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AGE INCIDENCE OF THE COMMON COMMUNICABLE DISEASES OF CHILDREN[1]

A STUDY OF CASE RATES AMONG ALL CHILDREN AND AMONG CHILDREN NOT PREVIOUSLY ATTACKED AND OF DEATH RATES AND THE ESTIMATED CASE FATALITY

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Introduction

A considerable mass of data on the chronological variation in the occurrence of the common communicable diseases as indicated by reports to the State boards of health has now been accumulated, and for some States and cities the cases are available by age and sex. But these morbidity reports to the State boards of health are deficient in that (*a*) they fail to indicate the total or complete incidence of the disease (29). Continued effort may secure fairly complete reports of recognized attacks of a severe condition like diphtheria, but by no amount of effort can we expect to secure even approximately complete reports of chicken pox and mumps. (*b*) The morbidity reports may fail to indicate the relative prevalence at different ages. It is usually assumed that the cases which are reported are distributed as the total are distributed so far as age is concerned. For mild conditions, such as chicken pox or even measles, this assumption may be incorrect, as it may be that a certain number of such cases discovered in school inspections would, in children below school age, not have been seen by a physician and would not therefore have been reported to the health department.

[1] From the Office of Statistical Investigations in cooperation with Field Investigations in Child Hygiene, United States Public Health Service.

However, these diseases of childhood are of great importance. Measles and whooping cough cases occur in such large numbers that, despite the small fatality, they together cause as many deaths as diphtheria. Even the milder of the children's diseases cause much absence from school and in sizable epidemics hamper the progress of the class.

The present study is an attempt to estimate from histories of past attacks of a disease, as given by persons of different ages, and from death rates, (*a*) the absolute incidence, (*b*) the case fatality, and (*c*) the incidence in successive ages among all children and among children not previously attacked.

If an attack of whooping cough gives a lasting immunity so that second attacks are rare and may be neglected, the proportion of 15-year old persons giving a history of whooping cough represents an accumulation of percentages having had the disease at each year of age under 15.

Of course, if we attempt to derive from histories of past attacks what, on the average, this accumulated percentage would be for different ages, there is a source of error in that attacks may be forgotten. As age increases, the number of attacks forgotten no doubt increases; and since the incidence of these childhood diseases is rather small among older children, the relative error may be considerable. These facts should be remembered in considering the rates derived from the histories for older children.

Of course, it is realized that the age incidence of these diseases varies under different conditions. For example, a larger proportion of the cases occurs in the very early years of life among urban children than among rural children (9), (11). Again, in isolated places where an epidemic has not occurred for a long time, measles has attacked adults freely (1); and in instances where it was introduced for the first time into a population not previously exposed to measles, as in the Faroe Islands in 1846 and in the Fiji Islands in 1875, adults were attacked as often as children (2), (5), (26). It should be emphasized that what is considered in the present study is the mean incidence for a considerable period of years under conditions such as exist in the more or less representative urban and rural communities where the data were collected.

Basic Data for the Study

A previous report by the Public Health Service considered the percentage of school children of different ages who had at some time in their lives suffered an attack of the communicable diseases of childhood, together with such approximations of the rates at specific ages as seemed warranted from the data then available on the history of these diseases (4). The data considered in that report were for children from 5 to 19 years of age. Similar data have since been collected by the Public Health Service for (*a*) a group of families, including persons of all ages in Hagerstown, Md., and (*b*) a group of college students attending various universities throughout the United States.

In the Hagerstown study the data on the history of infectious diseases were secured at the time of the initial visit to the household in connection with a study of morbidity which involved repeated visits (28). The informant was usually the wife or mother or some other adult member of the household. Data collected in this way are probably fairly accurate for the children of the household, particularly when the mother was the informant, but less accurate for adults about whose childhood diseases the wife would not have complete information.

A group of college students who had been making semimonthly reports of attacks of colds and other minor respiratory illnesses to the Public Health Service were requested to give information as to whether they had at any time in their lives been attacked by each of a list of diseases, the list including the children's diseases considered in the present study and one or two other infectious diseases (32). In this instance, therefore, the person is answering only for his own disease history, and the data should be more accurate than disease histories for adults collected by canvasses of households. Even here the person may have forgotten mild attacks of these more or less mild diseases or may have had an attack in early childhood but never have been told of its occurrence.

In addition to these two studies, similar data have been made available from certain other communities. Data collected in Baltimore by Dr. James A. Doull, of the department of epidemiology of the Johns Hopkins University School of Hygiene, in cooperation with the Baltimore City Health Department, have been published for certain age groups (6), (10). Through the courtesy of Doctor Doull and Surg. W. H. Frost, these data in more detailed age groups have been made available to us. They are particularly important for the preschool ages. The method of collection was similar to that used in Hagerstown, and the data should be accurate for the early ages.

Through the courtesy of the United States Children's Bureau, unpublished data on the history of certain infectious diseases for children from birth to 8 years of age, collected in connection with the study of the physical status of preschool children in Gary, Ind., have been made available to us (24).

Published data on the history of infectious diseases are available for the children of London, Canada, from birth to 20 years of age (13).

By far the largest mass of data of this kind is for the school children in the 15 localities studied in the previous report by the Public Health Service (4), the number of children considered for a single age running as high as 4,000. There is, of course, considerable variation in the different localities, due in part to the time at which the data were collected in relation to the chronological cycles in the incidence of the diseases in the locality, but the results for none of these localities seem to be sufficiently different from the average to warrant exclusion from the general mass of data represented by the total. Moreover, it seemed important to average as many localities as possible in order to eliminate the effect of the cycles in the incidence of these diseases. The desired percentage of children of different ages who have had an attack of the disease is one that is true, on the average, and is as free as possible from the effect of the time elapsing since an epidemic has prevailed in the community.

In the present study it was proposed to add to the data for school children similar data for the preschool ages and for adults. In doing this, data for the preschool ages were selected from such of the other sources as showed curves which agreed reasonably well with the early school ages. Similarly, data for adults were used for such localities as agreed with the later ages of the school data. In adopting this method it is not assumed that the data for the school children are more accurate than other data for those ages; but, since the number of children in the school group is so much larger than the number considered in any other group, percentages based on the combination of all the data available for the school ages will be very near to those based on the school group only, unless the different localities are given arbitrary weights. Such being the case it seemed reasonable to extend the combined data to the preschool and adult ages by adding only such data as agreed fairly well with the school group. Table 1 shows for the different localities used the percentage of children of each age who have had an attack of measles, as well as a similar percentage for all the localities combined. Tables 2, 3, 4, 5, and 6 show similar data for whooping cough, mumps, chicken pox, scarlet fever, and diphtheria, and Table 7 shows for three cities the percentage of children whose Schick test was negative.

TABLE 1.—*Measles history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities						Percentage of persons who have had an attack					Number of persons who have had an attack					Total number of persons considered				
Age (years)	Percentage of persons who have had an attack of measles: Computed	Percentage of persons who have had an attack of measles: Actual	Number of persons who have had an attack of measles	Total number of persons considered	Age [1] (years)	School children in 15 localities in United States (4)	Hagerstown, Md. (28)	College students in 11 universities in United States (32)	Baltimore, Md. (6)	Gary, Ind. (24)	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States	Baltimore, Md.	Gary, Ind.	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States [2]	Baltimore, Md.	Gary, Ind.
0.5	2.26	2.34	28	1,195	Under 1		3.2		3.3	1.0		5		18	5		157		546	492
1.5	11.04	11.44	136	1,189	1		13.3		15.0	7.2		23		77	36		173		514	502
2.5	22.87	22.16	263	1,187	2		18.4		24.8	20.5		28		130	105		152		524	511
3.5	36.07	36.45	433	1,188	3		30.1		36.9	37.9		46		199	188		153		539	496
4.5	49.02	46.09	602	1,306	4		41.5		46.7	47.2		85		258	259		205		552	549
5.4	59.45	61.48	988	1,607	5	67.1	61.7		60.3	60.6	141	127		316	404	210	206		524	667
6.3	68.16	68.12	1,733	2,544	6	67.4	63.2		66.7	71.7	803	122		319	489	1,191	193		478	682
7.1	74.31	76.05	2,835	3,728	7	75.7	82.7		77.2	73.6	2,166	134		373	162	2,863	162		483	220
8.0	79.52	79.92	2,958	3,701	8	79.9					2,958					3,701				
9.0	83.48	83.39	3,410	4,089	9	83.4					3,410					4,089				
10.0	85.97	84.45	3,524	4,173	10	84.4					3,524					4,173				
11.0	87.43	86.75	3,318	3,825	11	86.7					3,318					3,825				
12.0	88.23	86.45	3,184	3,683	12	86.5					3,184					3,683				
13.0	88.65	88.64	2,738	3,089	13	88.6					2,738					3,089				
14.0	88.85	89.02	1,938	2,177	14	89.0					1,938					2,177				
15.0	88.94	86.63	1,050	1,212	15	86.6					1,050					1,212				
16.0	88.98	90.87	567	624	16	90.9					567					624				
17.0	88.99	79.18	251	317	17	79.2					251					317				
18.3	89.00	89.52	316	353	18	90.1		89.1			136		180			151		202		
19.5	89.00	89.73	498	555	19	89.6		89.7			43		455			48		507		
22.5	89.00	89.30	1,660	1,859	20–24			89.3					1,660					1,859		
27.5	89.00	89.10	335	376	25–29			89.1					335					376		
32.5	89.00	94.41	152	161	30–34			94.4					152					161		
37.5	89.00	83.10	59	71	35–39			83.1					59					71		

[1] Ages for school children in the 15 localities are nearest birthday; all other groups are age last birthday.
[2] College based on total population known for either measles or German measles but unknown for both diseases is excluded; cases or attacks are of measles exclusive of German measles.

Table 2.—*Whooping cough history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities						Percentage of persons who have had an attack				Number of persons who have had an attack				Total number of persons considered			
Age (years)	Percentage of persons who have had an attack of whooping cough		Number of persons who have had an attack of whooping cough	Total number of persons considered	Age[1] (years)	School children in 15 localities in United States (4)	Hagerstown, Md. (28)	College students in 11 universities in United States (32)	London, Canada (13)	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States	London, Canada	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States	London, Canada
	Computed	Actual															
0.5	5.01	5.21	16	307	Under 1		4.5		6.0		7		9		157		150
1.5	9.70	10.46	39	373	1		5.8		14.5		10		29		173		200
2.5	17.40	17.81	70	393	2		14.5		19.9		22		48		152		241
3.5	26.99	24.51	100	408	3		22.2		25.9		34		66		153		255
4.5	37.25	37.83	227	600	4		36.4		38.6		75		152		206		394
5.4	46.13	43.27	408	943	5	48.6	39.3		42.7	102	81		225	210	206		527
6.2	53.23	55.72	1,144	2,053	6	56.8	49.5		55.7	676	94		374	1,191	190		672
7.1	60.01	60.41	2,246	3,718	7	60.8	63.8		58.0	1,741	102		403	2,863	160		695
8.0	65.37	66.63	2,586	3,881	8	66.7	64.4			2,470	116			3,701	180		
9.0	69.75	69.77	2,971	4,258	9	69.7	72.2			2,849	122			4,089	169		
10.0	72.72	69.73	3,029	4,344	10	69.4	76.6			2,898	131			4,173	171		
11.0	74.61	74.17	2,946	3,972	11	74.2	72.1			2,840	106			3,825	147		
12.0	75.73	75.07	2,873	3,827	12	75.0	76.4			2,763	110			3,683	144		
13.0	76.36	77.27	2,499	3,234	13	77.4	75.2			2,390	109			3,089	145		
14.0	76.70	76.93	1,791	2,328	14	76.7	80.8			1,669	122			2,177	151		
15.0	76.86	76.59	1,021	1,333	15	76.4	78.5			926	95			1,212	121		
16.1	76.95	79.32	606	764	16	79.2	80.0			494	112			624	140		
17.1	76.98	74.66	330	442	17	73.5	77.6			233	97			317	125		
18.3	76.99	77.43	374	483	18	78.8	79.3	75.7		119	84	171		151	106	226	
19.5	77.00	78.28	602	769	19	72.9	75.7	79.2		35	87	480		48	115	606	
22.5	77.00	76.63	2,190	2,858	20–24		79.4	76.1			378	1,812			476	2,382	
27.5	77.00	75.15	874	1,163	25–29		78.2	72.8			394	480			504	659	
32.5	77.00	75.34	492	653	30–34		74.5	76.9			319	173			428	225	
37.5	77.00	75.89	384	506	35–39		76.6	73.5			298	86			389	117	

[1] Ages for school children in the 15 localities are nearest birthday; all other groups are age last birthday.

Table 3.—*Mumps history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities						Percentage of persons who have had an attack				Number of persons who have had an attack				Total number of persons considered			
Age (years)	Percentage of persons who have had an attack of mumps: Computed	Percentage of persons who have had an attack of mumps: Actual	Number of persons who have had an attack of mumps	Total number of persons considered	Age (years) [1]	School children in 15 localities in United States (4)	College students in 11 universities in United States (32)	Baltimore, Md. (6)	London, Canada (13)	School children in 15 localities in United States	College students in 11 universities in United States	Baltimore, Md.	London, Canada	School children in 15 localities in United States	College students in 11 universities in United States	Baltimore, Md.	London, Canada
0.5	0.69	0.29	2	698	Under 1			0.4				2				548	150
1.5	1.49	1.26	9	713	1			1.4	1.0			7	2			513	200
2.5	2.95	3.65	28	768	2			3.0	4.8			16	12			527	241
3.5	5.41	3.42	27	790	3			2.6	5.1			14	13			535	255
4.5	9.12	9.08	86	947	4			7.6	11.1			42	44			553	394
5.4	13.59	12.13	153	1,261	5	20.5		11.5	9.4	43		60	50	210		524	527
6.3	18.95	19.91	465	2,336	6	23.7		14.2	17.3	282		67	116	1,191		473	672
7.2	24.81	25.75	1,041	4,042	7	27.3		20.7	23.0	781		100	160	2,863		484	695
8.1	30.73	31.56	1,551	4,914	8	33.7		20.7	27.7	1,249		102	200	3,701		492	721
9.1	36.89	36.74	1,758	4,785	9	36.5			38.1	1,493			265	4,089			696
10.1	42.30	41.54	2,011	4,841	10	41.8			39.8	1,745			266	4,173			668
11.1	46.82	46.77	2,068	4,422	11	46.1			50.9	1,764			304	3,825			597
12.1	50.49	49.15	2,112	4,297	12	48.8			50.9	1,799			313	3,683			614
13.1	53.43	53.45	1,961	3,669	13	52.8			57.1	1,630			331	3,089			580
14.1	55.78	55.99	1,486	2,654	14	57.4			49.7	1,249			237	2,177			477
15.1	57.64	59.53	940	1,579	15	61.6			52.5	747			193	1,212			367
16.2	59.29	58.52	546	933	16	60.6			54.4	378			168	624			369
17.0	60.28	61.83	196	317	17	61.8				196				317			
18.3	61.62	60.36	233	386	18	64.9	57.4			98	135			151	235		
19.5	62.67	62.94	411	653	19	64.6	62.8			31	380			48	605		
22.5	64.89	64.88	1,583	2,440	20–24		64.9				1,583				2,440		
27.5	68.43	68.71	481	700	25–29		68.7				481				700		
32.5	71.11	73.86	178	241	30–34		73.9				178				241		
37.5	71.93	68.91	82	119	35–39		68.9				82				119		

[1] Ages for school children in the 15 localities are nearest birthday; all other groups are age last birthday.

TABLE 4.—*Chicken pox history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities						Percentage of persons who have had an attack		Number of persons who have had an attack		Total number of persons considered	
Age (years)	Percentage of persons who have had an attack of chicken pox		Number of persons who have had an attack of chicken pox	Total number of persons considered	Age [1] (years)	School children in 15 localities in United States (4)	London, Canada (13)	School children in 15 localities in United States	London, Canada	School children in 15 localities in United States	London, Canada
	Computed	Actual									
0.5	2.96	0.67	1	150	Under 1		0.7		1		150
1.5	6.51	8.00	16	200	1		8.0		16		200
2.5	11.50	11.20	27	241	2		11.2		27		241
3.5	17.39	18.82	48	255	3		18.8		48		255
4.5	23.60	22.08	87	394	4		22.1		87		394
5.4	29.06	25.92	191	737	5	22.4	27.3	47	144	210	527
6.2	33.53	33.01	615	1,863	6	33.2	32.6	396	219	1,191	672
7.1	37.99	39.09	1,391	3,558	7	38.8	40.4	1,110	281	2,863	695
8.1	42.08	42.04	1,859	4,422	8	42.5	39.8	1,572	287	3,701	721
9.1	45.26	45.08	2,157	4,785	9	44.9	46.0	1,837	320	4,089	696
10.1	47.60	47.92	2,320	4,841	10	47.7	49.2	1,991	329	4,173	668
11.1	49.25	49.66	2,196	4,422	11	49.6	49.9	1,898	298	3,825	597
12.1	50.34	49.94	2,146	4,297	12	49.8	50.8	1,834	312	3,683	614
13.1	51.04	49.66	1,822	3,669	13	49.2	51.9	1,521	301	3,089	580
14.1	51.47	51.58	1,369	2,654	14	50.4	57.0	1,097	272	2,177	477
15.1	51.72	49.21	777	1,579	15	48.3	52.3	585	192	1,212	367
16.2	51.87	54.02	504	933	16	54.5	53.1	340	164	624	309
17.2	51.93	58.36	321	550	17	60.3	55.8	191	130	317	233
18.3	51.97	53.89	173	321	18	57.0	51.2	86	87	151	170
19.4	51.99	58.33	112	192	19	58.3	58.3	28	84	48	144
20.5	52.00	47.37	36	76	20		47.4		36		76

[1] Ages for school children in the 15 localities are nearest birthday; for other groups ages are last birthday.

TABLE 5.—*Scarlet fever history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities						Percentage of persons who have had an attack					Number of persons who have had an attack					Total number of persons considered				
Age (years)	Percentage of persons who have had an attack of scarlet fever: Computed	Percentage of persons who have had an attack of scarlet fever: Actual	Number of persons who have had an attack of scarlet fever	Total number of persons considered	Age [1] (years)	School children in 15 localities in United States (4)	Hagerstown, Md. (28)	College [2] students in 3 universities in United States (32)	Baltimore, Md. (6)	Gary, Ind. (24)	School children in 15 localities in United States	Hagerstown, Md.	College [2] students in 3 universities in United States	Baltimore, Md.	Gary, Ind.	School children in 15 localities in United States	Hagerstown, Md.	College [2] students in 3 universities in United States	Baltimore, Md.	Gary, Ind.
0.5		0.17	2	1,195	Under 1		0.64		0.18			1		1			156		547	492
1.5	0.18	.08	1	1,189	1				.19					1			172		515	502
2.5	1.04	1.01	12	1,190	2		1.97		.57	1.17		3		3	6		152		527	511
3.5	2.09	2.10	25	1,189	3		2.61		2.41	1.61		4		13	8		153		540	496
4.5	3.26	2.90	38	1,311	4		2.89		1.81	4.01		6		10	22		208		554	549
5.4	4.36	4.71	76	1,614	5	5.24	4.29		3.61	5.55	11	9		19	37	210	210		527	667
6.3	5.45	5.46	139	2,545	6	5.88	3.08		3.98	6.45	70	6		19	44	1,191	195		477	682
7.1	6.37	6.37	238	3,736	7	6.50	4.32		6.52	5.91	186	7		32	13	2,863	162		491	220
8.1	7.43	7.49	328	4,379	8	7.81	6.56		5.45		289	12		27		3,701	183		495	
9.1	8.36	8.16	387	4,743	9	8.40	5.14		7.31		343	9		35		4,089	175		479	
10.1	9.14	9.10	440	4,803	10	9.51	7.47		6.58		397	13		30		4,173	174		456	
11.1	9.77	11.74	517	4,404	11	12.10	8.11		9.74		463	12		42		3,825	148		431	
12.1	10.27	10.31	439	4,258	12	10.51	9.52		8.88		387	14		38		3,683	147		428	
13.1	10.65	10.65	392	3,680	13	11.10	7.48		8.56		343	11		38		3,089	147		444	
14.1	10.93	10.94	306	2,798	14	11.76	5.84		8.78		256	9		41		2,177	154		467	
15.2	11.14	10.23	180	1,759	15	10.64	10.48		8.98		129	13		38		1,212	124		423	
16.3	11.28	11.70	90	769	16	11.86	11.03				74	16				624	145			
17.3	11.36	12.05	54	448	17	12.93	9.92				41	13				317	131			
18.4	11.42	10.10	30	297	18	7.33	10.71	20.59			11	12	7			151	112	34		
19.5	11.46	11.68	25	214	19	8.33	11.67	15.23			4	14	7			48	120	46		
22.5	11.49	11.75	98	834	20-24		9.44	15.56				49	49				519	315		
27.5	11.50	11.13	81	728	25-29		10.53	13.67				62	19				589	139		
32.5	11.50	8.18	50	611	30-34		7.47	14.52				41	9				549	62		
37.5	11.50	8.69	47	541	35-39		7.06	26.67				35	12				496	45		

[1] Ages for school children in the 15 localities are nearest birthday; all other groups are ages last birthday.

[2] Includes only students in the south Atlantic, east south central, and west south central divisions, mostly in Johns Hopkins, Georgetown, and Tulane Universities.

TABLE 6.—*Diphtheria history among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO HAVE SUFFERED AN ATTACK AT SOME TIME IN THEIR LIVES

All localities					Age (years)[1]	Percentage of persons who have had an attack				Number of persons who have had an attack				Total number of persons considered			
Age (years)	Percentage of persons who have had an attack of diphtheria: Computed	Percentage of persons who have had an attack of diphtheria: Actual	Number of persons who have had an attack of diphtheria	Total number of persons considered		School children in 15 localities in United States (4)	Hagerstown, Md. (28)	College students in 11 universities in United States (32)	Baltimore, Md. (6)	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States	Baltimore, Md.	School children in 15 localities in United States	Hagerstown, Md.	College students in 11 universities in United States	Baltimore, Md.
0.5	--	0.14	1	704	Under 1	--	--	--	0.18	--	--	--	1	--	157	--	547
1.5	0.77	.58	4	687	1	--	1.16	--	.39	--	2	--	2	--	172	--	515
2.5	1.70	1.18	8	680	2	--	2.63	--	.76	--	4	--	4	--	152	--	528
3.5	2.64	3.02	21	695	3	--	1.96	--	3.32	--	3	--	18	--	153	--	542
4.5	3.56	3.53	27	765	4	--	2.88	--	3.77	--	6	--	21	--	208	--	557
5.4	4.36	4.33	41	947	5	3.33	3.79	--	4.94	7	8	--	26	210	211	--	526
6.2	5.04	5.04	94	1,866	6	4.37	2.56	--	7.71	52	5	--	37	1,191	195	--	480
7.1	5.75	5.86	206	3,517	7	5.59	6.13	--	7.33	160	10	--	36	2,863	163	--	491
8.1	6.47	5.73	251	4,378	8	5.78	7.69	--	4.65	214	14	--	23	3,701	182	--	495
9.1	7.11	7.19	341	4,744	9	6.97	8.57	--	8.54	285	15	--	41	4,069	175	--	480
10.1	7.66	7.22	347	4,803	10	7.14	8.57	--	7.47	298	15	--	34	4,173	175	--	455
11.0	8.09	8.53	339	3,972	11	8.52	8.84	--	--	326	13	--	--	3,825	147	--	--
12.0	8.50	8.09	310	3,830	12	8.06	8.84	--	--	297	13	--	--	3,683	147	--	--
13.0	8.84	7.11	230	3,236	13	7.09	7.48	--	--	219	11	--	--	3,089	147	--	--
14.0	9.11	7.59	177	2,331	14	7.58	7.79	--	--	165	12	--	--	2,177	154	--	--
15.0	9.33	10.41	139	1,335	15	10.81	6.50	--	--	131	8	--	--	1,212	123	--	--
16.1	9.52	10.16	78	768	16	10.26	9.72	--	--	64	14	--	--	624	144	--	--
17.1	9.65	12.05	54	448	17	12.62	10.69	--	--	40	14	--	--	317	131	--	--
18.3	9.76	10.44	52	498	18	12.58	7.08	10.68	--	19	8	25	--	151	113	234	--
19.5	9.84	8.81	69	783	19	6.25	8.40	9.09	--	3	10	56	--	48	119	616	--
22.5	9.95	10.70	322	3,008	20–24	--	12.24	10.38	--	--	64	258	--	--	523	2,485	--
27.5	9.99	11.89	155	1,304	25–29	--	11.79	11.96	--	--	69	86	--	--	585	719	--
32.5	10.00	8.58	69	804	30–34	--	8.00	9.84	--	--	44	25	--	--	550	254	--
37.5	10.00	8.52	52	610	35–39	--	6.95	14.88	--	--	34	18	--	--	489	121	--

[1] Ages for school children in the 15 localities are nearest birthday; all other groups are ages last birthday.

TABLE 7.—*Schick test for diphtheria immunity among white persons*

PERCENTAGE OF INDIVIDUALS OF EACH AGE WHO GIVE A NEGATIVE SCHICK REACTION

All localities						Percentage of persons who are negative Schick			Number of persons who are negative Schick			Total number of persons tested		
Age (years)	Percentage of persons who are negative Schick		Number of persons who are negative Schick	Total number of persons tested	Age last birthday (years)	Baltimore, Md. (10)	Syracuse, N. Y.	Kansas City, Mo. (16)	Baltimore, Md.	Syracuse, N. Y.	Kansas City, Mo.	Baltimore, Md.	Syracuse, N. Y.	Kansas City, Mo.
	Computed	Actual												
0.5	3.21	11.11	2	18	Under 1	11.1			2			18		
1.5	6.74	6.94	5	72	1	7.0			5			71		1
2.5	11.15	10.84	9	83	2	10.0		33.3	8		1	80		3
3.5	16.19	14.06	35	249	3	13.8		17.6	32		3	232		17
4.5	21.57	20.83	75	360	4	18.8	42.3	26.7	60	11	4	319	26	15
5.5	27.02	27.83	339	1,218	5	28.2	32.1	25.1	145	81	113	515	252	451
6.5	32.30	30.31	816	2,692	6	30.5	28.0	32.0	314	205	297	1,030	733	929
7.5	37.21	37.68	1,125	2,986	7	38.3	32.8	41.5	391	309	425	1,020	943	1,023
8.5	41.63	43.21	1,450	3,356	8	45.6	38.4	45.3	506	412	532	1,109	1,073	1,174
9.5	45.46	46.85	1,496	3,193	9	49.6	47.0	44.2	477	540	479	961	1,149	1,083
10.5	48.69	47.12	1,531	3,249	10	50.8	45.7	45.7	467	569	495	920	1,246	1,083
11.5	51.33	51.32	1,497	2,917	11	53.7	53.2	47.6	436	562	499	812	1,056	1,049
12.5	53.42	53.89	1,398	2,594	12	60.6	52.1	51.7	361	542	495	596	1,041	957
13.5	54.98	54.26	968	1,784	13	61.7	50.8	53.6	237	361	370	384	710	690
14.5	56.25	59.75	570	954	14	66.5	56.3	60.5	131	251	188	197	446	311
15.5	57.13	64.18	215	335	15	73.4	55.4	76.4	58	102	55	79	184	72
17.4	58.16	49.23	64	130	16–19	56.0	47.6		14	50		25	105	
20 and over	59.00	56.99	53	93	20 and over	75.0	17.2		48	5		64	29	

In the case of the school records the data were classified according to age nearest birthday, but in all other cases the classification was according to age last birthday. In making the combination of children 7 years of age in the different groups, the midpoint, 7.0, and 7.5 years of age for the school and other groups, respectively, were averaged, each group being weighted by the total number of children in it. This will explain such ages as 7.2 in the combined data.

Inasmuch as data from various sources were combined, it is important to note the extent of agreement or disagreement in the data for the various localities.

In the case of whooping cough the percentages with a history of this disease in Hagerstown, Md., and London, Canada, agree fairly well up to 7 years of age, after which age the London (Canada) percentages are considerably below those for Hagerstown. The Hagerstown data, however, agree very closely with the school data throughout the school ages. Furthermore, the data for adults in Hagerstown agree very closely with the data for college students, both indicating that the asymptote, or upper limit, lies between 75 and 80 per cent—that is, that 75 to 80 per cent of adults have had an attack of whooping cough at some time in their lives.

The data for Baltimore, Md., and Gary, Ind., on the other hand, are not in agreement with the above data except for about the first three years of life. The asymptote as indicated by the Baltimore data would be around 50 per cent. A rather consistent falling of the curve after about 9 years of age suggests that forgotten attacks are a rather important source of error in the data from Baltimore.

In the case of measles, the data for Hagerstown, Md., Baltimore, Md., Gary, Ind., and the school group are in excellent agreement up to 7 years. After that age the Hagerstown curve is rather consistently above and the Baltimore curve rather consistently below the curve for the school group. The percentages for London, Canada, are considerably below the other localities.

There is, of course, the possibility that measles and German measles have been confused and that a history of measles may have been given when the person had had German measles but had not had an attack of measles. Although the two diseases are clinically quite distinct and would not be confused as to the diagnosis at the time of occurrence, there is considerable possibility of confusion in reporting the history of the two conditions because of the similarity of the two names. The fact that the percentages reporting a history of measles are low in London, Canada, where both diseases were included in the list of infections on the schedule, suggests that such confusion did exist, although many other factors, such as the time since the occurrence of an epidemic of measles in the locality, may have been important in producing the difference.

The questionnaire sent to the college students also included both German measles and measles, and the results have been tabulated in some detail. Of 3,377 of these college students who knew whether or not they had ever had either measles or German measles, 90 per cent had had measles, 31 per cent had had German measles, and 95 per cent had had one or both diseases, leaving 5 per cent who had had neither measles nor German measles or were doubtful about one disease but not doubtful about the other. Of the 3,377 persons, 121, or 3.6 per cent, were doubtful as to measles, but of the 121 persons, all except 26 had had an attack of German measles. Of the 3,377 persons, 778, or 23 per cent, were doubtful as to German measles, but all of the 778 except 12 had had an attack of measles. For the purpose of the percentages given above, it seemed better to consider the doubtfuls as to one of the two diseases designated as measles as a negative history of that disease when the person was not doubtful as to the other disease. Those doubtful or unknown about both measles and German measles were eliminated from all computations. The large percentage of persons doubtful as to German measles indicates the difficulty of obtaining any accurate data on that disease.

Considering measles and German measles separately and independently: Of the 3,256 persons who gave, without qualification, a positive or negative history of measles, 93 per cent reported that they had suffered an attack of measles; of the 2,599 who were not doubtful about German measles, 40 per cent reported a history of German measles. In London, Canada, 15 to 20 per cent of the older school children (16 to 20 years of age) reported a history of German measles.

