Public Health Reports

Vol. 55 • JANUARY 26, 1940 • *No. 4*

THE DISABLING DISEASES OF CHILDHOOD*

Their Characteristics and Medical Care as Observed in 500,000 Children in 83 Cities Canvassed in the National Health Survey, 1935–1936

I. CHARACTERISTICS AND LEADING CAUSES

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The decline in the death rate which has occurred in the present century is largely the result of the reduction in the mortality of childhood. The diseases which have been brought under most successful control are infectious in nature, and the benefits of this advance have accrued mainly to the period of childhood in which these diseases are most frequent. While notable progress has been made in reducing childhood mortality, children continue to experience a high frequency of illness, of which the preventable diseases remain a major cause. These facts are familiar to the private practitioner and the medical and nursing personnel of official and nonofficial health agencies. It is believed, however, that a review of the characteristics of illness in childhood may be of use in redefining the objectives of professional and lay workers in the field of child health.

The disabling illnesses occurring in a 12-month period in over 500,000 children canvassed in the National Health Survey present the basic data required for such a broad analysis. The records relate to illness as it is recognized by the layman and enumerated in a house-to-house canvass. This method was first used in a representative general population by the Committee on the Costs of Medical Care in 1928–31 (*1*). The National Health Survey, made in 1935–36, represents its most recent and extensive application.

The second report in this series on disabling illnesses in childhood will consider the medical and nursing care of the diseases of children as observed in the survey. The present report thus serves the further purpose of providing a basis for the interpretation of the results relating to medical services received by the surveyed group.

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METHOD OF THE SURVEY

The records of illness which form the basis of the present report represent a 12-month experience of over half a million children in almost three-quarters of a million families canvassed by the United States Public Health Service in the winter of 1935–36. The canvass was Nation-wide in respect to its coverage of urban communities, which included 83 cities in 18 States,[1] but the scope of the survey permitted only a limited sampling of rural areas in 3 States.

The surveyed cities were selected in such a manner as to give adequate representation to each geographic area, but financial considerations made it impossible to include the number of cities required to give an urban sample having the same composition by city-size as the total urban population of the country.[2] Internal representativeness of the surveyed population was obtained by making a complete canvass of 51 cities of less than 100,000 population, and sampling [3] the households of 31 cities of 100,000 population and over, and 1 city of the former population class.[4]

The information concerning the social and economic characteristics of the family and its illness record in a 12-month period was obtained by the enumerator from a lay informant, usually the housewife.[5] "Illness"[6] was defined as a disease, injury, or permanent gross impairment, congenital or acquired, which had caused disability for at least 7 consecutive days in a 12-month period falling approximately in the year 1935. An exception to this definition was made in the enumeration of chronic diseases and gross permanent impairments

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[1] A list of the surveyed cities is given in Appendix B of "The National Health Survey: Scope and Method of the Nation-Wide Family Canvass of Sickness in Relation to its Social and Economic Setting," by George St. J. Perrott, Clark Tibbitts, and Rollo H. Britten. Public Health Reports, 54: 1663 (1939).

[2] The distribution of the surveyed population by geographic area agrees closely with that of the total urban population as enumerated in the Federal Census of 1930. The distribution by population class of the city of residence is necessarily somewhat less representative, 74 percent of the surveyed population being drawn from cities of 100,000 and over as compared with 52 percent for the total urban population in 1930. For the cities of 25,000 to 100,000 population the corresponding figures were: Health Survey, 14 percent; Census of 1930, 19 percent; and for cities of less than 25,000 population: Health Survey, 12 percent; Census of 1930, 29 percent.

[3] The sampling procedure consisted of a random selection of districts to be canvassed within each city, the districts used being those outlined for the enumeration of the population in the Federal Census of 1930. Districts containing approximately equivalent units of population were obtained by arbitrary division of the Census enumeration districts having a population in excess of 1,000. The number of such districts to be surveyed was determined by the number of surveyed families required to give a sample adequately representing the given city and sufficient to produce an urban sample representative of all regions of the country and, within the limitations of the survey, balanced in respect to size of the cities included. A complete canvass was made of the districts selected in this manner. For a complete description of the sampling procedure, see the publication referred to in footnote 1.

[4] The proportion of surveyed children under 10 years of age was somewhat lower than in the total population of the surveyed cities as enumerated in the Federal Census of 1930. The comparative figures (i. e., children under 10 years as a percentage of children under 15 years) are as follows: Cities of 100,000 population and over, Health Survey, 62.4, Census, of 1930, 65.8; cities of 25,000 to 100,000 population, Health Survey, 63.1, Census of 1930, 67.5; cities under 25,000 population, Health Survey, 63.0, Census of 1930, 65.5.

[5] A reproduction of the survey schedule is included in the publication referred to in footnote 1.

[6] Certain exceptions to this definition were made. Records of all confinements, hospital cases, and deaths were taken without limitation as to the duration of disability.

which were recorded without limitation as to the existence or duration of disability.

With the exception of the data on orthopedic impairments, the illnesses of childhood considered in this report are restricted to those disabling for a minimum of 7 consecutive days. In the period of childhood, disability was used in the sense of interference with normal activity, i. e., play of the preschool child or school attendance of older children. The latter criterion of disability is objective, but the lack of similarly definitive measures of disability among infants and very young children may lead to an understatement of the frequency and duration of disabling illness in the early years of childhood.

Confirmation of the informant's statement of the cause of illness was requested from the attending physician for cases so attended, but the majority of the medical causes of illness are those assigned by the lay informant. The diagnoses of illnesses having multiple causes were listed by the enumerator in order of their importance as causes of incapacity. In the subsequent coding of these records, the primary, as distinguished from the contributory, cause of illness was taken as the diagnosis which had caused the longest period of disability. An illness due to multiple causes was considered as a single illness, but data concerning the several causes were coded separately so that all cases of a given disease could be segregated, whether designated as the sole, primary, or contributory cause of the illness.

The present report relates principally to a 12-month illness experience of 518,767 white children under 15 years of age living in 83 surveyed urban communities.[7] Included in this total are 373,446 children of these ages in 31 surveyed cities of 100,000 population and over, 78,426 children in 10 cities of 25,000 to 100,000 population, and 66,895 children in 42 cities under 25,000 population. The results of the survey of children in rural areas, and of canvassed Negro children are considered only incidentally.

CHARACTERISTICS OF DISABLING ILLNESS IN A 12-MONTH PERIOD

Frequency.—Among white urban children, the period included in the first 10 years of life, exclusive of infancy, is characterized by a high frequency of illness which is not again approximated until the period of old age. This fact, first established by Sydenstricker's studies of illness in Hagerstown, Md. (*2*), was confirmed by the results of the canvass of representative white families made by the Committee on the Costs of Medical Care (*1, 3*). The results of the National Health Survey show general agreement with these earlier studies.

Among children 5 to 9 years of age, the frequency rate of disabling illness was 305 per 1,000. This rate was higher than that in any age

[7] The majority of tabulations of data which form the basis of the present report exclude 14,194 white children under 15 years of age in families whose annual income was reported as "unknown."

period observed, exceeding even the rate for persons over 65 years of age. Next in order of magnitude was the rate for children of preschool age (1 to 4 years), 251 per 1,000. In the age period 10 to 14 years, the rate was 153 per 1,000, representing a notably lower incidence than in the preceding quinquennium.[8] The experience of a sample of the surveyed child population forms the basis for these rates (see Appendix table 1).

The nature of the age variation in the frequency rate of disabling illness may be observed in figure 1. The rates plotted are based on the experience of 280,073 white persons in 8 large cities included in the survey. Appendix table 1 presents the frequency rates by age in the surveyed white population of these 8 cities, and in a sample of the entire surveyed white population of 83 cities. It will be noted that the absolute magnitude of the frequency rates in the two surveyed groups shows consistent differences, but the relative variation of the rates by age is of the same nature. The rates for the 8 cities are plotted since other data shown in figure 1 relate to this surveyed group.

The method of the present survey imposes certain limitations on the definition of the characteristics of disabling illness among infants under 1 year of age. The disabling illnesses recorded in the survey were those occurring in the 12 months prior to the date of the canvass. Infants under 1 year of age, as of the survey date, were the survivors of births occurring in the preceding 12 months, and were, therefore, exposed to the risk of illness for periods varying from less than a month to 12 months. In this respect, the illness experience of infants under 1 year of age differs from that of the population at ages 1 year and over, which, with the exception of persons dying in the survey year, was exposed to the risk of illness for 12 months. The conversion of the various measures of illness among infants under 1 year of age to a 12-month basis involves certain assumptions concerning the incidence rate of illness at specific months of age in the first year which cannot be verified on the basis of existing morbidity data. Future analysis of the results of the National Health Survey may contribute information on this point. The present report adopts the practice of expressing the *observed* rate of illness among infants under

[8] The frequency rate of disabling illness among children in certain canvassed rural areas showed departures from the pattern of age variation observed in the urban group. Among rural farm children canvassed in Missouri, the highest rate was observed not at the ages 5 to 9 years, but in the following quinquennium; in Michigan, the rate for rural farm children 10 to 14 years old was lower than that for ages 5 to 9, but represented 86 percent of the rate for children under 15, compared with 66 percent for rural nonfarm children in this State. The results are consistent with previous studies (*4, 5*) of the age incidence of certain acute communicable diseases which indicate a later age of attack in rural areas. A future report in this series will consider the results of the survey of children in rural areas.

On the other hand, a preliminary report has indicated that the highest disabling illness rate among Negro children occurs in the ages under 5 (*6*). This difference, in comparison with the experience of white children, is accounted for in part by the characteristic differences exhibited by the two groups in the incidence of the common communicable diseases of childhood.

1 year of age per 1,000 live births. Such a rate permits certain internal comparisons within the period of infancy, but its absolute magnitude in relation to the rates observed at subsequent ages is without significance.[9]

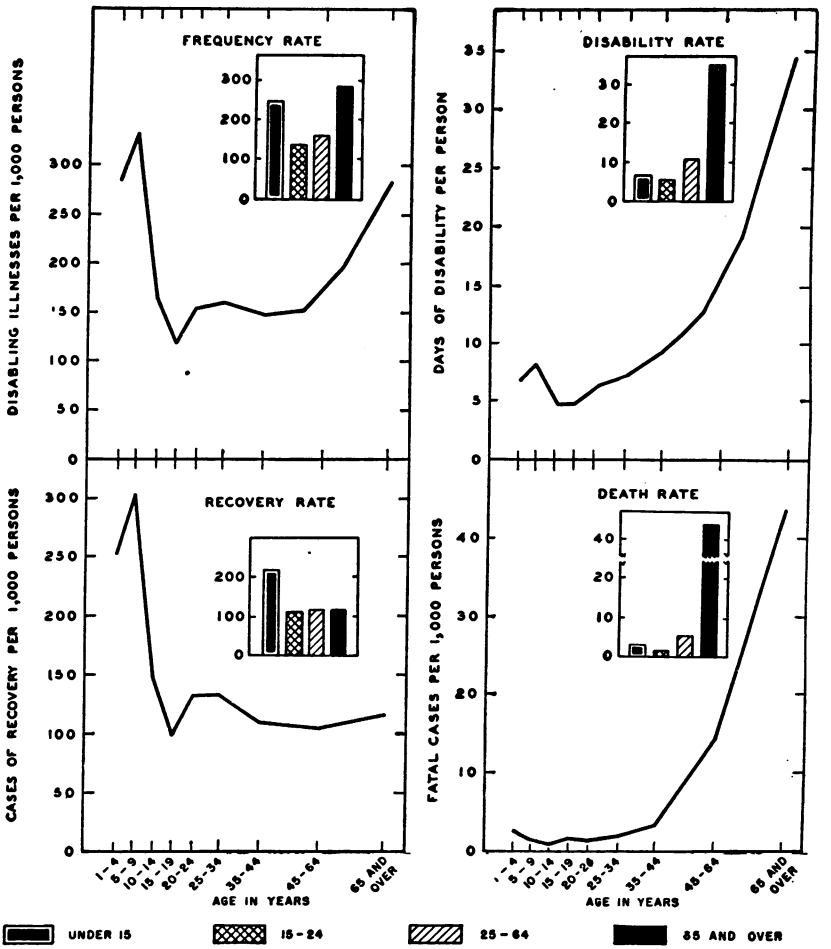

FIGURE 1.—Frequency, disability, and recovery rates of illness disabling for 7 consecutive days or longer, and the observed death rate based on all fatal cases in a 12-month period, by age—280,073 white persons in 8 large cities canvassed in 1935-36. The rates for infants under 1 year of age are not shown since the period of exposure was less than 12 months.

Severity.—The effect of the high frequency of illness on child health is ameliorated by the low mean duration and high recovery rate which characterize childhood illness except in the period of infancy.

[9] The only published data available on the incidence of illness among infants in a representative population are those obtained in the survey of the Committee on the Costs of Medical Care, reported by Falk, Klem, and Sinai (*1*). These authors show the incidence rate of illness, disabling and nondisabling, among (1) infants born during the survey year, and (2) infants under 1 year of age at the beginning of the 12-month period of observation. The exposure of the second group comprises part of the first and second years of life.

The severity rate, i. e., the mean duration of illness, was found to be lowest in childhood (Appendix table 1). As a result, the amount of disability accruing from the illnesses of childhood was disproportionately low with reference to the high frequency of illness at this period. This may be observed by a comparison of the frequency and disability rates plotted in figure 1.

At specific ages of childhood, the relative variation in the disability and frequency rates was similar, the maximum point in both rates in the period of childhood occurring at ages 5 to 9. Children 5 to 9 years of age (including both sick and well) experienced 8 days of disability per capita in the 12-month period from illness involving a minimum of 7 consecutive days of disability. Next in order was the rate for children of preschool age, 7 days per capita. In the age period 10 to 14 years, the rate was 5 days per capita. This rate is high in consideration of the low frequency of illness in this age period; it results from a mean duration of illness which exceeds that of children between 1 and 10 years of age. The disability rates at specific ages of childhood which are given here (shown in Appendix table 1 and figure 1) are based on the experience of 65,136 white children in 8 large cities included in the survey; these data are not yet available for the entire surveyed population.

The severity of illness may be evaluated also by a consideration of the probability of its termination in recovery or death. The recovery rate in childhood, exclusive of the first year, was found to be high compared with the rate in the adult period; and the death rate, i. e., the incidence of fatally terminating illnesses, is low compared with that of adults over 25 years of age. Within the period of childhood, it is notable that the recovery rate was lower and the death rate higher among children 1 to 4 years of age than in the age period 5 to 9 years. The nature of the age variation in these rates may be observed in Appendix table 1 and in the two lower graphs of figure 1; the rates are based on the experience of surveyed persons in 8 large cities. Appendix table 1 includes also the frequency rates of incompleted cases which had caused disability for a minimum of 7 days. It will be noted that in childhood, illnesses which were not terminated at the date of the survey formed a lower proportion of all disabling illnesses than in the period of adult life.

The death rates observed in the survey are lower than rates based on registered deaths; this deficiency results from the method employed, the house-to-house canvass, which does not obtain complete reporting of deaths. Previous surveys conducted by this method have shown a similar discrepancy. However, a correction for unreported deaths would not alter significantly the relative magnitude of the recovery and death rates.

Mortality rates are generally recognized as an incomplete measure of the importance of a given health problem. The implications of this fact are of particular significance in childhood, in which, after the first year of life, the probability of recovery from illness greatly exceeds the probability of death.

THE DISABLING DISEASES OF CHILDREN

Diseases classified in major groups.—Eight out of 10 disabling illnesses among children under 15 years of age observed in this survey were due to the acute communicable diseases of childhood or the acute diseases of the respiratory system, including influenza, tonsillitis, colds, pneumonia, and bronchitis. Among these 8 cases, about 5 were acute communicable diseases of childhood, and 3 were cases of acute respiratory disease.

