant manifestations, than is one who has the natural aliment until the time when weaning is proper.

But there are certain states of ill-health in the mother which contra-indicate suckling, states in which it should not be allowed, both for her sake and the infant's. Among these may be mentioned tuberculosis, incipient or confirmed, a decidedly scrofulous state, any chronic disease which reduces the strength in a marked degree and renders the milk thin, innutritious, and insufficient, and acute constitutional contagious diseases, which take away the appetite and exhaust the strength, as typhoid fever, and severe erysipelas. In other acute diseases, not so severe as to endanger life, destroy the

appetite, or cause much suffering, lactation should be supplemented, if need be, during the continuance of the disease by artificial feeding. In acute maladies of the mother of a grave type, attended by pain, loss of appetite, and prostration, but which will probably soon terminate favorably, it is commonly best to allow the infant to suckle two or three times in twenty-four hours, sufficiently often to prevent the breasts from drying, until convalescence is established. But whether or not under such circumstances of ill health, lactation should be continued, or to what extent, depends upon the particulars of each case, and must be determined by the attending physician, who should be fully aware of the importance of preserving the milk.

The return of the catamenia, which in some women is as early as the third or fourth month after parturition, but is not in the average till the sixth or eighth month, affects the composition of the milk, diminishing its nutritive properties. Charles Marchand found in three chemical analyses of the milk during menstruation, a diminution of two to four parts in the butter, of two to five parts in the sugar, and a diminution in the casein and albumen of two to five parts. This seems but a trifling change when we recollect that human milk in the state of health contains, according to the analysis of M. Robin and others, 25 to 37 parts of butter, 37 to 49 parts of sugar, and 29 to 39 parts of casein, in 1,000 of milk; still the alterations in the milk during the catamenial flow, some of which have not perhaps been detected, produce in exceptional instances more or less indigestion in the nursling and even diarrhœa. But these ill effects are transient, subsiding when the flow ceases. The return of the catamenia does not therefore contra-indicate lactation in ordinary cases.

Suckling should in general be discontinued if the mother have good reason to believe that she is pregnant. Regard for her own health and the development of the foetus require this, but if the family remain in the city it is safer for the infant to continue nursing during the first two or three months of her gestation, if the weather be hot, and no indi-

gestion or diarrhœa occur, than to be taken from the breast and placed on artificial food, for weaning in the city in mid-summer nearly always causes the much dreaded summer diarrhœa. The proper way under such circumstances is the employment of a wet-nurse, or removal to the country and weaning there. In the salubrious locality of the ordinary farm-house, or in a sanitarium, gradual weaning will probably be safe, even in the season of greatest atmospheric heat.

Sometimes there are insuperable obstacles to lactation in the state of the mother's breasts or nipples. The breast may be small, so as to secrete very little milk, or there may have been a previous inflammation so near the nipple as to occlude the milk ducts, or there may be an acute inflammation with induration and suppuration of the breast, or the nipple may be small and depressed, so that it cannot be seized by the infant's lips. This last obstacle may sometimes be remedied by the use of the artificial nipple, but if the milk be drawn with difficulty, such appliance does not fulfil the indication. The frequency of cracks and sores upon the nipples which seriously interfere with nursing is known to all practitioners.

In these various ways lactation is interfered with or prevented, and the family may not be in such circumstances that a wet-nurse can be employed. But the rule is imperative, admitting no exceptions, that the infant remaining in the city should be wet-nursed through the first year, for the fact needs to be repeated and emphasized, that the infant under the age of one year, if taken from the breast, though it may do well in the cool months, will in all probability be seriously sick during the hot season, with indigestion, followed by diarrhœa. In New York we are compelled every summer to witness the melancholy spectacle of infants pining away and dying upon the bottle, when we are convinced that this great waste of life might be prevented or greatly reduced by early removal beyond the city limits, to a sanitarium or farm house, where pure air and fresh milk can be obtained.

A large proportion of the mothers of America need detailed instruction in regard to the suckling and feeding of

their children, and I will therefore state somewhat fully, at the risk of writing upon matters which may not seem exactly pertinent to the wants of the Wilson Association, facts which every mother and wet-nurse should know, and a knowledge of which will tend to diminish infantile sickness and insure a more robust development of body. The subject of the diet from birth to the end of childhood is so important that it cannot, I think, be treated of too exhaustively.

After the birth of the infant the mother needs to rest a few hours, — four or five, or a little longer in tedious and exhaustive cases, — and then it should be applied to the breast. There is frequently a little milk at this time, and the act of nursing promotes the secretion and increases the quantity. The full secretion is not, however, established before the third day, and though the infant should be applied to the breast about every second hour by day and fourth hour by night on the first and second days, it obtains but little nutriment. Babies are so constituted that they need little food until it is naturally provided for them, and the common practice of feeding them to repletion with various sweetened mixtures almost as soon as life begins, because they obtain so little breast milk, is to be regretted. Filling their stomachs in this way has a tendency to prevent their drawing upon the nipples with the avidity which is required to stimulate a free flow of milk. Besides, as I have many times observed, indigestion, diarrhœa, and sprue, are common results of this injudicious feeding. If therefore the infant be applied to the breast every second hour when the mother is awake till the third day and be fed nothing besides, there need be no anxiety as regards its nutrition. If on the third day the breasts do not begin to fill and the secretion be delayed, a little fresh cow's milk, diluted with double its quantity of warm water, and slightly sweetened, should be given every fourth hour, but should be withheld as soon as the flow of milk occurs.

