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ORIGINAL ARTICLES.

THE CAUSES OF INFANTILE MORTALITY.

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Discussion at the Glasgow Medico-Chirurgical Society on 4th March, 1904.

Dr. A. K. Chalmers, in introducing the discussion, said—
In any review of the changes which have taken place in the causes of death during the last thirty years, few things stand more in need of investigation than the persistently high range of the mortality among infants during the first year of life.

It might be assumed that the reduction in the general death-rate, and more particularly in the death-rate among children under 5 years, would have been associated with a corresponding movement in the death-rate of infants. To some extent it may be shown that within limits a change of this nature has occurred, but investigation on these lines brings into prominence one feature at least of the infantile rate which is refractory, and, by reason of its volume, tends to obscure the other changes which have occurred. One group of the causes of infantile mortality may thus be regarded as "constant" in their operation, and the others as "variable."

It has been suggested that our decreasing birth-rate is being compensated by increased vitality in the children born; but the decrease in the birth-rate during the last thirty years

has been about 20 per cent, while the infantile mortality has only declined from 12 to 14 per cent. Moreover, vitality has a positive as well as a negative side—it is not merely the escape from perils which attend infant life; primarily, it is the possession of certain physiological acquirements which make independent life possible. Estimated on this basis, it would be difficult to establish for the infants of to-day any claim to a vitality which those of a past generation did not equally enjoy. If this view be correct, “vitality” is a quality of the child at birth, and not the accident of its surroundings afterwards.

The extent of actual loss to population which the mortality of the early years of life implies may be fairly represented by an illustration taken from the middle years of the period to which I have referred. According to the rates then obtaining in Glasgow, in 100,000 births of both sexes, nearly 32,000 (31,608) had died before reaching their fifth year; and of this number, more than one half (16,110, comprising 8,950 boys and 7,160 girls) were dead before completing their first year. In three periods of years, extending from 1886 to 1900, the rate per 1,000 born was 143, 146, 151; in 1901 it was 149, and in 1902 (a year of unusually low infantile rates owing to the almost entire absence of autumn diarrhœa) it was 128.

I need scarcely add that our local experience only illustrates what is occurring elsewhere, and, in point of actual extent, compares not unfavourably with other large centres of population.

Among Scottish towns, the infantile rate of Dundee during last decade exceeded that of Glasgow, and in Aberdeen it was only 3 per 1,000 lower, while in the large English towns it was without exception higher.

It will help towards an appreciation of the subject to refer

GLASGOW—EXPECTATION OF LIFE OF MALE CHILDREN.

Ages.	Expectation of Life in Years.	Difference.
—	35·18	—
1	41·54	6·36
2	45·25	3·71
3	46·55	1·30
4	47·03	·48
Increased expectation at ages 0-5 years = 11·85 years.		

for a moment to the rapid decrease in the liability to fatal disease which occurs in the early years of life. This can be readily done by an illustration taken from the increasing expectation of life in male children under 5 years (p. 242).

A child who has completed his fourth year has thus an expectation of future life which exceeds that at birth by almost twelve years, but it is to be observed that fully six of these have already been gained if he completes his first year. And when the enquiry is carried backwards into the several months of the first year of life, differences quite as great are to be observed between the several monthly periods. If we take the deaths in 1902 as an illustration (although it should be remembered that diarrhoea was relatively less prevalent than usual), we have this distribution:—

Number of deaths under 3 months,	.	.	1,633
Do. 3 to 6 „	.	.	557
Do. 6 to 12 „	.	.	748
			3,168

while, of the deaths occurring under 3 months, 1,072, or fully one-third of the total infantile deaths fall within the first four weeks of life. These are due in great part to causes which may be described as refractory to our present methods of dealing with the causes from which they arise.

It would be possible, I believe, to establish in a more extended enquiry the suggestion which arises from a comparison of single years that this element of refractoriness in the infant death-rate is confined to the first three months of life, and that especially during the subsequent months of the first years a progressive decrease in the incidence of fatal disease is going on, which is more in conformity with the general reduction of death-rates with which we are familiar in the subsequent periods of life. These are the illustrations

Deaths of Infants per 1,000 Births.	Year.	DEATHS UNDER			Total Deaths.
		3 Months.	6 Months.	12 Months.	
191	1871	1,460 (40 %)	636 (18 %)	1,512 (42 %)	3,608
159	1872	1,335 (42 %)	608 (19 %)	1,255 (39 %)	3,198
128	1902	1,663 (52 %)	557 (18 %)	948 (30 %)	3,168
142	1903	1,712 (48 %)	657 (18 %)	1,194 (34 %)	3,563

of what I have ventured to call the constant and the variable quantities. For example, in the year 1872, and again in 1902, the numbers of infant deaths almost correspond, but the proportions occurring under 3, under 6, and from 6 to 12 months varied as shown in the table (p. 243).

In this comparison, the restricted diarrhoeal rate in 1902 will be borne in mind; but, although the total infantile death-rate in 1872 was 159 per 1,000 births, and in 1902 only 128, the number dying during the first three months of life, out of 1,000 born in 1872, was 66, and in 1902, 67. In other words, it had not decreased despite the absence of diarrhoea; whereas, between the third and sixth months, this rate (per 1,000 births) fell from 32 to 23, and between the sixth and twelfth month the decrease is greater.

In order, then, to ascertain the causes of death in the several months of the first year of life, I have arranged the deaths for 1902 in a table which is based on the classification originally adopted by the English Registrar-General in his report for 1891, and of which the following is a summary:—

DEATHS, 1902.¹

	Total Deaths.	Death-rate per 1,000 Births.	Proportion of Total Deaths.
I. Immaturity,	1,088	44·0	34·4
II. Diseases of respiration, . .	746	30·2	23·6
III. Diseases of digestion, . .	389	15·7	12·2
IV. Tubercular diseases, . . .	268	10·8	8·5
V. Infectious diseases, . . .	20	0·8	0·6
VI. Diseases of nervous system, .	266	10·9	8·4
VII. Accidents of birth, . . .	39	1·5	1·2
VIII. Suffocation,	9	0·4	0·3
IX. Other violence,	149	6·0	4·7
X. All other causes,	194	7·8	6·1
Total,	3,168	128·1	100·0

¹ *Group I.*—Consists of (a) premature births, (b) congenital malformations, (c) atelectasis, (d) atrophy and debility. It may be suggested that a considerable number of these latter should be transferred to diseases of the digestive system; but, of 553 deaths ascribed to atrophy and debility in the first twelve months of life, 415 occurred during the first three months, and for this reason may reasonably enough be regarded as primarily owing to immaturity at birth.

Group III.—Includes diarrhoeal diseases, dentition, and other diseases of digestion not classified separately.