The figures shown in table 1 indicate that the frequency rate of disabling illness due to the communicable diseases in children under 15 years of age was about 12 times as high as the rate for the group of major chronic diseases and orthopedic impairments, 14 times as high as the rate for acute diseases of the digestive system, and almost 10 times as high as the rate for injuries due to accident. The communicable diseases are, furthermore, characteristically childhood diseases; their frequency declines sharply after the peak in childhood, and becomes almost negligible among adults. On the other hand, while the frequency of illness due to diseases of the respiratory system is likewise higher in childhood than in the adult period, the incidence of these diseases among adults is maintained at a relatively high level. The nature of the age variation in the frequency of disabling illness due to these two groups of diseases may be observed in figure 2 (page 148).[10]

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[10] For the purpose of a broad classification of the causes of disabling illness in childhood, four groups of diseases having certain common characteristics have been used. By excluding influenza, tuberculosis, and specific infections of the intestinal tract from the specific infectious diseases, a new *communicable* group has been established which comprises mainly the common communicable diseases of childhood—measles, mumps, chickenpox, whooping cough, scarlet fever, and diphtheria. Influenza has been combined with the diseases of the nose, throat, and lungs (except respiratory tuberculosis) to form the *respiratory* group which, in childhood, includes largely acute diseases—tonsillitis, colds, pneumonia, and bronchitis, in addition to influenza. The specific infectious diseases of the intestinal tract have been combined with other diseases of the digestive system to form the *digestive* group, which includes appendicitis, indigestion, biliousness, diarrhea and enteritis, ulcer of the stomach or duodenum, and diseases of the gall bladder or liver. Finally, tuberculosis, all forms; nervous and mental disease or defect; cancer; rheumatism; diabetes; cerebral hemorrhage and other forms of paralysis; diseases of the heart, arteriosclerosis and high blood pressure, and other diseases of the circulatory system, exclusive of hemorrhoids and varicose veins; and nephritis and other nonvenereal diseases of the genitourinary system, exclusive of circumcision and diseases of the female genital organs, have been combined under the group of major chronic diseases. By definition, certain chronic diseases of the respiratory and digestive systems are included, respectively, in the respiratory and digestive groups; however, the incidence of these chronic diseases is relatively low in childhood, and among children under 15 years of age the respiratory and digestive groups of diseases as used here comprise chiefly acute diseases.

TABLE 1.—*Frequency, severity, and disability rates of illness disabling for 7 consecutive days or longer in a 12-month period classified by age and cause in broad groups—sole or primary causes only—2,152,740 white persons [1] in 83 cities canvassed in 1935–36*

Age period (years)	All causes	Communicable diseases [3]	Diseases of the respiratory system [4]	Major chronic diseases and orthopedic impairments					Diseases of the digestive system [7]	All other diseases	Accidents
				Total	Tuberculosis, all forms	Nervous and mental diseases [5]	Other major chronic diseases [6]	Orthopedic impairments			
	Frequency rate (disabling [8] illnesses per 1,000 persons)										
All ages [2]	171.4	30.3	50.0	29.7	1.3	5.5	20.0	2.9	12.6	33.2	15.6
Under 15	224.6	105.4	74.2	9.1	.5	2.6	4.8	1.2	7.5	17.5	10.9
15–24	128.8	12.4	37.1	11.9	1.5	3.9	5.0	1.5	13.7	40.6	13.1
25–64	149.6	5.0	42.2	33.5	1.7	6.8	22.1	2.9	13.8	38.0	17.2
65 and over	275.6	2.3	58.6	134.7	.9	9.9	109.3	14.6	19.6	33.2	27.1
	Disability rate (days of disability per person)										
All ages [2]	9.83	0.70	1.15	4.69	0.32	1.03	2.45	0.89	0.74	1.79	0.75
Under 15	5.93	2.24	1.26	1.12	.09	.43	.32	.28	.23	.72	.36
15–24	5.31	.28	.67	1.96	.34	.81	.44	.38	.53	1.35	.51
25–64	10.26	.19	1.11	5.14	.43	1.28	2.56	.87	.91	2.03	.88
65 and over	35.44	.15	2.54	23.53	.20	1.99	16.26	5.08	1.96	5.28	1.97
	Severity rate (days of disability per disabling [8] illness)										
All ages [2]	57	23	23	158	243	190	123	306	59	54	48
Under 15	26	21	17	124	184	169	66	235	30	41	33
15–24	41	22	18	166	232	206	89	251	39	33	39
25–64	69	38	26	154	256	188	116	305	66	54	51
65 and over	129	65	43	175	221	203	149	347	100	160	73

[1] Exclusive of persons in families for which income was reported as unknown.
[2] Rates for all ages are based on the total cases and total population of known ages only.
[3] Include chiefly the communicable diseases of childhood, measles, mumps, chickenpox, whooping cough, scarlet fever, and diphtheria.
[4] Include influenza, pneumonia, colds, bronchitis, tonsillitis, pleurisy, sinusitis, asthma, hay fever, and other diseases of the respiratory system except respiratory tuberculosis.
[5] Include mental defects.
[6] Include cancer; rheumatism; diabetes; cerebral hemorrhage and other forms of paralysis; diseases of the heart, arteriosclerosis and high blood pressure, and other diseases of the circulatory system, exclusive of hemorrhoids and varicose veins; nephritis and other nonvenereal diseases of the genitourinary system, exclusive of diseases of the female genital organs.
[7] Include appendicitis, indigestion, biliousness, diarrhea and enteritis, ulcer of the stomach or duodenum, diseases of the gall bladder or liver, and other diseases of the digestive system.
[8] Disabling for 7 consecutive days or longer in a 12-month period. All confinements, fatal, and hospital cases are included without reference to the duration of disability.

The communicable and respiratory diseases likewise accounted for over half of the disability rate of children under 15 years of age in the survey year, the communicable diseases disabling each child on the average about 2 days and the acute respiratory diseases about 1 day. The disability rate for the major chronic diseases (exclusive of tuberculosis and nervous and mental disease and defect) was about three-tenths of a day per child; the rate for orthopedic impairments was approximately the same. Nervous and mental disease and defect accounted for a disability rate of about four-tenths of a day per child and tuberculosis for one-tenth of a day; however, these diseases are incompletely reported in the house-to-house canvass, and the actual rates are probably somewhat higher than those observed.

Broadly considered, the groups of acute communicable and respiratory diseases thus include the major diseases of childhood. The individual child suffering from heart disease, tuberculosis, or crippling impairments presents medical and social problems of the first importance; on the average, however, these diseases account for relatively little disability in childhood.

Table 2 shows the frequency rates of disabling illness due to the two major groups of children's diseases, the communicable and respiratory, among children in the surveyed cities classified by size. The incidence of the communicable diseases was notably higher among children in the small cities under 25,000 population than in the intermediate (25,000 to 100,000 population) and large cities (100,000 population and over). The excess is not attributable to epidemics occurring in the small cities of a single region, since it is apparent in the rates of small cities in each geographic area. The difference in the magnitude of the frequency rates of the communicable diseases among children in the small and large cities is not explained by variation in age composition of the child population, since the age distribution of children in the three groups of surveyed cities was found to be essentially the same. Furthermore, the excess in the frequency rates among children in the small cities, compared with the large cities, is of a high order only for the group of communicable diseases.

TABLE 2.—*Frequency rate and frequency index of disabling [1] illness in childhood in a 12-month period, by cause in two major groups in surveyed cities classified by geographic area and size—sole or primary causes only—518,767 white children under 15 years of age in 83 cities canvassed in 1935–36*

Area and population class of surveyed city	All causes	Communicable diseases [2]	Diseases of the respiratory system [3]	All other causes
	Frequency rate (disabling illnesses per 1,000 persons under 15 years of age)			
Total urban, all areas [4]	224.6	105.4	74.2	45.0
100,000 and over	211.7	93.4	73.9	44.4
25,000–100,000	220.0	103.8	71.9	44.2
Under 25,000	301.9	173.9	79.1	48.9
	Frequency index (frequency rate, cities of 100,000 population and over=100)			
Northeast:				
25,000–100,000	95	109	76	100
Under 25,000	119	148	98	102
Central:				
25,000–100,000	115	118	112	114
Under 25,000	181	247	105	121
West:				
25,000–100,000	96	111	75	99
Under 25,000	122	148	99	102
South:				
25,000–100,000	120	137	118	97
Under 25,000	112	148	93	94

[1] Disabling for 7 consecutive days or longer in a 12-month period. All fatal and hospital cases are included without reference to the duration of disability.
[2] Exclusive of cases and persons in families with income unknown.
[3] For the diseases included, see footnote 3, table 1.
[4] For the diseases included, see footnote 4, table 1.

When the frequency rates of disabling illness are classified in a similar manner by cause according to the income status of the surveyed children, as shown in table 3, it is found that the excess in the incidence of the communicable diseases in the small cities is marked in each income class. Among children in relief families in the small cities, illness due to the communicable diseases was 82 percent more frequent than among children in these families in cities of 100,000 population and over; among children in families with income in excess of $3,000, the figure was 81 percent, and in the intermediate income classes, the excess ranged from 85 to 96 percent. On the other hand, in no income class was an excess of this order observed in the small-city rates for other causes of illness.

TABLE 3.—*Frequency rate and frequency index of disabling [1] illness in childhood in a 12-month period, by income and cause in two major groups, in surveyed cities classified by size—sole or primary causes only—518,767 white children under 15 years of age in 83 cities canvassed in 1935–36*

Population class of city and income	All causes	Communicable diseases [3]	Diseases of the respiratory system [4]	All other causes
	Frequency rate (disabling illnesses per 1,000 persons under 15 years of age)			
Total urban, all incomes [2]	224.6	105.4	74.2	45.0
100,000 and over	211.7	93.4	73.9	44.4
25,000–100,000	220.0	103.8	71.9	44.2
Under 25,000	301.9	173.9	79.1	48.9
	Frequency index (frequency rate under 15 years, cities of 100,000 population and over=100)			
Relief:				
25,000–100,000	99	104	93	99
Under 25,000	136	182	101	102
Nonrelief:				
Under $1,000:				
25,000–100,000	102	109	97	99
Under 25,000	141	187	104	109
$1,000–$2,000:				
25,000–100,000	108	120	94	101
Under 25,000	152	196	114	116
$2,000–$3,000:				
25,000–100,000	111	111	117	98
Under 25,000	147	185	115	116
$3,000 and over:				
25,000–100,000	113	113	121	95
Under 25,000	146	181	119	119

[1] See footnote 1, table 2.
[2] See footnote 2, table 2.
[3] For the diseases included, see footnote 3, table 1.
[4] For the diseases included, see footnote 4, table 1.

Important specific diseases of children.—In the group of communicable diseases, the most frequently reported disabling illnesses of children under 15 years of age were measles, chickenpox, whooping cough, mumps, and scarlet fever. In general, measles showed the highest incidence and diphtheria the lowest, the relative frequency of the other communicable diseases of childhood showing some variation in the large, intermediate, and small surveyed cities. Among sur-

veyed children under 15 years of age in the large cities, measles occurred at a rate of 37.4 per 1,000, a rate notably higher than that for chickenpox (18.8), whooping cough (13.9), mumps (11.5), and scarlet fever (11.1). In the small surveyed cities, the frequency rate of measles was 67.5 per 1,000, and the rate for mumps, 47.4 per 1,000, was second in order of frequency. Table 4 gives the frequency rates of disabling illness due to certain important diseases of childhood among children under 15 years of age in surveyed cities of three population classes.

TABLE 4.—*Frequency rates of important disabling*[1] *diseases of childhood in a 12-month period in a sample of 518,767 surveyed white children under 15 years of age in 88 cities classified by size, and rates by specific ages in a sample of 373,446 white children in 31 cities of 100,000 population and over—sole, primary, and contributory causes—1935–36*

Diagnosis	Population class			Cities of 100,000 and over			
				Age period			
	100,000 and over	25,000–100,000	Under 25,000	Under 1	1–4	5–9	10–14
	Frequency rate per 1,000 persons under 15 years			Frequency rate			
				Per 1,000 live births	Per 1,000 persons		
Communicable diseases:							
Measles[2]	37.4	32.8	67.5	3.6	48.4	61.4	14.2
Chickenpox	18.8	15.5	27.2	8.1	27.8	29.9	4.8
Whooping cough	13.9	8.0	21.6	6.3	27.1	20.8	.7
Mumps	11.5	32.5	47.4	.9	8.1	19.0	8.4
Scarlet fever	11.1	9.5	11.7	----	10.2	17.1	7.9
Diphtheria	1.1	2.0	1.5	----	1.1	1.7	.8
Acute diseases of the respiratory system:							
Tonsillectomy, adenoidectomy	18.4	15.3	17.8	----	14.2	27.9	15.1
Influenza, grippe	14.4	25.5	22.8	3.6	11.5	18.2	14.2
Colds	13.6	6.5	12.6	13.5	18.5	16.1	8.4
Tonsillitis	8.2	6.8	9.4	1.8	8.8	10.7	6.5
Pneumonia	7.9	11.0	9.6	13.5	13.8	8.5	2.9
Bronchitis	6.9	3.8	5.8	10.8	9.7	8.2	3.5
Chronic diseases and impairments:							
Diseases of the nervous system	3.0	3.0	2.9	3.6	3.2	2.8	3.0
Diseases of the heart	2.1	1.0	1.8	8.1	.5	2.2	2.2
Rheumatism	1.9	1.8	2.0	----	.7	2.3	2.5
Nephritis	1.6	2.0	2.3	----	1.1	2.0	1.8
Orthopedic impairments	1.6	.8	.9	.9	1.8	1.5	1.7
Acute diseases of the digestive system:							
Appendicitis	3.9	4.0	3.8	----	1.4	3.7	6.2
Indigestion	1.7	2.0	3.2	----	2.9	1.5	1.2
Diarrhea, enteritis	1.0	1.8	2.3	5.4	2.0	.5	.3
All other diseases:							
Ear, mastoid diseases	8.5	4.3	7.6	8.1	14.5	.9	3.7
Cervical adenitis, other diseases of lymphatic system	2.4	1.5	1.8	----	4.5	2.6	1.4
Congenital malformations,[3] diseases of early infancy	1.3	1.5	.9	19.9	.2	----	.3
Circumcision	.7	1.0	1.2	2.7	1.1	.8	.1
Accidents, total[4]	11.2	10.5	14.3	1.9	10.2	11.6	12.8
Home	5.4	(5)	(5)	1.1	7.5	5.9	4.3
Other public	4.8	(5)	(5)	.3	1.2	5.4	7.1
Automobile	1.9	(5)	(5)	.3	1.1	2.2	2.3

[1] See footnote 1, table 2.
[2] Includes German measles.
[3] Except congenital malformation of the heart, which is included with diseases of the heart.
[4] Rates for accidental injuries by place of occurrence are based on the experience of 65,136 white children under 15 years of age in 8 cities of 100,000 population and over. For the cities included, see footnote 3, Appendix table 1. Rates are exclusive of contributory causes.
[5] Data not available.

On the average, measles shows a higher frequency than the other communicable diseases of childhood, but the marked excess observed in this survey reflects an unusually high incidence of this disease in 1935, the approximate survey year (*7*). The relatively high incidence of mumps, especially in the two groups of cities under 100,000 population, is of interest in view of the prevailing opinion (*8*) that this disease is notably less frequent than measles, whooping cough, and chickenpox. Collins (*9*) has also reported a relatively high incidence of mumps among children canvassed in the survey of the Committee on the Costs of Medical Care. The decreasing frequency of diphtheria as a cause of illness in childhood is evident in the relatively low rates observed for this disease in the present survey; among children 1 to 10 years of age, however, diphtheria remains a leading cause of death.[11]

The high incidence of the communicable diseases among children in the small surveyed cities was noted in the preceding section. The rates shown in table 4 indicate that the excess is accounted for principally by the higher frequency of measles and mumps among children in the small cities; the rates for whooping cough and chickenpox show the same tendency in less marked degree. The incidence of measles, based on cases reported by city health officers to the United States Public Health Service, was likewise higher in 1935 in small cities (10,000 to 25,000 population) than in cities of 100,000 population and over. The incidence of chickenpox in that year, based on data from the same source, showed a similar tendency. These rates are shown in the following table; they are based on cases in all reporting cities of the specified population classes located in the States included in the National Health Survey. Data for cities under 10,000 population were not available, and the "small cities," therefore, include those between 10,000 and 25,000 population.

[11] The importance of malaria as a child health problem in certain sections of the country is indicated by the results of the survey of rural children in a Southern State. Among white children under 15 years of age in surveyed rural areas, the disabling illness rates for malaria were 24.7 per 1,000 for the nonfarm area and 16.2 for the farm area, compared with rates between 1.0 and 2.8 per 1,000 for children in 20 Southern cities. The figures are shown in the following table:

Classification of population	Disabling illnesses per 1,000 persons under 15 years of age			
	Communicable diseases*		Malaria	
	White	Negro	White	Negro
Urban (sample):				
100,000 and over	60.7	22.5	1.0	2.0
25,000-100,000	83.2	21.7	1.5	2.6
Under 25,000	89.9	26.5	2.8	13.1
Rural:				
Nonfarm	54.5	62.2	24.7	17.8
Farm	42.0	43.0	16.2	22.1

*Include parasitic diseases. For the definition of this group, as used here, see footnote 10.