Infants under the age of one month should nurse about every hour and a half by day and at longer intervals by

night, or about ten times in twenty-four hours, for the stomach of the new born holds but little, and therefore receives but little at each nursing, and its digestion is active. The interval should be longer at night than in the day-time, so as to allow the mother more sleep. In the second month the interval should be about two hours, and it should be gradually lengthened as the age increases, so that after the fourth month nursing should be about every third hour, and after the sixth month, when the use of some artificial food is proper, every fourth hour.

The infant should be habituated to nursing at regular intervals, and when it is, it will ordinarily awaken at about the proper time. The practice on the part of the mother of applying the babe to the breast whenever it frets, and as a means of quieting it, although it have but just nursed, is pernicious and should be forbidden. Giving the stomach no time to rest, or filling it to repletion, tends to produce indigestion and diarrhœa, and to increase the fretfulness. The cause of the fretfulness should be sought for that the proper measures may be applied. In ignorance of the cause, it is better to quiet the restlessness by carrying the child, or even by rocking it, than to increase the task of the digestive function. Fretfulness of infants is often due to colic or griping in the bowels from gas or food that has not fully digested, and the addition of more food has a tendency to increase rather than to diminish it.

If the mother have sufficient breast milk, no other food need be given before the fifth month, but many for various reasons find it necessary to supplement the nursing before that time. If other food be required, a little cow's milk, diluted for young infants with water in the proportion stated hereafter, may be given two or three times daily. After the fifth month cow's milk should be given without dilution. If for any reason the cow's milk disagree, one of the farinaceous preparations described hereafter may be added to it or substituted for it.

A fixed rule in regard to the proper time for weaning is impossible, for robust mothers with abundance of milk

should suckle longer than those who are less favorably circumstanced. But in the ordinary condition of health, lactation should continue till about the age of twelve months, when the first molars have pierced or are about piercing the gums. The fact heretofore alluded to should be emphasized in this connection, namely, that weaning should never occur during or just before hot weather, within the limits of the city, where the atmospheric conditions are such that there is a strong liability to intestinal catarrh in infants, so that slight dietetic changes, as the substitution of a food which is not so easily digested as the breast milk, may produce it. In New York the second summer is greatly dreaded by mothers, on account of the known liability of their infants to diarrhoeal ailments, but the greater risk in the second summer over that in the first, which is known in all the tenement houses, is due solely to the fact that so many infants have been recently weaned, and placed upon new diet when the second summer begins. I have frequently advised mothers to suckle their infants of twelve, fifteen, or eighteen months through the period of atmospheric heat, rather than incur the risks of weaning at such an unfavorable time, and without apparent detriment to either party concerned, when I was convinced that weaning, even with judicious selection of artificial food, would result disastrously. In a salubrious rural locality, the change from the natural to artificial food involves little danger even in the hottest weather.

Unfortunately, there are not a few mothers who, from causes enumerated above, are unable to suckle their infants, and find it necessary to make use of artificial feeding. Many such cases will doubtless come under the care of the Wilson Association, either in the sanitarium or elsewhere, since infants thus fed from birth, as we have already shown, are very liable to disease, either of the digestive organs or of a general character, as rachitis or struma. It is important therefore to have some rules for guidance as regards the diet of such infants.

There is no food which so closely resembles human milk,

and which under ordinary circumstances is so good a substitute for it, as the milk of animals, particularly, since it is so readily obtained, that of the cow or goat. Infants under the age of six months should take it through the nursing bottle at the temperature of about $98\frac{1}{2}^{\circ}$, and the bottle as soon as used should, with the India rubber tip and attachment, be put in a quart or two-quart bowl of cold water, to which a teaspoonful of bicarbonate of sodium has been added; and this water should be drawn through the tube and nipple by suction with the mouth. As the infant under the age of one month, when in the normal state, nurses the breast about ten times in twenty-four hours, it should have the bottle about every two and a half hours. The stomach during the first six weeks of life is very small, as we have stated above, resembling more a dilatation of the intestines than a separate organ, not receiving more than one or two ounces of liquid without distention. Therefore, while it is fed so often, it is evident that the quantity given each time should be small and such as will be quickly digested and absorbed. In the first month after birth the cow's milk should be diluted with half its quantity, or sometimes an equal quantity, of water, from the second to the fifth month with one third to one fourth its quantity, and after the sixth month it should be employed without dilution.

The shops contain many substitutes for human milk, but cow's milk, if it can be obtained fresh from healthy grass-fed or hay-fed cows, is to be preferred to any of them for ordinary feeding. Condensed milk possesses no advantages which render it superior to ordinary milk if the latter can be obtained directly from the animal and sufficiently often.

When shall other food be allowed in addition to cow's milk, and what kind of food? Cow's milk, given unmixed with other kind of food, does not always agree with the infant. Possessing nearly the same chemical constitution as human milk, it nevertheless behaves differently, in some respects, in its digestion. The casein of human milk coagulates in light flocculi in the stomach of the infant so as to be read-

ily acted on by the digestive fluids, while that in cow's milk is apt to form large and firm coagula, which are with difficulty digested, and which therefore may cause colic and fever and make the infant restless, or cause vomiting, by which the mass is expelled; or it may pass the bowels only partially digested, and appear in the stools as whitish masses. Moreover, much of the cow's milk in market gives a more or less acid reaction, as we shall see hereafter. Now the casein of milk, which is already acid when administered to the infant, coagulates more rapidly and in larger masses than the casein of breast milk, which is alkaline. But if we mix with the cow's milk some bland and easily digested food, which by mechanically separating the caseous particles, prevents the formation of large masses, and which, while it has nutritive properties, dilutes the milk and enables the digestive fluids to act more readily upon it, the desired effect is attained of facilitating digestion without impairing the nutritive properties of the milk. Experience shows that this object can be effected, and that cow's milk, which disagreed with the feeble digestive function of the infant, can be made to agree by the admixture of certain dietetic preparations.