Although there is considerable chance for error in the confusion of the names "measles" and "German measles," it should be noted that in the use of the data as in this study error arises only to the extent that persons who have had German measles but have not had measles report a history of measles. Persons who have had both measles and German measles presumably have some immunity to measles and the additional immunity to German measles does not change the situation as regards measles. The data for the college students indicates that the maximum error—that is, the error when every history of German measles is counted as a history of measles—would not be more than 3 to 5 per cent for adults. The error might be larger for some of the younger ages.

In this connection it should be noted that the college students are all of the ages when the curve of the history of measles has about reached its maximum and therefore all ages have been considered together in the above discussion.

For mumps, the curve for London, Canada, agrees moderately well with that for the school group. The older ages of the school group and the early ages of the college group agree very well. The data for Baltimore, Md., agree fairly well with the other groups up to about 8 years, but after that age the percentages are very much below those for the other groups, indicating an asymptote of around 30 per cent as against over 70 per cent for the college students. It is at least possible that the difference is partly due to the fact that the students themselves are the informants—the milder the disease the less accurate would be the history obtained from some other member of the family.

No data on the history of mumps were collected in Hagerstown or other cities considered in connection with other diseases in this study.

The data on chicken pox for the London, Canada, and the school groups agree unusually well throughout the school ages, indicating an asymptote of from 50 to 55 per cent. The percentages for college students are considerably above this figure, being around 70 per cent. In no other places were data collected on the history of chicken pox.

Because of the smaller number of persons who contract scarlet fever, the percentages who have a positive history of this disease are irregular except where the population considered is very large. The data for Hagerstown, Md., and Gary, Ind., agree reasonably well with the school data. Up to 15 years the Baltimore data are very similar to the Hagerstown data. The percentages for London, Canada, are very much higher than those for the other localities, as might be expected in view of the higher incidence of scarlet fever in the North. The percentages for college students are above the other groups except in the Southern States, where the agreement is considerably better.

In diphtheria, likewise, there is fair agreement except in the case of London, Canada. The percentages for Baltimore actually dropped off perceptibly after 10 years, but before that age the agreement with the other localities is fair. The data for college students agree fairly well with the data for the older ages of the school group and for the Hagerstown adults.

In connection with the diphtheria history curve it should be noted that there may be an error in such a curve due to the decline in the prevalence of the disease. In the decade 1900–1909 diphtheria was considerably more prevalent than in more recent years (31). A higher proportion of adults who were children in that decade would therefore have a history of an attack of diphtheria than would be expected if the diphtheria prevalence had been about what it was in the early years of the present decade. The incidence of scarlet fever may have declined also (22), and the curve for that disease may therefore be somewhat in error. In the instance of measles, whooping cough, mumps, and chicken pox, there is little evidence of any change in their incidence during the past generation.

Data on the percentage of children of different ages who react negatively to the Schick test, and thereby indicate a certain degree of specific antitoxic immunity to diphtheria, were not available for the groups considered for the history of infectious diseases. Data available for groups of children in Baltimore, Md., Syracuse, N. Y., and Kansas City, Mo., show a fair agreement for most of the ages. Aside from one or two percentages based on very small numbers, the agreement is particularly good up to 12 years, but after that age the percentages Schick negative are somewhat less in Syracuse than in Baltimore and Kansas City. The percentages with a negative Schick test are higher in New York City (34) than in these three smaller cities, but the data for one group of schools in New York City (with a lower proportion of children with a negative Schick reaction) agree fairly well at the different ages with the Baltimore, Syracuse, and Kansas City data. On the other hand, the percentages for small towns in New Jersey (34) are lower than the Baltimore, Syracuse, and Kansas City percentages. The latter cities are probably fairly representative of moderately large cities in the middle or northern part of the United States.

The only extensive data on the percentage of children of different ages in the United States who react negatively to the Dick test, and thereby indicate a certain degree of immunity to scarlet fever, are from Kansas City, Mo. (16); Gary, Ind. (25); and New York City (35). As in the case of the Schick test, the percentage with a negative Dick reaction is highest in New York City. Kansas City had a slightly higher percentage negative than Gary. In a group of children in Fairfax County, Va. (8), the percentage with a negative Dick reaction was much lower than in any of the cities mentioned. In view of the paucity of comparable data, it did not seem worth while to attempt to include the negative Dick test in the present study.

Tables 1 to 7 include the data on the history of infectious diseases for the different localities only for the ages that showed sufficient agreement to warrant their inclusion in the general total for all localities. Figures 1, 2, 3, and 4 show these percentages plotted on cross-section paper.

These observations are, of course, based on different children at each age, the data in every case being the result of a cross-section survey only, that is, a survey in which each child was seen but once. In other words, the children 15 years of age were not observed for a period of 15 years and the percentage who had suffered an attack of the measles recorded as they occurred or at the end of each year, but the percentages for each age are based on a different group of children. If, however, we observed a group of children from birth to 1 year of age and recorded the percentage of the survivors who had had an attack of measles, and observed the same group from 1 year to 2

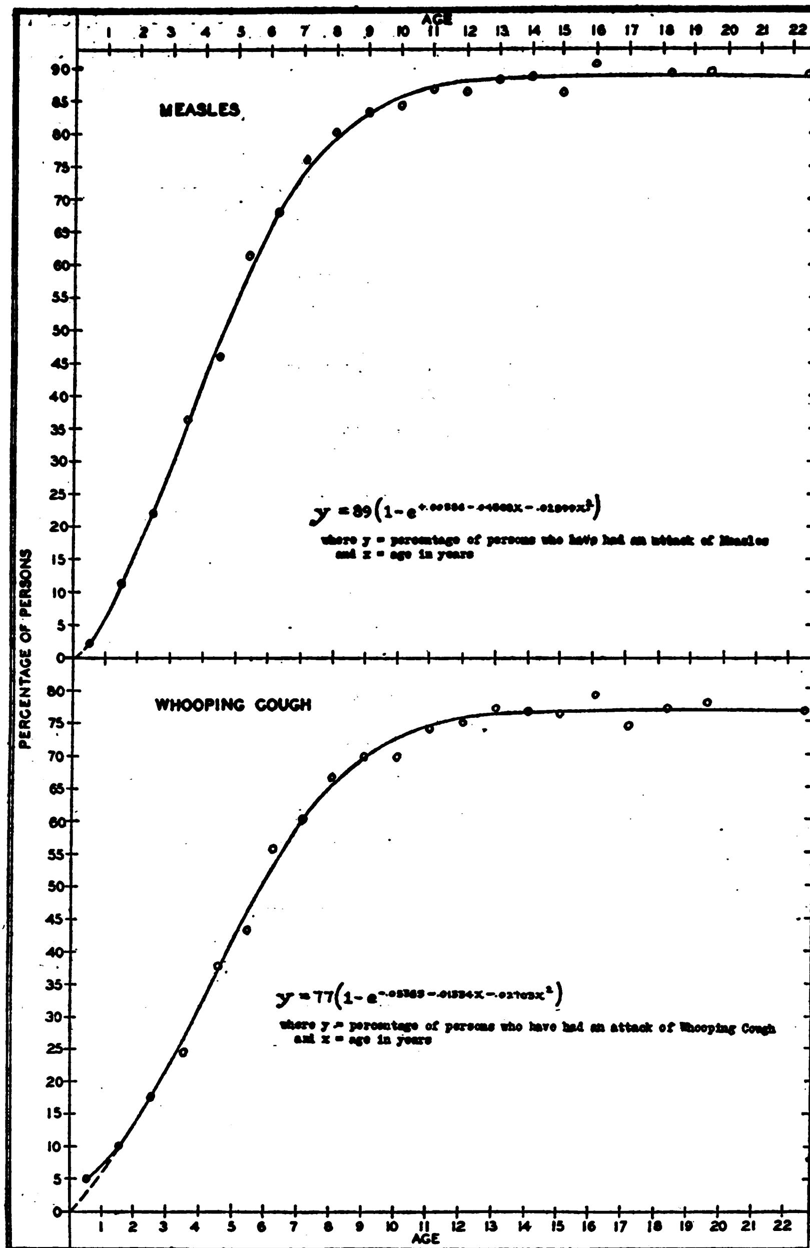

FIGURE 1.—Percentage of the population of specific ages who have at some time in their lives suffered attacks of certain communicable diseases of childhood (as approximated from histories of past attacks)

years of age and recorded the percentage of the survivors who had had an attack of measles, etc., up to adult life, we would presumably get a similar curve to the one in Figure 1, which is based on different children at each age. The case fatalities in the children's diseases considered in this study, except for diphtheria and scarlet fever, are so small after the first two years of life that a correction for the fatal

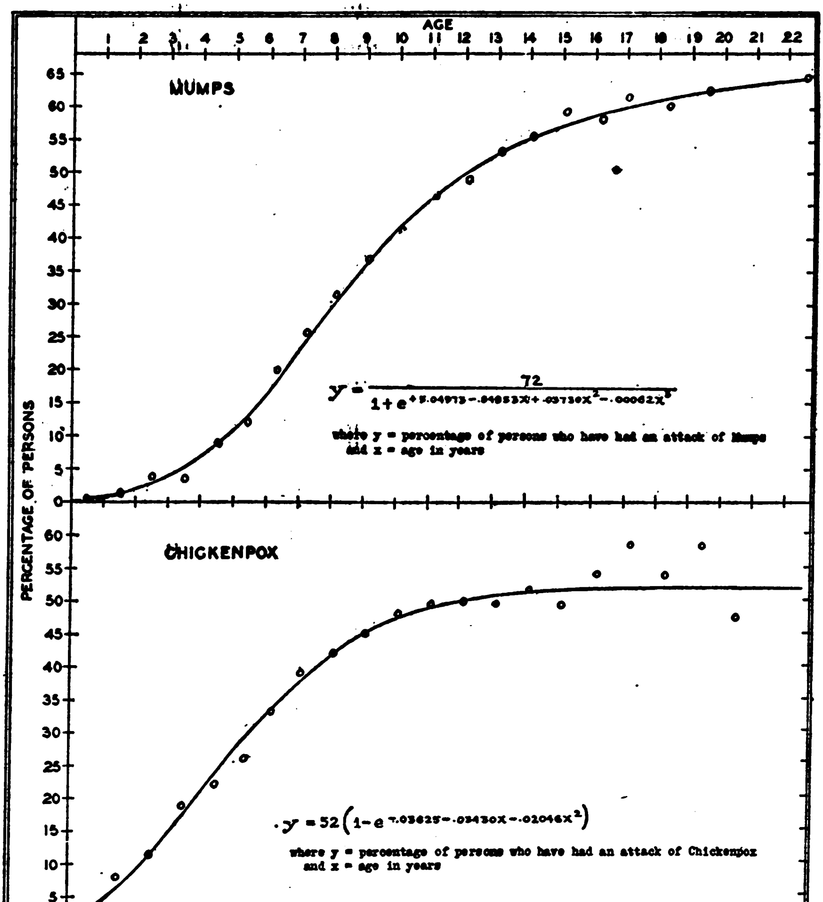

FIGURE 2.—Percentage of the population of specific ages who have at some time in their lives suffered attacks of certain communicable diseases of childhood (as approximated from histories of past attacks)

cases would hardly make a perceptible change in the curve. However, in considering case fatalities (Table 16), the case incidence has been corrected to include the fatal as well as the nonfatal cases. In none of the other tables and graphs was any correction made for the fatal cases.

Method of Graduating the Original Data

Statistical operations, which will be considered in later sections of this paper, made it important to substitute a smooth curve for the more or less irregular original points shown by the small circles in Figures 1, 2, 3, and 4. Even apart from these further mathematical

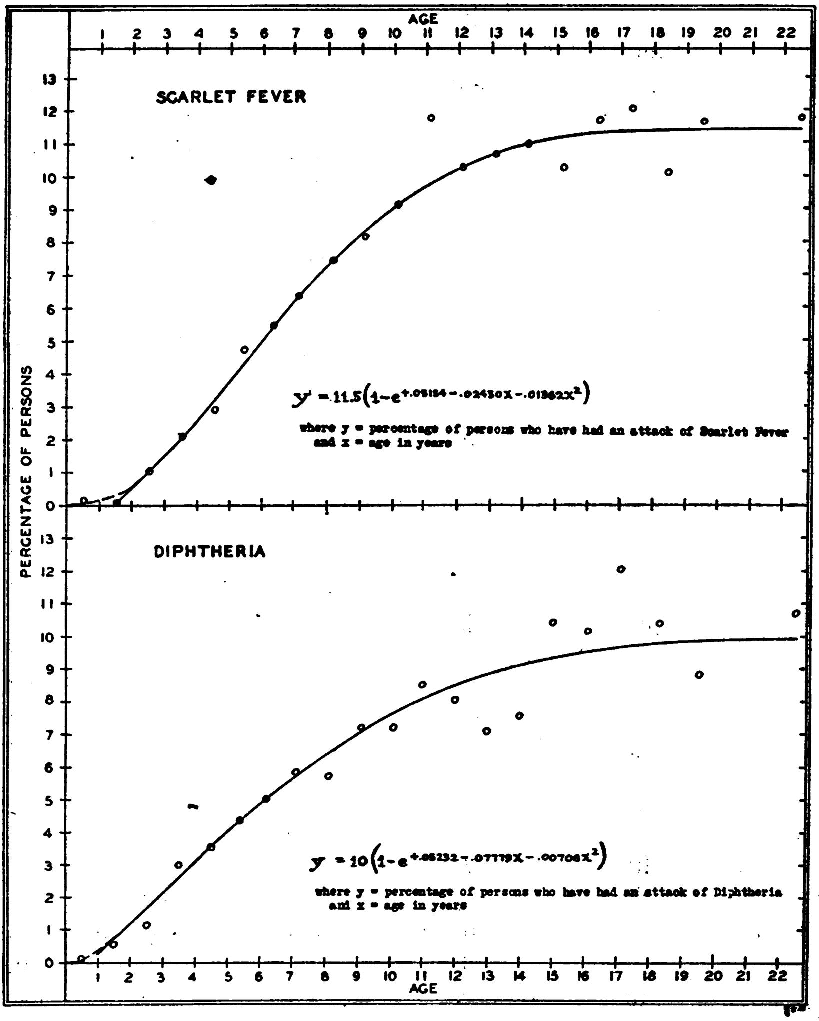

FIGURE 3.—Percentage of the population of specific ages who have at some time in their lives suffered attacks of certain communicable diseases of childhood (as approximated from histories of past attacks)

processes, a smooth curve is of interest as approximating the percentages which would be obtained by the consideration of a very large number of children for each year of age.

Some mathematical function was therefore sought which would represent these data. Thinking of the data as approximating what would be secured by the continuous observation of a very large number of children from birth to adult ages, the "growth" of cases of whooping cough, for example, in such a group may have some of the characteristics of the growth of population in a constant geographical area. It, therefore, seemed reasonable to expect a logistic or growth curve such as that described by Pearl and Reed to fit these data (19), (20), (21), (18), and (23). The smooth curves in Figures 1, 2, 3, and 4 are the graphs of logistic curves fitted to the data, the equation in each case being shown on the chart. The curve which was found to best fit the data for mumps is of the autocatalytic type, such as has been used extensively by Reed and Pearl for describing population growth. The curve used for mumps is of the skew variety of this type. For all other diseases and the negative Schick test, the curve

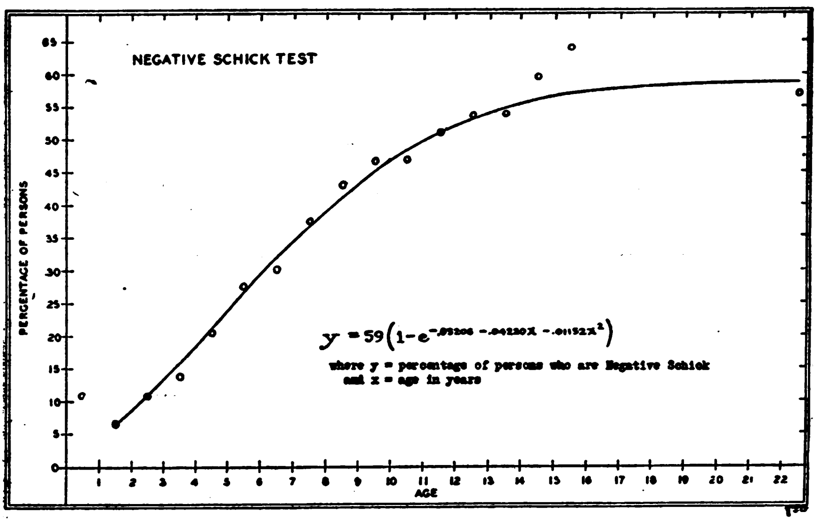

FIGURE 4.—Percentage of persons of specific ages who are relatively immune to diphtheria as indicated by a negative Schick reaction (Baltimore, Md., Syracuse, N. Y., and Kansas City, Mo.)

giving the best fit from about 2 years of age to adult life is the catalytic type of curve, the skew variety being used in every case.

In many respects the logic or philosophy of the logistic curves, both of the catalytic and autocatalytic types, is consistent with the logic of the growth of cases of these infectious diseases in a population. For example, after an initial period, which will be considered later, both the catalytic (skew type) and autocatalytic curves rise at an increasing rate (as measured in actual units rise per year) until the point of inflection is reached. This is the point where the slope of the curve is greatest and represents the age of maximum incidence of the disease. After this age the curve rises at a declining rate (as measured in actual units per year) and approaches an asymptote, or upper limit, the asymptote in the case of the infectious diseases under consideration being the percentage of the adult population who have at some time in their lives suffered an attack of the disease under consideration. The slowing up in the rate at which the curve rises would be consistent with the slowing up in the occurrence of the infectious disease as the susceptible population is eliminated by reason of an immunity gained by an attack of the disease or otherwise. Factors such as change in the amount and intimacy of contact with cases of the disease may also be important.

If the autocatalytic curve, such as that used for mumps, were continued to birth or zero age, the Y value (percentage) would not be zero, the nature of the curve being such that it approaches zero as a limit but never absolutely reaches zero. In this respect the logic of the autocatalytic growth curve is not consistent with the logic of the data being considered, since at birth no child, except in instances so rare that it is anomalous, would have already suffered an attack of any of these diseases. The catalytic curve becomes zero at zero age if the constant "a" is equal to zero. In the curves of this type shown in Figures 1, 2, 3, and 4 such is not the case, because a good fit could not be secured for the other points if the curve became zero at birth or zero age. The curves as used were fitted with particular attention to points for 1½ years of age and older. Below this age an inspection curve has been used to extend the curves to birth or zero age, the latter curves being indicated on Figures 1, 2, 3, and 4 by dotted lines. In no case does this latter curve affect any value above 2 years of age, and in most cases the correction is small for 1 year of age.

In the case of the percentage of children with a negative Schick test, the percentage under 1 year is, of course, higher than that for 1 year of age, because of the passive immunity which the newborn child gets from its mother, provided she has a specific immunity to diphtheria. The curve as fitted to the data is an attempt to approximate the net growth with age in the percentage of children who have acquired a sufficient degree of specific antitoxic immunity to diphtheria to give a negative Schick reaction. In so far as the percentage for children under 1 year of age is used at all, the actual observed percentage is used, although this is based on relatively few observations, particularly for the first half year of life. It will be recalled that above 12 years of age the Baltimore and Kansas City percentages were higher than those for Syracuse. In the higher ages, therefore, the curve may be somewhat unreliable.

It is possible that the autocatalytic type of curve might be used for some diseases other than mumps. There is in several instances some indication of a period during which the curve rises very slowly in the nature of the autocatalytic curve, rather than the catalytic curve which rises more rapidly from the beginning. However, the period of the slow rise is so short that it appears that the autocatalytic curve would have to be of an even more skew type than that used for mumps. This period, when the curve is rising very slowly, whether represented by the autocatalytic curve or the short inspection curve, is consistent with the idea that the new-born child gets some temporary immunity from its mother, as in diphtheria, and also with the fact of lesser contact in early infancy when the child is not playing with other children. Following the period when the curve rises slowly, both types of curve rise more rapidly to the point of inflection already mentioned as marking the age of maximum incidence of the disease.

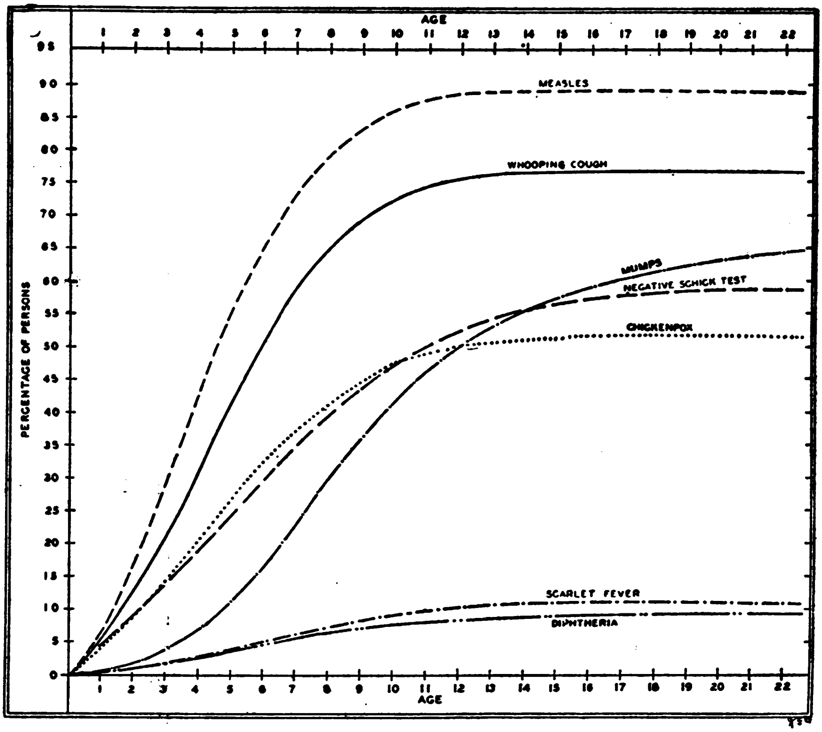

FIGURE 5.—Percentage of the population of specific ages who have at some time in their lives suffered attacks of the communicable diseases of childhood (as approximated from histories of past attacks)

Population at Specific Ages Who Have Been and Who Have Not Been Attacked

In Figure 5 the curves in Figures 1, 2, 3, and 4 have been superimposed to facilitate comparison. It will be seen that by 10 years of age 86 per cent of the children have had an attack of measles, 73 per cent have had whooping cough, 47 per cent chicken pox, 42 per cent mumps, 9 per cent scarlet fever, and 8 per cent have had a clinical attack of diphtheria, but 47 per cent gave a negative Schick reaction indicating a certain degree of specific immunity to diphtheria. Although the data available for Dick tests were insufficient to justify including that test in this study, the few existing data indicate that the percentage of children with a negative Dick test, and therefore with a certain degree of specific immunity to scarlet fever, is probably larger than the proportion with a negative Schick test. By 15 years of age the curves for measles, whooping cough, and chicken pox have virtually reached their asymptotes. The diphtheria curve and, to a

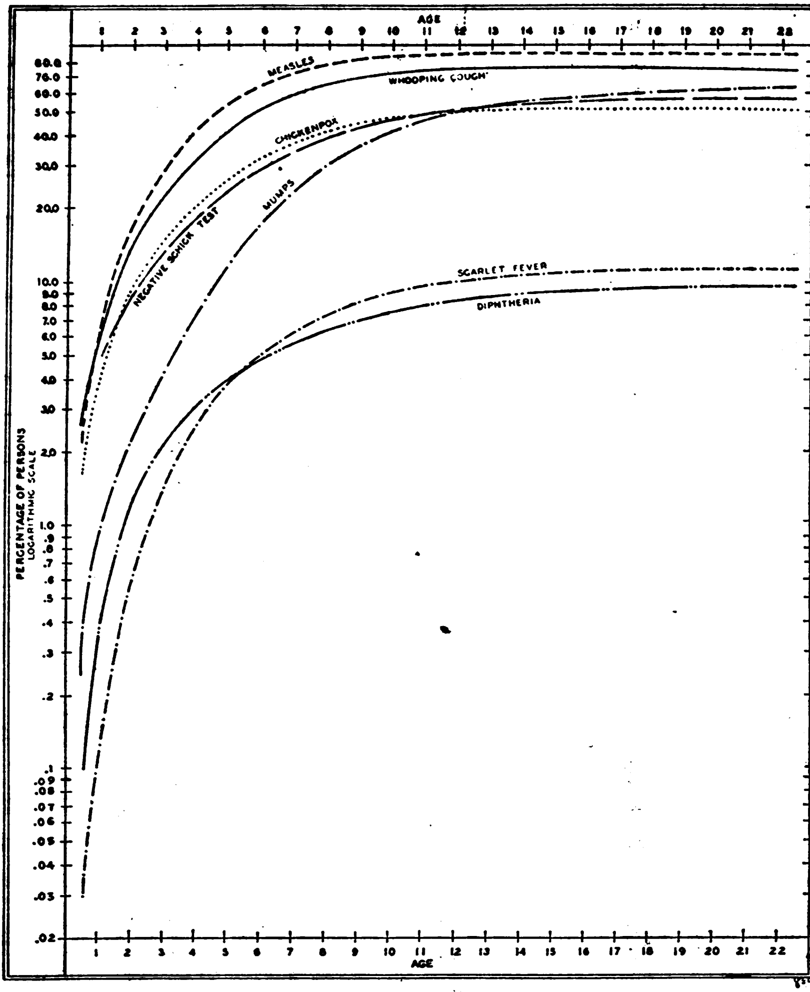

FIGURE 6.—Relative increase with age in the percentage of the population of specific ages who have at some time in their lives suffered attacks of the communicable diseases of childhood (as approximated from histories of past attacks)

lesser extent, the scarlet fever curve are still rising somewhat, but the curve for mumps continues to rise markedly until 25 or 30 years of age.

Better to compare the relative or proportionate increases in the curves for the different diseases, the graphs have been plotted on a semilogarithmic chart in Figure 6. This chart indicates that, although the percentages of persons who have had clinical attacks of scarlet fever and diptheria are low, the relative or proportionate rises in the curves of these diseases are similar to those of the curves of the diseases which occur more frequently. The curve for mumps, however, appears to be somewhat different from the curves for the other diseases.

The area below each of the curves in Figure 5 for the different diseases represents persons who have suffered attacks of these diseases

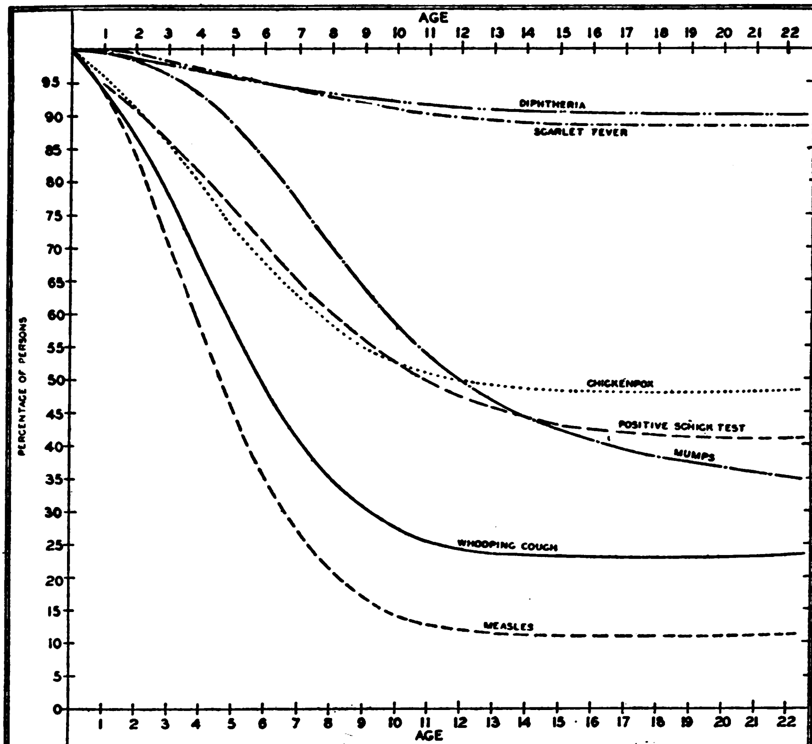

FIGURE 7.—Percentage of the population of specific ages who have not suffered attacks of the communicable diseases of childhood (as approximated from histories of past attacks)

and, with exceptions, have a considerable degree of specific immunity to further attacks of the disease. In the case of diphtheria and scarlet fever, we know from the Schick and Dick tests that many who have not suffered attacks of these diseases are nevertheless Schick or Dick negative, indicating a certain degree of specific immunity to attack. Second attacks of any of these diseases may occur, but they are relatively rare. However, some scarlet fever and many recovered diphtheria patients are still Schick positive and presumably relatively susceptible to the disease (14).

Similarly, the area above each curve in Figure 5 represents persons who have not suffered an attack of the disease. It may be of some interest to make a more direct comparison of the proportion of persons of different ages who have not been attacked by the different diseases. In Figure 7 the proportion of the population that has not been attacked by each disease has been plotted.

Age Incidence Among All Children

Although the age of the child at the time of the attack of the infectious disease was not tabulated in the data used for this study, we may approximate the curves of the age incidence of these diseases from the cumulative curves shown in preceding figures. The percentage of 5-year-old children who have had a disease is obviously a cumulation of the percentages who had the disease when under 1 year, 1, 2, 3, and 4 years of age. In other words, the data plotted in Figure 5 are of the nature of cumulative or integral curves. If we take the difference between the percentage who had been attacked at 5 years and the corresponding percentage who had been attacked at 4 years, we will find what percentage were attacked between 4 and 5 years of age. This difference represents the average slope of the cumulative or integral curve between 4 and 5 years of age. The slope of a curve indicates how fast the curve is rising, and that which indicates how fast the cumulative or integral curve of whooping cough, for example, is rising during a given age period, say 4 to 5 years, also indicates how fast children 4 and under 5 years of age are having whooping cough, that is, the incidence rate for this specific age. If it appeared worth while to go into greater refinement than the average rate for the age period 4 and under 5 years, we could find the slope of the curve at any point on the age scale by finding the first derivative of the equation of the cumulative or integral curve and the value of this expression for any exact age would indicate the age incidence for that age. In the present study the average rate for 1-year age intervals seemed the more appropriate measure of the specific age incidence and the difference method was therefore used in preference to the derivative method. The peak in the difference or derivative curve of course indicates the point of inflection in the cumulative or integral curve.

It should be noted that the fitting of a curve to the cumulative data, as was done in this study, obscures or neglects irregularities in the curves. While the great majority of these fluctuations obviously are the result of chance or at least of factors which we need not or do not wish to take account of in this study, certain variations from the fitted curve may have a definite significance. For example, for some of the diseases the actual value (percentage who have had the disease) for 6 years is above the smooth curve. Carried into the differences, this fact would mean that the actual difference which indicates the incidence rate at about 6 years of age should be larger than the one obtained from the fitted curves. Since children usually start to school at 6 years of age and thereby add considerably to the number of persons with whom they come in almost daily contact, the chance of having attacks of these diseases may be much increased. The values derived from the smooth curves, of course, fail to show such unusual rates. However, there appears to be no other period below adult ages where such a condition might arise. In adult life, parents who have not had attacks of these diseases or have not in some other way become immune to them (as in diphtheria and scarlet fever), are subjected to unusual contact when their children have the diseases. As the data considered in this study probably are not sufficiently accurate to determine anything about the incidence rates among adults, this second period of unusual contact need not concern us now.