Incidence rates of certain communicable diseases in 1935, based on cases of the notifiable diseases reported to the United States Public Health Service[1]

Disease	Rate per 1,000 persons (all ages)							
	East		Central		West		South	
	100,000 and over	10,000–25,000	100,000 and over	10,000–25,000	100,000 and over	10,000–25,000	100,000 and over	10,000–25,000
Measles	5.4	11.3	9.7	18.3	3.7	14.3	1.7	4.0
Scarlet fever	2.1	2.3	3.6	5.0	2.3	1.5	.7	.8
Whooping cough	1.7	2.4	1.6	1.2	1.5	1.0	.6	.9
Mumps	1.6	1.8	1.4	1.4	1.7	7.4	.8	1.0
Chickenpox	2.4	4.0	2.7	4.1	4.7	4.0	.7	2.7

[1] The population used as a base for the rates is that of the 1930 Federal Census. The minimum number of cities reporting and the aggregate population were as follows: (1) Cities 100,000 and over: East, 23 cities, 13,867,534 persons; Central, 17 cities, 9,993,116 persons; West, 10 cities, 2,351,682 persons; South, 9 cities, 1,892,920 persons; (2) Cities 10,000–25,000: East, 83 cities, 1,398,549 persons; Central, 28 cities, 493,627 persons; West, 8 cities, 130,020 persons; South, 7 cities, 118,628 persons.

In 1934, the incidence of measles showed the same tendency, the only departure occurring in the rate in the small Western cities, which was lower than that of the cities of 100,000 population and over. The generally large excess observed in the small-city rates for measles in 1934 and 1935 (the single exception being that noted for the West) may be accounted for by the marked epidemicity of measles in the country as a whole in these years. In 1933, in the small cities of both the Western and Central regions, the measles rates were lower than in the large cities.

In the interpretation of these rates, the relative completeness of reporting in small and large cities must be taken into account. Investigations made by Godfrey (*4*) indicated that the ratio of reporting was much less complete in larger than in smaller cities. The higher incidence of communicable diseases in small cities included in the present survey may likewise reflect a more complete enumeration of illness in these communities.

In the group of acute diseases of the respiratory system, the leading causes of disabling illness among children under 15 years of age were tonsillitis, influenza, colds, pneumonia, and bronchitis; tonsillitis (including other pathological conditions of the tonsils and adenoids which preceded operation) was the most frequently reported of these diseases. The disabling illness rate for pneumonia was approximately of the order of the rate for scarlet fever, and several times higher than the rate for diphtheria. As a cause of death among children under 15 years of age, pneumonia is exceeded in frequency only by the group of congenital malformations and diseases of early infancy. On the basis of its frequency both as a cause of illness and death, pneumonia is one of the major diseases of childhood, ranking in importance with diphtheria and scarlet fever; yet the control of

this disease has been given relatively little attention by organized health agencies.

Because of the possibilities for their prevention, accidents represent another broad group of importance as a cause of disability in childhood. Accidental injuries involving disability of at least a week in duration were approximately as frequent among children under 15 years of age as certain of the communicable diseases of childhood. Accidents assume even greater importance when their high fatality rate is considered; among children 5 to 14 years of age, they account, on the average, for about one-fifth of all deaths.

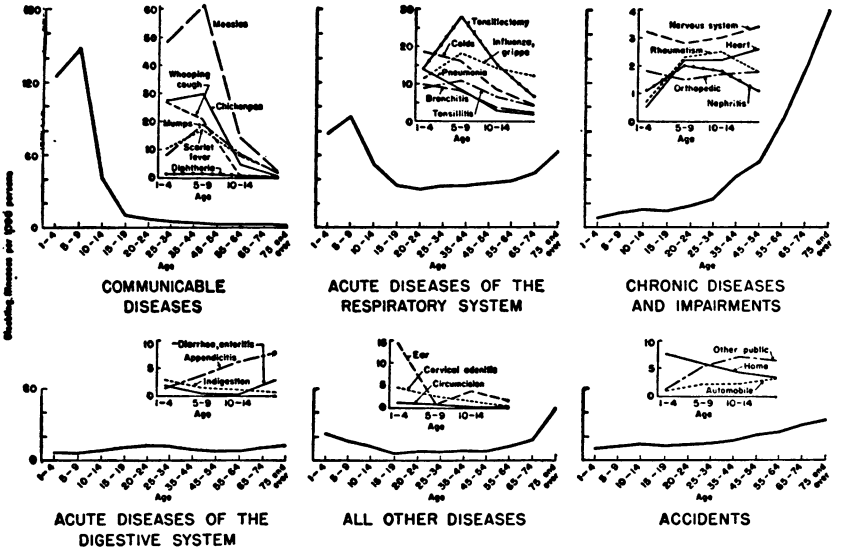

FIGURE 2.—Age variation in frequency rates of disabling illness in a 12-month period, classified by cause in broad disease groups (sole or primary causes only) and, for the period of childhood, by specific cause (sole, primary, and contributory causes). Conditions associated with the puerperal state, and diseases of the female genital organs are not included. Sample of 1,581,577 white persons in 31 cities of 100,000 population and over (exclusive of persons in families with income unknown) canvassed in 1935-36. The rates for infants under 1 year of age are not shown since the period of exposure was less than 12 months.

The diseases of children show a characteristically different frequency in the various periods of childhood. This may be observed in table 4 and figure 2, which show the frequency rates of disabling illness at specific ages of childhood for important diseases in each of five broad anatomic or etiologic groups. The data relate to a sample of surveyed children in the large cities.

The age trend of the frequency rates for the majority of the disabling diseases of children included in the two major groups, the communicable and respiratory, was definitely upward during the early years of life, approaching a maximum in the age period 5 to 9 years, and declining to a definitely lower level among children 10 to

14 years old. It should be noted, however, that these rates are based on the experience of white urban children; the age trend among rural and Negro children exhibits a different pattern (see footnote 8).

Among the communicable diseases, whooping cough represents an exception to this general trend, the frequency rate reaching a peak among children of the preschool ages. In Collins' study (*9*) of the age incidence of disabling and nondisabling illness, based on records obtained by the Committee on the Costs of Medical Care, the frequency of both whooping cough and measles was found to be higher among preschool children than in the age period 5 to 9 years.

In respect to the age incidence of measles and scarlet fever, the statements of other observers (*8*) are not supported by either the results of the present survey or Collins' analysis of the Committee's records. In both of these surveys, the ages under 10 years were found to include the period of highest incidence of measles, whereas the statement has been made previously that maximum incidence occurs at ages 5 to 14. The present survey and Collins' analysis indicate that scarlet fever is most frequent in the age period 5 to 9 years, a finding which is at variance with the designation of the preschool ages as the period of highest incidence of this disease (*8*). The incidence of the various communicable diseases at specific ages of childhood showed the same trend in samples of surveyed children in the intermediate and small cities; these rates are not shown because of the limitation of space.

In the respiratory group of diseases, tonsillitis (including tonsillectomies) and influenza occurred with greatest frequency in the age period 5 to 9 years. The frequency of pneumonia, however, was higher among preschool children than at ages 5 to 9.

Among other diseases showing a higher frequency among preschool children than in the age period 5 to 9 years, the diseases of the ear and mastoid process may be noted. Accidental injuries occurring in the home likewise were most frequent among children of the preschool ages. In the succeeding years of childhood, the frequency of home accidents declined but public accidents showed an upward trend.

Among infants born during the survey year, the acute diseases of the respiratory system considered as a group represented the major cause of disabling illness. As a cause of illness, this group of diseases outranked in frequency congenital malformations and other causes commonly designated as the diseases of early infancy, which are the leading cause of infant mortality. The acute respiratory diseases were more frequent causes of illness among infants than the acute communicable diseases; among children of preschool (1 to 4 years) and early school age (5 to 9 years) the relative importance of these two groups of diseases was reversed.

PREVALENCE OF PERMANENT ORTHOPEDIC IMPAIRMENTS

The illnesses of children considered in the preceding section were those which caused disability lasting for 7 consecutive days or longer in the survey year. It has been shown (table 1) that 12 in every 10,000 surveyed white children under 15 years of age had been disabled for a week or longer in the 12-month period by permanent orthopedic impairments. The severity of these cases is indicated by their mean duration, which was almost 8 months.

The survey included also an enumeration of cases of permanent orthopedic impairment which had caused no incapacity in the survey year, and cases resulting in disability of less than 7 consecutive days' duration. The combination of both nondisabling and disabling impairments, without limitation as to the duration of disability, makes possible the computation of the total prevalence rate of permanent orthopedic impairments. This total prevalence rate in children under 15 years of age was 49.5 per 10,000; at ages under 5, 25.6 per 10,000; at the school ages, 5 to 14 years, 59.3 per 10,000. These rates are shown in table 5, which relates to the experience of 602,814 white and colored children in 83 cities canvassed in the survey. Data now available do not permit the presentation of rates specific for color.

Among children under 15 years of age, the total prevalence rate of orthopedic impairments (49.5 per 10,000) is seen to be about four times as high as the rate for cases disabling for a week or longer (12 per 10,000). Thus, in about three-fourths of the orthopedic cases occurring among children under 15 years of age, the impairment had not seriously affected normal activity, insofar as this can be measured objectively at these ages. For children of school age, ability to attend school is a satisfactory measure of normal activity; among younger children, as has been noted previously, application of the criterion of "disability" by the layman may result in an understatement of disabling cases. It should be noted also that while only about one-fourth of the orthopedic cases among children under 15 years of age had suffered serious curtailment of the activities of childhood, a somewhat larger proportion of cases might be expected to result in a vocational handicap in adult life.

Figure 3 shows graphically the prevalence rates of orthopedic impairments classified according to the nature of the impairment and the part affected among children under 15 years of age; only rates of 0.5 per 10,000 or higher are shown here. It will be observed that, with the exception of lost fingers, impairments involving loss of members were relatively infrequent. On the other hand, the prevalence rates of crippling impairments without loss of the member, involving one or both lower extremities, upper and lower extremities in combination, and the trunk, were relatively high.

TABLE 5.—*Prevalence rate of disabling and nondisabling orthopedic impairments classified by the part affected and detailed cause, in two age periods of childhood—sole, primary, and contributory causes—602,814 white and colored children [1] in 83 cities canvassed in 1935–36*

Cause of impairment	Total, all impairments	Impairment without loss of member							Impairment involving loss of member [4]				Impairment (with or without loss) of other or unknown members or parts of the body [5]	Number of impairments, all types
		Fingers	Toes	One hand or arm [2]	Both hands or arms [2]	One foot or leg [2]	Both feet or legs [2]	Upper and lower extremities [3] or trunk [2]	Fingers	Toes	One hand, arm, foot, or leg	Upper and lower extremities, [3] both hands or arms		
	Prevalence rate per 10,000 persons under 15 years													
All causes	49.5	1.7	0.3	5.9	0.5	15.3	6.9	8.7	4.9	0.6	1.1	0.1	3.5	2,982
Congenital [6]	16.0	.5	.2	2.3	.3	3.6	2.9	3.7	.6	.1	.6	.08	1.1	964
Acquired:														
Diseases, total	20.8	.1	-------	1.7	.1	8.8	3.7	4.2	.08	.08	.05	.03	2.0	1,251
Poliomyelitis	11.6	.02	-------	1.0	.05	6.1	1.6	1.9	-------	.02	-------	-------	1.0	699
Paralysis, other forms	1.8	.02	-------	.1	.02	.2	.3	.6	-------	-------	-------	-------	.6	111
Meningitis	.2	-------	-------	.03	-------	.05	.07	.09	-------	-------	-------	-------	-------	14
Encephalitis	.07	-------	-------	.02	-------	.02	-------	.03	-------	-------	-------	-------	-------	4
Other mental and nervous diseases	.4	-------	-------	.05	-------	.03	.03	.2	-------	-------	-------	-------	.05	23
Tuberculosis, all forms	.4	-------	-------	.03	-------	.3	-------	.1	-------	-------	-------	-------	-------	25
Rheumatism	.3	.02	-------	.05	-------	.2	.03	.02	-------	-------	-------	-------	-------	18
Other diseases of the bones and joints	1.6	-------	-------	.03	-------	.6	.5	.3	-------	.05	.03	-------	.1	97
Weak arches	.7	-------	-------	-------	-------	.02	.6	-------	-------	-------	-------	-------	-------	39
Local infection	.3	-------	-------	.03	-------	.2	.02	.02	.02	-------	-------	-------	.02	15
All other specified diseases	.7	-------	-------	.05	-------	.3	.1	.2	.03	-------	.02	-------	.05	45
Unknown or ill-defined diseases	2.7	.05	-------	.2	.03	.9	.5	.8	.03	.02	-------	.03	.1	161
Accidents and other external causes	12.7	1.1	.07	1.9	.05	3.0	.3	.9	4.2	.4	.5	-------	.4	767

[1] The number of surveyed white and colored children under 5 years of age was 175,653; at ages 5 to 14 years, 427,161.

[2] Impairments of spine or back in combination with impairment of one or both upper or lower extremities are included with impairments of the extremities involved.

[3] Includes impairment of one hand or arm and one foot or leg; one hand or arm and both feet or legs; both hands or arms and one foot or leg; both hands or arms and both feet or legs.

[4] No cases involving loss of both feet or legs were reported.

[5] Includes impairments of specified parts of the trunk, except the joints, spine, back or side, and of unspecified parts of the trunk; and impairment (with or without loss of a member), in which the member or part of the body involved was not specified.

[6] Includes injuries at birth.

TABLE 5.—*Prevalence rate of disabling and nondisabling orthopedic impairments classified by the part affected and detailed cause, in two age periods of childhood—sole, primary, and contributory causes—602,814 white and colored children in 83 cities canvassed in 1935–36*—Con.

Cause of impairment	Total, all impairments	Impairment without loss of member							Impairment involving loss of member				Impairment (with or without loss) of other or unknown members or parts of the body	Number of impairments, all types
		Fingers	Toes	One hand or arm	Both hands or arms	One foot or leg	Both feet or legs	Upper and lower extremities or trunk	Fingers	Toes	One hand, arm, foot, or leg	Upper and lower extremities, both hands or arms		
	Prevalence rate per 10,000 persons under 5 years													
All causes	25.6	1.0	0.2	2.6	0.5	6.5	5.1	4.2	1.9	0.1	0.8	0.1	2.6	450
Congenital[6]	14.9	.5	.2	1.9	.4	3.4	3.1	2.6	.7	.1	.7	.06	1.1	261
Acquired:														
Diseases, total	7.2	.06	----	.3	----	2.4	1.9	1.3	----	----	----	.06	1.3	127
Poliomyelitis	3.1	.06	----	.2	----	1.4	.7	.3	----	----	----	----	.5	55
Paralysis, other forms	1.4	----	----	.06	----	.1	.2	.5	----	----	----	----	.5	24
Meningitis	.1	----	----	----	----	.06	----	.06	----	----	----	----	----	2
Encephalitis	.06	----	----	----	----	.06	----	----	----	----	----	----	----	1
Other mental and nervous diseases	.2	----	----	----	----	----	.06	.06	----	----	----	----	.06	3
Tuberculosis, all forms	.06	----	----	----	----	.06	----	----	----	----	----	----	----	1
Rheumatism	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other diseases of the bones and joints	.9	----	----	----	----	.1	.6	.2	----	----	----	----	.06	16
Weak arches	.2	----	----	----	----	----	.2	----	----	----	----	----	----	4
Local infection	.06	----	----	----	----	.06	----	----	----	----	----	----	----	1
All other specified diseases	.2	----	----	----	----	.2	----	----	----	----	----	----	.06	4
Unknown or ill-defined diseases	.9	----	----	----	----	.3	.2	.2	----	----	----	.06	.1	16
Accidents and other external causes	3.5	.5	----	.4	.06	.7	.1	.3	1.2	----	.06	----	.2	62

Prevalence rate per 10,000 persons 5–14 years

All causes	59.3	2.0	0.3	7.3	0.5	19.0	7.6	10.6	6.1	0.8	1.2	0.1	3.8	2,532
Congenital [6]	16.5	.5	.2	2.5	.3	3.7	2.8	4.1	.5	.1	.5	.09	1.1	703
Acquired:														
Diseases, total	26.3	.1	-------	2.2	.1	11.4	4.5	5.4	.1	.1	.07	.02	2.3	1,124
Poliomyelitis	15.1	-------	-------	1.4	.07	8.0	1.9	2.5	-------	.02	-------	-------	1.2	644
Paralysis, other forms	2.0	.02	-------	.1	.02	.2	.3	.7	-------	-------	-------	-------	.7	87
Meningitis	.3	-------	-------	.05	-------	.05	.09	.09	-------	-------	-------	-------	-------	12
Encephalitis	.07	-------	-------	.02	-------	-------	-------	.05	-------	-------	-------	-------	-------	3
Other mental and nervous diseases	.5	-------	-------	.07	-------	.05	.02	.3	-------	-------	-------	-------	.05	20
Tuberculosis, all forms	.6	-------	-------	.05	-------	.4	-------	.1	-------	-------	-------	-------	-------	24
Rheumatism	.4	.02	-------	.07	-------	.3	.05	.02	-------	-------	-------	-------	-------	18
Other diseases of the bones and joints	1.9	-------	-------	.05	-------	.8	.5	.3	-------	.07	.05	-------	.2	81
Weak arches	.8	-------	-------	-------	-------	.02	.8	-------	-------	-------	-------	-------	-------	35
Local infection	.3	-------	-------	.04	-------	.2	.02	.02	.02	-------	-------	-------	.02	14
All other specified diseases	1.0	-------	-------	.07	-------	.3	.2	.3	.05	-------	.02	-------	.05	41
Unknown or ill-defined diseases	3.4	.07	-------	.3	.05	1.2	.6	1.0	.05	.02	-------	.02	.1	145
Accidents and other external causes	16.5	1.4	.09	2.6	.05	3.9	.3	1.1	5.4	.6	.7	-------	.5	705

[6] Includes injuries at birth.