The belief has prevailed in the profession that infants, prior to the third or fourth month, can digest only a very small amount of starch, since the pancreatic and salivary glands, whose secretions convert starch into glucose, a necessary change in digestion, are almost rudimentary in the first months of infancy. Therefore it was held that farinaceous or starchy food is unsuitable for young infants, and the renowned Baron Liebig, wishing to subserve the cause of infantile hygiene, prepared a food in which, by the action of malt, the starch of wheat flour is converted into glucose. Liebig's food is extensively used, and mixed with milk or given separately it commonly agrees with the youngest infant, but when given unmixed and in considerable quantity, it has in my practice proved too laxative, especially in hot weather, from the amount of glucose or grape sugar which it contains. I consider it on account of this quality one of the

best foods for constipated infants, and for all infants except in the hottest weather when there is a marked tendency to diarrhoea. But now it is ascertained that the salivary and pancreatic secretions are not the only agents by which the saccharification of starch is effected in digestion. The mucous surfaces furnish an "epithelial ferment," which aids in the change, so that the secretions from the buccal and intestinal surfaces assist materially in the digestion of starchy food.¹

Therefore the theory seems now established that young infants can digest starch, though not to the extent of those who are older. The following are preparations containing starch which may be given, mixed with milk, to infants during the period of summer heat: Select the best wheat flour, bake it in an oven at a slow heat till it has a light fawn color, stirring it occasionally. This is very similar to the Ridge's Food of the shops. Another way of preparing flour is to press and tie it snugly in a bag, which should be boiled four or five hours in water sufficient to cover it. It is then like a piece of chalk, except the outside, which is moist and must be removed. Grate the flour from the mass as it is wanted for use. Flour prepared in this way, boiled with water in a gruel and mixed with more or less milk according to the age, agrees with most infants. It is somewhat constipating, and is therefore especially useful in the summer diarrhoea. If it be too constipating, it can be mixed with one third its quantity of oatmeal or Liebig's Food. Barley-flour is also a useful dietetic article, agreeing with most infants.

But there are not a few cases of infantile diarrhoea in which milk given at each feeding, however judiciously mixed with farinaceous or glucose preparations, does not agree. Many such will no doubt be received from time to time in the sanitarium; cases, in which diarrhoea with symptoms of indigestion occurs, and though temporarily checked by treatment, returns. Under such circumstances it is better to give the milk at longer intervals, at each second or third feeding, or it

¹ See résumé on Recent Discoveries in Digestion, by Charles Richert, *Review Medicale*, 1879; also remarks by Professor Flint, Jr.

may be omitted entirely for a few days and the gruel be given alone, or mixed with the white of the egg, or with the expressed juice of meat. A gruel made of flour and water is not sufficiently nutritive for prolonged use, and if the milk disagree and cause colic or diarrhœa so that it is necessary to withhold it from most of the feeding, take the white or albuminous part of half a fresh egg, beat it in a saucer or cup, and add it to the gruel after the latter has become cool. This is usually taken readily by young infants, and it has an excellent effect in diarrhœal cases, while it is very nutritious. Two or three times through the day, if the infant show signs of insufficient nutrition, one or two teaspoonfuls of the expressed juice of meat may be added to the gruel. It is better to make only one of these additions to the nursing bottle at a time, but I have occasionally employed at the different feedings in the same day, the egg, milk, and juice of meat with advantage.

Too little attention is given in families generally to the kind and quality of milk which their milkmen serve them with. In and near a great city much of the milk served to the people, all of that which is from cows constantly stabled, and from those that are fed on cheap and poor kinds of food, is apt to be acid even at the milking, and to disagree with the infant, causing diarrhœa. Therefore physicians who have had experience with sick children in the cities, emphasize the fact that only milk should be employed of the best quality, and from cows that have the range of the fields with grass or clover for food, or if stabled in the cool months are fed with hay and grain. If milk disagree and be found to be decidedly acid when tested by litmus paper, the acidity can be removed by adding to it lime-water or a little soda or potash, but it is far preferable to substitute for it other milk of the best quality that can be obtained, which is less acid.

Milk should be the chief article of food during the first year, and one of the chief during the whole period of infancy, but after the age of six months it is proper to allow some solid food. The proportion of solid food should be increased and

that of milk diminished as the infant grows older, but during the second and third years as well as during the first, milk should be allowed each day at, at least, certain of the meals. At the age of twelve months, the artificial food already mentioned may be made of greater consistence, so as to be given with the spoon. Crumbs of stale bread broken up should be boiled in water sufficient to cover them, for one or two hours, then removed, and to the pulp fresh milk be added. This may be given one or more times daily in addition to the nursing, care being taken that all lumps be reduced to a pulp. Beef tea is laxative, on account of the salts which it contains, as is also chicken tea, but a small, or moderate amount of it may be given once a day. Stale wheat bread or soda cracker should be crumbled in it and soaked, so as to be soft. If there be diarrhœa, the ordinary beef tea should not be allowed to young infants on account of its laxative effect, but the expressed juice may be given instead. Few vegetables are proper for infants under the age of one year, but the potato baked and mashed so as to be like flour, may be given at the tenth to twelfth month. It contains a large amount of starch, but appears to be readily digested by infants of the age mentioned, if given once a day in moderate quantity, with a little butter and salt added. In the second year a greater variety of food may be allowed, but the full diet of the table must not be given till after infancy, or the age of three years. In the beginning of the second year the infant is weaned. He has twelve teeth, the eight incisors, and four molars, which, with their broad surfaces, are designed for chewing. Let him have now, each day or second day, in addition to the food which has previously been employed, a small piece of roast beef, rare done and cut very fine. Other meat, as mutton, may sometimes be given instead. After the age of eighteen months, light puddings of farinaceous substances, properly prepared, as of rice and corn meal, are proper additions to the dietary.