The growth curves may give a good fit to the data as a whole, but in certain parts of the curve fail to fit the points as well as they should be fitted. In other words, the real curve of the growth of cases of one of these infectious diseases in a population may be a more complicated mathematical function than the logistic curve. The lack of fit may be so slight that it is not noticed in the cumulative data but shows up perceptibly only when the derivative or difference curve is considered. The small magnitude of the values considered in the derivative curve makes the errors relatively more important there.

With these limitations in mind we may proceed to consider the age incidence of these infectious diseases of childhood. Tables 8 to 13 contain data on age incidence as approximated from histories and also other computations which will be considered later in the study.

TABLE 8.—*Measles*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval	Of 1,000 living children considered—			Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000)
Period of lifetime between 2 exact ages (years)	Previously attacked (number at beginning of age interval who have had an attack)	Case rate per 1,000 total children (number having an attack during age interval)	Not previously attacked (number at beginning of age interval who have not had an attack)		
(1)	(2)	(3)	(4)	(5)	(6)
0–1	0	61.677	1,000.000	61.677	1.000
1–2	61.677	105.082	938.323	111.989	1.066
2–3	166.759	127.315	833.241	152.795	1.200
3–4	294.074	132.574	705.926	187.802	1.417
4–5	426.648	123.372	573.352	215.177	1.744
5–6	550.020	104.584	449.980	232.419	2.222
6–7	654.604	81.586	345.396	236.210	2.895
7–8	736.190	58.972	263.810	223.540	3.791
8–9	795.162	39.658	204.833	193.607	4.882
9–10	834.820	24.884	165.180	150.648	6.054
10–11	859.704	14.596	140.293	104.036	7.128
11–12	874.300	8.028	125.700	63.866	7.955
12–13	882.328	4.130	117.672	35.098	8.498
13–14	886.458	2.002	113.542	17.632	8.807
14–15	888.460	.908	111.540	8.141	8.966
15–16	889.368	.392	110.632	3.543	9.038
16–17	889.760	.151	110.240	1.370	9.073

TABLE 9.—*Whooping cough*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval	Of 1,000 living children considered—			Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000)
Period of lifetime between 2 exact ages (years)	Previously attacked (number at beginning of age interval who have had an attack)	Case rate per 1,000 total children (number having an attack during age interval)	Not previously attacked (number at beginning of age interval who have not had an attack)		
(1)	(2)	(3)	(4)	(5)	(6)
0-1	0	58.500	1,000.000	58.500	1.000
1-2	58.500	73.878	941.500	78.468	1.062
2-3	132.378	87.981	867.622	101.405	1.153
3-4	220.359	100.793	779.641	129.281	1.283
4-5	321.152	101.586	678.848	149.645	1.473
5-6	422.738	92.731	577.262	160.639	1.732
6-7	515.469	77.785	484.531	160.537	2.064
7-8	593.254	60.476	406.746	148.682	2.459
8-9	653.730	43.805	346.270	126.505	2.888
9-10	697.535	29.684	302.465	98.140	3.306
10-11	727.219	18.849	272.781	69.099	3.666
11-12	746.068	11.250	253.932	44.303	3.938
12-13	757.318	6.314	242.682	26.018	4.121
13-14	763.632	3.342	236.368	14.139	4.231
14-15	766.974	1.663	233.026	7.137	4.292
15-16	768.637	.781	231.363	3.376	4.323
16-17	769.418	.346	230.582	1.501	4.338

TABLE 10.—*Mumps*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval	Of 1,000 living children considered—			Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000)
Period of lifetime between 2 exact ages (years)	Previously attacked (number at beginning of age interval who have had an attack)	Case rate per 1,000 total children (number having an attack during age interval)	Not previously attacked (number at beginning of age interval who have not had an attack)		
(1)	(2)	(3)	(4)	(5)	(6)
0-1	0	8.500	1,000.000	8.500	1.000
1-2	8.500	12.668	991.500	12.777	1.009
2-3	21.168	19.216	978.832	19.632	1.022
3-4	40.384	30.608	959.616	31.896	1.042
4-5	70.992	43.824	929.008	47.173	1.076
5-6	114.816	56.031	885.184	63.299	1.130
6-7	170.847	64.033	829.153	77.227	1.206
7-8	234.880	65.960	765.120	86.209	1.307
8-9	300.840	62.241	699.160	89.023	1.430
9-10	363.081	54.870	636.919	86.149	1.570
10-11	417.951	46.092	582.049	79.189	1.718
11-12	464.043	37.545	535.957	70.052	1.866
12-13	501.588	30.079	498.412	60.350	2.006
13-14	531.667	23.957	468.333	51.154	2.135
14-15	555.624	19.125	444.376	43.038	2.250
15-16	574.749	15.415	425.251	36.249	2.352
16-17	590.164	12.629	409.836	30.815	2.440

TABLE 11.—*Chicken pox*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval — Period of lifetime between 2 exact ages (years) (1)	Of 1,000 living children considered— Previously attacked (number at beginning of age interval who have had an attack) (2)	Case rate per 1,000 total children (number having an attack during age interval) (3)	Not previously attacked (number at beginning of age interval who have not had an attack) (4)	Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval) (5)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000) (6)
0-1	0	41.000	1,000.000	41.000	1.000
1-2	41.000	47.566	959.000	49.600	1.043
2-3	88.566	55.084	911.434	60.437	1.097
3-4	143.650	61.225	856.350	71.495	1.168
4-5	204.875	61.843	795.125	77.778	1.258
5-6	266.718	57.871	733.282	78.921	1.364
6-7	324.589	50.695	675.411	75.058	1.481
7-8	375.284	41.839	624.716	66.973	1.601
8-9	417.123	32.677	582.877	56.062	1.716
9-10	449.800	24.216	550.200	44.013	1.818
10-11	474.016	17.067	525.984	32.448	1.901
11-12	491.083	11.466	508.917	22.530	1.965
12-13	502.549	7.342	497.451	14.759	2.010
13-14	509.891	4.488	490.109	9.157	2.040
14-15	514.379	2.615	485.621	5.385	2.059
15-16	516.994	1.467	483.006	3.037	2.070
16-17	518.461	.785	481.539	1.630	2.076

TABLE 12.—*Scarlet fever*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval — Period of lifetime between 2 exact ages (years) (1)	Of 1,000 living children considered— Previously attacked (number at beginning of age interval who have had an attack) (2)	Case rate per 1,000 total children (number having an attack during age interval) (3)	Not previously attacked (number at beginning of age interval who have not had an attack) (4)	Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval) (5)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000) (6)
0-1	0	1.200	1,000.000	1.200	1.000
1-2	1.200	4.575	998.800	4.580	1.001
2-3	5.775	9.641	994.225	9.697	1.006
3-4	15.416	11.227	984.584	11.403	1.016
4-5	26.643	12.067	973.357	12.397	1.027
5-6	38.710	12.190	961.290	12.681	1.040
6-7	50.900	11.689	949.100	12.316	1.054
7-8	62.589	10.709	937.411	11.424	1.067
8-9	73.298	9.412	926.702	10.156	1.079
9-10	82.710	7.960	917.290	8.678	1.090
10-11	90.670	6.490	909.330	7.137	1.100
11-12	97.160	5.110	902.840	5.660	1.108
12-13	102.270	3.891	897.730	4.334	1.114
13-14	106.161	2.866	893.839	3.206	1.119
14-15	109.027	2.046	890.973	2.296	1.122
15-16	111.073	1.414	888.927	1.591	1.125
16-17	112.487	.948	887.513	1.068	1.127

TABLE 13.—*Diphtheria*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Age interval	Of 1,000 living children considered—					Case rate per 1,000 children not previously attacked (number attacked during age interval among 1,000 who had not had an attack at beginning of age interval)	Ratio of case rate among children not previously attacked to case rate among all children (rate among all children =1.000)	Case rate per 1,000 Schick positive children (number attacked during age interval among 1,000 positive Schick children)	Ratio of case rate among Schick positive children to case rate among all children (rate among all children =1.000)
Period of lifetime between 2 exact ages (years)	Previously attacked (number at beginning of age interval who have had an attack)	Case rate per 1,000 total children (number having an attack during age interval)	Not previously attacked (number at beginning of age interval who have not had an attack)	Average number Schick negative (number at midpoint of age interval who are negative Schick)	Average number Schick positive (number at midpoint of age interval who are positive Schick)				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0-1	0	3.550	1,000.000	111.100	888.900	3.550	1.000	3.994	1.125
1-2	3.550	8.772	996.450	67.372	932.628	8.803	1.004	9.406	1.072
2-3	12.322	9.373	987.678	111.510	888.490	9.490	1.012	10.549	1.125
3-4	21.095	9.351	978.305	161.920	838.060	9.558	1.022	11.158	1.193
4-5	31.046	9.085	968.954	215.722	784.278	9.376	1.032	11.584	1.275
5-6	40.131	8.617	959.869	270.214	729.786	8.977	1.042	11.808	1.370
6-7	48.748	7.991	951.252	323.001	676.999	8.401	1.051	11.804	1.477
7-8	56.739	7.257	943.261	372.143	627.857	7.694	1.060	11.558	1.593
8-9	63.996	6.459	936.004	416.286	583.714	6.901	1.068	11.065	1.713
9-10	70.455	5.641	929.545	454.636	545.364	6.069	1.076	10.344	1.834
10-11	76.096	4.834	923.904	486.927	513.073	5.232	1.082	9.422	1.949
11-12	80.920	4.070	919.070	513.200	486.700	4.428	1.088	8.362	2.055
12-13	85.000	3.367	915.000	534.221	465.779	3.680	1.093	7.229	2.147
13-14	88.367	2.737	911.633	549.774	450.226	3.002	1.097	6.079	2.221
14-15	91.104	2.189	908.896	562.477	437.523	2.408	1.100	5.003	2.286
15-16	93.293	1.721	906.707	571.321	428.679	1.898	1.103	4.015	2.333
16-17	95.014	1.331	904.986	577.610	422.390	1.471	1.105	3.151	2.367

Figure 8 shows the incidence rates at each age up to 16 years, as indicated by the method of differences which was outlined above. Although the age curves of the different diseases are similar in many respects, there are distinct variations. The maximum incidence varies considerably. Diphtheria reaches its maximum at about 3 years of age—approximately nine-tenths of 1 per cent of 3-year-old children having diphtheria within the next year. According to data derived from the histories, measles reaches its maximum at about 3½ years, approximately 13 per cent of children having measles between 3 and 4 years of age. The maximum incidence of whooping cough and chicken pox occurs at about 4 years of age, approximately 10 per cent of children having whooping cough and 6 per cent having chicken pox within the next year. The maximum incidence of scarlet fever comes at about 5 years of age, approximately 1.2 per cent of children having the disease between 5 and 6 years of age. Mumps reaches its maximum at a later age than any other of these diseases—about 7 years, at which age approximately 7 per cent of children have the disease. The percentages quoted above are, of course, averages over many years. In the course of a single epidemic the proportion of 3-year-old children who are attacked by measles may far exceed 13 per cent. The figure of 13 per cent for measles and the percentages quoted similarly for the other diseases are an average of epidemic and nonepidemic years and can not be expected to be duplicated in an actual count of the cases of these diseases occurring at specific ages unless the observations extend over a period of years long enough to average ut the effect of epidemic cycles of the diseases, perhaps a minimum of 7 years being necessary for this to be done satisfactorily.

It must be borne in mind that the disease which in Figure 8 shows the greatest incidence at a specific age is not necessarily the one

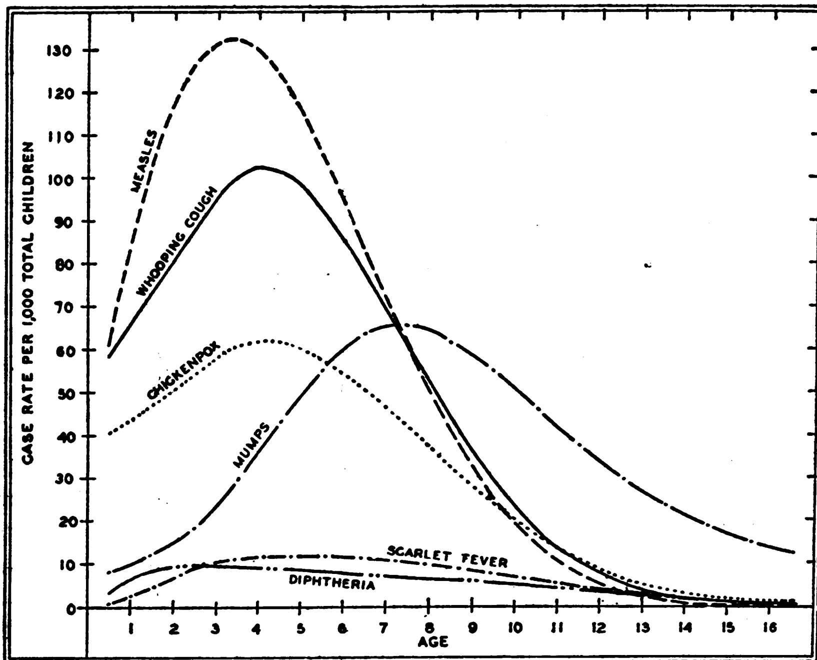

FIGURE 8.—Age incidence of the communicable diseases of childhood (as approximated from histories of past attacks)

which has the maximum asymptote in Figure 5, although such is usually the case. A disease like typhoid fever, which freely attacks persons of all ages, might have a rather low incidence at any one age and yet arrive at a higher asymptote than a disease like scarlet fever, which is confined largely to children.

Though these diseases differ as to their age of maximum incidence and in other fundamental respects, they are similar in that the rates decline rapidly as age increases after the maximum has been reached, mumps being the only one that shows any considerable incidence among the older children. To facilitate the comparison of the relative decline in the incidence of these diseases with age, the rates have been plotted in Figure 9 on a semilogarithmic or ratio chart. On such a graph an equal distance vertically represents an equal relative or proportional change rather than an equal actual change,

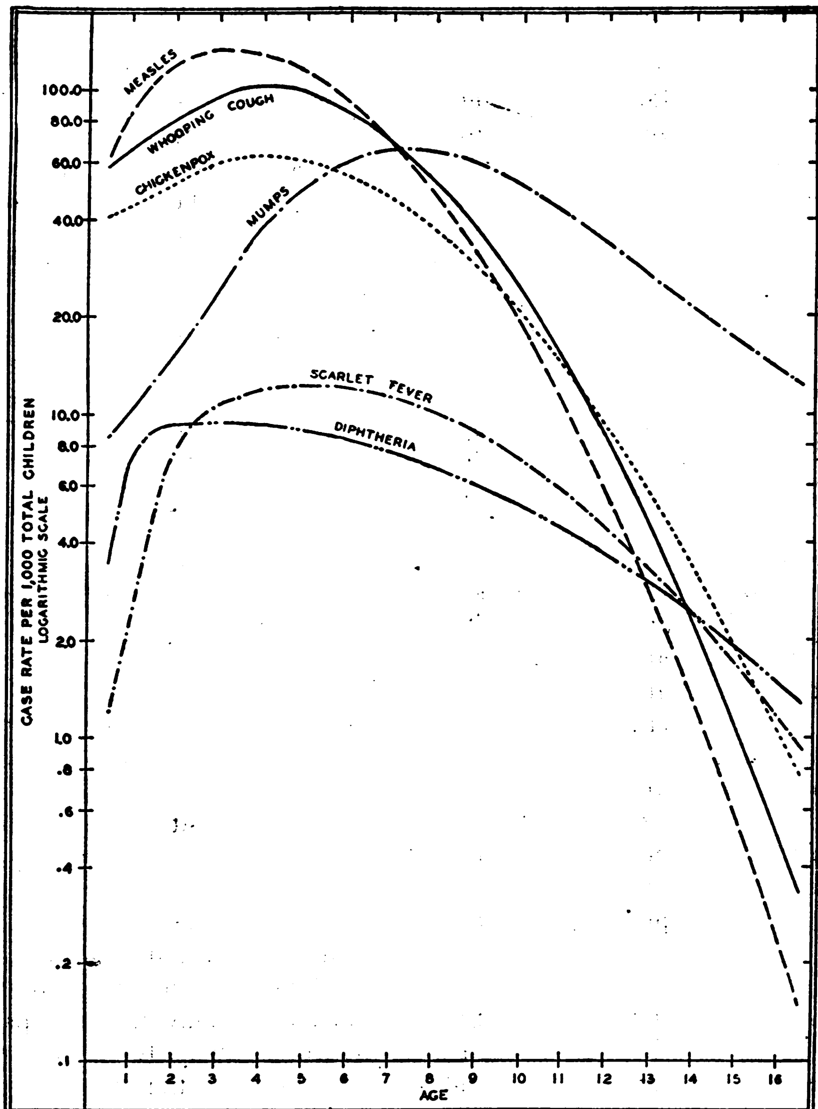

FIGURE 9.—Relative change in the age incidence of the communicable diseases of childhood (as approximated from histories of past attacks)

as in the usual graph on cross-section paper. It may be seen from this graph that measles, whooping cough, and chicken pox all decline relatively more rapidly with age than do diphtheria, scarlet fever, and mumps. In other words, the proportion of cases that occur among the older children is greater for diphtheria, scarlet fever, and mumps than for measles, whooping cough, and chicken pox. The actual number of cases of each of these diseases of course is much less among the older than among the younger children.

COMPARISON WITH RELATIVE AGE INCIDENCE AS INDICATED BY OTHER DATA

The preceding data on the age incidence of the communicable diseases of childhood have been derived from histories of past attacks of these diseases. Before proceeding to other computations based on the histories, it would be well to compare these data with rates obtained in more direct ways. Unless the latter data cover a considerable number of years, and unless the cases are fairly completely reported, the actual rates will not be comparable but the relative age incidence may be compared.

The extensive data collected by Fales (9) on the age incidence of these infectious diseases afford an exceptionally good picture of the age distribution of cases reported to State boards of health in several large areas. To this we may add the results of the Hagerstown periodic canvasses (30) and for some diseases the cases reported to the city health departments of Hagerstown, Md., Providence, R. I. (3), and Aberdeen, Scotland (33), (15). In Figure 10 the incidence rates at specific ages in the various areas have been plotted on a semilogarithmic chart, the rates for each disease being plotted in a separate section. On a semilogarithmic graph the shape and slope of the curves are comparable even though the actual rates are much higher in one area than in another.

The measles age incidence curve as approximated from the histories of past attacks is not unlike the age curve of the Hagerstown canvassed population where, presumably, the data included nearly all of the cases since they were secured by periodic visits to the households. However, it differs from all the other curves in two important respects. In the first place the peak of cases reported to State and city health departments comes at about 6 years of age, or three years later than the peak of the incidence as estimated from histories. The rates in the preschool ages are relatively higher for Aberdeen and Providence than for the States—a fact which may be due in part to more complete reporting in those cities, particularly in the preschool ages, but which may also be the result of the greater concentration of cases of measles in the younger ages in urban than in rural areas (9).

In Providence the maximum incidence of measles, except for a peak at 6 years, occurs from 3 to 5 years of age, the rate for each of these ages being about the same. The 6-year peak stands above any age before or after it, the rate at 7 years being distinctly less than at 5 years. In other words, the high incidence at 6 years may be a peak superimposed upon an otherwise falling curve. The 6-year peak no doubt occurs at a time of a really high incidence due to greater contact when the child enters school, but it may be

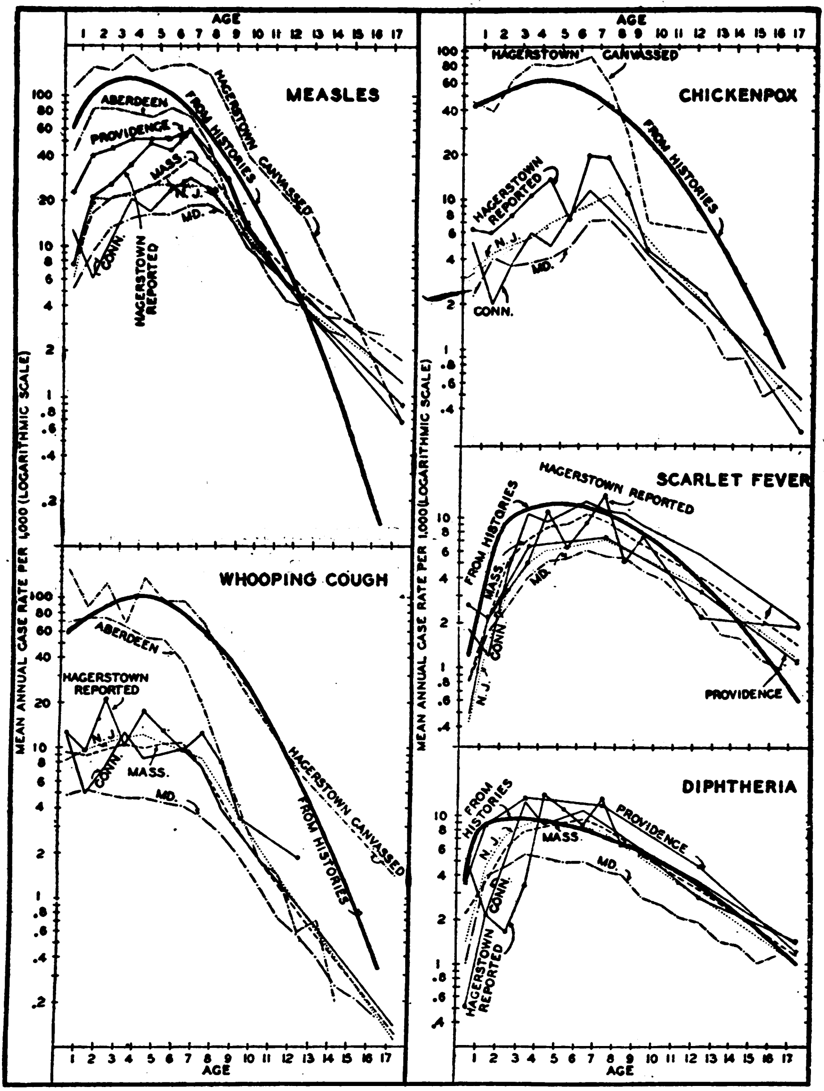

FIGURE 10.—Relative change in the age incidence of certain communicable diseases as indicated by cases reported to health departments compared with that indicated by data derived from histories of past attacks. [Years included in the data from the various areas and references where detailed tabular material may be found: Maryland, including Baltimore, (9)—measles 1907-1917, chicken pox 1913-1917, other diseases 1908-1917; New Jersey (9)—measles and whooping cough 1918-1921, other diseases 1917-1921; Massachusetts (9), 1918-1921; Connecticut (9), 1921-22; Providence, R. I. (3), 1917-1923; Aberdeen, Scotland (33, 15)—measles 1883-1902, whooping cough 1891-1900; Hagerstown, Md., canvassed families (30), December 1, 1921, to March 31, 1924; Hagerstown, reported to health department, 1922-1924]

somewhat heightened by reason of a larger proportion of cases being reported among school children than among children not in school.

The second respect in which the incidence curve as estimated from histories differs materially from most of the other curves is the somewhat less rapid decline immediately after the maximum has been reached and the increasingly rapid decline as age increases, with the resultant unusually low rate by the thirteenth or fourteenth year of age. The curve for the Hagerstown canvassed population is also in this respect rather similar to the curve based on histories but the rate for the age group, 15 to 19, is based on only one case and is therefore not reliable. However, for the ages under 15 years there are sufficient data to be fairly reliable, a total of 568 cases of measles having occurred in the 28-month period, only 6 of which were over 15 years of age. The curves for all the other areas fall very rapidly for a few years after the peak is reached, after which the decline slackens, indicating rates considerably higher at 13 to 16 years of age than those estimated from the histories. It is quite probable that the data based on the histories are unreliable for these older children, inasmuch as at these ages the average time since the attack is considerable and the occurrence of the milder diseases might be rather frequently forgotten. As already noted the error due to forgetting attacks would presumably increase with age, since the average time since the occurrence of the cases would increase as age increased. As the incidence materially decreases with age and the error due to forgotten attacks increases with age, the error of the rates in the older ages may be relatively large. It has already been stated that the history data are too unreliable to use as a basis for estimating the incidence among adults. For some of the diseases, particularly measles, whooping cough, and chicken pox, it is possible that the data above 13 years of age are not to be relied upon.

As already suggested, however, the rates in the lower ages in the reported cases are probably relatively low, because of less complete reporting in those ages. One class of cases that may be frequently unreported in a city with no follow-up of reported attacks are secondary cases, a physician being called for the primary case but not being called when the second child comes down. In the Providence data the modal primary case is 6 years of age, in this instance the 6-year peak being apparently the major one—in fact, almost the only peak. On the other hand, the modal age of the secondary cases is about 3 years. If the secondary cases are less well reported, it would result in relatively less complete reporting under 5 years than in the older ages.

The city of Syracuse, N. Y., is unusually well supplied with public health nurses. In the course of visits to households they discover cases of communicable diseases which have not been reported or perhaps not seen by physicians. For the years 1926–27, physicians reported 63 per cent of all cases under 5 years that came to the attention of the health department, as against 75 per cent of the cases 5 to 9 years and 85 per cent 10 to 14 years of age. Considered in single years of age, the most deficient reports were under 1 year, when 51 per cent of the reports were made by physicians, and 2 and 3 years of age with 60 per cent in each age being reported by the doctor. At both 6 and 7 years 76 per cent of the reports were made by physicians. In the average city with few or no public health nurses, the measles cases under 5 years would be least well reported and the relative age curve based on the reported cases would be too low for the younger ages.

It may also be worth while to make some comparison of the actual incidence of these diseases as reported to the State and city departments of health with those estimated from histories. Since 1916 the Providence department has made a special effort to get measles cases reported, and the data should be fairly complete for their kind. For the period 1917–1923 the average annual measles rate for persons under 15 years was 30 per 1,000, or slightly less than half of the rate estimated from the histories of measles—62 per 1,000.

The same comparison may be made in an entirely different way. If we have annual rates for children of different ages over a period long enough to average out the effect of epidemic and nonepidemic years, we may cumulate the rates from birth to adult ages and approximate the curve of the proportion of children who have at some time in their lives had an attack—that is, the history curve. In making such a cumulation, it must be remembered that rates for age groups of more than 1 year are averages for the age period and must be counted for each single year of age covered. In other words, a rate for 10 to 14 years must be counted five times in the cumulating process. Cumulating the Providence rates in this way, it is indicated that 44 per cent of the children have an attack of measles by the time they are 15 years of age—slightly less than half of the 89 per cent of the children in the history data. In Providence and other large cities, the real figure is probably above 89 per cent, as these diseases are more prevalent in cities than in rural areas, and some of the localities considered in the history data are more or less rural.

If the average annual rates for specific ages for Aberdeen, Scotland, (1883–1902) are cumulated up to 15 years, they indicate that a total of 63 per cent of the children 15 years of age had had an attack of measles, as against 44 per cent for Providence and 89 per cent in the data on histories. In other words, reporting was somewhat more nearly complete than in Providence but still far from complete. It is interesting to note that the difference in the reported incidence is in the early ages, particularly under 5 years. The rates for those ages in Aberdeen are higher than those for Providence but not as high as the rates estimated from histories. In the ages above 8 years there is not so much difference between the two cities.

The similar cumulation of the rates for the States shown in Figure 10 to indicate the proportion of children who would be reported as having measles by the fifteenth year of age, gives the following results: Massachusetts, 26 per cent; New Jersey, 25 per cent; Connecticut, 20 per cent; Maryland, 17 per cent. Rates for Baltimore cumulate to 24 per cent. Reporting would be expected to be less complete in rural areas and therefore in States including large rural areas within their boundaries.

In Figure 10 similar data on the age incidence of whooping cough have also been plotted. The rates for the younger children of the Hagerstown canvassed population are rather irregular but suggest a relatively higher incidence for the very early ages, particularly under 1 year, than is indicated by the curve derived from histories. The same might be said of the Connecticut curve. The data for Maryland and for Aberdeen, Scotland, would indicate the same thing, but in both of these instances the rate under 1 year is slightly less than the rate at 1 or 2 years of age. The curves for Massachusetts and particularly Connecticut are not unlike the history data so far as the early ages are concerned.

With the exception of Aberdeen the curves all decline less rapidly in the older ages than does the curve derived from the histories. It is probable that the history data for whooping cough, like that for measles, are unreliable after about 13 years of age.

If the whooping cough rates are cumulated (as discussed in connection with measles) to indicate the proportion of children who would be reported as having had whooping cough by the fifteenth year of age, the following results are obtained: Aberdeen, 46 per cent; New Jersey, 10 per cent; Massachusetts, 9 per cent; Connecticut, 8 per cent; Maryland, 4 per cent. In Baltimore the rates cumulate to 6 per cent. These percentages may be contrasted with 77 per cent found on questioning to give a history of whooping cough. Unless whooping cough varies considerably in different localities, the disease appears to be much less completely reported than measles.

Figure 10 also shows similar comparative data for chicken pox, but the number of localities available is less than in the case of measles and whooping cough. The rates in the Hagerstown canvassed population show a slightly different curve from that of the histories. However, the curve is irregular and, because of the few cases over 10 years of age, does not give much idea of the nature of the curve for older children. The curves for the three States are all very similar to one another but somewhat different from the curve based on histories, having later peaks and slower rates of decline in the older ages. It is probable that the chicken pox rates derived from histories, like the measles and whooping cough rates, are unreliable after about 13 years of age.

The cumulation of the chicken pox rates to show the proportion of children who would be reported as having had chicken pox by the fifteenth year of age gives the following results: New Jersey, 9 per cent; Connecticut, 7 per cent; Maryland, 5 per cent (Baltimore, 7 per cent), in contrast to 52 per cent of persons who give a history of chicken pox.

The peak of the diphtheria incidence curve derived from the histories comes somewhat earlier than that based on the other data, but in other respects the curves are all fairly similar. The same may be said of scarlet fever, except that the curve derived from histories declines in the older ages slightly more rapidly than the reported incidence of the disease.

Cases of scarlet fever and diphtheria are available by age for Providence for long periods (3). Scarlet fever cases for the period 1887–1923 have a maximum at 6 years, that apparently being about the only peak, the number of cases at 5 and 7 years not being much below the number at 6 years. In the instance of diphtheria the peak is somewhat earlier, around 4 years, with a secondary peak at 6 years. Diphtheria and scarlet fever vary in the different geographic sections, being considerably more prevalent in the northern than in the southern part of the country. The average annual diphtheria case rate in Providence for the period 1917–1923 was 8.8 per 1,000 population under 15 years, and in Baltimore the corresponding rate for the period 1908–1917 was 5.1 per 1,000. The rate estimated from the histories was 6.8 per 1,000 under 15 years of age. Either the estimate from the histories is low or diphtheria is more prevalent in Providence than in Baltimore or in the localities from which the history data were secured. Since diphtheria is more prevalent in cities than in rural areas and in the North than in the South, it may well be more prevalent in Providence, for a considerable number of the communities considered in the history data are in the South, and some are rather rural in character. Probably the reporting of the recognized cases of a serious disease like diphtheria is nearly complete in Providence. The lower rate in Baltimore may be due to less complete reporting or to a lesser prevalence of the disease or both.