Figure 3 also shows graphically the percentage distribution of orthopedic impairments among children under 15 years of age, by cause.[12] In the age group under 15 years, congenital defects, poliomyelitis, and injuries due to accidental causes accounted for 79 percent of all impairments which did not involve loss of the member; accidents alone accounted for 77 percent of all lost members.

Among children under 5 years of age, congenital defects and injuries at birth accounted for over half of the impairments reported. Children of school age (5 to 14 years) showed a relatively larger proportion of acquired impairments, a natural result of the progressive increase in exposure to disease and accident which occurs throughout life.

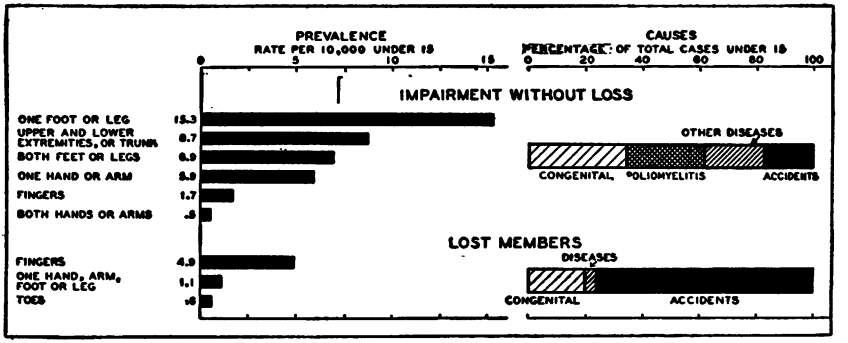

FIGURE 3.—Prevalence rate of disabling and nondisabling orthopedic impairments classified by the part affected, and the percentage distribution of impairments by cause, in 602,814 white and colored children in 83 cities canvassed in 1935-36—sole, primary, and contributory causes. The prevalence rates of impairments not shown here are as follows (rates per 10,000 persons under 15 years of age): Toes, impairment without loss, .3; loss of upper and lower extremities, both hands or arms, .1; impairment of unspecified part of trunk and other impairments of trunk, except those affecting the joints, spine, back, or side, 1.7; other impairments (with or without loss), the part involved not reported, 1.8. The combined prevalence rate of the impairments included in the last two groups is shown in column 13 of table 5. See also footnote 12 of the text.

Poliomyelitis was reported as the cause of 56 percent of all impairments due to disease among children under 15 years of age; in the age period under 5 years the proportion was 43 percent, and among children of school age, 57 percent. The prevalence rate of impairments due to poliomyelitis in children under 15 years of age was 11.6 per 10,000; for spastic and other forms of paralysis, except poliomyelitis, the rate was 1.8, for tuberculosis, 0.4, for rheumatism and other diseases of the bones and joints, 1.9 per 10,000. In comparison with poliomyelitis, other specific diseases are seen to be relatively infrequent as causes of orthopedic impairments.

[12] For the purpose of this distribution, the group of lost or impaired members or parts of the body in which the part affected was not specified (included in column 13 of table 5) was combined with "impairments without loss of member," since the method of coding these cases did not permit segregation of the lost members.

SUMMARY

In a canvass of 83 representative urban communities conducted by the United States Public Health Service in 1935–36, records of disabling illness in a 12-month period were obtained for 518,767 white children under 15 years of age. The records of sickness were limited to disabling illnesses, i. e., those which had prevented the usual activities of the preschool child, or school attendance of the school child, for at least 7 consecutive days in the 12-month survey period. The characteristics of the disabling diseases of childhood as observed in the survey may be summarized as follows:

Disabling illnesses occurred with greater frequency among children under 10 years of age than in any subsequent period except old age.

The duration of the average disabling illness was found to be lowest among children; as a result, childhood illnesses, although frequent in occurrence, gave rise to a relatively small volume of disability. The amount of disability accruing from illnesses disabling for 7 consecutive days or longer among children of preschool age (1 to 4 years) amounted to 7 days per capita; at ages 5 to 9 years, the rate was 8 days per capita. The lowest disability rate observed in childhood, 5 days per capita, was among children 10 to 14 years of age.

Except in the period of infancy, the rate of recovery from illness was notably higher among children than among adults.

Four in every five disabling illnesses occurring among children under 15 years of age were due to acute communicable or respiratory diseases; these diseases accounted for over half of the disability experienced by the average child in the 12-month period. Broadly considered, the control of the acute communicable and respiratory diseases represents the major problem in the field of child health, since many of these diseases are preventable.

Permanent orthopedic impairments incapacitated 12 in every 10,000 children under 15 years of age for at least a week during the survey year; the average duration of disability per case was almost 8 months.

On the date of the survey, permanent orthopedic impairments (including all cases without reference to the resultant incapacity) were found in 49.5 per 10,000 children under 15 years of age. Congenital defects, accidental injury, and poliomyelitis were reported most frequently as causes of impairments in this age period.

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Appendix

TABLE 1.—*Frequency rate of disabling [1] illness in a 12-month period, by age, in a sample of 2,152,740 white persons [2] in 83 cities; frequency rates of illness [1] according to termination, severity, and disability rates in a 12-month period, by age, in 280,073 white persons in 8 cities,[3] 1935–36*

Age period (years)	83 cities, sample	8 cities					
	Frequency rate of disabling [1] illness, total [4]	Frequency rate of disabling [1] illness with specified termination				Disability rate	Severity rate
		Total [5]	Recovery	Death	Incomplete [6]		
	Rate per 1,000 persons (at ages under 1, per 1,000 live births)					Days of disability per person	Days of disability per disabling [1] illness
All ages [4]	170	184	139	6.65	38.1	10.4	57
Under 15	225	249	220	3.16	25.6	6.4	26
Under 1 [7]	120	134	74	30.37	29.8	3.6	27
1–4	251	284	253	2.87	27.6	6.9	24
5–9	305	336	304	1.34	30.5	8.2	24
10–14	153	169	148	.92	19.4	4.9	29
15–19	107	117	98	1.48	17.0	4.7	40
20–24	148	154	132	1.45	20.6	6.4	42
25–34	151	161	133	1.73	26.0	7.3	46
35–44	136	147	109	3.40	34.6	9.3	63
45–64	155	170	104	10.45	55.3	15.2	89
65 and over	273	283	115	43.74	124.9	34.8	123

[1] Disabling for 7 consecutive days or longer in a 12-month period. All confinements, fatal, and hospital cases are included without reference to the duration of disability. Sole or primary causes only.

[2] Exclusive of persons of unknown age or unknown income.

[3] The 8 cities include: Atlanta, Ga.; Cincinnati, Ohio; Dallas, Tex.; Fall River, Mass.; Newark, N. J.; Oakland, Calif.; St. Paul, Minn.; Seattle, Wash

[4] The rates for persons of all ages in 8 cities include a small number of cases and persons of unknown age; the rate for persons of all ages in 83 cities is exclusive of cases and persons of unknown age.

[5] Disabling illnesses (as defined in footnote 1) per 1,000 persons; this rate represents the sum of the rates for recovered, fatal, and incompleted cases.

[6] Disabled on the date of the canvass after an illness causing incapacity for at least 7 consecutive days.

[7] In the period under 1 year, the frequency rates are computed per 1,000 live births, the disability rate, per live birth.

OCULAR MANIFESTATIONS OF ARIBOFLAVINOSIS [1]

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This paper presents observations on ocular changes in a small group of patients known to be receiving insufficient riboflavin, and on the beneficial effects of riboflavin therapy on these lesions. From slit-lamp examination and ocular signs the principal manifestation was found to be a keratitis. The corneal lesions improved or disappeared upon riboflavin therapy, and recurred on cessation of it. Two cases of keratitis associated with syphilis but resistant to antisyphilitic treatment were studied without attempting to control the diet. Riboflavin therapy appeared to be distinctly beneficial in these cases.

OBSERVATIONS ON OCULAR LESIONS DUE TO ARIBOFLAVINOSIS

Nine adults, 17 to 53 years of age, with ariboflavinosis were studied. Five were colored females, 3, white females, and 1, a white male. All the patients had evidence of ariboflavinosis, both eye lesions and other lesions. When first seen only 4 were free from other deficiency disease; 5 had signs of one or more other deficiency diseases. These were associated with ariboflavinosis in the following combinations: Avitaminosis C; pellagra; pellagra and avitaminosis A; pellagra, neuritis, and anemia; pellagra, neuritis, anemia, and nutritional edema.

As regards etiology, all gave a history of generally deficient diets; but 5 showed, in addition, other factors contributing to inadequate intake or to disturbance in utilization of nutrients. These factors were, respectively, colitis with diarrhea, sore tongue and diarrhea, sore tongue and self-imposed diet limitation, sore tongue and anorexia, and syphilis.

During the period of observation, 6 patients were hospitalized and three were treated as out-patients. Hospitalized patients were maintained on a basal diet on which the oral lesions of ariboflavinosis were known to occur when supplemented with adequate amounts of other vitamins. Out-patients were advised not to change their home diets and to avoid yeast and cod-liver oil except as the latter was prescribed. The program in administering vitamin supplements was designed to demonstrate the lesions specific for ariboflavinosis and the sequence of changes in them. Most cases had multiple deficiency diseases calling for various supplements. First, there was administration of vitamins other than riboflavin, for they were not present in the basal diet in amounts sufficient for prompt and complete removal of other

[1] In addition to funds supplied by the three organizations with which the authors are affiliated, facilities available to the University of Georgia Medical School from a grant-in-aid by the John and Mary R. Markle Foundation also were used in the study.

avitaminosis occurring with ariboflavinosis. The daily supplements with the dosages usually administered were thiamin chloride, 20 mg.; nicotinic acid, 300 mg.; cevitamic acid, 50 mg.; and cod-liver oil, 4 cc.[2] The method of administration, as well as any increase in dosage, was governed by etiological factors and the severity of the associated deficiency disease.

These daily supplements to the basal diet served the following purposes: (1) To remove or prevent lesions of deficiency diseases other than ariboflavinosis; (2) to demonstrate what lesions are not beneficially affected and therein to show the lack of effect on lesions which might be attributable to ariboflavinosis; (3) to allow, if advisable, early lesions of ariboflavinosis to progress under observation; (4) to permit imminent subclinical ariboflavinosis to emerge upon curing other existing deficiency diseases. But the procedures varied mostly in the administration of riboflavin, as to the point when it was administered, the length of time it was given, and when it was withdrawn. (1) If riboflavin is withheld while the other vitamins are supplied, it is possible, as already stated, to follow the progress of early lesions in ariboflavinosis or to observe any lesions of ariboflavinosis which might emerge upon curing other existing deficiencies. (2) After other supplements had been administered for sufficient time to produce their effects, riboflavin in 5-mg. daily dosage was then administered to observe its effects on lesions and signs which might be attributable to ariboflavinosis. (3) In several instances riboflavin therapy was discontinued, after healing was near completion, to bring about recurrence. (4) In a few cases the alternate discontinuance and resumption of riboflavin therapy was repeated several times at suitable intervals, permitting appearance and disappearance of lesions.

Details of physical examinations and laboratory investigations, repeated at frequent intervals, are omitted from this paper and will form part of a future report. Frequent examinations with the slit lamp were made by 2 observers and their findings checked by an ophthalmologist. For 3 patients, the lamp was not available until shortly after they were sent to the hospital. Two patients, who had been noted to have ocular lesions in association with severe ariboflavinosis but who had been dismissed before a slit lamp became available, were recalled for observation. In all, the salient clinical signs of ariboflavinosis were followed.

Manifestations of riboflavin deficiency.—Signs of ariboflavinosis previously described include lesions of lips and face. Reddened, then shiny, denuded lips with maceration and fissuring in the angles of the mouth, designated as cheilosis, and seborrheic accumulations at the

[2] Thiamin chloride and riboflavin were the pure synthetic vitamins furnished by E. R. Squibb and Sons. Merck and Co., and the Winthrop Chemical Co. Pure nicotinic acid was supplied by Merck and Co. and E. R. Squibb and Sons, cevitamic acid crystals by Mead Johnson and Co., and crystalline vitamin A for oral and parenteral administration by the Winthrop Chemical Co.

nasolabial folds have been described as manifestations of riboflavin deficiency (*1, 2, 3, 4*). To these two characteristics of ariboflavinosis, another should now be added. A specific type of glossitis can often be recognized before other signs of riboflavin deficiency are present. The tongue is clean, the papillae flattened or mushroom-shaped rather than atrophic, the color is definitely purplish-red or magenta as compared with the scarlet of nicotinic acid deficiency. Frequently the development of this type of glossitis can be observed in pellagrins whose red atrophic tongues have become normal in appearance under nicotinic acid therapy but whose diet has remained deficient in riboflavin. Thus cheilosis, seborrheic dermatitis, and glossitis are associated with riboflavin deficiency. In the present series of 9 cases, 7 showed cheilosis when first seen; in 2 it developed during the course of observation under therapy without riboflavin or with insufficient flavin. All these showed maceration and fissuring at angles of the mouth; in only 3 cases were there reddened denuded lips. Five cases showed typical glossitis of ariboflavinosis at onset and 3 later. Seborrheic accumulations were present in 2 cases when first seen, and developed in another later.

Ocular signs and lesions.—All had ocular changes for which there were symptoms and signs. Itching, burning, and a sensation of roughness of the eyes with mild photophobia were rather common complaints; severe photophobia, dimness of vision in poor light, and partial blindness were less frequent.

In 5 patients corneal opacities were grossly visible. Five cases showed congestion of the bulbar conjunctiva with marked circumcorneal injection. Such ciliary congestion usually accompanies diseases of the cornea, iris, and ciliary body. Associated with the bulbar congestion in these 5 cases was injection of the fornix conjunctivae, a relationship not uncommon in severe disturbances of the anterior part of the eye. Three cases showed injection only in the palpebral conjunctiva and fornix, indicative of conjunctival involvement. Most of the cases showed impaired visual acuity by test. No definite abnormalities in the fundi were seen upon ophthalmoscopic examination.

Slit-lamp examinations, however, were most revealing. The outstanding changes were in the cornea. These are most lucidly and succinctly presented by a composite description of the observations with the instrument on the 9 patients. When the patients were first examined, their corneal manifestations were in various stages. But some notion of the sequence of events was gained in the following ways: (1) In one instance ariboflavinosis with ocular as well as other signs developed upon curing other existing deficiency diseases; (2) early cases of ariboflavinosis were allowed to progress; (3) lesions of

ariboflavinosis after being healed were allowed to recur under observation.