All the teeth of the first set have appeared at the age of two years and five months, and the time has now arrived

when a more marked transition may be made from liquid to solid food. Certain fruits may be allowed, even before this period, as also the jellies of most berries, and of fruits, which being deprived of seeds and parenchyma are for the most part readily digested, while they give a relish to the farinaceous food with which they are eaten. Pastries as ordinarily made, whatever fruits they may contain, are too rich and indigestible for young children. The following judicious rule for the preparation of fruits for children, copied in popular treatises on hygiene of infancy and childhood, is from "Murray's Modern Cookery Book." "Put apples sliced or plums, currants, gooseberries, etc., into a stone jar, and sprinkle among them as much Lisbon sugar as necessary; set the jar in an oven or on a hearth, with a teacupful of water to prevent the fruit from burning; or put the jar into a sauce-pan of water till its contents be perfectly done." Berries and fruits thus prepared, and the fruit jellies, are best eaten spread on bread and butter, or on soda crackers.

It is obvious, from what has been stated above, that no rules or measures for the preservation of infantile life in the cities, during the summer, can be effectual in the highest degree, that do not particularize in regard to the quantity, as well as quality of the food, and the mode of feeding; and as in the future operations of the sanitarium it is probable that children of all ages will be cared for and fed, I shall detail, presently, observations, which show what quantity of food is required, both in infancy and childhood, to furnish the nutriment which is necessary for normal growth. There is lamentable ignorance in community as regards the dietetic needs of young children. The belief that children on account of being so much smaller require much less nutriment than adults, leads many astray. The following statistics, while showing how much food children require to do well and how much they receive in the large and well conducted institutions of New York City, will surprise many. The fact is, the digestion of children is more active than that of adults, and they suffer more from hunger if their meals are delayed be-

yond the usual time. The tissues undergo more active molecular change than those of adults, so that they need more nutriment for the waste, and they require additional nutriment for the purposes of growth.

The children upon whom the following observations were made are grouped according to their ages. New-born infants differ in some respects physiologically from those that are older, and they constitute the first group. The term "new-born" being applied to those under the age of five weeks. The second group embraces infants between the ages of two and ten months. These furnish a fair average of the dietetic requirement during the period of infancy after the second month. The observations embraced in the remaining tables relate to children who have passed beyond the age of lactation and been weaned.

It will be seen from the statistics that new-born infants require less milk than those who are older, and that after the first month the amount required is pretty uniform during the period of lactation.

For the purpose of procuring accuracy in the following observations, I obtained Fairbanks' Scales, weighing to the half drachm. The infants were accurately weighed before, and after each nursing, and the artificial food was weighed before and after each feeding. In this way the quantity taken at each meal was determined. The weights used were avoirdupois. The observations were made, at my request, by Dr. Kate Parker, resident physician of the New York Infant Asylum, and by Dr. Chadbourne, resident physician of the New York Foundling Asylum, and I can vouch for their accuracy. The avoirdupois ounce contains 437.5 grains, and Dr. Chadbourne ascertained, by very careful weight and measurement, employing the metric system for its greater accuracy, that one fluid ounce of human milk, with a specific gravity of 1,031, weighed 451.9 grains. With these data it was easy to determine the quantity in bulk of the milk from its weight. The observations in each case extended through twenty-four hours.

TABLE I. — *Age under Five Weeks.*

No.	Name.	Age.	No. of Nurs-ings.	Milk Nursed in 24 Hours.		
				Quantity in Weight.	Quantity in Fluid Ounces.	
1	Josephine Foley . . .	17 d.	11	Oz 10	Dr. $\frac{1}{2}$	9.75
2	Henry Cunningham . .	16 d.	9	13	5	13.24
3	Henry Jackson . . .	19 d.	9	10	3	10.07
4	— Rake . . .	5 d.	12	22	7	22.22
5	Henry Benton . . .	6 d.	12	15	$5\frac{1}{2}$	15.25
6	Wm. Fletcher . . .	5 d.	12	10	$1\frac{1}{2}$	9.88
7	Nora Hastie . . .	14 d.	12	17	3	16.85
8	Carl Flask . . .	5 d.	12	5	4	5.37
9	Clarence Humphrey . .	1 m. 5 d.	8	11	$1\frac{1}{2}$	10.84
10	Frederick Dighle . . .	7 d.	12	14	4	14.08
11	Edward Stace . . .	6 d.	12	8	1	7.74
12	Rosa Brown . . .	3 w.	12	14	1	13.68