The average annual scarlet fever case rate was 5.0 per 1,000 population under 15 years in Providence for the period 1917–1923 and 5.7 in Baltimore for the period 1908–1917. Both of these rates are lower than the corresponding rate estimated from the histories, 7.6 per 1,000. Of course, both diphtheria and scarlet fever are reported more nearly completely than the less severe of the children's diseases.

In making the various comparisons of the data derived from histories with other data, it is not assumed that the age incidence of these communicable diseases is the same in all places and under all circumstances. Fales (9) shows that the average age of occurrence of these diseases is younger in urban than in rural areas. Halliday (12) shows that measles occurs at earlier ages in tenement houses with a common entrance and hall, thus affording more contact between the children of the several families housed in the building. The age incidence of these diseases must be influenced to some extent by many factors. All that the curves derived from the histories represent is, as already stated, the approximate average age incidence in the communities from which data on infectious disease histories were secured.

The comparisons with other data seem to indicate that at least up to 12 years the relative age curves derived from the histories are not unreasonably different from curves based on reports to health departments, particularly when allowance is made for the probable variation with age in the completeness of reporting. The great advantage of the rates derived from histories over the reported rates lies in the fact that the former approximate the complete incidence of the disease whereas the rates based on reported cases are usually very incomplete, particularly for the milder diseases.

Age Incidence Among Children Not Previously Attacked

Of more importance, perhaps, than the incidence rates shown in Figure 8 for all children is the incidence of these diseases among children who have not previously suffered an attack of the disease, or, in the case of diphtheria and scarlet fever, who may be found to be relatively susceptible by the Schick and Dick tests, respectively. The cumulative curves shown in Figure 5 indicate what proportion of children of each age have already suffered attacks of these diseases in so far as the clinical attacks are recognized and remembered. If we eliminate from consideration the children who have already been attacked we can compute what proportion of the children of different ages who have not previously been attacked suffer attacks of these diseases at a given age. For example, if 32 per cent of children have had whooping cough by the time they arrive at the fourth year of age then only 68 out of 100 children 4 years of age are still unattacked by the disease. If 10 per cent of the children have the disease between 4 and 5 years of age (as determined by the derivative or difference method already discussed) then we may relate these 10 cases occurring in 100 children not to the total 100 children but to the 68 who have not been attacked and find what proportion of children 4 years of age and not previously attacked have the disease before they reach their fifth year. Carrying this principle to other ages we may determine approximately the incidence of whooping cough among children of each age who have not previously been attacked. Such rates for whooping cough and also for the other diseases have been plotted in Figure 11. In this figure the rates for diphtheria and scarlet fever are based on children who have not had a clinical attack; diphtheria rates among children with a positive Schick reaction will be considered later.

In connection with Figure 11 it should be remembered that these rates are not at all comparable with secondary attack rates among children not previously attacked, that is, with attack rates among children in a household where a case of whooping cough, for example, has occurred. In the computation of the secondary attack rate the only persons taken into consideration are those who have been exposed to the disease, in so far as living in the same household with a case constitutes exposure to the infection. The rates shown in Figure 11 are based on all children not previously attacked, including those in families with no attacks as well as those in families where cases have occurred. The vital difference between the two types of rates is, therefore, known exposure to the disease.

The age curves among children who have not previously been attacked are by no means the same for all diseases (fig. 11). The maximum incidence in the case of measles and whooping cough comes at about 6 years of age. In other words, among children who have not previously been attacked, there is, according to these data, a greater probability of having these diseases at 6 years than at any age before or after that time. The maximum incidence of chicken pox among children not previously attacked also comes at 6 years or possibly a little earlier, but the maximum incidence of mumps comes between 8 and 9 years of age. Of children who have not previously had an attack of measles, nearly one-fourth suffer an attack during the sixth year of age; for whooping cough the corresponding figure is about 16 per cent.

After the age of maximum incidence in the group, the rates among children who have not suffered a prior attack decline rapidly with age. This is true of every one of the diseases under consideration. The decline in such rates could be due to either or both of two factors:

(1) There may be, among children who have not had an attack of whooping cough, for example, a number who nevertheless have a certain degree of immunity to the disease. (*a*) Some children may develop a specific immunity without an attack of the disease, as in the case of Schick-negative children who have not had diphtheria. (*b*) As age increases, children may develop more or less general immunity to infections of this type which partially protects them from attacks. (*c*) An unrecognized or undiagnosed attack may have occurred. (*d*) Mild or other attacks, particularly those occurring in the early ages, may have been forgotten by older children when

making the report on the history of infectious diseases. These forgotten attacks merge into the unrecognized attacks, inasmuch as the milder the case the more probable it is that the individual would forget it, or, if it occurred in his early childhood, he might never have

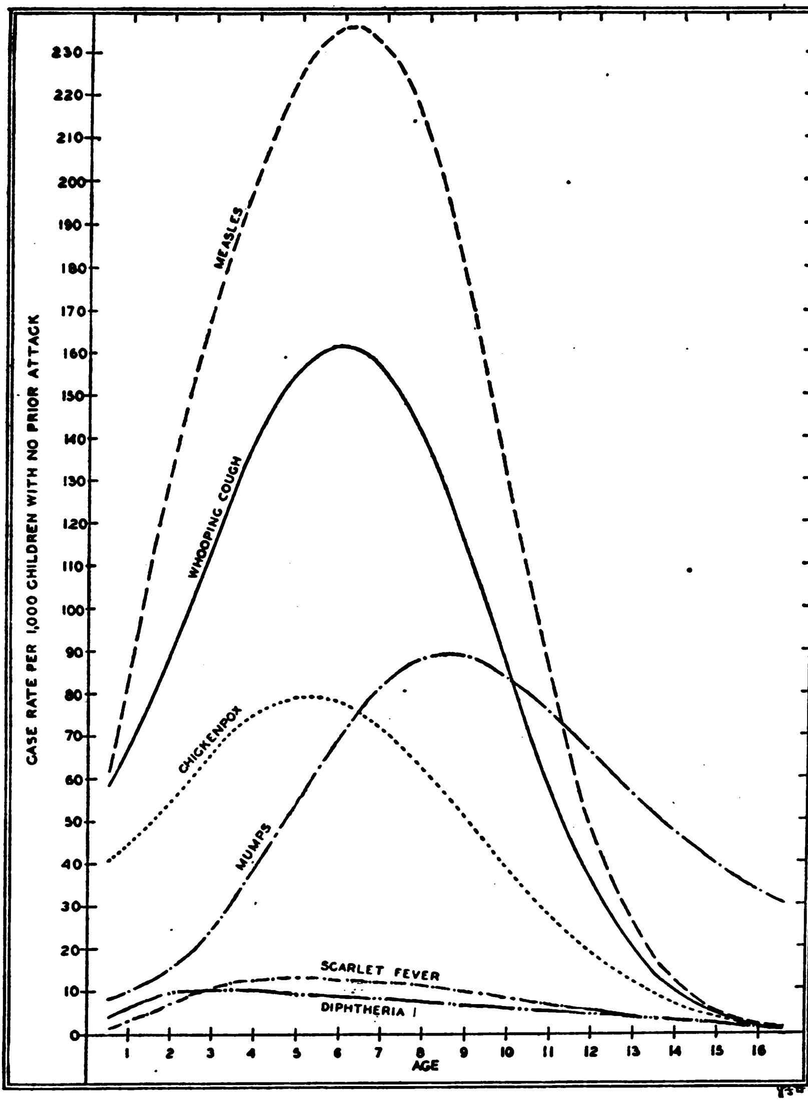

FIGURE 11.—Age incidence of the communicable diseases of childhood among persons not previously attacked (as approximated from histories of past attacks)

learned from his parents or others that he had suffered an attack. (*e*) Some children may have a natural immunity to the disease; that is, an immunity which they have had from birth.

(2) The decline in the rates as age increases among children not previously attacked may be due in part to less contact with cases or

to a difference in the intimacy of the contact. (*a*) Contact within the family may change. Inasmuch as there are many families with as many as four children with a difference of not more than six years between the ages of the oldest and the youngest child, it would not appear to be an unreasonable assumption that children who have reached the twelfth or thirteenth year are not as likely as younger children to be brought into contact within the family with a case of these diseases, since the maximum incidence occurs in the younger children. The smaller the family the less frequently will older children be found in the same household with younger children. Moreover, when a case occurs it must be easier to prevent its spread to older children in the family than to very young children who do not understand why they should keep away from the patient's room. (*b*) Contact with cases in school may be less frequent. Older children are not often in the same grade or room with the younger children at school, and therefore are less likely to be exposed to infections occurring among the younger children.

Chapin (3) and Butler (2) both show, by extensive data for Providence, R. I., and Willesden, England, respectively, that the measles secondary attack rate [2] among children in these cities who have not suffered a prior attack declines more or less regularly from a maximum of nearly 90 per cent at 2 to 4 years of age to considerably less than half that percentage by 15 years of age. The decline is more rapid after about 10 years of age. Since in dealing with the measles secondary attack rate there are considered only children living in households with a case of the disease, the decline could hardly be attributed to lessened contact as age increases, but must be due to some degree of immunity on the part of the children exposed to the disease, even though they gave no history of a prior attack.

From the histories of diphtheria and the Schick test we may approximate diphtheria rates among children giving a positive Schick test (Table 13). Such rates appear to decline as age increases after about the sixth or seventh year. The decline is not so rapid as in the case of some of the other infectious diseases; but, as already noted, the rate for diphtheria among all children also declines less rapidly than the rates for some of the other infectious diseases. These facts are illustrated in Figure 12, where the rates among children not previously attacked, including diphtheria rates among children giving a positive Schick test, have been plotted on a semilogarithmic chart.

It will be remembered that the curve (fig. 5) of the percentages of children of different ages who have had an attack of whooping cough,

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[2] In computing the secondary attack rate, cases occurring in the household (other than the primary case) are related to the number of persons in the household (other than the primary case), thus securing the percentage of persons exposed to the disease by family contact who suffer an attack. In computing the secondary attack rate among persons who have not had a prior attack, all persons exposed to the disease who have suffered a prior attack are eliminated from the computation.

for example, approaches an asymptote, or upper limit, which indicates the percentage of persons who at some time in their lives suffer a recognized attack of whooping cough. The asymptotes vary for the different diseases; about 10 per cent of persons suffer recognized attacks of diphtheria and 89 per cent suffer recognized attacks of measles, the other diseases falling between these two extremes. As already suggested, those persons who apparently do not have attacks

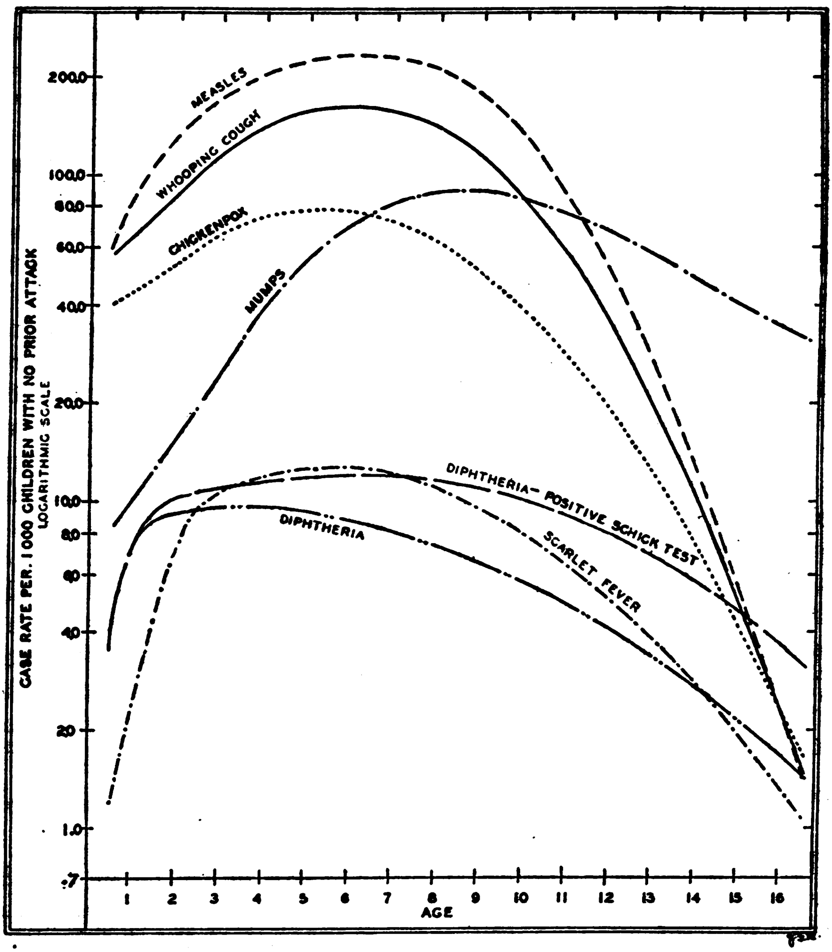

FIGURE 12.—Relative change in the age incidence of the communicable diseases of childhood among persons not previousy attacked (as approximated from histories of past attacks)

of whooping cough, for example, may have a natural immunity to the disease, that is, an immunity which they had at birth and have had throughout life. It might be argued that all of the 23 per cent who never have whooping cough represents persons with a natural immunity to the disease. If we assume that such is the case, then to find whooping cough rates among really susceptible children we would take out of consideration at every age the 23 per cent who never have a recognized clinical attack of whooping cough. To revert to the example previously considered, if 32 per cent of children have had whooping cough by the time they arrive at the fourth year of age, then the other 68 out of 100 children 4 years of age are not all susceptible to the disease but only the 45 left after deducting the 23 out of 100 who are assumed to have been immune from birth. If 10 per cent of children have the disease between 4 and 5 years of age, then we may relate these 10 cases occurring in 100 children not to the total 100 nor to the 68 who have not had attacks but to the 45 who have not had attacks but who will at some time in their lives suffer attacks and are therefore known to be susceptible. If rates of this sort are computed, they rise consistently from birth to 16 years of age for every disease except mumps. In fact, the nature of the curves fitted to the data would indicate that this is true; but, since the curves give a fairly reasonable fit to the data, it would appear that the data themselves are of the same nature.

It does not seem reasonable to assume that all adults who do not report recognized attacks at some time in their lives have a natural immunity to the disease which they have had from birth. As already pointed out, some may have acquired an immunity by an unrecognized or a forgotten attack and some may by chance even escape exposure to the disease. It would seem more reasonable to assume that only some of the adults who do not report recognized attacks have a natural immunity from birth. We have at present no means of estimating what proportion of person not suffering recognized attacks have a natural immunity to these diseases. Computations in this study have, therefore, been limited to incidence rates among children who did not report a prior attack, with no attempt to correct for natural immunity or immunity acquired by unrecognized or forgotten attacks.

COMPARISON WITH OTHER DATA ON THE AGE INCIDENCE AMONG CHILDREN NOT PREVIOUSLY ATTACKED

For a considerable group of school children in Hagerstown, Md., data were obtained on the history of childhood diseases prior to the period of observation, as well as the occurrence of the disease for a period of four school years during which time weekly reports were received from the teachers on absences of their pupils on account of sickness. These data made it possible to compute incidence rates for children of different ages who had not suffered a prior attack of the disease. These rates are shown in Table 14. In the instance of measles the only children considered were those who had not suffered a prior attack of either measles or German measles.

TABLE 14.—*Age incidence of certain communicable diseases among children who had not had a prior attack* [1] *of the disease, Hagerstown, Md., 1921–1925*

[Based on teachers' weekly reports of illnesses among white school children and reports by the children or parents of histories of attacks of these diseases prior to the period of observation]

Age in years	Case rates per 1,000 persons per year among children who had not had a prior attack of the disease				Number of cases occurring among children who had not had a prior attack of the disease				School years of exposure for children who had not had a prior attack of the disease			
	Measles, 1921–1925	Whooping cough, 1921–1925	Chicken pox, 1921–1925	Mumps, 1924–1925	Measles, 1921–1925	Whooping cough, 1921–1925	Chicken pox, 1921–1925	Mumps, 1924–1925	Measles, 1921–1925	Whooping cough, 1921–1925	Chicken pox, 1921–1925	Mumps, 1924–1925
Total 6–11	322.2	63.1	90.1	416.5	242	126	156	359	751	1,996	1,731	862
6	446.7	130.8	134.1	363.6	67	31	33	24	150	237	246	66
7	438.0	87.9	157.7	395.8	106	42	73	57	242	478	463	144
8	323.4	73.3	66.5	433.3	54	33	27	78	167	450	406	180
9	102.0	30.6	53.7	470.6	10	11	16	88	98	359	298	187
10–11	53.2	19.1	22.0	393.0	5	9	7	112	94	472	318	285

[1] The only children considered in this table are those who, prior to the beginning of the school year under consideration, had not had an attack of the disease being tabulated. In the case of measles this table includes only those who had not had an attack of measles (rubeola) or of German measles (rubella).

It must be borne in mind that these are not secondary attack rates, inasmuch as they are based on all school children who had not had a prior attack regardless of exposure to the disease, whereas the secondary attack rate considers only children who are exposed to the disease by family contact.

It may be seen from Table 14 that the measles and whooping cough rates both decline regularly after 6 years of age. The chicken pox rate declines after 7 years. In the case of mumps the rate increases up to 9 years and then declines. In all cases these data are more or less in agreement with similar rates approximated from histories of past attacks. The attack rates among children who have not had a prior attack seem to decline definitely with age.

A study of measles by the (British) Medical Research Council (12) shows for one school the percentage of the children who had not had a prior attack of measles who were attacked during the year under observation. The data are shown in three departments, infant (5 and 6 years old), junior (7, 8, and 9 years old), and senior (10, 11, and 12 years old). Measles occurred in all three departments during the year. Of 62 children in the infant department who had not had a prior attack, 41 children, or 66 per cent, were attacked during the year; of 28 children in the junior department who had not previously had measles, 15 children, or 54 per cent, were attacked; and of 17 children in the senior department who had not previously had measles, 5 children, or 29 per cent, were attacked. Although the numbers considered are too small to furnish reliable results, it may be noted that, in agreement with the data based on histories of measles as well as the Hagerstown school data, the rates among children who had not had a prior attack decline as age increases.

Comparison of the Age Incidence Among All Children and Among Children Not Previously Attacked

In order to facilitate comparison of the age incidence of these diseases among all children with the age incidence among children not previously attacked, the curves plotted in Figures 8 and 11 have been reproduced in Figures 13, 14, and 15, the two curves for each disease being put on the same graph. For diphtheria (fig. 15) there is a third line representing diphtheria case rates among children with a positive Schick test. For every disease, of course, the maximum incidence among children not previously attacked comes at a later age than the maximum incidence among all children. Considering all children the maximum incidence of measles, according to the data derived from histories, comes in the third year of life, during which year about 13 per cent of all children are attacked. The maximum among children not previously attacked comes about 6 years of age, during which year about 24 per cent of the children who have not previously had the disease suffer an attack. Likewise in the case of whooping cough the maximum incidence is moved from 4 years to 6 years when children who have already been attacked are eliminated from consideration, and similarly for chicken pox, although the peak in chicken pox is slightly under 6 years of age. Even in the case of diphtheria, where the peak for all children is about 3 years of age, the maximum incidence among children of a positive Schick test is about 6 years. The fact that the maximum incidence among children not previously attacked occurs around 6 years of age in several of the diseases would seem to be associated with the time of school entrance and the consequent increase in the opportunity for contact and infection. In the case of mumps the maximum incidence among all children, as well as among those not previously attacked, occurs at a later age, the former occurring at about 7 years and the latter at 8 to 9 years of age. Unfortunately, we do not have sufficient data on the percentage of children with a negative Dick test to approximate what the curve would be, and it is therefore impossible to say when the maximum incidence of scarlet fever among Dick-positive children occurs. The elimination of those who have had a clinical attack of scarlet fever leaves the maximum incidence at about 5½ to 6 years of age; but, of course, the number of children who have suffered a clinical attack is only a small proportion of the total with a Dick-negative reaction.

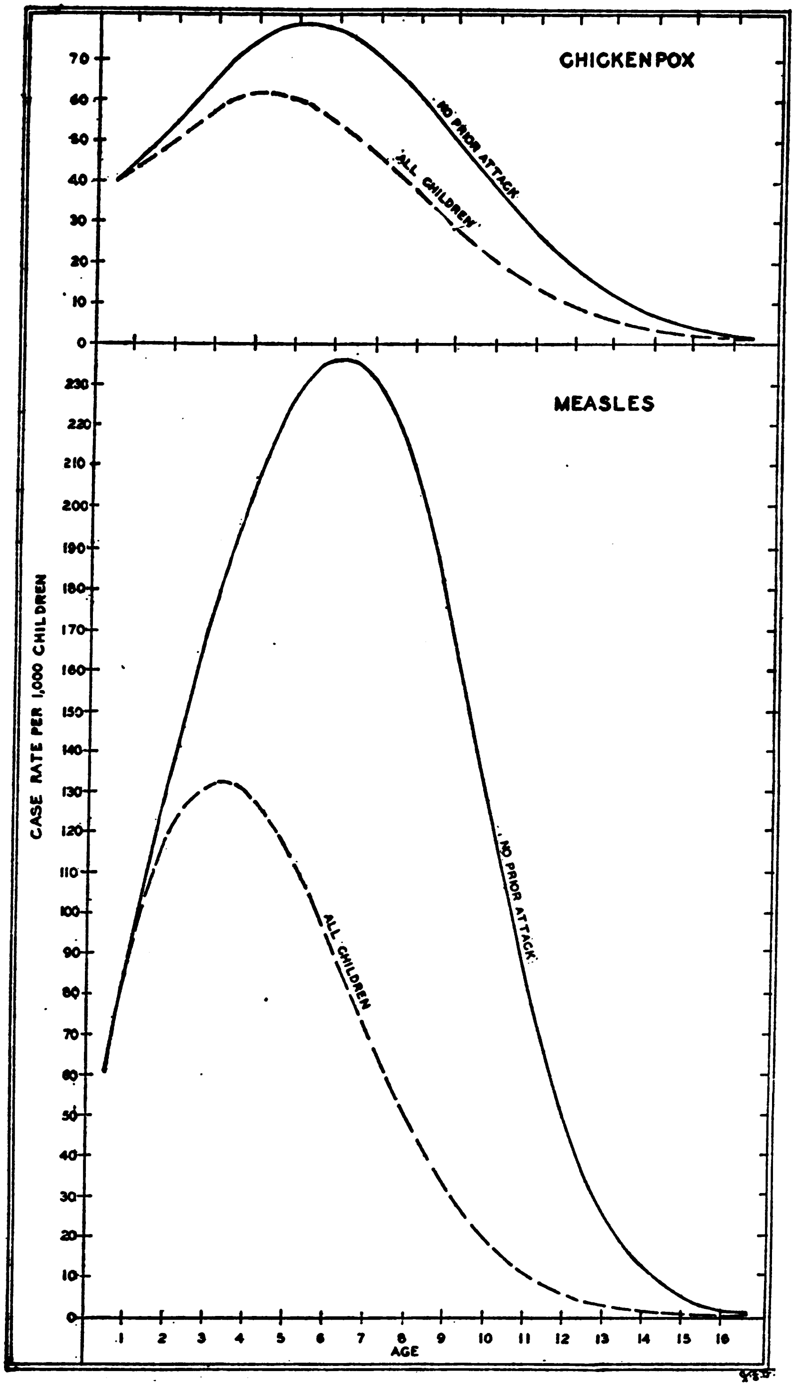

FIGURE 13.—Age incidence of certain communicable diseases among all children and among children not previously attacked (as approximated from histories of past attacks)

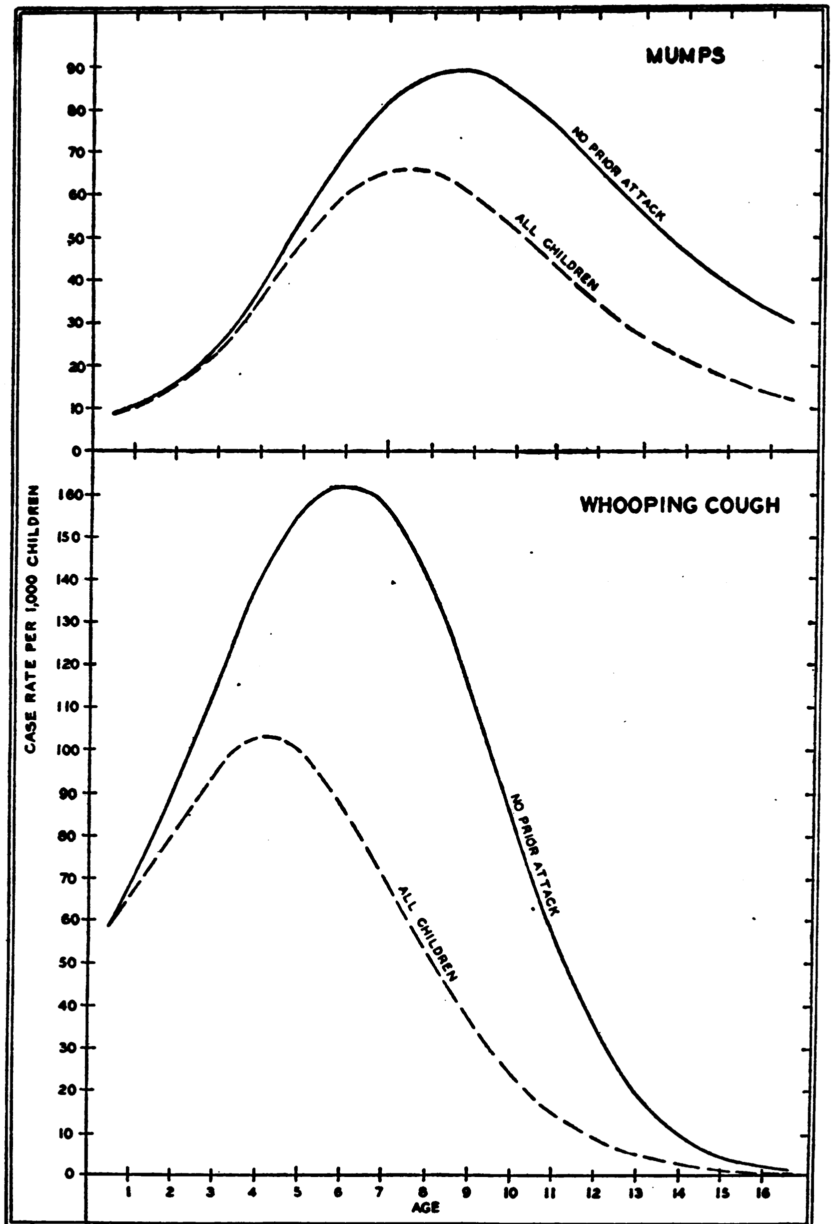

Figure 14.—Age incidence of certain communicable diseases among all children and among children not previously attacked (as approximated from histories of past attacks)

In Figures 13, 14, and 15 the age curves for children not previously attacked appear to decline even more rapidly than the age curves based on all children. Although the actual decline is greater, the

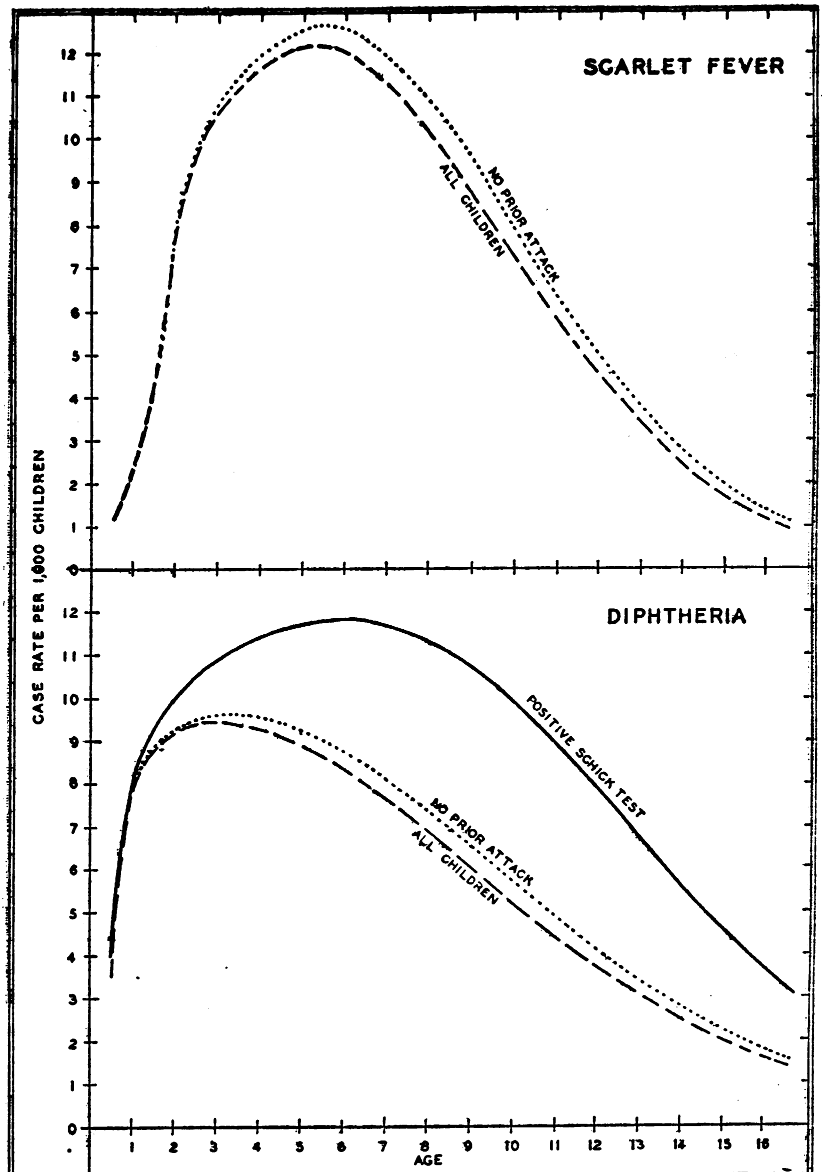

FIGURE 15.—Age incidence of scarlet fever and diphtheria among all children and among children not previously attacked and the age incidence of diphtheria among children giving a positive Schick test (as approximated from histories of past attacks and the results of Schick tests)

relative decline is not as great as in the curves for all children. Figure 16 shows for specific ages the ratio of the rate among children not previously attacked to the rate among all children.