The earliest change noted was superficial invasion of the cornea by capillaries arising at either or both the nasal and temporal side of the limbus from the anterior ciliary vessels, while later the capillaries extended into the substantia propria of the cornea. There were anastomoses between the capillaries arising from widely separated sectors of the limbus. Accompanying the vascular proliferation, the ciliary vessels encircling the limbus were dilated and engorged. Still later extensive interstitial infiltration with exudate appeared. Both superficial and interstitial opacities, sometimes diffuse, sometimes patchy, were seen after vascularization was well under way. It is evident that active cases in various stages may, when first seen, present combinations of these features. In 3 cases there was evidence of an old iritis, with the structure and color of the iris changed by exudate.

As in other deficiency diseases, in ariboflavinosis these histopathological changes in the cornea are reversible. Riboflavin therapy to active cases brings about almost complete effacement of the lesions. In the process of healing the capillaries become occluded and may show interrupted columns of blood, sometimes mere "beads" of trapped corpuscles. All vessels may become empty though still easily visible and may undergo progressive dimunition in size. There is resolution of exudate. Both superficial and interstitial opacities clear to a marked extent.

When riboflavin therapy is discontinued after the healing process is near completion, there is recurrence of the corneal lesions. Capillaries which had become occluded during the period of treatment become patent and filled with circulating corpuscles. The opacities likewise recur during relapse.

Examination of two patients recalled 1 year after cure of ariboflavinosis showed residua in the cornea in the form of numerous empty capillaries and old superficial and interstitial opacities. Whether these occluded capillaries would disappear after vigorous therapy cannot now be said. Nor have we studied the therapeutic effectiveness of riboflavin on opacities of long standing such as may be found in neglected or arrested but incompletely healed cases.

By the several procedures in supplying supplements, it was found that the corneal lesions, the ocular signs and symptoms, cheilosis, characteristic glossitis, and nasolabial seborrhea were not benefited by nicotinic acid, thiamin, cevitamic acid, cod-liver oil (or crystalline vitamin A), but were by riboflavin. The ocular lesions and signs reappeared, usually with cheilosis and glossitis also, upon discontinuance of the riboflavin therapy and again disappeared following riboflavin therapy.

As representative in showing the specificity of the eye, lip, and tongue lesions for ariboflavinosis and the sequence of the corneal changes, 2 of the 9 case reports are presented here briefly.

The first case, a colored female 27 years of age, had ariboflavinosis complicated with pellagra and avitaminosis A. Upon admission she had diarrhea, emaciation, cheilosis, photophobia, circumcorneal injection with congestion of the bulbar and fornix conjunctiva, and corneal opacities. Daily supplements of nicotinic acid, 1,000 mg., and liver extract, 60 cc., were started. After 6 days cheilosis and ocular congestion had disappeared, so liver extract was discontinued. Two months later follicular keratosis of avitaminosis A appeared but responded to daily therapy of percomorph oil, 2 cc. One month thereafter cheilosis recurred; therefore riboflavin, 5 mg. daily, was given. On slit-lamp examination the corneae showed slight superficial and old interstitial opacities. A plexus of empty capillaries extended from the limbus to the area of interstitial opacity. For 10 weeks there was no change, then riboflavin therapy was discontinued. Sixteen days later severe cheilosis and glossitis occurred and during the next 12 days many of the capillaries, extending in the cornea from the ciliary plexus to the opacity, had become patent and contained blood. Riboflavin, 15 mg. daily by mouth, was resumed. In 5 days there was healing of the cheilosis and glossitis. All the capillaries in the right cornea were again occluded, and in the left cornea, though many capillaries there were patent, many others were empty and still others showed interrupted columns of blood. One week later all corneal capillaries were occluded, though many in the left eye contained "beads" of trapped corpuscles. Visual acuity at this time had improved from 15/40 to 15/20.

Case G. S., a colored female 19 years old, had been admitted twice previously for "keratitis and iritis, cause undetermined." On present admission her eyes showed extreme photophobia, swollen lids, seropurulent exudate, conjunctival and circumcorneal injection, and corneae so opaque that pupils could barely be seen. She also had cheilosis, and extensive and severe seborrheic dermatitis and glossitis typified by a magenta-colored tongue with flattened papillae. While she was on the control diet for 11 days, the seborrheic and ocular manifestations showed no improvement; the cheilosis and glossitis became somewhat worse. Daily supplements of thiamin chloride, nicotinic acid, cevitamic acid, and cod-liver oil were then prescribed in amounts previously cited. Upon slit-lamp examination 4 weeks later there was universal vascularization of both corneae, with numerous anastomoses between many capillaries arising from various sectors of the ciliary vessels, extensive interstitial infiltration, and extreme superficial and interstitial opacities. There was evidence of an old and recent iritis. The cheilosis, seborrheic dermatitis, and glossitis were unchanged.

At this point riboflavin (5 mg.) was given intramuscularly each day. Four days later the cheilosis was healed; the tongue was pink with some coating. As for the eyes, the photophobia was much less and the gross injection of conjunctival vessels was absent. Slit-lamp examination showed marked diminution in the number of minute vessels in the cornea and some resolution of interstitial opacities. Six days thereafter the keratitis was much improved. Most of the superficial and interstitial vessels had become empty or "beaded," and the opacities had so cleared that the fundus could be seen for the first time. Riboflavin was then discontinued. Eight days later cheilosis and glossitis recurred. Six days thereafter almost all the corneal vessels which had become occluded during riboflavin therapy were now patent with circulating blood and the interstitial opacities relapsed. Riboflavin therapy (5 mg. daily by mouth) was resumed. In 18 days the cheilosis and glossitis had disappeared but corneal vascularization persisted.

But after 18 more days only the larger superficial vessels remained patent, and interstitial opacities, which had cleared on previous riboflavin treatment but recurred on discontinuance of therapy, had now again disappeared. At this time crystalline vitamin A (20,000 units daily) was substituted for fish liver oil, all other supplements including riboflavin being continued. Twenty-four days later the vascularization showed no change but the opacities had cleared further. Riboflavin therapy was withdrawn at this point. In 9 days there was photophobia and both superficial and interstitial vessels in the cornea became patent and in increased numbers showed circulating blood. Twelve days later photophobia and corneal opacities were greatly increased; cheilosis and glossitis had also recurred. Riboflavin therapy (15 mg. daily by mouth) was again resumed. In 4 days the cheilosis and glossitis had disappeared. Seven days later photophobia was absent; almost all the vessels in both corneae were empty; the superficial and interstitial opacities in the corneae were less than on any previous occasion. Visual acuity which had been found to be 20/40 in the right eye and 20/100 in the left eye at the first examination, possible only after the eyes cleared, improved to 15/20 in both eyes.

OBSERVATIONS ON OCULAR LESIONS ASSOCIATED WITH SYPHILIS

Patients were selected who presented severe interstitial keratitis which had ceased to improve under continuous antisyphilitic therapy. Since these were outpatients, no effort was made at dietary control, but all antisyphilitic medication was stopped. Two patients were given riboflavin, 2 others who served as controls were given tablets of acetylsalicylic acid. All were examined with the slit lamp once each week.

Case 11, a white girl, aged 9, with a diagnosis of congenital syphilis, had been under continuous antisyphilitic treatment for 15 months. Her severe keratitis had shown no improvement during the preceding 3 months. At the end of this time she had marked photophobia and lacrimation; both corneae were grossly clouded. The slit lamp showed that the entire cornea was covered with fine interlacing and anastomosing vessels located just beneath the epithelium. There was extensive interstitial invasion and the posterior membrane was also covered with a fine vascular plexus. Superficial and interstitial opacity was present in each cornea, several areas of dense opacity occurring especially in the substantia propria. Marked changes in the iris and the presence of many fine deposits on the posterior surface of the cornea gave evidence of an associated uveitis. All antisyphilitic treatment was stopped and riboflavin (5 mg. daily) was given. Nine days later it was evident that the diffuse interstitial opacity was less and that many of the smaller vessels were empty. Three weeks thereafter photophobia was absent and the opacities had cleared to such a degree that the child was reading without her glasses. At this time great numbers of small corneal vessels were empty and several of the larger ones showed interrupted columns of blood. One month later the right cornea was grossly clear. By slit lamp, however, there was moderate anterior opacity, and some residual interstitial opacity, more in the left than in the right eye. The vascular changes were also improved. Only a few of the smaller vessels in each cornea remained patent; the majority of the larger vessels showed interrupted columns of blood. There were scattered interstitial exudates. The fine deposits on the posterior surface of the cornea remained unchanged, a few of the minute vessels in each cornea remained patent, the majority of large vessels showed interruption of the columns of blood. Two weeks

later there was no evident change in the opacities but further obliteration of vessels was noted. Various observers pronounced the improvement during the 12 weeks of riboflavin therapy as extraordinary.

Case 12, a colored female, aged 24, with a diagnosis of acquired syphilis, had been previously treated with antisyphilitics at various times, but for 5 months the treatment had been continuous and intensive. No improvement had been noted in the keratitis during the preceding month. Examination with the slit lamp showed a picture comparable in most respects to that described for case 11. The distribution, number, and size of the vessels were remarkably similar, but the interstitial opacities were somewhat denser. The fine deposits on the posterior surface of the cornea were more numerous. Antisyphilitic treatment was stopped and riboflavin (5 mg. daily) was given. There was obvious resolution of anterior and interstitial opacities by the end of the second week of treatment and a notable decrease in the number of blood vessels which had invaded the cornea. As in the previous case there was thereafter progressive obliteration of vessels and clearing of anterior and interstitial opacities. Two and a half months later no patent vessels could be found and only a few small areas of interstitial exudate remained. The fine deposits on the posterior surface of the cornea persisted. The degree of improvement in the eyes in this case was also remarkable.

Case 13, a colored female, aged 16, with a diagnosis of congenital syphilis, and case 14, a white male, aged 26, with a diagnosis of acquired syphilis, presenting keratitis similar in severity to that of cases 11 and 12, had shown no improvement from antisyphilitic therapy for 2 months. Treatment was withdrawn and acetylsalicylic acid given. During the subsequent two and one-half months there was no appreciable change in the condition of the cornea in these control cases.

DISCUSSION

At least six lines of evidence point to keratitis as a specific manifestation of ariboflavinosis. (1) Keratitis appeared in persons whose diets, at home or in the hospital, were deficient in riboflavin; it persisted or grew worse on a basal diet deficient in riboflavin. (2) It was not cured by thiamin chloride, nicotinic acid, cevitamic acid, crystalline vitamin A or fish liver oils. (3) It was cured by riboflavin. (4) It relapsed upon withdrawal of riboflavin therapy. (5) It occurred with other signs of ariboflavinosis, namely, cheilosis, glossitis, and seborrheic dermatitis; but, more important, it corresponded with them in progression or regression, according to discontinuance or administration, respectively, of riboflavin. (6) It has an analogue in ariboflavinosis experimentally produced in animals. As for the interstitial keratitis associated with syphilis, the rapid and almost complete response to riboflavin therapy in the two cases suggests that there may be a riboflavin involvement.

Using a slit lamp as well as injection methods, Bessey and Wolbach (*5*) observed vascularization of the cornea as an early sign of ariboflavinosis in the rat, then infiltration and opacities after a longer deprivation of the vitamin. As soon as 12 hours after riboflavin administration by mouth, opacity of moderate degree disappeared, and within 48 hours the cornea, unless severely damaged, was clear. Later there was resolution of exudate and gradual occlusion of the

corneal vessels until they were no longer visible by slit-lamp illumination, though they could be demonstrated by india-ink injection. They persist demonstrable only by injection in apparently normal corneas for a long period. Similarly, it may be mentioned that interstitial keratitis due to syphilis is said to leave evidence in later years of its previous occurrence; the slit lamp reveals delicate opaque lines representing obliterated blood vessels In 109 patients with leiodystonia and sprue, Pock-Steen (*6*) noted eye symptoms, the principal one being reduced visual acuity in dim light. This twilight-blindness, which he calls aknephascopia, was greatly ameliorated after riboflavin administration and was therefore regarded as a specific sign of ariboflavinosis. It differs from night-blindness and is not influenced by administration of vitamin A. It is interesting that he lists mydriasis, conjunctival irritation, keratitis, and disturbances in accommodation as other eye conditions observed in sprue; of these only conjunctival pains were mitigated by riboflavin. These eye symptoms of sprue, he believes, result partly from riboflavin deficiency and partly from histamine toxicosis. In the abstract no mention is made of a study of ocular lesions which might be associated with the diminished vision. Still another group of investigators (*4*), in reporting on 6 cases of ariboflavinosis with cheilosis, mentioned that one case showed conjunctival congestion and photophobia which responded to riboflavin.

Keratitis in human beings due to riboflavin deficiency has not been previously reported. As in most nutritive disturbances, deficient diet is not the only possible causative mechanism. It is probable that insufficient intake and disturbance in transport or utilization in the body may lead to the same result, and that these several mechanisms may operate simultaneously. In the nine dietary cases here reported, it is probable that the anorexia of several, the pellagric diarrhea of others, and the colitis in still another contributed with the deficient diet to the bodily deprivation of riboflavin. It is likewise probable that Pock-Steen's patients with sprue did show ariboflavinosis attributable to poor absorption if not also to deficient diets.

In the association between syphilis and keratitis, there are three possibilities: (1) Syphilis may have no causal relationship to keratitis; their association may be a pure coincidence. With evidence that interstitial keratitis arises from deficienicy in riboflavin, it may be questioned whether keratitis occurring with inherited syphilis is actually due to syphilis or to other causes. That interstitial keratitis has, in the past, been most frequently noted in association with syphilis is suggestive but not conclusive evidence that it arises from syphilis. True, interstitial keratitis attributed to syphilis could conceivably occur through involvement of riboflavin. As an infectious process, syphilis could, directly or indirectly, act through a mechanism which would affect nutrition, namely, by disturbance of utilization.

(2) Syphilis may be a contributing or precipitating cause of keratitis. In this event, when the body is in a satisfactory nutritive state, particularly with respect to riboflavin, and other causes are not operating, no corneal involvement with syphilis would be expected. But if the bodily state with reference to riboflavin is mildly but imperceptibly impaired from a cause such as ariboflavinosis, corneal involvement might be expected with syphilis. Or syphilis, though not inducing lesions in the cornea, may make bodily tissues more sensitive to subsequent deficiency or disturbance in riboflavin. Under either circumstance syphilis could not produce keratitis but could contribute to it or precipitate it. That interstitial keratitis is said to occur only in a portion of cases with congenital syphilis would accord with this possibility but would not prove it. If syphilis has this relation to keratitis, administration of flavin might be expected to prevent corneal lesions.

(3) Syphilis may be a primary cause of keratitis. Here, regardless of a satisfactory nutritive state with respect to riboflavin and the absence of other causes, corneal involvement might be expected from syphilis. In this event keratitis should occur in a greater proportion of congenital syphilis cases. If congenital syphilis were the sole primary cause in a case, it would be helpful to know whether administration of riboflavin in generous amount in the very early stages of the keratitis, while the process was progressive, might mitigate the corneal lesions, particularly along with appropriate antisyphilitic therapy. But assuming syphilis to be a primary cause, other causes may operate simultaneously with it. Indeed, in a case of keratitis with syphilis, it may be questioned how much arises from syphilis and how much from ariboflavinosis or other causes. Diets consumed by infants and children with keratitis associated with syphilis may be and probably often are deficient in riboflavin and add to the severity of the eye lesion. When the progress of the keratitic process has halted because the cause, whatever it is, has abated or disappeared, whether corneal repair occurs would seem to depend on the riboflavin which the body receives, usually in the diet. It is proverbial that the effective therapeutic dose of vitamins is many times larger than the amount for maintenance, often larger than the amount supplied by diet. Hence, if the diet were low in riboflavin, repair might be much delayed, if not indefinitely postponed. What has been said concerning syphilis in relation to interstitial keratitis may apply similarly to tuberculosis and interstitial keratitis.

Keratitis is usually classified as interstitial or superficial. The keratitis associated with syphilis or tuberculosis has long been regarded as the classic example of the interstitial type. It takes its name from cellular infiltration in the deep layers of the cornea. But this represents the description of one feature in the advanced stage.