Group V.—Infectious diseases include syphilis.

Immaturity.—More than a third of the deaths arise from this cause—515 die in the week of their birth, 121 in the following week, and 939 out of the 1,088 within three months.

In the healthiest districts of the city—Crosshill, Langside and Mount Florida, Pollokshields (East) and Strathbungo, Pollokshields (West) and Bellahouston, Hillhead and Kelvin-side—in none of which the general death-rate in 1881-90 reached 12 per 1,000, and in two of which it was only 8 and 9 per 1,000, while the rate for the city was 21·5; and where the highest infantile death-rate in that period was only 86, and the lowest 63, compared with 149 for the city, this proportion to the total deaths of those grouped under immaturity, and their distribution throughout the early weeks of life, are maintained, although the total deaths for the year 1902 numbered only 68.

With larger numbers, some variation in the constituents of the group might become apparent; but, should a more extended enquiry confirm the impression which the comparison creates, we have much to learn both from the physiologist and the obstetrician before a successful effort to reduce this section of the infantile death-rate can be attempted. As

SEASONABLE VARIATION IN DEATHS OF INFANTS FROM
DIARRHŒA.

	1901.	1902.
First quarter,	44	61
Second quarter,	73	42
Third quarter,	328	91
Fourth quarter,	87	89
Totals,	532	283

MEAN TEMPERATURE IN SHADE.

	1901.	1902.
June,	54·3	53·5
July,	61·5	54·9
August,	57·1	54·3
September,	55·4	53·5

causes of death, they would appear to be less related to those which prove fatal in the later months than to conditions of vitality affecting the child *in utero*, and, it may be, should be regarded as a fragment of a still greater volume of ante-natal deaths to which compulsory registration of stillbirths would alone give us the key.

Diseases of respiration.—This forms the next largest group of infantile deaths, and is distributed throughout all the months, but in decreasing numbers after the second month. They form about one-fifth of the total deaths.

Diseases of digestive system.—Many of these most probably owe their origin to an unstable condition of the nervous system, and this again may bring them into relationship with the "immature" group. The year selected for the tabling fails to afford a true impression of the most important section of these deaths, because of the diminished incidence of diarrhœa. This may be illustrated by a comparison of the years 1901-1902 (p. 245).

In an analysis of 122 deaths of infants occurring during the months of August and September, the proportion of those fed only on breast milk was 28 per cent, while 72 per cent were artificially fed either on cows' milk or on patent foods.

Professor Glaister said—It is of great significance to a State that it is being well supplied with young lives to take the place of those which have become worn out and of persons who have emigrated. In order, therefore, to estimate whether this is the case or not, the birth-rate and the rate of infantile mortality must be closely scrutinised from time to time. Deficiency in young lives, it will be obvious, may depend upon both causes—the former contributing by lack of normal supply, the latter by depriving of life in a wasteful manner the young lives which are brought into the world. In face of a healthy birth-rate, the annual increment of lives being much greater than the annual loss by deaths, probably less critical attention is apt to be paid to this subject than where the balance of lives and deaths comes closer to the point, indeed, that the population becomes stationary or non-progressive.

Another important feature of infantile death-rates is that, while during the last thirty years particularly there has been seen in all countries in which progress has been made in general sanitation a progressive declination of the general death-rate, no such diminution has been discernible in the death-toll of children. It is quite obvious, therefore, that those causes which have operated toward the amelioration of

the condition of the lives of average citizens have failed to reach the infants under 1 year of age. That this is true there can be no doubt, and that the fact has been disappointing to sanitarians there is, equally, no doubt. As Dr. Chalmers has already remarked, the term "infantile mortality" is understood to mean the proportion of deaths of young children under 1 year of age in 1,000 children born in that year. The rate is therefore stated as a given figure per 1,000.

Dr. Chalmers has mainly confined himself to the state of infantile mortality in Glasgow. I should like, however, to take a broader outlook of the subject than that, and, therefore, my first proposition is that *high death-rates in children under 1 year prevail in all parts of the civilised world.* It is not necessary to quote extensive statistics to prove this fact, or even to consider the figures which prevail in the chief centres of population, such as those of the United States. If, for example, we confine our attention to France and Germany on the one hand, as representing foreign countries, and to the conditions particularly of our own country, and under different phases of existence, sufficient statistical evidence will be afforded us to show that that proposition is true. Take France first. Especial attention is being given to the subject of infantile deaths because of the stationary state of the population of that country. It, therefore, becomes highly desirable and necessary that infant lives should be preserved and tended. If we take the range of the mortality-rates which obtains among infants in the chief places of population in that country, it will be seen that the mortality per 1,000 varies from 145 in Paris up to 509 in St. Pol-sur-Mer. Germany tells the same story, and so also do Austria, Russia, Spain, Italy, and other countries of the continent of Europe.

But it will be wise to consider at greater length the statistical evidence of infantile deaths in our own country, because, if a remedy, or remedies, are to be suggested, obviously such would be made to apply in our own country in the first place. In order, therefore, to form some concrete idea of the extent of death-toll per annum in children under 1 year of age, let me ask your attention to the accompanying table (p. 248).

Summing these figures for both sexes who died under 1 year of age, there is obtained for England and Wales in the year 1891 a total of 135,801 deaths, of which 20,776 occurred in London and 115,025 in the provinces; and for the year 1900 the figures are 142,912, 21,039, and 121,873 respectively. These gross totals, however, are subject to correction by comparison of the total births in these respective years. But

TABLE I.—DEATHS OF CHILDREN UNDER 1 YEAR IN ENGLAND AND WALES, IN LONDON, AND IN THE ENGLISH PROVINCES FOR THE YEARS 1891 AND 1900.

MALE INFANT DEATHS.					
	Year.	Under 3 Months.	Under 6 Months.	Under 12 Months.	Total Under 1 Year
England and Wales,	1891	37,912	15,266	23,079	76,257
London,	„	5,379	2,397	3,632	11,408
English Provinces, .	„	32,533	12,869	19,447	64,849
England and Wales,	1900	39,158	16,745	23,555	79,458
London,	„	5,575	2,459	3,518	11,552
English Provinces, .	„	33,583	14,286	20,037	67,906
FEMALE INFANT DEATHS.					
England and Wales,	1891	28,609	11,874	19,961	59,544
London,	„	4,283	1,889	3,196	9,368
English Provinces, .	„	24,326	9,985	15,865	50,176
England and Wales,	1900	29,662	13,538	20,254	63,454
London,	„	4,269	2,080	3,138	9,487
English Provinces, .	„	25,393	11,458	17,116	53,967

the maintenance of a high mortality figure is seen by taking the mortality-rate for England and Wales per 1,000 births for these respective years. These figures are from all causes—164 per 1,000 for 1891 and 169 per 1,000 for 1900 for males, and 133 per 1,000 for 1891 and 139 per 1,000 for 1900 for females. These figures, therefore, of themselves justify the assertion that the rate of infantile mortality is not diminishing.