This ratio is, of course, in all instances unity for the first year of life, inasmuch as no children have suffered attacks before birth and therefore all fall in the group not previously attacked. As age increases, the ratios in every case increase. By the twelfth year of age the measles rate among susceptibles is 8.5 times what it is among the total population of that age, whooping cough 4.1 times, and

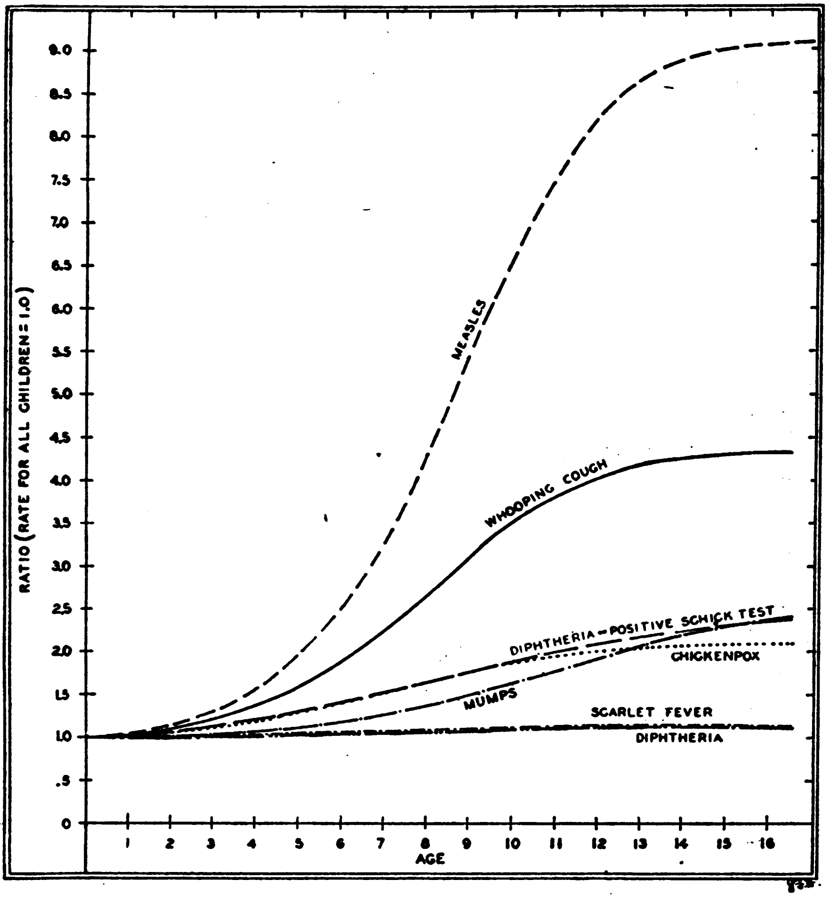

FIGURE 16.—Ratio of the case rate among children not previously attacked to the case rate among all children (as approximated from histories of past attacks)

chicken pox 2.0 times. The diphtheria rate among 12-year-old children with a positive Schick test is about 2.1 times the rate among all children of that age.

Death Rates at Specific Ages

To complete the picture of the age incidence of these infectious diseases of children, it seemed worth while to find the age incidence of the fatal cases; that is, the death rates at specific ages. Deaths as published by the United States Census Bureau are tabulated in single years of age only up to 5 years, after which age we must be content with 5-year age groups. However, since the deaths occur largely in the ages under 5, and in every instance the death rates are declining rapidly before 5 years of age, the 5-year age groups above 5 years are sufficient to give a very accurate picture of the death rates from these diseases.

Since we are dealing with average case rates and are trying to get away from unusually high rates occurring in epidemics or usually low rates occuring between epidemics, we selected the 7-year period 1917–1923 for the deaths. A second reason for selecting this period, rather than a more recent one, was that the average of the rates for all ages for the period 1917–1923, in the case of nearly every one of the diseases considered in this study, approximates the average of the rates for the considerably longer period 1910–1926. The latter consideration is particularly important if we expect to relate the death rates to the case rates to secure an approximation of the case fatality of the different diseases. This phase of the matter will be taken up in a later section.

Figure 17 shows the death rates among children of specific ages in the registration area of the United States for the period 1917–1923. A glance at this figure in comparison with Figure 8, which shows the case rates of the same diseases at specific ages, will indicate the widely different character of the age incidence of the cases and of the deaths. The death rates for whooping cough are far higher under 1 year of age than at any other age among children. In the case of measles the maximum death rate comes between 1 and 2 years of age, after which time there is a constant decline as age increases. The slightly lower death rate for measles under 1 year of age than from 1 to 2 years of age is apparently significant, inasmuch as it occurs consistently year after year in the data for the registration area. The death rate for diphtheria is highest between 2 and 3 years of age. The similarity of the age incidence of deaths to the age incidence of cases appears to be greater in the case of diphtheria than in any of the other diseases. Inasmuch as the fatality of diphtheria far exceeds that of any of the other infectious diseases of children, the greater similarity might be expected, the death curve being composed of a greater percentage of the total cases than in the instance of the other diseases where the fatality is much lower. The maximum death rate from scarlet fever also occurs between 2 and 3 years of age, but it is considerably lower than the death rate from diphtheria. Mumps was not shown separately as a cause of death until 1921, and the period

1921–1926 was therefore used in the case of mumps. The death rate from mumps is very low; but, like whooping cough, the maximum rate comes in the first year of life.

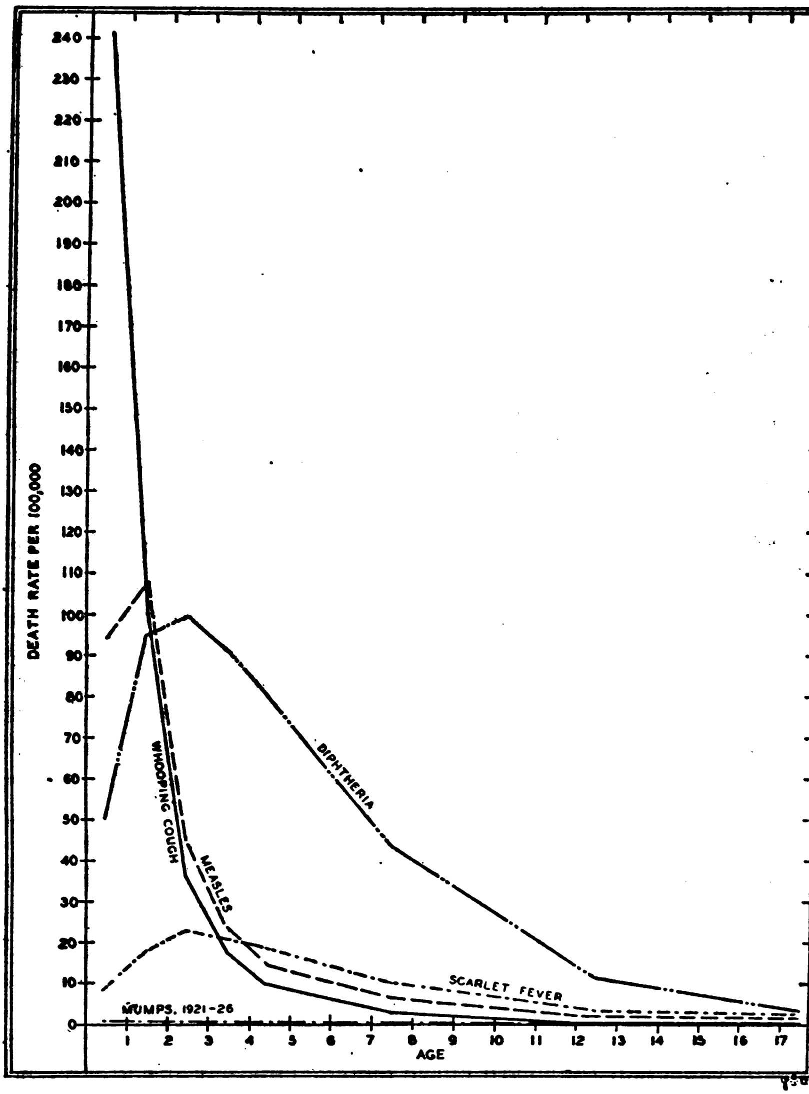

FIGURE 17.—Mortality from certain communicable diseases at specific ages. (White children in the registration area of the United States, 1917–1923)

In Figure 18 the death rates from these diseases among children are plotted on a semilogarithmic chart to facilitate comparison of the relative decline in the rates for the different diseases as age increases.

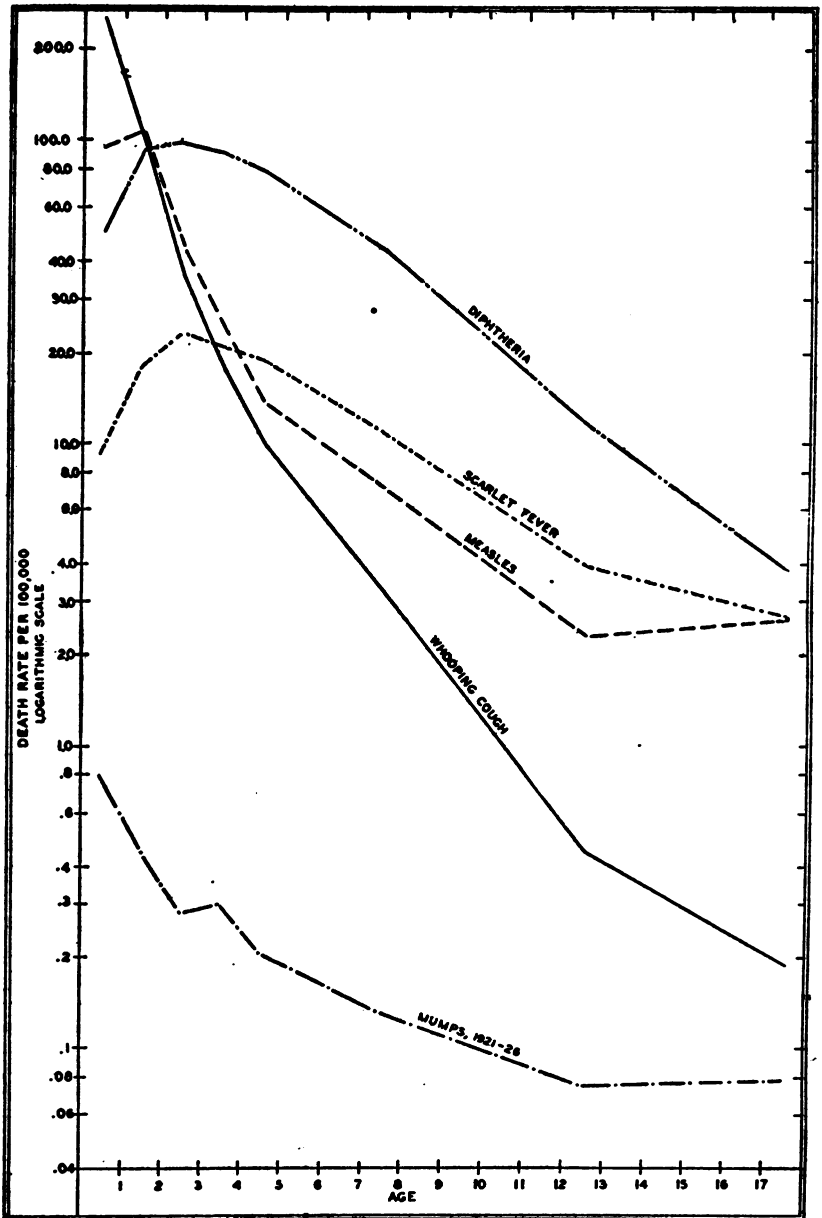

FIGURE 18.—Relative change with age in the mortality from certain communicable diseases at specified ages. (White children in the registration area of the United States, 1917-1923)

TABLE 15.—*Average annual mortality from certain communicable diseases of childhood among white persons in the registration area of the United States*

Years and disease	All ages [1]	Age in years										
		Under 5	5-9	10-14	15-19	20-24	25-29	30-34	35-44	45-54	55-64	65 and over
DEATH RATE PER 100,000 POPULATION PER YEAR												
1917-1923 [2]												
Diphtheria	15.55	83.40	43.87	11.55	3.81	1.99	1.43	1.36	1.11	1.02	.763	.690
Scarlet fever	4.13	18.23	10.82	3.91	2.65	2.01	1.44	.919	.546	.229	.135	.110
Whooping cough	8.79	78.88	3.21	.441	.185	.096	.059	.046	.039	.043	.058	.274
Measles	7.89	56.85	7.11	2.27	2.61	1.65	.953	.962	1.00	.976	1.01	1.67
1921-1926 [3]												
Mumps	.109	.407	.132	.076	.079	.047	.042	.048	.036	.040	.073	.255
NUMBER OF DEATHS												
1917-1923 [2]												
Diphtheria	85,772	48,704	25,079	6,108	1,747	911	678	593	842	590	288	194
Scarlet fever	22,758	10,645	6,187	2,066	1,214	928	681	400	416	133	51	31
Whooping cough	48,499	46,065	1,834	233	85	44	28	20	30	25	22	77
Measles	43,510	33,198	4,065	1,203	1,198	755	452	419	761	566	381	468
1921-1926 [3]												
Mumps	541	213	68	36	32	19	18	19	25	21	25	65
YEARS OF LIFE EXPOSED (IN THOUSANDS)												
1917-1923 [2]	551,706	58,399	57,167	52,889	45,836	45,839	47,414	43,546	76,133	58,020	37,712	28,107
1921-1926 [3]	496,733	52,397	51,663	47,692	40,611	40,539	42,510	39,263	68,839	52,691	34,455	25,517

[1] Including a few of unknown age.
[2] Total registration area except that registration cities in nonregistration States are excluded after 1919.
[3] Registration States of 1920.

Deaths from chicken pox and German measles are not available by age or color; the same is true of mumps prior to 1921. For the period 1917-1923, the average annual death rates per 100,000 total population of all ages in the registration area were: Chicken pox, 0.174; German measles, 0.0599; mumps, 0.134.

The two preceding figures have shown death rates for children only, the rates up to 5 years being computed for each single year of age. Although the death rates from these diseases are low for adults, the whole registration area for the period 1917–1923 affords sufficient data to indicate the age incidence among adults. (Table 15.) In Figure 19 the rates have been plotted on a semi-logarithmic graph for the ages throughout life, the age period under 5 years being plotted as a single group. Deaths from diphtheria and scarlet fever continue to decline as age increases, even up to 70 years. The death rates from whooping cough, mumps, and, to a lesser extent, measles, rise after about 50 years of age. Undoubtedly, few cases occur in the older ages and the fatality therefore must be rather high for the cases that do occur.

Case Fatality at Specific Ages

The examination of the curves representing the percentage of children of different ages who have suffered an attack of these diseases did not reveal any marked differences for the different localities

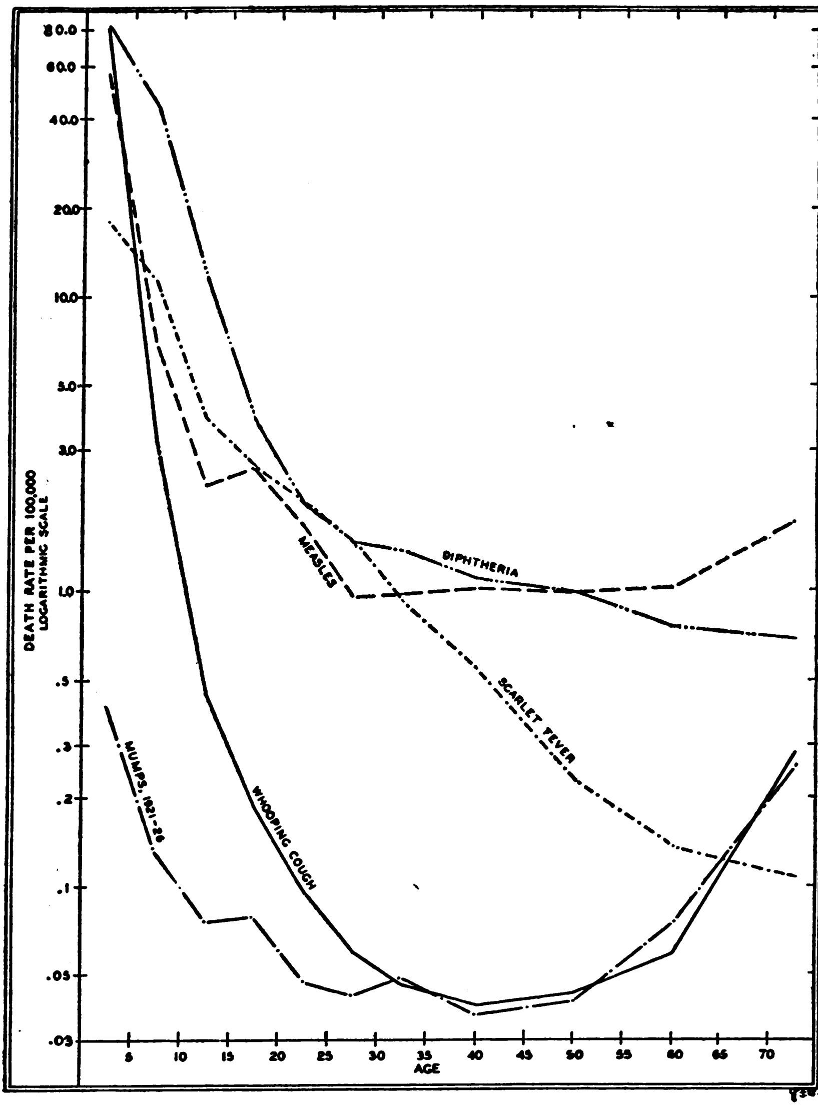

FIGURE 19.—Relative change with age in the mortality from certain communicable diseases at specific ages throughout life. (White persons in the registration area of the United States, 1917-1923)

other than that which might be accounted for by the cyclical variation in the incidence of these diseases. Inasmuch as the effect of these cycles is largely averaged out by reason of the combination of many localities in the general total, we may assume that the rates at specific ages are fairly representative of what occurs on the average in these communities. No data have been collected for the deaths from the infectious diseases of children in the particular communities included in the case study. Inasmuch as deaths from these diseases are not frequent, it would, in fact, be necessary to include a considerable number of years or quite a large area in the observations in order to "average out" the effect of the chronological cycles in the incidence of the diseases and get anything like a normal or average death rate from these causes. In the absence of data specifically relating to the particular communities where data on the cases were collected, as already mentioned, death rates were computed for the registration area [3] of the United States, the period 1917–1923 being taken because the average of the rates for all ages for this period approximates the average of the rates for the considerably longer period, 1910-1926. If we take the ratio of the death rate for whooping cough at, say, 3 years of age to the case rate at the same age, we may obtain an approximation of the case fatality of whooping cough at that age. Case fatality as usually defined and as used in this study means the number of deaths per 100 cases. The particular advantage in the rates that result from data used in this study is that the case rate comes nearer representing the actual or complete incidence than a rate based on the reported cases of the disease, because of the many attacks of these mild diseases that are never reported to the health department. Table 16 and Figure 20 show the case fatality of the different diseases from birth to 15 years of age, the last 10 years being shown in 5-year age groups because the deaths from these diseases are not available in single year age groups above 5 years of age.

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[3] The urban part of the registration area might have been more appropriate, but the deaths are not available by age.

Scarlet fever and diphtheria vary considerably in different geographic sections of the country, and all the children's diseases vary in age distribution in urban and rural areas (9). The average of the diphtheria death rates among white persons of all ages for the 11-year period 1910–1920 was 55 per cent greater in cities (10,000 or over in 1920) in the registration area of the United States than in the rural part of the area. The scarlet fever death rate was 64 per cent higher in the cities than in rural areas (17). At certain ages the differences may have been even greater. It may be seen, therefore, that, in so far as the case rates in this study applied to less rural districts than the average of the registration area, the estimated case fatalities would tend to be too low for these two diseases. On the other hand, the areas included in the history data probably include a higher percentage of southern localities than in the case of the registration area. Because diphtheria and scarlet fever are more prevalent in the North, the computations made in this study would tend to overstate the fatalities. Of the two errors the urban-rural error is probably the more important and the fatalities are probably underestimated.

For measles the difference is not so large. The rates for all ages for the period 1910–1920 average 11 per cent higher in the urban than in the rural parts of the registration area (17); but because of the greater concentration of cases in the younger ages in the cities, the differences at certain ages might be greater.

Mortality from whooping cough is actually higher in the rural than in the urban part of the registration area. For the period 1910–1920 the urban rate for all ages averaged 13 per cent less than the rural rate (17). Aside from the possibility of error due to greater concentration of cases in the younger ages in the cities, the estimated whooping cough fatality would, therefore, appear to be overstated rather than understated.

Inasmuch as the disease history data used in this study included some rural localities, it could not be classified as all urban, and the error due to using death rates in the registration area as a whole would not be as large as the differences between urban and rural rates would indicate.

Because the case rates approximated from the histories would not include fatal cases, they have been corrected by adding the death rate to the case rate to approximate the total fatal and nonfatal inci-

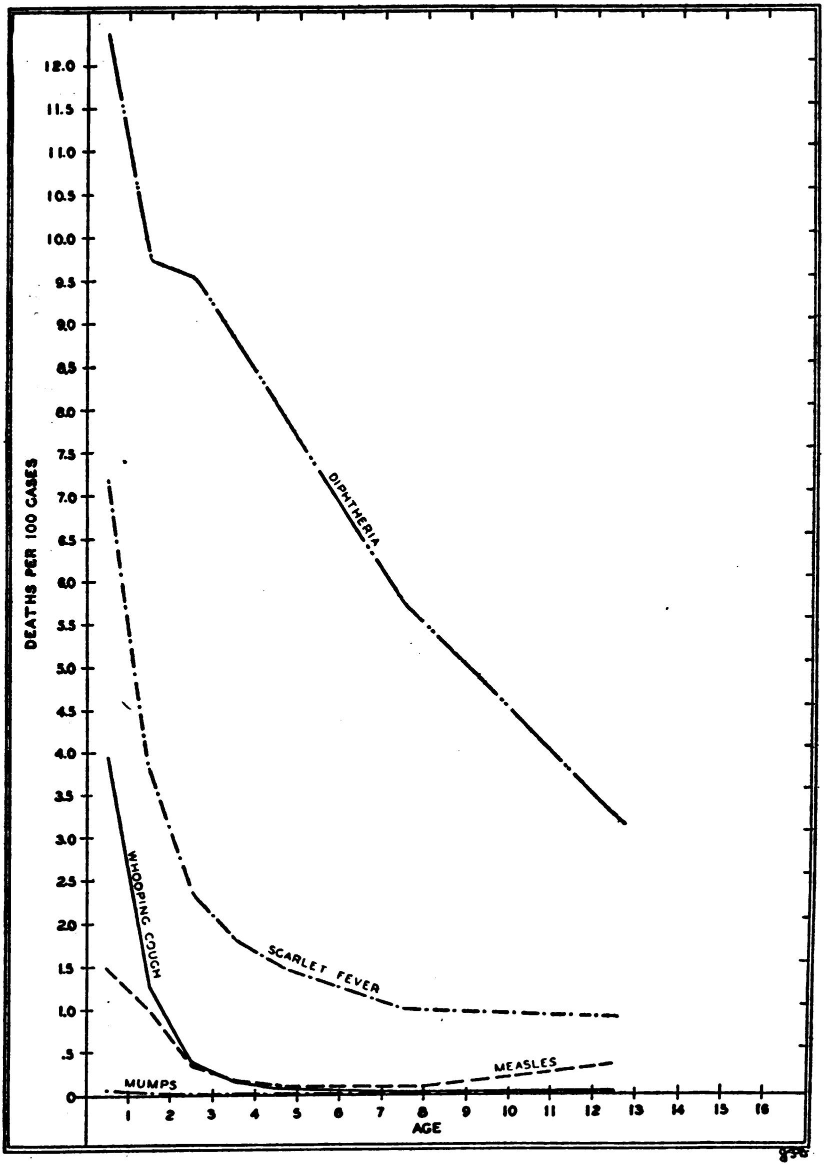

FIGURE 20.—Estimated case fatality of certain communicable diseases at specific ages

dence as a basis for computing the fatality rate. The correction makes no real difference except in diphtheria and possibly scarelt fever.

Table 16.—*Estimated case fatality of certain communicable diseases of childhood at specific ages*

WHITE PERSONS IN VARIOUS LOCALITIES IN THE UNITED STATES

Disease	Total under 15 years	Age in years						
		Under 1	1	2	3	4	5-9	10-14
ESTIMATED CASE FATALITY: DEATHS PER 100 CASES [1]								
Diphtheria	6.964	12.354	9.782	9.576	8.828	8.069	5.725	3.221
Scarlet fever	1.467	7.236	3.804	2.360	1.833	1.538	1.026	.938
Whooping cough	.537	3.963	1.329	.406	.174	.098	.052	.052
Measles	.370	1.507	1.018	.354	.177	.120	.113	.372
Mumps	.0054	.0957	.0352	.0148	.0100	.0048	.0022	.0024
DEATH RATE PER 100,000 [2]								
Diphtheria	47.43	50.04	95.11	99.26	90.54	79.74	43.87	11.55
Scarlet fever	11.22	9.36	18.09	23.30	20.96	18.85	10.82	3.91
Whooping cough	28.57	241.42	99.49	35.87	17.53	9.99	3.21	.44
Measles	22.83	94.38	108.11	45.29	23.56	14.78	7.11	2.27
Mumps	.209	.814	.446	.284	.307	.210	.132	.076
CASE RATE PER 100,000 [3]								
Diphtheria	681.03	405.04	972.31	1,036.56	1,025.64	988.24	766.27	358.55
Scarlet fever	764.72	129.36	475.59	987.40	1,143.66	1,225.55	1,054.62	416.91
Whooping cough	5,322.67	6,091.42	7,487.29	8,833.97	10,096.83	10,168.59	6,157.21	847.44
Measles	6,173.73	6,262.08	10,616.31	12,776.79	13,280.96	12,351.98	6,280.61	610.17
Mumps	3,847.71	850.81	1,267.25	1,921.88	3,061.11	4,382.61	6,067.53	3,166.18

[1] Percentage that death rate is of the case rate.
[2] In the registration area of the United States, 1917–1923, except for mumps, which is 1921–1926.
[3] Including both the fatal and the nonfatal cases, that is, the case rate estimated from the histories plus the death rate in the registration area. The nonfatal case rate used for the 5-year age groups was derived by adjusting the rates for single years of age to the age distribution, within the 5-year age period, of the white population of the United States in 1920. The rate for the age group under 15 years was obtained by a similar method.

Without exception the highest case fatality occurs under 1 year of age. After that time the fatality rapidly falls until at 4 or 5 years of age it is very small for all diseases except diphtheria and scarlet fever. The diphtheria case fatality stands out as far above any of the other diseases and remains so even up to 15 years of age. Although the fatality of scarlet fever is considerably below that of diphtheria, it is nevertheless much greater than that of measles or whooping cough. The fatality of mumps is almost negligible, even in the youngest ages.

In Figure 21 these case fatality rates have been plotted on a semi-logarithmic, or ratio, chart to facilitate the comparison of the relative decline with age in the case fatality of the different diseases. It may be seen that the decline with age is less in the case of diphtheria fatality than in the case of any of the other diseases. If measles and whooping cough can be postponed until 3 or 4 years of age, the danger of the attack is largely eliminated; but the same can not be said of diphtheria at any age. In this connection it should be noted that the data here used, both for cases and deaths, pertain largely to the

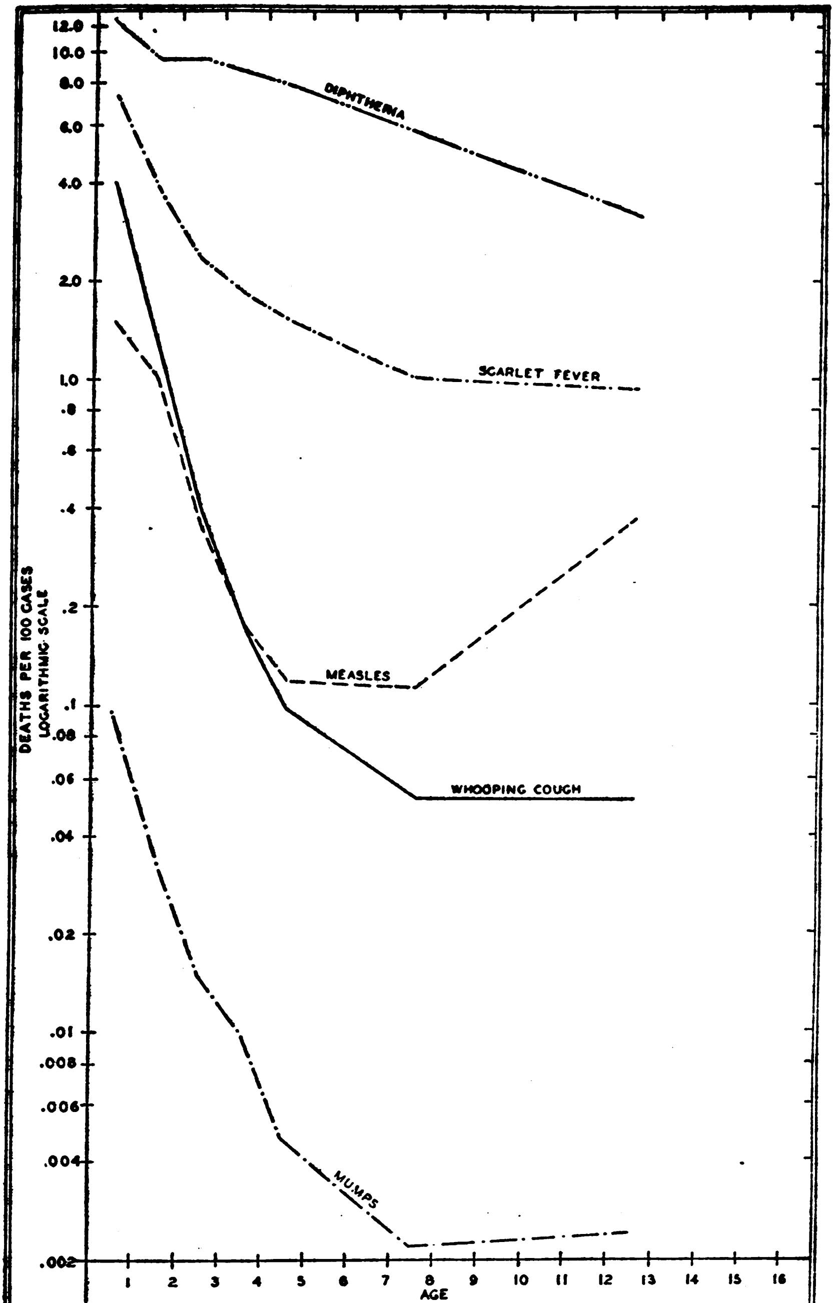

FIGURE 21.—Relative change with age in the estimated case fatality of certain communicable diseases at specific ages

period before toxin-antitoxin immunization was widely used, but they are, however, well within the period when antitoxin was extensively used. The case fatality of scarlet fever declines slightly more with age than that of diphtheria, but here again it does not appear that the postponement of cases beyond the first few years of life would avoid all the danger of the attacks.