The two cases with syphilis and several of the dietary cases here reported were likewise in this fully developed stage. By that time vascularization and infiltration with opacity are both superficial and deep as well as extensive in area. Indeed they may spread to involve the whole cornea. Actually interstitial keratitis may be more readily understood from studying the sequence of details in its development, as has been done in the dietary variety. In describing the ocular histopathology of ariboflavinosis in rats, Bessey and Wolbach (*5*) pointed out that the capillaries proliferate first beneath the corneal epithelium, then extend deep in the tunica propria and far toward the center of the cornea. Several early cases of keratitis in humans on a dietary basis, as reported in the present paper, bear out that superficial vascularization is an initial change. Later, they state, leucocytic infiltration accumulated beneath the corneal epithelium, and still later in the central nonvascularized portion of the cornea. Thus, the keratitic process extends downward and soon involves the whole cornea. However, the integrity of the corneal epithelium, which is linked so closely with vitamin A, is disturbed only in the very late stages by the progression of ocular lesions in ariboflavinosis.

As regards superficial keratitis, evidence from three sources shows its common features, its mode of progression, and the nutritive factors involved. In the first group of conditions it starts as a conjunctivitis which in its course involves the cornea. There may be pannus, i. e., vascularization and infiltration. Or there may be ulceration from infiltration of a circumscribed portion of the cornea which may advance in area and depth with loss of substance. Either pannus or ulcer produces opacities. Both occur in phlyctenular keratitis and in trachoma. Ulcers also occur in the course of conjunctivitis on a bacillary basis. Secondly may be considered the manifestations of avitaminosis A in humans, namely, xerophthalmia and keratomalacia. Here again, the conjunctiva is affected first. Not only it but also the corneal epithelium undergoes keratinizing metaplasia resulting in xerosis of these structures. The pathological process extends downward through the corneal epithelium to involve the cornea with softening (keratomalacia), ulceration, and opacity. Thirdly, among the effects of avitaminosis A in rats, Wolbach and Howe (*7*) noted not only hyperkeratinization of corneal epithelium but also vascularization of the cornea accompanied by infiltration. After reviewing this material Bessey and Wolbach (*5*) argued that since the ingrowth of capillaries took place concurrently with epithelial changes and prior to any appreciable inflammatory response, it was not explainable on the latter grounds. Apart from the hyperkeratinization of the corneal and conjunctival epithelia, they found great similarity in nature between the ocular lesions of avitaminosis A and ariboflavinosis.

The former, however, responded to vitamin A. As the processes in conjunctivitis or avitaminosis A extend through the corneal epithelium and down into the cornea, it is not surprising that they disturb the cornea with a typical, but probably secondary, response like that seen in ariboflavinosis. Since the site of the first reaction of riboflavin is just beneath the corneal epithelium, it is possible to conceive how riboflavin may thus be secondarily disturbed.

These foregoing observations are helpful in differentiating the pathogenesis of the superficial and interstitial types of keratitis, particularly in their relation to avitaminosis A and ariboflavinosis, respectively. Interstitial keratitis, in advancing, may involve the whole cornea. It results from a deficiency or disturbance in riboflavin. In this process the corneal epithelium, linked with vitamin A, may be involved secondarily in the very late stages. Superficial keratitis, on the other hand, follows by extension a primary involvement of the conjunctiva. It is brought about by infection, with probable disturbance in vitamin A, or by avitaminosis A. As the process reaches the lamellae just under the corneal epithelium, it is possible that the keratitic manifestation represents a secondary riboflavin disturbance. In consequence, avitaminosis A concurrent with ariboflavinosis might be expected to add to the extent or intensity of the keratitis due to the ariboflavinosis.

Keratitis is the principal ocular lesion of ariboflavinosis, but associated signs indicate involvement of neighboring structures. In all cases there was a pronounced circumcorneal injection. At first glance it may be mistaken for conjunctival injection, particularly since it often also involves the latter, but careful examination reveals the prominence of the circumcorneal distribution. Circumcorneal injection, indicative of ciliary congestion, is known to occur in diseases of the cornea, iris, and ciliary body. Keratitis with syphilis is usually associated with inflammation of the uveal tract; indeed, by some, keratitis is regarded as merely a part of a uveitis. In mild cases only the iris is involved, but in more serious types also the ciliary body. In the two cases with syphilis reported here, changes in the iris, keratic precipitates, and synechia indicate uveitis. It is not unlikely that the ciliary congestion is due to involvement of the uvea. As has been stated, in these patients riboflavin therapy cleared the ciliary congestion along with the corneal lesions. It had no beneficial effect on the keratic precipitates, but judgment on this point should be reserved until there are observations over a longer period. In the ariboflavinosis cases there was likewise ciliary injection, cleared by riboflavin. In some instances the iris also showed change. Thus there was a mild iritis accompanying the keratitis. Although keratic precipitates were not present, it is not known whether ariboflavinosis with very severe keratitis over a protracted period would also show

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uveitis. In brief, whereas uveitis was associated with keratitis and syphilis, mild iritis with circumcorneal injection as its most marked and frequent sign was often associated with keratitis from ariboflavinosis.

Although circumcorneal injection in the ariboflavinosis cases was constant and pronounced, conjunctival congestion also frequently occurred. In most the fornix was injected, but with less intensity than the circumcorneal area; in a few the palpebral conjunctiva was also congested. In one case there was a mucopurulent discharge. Thus conjunctivitis occurred, but in only one case was it pronounced. It should be recalled that the conjunctivitis is the primary step in the development of superficial keratitis. On the other hand, mild conjunctivitis was common; often congestion was the only sign. It was probably secondary to iritis, for if circumcorneal congestion is intensive in iritis, it also involves the conjunctival vessels.

We are at present extending our series of cases in order to obtain further observations on details in the sequence of events as well as on some of the points discussed. Especially with reference to interstitial keratitis associated with syphilis, we hope to obtain further evidence, as opportunity provides, on the beneficial effects of riboflavin.

SUMMARY

Nine patients with other symptoms of riboflavin deficiency developed ocular lesions. Slit-lamp examinations and ocular signs revealed that the principal manifestation was a keratitis. The corneal lesions improved or disappeared upon administration of riboflavin and reappeared on cessation of riboflavin therapy.

In addition to cheilosis and seborrheic dermatitis already known to be characteristics of ariboflavinosis, a specific type of glossitis was also observed in these patients. This glossitis, like the cheilosis, seborrheic dermatitis and keratitis, also disappeared upon riboflavin treatment and recurred upon cessation of therapy.

Two patients with severe interstitial keratitis associated with syphilis showed very marked improvement while under therapy with riboflavin.

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ORIGIN OF INDUCED PULMONARY TUMORS IN STRAIN A MICE [1]

By Hugh G. Grady, *Research Fellow*, and Harold L. Stewart, *Pathologist*, *United States Public Health Service*

Since the first recorded description of a spontaneous pulmonary tumor in a mouse was made over 40 years ago many histologic studies of these growths have appeared in the literature, but no clear-cut evidence as to their mode and site of origin has been forthcoming. Within recent years the striking susceptibility of strain A mice to the development of lung tumors, especially after the administration of carcinogenic hydrocarbons, has been repeatedly noted. Moreover, no essential histologic differences have been observed between the spontaneous and induced tumors. Consequently a study was outlined in which serial sections of the lungs of strain A mice injected with carcinogenic hydrocarbons could be examined during the period of tumor development.

Two hundred strain A mice, 2½ to 3 months of age and equally divided as to sex, were used. One hundred mice received 0 8 mg. of 1:2:5:6-dibenzanthracene in 0.8 cc. of lard subcutaneously; 60 mice received 1.6 mg. of methylcholanthrene in 0.4 cc. of lard subcutaneously; 40 mice received 0.8 cc. of lard and served as controls. Animals which developed tumors at the site of injection, or which died as a result of hemorrhage, infection, or any other cause, were not included in this study. The final effective number consisted of 130 mice injected with the carcinogens and 30 control animals. The animals were sacrificed daily (except on Sundays and holidays) over a period of 3 months, 98 being killed between the twenty-sixth and sixtieth days. In all animals the lungs were fixed *per tracheam* in Zenker's fluid and the entire right lower lobe sectioned in series. The remaining lung tissue was embedded in paraffin and kept in reserve. Sections were routinely stained with eosin-methylene blue and Masson's trichrome technique. Foot's method for reticulum, phosphotungstic acid hematoxylin, and Giemsa's methods were also used on occasion.

The earliest recognizable pulmonary tumor was found 32 days after injection of methylcholanthrene and 36 days after the injection of 1:2:5:6-dibenzanthracene. No difference in the character of the

[1] Abstract of an article entitled "Histogenesis of Induced Pulmonary Tumors in Strain A Mice" (publication pending).

tumors produced by the two hydrocarbons was observed. From the fortieth day onward tumors were found with increasing frequency. All tumors examined appeared to be adenomatous growths and were histologically similar to those previously described as induced tumors. They also resembled closely the spontaneous lung tumors of mice. Few were connected with the bronchial epithelium at any point. Practically all the early growths could be seen to arise from the alveolar wall when followed in complete serial sections. Immediately preceding the development of tumors and accompanying the early stages of their formation was a notable proliferation of large mononuclear cells from the alveolar walls. Frequently they would form columns of varying length partly or completely lining the alveolar space, or they might coalesce to form small groups. These groups might project into the alveolar lumen or occur within or on the septal wall. The adenomatous nodules developed through a combination of these processes but when developed they were remarkably uniform in appearance. The recognizable tumor was composed of more or less closely packed columns of columnar or cuboidal cells with relatively large nuclei. The sparse stroma was furnished by the alveolar septal walls. No recognizable inflammatory lesions were encountered either prior to or concomitant with the development of the tumors.

CONCLUSIONS

Pulmonary tumors induced in strain A mice arise from alveolar cells and begin to appear 5 weeks after subcutaneous injection of carcinogenic hydrocarbons.

The development of these tumors in the lung is not associated with any demonstrable inflammatory reaction.

COURT DECISION ON PUBLIC HEALTH

Recovery allowed for occupational disease contracted by employee.—(Indiana Supreme Court; *Illinois Steel Co.* v. *Fuller*, 23 N.E.2d 259; decided November 6, 1939.) An action was brought to recover damages because of an occupational disease (benzol poisoning) which was alleged to have been contracted by an employee through the negligence of the employer. Liability was asserted under the State employers' liability law and negligence was based upon charges of violations of statutory provisions requiring an employer to supply serviceable gas masks and to provide sufficient means of ventilation.

The title and body of the employers' liability law purported to make it applicable to liability for injuries rather than to accidental injuries, and the supreme court, in deciding that an action on account

of occupational disease occurring prior to the enactment of the 1937 Indiana Workmen's Occupational Diseases Act could be maintained under the liability law, stated as follows:

* * * The word "injury" is a generic term of broad designation. As applied to the human body, it may result from other causes than trauma. Disability from an occupational disease may be no less an injury than one resulting from accident. While the applicability of the Employers' Liability Law to occupational diseases does not seem to have been specifically considered by this tribunal, in at least three cases judgments obtained thereunder have been sustained by our appellate court. [Cases cited.] In the last mentioned case that court said: "It is the contention of appellee that her decedent died as the result of an occupational disease * * * as a proximate result of appellant's negligence and failure to comply with the Employers' Liability Act, *supra*. If appellee's contention is correct, then her remedy for redress would be under the common law as supplemented by the Employers' Liability Act, and not by resort to the Workmen's Compensation Act. * * *"

The statute on gas masks required employers of workmen employed in any enclosed room or structure in which there may be dangerous, noxious, or deleterious gases, "to supply such workmen with serviceable gas masks, to be worn while such work is being performed". The ventilation statute provided that "there shall be sufficient means of ventilation provided in each workroom of every manufacturing or mercantile establishment". The employer urged that the requirements that it supply "serviceable gas masks" and provide "sufficient means of ventilation" were so vague, indefinite, and uncertain as to be unenforceable and that to enforce these provisions would result in a denial of due process of law and would amount to an unconstitutional delegation of legislative power to courts and juries. The supreme court said that it found no basis for the claim that these statutes were unconstitutional and, respecting this point, used in part the following language:

* * * When it is asserted that a statute is so indefinite that its enforcement would result in a denial of due process or amount to an unauthorized delegation of legislative functions, the court must consider the enactment in the light of the problems with which the legislature was undertaking to deal. Meticulous exactitude and absolute precision is rarely attained, nor is it required, in the drafting of statutes of this character. It may be observed that in the adoption of the gas mask and ventilation statutes here under consideration, the general assembly was undertaking to impose safety measures with respect to factories, establishments, and industries of many kinds. For example, masks that would be serviceable and a means of ventilation that would be sufficient in a gaseous mine might be wholly unsuited or inadequate in a factory where poisonous chemicals or explosives were manufactured, or vice versa. It would, no doubt, be impossible to prescribe by law definite specifications as to what particular type of gas mask or what peculiar means of ventilation would be serviceable and sufficient under all the varying circumstances to which these acts are applicable; and if there is an inflexible and comprehensive rule for determining when statutes of the character of those now under consideration meet the requirement of due process, our attention has not been called to it. Perhaps it is enough to say that such statutes are valid when

they clearly designate the dangers and hazards against which the legislature sought to provide protection and reasonably indicate the means or methods by which that is to be accomplished.

The appellate court, after considering certain other contentions of the employer regarding the evidence in the case, affirmed the judgment of the trial court in favor of the appellee (employee).

DEATHS DURING WEEK ENDED JANUARY 6, 1940

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 6, 1940	Corresponding week, 1939
Data from 88 large cities of the United States:		
Total deaths	9,250	9,142
Average for 3 prior years	10,027	----------
Deaths under 1 year of age	566	567
Average for 3 prior years	607	----------
Data from industrial insurance companies:		
Policies in force	66,416,327	68,314,978
Number of death claims	10,204	9,375
Death claims per 1,000 policies in force, annual rate	8.0	7.2

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

REPORTS FROM STATES FOR WEEK ENDED JANUARY 20, 1940

Summary

Although the number of influenza cases reported continued to increase, the rate of increase dropped sharply during the week ended January 20, and was only less than ½ of 1 percent, as compared with 30 and 36 percent for the 2 preceding weeks, respectively. For the current week 12,568 cases were reported, as compared with 12,516 for the week ended January 13, with 9,630 for the week of January 6, and with 3,144 for the corresponding median week of the 5-year period 1935–39.

The highest incidence is still shown in the South Atlantic and South Central groups of States, which reported 11,095 cases, or approximately 88 percent of the total. The New England States appear to remain comparatively free from the disease, and the other areas show no significant epidemic tendency.

Mortality figures for the large cities are not available for the current week, but 9,716 deaths were reported for the week ended January 13, as compared with 9,250 for the preceding week, an increase of 466, and with 9,824 for the 3-year average for the corresponding weeks of 1937, 1938, and 1939.

No unusual incidence is shown for any of the other eight important communicable diseases which are included in the weekly telegraphic reports.

The following reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables, a zero (0) indicates a positive report and has the same significance as any other figure, while leaders (..) represent no report, with the implication that cases or deaths may have occurred but were not reported to the State health officer.