From these statistics, it is seen that each of these infants, who were all under the age of five weeks, and all but one under that of twenty days, nursed in the average 12.41 fluid ounces of breast milk in twenty-four hours, and as the average number of nursings for each during the day was 11.0, the quantity of milk received at each nursing averaged only a little more than one fluid ounce, 1.12, or to state the result of these observations in a different way, in 133 nursings of 12 infants in the twelve hours of day and twelve of night, the total quantity of milk received was 148.97 fluid ounces, with a daily average of 12.41 ounces for each infant, and 1.12 fluid ounce for each nursing. These infants were selected on account of their healthy condition, none of them showing symptoms of imperfect nutrition. They were selected as fair examples of healthy infants under the age of five weeks. The practical benefit from these observations is apparent. We can do no better than imitate what is natural in the feeding of infants, and if, for any cause, lactation of a new-born infant be prevented, it should not be fed more than one and one fourth ounces, each two and a half hours, of cow's milk, pre-

pared as directed above, so as to resemble as closely as possible, human milk. New-born infants, deprived of the natural mode of feeding, are apt to be over-fed by anxious mothers, with the inevitable result of indigestion, diarrhœa, and unhealthy stools, colic and sprue. Statistics like the above may assist in correcting such error. •

TABLE II. — *Ages from Five Weeks to Ten Months.*

No.	Name	Age.	No. of Nurs-ings.	Milk Nursed in 24 Hours.		
				Quantity in Weight.	Quantity in Fluid Ounces.	
				<i>Oz.</i>	<i>Dr.</i>	
1	Agnes Sunkle . . .	6 m.	8	26	1½	25.3
2	Jessie Bradley . . .	4 m.	9	38	½	36.8
3	Walter Gorman . . .	3½ m.	8	24	2	23.5
4	Lottie Brooks . . .	7 m.	10	27	3	26.6
5	Willie Leonard . . .	5½ m.	11	28	7	28.0
6	John Clay	5 m.	10	29	7	29.0
7	Agnes West	3½ m.	8	19	2	18.6
8	Freddy Van Buren . .	2 m. 10 d.	7	24	4	23.7
9	Eddie Wilson	6 m.	10	12	4½	12.2
10	Frank Smith	3½ m.	8	26	7	26.1
11	Sarah White	4 m.	8	23	5	22.9
12	John Gafney	9 m.	8	24	1½	23.4
13	Bernhard Joseph . . .	7 m.	8	27	4	26.6
14	Thomas Cole	6 m.	10	26	6½	26.0
15	Astie Russel	6 m.	10	21	6	21.1

The average quantity of milk, which these infants, who were all well-nourished, received in the twenty-four hours, was 24.65 fluid ounces. The quantity received at each nursing was 2.73 fluid ounces in the average. Comparing the statistics in the two tables we find that infants in the first month require only half the nutriment which is needed in the subsequent months of the first year. In other words, the nursling, after the first three or four weeks, requires about one ounce of milk, for each hour between the nursings. If therefore it be bottle-fed, every third hour, with cow's milk, or other food, so prepared as to have about the same amount of nutriment as breast milk, three or three and a half ounces would be sufficient for each feeding.

The following observations, relating to the diet of children who have passed beyond the age of lactation, were made in the New York Foundling Asylum, with all possible care in order to avoid errors. In this institution children are not stinted in their eating, but those who eat little are reminded of their remissness, and are urged to eat more, so that no one leaves the table hungry. On the days in which Dr. Chadbourne made the observations vegetables, except potatoes, were withheld, so that computation of the quantity of food consumed would be more accurate.

TABLE III. — *Observations Relating to the Diet during Twenty-four Hours, of Twenty-eight Healthy Children, between the Ages of Two and Three Years, with an Average Age of Two Years Eight Months.*

	Total Amount.	Average for each.
BREAKFAST.		
Bread	6 lbs. 4 oz. 1 dr.	3.5 oz.
Butter	13 oz. 5 dr.	.45 oz.
Milk	22 lbs. 14 oz. 2 dr. ¹	12.7 fl. oz.
DINNER.		
Meat	8 lbs. 0 oz. 5 dr.	4.6 oz.
Potatoes	6 lbs. 13 oz. 7 dr.	3.9 oz.
Milk	17 lbs. 9 oz. 7 dr.	9.4 fl. oz.
SUPPER.		
Milk	19 lbs. 12 oz. 1 dr.	10.5 fl. oz.
Bread	7 lbs. 1 oz. 2 dr.	4.0 oz.
Butter	14 oz. 7 dr.	.53 oz.

¹ 354.6 fluid ounces.

AVERAGE FOR EACH CHILD PER DAY.

Bread	7.5 oz.
Butter98 oz.
Meat (beef)	4.6 oz.
Potatoes	3.9 oz.
Milk	32.6 fl. oz.

TABLE IV. — *Observations upon Twelve Children between the Ages of Three and Six Years: Average Age, Four Years Ten Months.*

	Total Amount.	Average for each.
BREAKFAST.		
Bread	4 lbs. 6 oz. 3½ dr.	5.86 oz.
Butter	5 oz. 2 dr.	.427 oz.
Milk	280 fl. oz.	23.3 fl. oz.
DINNER.		
Beef	9 lbs. 1 oz. 3 dr.	12.1 oz.
Bread	1 lb. 0 oz. 1 dr.	1.6 oz.
Rice	9 lbs. 12 oz. 7 dr.	13.0 oz.
Milk	112 fl. oz.	9.3 fl. oz.
Butter	2 oz. 2½ dr.	—
SUPPER.		
Bread	2 lbs. 4 oz. 1½ dr.	3.0 oz.
Butter	5 oz. 5½ dr.	—
Milk	192 fl. oz.	16.0 fl. oz.

AVERAGE PER DAY FOR EACH CHILD.