It is doubtful whether the rise in the fatality of measles for the age group 10 to 14 years is significant. The fatality of measles seems to be higher for adults than for children, but whether the increase comes at as early an age as 10 to 14 is somewhat doubtful. The effect of forgotten attacks of these diseases has already been mentioned; attacks forgotten by children of the ages 10 to 14 would tend to make the case rate too small at those ages, and this, of course, would result in the indicated case fatality being too high.

Although the case fatality of mumps is very small, even in the youngest ages, it may be seen from Figure 21 that the relative age curve of its case fatality is like that of whooping cough and measles. In other words, what little danger there is in an attack of mumps in a child may be largely avoided if the attack can be postponed beyond the first few years of life. Although rarely fatal, mumps is more severe in adults than in children.

It has already been mentioned that data such as are used in the study of cases of these diseases are not sufficiently accurate to determine the incidence among adults. For this reason there is no way to estimate the case fatality of these diseases among adults. The death rates throughout life have already been shown and, inasmuch as the case rates for adults probably vary little with age, the curve of the death rates is a fair indication of the relative fatality of the few cases that do occur.

COMPARISON WITH CASE FATALITY AS INDICATED BY OTHER DATA

Out of the 562 cases of measles occurring in the Hagerstown canvassed population under 15 years of age, two deaths occurred, giving a fatality of 0.356 per cent. Out of the 36 cases of diphtheria under 15 years, one death occurred, giving a fatality of 2.77 per cent. In the case of measles the fatality is about the same as that obtained from the histories and death rates in the registration area of the United States, but the Hagerstown fatality is considerably less in the case of diphtheria. In neither disease can much dependence be put on the Hagerstown fatality rates as they are based on one and two deaths only. In the case of the other communicable diseases of childhood no deaths occurred in the Hagerstown canvassed population.

The average annual measles death rate in Providence for the period 1917–1923 was 47.6 per 100,000, or more than twice the rate of 22.8 in the registration area as a whole. The case fatality in Providence for persons under 15 years was 1.57 deaths per 100 reported cases of measles for the period 1917–1923, as against 0.37 per cent estimated from the histories and the death rate in the registration area of the United States. Case fatalities based on the reported cases are, of course, too high because of the incompleteness of reporting of cases and the relatively complete reporting of deaths but even after making allowance for incompleteness of reporting, the Providence fatality rate would appear to be materially higher than the estimate based on histories.

On the other hand, measles cases and deaths reported to the Public Health Service in 44 States for the year 1927 indicate a fatality of 0.94 per cent (27). If the Providence Health Department has made a special effort to secure reports of measles cases and has secured reports of only about half of the total cases that might be expected to occur, it would not appear that more than one-third of the measles cases over the country as a whole would be reported to health departments. On the assumption that from one-third to one-half of the cases are reported, the actual fatality rate in these 44 States would be somewhere near the rate estimated from the histories and the death rate.

At certain ages, of course, the disagreement is greater than it is at all ages. In Aberdeen, Scotland, 1883–1902, where reporting seemed to be about two-thirds complete, the case fatality under 1 year of age was nearly 14 per cent and at 1 year of age was 10 per cent (33). In Willesden, England, however, the fatality under 1 year was less than 3 per cent and at 1 year was 5 per cent (2). There is, therefore, great variation in the case fatality of measles in different localities.

The death rate from diphtheria in Providence for the period 1917–1923 was 58.6 per 100,000 persons under 15 years, or somewhat greater than the corresponding rate in the registration area for the same period, 47.4 per 100,000. The case fatality of diphtheria under 15 years in Providence for this period was 6.64 deaths per 100 cases. The corresponding fatality rate estimated from the histories and the death rate in the registration area was about the same, 6.96 deaths per 100 cases. At certain ages, however, the agreement is not so close.

In 45 States reporting diphtheria cases and deaths to the Public Health Service in 1927, the case fatality was 8.30 per cent (27).

The scarlet fever death rate for the period 1917–1923 was the same in Providence as in the registration area, 11.2 per 100,000 population under 15 years. The reported case rate in Providence was 5.02 cases per 1,000 persons under 15 years as against 7.65 as estimated from the histories. Since scarlet fever is more prevalent in the North than in the South and also more prevalent in the city than in rural areas, the reported cases in Providence may be even more incomplete than the above rates would indicate.

The case fatality of scarlet fever under 15 years of age in Providence for the period 1917–1923 was 2.24 deaths per 100 reported cases, as against 1.47 as estimated from the histories and the death rate in the registration area.

In 45 States reporting scarlet fever cases and deaths to the Public Health Service in 1927, the case fatality was 1.15 per cent (27).

Few data are available on the fatality of whooping cough. The reports of cases of this disease appear to be very incomplete, so the indicated fatalities are considerably too high. In 45 States reporting whooping cough cases and deaths to the Public Health Service in 1927, the case fatality was 4.08 per cent (27). Judging from data presented in connection with reported whooping cough rates, it would not appear that over one-eighth of the cases are reported. If allowance be made for incompleteness of reporting on this basis, the fatality in these States compares favorably with that estimated from the histories and the death rates.

In Aberdeen, Scotland, 1891–1900, whooping-cough fatality under one year was 12 per cent. Like the measles fatality in Aberdeen, whooping-cough fatality seemed to be unusually high.

Summary

Data from a number of sources on the percentage of children of specific ages who gave a history of a past attack of certain of the common communicable diseases of children were combined to secure an average curve of this type. The diseases included were measles, whooping cough, mumps, chicken pox, scarlet fever, and diphtheria. Although there is considerable variation in the age incidence of these diseases in different localities, the data at hand did not seem sufficiently accurate to make it worth while to study anything but the average for all communities combined. In data of this kind there are fairly large errors, not only those due to sampling but errors of observation such as those due to forgotten attacks, which would presumably become increasingly important as age increases. Nevertheless, it appears that the data are a fairly accurate and complete record of the proportion of the population that is attacked by these diseases. The data considered in this study are chiefly from urban communities of moderate size, but they include some distinctly rural areas.

The logistic curves used extensively by Reed and Pearl to describe population growth were fitted to the percentages of children of specific ages who had suffered attacks of these diseases. The autocatalytic type gave the best fit in the case of mumps, but the catalytic type

gave the best fit for the other five diseases and for the curve of the percentage of children with a negative Schick test.

From these curves, which may be considered as representing an accumulation of cases in a hypothetical population observed from birth to adult ages, we may secure an approximation of the incidence of these diseases at specific ages. The maximum incidence varies from about 3 years for diphtheria to about 8 years for mumps. After the maximum is reached, the rates in every case decline rapidly as age increases.

From the cumulative curves we may also secure an approximation of the incidence of these diseases among children of specific ages who have not previously suffered a recognized and remembered attack and, therefore, in the absence of immunity from some other source, may be considered relatively susceptible. The maximum incidence of measles, whooping cough, chicken pox, and scarlet fever among children who have not suffered a prior attack and the maximum incidence of diphtheria among children of a positive Schick test occurs at about 6 years of age. It appears that, on the average, children who have not suffered attacks of these diseases prior to school entrance are more likely to be attacked during their first school year than at any other time.

After the maximum, the incidence rates among children who have not suffered a prior attack decline considerably as age increases, although the relative decline is not as rapid as in the instance of the rate among all children. Apparently this decline could be due either to the development of immunity or to a change in contact or both.

1. Some children counted as relatively susceptible because they report no prior attack may be immune to these diseases: (*a*) It may be that some children develop a specific immunity without having an attack of the disease, as in the case of Schick negative children who have not suffered an attack of diphtheria; (*b*) as age increases, children may develop a more or less general immunity to infections of this type, which partially protects them from attacks; (*c*) immunity may have been acquired by mild unrecognized or forgotten attacks; (*d*) some children may have from birth a natural immunity to some of these diseases.

2. The frequency and intimacy of contact with cases of these diseases may decrease to some extent as age increases.

Death rates were computed for children of specific ages in the registration area of the United States for the period 1917–1923. With the exception of diphtheria the maximum death rate in every instance comes at an earlier age than the maximum case rate.

By relating the death rates and the case rates we may secure an approximation of the case fatality of these diseases. In every instance the maximum fatality occurs under 1 year of age. The fatality of measles, whooping cough, and mumps declines to an almost negligible percentage by 5 years of age, but the decline for scarlet fever and particularly diphtheria is by no means as great as in the case of the other three diseases.

Acknowledgments

In the preparation of this paper unpublished data have been made available to us from several sources. Data on the history of these infectious diseases and on Schick tests in Baltimore were collected under the direction of Surg. W. H. Frost and Prof. James A. Doull, of the Johns Hopkins University School of Hygiene and Public Health. Data on the history of these diseases among students in various universities in the United States were collected by Surg. J. G. Townsend in connection with a study of respiratory diseases. Data on histories in Hagerstown, Md., were collected by Statistician Edgar Sydenstricker in connection with the study of morbidity in that city. Data on the histories of a few of these diseases were collected by the United States Children's Bureau in connection with a study of preschool children in Gary, Ind. Data on Schick tests among children in Syracuse, N. Y., were collected under the direction of Dr. G. C. Ruhland, health commissioner of that city. In addition to the above unpublished data which were made available to us, the few published reports that contain data of this type have been drawn upon.

In the analysis of the data I have had the advice of Statistician Edgar Sydenstricker and other members of the staff of the Office of Statistical Investigations and the associated field offices of the United States Public Health Service.

I am especially indebted to Dr. W. H. Frost, who read the manuscript and gave many valuable suggestions for its revision, and to Prof. Lowell J. Reed, of the Johns Hopkins School of Hygiene and Public Health, and consultant in statistics to the United States Public Health Service, for advice in connection with the fitting of the curves and the suggestion of the use of the catalytic type of curve for data which did not appear to conform to the autocatalytic type of curve.

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES[1]

February 3–March 2, 1929

The prevalence of certain important communicable diseases in the United States, as indicated by weekly telegraphic reports received from State health officers,[2] from February 3 to March 2, 1929, is summarized below.

During the four weeks ended March 2 the incidence rates of diphtheria, scarlet fever, measles, typhoid fever, and smallpox were all lower than during the corresponding period of any of the three preceding years. For meningococcus meningitis and influenza, however, the incidence was appreciably above the normal.

[1] From the Office of Statistical Investigations, United States Public Health Service.
[2] The number of States reporting for the various diseases were as follows: Typhoid fever, 41; poliomyelitis, 43; meningococcus meningitis, 42; smallpox, 42; measles, 38; diphtheria, 42; scarlet fever, 41; influenza, 31.

Meningococcus meningitis.—During February the reported attack rate from this disease was the highest in 11 years. For the four weeks ended March 2 the number of cases totaled 952, representing a case rate (annual basis) of 11.9 per 100,000 population. This compares with a rate of 13.2 during February, 1918. Among the States showing an outstanding incidence of the disease were the following: Idaho (24 cases), Michigan (98 cases), Missouri (93 cases), Pennsylvania (40 cases), Utah (60 cases). On the other hand, an appreciable decline since January occurred in Oklahoma, Arkansas, and Montana.

Poliomyelitis.—The incidence rate of poliomyelitis maintained a normal level during the month of February. With the exception of 9 cases in California, 8 in New York, and 5 each in Pennsylvania and Alabama, no more than 3 cases were reported in any State during the four weeks ended March 2. The total number of cases (62) was slightly higher than that reported during the corresponding period in 1927 and lower than in 1926.

Typhoid fever.—The incidence rate of typhoid fever was relatively low during the month of February; 538 cases were reported, as compared with 703 during the corresponding period in 1928 and 941 in 1927.

Smallpox.—In Maine 21 cases of smallpox were reported during the four weeks ended March 2. In Vermont the number of cases totaled 11 for the same period. Reports from the Western and East and West North Central sections of the country indicated a continuation of the relatively high prevalence of smallpox in those States. An average of 825 cases weekly was reported during the month of February. The rate for the month was considerably below that for the corresponding period in 1928 and closely approximated that for 1927.

Influenza.—The attack rate of influenza continued to decline during the month of February, but was still higher than during the corresponding period in either of the two preceding years. For the four weeks ended March 2 the number of cases totaled 32,085.

Scarlet fever.—On the average approximately 4,500 cases of scarlet fever were reported weekly during the month of February. The rate was about the same as that for the corresponding month of 1928 and was slightly lower than that for 1927. As the lowest incidence of scarlet fever does not usually occur until late in the summer, the present level may continue for several weeks. For the four weeks ended March 2 the number of cases reported totaled 18,198.

Measles.—The expected seasonal increase in measles took place in all sections of the country during February. The incidence was, however, relatively low as compared with the two preceding years. For the four weeks ended March 2 the number of cases totaled 33,340, as against approximately 63,000 and 55,000 for the corresponding month in 1928 and 1927, respectively.

Diphtheria.—The diphtheria rate showed little change during February. For the four weeks ended March 2 the number of cases totaled 5,669, as compared with 7,624 in 1928 and 7,499 in 1927 during the same month.

Mortality from all causes.—The mortality rate from all causes in large cities as shown by the Weekly Health Index of the Bureau of the Census continued to decline through the month of February. A sharp rise occurred during the week ended March 2, which appeared to be due in part to an excess in the deaths from influenza and pneumonia in cities in the East and West South Central and the Mountain States. Later reports indicated that the rate had dropped again; and for the week ended March 16 the rate (14.7) was practically the same as that for the corresponding week in 1928 and but little above the rate in 1927.

COURT DECISIONS RELATING TO PUBLIC HEALTH

Pneumonoconiosis held to be a personal injury and compensable under compensation act.—(Massachusetts Supreme Judicial Court; Sullivan's Case, 164 N. E. 457; decided January 4, 1929.) In a proceeding under the workmen's compensation act compensation was claimed by an employee whose work was on granite or other stone with a surface-cutting machine. The employee was suffering from pneumonoconiosis, and the question for decision was whether he had received a personal injury arising out of and in the course of his employment or whether he was merely suffering from disease so induced. The supreme court affirmed an award of compensation, taking the view that the employee had sustained a personal injury. In deciding the matter the court said:

> * * * It is settled that simple disease resulting from employment affords no ground for recovery under our workmen's compensation act. * * * In certain circumstances, however, disease may also be a personal injury within the meaning of the act. * * * In the case at bar there was evidence tending to show the tangible impact of particles of granite upon the lungs of the employee producing definite damage to his body. The "personal injury," for which alone compensation is payable under G. L. c. 152, sec. 26, might have been found to be due to physical deterioration flowing immediately from corporeal collision with a foreign substance set in motion by the business of the employer performed by the employee by virtue of his contract for service. It might have been found to be as tangible as a broken bone. Although this result may be termed "granite cutters' disease," that factor is not decisive that it was a disease rather than a personal injury under the workmen's compensation act. Its nature in that respect must be ascertained from an analysis of the physical condition which in truth resulted and not from mere nomenclature. The personal injury may be none the less the direct and consequential result of the employment, although a condition may arise termed in some connections a disease. * * *

Gas appliance ordinances held valid.—(Maryland Court of Appeals; Portsmouth Stove and Range Co. *v.* Mayor and City Council of Baltimore et al., 144 A. 357; decided January 16, 1929.) Suit was brought by the plaintiff company to restrain the mayor and city council of Baltimore and the city commissioner of health from enforcing certain city ordinances pertaining to the testing, registration, sale, and installation of tubing and appliances for use with manufactured (illuminating) gas. Relevant portions of the ordinances are summarized as follows:

The sale, connection, or installation in the city of any tubing, appliance, appurtenance, or device for use with, by, or for the combustion of manufactured (illuminating) gas was forbidden unless the type, sample, or model thereof was registered with the health commissioner. Application forms were provided for and the applicant was required to furnish such information and certificates and cause such tests to be conducted as might be required by the commissioner to secure proper registration and identification of any tubing, etc. Before approving such application the commissioner was required to determine whether the tubing, etc., conformed to the rules and specifications which he was authorized to adopt. Whenever the commissioner determined that, before passing upon any registration application, it was "necessary and/or desirable to test in a laboratory or testing agency any tubing," etc., to determine whether there was compliance with prescribed specifications, he was authorized to direct the tests to be made by the laboratories of either the United States Bureau of Standards, the Johns Hopkins University, the American Gas Association, or any other laboratory or agency approved by him, and he was further authorized and directed to require the applicant to pay the costs. The commissioner in adopting the authorized rules and specifications could consider those established by the American Gas Association or any other rules, etc., relating to the subject, and could accept the certificate of any laboratory or testing agency approved by him in determining whether any tubing, etc., required by him to be tested met the prescribed tests.

The rules and specifications promulgated by the commissioner of health under the authority of the ordinances were, with certain omissions, those of the American Gas Association.

The plaintiff filed letters from the Bureau of Standards and Johns Hopkins University, the bureau stating that it did not make such tests as the ordinances required and the university stating that it had only made such tests for the accommodation of its friends or its own information, although it did not decline to entertain a proposition to do such work and in fact invited the plaintiff to confer and expressed its willingness to do what it could in the matter. With this the plaintiff seemed to eliminate as unavailable all except the American

Gas Association, which had a laboratory at Cleveland, Ohio, equipped to make the tests contemplated. The plaintiff was not a member of such association, and nonmembers were asked to pay 50 per cent more than members for the services rendered, but it was shown that members were charged less because of having contributed to the laboratory through their dues.

The court of appeals decided in favor of the city, declaring the ordinances to be within the range of the police power and valid. It held that the ordinances did not unlawfully delegate authority to unofficial agencies, the plaintiff having contended that said ordinances gave the power of decision to the testing agency. Concerning this the court said: "The testing agency does not decide anything; it ascertains as a fact whether the sample appliance or device is within the specifications prescribed by the commissioner of health. It is a matter of 'measurement and arithmetical calculation' * * * which some one with the requisite facilities must of necessity do.".

It was also held that the plaintiff was not denied the equal protection of the laws because nonmembers of the gas association paid more for tests than did members, the opinion stating that "The facilities and equipment have been provided by the association, presumably from the membership, and the 50 per cent additional fees demanded of nonmembers is imposed for the purpose of equalizing the cost of tests between them and the membership of the association, and not for the purpose of discriminating against nonmembers."

With regard to the plaintiff's complaint that the ordinances "may be the instruments of oppression, and under their authority the commissioner of health may arbitrarily require tests to be made at such cost as to drive the appellant out of the Baltimore market," the court said that this was only a fear and apparently not well founded, and then went on to say that "If, in the exercise of his discretion, the commissioner acts 'arbitrarily, or unreasonably, or exceed[s] the power conferred by the ordinance, those injured thereby can obtain relief from the courts.'"

DEATHS DURING WEEK ENDED MARCH 23, 1929

Summary of information received by telegraph from industrial insurance companies for the week ended March 23, 1929, and corresponding week of 1928. (From the Weekly Health Index March 27, 1929, issued by the Bureau of the Census, Department of Commerce)

	Week ended Mar. 23, 1929	Corresponding week, 1928
Policies in force	73, 638, 229	70, 702, 349
Number of death claims	16, 659	14, 519
Death claims per 1,000 policies in force, annual rate	11. 8	10. 7

Deaths from all causes in certain large cities of the United States during the week ended March 23, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928. (From the Weekly Health Index, March 27, 1929, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Mar. 23, 1929		Annual death rate per 1,000, corresponding week, 1928	Deaths under 1 year		Infant mortality rate, week ended Mar. 23, 1929 [2]
	Total deaths	Death rate [1]		Week ended Mar. 23, 1929	Corresponding week, 1928	
Total (62 cities)	7,928	14.2	14.7	756	854	[3] 67
Akron	50			5	5	52
Albany [4]	36	15.6	16.5	4	4	79
Atlanta	77	15.8	15.6	7	8	73
White	38			5	5	
Colored	39	(5)	(5)	2	3	
Baltimore [4]	225	14.2	17.3	12	25	38
White	168			8	15	32
Colored	57	(5)	(5)	4	10	63
Birmingham	73	17.2	15.8	6	7	54
White	28			4	5	60
Colored	45	(5)	(5)	2	2	46
Boston	283	18.5	14.9	25	30	69
Bridgeport	37			6	6	104
Buffalo	149	14.0	14.4	12	19	52
Cambridge	33	13.7	10.4	1	2	18
Camden	35	13.5	14.7	1	7	17
Chicago [4]	798	13.2	14.9	69	76	62
Cincinnati	178			15	17	87
Cleveland	202	10.5	12.1	18	19	53
Columbus	85	14.9	11.7	5	6	47
Dallas	61	14.6	12.2	5	6	
White	46			4	5	
Colored	15	(5)	(5)	1	1	
Dayton	52	14.7	9.9	9	0	143
Denver	85	15.1	17.6	6	6	58
Des Moines	32	11.0	12.7	3	3	54
Detroit	358	13.6	13.1	43	72	69
Duluth	29	13.0	8.1	2	1	48
Erie	27			5	4	102
Fall River [4]	22	8.6	12.8	4	0	75
Flint	28	9.8	10.9	7	7	85
Fort Worth	38	11.6	11.6	3	3	
White	31			3	1	
Colored	7	(5)	(5)	0	2	
Grand Rapids	27	8.6	10.5	1	4	15
Houston	76			9	6	
White	64			8	4	
Colored	12	(5)	(5)	1	2	
Indianapolis	123	16.8	15.1	4	4	32
White	93			4	4	37
Colored	30	(5)	(5)	0	0	0
Jersey City	65	10.5	13.2	7	10	54
Kansas City, Kans	38	16.8	19.0	6	8	133
White	29			4	4	101
Colored	9	(5)	(5)	2	4	358
Kansas City, Mo	110	14.7	16.6	12	9	101
Knoxville	34	16.9	12.4	3	0	66
White	29			3	0	73
Colored	5	(5)	(5)	0	0	0
Los Angeles	310			27	25	79
Louisville	102	16.2	14.0	8	8	65
White	84			6	7	56
Colored	18	(5)	(5)	2	1	126
Lowell	31			1	2	23
Lynn	24	11.9	17.8	2	1	55
Memphis	89	24.5	20.9	9	6	106
White	41			3	2	57
Colored	48	(5)	(5)	6	4	188
Milwaukee	151	14.5	11.0	30	22	132
Minneapolis	98	11.2	11.2	14	6	87
Nashville	56	21.0	20.2	8	9	129
White	35			6	5	130
Colored	21	(5)	(5)	2	4	126
New Bedford	31			2	3	43
New Haven	51	14.2	12.8	3	4	46
New Orleans	151	18.4	19.2	13	10	65
White	88			5	2	35
Colored	63	(5)	(5)	8	8	135

Footnotes at end of table.

Deaths from all causes in certain large cities of the United States during the week ended March 23, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928—Continued

City	Week ended Mar. 23, 1929: Total deaths	Week ended Mar. 23, 1929: Death rate [1]	Annual death rate per 1,000, corresponding week, 1928	Deaths under 1 year: Week ended Mar. 23, 1929	Deaths under 1 year: Corresponding week, 1928	Infant mortality rate, week ended Mar. 23, 1929 [2]
New York	1,619	14.1	15.2	168	195	69
Bronx Borough	209	11.0	12.8	15	20	44
Brooklyn Borough	572	13.0	13.4	71	68	72
Manhattan Borough	652	19.5	21.5	68	81	83
Queens Borough	160	9.8	10.0	13	21	53
Richmond Borough	35	12.1	15.3	1	5	18
Newark, N. J	136	15.0	12.8	11	11	58
Oakland	74	14.1	12.6	4	4	44
Oklahoma City	38			3	3	60
Omaha	60	14.1	16.2	7	3	82
Paterson	41	14.8	15.2	4	4	71
Philadelphia	542	13.7	14.4	54	66	76
Pittsburgh	216	16.8	15.4	23	30	79
Portland, Oreg	66			1	2	11
Providence	85	15.5	15.7	9	7	79
Richmond	64	17.2	16.1	6	9	84
White	41			2	3	42
Colored	23	(5)	(5)	4	6	164
Rochester	72	11.5	16.4	6	8	51
St. Louis	281	17.3	18.9	20	19	67
St. Paul	57			2	7	21
Salt Lake City [4]	37	14.0	12.1	7	7	108
San Antonio	53	12.7	20.4	8	16	
San Diego	50	21.8	21.4	2	6	38
San Francisco	136	12.1	15.1	6	7	38
Schenectady	14	7.8	7.8	3	2	96
Somerville	21	10.7	12.7	3	2	108
Spokane	32	15.3	14.9	1	3	26
Springfield, Mass	41	14.3	12.2	5	2	83
Syracuse	60	15.7	11.5	6	5	72
Tacoma	17	8.0	8.5	0	0	0
Toledo	79	13.2	11.5	7	6	65
Trenton	40	15.0	15.8	4	9	72
Washington, D. C	175	16.6	16.8	9	14	53
White	118			7	6	59
Colored	57	(5)	(5)	2	8	38
Waterbury	18			1	2	25
Wilmington, Del	41	16.7	9.8	3	4	78
Worcester	59	15.6	17.7	9	6	113
Yonkers	24	10.3	10.8	3	2	70
Youngstown	39	11.7	13.5	6	5	86

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births. Cities left blank are not in the registration area for births.
[3] Data for 70 cities.
[4] Deaths for week ended Friday.
[5] In the cities for which deaths are shown by color the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended March 23, 1929, and March 24, 1928

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 23, 1929, and March 24, 1928

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928
New England States:								
Maine	6	5	26	7	251	33	0	0
New Hampshire	3	2	14		36	16	0	0
Vermont	3				7	98	0	0
Massachusetts	84	86	65	11	387	1,809	5	2
Rhode Island	11	7	6		90	91	0	0
Connecticut	28	23	18	7	515	301	2	1
Middle Atlantic States:								
New York	310	390	[1] 52	[1] 57	1,214	2,548	42	33
New Jersey	107	149	22	41	246	1,307	6	3
Pennsylvania	189	197			2,293	1,345	7	4
East North Central States:								
Ohio	29	68	43	22	1,263	1,071	5	5
Indiana	30	25		65	485	280	0	0
Illinois	157	192	220	251	1,637.	232	14	17
Michigan	88	51	20		417	1,536	38	3
Wisconsin	17	23	50	78	1,142	106	8	6
West North Central States:								
Minnesota	27	27	1	5	752	82	3	2
Iowa	11	11			57	36	5	2
Missouri	52	52	14	167	384	339	36	9
North Dakota	8	3			81		6	3
South Dakota	3	7	1	45	16	29	2	
Nebraska	16	6		90	49	69	2	0
Kansas	9	8	26	50	290	87	9	1
South Atlantic States:								
Delware	1	1	3		32	21	0	0
Maryland [2]	20	22	98	50	83	1,163	1	0
District of Columbia	11	21	5	11	24	182	0	1
West Virginia	9	23	64	50	249	120	3	2
North Carolina	22	111			72	3,290	5	0
South Carolina	17	21	623	859	10	950	0	0
Georgia	7	12	55	154	25	105	1	0
Florida	6	10	4	1	26	70	0	0

[1] New York City only.

[2] Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 23, 1929, and March 24, 1928—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928
East South Central States:								
Kentucky	-------	-------	-------	16	54	240	0	0
Tennessee	11	3	95	211	6	281	5	0
Alabama	26	31	111	254	114	586	7	3
Mississippi	3	15	-------	-------	-------	-------	-------	1
West South Central States:								
Arkansas	16	2	148	377	56	506	6	3
Louisiana	21	11	99	157	85	374	2	1
Oklahoma [3]	13	18	153	489	24	287	5	3
Texas	21	42	64	52	150	491	2	6
Mountain States:								
Montana	4	2	-------	-------	130	1	6	5
Idaho	3	-------	6	-------	4	-------	10	1
Wyoming	2	-------	4	-------	22	45	0	2
Colorado	10	26	4	4	11	25	6	14
New Mexico	4	6	9	9	2	142	3	0
Arizona	-------	8	1	-------	-------	27	2	5
Utah [2]	1	4	4	7	4	11	14	7
Pacific States:								
Washington	7	7	-------	-------	105	278	34	2
Oregon	8	8	107	49	194	125	2	7
California	58	102	102	82	57	234	18	4

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928
New England States:								
Maine	0	0	56	26	2	0	0	0
New Hampshire	0	0	26	9	0	0	0	0
Vermont	0	0	20	17	11	0	0	0
Massachusetts	0	1	396	317	0	0	4	2
Rhode Island	0	0	23	46	0	0	2	0
Connecticut	0	0	74	55	9	0	1	1
Middle Atlantic States:								
New York	1	9	708	943	5	5	11	16
New Jersey	1	1	233	317	0	1	4	6
Pennsylvania	2	3	531	603	0	0	17	12
East North Central States:								
Ohio	2	2	306	232	47	57	16	4
Indiana	0	0	280	150	60	228	6	1
Illinois	3	2	523	345	157	58	4	13
Michigan	1	1	368	277	84	36	5	4
Wisconsin	0	2	263	209	5	12	4	1
West North Central States:								
Minnesota	0	0	103	145	0	0	8	3
Iowa	1	0	182	79	60	33	3	0
Missouri	0	2	87	105	40	71	7	1
North Dakota	0	0	47	79	6	0	0	2
South Dakota	0	3	31	29	15	10	1	0
Nebraska	0	0	129	100	71	53	1	0
Kansas	0	1	223	196	79	84	0	0
South Atlantic States:								
Delaware	0	0	2	3	0	0	0	0
Maryland [2]	0	0	106	72	0	0	2	5
District of Columbia	0	1	24	44	0	2	0	1
West Virginia	0	1	16	54	21	67	21	3
North Carolina	2	0	33	23	14	121	6	3
South Carolina	0	0	13	4	3	7	6	2
Georgia	0	0	20	27	15	0	6	3
Florida	0	0	10	6	0	2	3	7

[2] Week ended Friday.