Further examination of English statistics for the same decade also establishes the fact that the incidence of infantile mortality varies in different parts of England. For example, in counties which possess large urban or populous centres the rate is higher than in those the population of which is mainly rural. Thus, in the counties of Lancashire, Northumberland, and Durham—counties which contain large manufacturing centres—the average mortality in 1901 was 197 for males and 163 per 1,000 for female children, whereas in such counties as Rutland, Wilts, and Dorset—which are chiefly agricultural—

the average mortality in the same year was 102 per 1,000 for males and 88 per 1,000 for female children. In this way may be analysed the incidence of the infantile mortality of different counties of England.

The following table (Table II) shows some of the registration counties in which the rate is 166 per 1,000 or under for males and 136 or under for females; and Table III, some of those in which the figure for males is 166 and over per 1,000, and for females, 136 or over.

These dividing figures have been chosen because the average rate for males in England and Wales for 1901 was 166 per 1,000, and 136 for females.

TABLE II.—SOME REGISTRATION COUNTIES IN ENGLAND IN WHICH FOR THE YEAR 1901 THE MALE INFANTILE MORTALITY WAS 166 PER 1,000 OR UNDER, AND THE FEMALE MORTALITY WAS 136 PER 1,000 OR UNDER.

Registration County.	Males.	Females.
Rutland,	99	90
Wiltshire,	101	80
Dorset,	107	93
Westmoreland,	109	79
Hertford,	111	82
Buckingham,	113	101
Huntingdon,	115	76
Somerset,	117	89
Hereford,	118	92
Berkshire,	119	95
Shropshire,	119	100
Sussex,	121	103
Oxford,	122	89
Gloucester,	125	105
Bedford,	128	97
Cambridge,	128	99
Surrey,	129	100
Hampshire,	136	113
Devon,	136	107
Middlesex,	138	122
Cornwall,	139	105
Cumberland,	141	117
Suffolk,	142	106
North Wales,	148	125
Kent,	149	111
Worcester,	149	120
Lincoln,	153	125
Norfolk,	157	113
Yorks (North Riding),	158	140
Essex,	159	133
London,	162	136
Derby,	164	113

TABLE III.—SOME REGISTRATION COUNTIES IN ENGLAND IN WHICH FOR THE YEAR 1901 THE MALE INFANTILE MORTALITY WAS 166 PER 1,000 OR OVER, AND THE FEMALE MORTALITY WAS 136 PER 1,000 OR OVER.

Registration County.	Males.	Females.
Leicester,	167	138
Monmouth,	167	144
Cheshire,	171	138
Yorks (East Riding),	177	143
Stafford,	181	146
Yorks (West Riding),	184	152
Warwick,	184	151
Nottingham,	186	157
South Wales,	187	153
Durham,	194	164
Lancashire,	196	162
Northumberland,	201	163
England and Wales,	166	136

Careful consideration of these tables will at once indicate that those counties in which infantile mortality is highest are those in which large industrial operations are carried on, in many of which women are employed, doubtless while they are nursing their infants, or because of such employment either neglect or are unable to perform this maternal duty.

Diseases which contribute chiefly to infantile mortality.—When the diseases which produce infantile deaths are closely analysed, it is found that they may be resolved into well-defined groups. Under these group-headings are embraced different certifiable causes, which, however, are mainly referable to such groupings. A serviceable series of groups is as follows:—(a) Infectious diseases; (b) diarrhœal diseases; (c) tubercular diseases; (d) meningitis and convulsions; (e) lung diseases; (f) wasting diseases; (g) other causes.

Under the head of diarrhœal diseases are grouped those certifiable causes of death which are referable to the gastrointestinal tract—viz., diarrhœa and epidemic diarrhœa, enteritis (infective), English cholera, gastric catarrh, enteritis, and gastro-enteritis. The heading “tubercular diseases” includes phthisis, pulmonary tuberculosis, tuberculous meningitis, tuberculous peritonitis, tabes mesenterica, general tuberculosis, and tuberculous diseases of any other part of the body. Under

the heading of "wasting diseases," however, are grouped very dissimilar conditions: thus are usually included such unlike conditions as immaturity or premature birth, injury at birth, congenital defects and deformities, atrophy, birth debility, and marasmus.

If we divide into percentages the mortality per 1,000 infants under 1 year in England and Wales from these different groups of diseases, we shall be able to arrive approximately at their relative incidence. In 1891, for example, the mortality per 1,000 births was 164 for males and 133 for females for all causes respectively. Of the 164 deaths per 1,000, infectious diseases contributed 5·5 per cent; diarrhœal diseases, 9·15 per cent; tuberculous diseases, 6·1 per cent; meningitis and convulsions, 15·8 per cent; lung diseases, 20·74 per cent; wasting diseases, 28·65 per cent; and other causes, 14 per cent. Of the 133 female deaths per 1,000, these groups gave the following percentages—viz., 7·5, 9·8, 6, 15·04, 20·3, 28·56, and 12·8 respectively. In the year 1900 the male mortality had risen to 169 per 1,000, and, following the same grouping of classes of causes, these groups contributed the following percentages—viz., 5·9, 19·5, 4·74, 13, 16·56, 29·5, and 10·65 respectively. In the same year the female mortality had risen to 139 per 1,000, and was composed of the following percentages of the above group headings—viz., 6·5, 20·15, 4, 12, 15·8, 28·8, and 12·2. It will be observed that in the above-named groups nothing has been said of congenital diseases such as syphilis, although it is within the experience of most practitioners that it is by no means unknown. Probably it is included under some other designation, for reasons which will probably suggest themselves to those engaged in practice.

In Glasgow, in the year 1899, the number of infants who died before they had attained the first year of life was 3,686. Of this total, 6 per cent died from infectious diseases (measles and whooping-cough), 16 per cent from diarrhœal diseases, 20 per cent from respiratory diseases, 7 per cent from nervous diseases, 13 per cent from birth debility, &c., and the remaining 36 per cent from other causes. Diarrhœal diseases in infants vary much in incidence according to the season of the year. They may be said to rapidly increase in number in the month of July, to reach their maximum in August and September, and to diminish rapidly thereafter in the early winter months. But, as their incidence very largely depends upon unclean vessels by which the nourishment is given to infants, they are found to prevail more or less throughout the year. Budin, who has given much attention to the subject of infantile

mortality in France, has recently recorded the fact that, out of every 1,000 infants who die in Paris, 380 die from diarrhœa; in Rouen, 510; in Dijon, 584; and in Troyes, 682. And in the *Journal d'Obstétrique* for January, 1903, the same observer states that of 69 infants who died of diarrhœa at Boulogne, only 8 were suckled by the mother, 20 were brought up on the bottle, and 41 were fed on different forms of food.