Milk	48.6 fl. oz.	
Beef	12.1 oz. (avoird.)	
Rice	13.0 oz.	"
Bread	10.3 oz.	"
Butter	1.08 oz.	"

TABLE V. — *Observations relating to the Diet of Twenty-four Children, Twelve Boys and Twelve Girls, between the Ages of Four Years and Ten Years: Average, Six Years Ten Months.*

	Total Amount.	Average for each.
BREAKFAST.		
Bread	7 lbs. 13 oz. 3 dr.	5.21 oz.
Butter	12 oz. 3½ dr.	.51 oz.
Milk	348 fl. oz.	14.5 fl. oz.
DINNER.		
Roast Beef	18 lbs. 11 oz. 0 dr.	12.46 oz.
Potatoes	15 lbs. 8 oz. 3 dr.	10.30 oz.
Bread	1 lb. 6 oz. ¼ dr.	.92 oz.
Milk	192 fl. oz.	8.0 fl. oz.
Butter	4½ dr.	.012 oz.
SUPPER.		
Bread	6 lbs. 2 oz. 3½ dr.	4.1 oz.
Milk	384 fl. oz.	16.0 fl. oz.
Butter	11 oz. 5½ dr.	.16 oz.

AVERAGE PER DAY FOR EACH CHILD.

Roast beef	12.46 oz.
Bread	10.23 oz.
Potatoes	10.3 oz.
Butter99 oz.
Milk	38.5 fl. oz.

Compare the above observations with those of Professor Dalton, who estimates that a healthy adult taking active exercise requires each day, —

Meat	16 oz.
Bread	19 oz.
Butter	3½ oz.
Water	52 oz.

while one leading a sedentary life needs considerably less.

It will be seen by the above tables, that even more food appears to be needed during the period of childhood, than in adult life. We would suppose this to be so without statistical evidence, for the active exercise, and rapid and progressive growth of this period, would necessarily require a large

amount of nutriment. Moreover while adults do well with solid food and water, statistics show, that the best diet for children, who have passed beyond infancy, is one of milk with solid food, for at least breakfast and supper.

Although we are able, by observations, to determine the average amount of food required in twenty-four hours, by children of various ages, it would be wrong to limit the diet to a fixed quantity, for some need more than others. A child should never go hungry after a meal. In some of the best conducted institutions of New York, the children eat of plain food all that they desire at each meal, while in other institutions, the food at supper is limited, but is abundant at the other meals. As children go to bed so soon after supper, it is proper to have this meal light, and of such food as is easily digested.

I have obtained the following dietaries of three of the largest and best conducted of the New York Institutions, the children in which exhibit a healthy and contented appearance, and have little sickness.

New York Orphan Asylum.

This institution, of which Mrs. Alexander Hamilton, after the death of her distinguished husband, was during many years first directress, is located in West Seventy fourth Street, and the children in it, about one hundred and eighty, eat all which they wish at each meal.

BREAKFAST.

Two or three thick slices of bread with milk ; no butter.

DINNER.

This always consists of hearty food, as corn beef, fresh meat, pork and beans, fish, potatoes, with other vegetables ; bread ; no soups.

SUPPER.

Bread and milk.

New York Foundling Asylum.

Inmates, about six hundred, all under the age of eight years. Those over the age of two and a half years have the following diet :—

BREAKFAST.

Bread and milk ; butter ; eggs for the delicate ; occasionally oat-meal porridge.

DINNER.

Roast beef, potatoes, and four times each week other vegetables, as peas, beans, tomatoes, turnips, cabbage, and parsnips. Bread and milk for delicate children. On Monday rice, and on Friday eggs.

SUPPER.

Bread and milk; butter; berries in their season; apple-sauce; cake; syrup.

The roast beef is sliced, passed through a machine chopper, so as to be made into hash, which is then moistened by the gravy, or juice of the meat. In the form of hash it is easily digested, while it contains all the nutritive properties of the beef. It would be well if this mode of preparing beef were imitated in other institutions and in families.

Protestant Episcopal Orphan Asylum.

BREAKFAST.

One pint of milk; five to seven large slices of bread (two thirds of a pound to one pound.)

DINNER.

Monday. — Indian meal and syrup, or rice and sugar; bread; at times potatoes and codfish.

Tuesday. — Strong beef soup, containing onions, carrots, potatoes, turnips, parsley, celery, and rice; bread.

Wednesday. — Codfish and potatoes; bread.

Thursday. — Same as on Tuesday.

Friday. — Corned beef, corned pork; bean soup.

Saturday. — Rice or Indian meal; hominy; potato stew.

Sunday. — Cold corned beef; boiled potatoes; bread.

SUPPER.

Same as breakfast.

All the ordinary berries and fruits are also liberally used in their season.

BATHING.

Bathing is now recognized in all civilized countries as one of the chief promoters of bodily comfort and health. The first bathing of the infant, which is immediately after birth, should be in water at a temperature a little below that of the blood, namely, at about 96°, after which the general bath is inadmissible until the navel string is detached. In the infant reaction of the surface when chilled is tardy and uncertain, and therefore there is great danger of catching cold when the surface is cooled by water, and does not quickly react. It is a matter of daily observation that infants become chilly and

their extremities remain cool in a medium, whether air or water, in which older children and adults would have comfortable warmth. Therefore they are liable to contract bronchitis, sore throat, intestinal catarrh, or other inflammation from very slight exposures. This fact must be borne in mind in considering the subject of bathing.

During the first year after the detachment of the navel string, the bath should be employed daily, but not longer than three minutes, during which time thorough ablution can be performed. Different authorities disagree in regard to the proper temperature of the bath during the first months of infancy. Steiner of Prague, a high authority in children's diseases, says, "During the first nine months the infant should have a daily bath a little above blood heat," . . . but most state a temperature a little below blood heat. In my opinion it should be 92°, which is considerably below blood heat, but which communicates a moderately warm sensation to the hand. After the age of ten months or even of eight months for vigorous children, the temperature of the bath may be reduced to 90°, and it should not be lower than this during the remainder of infancy, or if it be used a little lower, care should be taken to produce reaction by brisk rubbing and exercise after a short bath. At the close of infancy, namely, at two and a half years, the temperature may be still farther reduced, but it should not even for the most robust children of eight or ten years be below 78°, which is recorded on our thermometers as the temperature of summer heat, and is about that of our northern lakes during midsummer.