[3] Figures for 1929 are exclusive of Oklahoma City and Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 23, 1929, and March 24, 1928—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928	Week ended Mar. 23, 1929	Week ended Mar. 24, 1928
East South Central States:								
Kentucky	0	3	112	34	43	19	6	3
Tennessee	0	0	52	17	0	20	4	5
Alabama	1	1	11	19	6	10	12	13
Mississippi	0	0	7	16	1	3	2	3
West South Central States:								
Arkansas	0	0	9	26	6	11	3	4
Louisiana	0	0	53	15	5	34	7	4
Oklahoma [3]	0	1	20	80	99	249	3	3
Texas	1	0	71	144	85	48	3	4
Mountain States:								
Montana	0	0	21	6	4	16	0	0
Idaho	0	0	2	10	11	1	0	0
Wyoming	1	0	7	14	2	3	0	0
Colorado	0	0	20	81	26	2	1	0
New Mexico	0	0	27	31	0	1	3	1
Arizona	0	0		5	6	20	1	0
Utah [2]	0	0	6	6	2	14	1	0
Pacific States:								
Washington	1	0	20	37	52	49	5	2
Oregon	1	1	53	17	36	77	1	1
California	8	2	473	153	37	29	13	5

[2] Week ended Friday. [3] Figures for 1929 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January, 1929										
Florida	3	49	3,452	14	26	3	0	49	7	8
February, 1929										
Illinois	54	536	1,091	1	2,791		1	1,792	486	18
Indiana	4	110	620		1,253		1	861	226	7
Louisiana	22	76	1,018	31	362	19	0	161	25	35
Maryland	0	98	3,404	2	434		1	278	0	14
Michigan		317	235		1,406	1	3	1,427	146	12
Minnesota	9	101	6		1,598		0	679	13	14
Mississippi	2	52	11,050	1,950	2,377	364	3	67	6	35
Missouri	67	215	980	7	1,123	1	0	428	198	7
New York	148	904		4	3,549		10	1,971	0	44
North Carolina	4	134			343		2	202	66	6
Ohio	25	265	784		4,163		1	1,224	178	27
Oklahoma [1]	26	79	2,274	42	19	4	3	131	185	16
Oregon	7	48	346		463		1	185	188	3
Pennsylvania	46	570			7,239	1	6	1,737	1	41
Rhode Island	2	54	177		383		0	147		3
West Virginia	6	63	1,743		558		0	109	73	25

[1] Exclusive of Oklahoma City and Tulsa.

January, 1929	Cases
Florida:	
Chicken pox	67
Dysentery	2
Mumps	13
Rabies in man	1
Typhus fever	1
Whooping cough	65

February, 1929	Cases
Actinomycosis:	
Illinois	1
Anthrax:	
Pennsylvania	2
Chicken pox:	
Illinois	1,042
Indiana	406
Louisiana	94
Maryland	406
Michigan	764
Minnesota	576
Mississippi	917
Missouri	314
New York	2,100
North Carolina	768
Ohio	1,151
Oklahoma [1]	97
Oregon	212
Pennsylvania	2,356
Rhode Island	25
West Virginia	143
Dengue:	
Mississippi	1
Dysentery:	
Illinois	14
Indiana (amebic)	1
Mississippi (amebic)	45
Mississippi (bacillary)	221
New York	3
Oklahoma [1]	2
Pennsylvania	1
German measles:	
Illinois	89
Maryland	18
New York	336
North Carolina	73
Ohio	9
Pennsylvania	75
Rhode Island	4
Hookworm disease:	
Louisiana	2
Mississippi	267
Impetigo contagiosa:	
Maryland	3
Oregon	10
Lead poisoning:	
Illinois	14
Ohio	17
Lethargic encephalitis:	
Illinois	7
Louisiana	1
Michigan	13
Minnesota	1
New York	23
Ohio	12
Pennsylvania	13

[1] Exclusive of Oklahoma City and Tulsa.

Mumps:	Cases
Illinois	446
Indiana	67
Louisiana	3
Maryland	429
Michigan	459
Mississippi	404
Missouri	210
New York	1,178
Ohio	396
Oklahoma [1]	36
Oregon	149
Pennsylvania	1,943
Rhode Island	3
Ophthalmia neonatorum:	
Illinois	38
Indiana	1
Maryland	1
Mississippi	14
Missouri	1
New York	1
North Carolina	1
Ohio	78
Oklahoma [1]	2
Pennsylvania	8
Rhode Island	1
Paratyphoid fever:	
Illinois	2
Puerperal septicemia:	
Illinois	18
Mississippi	31
New York	15
Ohio	19
Pennsylvania	18
Rabies in animals:	
Illinois	7
Maryland	8
Minnesota	1
Mississippi	6
Missouri	14
New York	20
Oregon	1
Rhode Island	14
Rabies in man:	
Michigan	2
Scabies:	
Maryland	3
Oregon	12
Septic sore throat:	
Illinois	18
Maryland	3
Michigan	23
Missouri	29
New York	12
North Carolina	5
Ohio	62
Oklahoma [1]	30
Oregon	9
Tetanus:	
Louisiana	2
Maryland	1
New York	4
Ohio	2
Pennsylvania	4

Trachoma:	Cases
Illinois	16
Maryland	1
Minnesota	3
Mississippi	9
Missouri	2
New York	1
Ohio	1
Oklahoma [1]	5
Trench mouth:	
Maryland	2
Trichinosis:	
Ohio	4
Tularaemia:	
Maryland	1
Ohio	1
Typhus fever:	
Louisiana	1
Undulant fever:	
Maryland	1
Minnesota	1
New York	3
Ohio	11
Pennsylvania	1

Vincent's angina:	Cases
Maryland	9
New York	67
Oklahoma [1]	2
Whooping cough:	
Illinois	567
Indiana	267
Louisiana	13
Maryland	382
Michigan	883
Minnesota	324
Mississippi	957
Missouri	258
New York	1,197
North Carolina	735
Ohio	1,658
Oklahoma [1]	78
Oregon	24
Pennsylvania	1,653
Rhode Island	24
West Virginia	125

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 98 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 31,565,000. The estimated population of the 91 cities reporting deaths is more than 29,995,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended March 16, 1929, and March 17, 1928

	1929	1928	Estimated expectancy
Cases reported			
Diphtheria:			
46 States	1,461	1,893	
98 cities	767	950	928
Measles:			
44 States	12,742	19,854	
98 cities	4,124	8,051	
Meningococcus meningitis:			
45 States	325	155	
98 cities	152	73	
Poliomyelitis:			
46 States	14	27	
Scarlet fever:			
46 States	5,947	5,017	
98 cities	1,971	1,786	1,553
Smallpox:			
46 States	1,058	1,424	
98 cities	75	127	98
Typhoid fever:			
46 States	142	161	
98 cities	28	27	31
Deaths reported			
Influenza and pneumonia:			
91 cities	1,256	1,424	
Smallpox:			
91 cities	0	1	
Sacramento, Calif.	0	1	

[1] Exclusive of Oklahoma City and Tulsa.

City reports for week ended March 16, 1929

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1920 is included. In obtaining the estimated expectancy the figures are smoothed when necessary to avoid abrupt deviation from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Population July 1, 1928, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	78,600	2	1	1		0	40	0	1
New Hampshire:									
Concord	(1)	0	0	1		0	0	0	1
Manchester	85,700	0	1	0		1	0	0	3
Vermont:									
Barre	(1)	0	0	0		0	0	8	0
Massachusetts:									
Boston	799,200	47	40	25	17	5	30	15	35
Fall River	134,300	1	3	4	1	1	19	0	2
Springfield	149,800	3	3	3		0	23	3	1
Worcester	197,600	14	4	2	2	0	15	1	7
Rhode Island:									
Pawtucket	73,100	4	1	2		0	15	0	5
Providence	286,300	0	9	10	2	2	51	1	13
Connecticut:									
Bridgeport	(1)	2	6	5	5	1	24	0	9
Hartford	172,300	2	8	6		1	48	7	6
New Haven	187,900	17	2	1	2	1	10	0	9
MIDDLE ATLANTIC									
New York:									
Buffalo	555,800	15	13	17		0	14	4	21
New York	6,017,500	348	236	211	78	35	58	0	226
Rochester	328,200	8	10	6	8	0	40	22	11
Syracuse	199,300	57	6	0		1	3	5	12
New Jersey:									
Camden	135,400	2	5	7	2	1	5	1	6
Newark	473,600	37	16	31	11	1	14	81	20
Trenton	139,000	1	4	2		0	1	0	1
Pennsylvania:									
Philadelphia	2,064,200	186	70	33	30	19	60	13	72
Pittsburgh	673,800	57	20	17	18	8	15	11	38
Reading	115,400	8	3	5		0	70	0	1
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	413,700	17	10	10		4	1	0	19
Cleveland	1,010,300	88	31	13	12	4	526	16	27
Columbus	299,000	18	4	3	4	4	29	0	6
Toledo	313,200	14	5	4	2	2	15	20	7
Indiana:									
Fort Wayne	105,300	7	2	3		0	40	0	4
Indianapolis	382,100	0	5	2		2	90	0	16
South Bend	86,100	1	1	2		0	60	0	4
Terre Haute	73,500	2	1	3		1	4	0	1
Illinois:									
Chicago	3,157,400	107	77	101	20	11	463	13	82
Springfield	67,200	6	1	0	1	1	4	1	3
Michigan:									
Detroit	1,378,900	98	53	43	17	9	55	16	58
Flint	148,800	15	3	1		0	8	0	4
Grand Rapids	164,200	2	2	1		0	216	0	3

1 No estimate of population made.

City reports for week ended March 16, 1929—Continued

Division, State, and city	Population July 1, 1928, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued									
Wisconsin:									
Kenosha	56,500	12	1	0		0	33	0	0
Milwaukee	544,200	100	18	6		0	487	7	14
Racine	74,400	16	2	1		0	157	0	1
Superior	[1]	5	0	0		0	0	5	1
WEST NORTH CENTRAL									
Minnesota:									
Duluth	116,800	8	0	0		3	0	115	4
Minneapolis	455,900	86	14	18		2	322	101	9
St. Paul	[1]	22	10	3		1	229	21	5
Iowa:									
Davenport	[1]	1	1	0			3	0	
Des Moines	151,900	0	2	0			2	0	
Sioux City	80,000	8	1	0			0	1	
Waterloo	37,100	1	0	0			4	65	
Missouri:									
Kansas City	391,000	28	6	3		2	410	9	24
St. Joseph	78,500	2	0	0		1	7	0	0
St. Louis	848,100	22	43	49	8		20	13	
North Dakota:									
Fargo	[1]	0	1	0		0	11	1	0
Grand Forks	[1]	0	0	0	1		2	0	
South Dakota:									
Aberdeen	[1]	0	0	0			9	1	
Nebraska:									
Lincoln	71,100	2	2	1		0	3	0	0
Omaha	222,800	4	3	3		0	18	0	9
Kansas:									
Topeka	62,800	16	1	2		0	0	1	3
Wichita	99,300	10	2	1		0	1	51	6
SOUTH ATLANTIC									
Delaware:									
Wilmington	128,500	0	3	2		2	32	0	5
Maryland:									
Baltimore	830,400	69	27	10	42	3	5	138	47
Cumberland	[1]	0	1	1	1	0	1	1	1
Frederick	[1]	1	0	0		0	0	0	0
District of Columbia:									
Washington	552,000	30	12	16	5	1	19	0	22
Virginia:									
Lynchburg	38,600	7	0	1	2	0	0	106	3
Norfolk	184,200	50	1	2		0	4	114	9
Richmond	194,400	2	3	2		0	4	12	6
Roanoke	64,600	4	1	1		1	0	2	1
West Virginia:									
Charleston	55,200	1	0	0	4	3	85	0	1
Wheeling	[1]	7	2	0		0	47	4	3
North Carolina:									
Raleigh	[1]	7	0	0		0	0	0	1
Wilmington	39,100	15	0	0		1	0	0	2
Winston-Salem	80,000	1	1	0		0	1	0	1
South Carolina:									
Charleston	75,900	0	0	1	18	0	0	0	2
Columbia	50,600	25	0	0		1	0	2	0
Greenville	[1]	1	0	0		0	0	0	2
Georgia:									
Atlanta	255,100	3	3	8	17	5	7	1	7
Brunswick	[1]	0	0	0		0	0	2	0
Savannah	99,900	2	1	2	3	2	0	0	4
Florida:									
Miami	156,700	3	3	2	1	0	38	0	0
Tampa	113,400	10	1	1	7	1	2	1	0

[1] No estimate of population made.

City reports for week ended March 16, 1929—Continued

Division, State, and city	Population July 1, 1928, estimated	Chicken pox, cases reported	Diphtheria: Cases, estimated expectancy	Diphtheria: Cases reported	Influenza: Cases reported	Influenza: Deaths reported	Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
EAST SOUTH CENTRAL									
Kentucky:									
Covington	59,000	0	0	0	--------	0	0	0	3
Tennessee:									
Memphis	190,200	19	5	4	--------	6	0	0	9
Nashville	139,600	7	1	1	--------	4	0	0	6
Alabama:									
Birmingham	222,400	7	2	3	17	5	1	2	8
Mobile	69,600	1	0	0	--------	1	4	1	1
Montgomery	63,100	10	0	0	--------	--------	1	1	--------
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	(1)	1	0	0	--------	--------	0	2	--------
Little Rock	79,200	1	1	0	--------	3	6	1	5
Louisiana:									
New Orleans	429,400	3	11	14	10	7	14	0	18
Shreveport	81,300	3	1	0	--------	1	0	0	1
Oklahoma:									
Tulsa	170,500	28	1	1	--------	--------	3	4	--------
Texas:									
Dallas	217,800	6	5	2	1	2	10	0	15
Fort Worth	170,600	11	3	6	--------	6	32	2	6
Galveston	50,600	0	1	0	--------	0	1	0	2
Houston	(1)	7	3	5	--------	1	5	0	8
San Antonio	218,100	1	2	4	2	12	1	1	10
MOUNTAIN									
Montana:									
Billings	(1)	3	0	0	--------	1	0	1	0
Great Falls	(1)	2	1	0	--------	0	35	1	0
Helena	(1)	0	0	0	--------	0	18	0	1
Missoula	(1)	2	0	0	--------	0	9	0	1
Idaho:									
Boise	(1)	1	0	0	--------	0	0	0	0
Colorado:									
Denver	294,200	38	10	4	1	3	2	30	16
Pueblo	44,200	26	1	1	--------	0	7	0	2
New Mexico:									
Albuquerque	(1)	4	0	0	--------	0	0	0	1
Utah:									
Salt Lake City	138,000	26	2	0	--------	0	2	172	8
Nevada:									
Reno	(1)	0	0	0	--------	0	0	0	1
PACIFIC									
Washington:									
Seattle	383,200	53	5	2	--------	--------	2	19	--------
Spokane	109,100	7	2	0	--------	--------	23	0	--------
Tacoma	110,500	17	1	0	--------	0	2	8	2
Oregon:									
Portland	(1)	14	8	6	6	4	50	4	11
Salem	(1)	3	0	0	--------	0	1	4	1
California:									
Los Angeles	(1)	91	44	16	52	3	24	54	32
Sacramento	75,700	4	2	0	2	2	0	11	5
San Francisco	585,300	32	21	9	8	0	4	10	4

[1] No estimate of population made.

City reports for week ended March 16, 1929—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases, reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
NEW ENGLAND											
Maine:											
Portland	4	10	0	0	0	0	0	0	0	3	21
New Hampshire:											
Concord	0	1	0	2	0	2	0	0	0	0	10
Manchester	3	0	0	0	0	0	0	0	0	0	17
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	5	4
Massachusetts:											
Boston	85	84	0	0	0	13	2	1	1	33	272
Fall River	5	11	0	0	0	3	0	0	0	10	34
Springfield	8	7	0	0	0	1	0	0	0	0	35
Worcester	10	10	0	0	0	2	0	0	0	20	61
Rhode Island:											
Pawtucket	2	6	0	0	0	1	0	0	0	0	24
Providence	10	18	0	0	0	4	0	0	0	4	94
Connecticut:											
Bridgeport	13	4	0	0	0	4	0	0	0	1	45
Hartford	6	10	0	0	0	1	0	0	0	5	47
New Haven	12	3	0	0	0	1	0	0	0	5	42
MIDDLE ATLANTIC											
New York:											
Buffalo	26	45	0	0	0	2	0	0	0	21	167
New York	351	337	0	0	0	122	8	5	0	60	1,720
Rochester	13	1	0	0	0	0	1	0	0	24	77
Syracuse	14	9	0	0	0	2	0	0	0	16	68
New Jersey:											
Camden	7	7	0	0	0	0	0	0	0	1	42
Newark	44	25	0	0	0	18	0	0	0	27	129
Trenton	5	2	0	0	0	4	0	0	0	0	35
Pennsylvania:											
Philadelphia	103	98	0	0	0	29	2	2	0	55	545
Pittsburgh	31	19	0	0	0	17	0	1	0	19	219
Reading	4	8	0	0	0	1	0	0	0	6	23
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	20	67	1	6	0	9	1	0	0	22	139
Cleveland	49	26	0	0	0	19	1	0	0	58	255
Columbus	12	5	2	0	0	2	0	0	0	28	88
Toledo	14	13	0	2	0	4	0	1	0	84	82
Indiana:											
Fort Wayne	7	2	0	0	0	3	1	0	0	0	29
Indianapolis	11	88	12	2	0	7	0	3	0	0	112
South Bend	3	2	0	0	0	1	0	0	0	0	22
Terre Haute	3	2	1	0	0	2	0	0	0	0	21
Illinois:											
Chicago	136	157	3	3	0	65	2	0	0	48	765
Springfield	3	4	0	3	0	0	0	0	0	4	42
Michigan:											
Detroit	111	200	2	3	0	18	1	0	0	131	366
Flint	10	24	1	7	0	2	0	0	0	6	34
Grand Rapids	11	9	0	7	0	0	0	0	0	25	38
Wisconsin:											
Kenosha	4	0	1	0	0	1	0	0	0	1	13
Milwaukee	31	63	0	0	0	8	0	0	0	133	137
Racine	6	4	0	0	0	1	0	0	0	4	15
Superior	4	2	1	0	0	0	0	0	0	3	2
WEST NORTH CENTRAL											
Minnesota:											
Duluth	10	10	0	0	0	0	0	0	0	2	27
Minneapolis	57	26	2	0	0	2	0	0	0	67	95
St. Paul	34	27	0	0	0	3	0	0	0	44	55
Iowa:											
Davenport	3	3	2	0	-------	-------	0	0	-------	2	-------
Des Moines	7	38	2	0	-------	-------	0	0	-------	2	31
Sioux City	2	2	1	0	-------	-------	0	0	-------	2	-------
Waterloo		52	0	1	-------	-------	0	1	-------	11	-------

City reports for week ended March 16, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases, reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL—con.											
Missouri:											
Kansas City	17	25	4	3	0	8	0	0	0	15	156
St. Joseph	3	1	1	1	0	3	0	0	0	0	38
St. Louis	38	16	3	1	0	13	1	0	0	41	290
North Dakota:											
Fargo	1	2	0	0	0	0	0	0	0	3	7
Grand Forks	2	4	0	0	-------	-------	0	0	-------	0	-------
South Dakota:											
Aberdeen	4	0	0	0	-------	-------	0	0	-------	0	-------
Nebraska:											
Lincoln	2	21	0	0	0	0	0	0	0	1	28
Omaha	4	8	4	3	0	2	0	0	0	4	80
Kansas:											
Topeka	3	3	1	0	0	0	0	0	0	7	17
Wichita	4	19	1	7	0	1	0	0	0	8	39
SOUTH ATLANTIC											
Delaware:											
Wilmington	4	4	0	0	0	0	0	0	0	0	26
Maryland:											
Baltimore	36	29	0	0	0	16	1	1	0	118	256
Cumberland	1	4	0	0	0	1	0	0	0	0	12
Frederick	1	0	0	0	0	0	0	0	0	0	4
Dist. of Columbia:											
Washington	27	19	1	0	0	10	1	0	0	28	181
Virginia:											
Lynchburg	0	0	0	0	0	0	0	0	0	0	12
Norfolk	2	0	0	0	0	0	0	0	0	17	-------
Richmond	3	9	0	0	0	3	0	0	0	1	66
Roanoke	1	2	0	0	0	0	0	0	0	0	14
West Virginia:											
Charleston	0	2	0	0	0	0	0	1	0	4	29
Wheeling	2	0	0	0	0	1	1	0	0	4	25
North Carolina:											
Raleigh	1	0	0	1	0	0	0	0	0	11	8
Wilmington	0	1	0	2	0	0	0	0	0	2	16
Winston-Salem	0	1	3	0	0	2	0	0	0	15	21
South Carolina:											
Charleston	1	0	0	0	0	1	0	2	0	0	18
Columbia	0	1	0	0	0	0	0	0	0	0	14
Greenville	0	0	0	0	0	2	0	0	0	3	10
Georgia:											
Atlanta	5	4	4	0	0	8	0	0	0	2	79
Brunswick	0	0	0	0	0	0	0	0	0	0	2
Savannah	1	0	0	0	0	2	0	0	1	9	35
Florida:											
Miami	1	1	0	0	0	0	0	0	0	18	21
Tampa	0	2	0	0	0	3	1	0	0	10	17
EAST SOUTH CENTRAL											
Kentucky:											
Covington	2	4	0	0	0	3	0	0	0	0	23
Tennessee:											
Memphis	5	11	3	0	0	3	1	1	0	0	69
Nashville	3	7	1	0	0	5	0	0	0	1	62
Alabama:											
Birmingham	3	9	8	0	0	6	1	0	0	-------	78
Mobile	0	2	0	0	0	3	0	0	0	0	31
Montgomery	0	1	1	1	-------	-------	0	0	-------	0	-------
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	1	0	0	-------	-------	0	0	-------	0	-------
Little Rock	2	4	1	0	0	2	0	0	0	1	-------
Louisiana:											
New Orleans	7	67	0	0	0	15	2	1	0	1	154
Shreveport	0	0	1	0	0	0	0	0	0	0	29

City reports for week ended March 16, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases, reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL—continued											
Oklahoma:											
Tulsa	1	3	2	3			0	0		6	
Texas:											
Dallas	3	18	4	5	0	0	1	0	0	9	62
Fort Worth	2	11	2	35	0	0	0	0	0	0	39
Galveston	0	1	0	0	0	1	0	0	0	0	14
Houston	1	5	2	5	0	4	0	0	1	0	83
San Antonio	1	0	0	1	0	7	0	2	0	0	67
MOUNTAIN											
Montana:											
Billings	1	2	0	1	0	1	0	0	0	0	9
Great Falls	1	4	1	0	0	1	0	0	0	10	9
Helena	0	0	0	0	0	1	0	0	0	0	6
Missoula	0	0	0	0	0	0	0	0	0	0	8
Idaho:											
Boise	0	1	0	0	0	0	0	0	0	0	8
Colorado:											
Denver	15	5	2	0	0	10	0	0	0	3	88
Pueblo	1	0	0	0	0	1	0	1	0	0	10
New Mexico:											
Albuquerque	1	2	0	0	0	3	0	0	0	57	14
Utah:											
Salt Lake City	3	6	2	1	0	0	0	2	0	6	40
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	1
PACIFIC											
Washington:											
Seattle	11	5	4	0			0	1		41	
Spokane	7	2	7	0			0	0		1	
Tacoma	3	2	3	5	0	2	0	1	0	2	23
Oregon:											
Portland	6	17	11	27	0	7	1	0	0	0	96
Salem	1	0	1	0	0	0	0	0	0	0	
California:											
Los Angeles	32	79	5	0	0	24	1	0	0	31	287
Sacramento	2	32	1	1	0	1	0	0	1	7	38
San Francisco	17	64	3	3	0	15	1	2	0	38	168

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
NEW ENGLAND									
Massachusetts:									
Boston	2	3	1	0	0	0	0	0	0
Connecticut:									
Hartford	0	0	1	1	0	0	0	0	0
MIDDLE ATLANTIC									
New York:									
Buffalo	1	0	0	0	0	0	0	0	0
New York	36	16	8	3	0	0	1	0	0
Rochester	1	0	0	0	0	0	0	0	0
Syracuse	0	0	0	1	0	0	0	0	0
New Jersey:									
Newark	2	0	0	0	0	0	1	0	0
Pennsylvania:									
Philadelphia	3	3	0	0	1	1	0	0	0
Pittsburgh	2	6	0	0	0	0	0	0	0

City reports for week ended March 16, 1929—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST NORTH CENTRAL									
Ohio:									
Cleveland	3	2	2	1	0	0	0	1	0
Columbus	0	1	0	0	0	0	0	0	0
Toledo	1	0	0	0	0	0	0	0	0
Indiana:									
Indianapolis	0	4	0	0	0	0	0	0	0
Illinois:									
Chicago	7	3	0	1	0	0	0	0	0
Michigan:									
Detroit	21	12	0	0	0	0	0	0	1
Flint	1	1	0	0	0	0	0	0	0
Wisconsin:									
Milwaukee	8	3	0	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
St. Paul	0	0	0	1	0	0	0	0	0
Missouri:									
Kansas City	9	4	0	0	0	0	0	1	0
St. Louis	12	1	0	0	0	0	0	0	0
North Dakota:									
Grand Forks	1	0	0	0	0	0	0	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	1	0	1	0	0	0	0	0	0
Virginia:									
Richmond	0	0	0	1	0	1	0	0	0
North Carolina:									
Raleigh	0	0	0	0	0	2	0	0	0
Wilmington	1	0	0	0	0	0	0	0	0
Winston-Salem	0	0	0	0	2	1	0	0	0
South Carolina:									
Charleston [1]	0	0	0	0	2	0	0	0	0
Columbia	0	1	0	0	0	0	0	0	0
Georgia:									
Atlanta	8	4	0	0	1	0	0	0	0
Savannah	0	0	0	0	2	1	0	0	0
Florida:									
Tampa	0	0	0	0	1	0	0	1	0
EAST SOUTH CENTRAL									
Alabama:									
Birmingham	0	1	0	0	0	0	0	0	0
Mobile	1	1	0	0	0	0	0	0	0
Montgomery	0	0	0	0	1	0	0	0	0
WEST SOUTH CENTRAL									
Arkansas:									
Little Rock	1	0	0	0	0	0	0	0	0
Louisiana:									
New Orleans	5	1	0	0	1	0	0	0	0
Texas:									
Fort Worth	0	0	0	0	0	1	0	0	0
Galveston	0	0	0	0	0	1	0	0	0
Houston	0	0	0	0	0	1	0	0	0
San Antonio	0	0	0	0	0	1	0	0	0
MOUNTAIN									
Colorado:									
Denver	6	3	0	0	0	0	0	0	0
Utah:									
Salt Lake City	6	3	0	0	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	3	0	0	0	0	0	0	0	0
Oregon:									
Portland	0	0	1	1	0	0	0	0	0
California:									
Los Angeles [2]	7	4	1	1	0	0	0	2	1
Sacramento	4	2	0	0	0	0	0	0	0
San Francisco	1	2	0	0	0	0	0	0	0

[1] Dengue: 1 case at Charleston, S. C.
[2] Rabies (in man); 1 case and 1 death at Los Angeles, Calif.

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended March 16, 1929, compared with those for a like period ended March 17, 1928. The population figures used in computing the rates are approximate estimates, authoritative figures for many of the cities not being available. The 98 cities reporting cases had estimated aggregate populations of more than 31,000,000. The 91 cities reporting deaths had nearly 30,000,000 estimated population. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, February 10 to March 16, 1929—Annual rates per 100,000 population compared with rates for the corresponding period of 1928 [1]

	Week ended—									
	Feb. 16, 1929	Feb. 18, 1928	Feb. 23, 1929	Feb. 25, 1928	Mar. 2, 1929	Mar. 3, 1928	Mar. 9, 1929	Mar. 10, 1928	Mar. 16, 1929	Mar. 17, 1928
DIPHTHERIA CASE RATES										
98 cities	122	177	118	177	[2] 122	174	134	174	127	160
New England	131	172	118	138	124	140	109	145	136	136
Middle Atlantic	147	235	139	224	140	234	185	214	159	213
East North Central	115	169	106	169	131	163	130	171	120	135
West North Central	150	125	131	125	[3] 136	113	144	131	152	115
South Atlantic	73	155	67	168	64	140	67	132	84	151
East South Central	81	63	68	35	54	98	68	84	54	119
West South Central	119	126	182	191	[4] 156	93	119	170	99	138
Mountain	44	186	44	71	61	186	61	97	44	106
Pacific	80	82	110	161	75	141	37	171	67	125
MEASLES CASE RATES										
98 cities	406	885	458	993	[2] 585	1,123	539	1,120	681	1,356
New England	545	1,658	385	1,908	640	1,980	428	1,658	622	2,267
Middle Atlantic	114	702	140	880	158	1,003	162	973	135	1,216
East North Central	760	530	882	564	1,141	760	982	864	1,385	1,061
West North Central	982	241	1,252	256	[3] 1,687	342	1,698	491	1,965	593
South Atlantic	135	2,275	167	2,489	197	2,698	234	2,830	380	3,105
East South Central	41	1,543	0	1,171	61	1,543	61	1,227	41	1,824
West South Central	51	1,925	83	1,986	[4] 63	1,719	107	1,309	146	1,346
Mountain	1,019	97	923	168	697	142	819	283	636	346
Pacific	170	693	150	750	237	893	147	906	137	832
SCARLET FEVER CASE RATES										
98 cities	278	290	262	291	[2] 301	290	299	299	326	301
New England	376	441	294	414	339	347	310	377	371	402
Middle Atlantic	222	331	202	336	230	346	228	359	266	353
East North Central	340	280	340	285	401	309	410	292	417	296
West North Central	360	266	373	276	[3] 340	262	356	291	367	272
South Atlantic	157	222	144	243	137	207	155	245	146	216
East South Central	258	98	183	98	217	112	197	175	231	63
West South Central	265	118	281	122	[4] 220	97	281	130	379	211
Mountain	87	346	113	204	218	257	157	195	157	248
Pacific	339	230	302	233	509	194	424	192	459	217

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1929 and 1928, respectively.
[2] Omaha, Nebr., Fort Smith, Ark., and Galveston, Tex., not included.
[3] Omaha, Nebr., not included.
[4] Fort Smith, Ark., and Galveston, Tex., not included.

Summary of weekly reports from cities, February 10 to March 16, 1929—Annual rates per 100,000 population compared with rates for the corresponding period of 1928—Continued

SMALLPOX CASE RATES

	Week ended—									
	Feb. 16, 1929	Feb. 18, 1928	Feb. 23, 1929	Feb. 25, 1928	Mar. 2, 1929	Mar. 3, 1928	Mar. 9, 1929	Mar. 10, 1928	Mar. 16, 1929	Mar. 17, 1928
98 cities	8	20	12	25	[2] 16	17	12	23	12	21
New England	0	0	0	0	2	0	0	0	5	0
Middle Atlantic	0	0	0	0	0	0	0	0	0	0
East North Central	15	12	15	13	24	18	18	14	20	26
West North Central	0	102	15	92	[3] 10	63	6	92	31	65
South Atlantic	2	27	4	29	7	21	6	25	6	33
East South Central	0	35	0	56	7	0	7	21	7	21
West South Central	24	20	99	8	[4] 118	20	99	36	43	45
Mountain	70	168	35	62	87	53	44	115	17	53
Pacific	25	18	20	126	26	49	17	69	22	38

TYPHOID FEVER CASE RATES

98 cities	5	5	4	5	[2] 4	10	5	4	5	5
New England	5	5	9	7	2	0	5	2	2	7
Middle Atlantic	4	3	4	5	2	8	4	3	4	2
East North Central	2	3	2	1	0	7	3	4	2	3
West North Central	12	4	6	4	[3] 8	6	4	2	2	4
South Atlantic	6	8	4	10	2	13	6	10	7	11
East South Central	14	14	7	28	14	70	7	7	7	14
West South Central	12	12	8	16	[4] 21	32	20	4	12	12
Mountain	0	0	0	0	9	9	0	0	26	0
Pacific	7	8	5	5	7	8	17	3	10	5

INFLUENZA DEATH RATES

91 cities	54	23	45	22	[2] 40	25	33	23	33	26
New England	57	11	41	7	20	7	16	21	25	7
Middle Atlantic	44	18	35	24	30	16	25	20	31	26
East North Central	36	12	33	14	31	17	31	16	23	12
West North Central	33	9	46	3	[3] 45	15	21	18	27	24
South Atlantic	60	38	69	31	67	34	47	27	37	21
East South Central	222	54	81	46	148	123	74	54	118	123
West South Central	158	92	138	75	89	104	122	75	106	117
Mountain	87	71	78	35	52	89	61	62	35	80
Pacific	43	27	39	20	33	24	23	20	16	10

PNEUMONIA DEATH RATES

91 cities	223	177	194	166	[2] 222	193	204	196	185	227
New England	305	170	235	147	274	193	219	205	201	239
Middle Atlantic	254	196	192	156	240	218	233	221	197	259
East North Central	182	137	170	156	180	148	159	156	155	197
West North Central	180	141	207	107	[3] 214	159	195	144	180	208
South Atlantic	243	216	238	231	255	205	234	212	199	216
East South Central	163	192	155	222	281	245	237	306	200	268
West South Central	219	283	260	275	215	266	235	258	239	266
Mountain	244	168	226	248	279	266	183	266	253	204
Pacific	128	172	134	115	154	155	144	121	141	125

[2] Omaha, Nebr., Fort Smith, Ark., and Galveston, Tex., not included.
[3] Omaha, Nebr., not included.
[4] Fort Smith, Ark., and Galveston, Tex., not included.