Cases of certain diseases reported by telegraph by State health officers for the week ended January 20, 1940, and comparison with corresponding week of 1939 and 5-year median

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39	Week ended		Median, 1935–39
	Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939	
NEW ENG.												
Maine	0	6	4	30	2	4	105	5	102	0	0	0
New Hampshire	0	0	1	----	----	----	20	0	22	0	0	0
Vermont	0	0	0	----	----	----	13	3	7	0	0	0
Massachusetts	15	5	6	----	----	----	210	427	370	0	1	1
Rhode Island	0	0	1	----	----	----	125	1	25	0	0	0
Connecticut	6	3	5	4	13	18	121	273	273	0	0	1
MID. ATL.												
New York	28	39	40	[1] 19	[1] 37	[1] 29	175	1,022	826	1	6	6
New Jersey	9	15	16	25	12	15	23	29	95	0	0	2
Pennsylvania	30	36	54	----	----	----	61	131	209	2	9	6
E. NO. CEN.												
Ohio	21	37	37	9	----	57	23	20	85	2	0	2
Indiana	19	22	29	58	22	44	4	7	34	1	2	2
Illinois	25	43	43	34	60	60	47	45	45	2	1	8
Michigan [2]	12	12	16	6	1	6	465	511	234	0	1	2
Wisconsin	0	1	1	54	52	52	282	378	378	1	0	0
W. NO. CEN.												
Minnesota	0	6	6	2	3	3	206	871	122	0	0	1
Iowa	0	12	9	3	10	10	36	123	40	0	0	0
Missouri	15	14	28	70	24	212	11	13	33	1	1	1
North Dakota	0	4	4	131	12	17	4	261	8	0	0	0
South Dakota	0	6	1	1	----	----	0	361	28	0	0	0
Nebraska	1	3	3	----	----	1	20	55	27	0	1	0
Kansas	7	14	10	125	9	12	174	5	15	1	0	0
SO. ATL.												
Delaware	0	0	1	----	----	1	2	2	8	0	0	0
Maryland [3]	13	9	9	59	12	27	3	665	143	0	2	3
Dist. of Col.	0	3	9	9	6	6	7	5	6	0	0	1
Virginia [3] [4]	9	27	27	1,128	282	----	14	30	188	0	2	2
West Virginia	9	14	17	40	34	56	2	26	26	3	3	4
North Carolina [3]	27	39	29	403	28	35	86	524	524	2	1	1
South Carolina [3]	2	13	5	2,825	865	861	2	8	9	1	3	2
Georgia [3]	13	12	12	1,626	143	284	18	52	0	1	0	3
Florida	8	9	9	59	2	5	7	40	11	0	1	2
E. SO. CEN.												
Kentucky	9	8	20	29	37	54	27	73	73	1	4	7
Tennessee [3]	12	14	20	185	87	200	47	71	32	3	1	3
Alabama [3]	10	13	14	1,085	188	313	42	146	146	1	1	1
Mississippi [3]	13	11	11	----	----	----	----	----	----	1	0	1
W. SO. CEN.												
Arkansas	10	16	15	1,799	145	145	0	17	17	0	0	1
Louisiana [3]	6	16	27	21	12	26	5	85	15	1	0	2
Oklahoma	7	15	15	422	119	191	1	88	7	0	0	3
Texas [3]	42	44	67	1,405	531	531	261	195	195	1	0	3
MOUNTAIN												
Montana	1	0	0	----	33	33	12	590	7	0	0	0
Idaho	0	0	0	----	1	2	4	60	59	0	1	0
Wyoming	1	0	0	3	----	----	9	21	2	0	0	0
Colorado	9	8	7	73	31	----	39	64	64	0	1	0
New Mexico	4	1	1	27	21	21	16	49	32	0	9	1
Arizona	5	9	7	230	132	132	9	1	6	0	0	0
Utah [3]	0	0	0	75	2	----	164	29	16	0	0	0
PACIFIC												
Washington	0	0	1	9	1	----	521	117	110	0	0	1
Oregon	6	2	2	190	46	56	130	22	22	0	0	0
California	11	36	42	295	82	131	246	1,763	148	3	1	1
Total	415	597	669	12,568	3,097	3,144	3,799	9,284	9,284	29	52	74
3 weeks	1,446	1,888	2,070	34,714	9,370	9,370	11,250	25,811	25,811	87	155	273

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended January 20, 1940, and comparison with corresponding week of 1939 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median, 1935–39	Week ended—		Median, 1935–39	Week ended—		Median, 1935–39	Week ended—		Median, 1935–39
	Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939		Jan. 20, 1940	Jan. 21, 1939	
NEW ENG.												
Maine	0	0	0	3	11	17	0	0	0	0	0	0
New Hampshire	0	0	0	0	16	15	0	0	0	0	0	0
Vermont	0	0	0	3	6	19	0	0	0	0	2	0
Massachusetts	1	0	0	136	195	235	0	0	0	4	1	1
Rhode Island	0	0	0	8	7	25	0	0	0	0	0	0
Connecticut	0	0	0	78	75	68	0	0	0	1	0	1
MID. ATL.												
New York	1	0	1	461	543	692	0	0	0	9	7	6
New Jersey	0	1	0	278	146	146	0	0	0	1	6	2
Pennsylvania	[4]	0	1	422	500	509	0	0	0	6	7	7
E. NO. CEN.												
Ohio	1	3	2	251	366	366	0	23	3	2	6	5
Indiana	1	0	0	142	228	228	3	104	4	0	2	1
Illinois	0	0	0	449	558	640	1	21	21	6	7	7
Michigan [2]	0	0	0	325	725	574	0	0	0	2	2	2
Wisconsin	0	0	0	137	303	339	12	12	14	0	0	0
W. NO. CEN.												
Minnesota	2	0	0	156	139	141	11	28	28	0	0	0
Iowa	1	0	0	87	140	165	3	42	15	1	1	1
Missouri	0	0	0	75	174	206	0	18	18	3	1	3
North Dakota	0	0	0	10	9	30	0	2	5	2	0	0
South Dakota	0	0	0	14	18	26	2	10	10	0	0	0
Nebraska	0	0	0	27	28	49	0	0	13	0	1	0
Kansas	0	0	0	89	151	198	0	33	26	0	1	2
SO. ATL.												
Delaware	0	0	0	21	7	14	0	0	0	0	0	0
Maryland [3]	0	0	0	40	54	72	0	0	0	1	3	3
Dist. of Col	1	0	0	21	13	18	0	0	0	0	1	2
Virginia [3 4]	0	2	0	29	22	51	1	0	0	3	6	7
West Virginia	0	0	0	60	60	60	0	1	0	3	9	2
North Carolina [3]	1	0	0	61	58	45	0	0	1	1	2	2
South Carolina [3]	1	2	1	14	12	7	0	0	0	3	2	2
Georgia [3]	0	2	1	40	15	19	0	0	0	1	2	2
Florida	0	0	0	2	12	9	1	0	0	0	0	0
E. SO. CEN.												
Kentucky	1	0	0	76	86	81	0	2	0	0	2	2
Tennessee [3]	0	1	1	97	47	38	0	1	0	2	1	3
Alabama [3]	0	1	1	20	18	18	0	0	1	3	1	2
Mississippi [3]	1	1	0	4	16	10	0	0	1	1	2	1
W. SO. CEN.												
Arkansas	0	1	0	17	9	11	16	5	2	3	3	3
Louisiana [3]	1	0	0	12	21	22	0	0	2	7	6	5
Oklahoma	0	0	0	25	51	51	1	8	1	2	2	2
Texas [3]	4	0	0	93	97	107	1	13	6	15	10	11
MOUNTAIN												
Montana	0	0	0	53	36	36	0	3	12	0	2	0
Idaho	3	0	0	11	38	38	0	9	8	0	2	2
Wyoming	0	0	0	10	6	13	0	1	6	0	0	0
Colorado	2	0	0	46	61	63	15	8	8	2	0	0
New Mexico	0	0	0	14	30	27	0	7	0	0	2	3
Arizona	0	0	0	17	6	24	0	36	0	0	0	0
Utah [3]	0	0	0	23	28	31	0	0	0	0	0	0
PACIFIC												
Washington	0	1	1	78	67	67	0	1	27	0	2	1
Oregon	0	2	1	35	63	50	1	5	5	2	0	0
California	7	1	1	154	221	264	12	20	10	5	5	5
Total	33	18	23	4,229	5,492	6,218	80	413	278	91	109	116
3 weeks	118	50	66	11,960	15,238	17,428	264	1,160	869	250	329	369

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended January 20, 1940, and comparison with corresponding week of 1939 and 5-year median—Continued

Division and State	Whooping cough, week ended—	
	Jan. 20, 1940	Jan. 21, 1939
NEW ENG.		
Maine	60	21
New Hampshire	3	6
Vermont	40	50
Massachusetts	187	217
Rhode Island	12	0
Connecticut	72	93
MID. ATL.		
New York	434	527
New Jersey	123	438
Pennsylvania	373	636
E. NO. CEN.		
Ohio	128	197
Indiana	36	28
Illinois	84	449
Michigan [2]	146	383
Wisconsin	150	320
W. NO. CEN.		
Minnesota	63	71
Iowa	2	21
Missouri	15	15
North Dakota	17	29
South Dakota	0	3
Nebraska	1	1
Kansas	11	17
SO. ATL.		
Delaware	3	8
Maryland [2]	86	58
Dist. of Col.	8	32
Virginia [3 4]	43	44
West Virginia	18	30
North Carolina [3]	45	323
South Carolina [3]	9	79
Georgia [3]	20	20
Florida	14	15
E. SO. CEN.		
Kentucky	77	4
Tennessee [3]	42	35
Alabama [3]	19	29
Mississippi [2]	----------	----------
W. SO. CEN.		
Arkansas	3	14
Louisiana [3]	2	4
Oklahoma	3	4
Texas [3]	111	87
MOUNTAIN		
Montana	5	24
Idaho	0	5
Wyoming	24	10
Colorado	8	47
New Mexico	32	41
Arizona	15	3
Utah [3]	87	7
PACIFIC		
Washington	30	28
Oregon	32	21
California	163	115
Total	2,856	4,609
3 weeks	7,727	12,963

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Jan. 20, 1940, 20 cases as follows: Virginia, 1; North Carolina, 1; South Carolina, 3; Georgia, 14; Tennessee, 2; Alabama, 6; Louisiana, 2; Texas, 5.
[4] Rocky Mountain spotted fever, week ended Jan. 20, 1940, 1 case, in Virginia.
[5] Diagnosis was changed in 1 case reported as poliomyelitis in Pennsylvania for the week ended Dec. 30, 1939, Public Health Reports of Jan. 5, 1940, p. 32.

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 6, 1940

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	190	889	126	1,886	974	1,617	32	362	21	1,089	------
Current week [1]	97	670	61	753	594	924	2	341	12	562	------
Maine:											
Portland	0	------	0	15	2	0	0	0	0	3	22
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	0	4
Manchester	0	------	0	0	1	0	0	0	0	0	16
Nashua	0	------	0	4	0	0	0	0	0	0	4
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	1	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	2	17	9	19	0	11	0	35	224
Fall River	1	------	0	0	1	0	0	1	0	9	25
Springfield	0	------	0	0	0	3	0	0	0	4	42
Worcester	0	------	0	0	10	2	0	1	0	1	49
Rhode Island:											
Pawtucket	0	------	0	1	0	0	0	0	0	5	20
Providence	0	------	0	148	7	3	0	2	0	12	79
Connecticut:											
Bridgeport	0	1	1	0	1	3	0	1	0	0	36
Hartford	0	------	0	0	2	2	0	1	0	8	49
New Haven	0	------	0	0	1	2	0	0	0	2	38
New York:											
Buffalo	0	------	0	2	13	9	0	8	0	9	154
New York	14	16	2	11	87	123	0	73	2	53	1,599
Rochester	0	------	0	0	7	6	0	1	0	3	76
Syracuse	0	------	0	0	3	4	0	1	0	16	46
New Jersey:											
Camden	2	------	0	0	7	10	0	1	0	0	40
Newark	0	3	0	1	11	14	0	4	0	20	106
Trenton	0	------	0	0	3	3	0	1	0	0	41
Pennsylvania:											
Philadelphia	3	15	5	2	29	69	0	31	2	32	562
Pittsburgh	0	6	5	0	17	31	0	3	0	4	237
Reading	0	------	0	1	0	0	0	0	0	1	14
Scranton	0	------	------	0	------	6	0	------	0	0	------
Ohio:											
Cincinnati	4	------	2	0	12	22	0	9	0	10	174
Cleveland	0	32	1	4	11	37	0	11	0	35	194
Columbus	4	3	3	1	6	4	0	0	1	1	122
Toledo	0	1	0	6	3	25	0	4	0	5	70
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	1	16
Fort Wayne	0	0	0	0	3	4	0	1	0	3	27
Indianapolis	0	------	1	1	9	13	0	7	0	8	108
Muncie	0	------	0	0	2	0	0	0	0	0	12
South Bend	0	------	0	0	0	2	0	0	0	0	17
Terre Haute	0	------	0	1	3	1	0	0	0	0	17
Illinois:											
Alton	0	------	0	0	0	3	0	0	0	0	14
Chicago	10	16	0	9	23	178	0	36	0	54	732
Elgin	1	------	0	0	0	1	0	0	0	0	9
Moline	0	------	0	1	0	0	0	0	1	1	9
Springfield	0	------	1	0	2	2	0	0	0	0	22
Michigan:											
Detroit	5	3	1	4	20	65	0	13	0	19	262
Flint	0	------	0	1	6	11	0	2	0	8	34
Grand Rapids	0	------	1	1	3	22	0	0	0	1	38
Wisconsin:											
Kenosha	0	------	0	0	1	1	0	0	0	0	14
Madison	0	1	0	0	1	0	0	0		4	22
Milwaukee	0	------	0	3	11	40	0	3	0	11	111
Racine	0	------	0	0	0	1	0	0	0	0	13
Superior	0	------	0	0	2	2	0	0	0	0	8

[1] Figures for Barre estimated; report not received.

City reports for week ended Jan. 6, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	91	1	2	0	1	0	0	22
Minneapolis	0	------	0	0	5	25	0	1	0	4	101
St. Paul	1	------	0	0	7	13	0	0	0	22	75
Iowa:											
Cedar Rapids	0	------	--------	9	-------	1	0	-------	0	0	--------
Davenport	0	------	--------	0	-------	1	0	-------	0	0	--------
Des Moines	0	------	0	15	0	13	0	0	0	0	33
Sioux City	0	------	--------	0	-------	7	0	-------	0	0	--------
Waterloo	2	------	--------	0	-------	3	0	-------	0	0	--------
Missouri:											
Kansas City	0	------	1	1	14	10	0	4	0	0	126
St. Joseph	0	------	0	0	2	1	0	0	0	0	12
St. Louis	2	------	0	0	15	8	0	5	0	3	209
North Dakota:											
Fargo	0	------	0	1	0	1	0	0	0	0	9
Grand Forks	0	------	--------	0	-------	0	0	-------	0	3	--------
Minot	0	------	0	0	0	1	0	0	0	0	4
South Dakota:											
Aberdeen	0	------	--------	0	-------	1	0	-------	0	0	--------
Sioux Falls	0	------	--------	0	0	1	0	0	0	0	9
Nebraska:											
Lincoln	0	------	--------	0	-------	1	0	-------	0	0	--------
Omaha	2	------	0	0	11	2	0	0	0	4	75
Kansas:											
Lawrence	0	3	0	0	1	0	0	0	0	0	8
Topeka	0	1	1	0	4	8	0	0	0	1	29
Wichita	4	6	1	90	2	4	0	0	0	0	25
Delaware:											
Wilmington	0	------	0	0	5	3	0	1	0	3	31
Maryland:											
Baltimore	3	13	4	0	15	8	0	14	0	39	251
Cumberland	0	------	0	0	0	0	0	0	0	0	11
Frederick	2	------	0	0	0	1	0	0	0	0	2
Dist. of Col.:											
Washington	3	1	1	1	13	11	0	13	1	7	191
Virginia:											
Lynchburg	0	------	0	0	2	1	0	0	0	11	10
Norfolk	0	8	0	0	2	5	0	0	0	0	28
Richmond	0	------	0	6	8	8	0	1	0	0	65
Roanoke	1	------	0	0	0	2	0	0	0	0	12
West Virginia:											
Charleston	1	3	0	0	4	1	0	0	1	0	32
Huntington	2	------	--------	0	-------	1	0	-------	0	0	--------
Wheeling	0	------	0	0	2	3	0	2	0	2	20
North Carolina:											
Gastonia	0	1	--------	0	-------	0	0	-------	0	0	--------
Raleigh	0	------	0	0	5	0	0	0	0	0	21
Wilmington	1	------	0	0	1	0	0	0	0	0	15
Winston-Salem	0	------	0	0	2	5	0	2	0	0	13
South Carolina:											
Charleston	1	281	0	0	3	0	0	0	0	0	20
Florence	4	47	1	0	3	1	0	0	0	0	11
Greenville	0	------	0	0	8	0	0	1	0	0	52
Georgia:											
Atlanta	1	134	2	12	5	7	0	9	0	1	90
Brunswick	0	------	0	0	1	1	0	0	0	1	3
Savannah	0	86	5	0	6	5	0	1	0	0	49
Florida:											
Miami	0	3	1	0	2	2	0	1	1	0	40
Tampa	1	------	0	0	1	0	0	0	0	1	24
Kentucky:											
Ashland	0	1	0	0	1	0	0	0	0	3	6
Covington	0	------	0	2	1	1	0	0	0	0	19
Lexington	0	------	0	0	2	1	0	1	0	1	18
Louisville	0	------	0	0	12	0	0	3	0	0	88
Tennessee:											
Knoxville	0	------	0	0	5	7	0	1	0	0	28
Memphis	1	------	2	1	9	5	0	1	0	6	100
Nashville	1	------	0	10	2	0	0	3	0	1	43
Alabama:											
Birmingham	3	5	2	1	5	4	0	4	0	1	95
Mobile	0	------	0	0	5	0	2	0	0	0	31
Montgomery	2	26	--------	9	-------	0	0	-------	0	0	--------