The following tables illustrate the condition of infantile mortality in Scotland:—

TABLE IV.—INFANTILE MORTALITY PER 1,000 BIRTHS IN THE PRINCIPAL TOWNS OF SCOTLAND.

	1891.	1900.
Glasgow,	166·9	172·8
Edinburgh,	140·5	154·0
Dundee,	203·2	199·2
Aberdeen,	149·8	177·8
Leith,	145·1	135·2
Paisley,	157·8	144·7
Greenock,	161·6	152·5
Perth,	114·3	145·6
Kilmarnock,	135·0	128·8
Govan and Partick,	156·1
Coatbridge,	145·9

If we contrast the incidence in infantile mortality in Scotland generally with those of different areas characterising differing groups of population living under diverse circumstances, a better opinion will be obtained of the differences which obtain therein. The following table gives such particulars with respect to the years 1891 and 1900:—

TABLE V.—INFANTILE MORTALITY IN SCOTLAND IN DIFFERENT GROUP AREAS PER 1,000 BIRTHS AND FOR BOTH SEXES UNDER 1 YEAR OF AGE, FOR THE YEARS 1891 AND 1900.

	1891.	1900.
Scotland,	127·8	128·5
Principal town districts,	147·2	146·9
Large town districts,	129·7	135·3
Small town districts,	126·5	121·3
Mainland-rural districts,	95·3	94·5
Insular-rural districts,	95·1	75·0

It is a well-established observation regarding the deaths of infants that about one half of all children who die before the completion of their first year do not survive the first three months of their existence. This is brought out in the following tables:—

TABLE VI.—FOR 1891.

	Total Births.	Under 3 Months.	Under 6 Months.	Under 12 Months.
Scotland,	125,986	8,211	2,890	5,009
Principal towns,	52,407	3,782	1,333	2,598
Large towns,	15,883	1,077	368	615
Small towns,	26,860	1,700	672	1,026
Mainland-rural districts,	27,977	1,499	476	692
Insular-rural districts,	2,859	153	41	78

TABLE VII.—FOR 1900.

	Total Births.	Under 3 Months.	Under 6 Months.	Under 12 Months.
Scotland,	131,401	8,626	3,220	5,042
Principal towns,	57,089	4,131	1,604	2,652
Large towns,	18,686	1,245	500	783
Small towns,	28,459	1,804	640	1,010
Mainland-rural districts,	24,582	1,317	453	555
Insular-rural districts,	2,585	129	23	42

Causes of high prevalence of mortality.—All the causes of infantile mortality may be divided into two classes:—(a) Unavoidable; (b) preventable.

Under the heading *unavoidable* may be included such as the following, viz., (1) Premature birth; (2) injury at birth; (3) congenital defects and deformities; and (4) congenital diseases.

There is no doubt that there is much waste of infant life due solely to marriage between parents of unhealthy stock. There seems to be clear proof that the procreative faculty is not confined to women of robust or even good health, but is existent in no small degree among women who enjoy only indifferent or even weak health. Such women as the latter beget children who have just sufficient vitality to enable them to be born alive, and then, shortly thereafter, to die. It

almost seems disheartening that, notwithstanding generations of educative facilities and the growth generally of the knowledge of the simple truths of hygiene, men and women are so little alive to the subject of fitness in matrimony. It is, indeed, not too strong to say that less care is being exercised in the present day in the marital unions of human beings than in the mating of prize cattle or horses. Such a cause as this must be looked upon as irremediable or unavoidable so long as unfit marriages continue, and it is hardly likely that a State will lightly intervene in this matter. It is obvious, further, that, irrespective of the best sanitary environments and circumstances, weakly infants will be born of such marriages only to swell the infantile death-toll. Sanitarians and statisticians must, therefore, reckon in the future, as in the present, with these unavoidable causes.

Under the head of preventable or avoidable causes may be placed the following, viz., (1) Insanitary domestic surroundings; (2) vicious and objectionable habits and modes of life of parents; (3) effects of parental poverty; (4) occupation of mothers during the early months of child-nursing; (5) wilful or compulsory abstinence on the part of mothers from nursing their offspring; and (6) physical unfitness of mothers for that duty, owing to different prime causes.

There is behind some of these causes the record of much hardship, misery, and despair; not a little heartlessness, cruelty, neglect, unmotherliness; and a great deal of all that indicates the absence of maternal instinct for the care of offspring. The combined effect of these causes is, without question, a deplorable wastage of infantile life, much of which is, or ought to be, preventable.

Infantile mortality in relation to declining birth-rates.—The prevalent high rates of infantile mortality reach a higher significance because of the gradual diminution which has been taking place during the last thirty years in the numbers of children born. In certain countries, indeed, it has rightly become a matter of national concern. It is significant that, with the probable exception of Germany, decline in the birth-rate is a noteworthy feature of most of the nations of the world. France has become a stationary population, and barely makes ends meet in its balance of lives. Italy possesses as yet a small balance on the right side. In America, President Roosevelt has had to draw the attention of his people to this, and designates the prevailing conditions as "race-suicide." Even in such young colonies as New Zealand the same element of diminution has to be recorded. Estimated per

1,000 of the population, the birth-rate of that colony has fallen from 40·78 in 1880 to 26·34 in 1901. Indeed, the annual increase of population in New Zealand is only better than that of France by the very small margin of 3 per cent. Coming nearer home, the same condition of reduced and falling birth-rates is found. Taking the United Kingdom as a whole, this declination has been steady since 1876. In that year, in England and Wales, the rate was 36·3 per 1,000 of population. In 1899 it had fallen to 29·2. In Scotland, in the decennium 1861-70, the rate was 35 per 1,000, and in 1891-1900 it had fallen to 30·70 per 1,000. Even in Ireland, which has always been noted for relatively lower birth-rates than Scotland or England, the same fact is to be recorded. In 1880 the rate was 24·7 per 1,000, and in 1901 it had fallen to 22·7. This fact for the United Kingdom may be expressed in a different way. If the figures for the United Kingdom be taken roundly, the decline in the birth-rate indicates that, in a total population of forty-one and a half millions, there has been an annual deficiency of about 250,000 infants reckoned on the rate which obtained in 1875. Or, to put it in another way, if the birth-rate for 1875 had been maintained up till 1900, the number of children born would have been approximately five millions more than the number which was actually born within these years.

If, then, we connote the high prevailing infantile mortality, which seems to persist in spite of advancing sanitation, and the gradually declining birth-rate, the significance of the relationship, and the need for enquiry on the part of statesman and sanitarian alike, become the more obvious.