Number of cities included in summary of weekly reports, and aggregate population of cities of each group, approximated as of July 1, 1929 and 1928, respectively

Group of cities	Number of cities reporting cases	Number of cities reporting deaths	Aggregate population of cities reporting cases		Aggregate population of cities reporting deaths	
			1929	1928	1929	1928
Total	98	91	31, 568, 400	31, 052, 700	29, 995, 100	29, 498, 600
New England	12	12	2, 305, 100	2, 273, 900	2, 305, 100	2, 273, 900
Middle Atlantic	10	10	10, 809, 700	10, 702, 200	10, 809, 700	10, 702, 200
East North Central	16	16	8, 181, 900	8, 001, 300	8, 181, 900	8, 001, 300
West North Central	12	9	2, 712, 100	2, 673, 300	1, 736, 900	1, 708, 100
South Atlantic	19	19	2, 783, 200	2, 732, 900	2, 783, 200	2, 732, 900
East South Central	6	5	767, 900	745, 500	704, 200	682, 400
West South Central	8	7	1, 319, 100	1, 289, 900	1, 285, 000	1, 256, 400
Mountain	9	9	598, 800	590, 200	598, 800	590, 200
Pacific	6	4	2, 090, 600	2, 043, 500	1, 590, 300	1, 551, 200

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended March 9, 1929.—The Department of Pensions and National Health reports cases of certain communicable diseases from nine Provinces of Canada for the week ended March 9, 1929, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal fever					1	1			3	5
Influenza		21		56	72	2	42		82	275
Smallpox	2			5	7	5	4	1	18	42
Typhoid fever			1	6	6			13		26

Quebec Province—Communicable diseases—Three weeks ended March 16, 1929.—The Bureau of Health of the Province of Quebec reports cases of certain communicable diseases for the three weeks ended March 16, 1929, as follows:

Disease	Week ended—			Disease	Week ended—		
	Mar. 2	Mar. 9	Mar. 16		Mar. 2	Mar. 9	Mar. 16
Cerebrospinal meningitis			1	Mumps	5	19	52
Chicken pox	66	40	39	Scarlet fever	125	128	159
Diphtheria	41	42	55	Smallpox	3	5	4
German measles	5	11	13	Tuberculosis	57	45	54
Influenza	9	56	34	Typhoid fever	5	5	8
Lethargic encephalitis	1			Whooping cough	13	30	19
Measles	72	105	149				

MEXICO

Tampico—Communicable diseases—February, 1929.—During the month of February, 1929, communicable diseases were reported at Tampico, Mexico, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chicken pox	1		Measles	8	4
Enteritis (various)		48	Smallpox	1	
Influenza	16	8	Tuberculosis	60	37
Malaria	32	8	Whooping cough	1	

VIRGIN ISLANDS

Communicable diseases—February, 1929.—During the month of February, 1929, cases of certain communicable diseases were reported from the Virgin Islands, as follows:

St. Thomas and St. John:	Cases
Chancroid	1
Dengue	1
Fish poisoning	1
Gonorrhea	2
Pellagra	1
Syphilis	4
Uncinariasis	1

St. Croix:	Cases
Gonorrhea	2
Malaria	1
Syphilis	6
Tetanus	1
Uncinariasis	2

YUGOSLAVIA

Communicable diseases—February, 1929.—During the month of February, 1929, communicable diseases were reported from Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	28	6	Measles	1,674	44
Cerebrospinal meningitis	16	7	Scarlet fever	1,573	307
Diphtheria	313	78	Tetanus	5	4
Dysentery	17	2	Typhoid fever	82	16
Lethargic encephalitis	2	1	Typhus fever	13	2

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given:

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928		January, 1929				February, 1929				March, 1929		
					22	29	5	12	19	26	2	9	16	23	2	9	16
Ceylon	C					5	2										
	D					2	2										
Colombo	C							3	1	1							
	D							1									
Ingiriya Province	C		1														
	D		1														
China:																	
Canton	C		2		2			1									
	D				1												
Shanghai	D	3															
India	C	17,028	20,937	23,528	4,602	4,507	4,128	3,801	4,173	3,739							
	D	10,187	12,490	14,950	2,839	2,673	2,589	2,406	2,358	2,233							
Bassein	D			1					1	4	1		2			2	
Bombay	C	15	1	4					1								
	D	7	1	4												1	
Calcutta	C	41	219	247	28	12	33	30	23	43	34	29					
	D	39	140	155	15	13	13	30	13	30	19	23	30	31	40		
Madras	C	97	203	102	6		6	4	1		1	2	2				
	D	73	115	42	4	2	8	3		1	4		1		3		
Madras Presidency	C			1													
	D			1													
Moulmein	D			1													4
Negapatam	C			1		3	1	2	8	9		1	1	1	1		
	D	1		1													
Rangoon	C	1		5				6	4	4	1						
	D	2		3			1	4	1	3	1	4			4	1	
Tuticorin	C	1		2	33	39	27	16	31	31	7	16	5	1			
	D		1		19	18	15	9	15	21	5	11	2	2			

India (French):																	
Chandernagor	C	16	43	25	2	1		1									
	D	7	34	10	2	1		1									
Karikal	C	9	111	7	4	9	20	21	40	61	31	18	28		28		
	D	8	85	4	4	8	13	16	34	46	31	17	21		21		
Pondicherry Province	C	31	6	37	5	25	37	25	27	58	32	22	29		29		
	D	19	5	30	3	12	21	19	21	45	22	16	24		24		
Indo-China (see also table below):																	
Pnompenh	C		1	1		1	3	2	1			1	7	22	12		
	D		1	1		1						1	5	20	10		
Saigon	C		1			3	1	2	3	1	2						
	D					1	1	2	1	1	1						
Japan: Osaka	C	1															
Kwangchow-Wan (see table below).																	
Siam	C	14	47	104	35	45	84	60	59	72	29	35	39	43	41	42	
	D	10	27	68	13	33	53	51	50	38	23	27	26	32	22	37	
Anthoang	C				4				1				3				
	D				1				1				2				
Ayudhaya	C	7	15	2	1	2	8	5	1		2	1			4		
	D	6	12	2	1	1	6	6	1		2	1			4		
Bangkok	C	4	5	18	9	8	2	3	11	14	12	17	17	19	12		
	D	1	3	12	3	1	2		18	8	8	9	12	7	5		
Chaxoengsao	C								1		3	5		1			
	D								1		3	5		1			
Dhannapuri	C			6	2	3	9	2	2			1	1	1	1		
	D			5	1	2	7		2					1			
Lobpuri	C					26	27	21					2			1	
	D					23	18	20					1				
Nondpuri	C			1		4											
	D			1		2											
Pradhumdham	C											1					
	D											1					
Singhapuri	C							17	2		3	1	1				
	D							12	2		4	1	1				
Smud Prakar	C			37	19	6	3	2	6		2	2	1				
	D			28	4	5	1		5		2	1					
Smud Sagara	C		27	34													
	D		12	16													

Place		September, 1928	October, 1928	November, 1928			December, 1928			January, 1929			February, 1929	
				1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20
Indo-China (French) (see also table above):														
Annan	C	4	11			5								
Cambodia	C	16	25		4	17		21	4	26	25	28	29	40
Cochin-China	C	28	52	27	48	81		351	346	232	202	226	107	115
Kwangchow-Wan	C				1									

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928: 22	December, 1928: 29	January, 1929: 5	January, 1929: 12	January, 1929: 19	January, 1929: 26	February, 1929: 2	February, 1929: 9	February, 1929: 16	February, 1929: 23	March, 1929: 2	March, 1929: 9	March, 1929: 16	March, 1929: 23
Algeria:																		
Algiers	C		2															
Oran	C	1	2															
Philippeville	C	2																
Argentina:[1]																		
Buenos Aires [2]																		
Catamarca Province: Recreo	C		P	9														
Cordova Province—																		
Canada Honda	C		14															
Laborde	C						1											
Jujuy Province: Perico	C						1					3						
Rosario	C					1	1					1						[3] 20
Santiago del Estero	C		7															
Tucuman Province: El Mollar	C			5														
Azores: St. Michaels Island	C	3	3			1	1		1									
	D		1															
Belgian Congo:																		
Djugu	C		2									1						
Lenza	C		1	1		1												
Brazil:																		
Para	C									1								
Santos	C			2														
British East Africa (see also table below):																		
Mombasa	C	3																
	D	3																
Plague-infected rats		2																
Uganda	C	106	114	124	36	21	51	47	39	37								
	D	86	103	121	35	21	51	45	38	37								
Canary Islands:																		
Las Palmas	C	2																
	D	1																
Teneriffe	C	2		1														
Laguna	C	4										1						
Ceylon:																		
Colombo	C	2	1	4	2	1	2	3		1	2	3	2			2		
	D	1	1	4	2	1	2	3		2	1	2	2			1		
Plague-infected rats		1		5								2	2					

Jaffna	C	2	1															
	D	2																
China:																		
Hainan	C												P					
Mongolia—																		
Chien Chia Tien	C	P																
Tungliao	C	173	19															
Shansi—Fengchow	C	P																
Suyuan Province	C											P						
Dutch East Indies:																		
Celebes—Makassar	C	1																
	D	1						1										
Plague-infected rats		4	2									1						
Java—																		
Batavia and West Java	C	29	23	43	9	18	13	14	13	12		1					1	
	D	29	22	42	9	18	12	14	13	12							1	
Plague-infected rats				1												2		
East Java and Madura	C	16																
	D	16																
Surabaya	C	1	2	1					1	1								
	D	1	2						1	1								
Kediri Residency	C									P								
Ecuador (see table below).																		
Egypt:																		
Alexandria	C									2	1							
Amrieh District	C	1																
	D	1																
Assiout Province	D	1	3															
Beheira Province	C	1																
Beni-Suef	C			4		4	2	3	1	2						4	2	
	D			1		1	1			3						1	1	1
Dierout	D		1															
Girga	C			1														
Kena Province	C			4														
Menoufieh Province	C		7															
Suez	C														1			
Tanta	C		5															
Greece (see also table below):																		
Athens and Piræus	C	5	5															
Corfu	C			1														
India	C	6,209	8,710	7,767	1,750	1,239	2,402	2,450	2,592	3,119								
	D	3,225	4,428	4,863	1,194	771	1,611	1,658	1,834	2,166								
Bassein	D		2					1	1		3		2	1				
Bombay	C	4	5	4					1									
	D	5	2	6					1	1	2		1	1				
Plague-infected rats		13	7	32	7	5	14	9	11	10	11	6		8	12			

[1] During the period from Nov. 10 to Dec. 11, 1928, 13 cases of plague were reported at El Mollar, Tucuman Province, Argentina. During the same period 1 case of plague was reported at Chipion and 1 at Ucacha, both in Cordoba Province, Argentina.
[2] 18 plague-infected rats were reported at Buenos Aires, Argentina, from July 1 to Dec. 31, 1928.
[3] Unofficial report.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended—December, 1928 22	December, 1928 29	January, 1929 5	January, 1929 12	January, 1929 19	January, 1929 26	February, 1929 2	February, 1929 9	February, 1929 16	February, 1929 23	March, 1929 2	March, 1929 9	March, 1929 16	March, 1929 23
India—Continued.																		
Cochin	D						10											
Madras Presidency	C	196	539	686	136	111	152	101	120	107								
	D	97	235	307	69	41	73	48	65	60								
Rangoon	C	7	2	1				1		1	2							
	D	5	3	1	1			1	1	1	2	1	1	1	2			
Plague-infected rats			4									5	1	4	3	3		
Indo-China (see also table below):																		
Pnompenh	C	1	1	4		2	2	4	2	4	1	3	2		1			
	D	1	1	4		1	2	3	2	4	1	2	1		1			
Saigon	C		1											1				
Tourane	C												5					
Iraq:																		
Baghdad	C		9	10	1	2	5	1	2	1	3			1	6	3	4	5
	D		5	5	1	2	5			1	2				3			2
Plague-infected rats											1	5	6	6		5		
Naudham	C									2								
Plague-infected rats												1						
Madagascar (see also table below):																		
Tamatave	C	13	7		2				1									
	D	10	3	1														
Nigeria:																		
Lagos	C	88	83	43	5	4	2	1	1	4	2		2	4	5			
	D	88	77	41	5	3	2	1	1	3	1		1	4	5			
Plague-infected rats		91	145	30		13	15			14	12							
Paraguay: Asuncion	C	3																
Peru (see table below).																		
Senegal (see table below).																		
Siam	C		1	9				4	2	11	6	1						
	D		1	8				3	2	6	6	1		1				
Bangkok	C		1				2	2	1					1				
	D		1				1		1		1			1				
Panknampo	C			8														
Straits Settlements:																		
Penang	C	1																
Singapore	C													1				

Syria (see table below).	D													1				
Turkey:																		
Adalia	C	1	1															
Constantinople	C	1																
Union of South Africa:																		
Cape Province	C		2	1			2	2										
Orange Free State	C	1	P					1	1		2	3						
Transvaal	C							3										
Union of Socialist Soviet Republics:																		
Kalmouks District	C		10															
Kasacks	C		7															
Ural Government	C		7															
Uruguay: Rivera	C							1										
On vessel:																		
S. S. Automedon, at Penang, Straits Settlements	C	P																
S. S. Halydan, at Bangkok, from Singapore	C					1												
S. S. Sjomand, at Alexandria, from Batoum	C									1								

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
British East Africa (see also table above):							
Kenya	C	15	37	16	15		
Uganda	D	128	134				
	D	98	108				
Ecuador: Guayaquil	C	3	3	21	20	25	
	D		2	8	7	12	
Plague-infected rats		27	21	29	75	29	
Greece (see also table above)	C			1	2	3	
	D			1	1	1	
Indo-China (see also table above)	C	6	2			11	
Madagascar (see also table above)	C	59	88		282		
	D	51	84		263		
Ambositra Province	C		8	14	79		
	D		8	14	74		
Antisirabe Province	C	10	2	6	4		
	D	10	2	6	4		
Itasy Province	C	2	5	6	11		
	D	2	5	6	11		
Moramanga Province	C	20	38	32	28		
	D	18	35	32	27		
Tamatave	C	18	9	2	2		
	D	10	7	2	2		

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
Madagascar—Continued.							
Tananarive Province	C	75	100	159	158		
	D	62	95	141	144		
Peru	C	3	10	18	26		
	D	1	4	6	6		
Senegal	C	199					
	D	127					
Baol [1]	C	73	39	18	4		
	D	40	14	6	2		
Cayor [1]	C	20	17		14		
	D	8	6		10		
Fatick [1]	C		35				
	D		20				
Louga [1]	C		14	2			
	D		5	1			
Rufisque [1]	C	1	49	8			
	D	1	14	4			
Thies [1]	C	106	51	11			6
	D	78	29				4
Tivaouane [1]	C						12
Syria: Beirut	C		1	3			

[1] Reports incomplete.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928: 22	December, 1928: 29	January, 1929: 5	January, 1929: 12	January, 1929: 19	January, 1929: 26	February, 1929: 2	February, 1929: 9	February, 1929: 16	February, 1929: 23	March, 1929: 2	March, 1929: 9	March, 1929: 16	March, 1929: 23
Algeria:																		
Algiers	C	4	2	1														
Oran	C	21		7														
Arabia: Aden	C		1	1				1	1	1								
Brazil (see table below).																		
British East Africa (see also table below), Kenya:																		
Mombasa	C	1			3													
British South Africa:																		
Northern Rhodesia	C	195	342	67	173													
	D	7	14	8	23													
Southern Rhodesia	C	9	1	5														
Tanganyika	C		1								1				1			
Canada:																		
Alberta	C	4	4	21	1		1	1	3					2	1	1		
Calgary	C															1		
Edmonton	C				1	11	1	1	2					2				
British Columbia—Vancouver	C	16	21	25	13	9	17	12	24	16	13	10	17	14	21	18		
Manitoba	C	1	14	29	16	2	1	4	3		[illegible]	6	2	5	3	5		
Winnipeg and vicinity	C			17		1	1											
Nova Scotia	C							5	1		1							
Ontario	C	15	12	15	4	1	14	17	7	4	25	47	38	23	15	7		
Kingston	C		1															
North Bay	C			1									1	2		1		
Ottawa	C	2	6	2										1				
Sarnia	C		1															
Toronto	C										1							1
Prince Edward Island	C										2							
Quebec	C	75	118	125	10	8	7	12	9	5	5	5	6	14	3	5	4	
Montreal	C	4	10	3	2	1	2	3	5	2	2	1	3	10	2	1	3	
Quebec	C	12	12	6				4	4	2		2						
Saskatchewan	C	1	10	52	1	6	7		3	2	13	17	13	22	31	4		
Moose Jaw	C		2	1														
Regina	C			2			1		2	4								
Saskatoon	C										3	1						

China:																		
Amoy	C	P	P	2	2	1	1	1				P						
Canton	C			14	7			11	14	21	38	16	17	25	15			
	D							2	1			1	3	1	2			
Chefoo	C		P	P														
Foochow	C	P	P	P	P	P	P	P	P	P	P							
Hong Kong	C	13	66	202	81	73	80	85	91	78	58	80	47	54	51	37		
	D	8	21	78	22	38	48	44	83	77	67	59	61	59	34	42		
Manchuria—																		
Changshun	C										3			2				
Fushun	C		1						1		1	3						
Harbin	C	1	7	4				2	5									
Kwantung—Dairen	C	1	2	5								1		1	3	1		
	D	1										1			2			
Mukden	C	1					1					3						
	D											1						
Shanghai—																		
Foreigners only	C	3	9	6	5	9	5	4	8	3	4	8	3					
Including natives	D	6	20	32	14	12	14	24	15	18	18	9	9	9	10			
Tientsin	C	4	6	2			4	3		3		1						
Tsingtao	C												P	P				
Colombia; Cartagena	D			7														
Dominican Republic	C											1						
Dutch East Indies:																		
Balikpapan	C													1				
Belawan Deli	C	9	5	6		2	3	2	5	11	2	8	4	3	1	1		
	D	3	2	2			3		1	4		1	3	2	1			
Borneo—																		
Pontianak	C	2	1															
	D	1																
Samarinda	C	3	16	27	8	3						4		17	3	27		
	D		2	4	2		1							3	1			
Celebes—Makassar	C			1														
Java—																		
Batavia and West Java	C	6	2	1														
	D	2																
East Java and Madura	C	5	1															
	D		1															
Surabaya	C	2	1	2														
Palembang	C														8			
	D												1		1			
Sumatra—																		
Baros	C						70	26	50	14	25							
	D						22	8	12	7	5							
Medan	C	14	4	3	3	1	3	2		1	2	8						50
	D	4	2	1	1	1	3			4		1						
Ecuador (see table below).																		
Egypt:																		
Gharbieh	C												1					
Port Said	C											1						
Suez	C			1														
France (see table below).																		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928 22	29	January, 1929 5	12	19	26	February, 1929 2	9	16	23	March, 1929 2	9	16	23
Great Britain:																		
England and Wales	C	514	581	719	201	131	188	213	171	239	250	231	275	288				
Bradford	C	1		1								1		1				
Bristol	C								1									
Cardiff	C			1							4							
Castleford	C	8	6	8	3	2	4	7	4	14	16	14	22	31	12			
Hull	C	7	3	1							2							
Leeds	C		1	2	1					1	1	1	1	1	3	1		
Liverpool	C								1									
London	C	12	21	14	6	10	14	6	6	13	17	4	9	17	10			
Manchester	C	1																
Newcastle-on-Tyne	C	1	1	3							1	5	2		3			
Nottingham	C	5	1	3	3							1						
Plymouth	C	2	6															
Stoke-on-Trent	C		9	11	1	1	1	1	2	8	2	2	5	4	4			
Scotland—																		
Dundee	C	3	2	1														
Greece (see table below).																		
Hedjaz	C						22	26	55	21	22	55	29	42	37			
	D						9	6	20	7	9	20	13	15	12			
India	C	2, 792	3, 041	5, 902	1, 583	1, 621	2, 176	2, 497	2, 887	3, 285								
	D	696	836	1, 602	388	406	702	647	729	798								
Bombay	C	24	9	11		3	10	21	34	42	44	38	44	93	112			
	D	12	4	4		1	6	14	13	17	25	23	32	37	49			
Calcutta	C	7	2	13	6			4	8	4	7	13	13	9	11			
	D	4	2	7	2	1		3	5	1	3	7	6	7	7			
Karachi	C	1					2	4		10	1	16	28	24	49	46		
	D									1		4	7	4	11	22		
Madras	C	77	71	58	8	5	36	45	50	82	37	54	60	56	68	76		
	D	23	22	16	2	1	4	18	6	11	12	6	13	6	18	24		
Moulmein	C	2		5				3	2	2	2		4		5			
	D			1			1			1	1							
Negapatam	C	51	38	33		4	3	1	3	14	2	7	2	2		1		
	D	11	8	5						1		5	2	1		1		

Rangoon	C		1	1			1			4	1	3	4	6	2	5		
	D										1		1	1	2	2		
Tuticorin	C	3							1		1			1				
Vizagapatam	C	1						2	2			6	12	4	17			
	D												2		3			
India (French):																		
Chandernagor	C	4	3															
	D	4	3															
Pondicherry Province	C	111	84	48	24	19	11	21	22	13	12	12	18	26				
	D	73	67	46	20	18	10	14	20	13	10	8	14	22				
Indo-China (see also table below):																		
Pnompenh	C	28	30	44	13	10	6	9	11	6	38	22	19	15	18	10		
	D	10	5	20	8	6	1	6	8	3	17	14	10	8	11	7		
Saigon	C	3	2			2	1	9	2		1			1	1			
	D		2					6			1							
Iraq:																		
Baghdad	C	38	40	46	5	6	7	2	13	1	1	2	4	2	1		2	
	D	12	23	45	10	1	6	12	2	1			4	1				
Basra	C	23	35	35	3	3	5		5	4	1	8	4	2		1	2	
	D	9	33	26	2	2	3		4	3	1	2	3	1		1		
Hillah Liwa	C						34	20	20									
	D						5	9	9									
Kirkuk Liwa	C			173			86						9	9				
	D			38			17						2	2				
Mossoul	C		53	294	6	13	30	6	2		23	5	14	14				
	D		23	110	12	14	5	8	4		12	1	2	2				
Sinjar	C						45	8	61									
	D						1	4	15									
Italy:																		
Palermo	C		2	3	1	2												
Turin	C												1					
Ivory Coast (see table below).																		
Jamaica (outside Kingston) (alastrim)	C	2						1										
Kingston (alastrim)	C			1														
Japan:																		
Nagasaki	C								1	1	1							
	D									1	1							
Osaka	C														1			
Macao	D						5	4	2	8		14	24	24	12	15		
Malta: Valetta	C	1																
Mexico:																		
Aguascalientes	D			2			1		1	1	1			3				
Chihuahua	D								1									
Jalisco (State)	C	11																
Guadalajara	D	1		4		1				2	2	4	4	2	1	1		
Juarez	D	1			2	3				1					1		3	
Mexico City and surrounding territory	C	1	5		1		1	5	2					2				
Palomas	C														1			
Saltillo	D		1															
San Luis Potosi	D	2	1															
Tampico	C		1															
Torreon	D	1																

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928		January, 1929				February, 1929				March, 1929			
					22	29	5	12	19	26	2	9	16	23	2	9	16	23
Morocco (see table below).																		
Nigeria:																		
Lagos	C		1															
Southern Provinces	C									57	105							
	D									11	20							
Poland	C	1	1	3	1							41						
	D		1									3						
Portugal (see also table below):																		
Lisbon	C				2				2		2							
Senegal (see table below).																		
Siam	C	3	1	8				19				2						
	D							2										
Bangkok	C			1														
Spain: Valencia	C													1	1			
Straits Settlements: Singapore	C	2					1			2	1	2	2		1			
Sudan (Anglo-Egyptian)	C	89	79	220	192	157	129	13	190	17	58		49	71	13	55	30	22
	D	19	13	42	12	43	1	1	24	5	5		13	14	11	16	6	
Sudan (French) (see table below).																		
Sweden: Stockholm	C			1														
Switzerland: Lucerne Canton	C	1																
Syria (see table below).																		
Tunisia: Tunis	C		1	2	13		1								2			
Union of South Africa:																		
Cape Province	C	P	P	P														
Natal	C					1												
Orange Free State	C	P	P															
Transvaal	C	P	P															
Upper Volta	C	10	5							1			2					
On vessel:																		
S. S. Ballarat, en route to Cape Town, South Africa	C		1															
Motorship Tantalus at Amsterdam	C													3				

Place		September, 1928	October, 1928	November, 1928			December, 1928			January, 1929			February, 1929	
				1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20
Indo-China (see also table above)	C	73	100	55	57	32	23	100	120	74	130	107	128	236
Ivory Coast	C	2	1											
Senegal	C	4	2											
Sudan (French)	C	P	32				2		P					
	D		2											
Syria: Beirut	C		1	1		1			1		1		21	3

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
Brazil: Porto Alegre	C	1	12	3			
British East Africa (see also table above):							
Kenya	C		36	37	31		
Zanzibar	C		2				
Ecuador: Guayaquil	C	22	6	6	13	12	7
	D	1	3	1	1	1	2
France	C	3	3		18	9	

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
Greece	C	6	6	6	6	8	5
	D		1			1	1
Morocco	C	4	5	2			
Portugal (see also table above)	C	24	27				
	D	2	3				
Turkey	C					16	
	D					6	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Nov. 18–Dec. 15, 1928	Week ended— December, 1928: 22	December, 1928: 29	January, 1929: 5	January, 1929: 12	January, 1929: 19	January, 1929: 26	February, 1929: 2	February, 1929: 9	February, 1929: 16	February, 1929: 23	March, 1929: 2	March, 1929: 9	March, 1929: 16
Algeria:																	
Algiers	C	1	4														
Constantine Department	C											2	2				
Oran	C	1	2							5							
Bulgaria	C	8	4	9			4	1	3	4			3				
	D		1														
Sofia	C											1					
Chile: Valparaiso	C			1													
China:																	
Canton	C								2								
	D								2								
Hong Kong	C								1								
Manchuria—																	
Harbin	C			2													
Kwantung	C	2	1														
Chosen (see table below).																	
Egypt:																	
Alexandria	C																1
Assiout Province	C	1															
Assouan Province	C												2				
	D												2				
Beheira Province	C	2							6								
	D	1															
Cairo	C	1															
	D	1															
Daqalhiya Province	C			15	4	3	3	1									34
	D			1				2									
Gharbieh	C											1					
Menoufieh Province	C	1															
	D	1															
Port Said	C	1	1														
Suez	C	4															
Greece (see table below).																	

Ireland:																	
Irish Free State—																	
Clare County—Scariff	C		1														
Cork County	C														1		
Dublin	C									1							
	D										1						
Kerry County—Tralee	C	7															
Japan: Miyagi	C	2															
Lithuania (see table below).																	
Mexico (see also table below):																	
Aguascalientes	D			2													3
Chihuahua	D					1											
Mexico City, including municipalities in Federal District	C	9	15	12	3	2	1	3	3	4	1	3	1	3	1		
	D	1	2	1			1	1		1		2	1				
San Luis Potosi	D				1												
Morocco	C	1	1	16				4	1	7	7	5	6	10			
Palestine	C	11	6	12	1		1			2		1		2			
Peru (see table below).																	
Poland	C	31	81	117	47	73	38	45	33	76	72	41	47				
	D	4	10	11	2	5	4	5	5	3	4	3	6				
Portugal: Oporto	C			1													
Rumania	C	11	17	42	21	49	38	59	56	40	47						
	D			1		2	3	6	5	7	7						
Tunisia	C		4	6							2		3				
Menzel	C	1	1														
Sfax	C	11															
Turkey (see table below).																	
Union of South Africa:																	
Cape Province	C	P	P	P	P	P	P	P		P	P	P					
East London	C	1															
	D		1														
Natal	C	P	P	P	1	1	P										
Orange Free State	C	P	P	P	P	P	P	P		P	P	P					
Transvaal	C							P		1							
Yugoslavia (see table below).																	

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
Chosen	C	36					
Chemulpo	C		1	1			
Seoul	C	2	3		3		
Greece: Athens	C	1	1	4	1		
Lithuania	C	1		4	11	32	24
	D					3	3

Place		September, 1928	October, 1928	November, 1928	December, 1928	January, 1929	February, 1929
Mexico: Sonora (see also table above)	D					1	
Peru	C			8			
Turkey	C	6	4		19	1	
Yugoslavia	C	6	1	17	7	15	13
	D						2

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Aug. 26–Sept. 22, 1928	Sept. 23–Oct. 20, 1928	Oct. 21–Nov. 17, 1928	Week ended—									
					Nov. 24, 1928	December, 1928					January, 1929			
						1	8	15	22	29	5	12	19	26
Brazil:														
Bahia	C	1		1										
	D	2									1			
Para	D											2		1
Rio de Janeiro [1]	C	9	6	2			2				2			
	D	8	4	1							2			
Dahomey: Ouidah Military Camp	C			1		1								
	D			1										
Gambia: Bathurst	C			4	2		1							
	D			1	1		1							
Liberia: Monrovia	C													[2] 3
	D													2
On vessel:														
S. S. Berini, at Santos, Brazil	C		4											
	D		1											
S. S. Victoria, at Manaos, from Para, Brazil	C											1		
	D											1		

[1] 29 cases of yellow fever with 14 deaths were reported at Rio de Janeiro during January, 1929, mostly suburban. During February there were 25 confirmed cases of yellow fever at Rio de Janeiro, with a mortality of about 66 per cent of the cases.

[2] Suspected cases.