City reports for week ended Jan. 6, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	2	-------	0	-------	0	0	-------	0	0	-------
Little Rock	2	2	1	0	4	3	0	0	0	0	25
Louisiana:											
Lake Charles	0	-------	0	0	4	1	0	0	0	0	8
New Orleans	7	3	3	1	20	8	0	9	0	0	225
Shreveport	0	-------	0	0	7	1	0	0	0	0	48
Oklahoma:											
Oklahoma City	0	-------	0	0	3	2	0	2	1	2	52
Tulsa	0	-------	-------	0	-------	1	0	-------	0	1	-------
Texas:											
Dallas	5	-------	2	1	4	4	0	4	0	0	71
Fort Worth	0	-------	0	0	1	2	0	1	0	5	44
Galveston	0	-------	0	0	3	1	0	1	0	0	21
Houston	0	-------	0	0	8	4	0	5	1	1	96
San Antonio	1	6	1	60	7	1	0	8	0	0	75
Montana:											
Billings	0	-------	0	0	2	2	0	0	0	0	9
Great Falls	0	-------	0	2	1	0	0	1	0	0	10
Helena	0	-------	0	1	0	0	0	0	0	0	5
Missoula	0	-------	0	0	2	0	0	0	0	2	7
Idaho:											
Boise	0	-------	0	0	0	0	0	0	0	0	7
Colorado:											
Colorado Springs	0	-------	0	0	3	0	0	0	0	0	17
Denver	2	-------	3	1	12	4	0	6	0	14	115
Pueblo	0	-------	0	0	0	0	0	0	1	0	9
New Mexico:											
Albuquerque	0	-------	0	0	2	0	0	0	0	1	8
Utah:											
Salt Lake City	0	-------	2	32	2	2	0	1	0	30	55
Washington:											
Seattle	0	-------	0	28	2	7	0	2	0	13	62
Spokane	0	-------	0	0	1	6	0	0	0	0	26
Tacoma	0	-------	0	184	3	3	0	0	0	0	27
Oregon:											
Portland	1	8	0	20	1	7	0	2	0	6	85
Salem	0	2	-------	4	-------	1	0	-------	0	0	-------
California:											
Los Angeles	7	30	4	3	14	21	0	8	0	18	330
Sacramento	1	-------	0	0	3	1	0	1	0	2	28
San Francisco	1	3	1	3	13	5	0	6	0	10	168

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				**North Carolina:**			
New York	1	0	0	Wilmington	1	1	0
Rochester	0	0	1	**Florida:**			
Illinois:				Miami	1	0	0
Alton	1	1	0	**Louisiana:**			
Chicago	1	0	0	Shreveport	0	2	0
Michigan:				**Texas:**			
Detroit	0	0	1	Galveston	0	0	1
Minnesota:				**Utah:**			
St. Paul	0	0	1	Salt Lake City	0	0	1
Iowa:				**California:**			
Des Moines	0	0	1	Sacramento	0	0	1
Missouri:				San Francisco	1	0	0
St. Joseph	1	0	0				
District of Columbia:							
Washington	0	0	2				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Denver, 1.
Pellagra.—Cases: Boston, 1; Baltimore, 1; Florence, 1; Atlanta, 1; Savannah, 1; Birmingham, 1; Montgomery, 4.
Typhus fever.—Cases: New York, 1; Baltimore, 1; New Orleans, 1.

FOREIGN REPORTS

BRAZIL

Rio de Janeiro—Poliomyelitis.—According to a report dated January 5, 1940, poliomyelitis has been reported in Rio de Janeiro, Brazil, as follows:

Week ended—	Cases	Deaths	Week ended—	Cases	Deaths
November 4, 1939	22	2	December 2, 1939	3	2
November 11, 1939	12	3	December 9, 1939	3	2
November 18, 1939	17	--	December 16, 1939	5	--
November 25, 1939	11	1	December 23, 1939	2	--

CANADA

Provinces—Communicable diseases—Week ended December 16, 1939.—During the week ended December 16, 1939, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		34	7	234	529	62	29	34	87	1,016
Diphtheria				11	3	11	7			32
Influenza		44			19				6	69
Lethargic encephalitis				2						2
Measles		5	1	57	311	20	3	6	10	413
Mumps				39	163	13	10		4	229
Pneumonia		14			20		1		5	40
Poliomyelitis				1						1
Scarlet fever	28	11	33	102	136	24	11	39	18	402
Tuberculosis	2	3	22	71	42					140
Typhoid and paratyphoid fever		2		14	3	1	1			21
Whooping cough		17	1	173	127	31	52	24	9	434

CUBA

Provinces—Notifiable diseases—4 weeks ended November 11, 1939.—During the 4 weeks ended November 11, 1939, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	2	3	1	5		4	15
Chickenpox						1	1
Diphtheria		20		2	1	1	24
Hookworm disease		101		1			102
Leprosy		1		3	1	1	6
Malaria	41	31		13	2	53	140
Measles						7	7
Poliomyelitis	4	6		1			11
Tetanus, infantile			1				1
Trachoma				1			1
Tuberculosis	22	42	31	37	14	22	168
Typhoid fever	18	48	8	38	10	36	158

IRISH FREE STATE

Vital statistics—Quarter ended September 30, 1939.—The following vital statistics for the Irish Free State for the quarter ended September 30, 1939, are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	4,505	6.1	Deaths from—Continued.		
Births	14,204	19.4	Influenza	62	0.1
Total deaths	8,600	11.7	Measles	11	----------
Deaths under 1 year of age	744	[1] 52	Puerperal sepsis	9	[1] .6
Deaths from:			Scarlet fever	8	----------
Cancer	893	1.2	Tuberculosis (all forms)	759	1.0
Diarrhea and enteritis (under 2 years)	161	----------	Typhoid fever	14	----------
Diphtheria	38	----------	Typhus fever	3	----------
			Whooping cough	27	----------

[1] Per 1,000 live births.

SCOTLAND

Vital statistics—Third quarter 1939.—Following are vital statistics for Scotland for the third quarter of 1939:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	15,617	12.4	Deaths from—Continued.		
Births	21,546	17.1	Lethargic encephalitis	22	----------
Deaths	13,587	10.8	Malaria	2	----------
Deaths under 1 year of age	1,220	[1] 57	Measles	5	----------
Deaths from:			Nephritis, acute and chronic	348	----------
Appendicitis	91	----------	Pneumonia (all forms)	425	.34
Cancer	1,913	1.51	Poliomyelitis	1	----------
Cerebral hemorrhage	1,518	----------	Puerperal sepsis	15	----------
Cerebrospinal fever	7	----------	Scarlet fever	9	----------
Cirrhosis of the liver	33	----------	Senility	489	----------
Diabetes mellitus	172	----------	Suicide	125	----------
Diarrhea and enteritis (under 2 years)	249	----------	Syphilis	15	----------
Diphtheria	77	----------	Tuberculosis (all forms)	782	.62
Dysentery	8	----------	Typhoid fever	9	----------
Heart disease	3,269	----------	Whooping cough	39	----------
Influenza	24	----------			

[1] Per 1,000 live births.

VIRGIN ISLANDS

Notifiable diseases—October–December 1939.—During the months of October, November, and December 1939, cases of certain notifiable diseases were reported in the Virgin Islands as follows:

Disease	October	November	December	Disease	October	November	December
Chickenpox	----------	1	----------	Pneumonia	2	----------	----------
Filariasis	4	2	6	Schistosomiasis	2	1	----------
Gonorrhea	11	8	8	Sprue	1	----------	----------
Hookworm disease	4	6	6	Syphilis	61	21	30
Malaria	----------	1	----------	Tuberculosis	1	----------	2

YUGOSLAVIA

Communicable diseases—4 weeks ended December 3, 1939.—During the 4 weeks ended December 3, 1939, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	32	3	Paratyphoid fever	21	
Cerebrospinal meningitis	31	12	Poliomyelitis	5	
Diphtheria and croup	1,123	110	Scarlet fever	516	2
Dysentery	36	10	Sepsis	5	2
Erysipelas	231	10	Tetanus	28	15
Favus	11		Typhoid fever	491	48
Leprosy	2		Typhus fever	13	
Lethargic encephalitis	16		Weil's disease	1	

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From the medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, 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]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		Jan. 1–Oct. 31, 1939	November 1939	December 1939—Week ended—				
				2	9	16	23	30
ASIA								
Afghanistan	D	578						
Ceylon: **Batticaloa**	C	7						
China	C	2,637	68					
Canton	C	9						
Hong Kong	C	672	12				3	1
Shanghai	C	421	6					
Tientsin	C	1	33					
India	C	106,729	6,001					
Bassein	C	14						
Calcutta	C	3,734	69	18	25	33	28	20
Madras	C	6						
Negapatam	C	2						
Rangoon	C	17						1
India (French)	C	89	1					
India (Portuguese)	C	17						
Indochina (French)	C	1						
Iran	C	435						
Iraq: **Basra**	C	[1] 1						
Japan: **Osaka**	C	[2] 1						
Thailand	C	25						
Bangkok	C	7						

[1] Suspected.
[2] Imported.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		Jan. 1–Oct. 31, 1939	November 1939	December 1939—Week ended— 2	9	16	23	30
AFRICA								
Algeria: Algiers	C	1						
Belgian Congo	C	52	2	1	1	1		1
British East Africa:								
Kenya	C	4						
Nyasaland	C	2						
Uganda	C	282	11					
Egypt: Asyut Province	C	102						
Madagascar	C	429						
Tunisia: Tunis	C	1						
Plague-infected rats		5						
Union of South Africa	C	67	6	4				
ASIA								
China:								
Fukien Province	D	[1] 753						
Manchuria	D	332						
Dutch East Indies:								
Java:								
Batavia	C	[2] 1						
Batavia Residency	D	[2] 84						
Java and Madura	C	1,441						
India	C	30,405						
Bassein	C	12						
Calcutta	C	[2] 1			[2] 1			
Cochin	C		1			1	1	
Plague-infected rats						2	1	
Rangoon	C	7	[2] 1					
Indochina (French)	C	2						
Thailand:								
Bichitr Province	C	4						
Bisnulok Province	C	35						
Kamphaeng Bajr Province	C							6
Lampang Province	C	1						
Prae Province	C	6						
Svargalok Province	C	30						
Tak Province	C	10						
SOUTH AMERICA								
Argentina:								
Jujuy Province	C	1						
Mendoza Province	C	1						
Salta Province	C	1						
San Luis Province	C	1						
Tucuman Province	C	1						
Bolivia	C	[2] 2						
Brazil:								
Alagoas State	C	43						
Bahia State	C	1						
Parahiba State	C	1						
Pernambuco State	C	32						
Sao Paulo State	C	1						
Ecuador:								
Chimborazo Province	C	24						
Riobamba	C	[2] 16						
Guayaquil	C	3						
Plague-infected rats		45						
Loja	C	4						
Puebla Viejo	C	3						
Peru:								
Cajamarca Department	C	3						
Lambayeque Department	C	5						
Libertad Department	C	25						
Lima Department	C	17						
Piura Department	C	26						
Venezuela [4]	C				3			
OCEANIA								
Hawaii Territory:								
Paauhau	C							[2] 1
Plague-infected rats		42	5		2	3	2	

[1] Includes 94 deaths from pneumonic plague.
[2] Imported.
[3] Pneumonic.
[4] For the period December 7, 1939, to January 4, 1940, there have been reported 11 cases of plague with 8 deaths in Venezuela.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, death,]

Place		Jan. 1–Oct. 31, 1939	November 1939	December 1939—Week ended— 2	9	16	23	30
AFRICA								
Algeria	C	6						
Angola	C	104						
Belgian Congo	C	1,807	141	70	78			
British East Africa	C	664	1					
Dahomey	C	39	12		15			
Eritrea	C	2						
French Equatorial Africa	C	45						
French Guinea	C	40						
Gold Coast	C	141						
Ivory Coast	C	239	69					
Morocco	C	10						
Mozambique	C	66	13					
Nigeria	C	4,335	40					
Niger Territory	C	134						
Portuguese East Africa	C	10						
Portuguese Guinea	C	122						
Rhodesia:								
Northern	C	9	11					
Southern	C	131	6					
Senegal	C	256						
Sierra Leone	C	50						
Sudan (Anglo-Egyptian)	C	327	89	57	34		45	
Sudan (French)	C	27						
Union of South Africa	C	144						
ASIA								
Arabia	C	1						
Ceylon	C	1						
China	C	1,565	4	3	3	8		
Chosen	C	90						
India	C	99,638	1,236					
India (French)	C	54						
Indochina (French)	C	3,470	42					
Iran	C	46	20					
Iraq	C	20	31		7	10	21	2
Japan	C	228						
Straits Settlements	C	1						
Syria	C	1						
Thailand	C	155						
EUROPE								
France	C	4						
Great Britain	C	1						
Greece	C	69						
Portugal	C	834	13					
Spain	C	192	255					
Canary Islands	C	3						
Turkey	C	367						
NORTH AMERICA								
Canada	C	156			4			
Guatemala	C	9						
Mexico	D	1,264						
Salvador	C	1						
SOUTH AMERICA								
Argentina	C	3						
Bolivia	C	187						
Brazil	C	13						
Colombia	C	2,571	13	3	5			
Ecuador	C	8						
Uruguay	C	5						
Venezuela	C	84	16			1		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		Jan. 1–Oct. 31, 1939	November 1939	December 1939—Week ended—				
				2	9	16	23	30
AFRICA								
Algeria	C	1,806	31	4				
British East Africa	C	2						
Egypt	C	3,991	6	5	15	17	39	
Eritrea	C	9						
Libya	C	37						
Morocco	C	894	3		4			
Nigeria	C	1						
Portuguese East Africa	C	2						
Southern Rhodesia	C		3					
Swaziland	C	1						
Tunisia	C	6,002	19	16	34	33		
Union of South Africa	C	785	21					
ASIA								
China	C	199	23	2	4			
Chosen	C	729						
India	C	17						
Iran	C	66	2					
Iraq	C	46			1			
Palestine	C	98	21	4	2	2	8	4
Straits Settlements	C	12	1					
Sumatra	C	1						
Syria	C	5						
Trans-Jordan	C	18	1					
EUROPE								
Bulgaria	C	50						
Greece	C	13						
Hungary	C	23						
Irish Free State	C	5						
Latvia	C	3						
Lithuania	C	149						
Poland	C	3,140						
Portugal	C	15	1					
Rumania	C	716	95		25	37		26
Spain	C	42	12					
Turkey	C	347	3					
Yugoslavia	C	367	9	7				
NORTH AMERICA								
Cuba	C					[1] 1		
Guatemala	C	161	29					
Mexico	D	331	8					
Panama Canal Zone	C	3						
SOUTH AMERICA								
Bolivia	C	93	19	5	1			
Chile	C	1,119						
Peru	C	197						
Venezuela	C	9	1					
OCEANIA								
Australia	C	20						
Hawaii Territory	C	28	2		2	2		

[1] Exact date not given.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		Jan. 1-Oct. 31, 1939	November 1939	December 1939—Week ended— 2	9	16	23	30
AFRICA								
Cameroon: Bafia	C	1						
French Equatorial Africa:								
Bangui	C	[1]1						
Chad—Fort Lamy	C	1						
Gabon	D	1						
French Guinea	C	2						
Gold Coast	C	2						
Ivory Coast [2]	C	[3]22	1	[1]1				
Nigeria	C	[4]7	3			1		
Niger Territory:								
Dosso	C		3					
Konni Circle	C	3						
Tahua	C	[1]1						
Senegal:								
Bambey	C	1						
Dakar	C		[1]1					
Diourbel	C	6						
Louga	C				[1]1			
Ziguinchor	C	10						
Sudan (French): Bandiagara	C	1						
Togo (French): Anecho	C	1						
SOUTH AMERICA								
Brazil:								
Amazonas State	D	[5]1						
Bahia State	D	[5]1						
Espirito Santo State	D	96				[5]3	[5]3	
Minas Geraes State	D	13						
Para State	D	3						
Rio de Janeiro State	D	3						
Colombia: Antioquia Department—								
Caracoli	D	2						
San Carlos	D	5						

[1] Suspected.
[2] During the week ended Jan. 6, 1940, 1 fatal case of yellow fever was reported in Sankadiokro, Ivory Coast.
[3] Includes 7 suspected cases.
[4] Includes 3 suspected cases.
[5] Jungle type.

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