Preventive measures.—It is quite apparent that the provisions of the Acts of Parliament for the protection of infant life, while they doubtless have contributed to prevent loss of lives by baby-farming and to remove the possibilities of over-insurance of infant lives, have done but little to conserve infant life generally. It would appear, indeed, in view of the many causes which tend to wastage in infant life, as if the institution of preventive measures must depend jointly upon the State, municipalities, and the medical profession. As has been said, it is not likely that the State will attempt to enact any measure which had for its object the prevention of unsuitable marriages between persons of unhealthy stock. Much might be said of the advantages which would likely follow the passing of such a measure, but it is not within the region of practical politics. In view, however, of the fact that so many child-bearing mothers are employed in certain

industries, and that such mothers are in the habit of resuming employment soon after delivery, it is a reasonable proposal that an Act should be passed whereby women should not be permitted to resume their work until the completion of a full month after delivery. This would be quite in keeping with certain provisions of the Factories Acts, which had for their object the prevention of inimical effects upon young persons and women employed in factories. Surely, if it be of importance to conserve the lives of such young persons and women, it ought to be the object of the State to preserve, as far as it can, the lives of the children who, if they survive, are to become the workers of the future. Not a little hardship would be likely to follow the passing of such a law at first, but that it would be salutary there cannot be the least doubt. The duty of municipalities or local authorities in this matter will be subject to much discussion. These duties seem to me, however, to be divisible into two classes—viz., administrative and educational. Keeping in mind that much of the infantile mortality is attributable to negligence and ignorance, both conditions will have to be fought, and, if possible, overcome. It has been too much taken for granted that all women who have borne children are instinctively able to care properly for them. This doctrine must be accepted only with misgiving, especially when applied to certain classes of our female population. It is quite true that enlightened communities, through the agency of sanitary and registration offices, have for long been distributing pamphlets explanatory of the best modes of caring for and rearing children; and such a practice is good, as far as it goes. But the fact remains that no benefit, so far at least as is discernible in infant death-rates, has yet accrued from the practice. Something more evidently requires to be done. It appears to me that nothing short of practical demonstration of approved methods of rearing children, and especially of the artificial methods of feeding children, in cases where lack of maternal milk supply, or necessity to work, prevents natural feeding, will suffice. Not only so, but even where infants are fed at the breast, many mothers require to be educated respecting times of feeding. Such a duty might, with great advantage, be imposed on trained women appointed for the purpose; and such women might, with further advantage to the poorer classes of the community, inculcate the need for, and indeed supervise, cleanliness of the home. Experiments of this kind have already been made, and have been followed with beneficial results.

One such experiment may be instanced. In Salford, where one of the latest experiments was made, the average infantile mortality per annum between the years 1895 and 1900 was 211 per 1,000 births, and in 1901 was 205 per 1,000. By reason of these very high rates, the Council determined to try means toward reduction, and they appointed trained women to the district of the town called Greengate. In this district the infantile mortality in 1900 was 224 per 1,000 births; in 1901, 246 per 1,000; but in 1902, after the conclusion of the year's experiment, it fell to 178 per 1,000. While it would not be legitimate to infer from these figures that the reduction was solely due to the nature of the experiment, it would be quite fair to say that the experiment was likely to be a not unimportant factor.

In this district, during the currency of the experiment, the feeding of 494 infants was carefully observed and supervised. Of that total, 384 infants were reared exclusively on the milk of the mother, and 39 died, giving a death-rate of 104 per 1,000; 65 others were fed on food supplementary to the milk of the mother, and of these 10 died, showing a death-rate of 154 per 1,000; 30 were reared artificially on the milk of the cow, of whom 12 died, the mortality being at the rate of 400 per 1,000; 25 were fed on other food, of whom 11 died, showing a rate of 440 per 1,000.

Such figures as these, which might be multiplied indefinitely, are more eloquent than words to show the pernicious effects of improper and injudicious feeding. It is not to be wondered at, therefore, in face of this deplorable wastage of infant life, that sanitary authorities have been seeking a remedy in the direction of improved infantile feeding. It will be readily apparent that whenever an infant is deprived of the healthy milk of its mother, its risks of non-survival are greatly increased. Not only is it in ordinary circumstances subject to the dangers of gastro-intestinal ailments arising from the use of artificial foods, but, in the case of milk, it is specially liable to the dangers which are due to microbic contamination of the milk from imperfect cleanliness of the bottles in feeding, and also to such contamination as the milk may receive from the insanitary state of the house or place in which the supply is kept. This is especially true during those months of the year when climatic conditions tend to the greater activity of those organisms which determine the incidence of infective or epidemic diarrhoea. For these reasons the plan of sterilising milk was first suggested.

This project of sterilising and humanising milk of cows for

infant feeding had its origin in the town of Fécamp, in Normandy. The success which attended its use caused further enquiry on the part of certain sanitary authorities who were anxious to prevent, as far as possible, the deaths of infants from causes attributable to bottle-feeding under ordinary circumstances. This practice was followed by the town of St. Helens, Lancashire—a manufacturing town in which many mothers are employed in the public works—on the advice of Dr. Drew Harris, its medical officer of health. The milk is subjected to a temperature of 102° C. for three-quarters of an hour in closed bottles, is thereafter removed and allowed to cool in the bottles. It is thus perfectly sterilised, and will keep sweet for over a month if retained in the closed bottles. It is obvious that in any scheme of municipal sterilised milk supplies, suitable precautions must be exercised respecting its distribution. Where a woman is unable, for any legitimate reason, to nurse her infant, such a supply, put up in bottles containing quantities sufficient for one meal for infants of different ages, and at a price easily within the reach of such persons, would not only be an invaluable boon to the parent, but would undoubtedly tend toward the preservation of the life of the infant. In order, however, to derive the fullest value from these supplies, some collaboration between hospital dispensaries and the milk dispensers would be requisite. Apart from this, however, much good may be expected where the scheme is instituted.

Establishment of public crèches.—A very slight acquaintance with the problems of the poorer classes quickly shows that not a little of the infantile mortality depends upon the inability of the mother to give the requisite time to the nursing of the child, when for the time being she happens, from the illness or want of employment of the husband, to be the breadwinner of the family. Absence of attendance, or want of intelligent attendance upon the wants of the child, is not infrequently the beginning of the mischief which culminates in the child's death. This may easily happen where the person left in charge is an elder sister of the infant, but who herself may be of tender years, or a neighbour. It appears to me that very important help might be rendered to overcome this difficulty by the establishment of municipal crèches in the poorer parts of a city. It may be said that established crèches in towns have not proved the success which was expected from their institution. How much this has been due to the cost of keep of the child is difficult to answer, but it can easily be imagined that even the small cost

which is commonly demanded is a serious item of expense where the woman's earnings are always low.