The rules given in the books not to bathe or direct a child to be bathed immediately after eating, or after much exercise, when the pores of the skin are perspiring, should be heeded. The head should first be wet with the water, and castile soap should be applied over the surface to insure cleanliness. The strongly scented toilet soaps sometimes contain rancid fats, or other deleterious substances, and should be regarded with suspicion. In hot weather a daily bath is advisable, but in the cooler months it is sufficient if the child bathe twice or three

times in the week. If from lack of conveniences, or for other reason, general bathing be dispensed with and the surface be washed from a basin or bowl, cooler water may be used than would be proper for the general bath, and a longer time to complete bathing would evidently be required. The bathroom should be comfortably warm, and after the bath the surface should be briskly rubbed with flannel, or in case of the older children with a suitable coarse towel, and exercise afterward encouraged to insure full reaction. In New York, in one of the largest and best managed asylums, both boys and girls are allowed to bathe in bath houses in the Hudson, when the water and weather are not too cool.

It may be well to add to these general remarks on bathing the recent remarkable statement of a high authority on thermometric observations and temperature, that during hot days a bath in hot water employed in the hours of greatest atmospheric heat, tends to reduce the heat of body and to preserve its normal temperature during the remainder of the day. Wunderlich says, "in tropical countries and in very hot seasons, no means of cooling is so lasting as a bath or a douche of very warm water.

CLOTHING.

One of the most important duties of the mother or nurse, is the selection of clothing for children which will be suitable for their age and the season. In the matter of dress as in that of diet, many errors are unconsciously committed. In a room of proper temperature, which during the cool months should be 70° for infants and 68° for children old enough to run about, the head should never be covered unless in case of young infants, the sides of whose heads as well as their necks and shoulders may be lightly covered in sleep. It is the common practice to leave off the "belly band" which is applied after birth, when the infant has reached the age of three or four months, but from the fact that infants so often take cold, especially at night by throwing off bed clothes, both in cool weather, when the temperature of the apartment

may fall below 70°, and in summer when there are currents of air through open windows, I advise the continuance of the band during the first year or eighteen months. In the summer it should be made of light merino, and in the winter of flannel. It should never be so thick and heavy as to be uncomfortable, or so snug as to interfere in the least with the free movements of the chest and abdomen in respiration. It should extend to and not over the ribs, and should be secured either with safety pins or a few stitches. If excoriations or prickly heat appear on the skin under the band in hot weather, a very common eruption in infancy, the surface should be dusted with subnitrate of bismuth or a mixture in equal parts of lycopodium and oxide of zinc, and a single layer of linen should be applied over it and under the band. If the eruption be severe, it might be best to substitute a linen or soft muslin band for a time in place of the merino.

A cardinal principle in the clothing of children is that the garments should always be so loose as not to interfere in the least with the functional activity of organs. The fitting and putting on of the dress is left too much to the discretion of the nurse, who is usually ignorant of the important facts in physiology, and, unwittingly and with the best intentions, injures her charge. I have often interposed to loosen the dress of young infants, which was so tight as to sensibly embarrass respiration, and the case of a new-born infant has been reported to me in which it seemed probable that death resulted from this cause. Infants especially who are so liable to pulmonary collapse and intestinal hernia, should have loose covering of both chest and abdomen. Pressure over the stomach always feels uncomfortable, and this organ, almost as much as the lungs, needs full expansion and free movement, in order to perform its function of digestion properly. The same is true also of the intestines, but they tolerate compression better, and their movements are less impeded than those of the stomach by too tight dressing. Another part, where too snug an application of the dress does very great harm, is the neck, since moderate pressure in this region may retard

the circulation of blood through very important vessels, namely, those which supply the brain, or return blood from this organ. The dress about the neck should always be so loose that the four fingers of the nurse can be readily introduced underneath it. Skirts upon girls are sometimes supported by being tied tightly around the waist and over the stomach. This should never be allowed, but skirts should always be supported by shoulder straps, and be loose around the waist.

Clothing protects the body according to its thickness and the feebleness of its power of conducting heat. Woolen, fur, and feather garments have very low conducting power, and wool, from its plentiful supply and cheapness, must always be the material which is chiefly worn in the winter season; while cotton, and in still greater degree, linen, are active conductors of heat, allowing its quick escape from any part of the body which it covers, and they are therefore the proper material for summer clothing.

The color of a garment matters little as regards the escape of heat from the body, for whatever its color its surface next the body is necessarily dark from the exclusion of light; but the color is important as regards the absorption of heat from the atmosphere and the solar rays. Black has the highest absorptive power, while white has the least, and the mixed colors have absorptive powers which are intermediate. In experiments made with shirtings of different colors, while white received 100° F., black received 208° F. A light color is therefore the best to dress children in in the hottest weather.

The covering, which is proper for the head of a child when out-door, must evidently vary considerably in different seasons, and in different states of weather. Many a young child, with scanty growth of hair, has contracted that painful disease, inflammation of the ear, followed perhaps by a protracted discharge, and more or less impairment of hearing, in consequence of taking cold from insufficient covering of head and ears in inclement and changeable weather. Even leaving

off accidentally a band or tie, to which a child is accustomed, will sometimes give it a cold.