Much might be further elaborated on this subject generally, but whatever measures are adopted on these lines, municipally or otherwise, the beneficial results which will follow, as has already been demonstrated in France, will far outweigh the cost, since, viewed either from an ethical or economic standpoint, there can be no higher work than the preservation of infant life, and all the more especially as sanitary enactments seem to have failed to lessen the mortality of the infantile section of the community.

Professor Jardine said that recently a great deal had been said about deterioration of the race. He had taken the average weight of 100 full-time children born in the Maternity Hospital in 1866, and he had found that it worked out at 7 lb. 3½ oz. Similarly, the average in 100 born in the beginning of this year had given 7 lb. 9½ oz., or a gain of exactly 6 oz. The number was not a very large one, but he thought it was quite sufficient to prove that, at all events, there was no deterioration in the infants prior to birth. If there were deterioration, and he was afraid there was, it arose later from improper feeding and insanitary surroundings—especially from the want of sunlight and fresh air.

The subject of rickets was a very important one in Glasgow, and although it might be somewhat outside the scope of the present discussion, he would like to draw attention to statistics of the Glasgow Maternity Hospital which he had published some years ago in the third volume of the *Glasgow Hospital Reports*, and also in his *Clinical Obstetrics*. Between 1869 and 1878, in the outdoor cases, 4 craniotomies were done (1 in 2,138); and in the indoor cases, 2 craniotomies (1 in 1,480) and 2 inductions of labour (1 in 1,480). Between 1879 and 1888, in the outdoor cases, 20 craniotomies were done (1 in 620); and in the indoor cases, 38 craniotomies (1 in 76), 10 inductions of labour (1 in 296), and 3 Cæsarean sections (1 in 987). Between 1889 and 1898, in the outdoor cases, 16 craniotomies were done (1 in 1,260) and 3 inductions of labour (1 in 6,718); in the indoor cases, 112 craniotomies were done (1 in 39), 91 inductions of labour (1 in 48), and 56 Cæsarean sections (1 in 77). He also stated that in 1903 the average of badly contracted pelves treated in the hospital had been 1 in 7. The figures showed that during the fifties rickets must have been a comparatively rare disease, because it must be borne in mind that these patients were at least

20 years old. Then there must have been a sudden great increase. Now, what was the cause of this? It was not a question of bad times, because during that time there had been undoubtedly hard times among the poor, but there had also been spells of good times without any appreciable diminution of the disease.

Within recent years sanitary science had done much in the slums, and he was of the opinion that rickets was on the decline. The Maternity Hospital statistics did not show this as yet, but fifteen or twenty years hence he was quite confident there would be fewer contracted pelves to deal with than at present. At present they were dealing with cases that had arisen twenty or more years ago, when the disease was extremely prevalent.

As regards the children of these rickety women, they were quite healthy and well developed at birth. He had never seen a case of foetal rickets among them, and there was no record of any such in the hospital books.

As Dr. Chalmers had based his statistics on the deaths which had occurred in 1902, he (Dr. Jardine) had thought it might be of interest if he gave the statistics of the outdoor department of the hospital for that year. In all, 2,091 cases had been attended at their own homes, and of these 35 had aborted and 151 had had stillborn children—42 from accidents at birth (*i.e.*, where there had been difficult deliveries by forceps, versions, and craniotomies), 41 in which no cause was given, 43 macerated foetuses, 24 premature, and 1 monster. Five children had died within a week, and 1 in the second week. Seventy-three children per 1,000 births were thus born dead. Of the 43 macerated foetuses he was quite sure that syphilis played a large part in the cause, and the same might be said of the premature births. Syphilis was a disease which must be taken into account in dealing with infantile mortality, and, as they were aware, the registrar's returns could not be relied upon in respect to it.

There was little doubt that the terrible mortality in infants was very largely due to improper feeding. Improper feeding of the mothers would undoubtedly tell upon the infant in lessening the mother's supply of milk, but he did not think it had much effect upon the foetus *in utero* unless the starvation was extreme. In a case of excessive vomiting of pregnancy, where the mother had become extremely emaciated, the foetus had suffered to a like degree. In the siege of Paris and in the times of famine he believed the infant mortality had been lower than usual, due, no doubt, to the mothers suckling them.

Mother's milk was the proper food for the child, but, unfortunately, many mothers were unable to nurse their children. There were, of course, some who could but would not do it, but it was a fact that there were many who were quite willing and anxious to do so but could not. In all his private cases he insisted on the mothers nursing if they were healthy, but in quite a number he found they could not do so. Pasteurised cow's milk and cream was the best substitute for mother's milk, and if it was properly prepared, and the bottles carefully attended to, the children would do well on it.

Among the poor there was great difficulty in getting them to take proper care, and the results were often disastrous. The wonder was that any of the children lived. The pasteurised and sterilised milk supplied by the dairies he had found not satisfactory. For the poor it was better than the ordinary milk, but if possible the milk should be prepared at home, night and morning. Unless some means were taken to educate the mothers, he was afraid the terrible sacrifice of infants would go on.

Dr. R. Barclay Ness said—You have seen from the figures on infantile mortality presented to you by *Dr. Chalmers* that Glasgow holds, in comparison with other large towns in England and Scotland, a very good place.

These figures show that the death-rate among infants in Glasgow for the year 1902, for example, was lower than that of Manchester, Birmingham, Liverpool, London, Aberdeen, and Dundee, though it is little higher than that of Edinburgh. Nevertheless, the infant mortality in Glasgow for this year was 128 per 1,000 births, and that, apart from comparisons, for it was unusually low, indicates, indeed, a serious loss of life.

But what standard should be aimed at? On this point *Budin*, of Paris, gives it as his opinion that deaths of infants should not exceed 90 to 100 per 1,000 births.¹ This is not too low a standard; certain organisations have reduced infant mortality even to 69 per 1,000 births.

Now, it has been pointed out that the heaviest mortality is in the first month of life, being in Glasgow for 1902 during that month as high as 340·6 per 1,000 births, as compared with 128 per 1,000 for the whole of the first year. Each month after the first shows a gradual reduction, with the exception of the eighth, during which there is a rise in the death-rate, presumably connected with the disturbances common at the period of dentition.

¹ *British Medical Journal*, 26th September, 1903, pp. 764, 765.

From these figures it would appear that if any very great reduction in the death-rate of infants is to be brought about it must be by measures which will influence the death-rate of the first month. It is during this month that weaklings die. How are these to be diminished in number? Stronger infants can only be brought forth by healthier parents, hence the necessity for diminishing the prevalence of tuberculosis, syphilis, alcoholism, &c.; for dealing with the sanitary conditions under which people live, especially those connected with the one apartment houses; for taking greater care of the women during the latter months of their pregnancy, and for rendering them efficient aid during their confinement.

Such measures would tend to diminish the number of premature births, the births of weaklings, and the birth of children injured during delivery. It would also ensure the safety of the mother and her ability to nurse the child.

The points raised here cover a very wide field, but are none the less important in any organised attempt to deal with the question. But the very breadth and extent of the subject may tend to make the practical physician feel that the business lies outside his province, and that it is more for public sanitary authorities, like our medical officer of health and Professor Glaister, than for him.

Dr. Jardine has presented to you some practical suggestions from his experience at the Maternity Hospital; my views have taken shape from my experience at the Sick Children's Hospital, and, I believe, while recognising that great social and sanitary problems must be solved before a great reduction in infant mortality can be brought about, that a very substantial difference may be made by measures directed chiefly towards the care of the children themselves.

Causes.—If we consider what are the most important causes of death during the first year of life, we will find, according to Dr. Chalmers' table, that there are three—(1) immaturity, (2) diseases of digestion, (3) diseases of the respiratory system. The first go to increase the death-rate during the first month, and represent to some extent Dr. Chalmers' refractory element, but the second and third represent what Professor Glaister has spoken of under the heading of preventable diseases.

My experience at the Dispensary of the Sick Children's Hospital is with the latter, and as they affect children above one month. Infants under one month are rarely brought to the dispensary, and when they are it is usually on account of some injury received at birth or some congenital malformation.

Of 9,109 new cases (children under 12 years) who attended the dispensary during 1902, 5,340 were medical and 3,769 were surgical. Dealing with the medical cases only, it was found that half of these were equally divided among three classes—(1) respiratory diseases, (2) gastro-intestinal disorders, (3) rickets, a condition closely associated clinically with the first two. The other half of the medical cases was distributed among the other disorders of childhood.

This shows how common these diseases are among children, and when we consider the fact that 1,790 of these medical cases were under 1 year—that is, more than one-third of the whole number representing children under 12 years of age—we find that we are dealing at least with two classes of the diseases which appear in the registrar's returns as causing death among infants. Though rickets is not reckoned as an important cause of infant mortality, the above figures indicate how prevalent the disease is, and should be taken as pointing to the prevailing conditions of child life.

These cases usually come from small overcrowded houses, they breathe a vitiated atmosphere from morning till night, they get little fresh air by ventilation, and they are seldom taken out of doors. I have read with some care Dr. Chalmers' address to the Royal Philosophical Society "On the Death-rate in One Apartment Houses," and although he was naturally guarded in what inferences he drew from his statistics and was content to indicate that it was the mode of life in these houses that was at fault, yet there could be no more convincing proof offered than he has done of the fact that the diseases from which child-life suffers is largely associated with the surroundings in which the children live.

Admitting the fact, let us pass from this aspect of the question with the hope that a gradual amelioration of the conditions referred to will take place, and let us consider some points connected with the two important causes of infant mortality already referred to—(1) gastro-intestinal disorders, (2) respiratory diseases.

Gastro-intestinal disorders.—In connection with gastro-intestinal disorders of infants, I would refer, in the first instance, to the unwillingness or inability on the part of the mother to suckle her children. It is true, I think, that very often women in the upper ranks of society are unable to nurse their children, but many who are able find it inconvenient. As a general rule, on the other hand, the women of the middle class are both able and willing, while those of the lower class are willing but often unable owing to the outside duties that

devolve upon them. This lies at the root of the matter. The infants that suffer from gastro-intestinal disorders are bottle-fed children.

Cautley¹ states that in Norway and the Faroe Islands, where infants are mostly breast-fed, the mortality falls as low as from 8·5 to 10·5 per cent; while in such countries as Iceland, Bavaria, Austria, Hungary, and Spain, where infants are fed largely on farinaceous food, the mortality rises as high as 30 per cent. At the siege of Paris and during the Lancashire cotton famine, the infant mortality was largely reduced, while the adult mortality increased, because the mothers naturally kept their infants at the breast.

Dr. Cameron, of Leeds, has also showed that of 153 cases of diarrhoea among infants which he investigated, 18 per cent were on the breast only, 14 per cent were on the breast partially, 68 per cent were not on the breast, while 76 per cent were on the bottle wholly or partially.

In France the question of infant mortality is a far more serious one than it is at present in Britain, because of the very marked diminution in the birth-rate—a fact which is beginning to present itself in this country too, but which is still counter-balanced by the gradual diminution in the general death-rate.

In France, Zola was led to deal with the question in one of his later books—*Fécondité*—in which he tried to awaken the nation to the reality. In one passage he makes the doctor say, “It may be all summed up in this verity, ‘It is a mother’s duty to suckle her child,’ . . . when we know how to worship motherhood our country will be saved, and this is why I should like a mother suckling her babe to be adopted as the highest expression of human beauty.”

France, because of its greatly diminished birth-rate, and the gradual depopulation that is consequently taking place, has been forced to adopt wider measures for the preservation of infant life than any other country. Among the many institutions established for the purpose are the “Hospital Consultations for Infants.”² To these hospitals women are admitted for their confinements, free of charge. They are induced to suckle their infants, and even after they leave constant supervision is kept up, whereby the child is reared in most cases on the breast. If for some reason the mother is absolutely unable to suckle the child, she can get pure sterilised milk at the hospital daily.

¹ Cautley, *The Natural and Artificial Methods of Feeding Infants and Young Children*, second edition, pp. 7-9.

² *British Medical Journal*, 25th April, 1903, pp. 974, 975.

Statistics show the advantage of such a system. At the Clinique Tarnier, of 527 infants, only 23 died; of these latter 3·12 per cent were breast-fed, 12·50 per cent had mixed feeding, while 10·10 per cent were reared altogether artificially. Among all these cases there was not one of gastro-enteritis.

This indicates what supervision will do, and it points out the lesson that some organisation should be set up for the express purpose. It is a question for the Maternity Hospital whether or not it would have an outdoor department of this kind conducted on the same lines. The difficulties are obvious, but the advantages would be very great, the most important being that the mother would be constantly reminded of her duty to the child.

Artificial feeding.—However much we deplore the fact that mothers do not nurse their children at the breast as they should, the problem presented at the Children's Dispensary as elsewhere is how best to feed the children artificially who cannot be reared in the natural way. It is surprising that so many bottle-fed children live at all. They are constantly brought up to the dispensary drinking from tubed bottles sour-smelling milk, which will turn blue litmus paper quickly red from excessive acidity, the result of lactic acid fermentation, the child meanwhile suffering from symptoms of gastro-intestinal catarrh.