In this connection, I wish to call attention to the common and dangerous practice among the poor of allowing children to go bare-headed in the sun, during the season when the atmospheric heat is highest. Not a summer passes in which I do not meet cases of inflammation of the brain, which I believe to be largely due to exposure to the sun's rays. There is no better and safer covering of the head of a child, who is allowed to go in the open air during the hot weather, than the light, cool, and inexpensive straw hat.

The feet should always be warm and dry, the shoes worn in wet weather being water-proof; and special care should be taken in the selection of shoes, that they be pliable and loose, so as to allow freedom of growth without compression of any part. If during the period of growth, proper precautions are taken in this respect, the chiropodist would have little to do in subsequent years. Corns, bunions, and ingrowing toe-nails originate from shoes, hard and unyielding, or too tightly fitting.

SLEEP.

The new-born infant requires from fifteen to eighteen hours sleep each day. If it do not have this amount and be wakeful, it is probably not well. It sleeps therefore most of the time when not awake for nursing, bathing, and change of clothing. As it grows older, a less and less amount of sleep is required. At the age of three years, about nine hours are needed, and it is better, in my opinion, for healthy development, to allow children of this age one or two hours of sleep in the middle of the day. They indeed often take it by falling asleep on the sofa, or floor, or in places where they are liable to take cold through currents of air, and scant covering.

Immense harm has been done to children, who were wakeful, by nurses and mothers too, who have given them active and dangerous drugs, as laudanum or morphine, under some

enticing name as soothing syrup or cordial. A wakeful and fretting child is not well. Its ailment may be trivial or grave, but it should never, under such circumstances, receive from mother or nurse any of those proprietary mixtures having seductive names which the shops contain. If it need medicine, it should be examined and prescribed for by the physician. It is scarcely necessary to call attention to some accepted and important facts, regarding the dormitory of children. A free ventilation is required either through ventilators, or open windows, and a sufficient number of cubic feet of air should be allowed for each sleeper. A small room should not contain more than two children. Curtains should not as a rule be employed, and no open vessels of foul water should stand in the room, or anything else, which may contaminate the air. The garments worn through the day must be entirely removed and hung up away from the bed.

In the asylums of New York, where from long and abundant experience the management of children is systematized, infants and the younger children are usually put to bed between six and seven, and the older children between seven and eight o'clock, the last meal or supper, as I have stated elsewhere, being light and easily digested.

EXERCISE.

Exercise is an important hygienic requirement. Harm often results from modes of exercise which are not adapted to the age. Occasionally I meet cases of permanent bow-leg, which has manifestly resulted from attempts to make the infants stand at the age of four or five months. They should never be encouraged to walk or stand till about the age of one year, and if they do at the age of nine or ten months let it be voluntary, and not taught by standing them upon their feet. In case of infants with rachitis, which disease is common in the cities, and is characterized by a lack of lime-salts in the bones, and can be detected by great backwardness in teething, attempts to stand or walk for any length of time should be discouraged, till by the use of lime-salts and cod

liver oil, and improvement of the general health, the rachitis is cured. Much of the permanent deformity which mars the beauty and symmetry of adult life originates in rachitis and might have been prevented.

The infant before he is old enough to stand takes sufficient exercise in a way that is natural and harmless. Let him lie upon his back in the crib, or on the floor with a blanket under his body and a pillow under his head, and all his clothes loose so as not to restrain the free movements of his limbs. A healthy infant seems to enjoy this attitude, moving all his limbs sufficiently to give them the required exercise, and evincing his delight and exuberance of life by utterances which are as expressive as words.

In the cool months of our latitude infants should not be taken out-door until the age of three months, and then only for a brief time in the warmest part of the day, but in the summer they should begin to receive out-door air and exercise at the age of one month. In warm weather the face should never be covered by a veil or otherwise, and air and light should have free access to it. The rays of the sun, however, from a clear sky should be excluded either by a parasol, or the shade of trees or houses or the carriage in which the infant may be carried. In cold weather, or when there is a strong wind, the protection of a veil is needed. Rude tossing of infants, which is common in families, should always be forbidden. Its effect on the cerebral circulation is likely to be bad, and it involves risk of a serious accident. In one instance to my knowledge, death resulted from such accident.

Walking, as it is the natural, so it is the best, exercise for the older infants and during the period of childhood. It promotes digestion when not carried to the extent of fatigue, and gives gentle exercise to all the muscles. The baby-carriage answers a useful purpose, when combined with walking. With the ordinary hired nurse it is safer for the infant to be taken out in this vehicle than in the arms, for if the nurse in careless walking should trip, great harm might result. In

one instance which came under my notice convulsions and idiocy were plainly referrible to the fall of an infant from the nurse's arms upon its head.

The ordinary lawn sports of childhood, as croquet for both sexes, playing ball or quoits for boys, which are rendered more exciting by the spirit of rivalry, are also useful for muscular exercise and development, while they involve little danger. Swinging is a pleasant pastime to most children, and with the propulsion required it gives gentle but efficient exercise to the muscles.

Many of the gymnastic exercises are too severe, and involve too much risk of ruptured tendons, sprained joints, and even of dislocated or broken limbs.

But with all the ingenious inventions to procure sports and pastimes for children, there are none better than gardening and farming, where facilities will allow it, conjoined with the ordinary household duties. The healthy and robust development of the farming population, — their almost complete immunity from rachitic and serofulous ailments, is attributable to their out-door mode of life, and the many kinds of healthful work which farm life requires. Such work is always in the highest degree beneficial for children old enough to participate in it, while it develops the habit of productive industry.