At this dispensary everything is done to bring about a radical change in their methods of feeding infants. A proper bottle at cost price is even supplied if necessary. Instructions, both verbal and printed, are given as to procuring and preserving the milk; also, its modification to suit the age of the child, the use of such diluents as limewater and barley-water, &c.; the quantities to be given and at what intervals; the cleansing of bottles, &c.

It is obvious, however, that among this class certain essentials to the proper feeding of the infant may be absent. The milk obtained may be good or bad; when obtained it is too often kept in a vitiated atmosphere for hours before it is used; the modification of the milk is too often imperfectly carried out.

Pure milk.—The most important point of all is whether or not the child obtains pure milk; and Dr. Chalmers has adopted the sound position, namely, that it must be the first aim of the community to obtain a pure milk-supply. Milk may satisfy the required standard in having a sufficient amount of cream or fat, yet it may be altogether impure as judged by a proper bacteriological standard, and it has to be remembered that sterilisation can never convert impure milk into pure milk.

If the Glasgow Corporation would establish an ideal farm which would supply milk to all the fever hospitals, and the general hospitals if desired, and established milk depôts in the city for the supply of *pure milk for infants*, this would be the first step in the right direction. At the present time this pure milk is not supplied, and the farmers are best to know it by some practical lesson such as this.

Milk depôts would be a great advantage to the community, and would exist for two purposes—the supply of

1. *Pure milk*.—Milk obtained as pure as possible and cooled quickly, or pasteurised at a temperature of 158° F., or sterilised at a temperature of 212° F.

2. *Modified milk*.—That is pure milk, sterilised or pasteurised, and modified to suit the child at a particular age. Such milk, supplied in a series of bottles, each containing the necessary quantity for one feed, would be a great boon to the poorer class of the community. Under any circumstance the milk mixture given the infant must be infinitely better than that made up by the mother in her own way at home. The establishment of milk depôts by the Corporation of this city must be accepted as an effort to assist in a practical way those mothers unable to modify the milk for themselves. It is to be hoped that this will tend to diminish the gastro-enteritis so common among bottle-fed infants; possibly influence, too, that severe form of this condition, epidemic diarrhœa, which is the result of an acute toxic poisoning, occurring commonly during the third quarter of the year, by milk undergoing rapid changes under the influence of bacterial poisons. This condition is particularly fatal to young infants. They succumb often with very few symptoms, and often from an attack apparently mild at the onset.

The real advantage, then, of these milk depôts is to prevent the gastro-intestinal disorder to which the child is liable. But anyone who has had much experience in the feeding of infants will acknowledge how difficult it is often to get cow's milk to agree with the child, and how necessary it is to study the requirements of each, and modify the various ingredients of the milk accordingly. One could scarcely, therefore, expect that the same modification of milk will suit all children under 3 months, yet this is often the weakest milk supplied at such depôts.

One test, among others, as to the suitability of the milk for the child is the gradual increase of weight, and a record of this should, therefore, be kept for each child receiving the

milk. If the child is not gaining weight, the milk is not suitable, and there will be other indications that the milk is not agreeing with the child. The milk will then require further modification, and this must be indicated by the one in charge of the depôt. This, I think, can only be done in an efficient manner by a physician who understands the percentage methods of modifying milk, and who knows how to deal with the milk so as to prevent undesirable effects.

If this is true with regard to more or less healthy children, it is more particularly so with regard to children who are already suffering from a more or less acute form of gastro-intestinal catarrh. These cases have to be treated by the general practitioner or at the dispensaries, and the milk for these require to be modified to a still greater extent than is necessary for healthy children or children only slightly disturbed by improper feeding. I would, therefore, point out the great advantage a milk depôt would be if carried on in the neighbourhood or in association with an institution like the Children's Dispensary, where the milk would be supplied according to the prescription of the physician. The advantage to the infant, I believe, would be greater than would be derived from much medicine. There would also be greater opportunity of testing the efficacy of the system.

Hospital treatment of infants suffering from acute gastro-intestinal disorder, especially the epidemic form, is necessary in view of the fact that the recognised treatment of these cases has often to do with such measures as will rid the gastro-intestinal tract of the poisons, and others that will counteract the depressing effect of these, *e.g.*, stomach washing, purgatives, irrigation of the colon, hot baths, saline injections, stimulants, drugs; yet of all serious cases among children these at the present time derive least help from hospital treatment. Cases of acute gastro-intestinal catarrh often run a very rapid course, and end fatally within a short time, therefore they should be admitted early.

A few of these cases are admitted at the present time on the plea of urgency, the only plea which is of avail, there being no infant wards in connection with our hospitals.

Respiratory diseases.—This is the other large group of diseases which has to do with infant mortality, and is more intimately connected with the vitiated atmosphere of the overcrowded houses than the gastro-intestinal cases just considered. These conditions are often secondary to rickets, whooping-cough, and measles, though the last is not so common among

infants. Where these cases are independent of infectious disease, I think more provision should be obtained for them also in hospitals by the establishment of infant wards.

With regard to the treatment of bronchitis and bronchopneumonia as a complication of whooping-cough and measles, more advantage should be taken of the municipal facilities. These cases, if the mother will take them, should be sent to the fever hospitals, and they should be treated there for the pulmonary complications, even though the period of infectivity might be considered past, because these children are not admitted into other hospitals, even at a late date, for fear of infection.

Illegitimacy.—The next point for attention is illegitimacy. It is a notable fact that illegitimate children under 1 year die at almost twice the rate of legitimate children. Thus, in 1902, the death-rate for legitimate children was 126 per 1,000 births, while for illegitimate children it was 244. This may be shown to be true year after year, and, in Dr. Chalmers' words, "too faithfully reflects the systematic neglect to which many of them are exposed." If personal experience is of any further value in view of these figures, it may be said that at the Sick Children's Dispensary the fact is very apparent. It is not an uncommon occurrence for a thin, wasted, neglected infant to be brought up for treatment, not by the mother, but by some relation, a friend, or some one who has lately adopted the child. The story is such as to show that the child has passed from one person to another while the mother is trying to make her livelihood, and that the infant has been fed without any care as to what the nature of the food should be, with the result that the child, though fed, is starved, and soon presents the picture of neglect, and "no one is to blame." There is little doubt that these infants should be taken from among the hands of those who care so little for their welfare; even a mother who no longer desires to have her child should be relieved of it.

The above figures show that whatever agencies are already at work to save these children, they require to be largely supplemented.

Crèche.—In conclusion, I would refer to the crèche or day-nursery, which is of great assistance to those mothers who are forced to work for their livelihood. These institutions should be more largely supported, and under the charge of women well versed in the artificial feeding of children. Their efficiency would be much enhanced by the assistance which might be obtained from the milk depôts.