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Why Cancer "Control"?

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In the last decade there has been a tremendous upsweep of public interest in cancer and an increasingly voiced demand that the disease be brought under control. Why? Almost everyone has friends, acquaintances or relatives who have died of cancer. These personal experiences, plus the effect of the wide publicity of the fact that cancer is the second highest cause of death, have made most people aware that cancer is a common cause of death and that the disease is a serious health problem. The publicity given over a number of years to the total number of individuals dying annually of cancer has further impressed the public with the extent and seriousness of the disease. The cancer movement has gained such momentum that the public in general recognizes and accepts cancer as a major health problem.

With cancer established as a health problem, the question arises as to whether it can be considered a public health problem. When does a health problem become a public health problem? According to Mustard, this transition occurs when a health problem, because of its nature and extent, may be solved only by systematized social action. "When, or if, a given problem of health and disease can no longer be solved by the unassisted effort of the citizen and the uncoordinated resources of the community" (*1*) then it becomes a public health problem.

With the control of the communicable diseases, industrialization, increasing urbanization, and the aging of the population, there has come about a reversal in the relationship of disease problems associated with the diseases of children and young adult life as compared with those diseases associated with maturity (*2*). Formerly, this latter group of diseases was of relatively minor public health significance when compared with the disease problems of younger life. Today, the group of disease problems associated with adult life has become the dominant problem of public health. Of this disease group, due to the widespread public interest in the disease, the extent and nature of this disease and its effect on the Nation's people, individually and collectively, cancer has assumed a position of significance heretofore overshadowed and

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unrecognized in the traditional fields of public health activities.

In part this is due to the extent of the problem—approximately 200,000 deaths a year in this Nation are due to cancer, and cancer accounts for 14 percent of deaths from all causes. Reduced to more tangible terms this means that in an average American community with a population of 10,000 people approximately 100 will die during the course of a year. Of these deaths, 14 will be due to cancer. During the same year, approximately 40 individuals will develop the disease. Of this number, all will die if the cancer goes untreated. This, then, from a community standpoint, is a disease of major concern.

Cancer as a public health problem is important only as the suffering of the individual is important to the community as a whole. Few diseases affect family life in the manner cancer does—it hits the individual usually at the height of his productive period, when he has heavy family responsibilities, and disrupts family activities. The disease creates a tremendous strain on the family finances, plus a strain on the family group because of the prolonged nature of the disease. With cancer one has the problem of a sick person, needing specialized care, creating a heavy financial burden which the individual, in a large number of instances, is not able to bear himself. As a consequence, care of the cancer patient must be regarded as a community problem. As more and more people reach maturity this will become an increasingly heavy burden. The care of cancer patients is obviously a humanitarian venture. With the increasing interest of the public in the problem, it may well be that the public will assume this common responsibility as contrasted to individual responsibility for care of the cancer patient as it has done for certain other diseases (care of the insane and tuberculous) and for certain groups of the population (care of the indigent). Irrespective of the outcome in this regard, it cannot be denied that cancer is of considerable significance when viewed from a socioeconomic standpoint.

The cancer death rate shows a sharp increase at approximately 40 years of age and rises precipitously thereafter. It is essentially a disease associated with maturity and adult life. Most assuredly, humans must die of something and it may be that deaths of unproductive older persons, from a sociologic and biologic standpoint, are a less serious matter than a similar number of deaths of the young. However, now that efforts directed toward the extension of the average human life span have been successful, with a resultant increase in man's productive years, can the product of these endeavors be ignored and all efforts to further man's status in relation to these diseases, specifically cancer, be abandoned? Obviously not—so one sees that even from a philosophic standpoint cancer is significant.

When one considers that cancer often strikes the individual at the height of his productive years, it becomes apparent that the disease can produce a considerable disruption in family life and a tremendous economic loss to the individual. Drolet, in a recent review of all causes of death in New York City, (3) pointed out that cancer is responsible for a greater loss of working time among women than any other disease. To arrive at an estimate of the relative value of life at various ages would be extremely difficult and quite arbitrary. However, it is obvious that by reducing cancer mortality the economic structure of the Nation would be enhanced.

A reduction in mortality of a given disease and its prevention are two of the basic elements of a program to control any disease. The current concept of cancer control embraces both of these premises. The extension of available knowledge of cancer and its diligent application makes possible the control of the disease in these senses. It is unnecessary to await the discovery of the cause of cancer to accomplish a considerable degree of control over the disease.

Today it is known that a number of cancers are initiated by exposure to various environmental or exogenous agents, usually over an extended period of time. All such cancers definitely belong in the class of preventable diseases in the strict sense of the term. Much can be done in preventing those cancers due to various industrial and occupational hazards through the application of corrective measures which reduce or eliminate the exposure. Such an activity is a function of cancer control.

One of the precepts of cancer control is to reduce the mortality due to the disease. How can this be accomplished? As in the control of any other disease, by the application of available knowledge concerning cancer through preventive, medical, and educational services. A cancer educational program for the public should remove from the public mind the misconception that cancer is an incurable disease with associated prolonged suffering and pain, through the publication of factual data about cancer which are applicable to the development of a reasonable mental attitude toward the disease.

The mental attitude of every individual toward cancer is an important factor in the control of the disease and every cancer educational program directed to the public should take cognizance of this fact. It would accomplish little to establish in the public mind a fear of the disease which would lead to an emotional response in which the individual is so afraid of the disease he will not even look for signs of cancer and will not act if he becomes aware of it. In like manner, such a program should not promote the development of an "It can't happen to me" or a fatalistic attitude. Neither of these responses need result from a cancer educational program. It is possible to design a program of such a nature that it would lead to the creation of a common sense attitude toward the problem, in which the informed individual would give more than a casual thought to the possibility of the disease, be on the alert to possible signs of the disease, and, if evidence of the disease is found, be motivated to seek attention at the earliest opportunity. Such an attitude will accomplish much toward the control of cancer and will be a determining factor as to whether we continue to have 200,000 and more deaths annually from this disease.

However, there is one significant difference between cancer "control" and other disease control, a difference which provides justification for emphasis on cancer control above and beyond other disease conditions. This difference is that with cancer the speed with which medical services are efficiently utilized is a measure of the life expectancy of the individual. Prompt action is the absolute prerequisite to survival. Consequently, the reduction of the delay period between onset of the disease, diagnosis of the condition, and initiation of treatment is one of the major responsibilities of cancer control.

The control of cancer further differs from other disease control programs in the fact that there is no simple test to determine its presence, that in the early stages its symptoms are obscure and difficult to assess and that treatment, to be effective, requires diagnosis in the earliest stages of the disease.

Since cancer is often symptomless in its initial and most curable stage, diagnosis usually starts in the family physician's office where, frequently, if the physician is alert to cancer, indications of its existence may be picked up while the patient is being examined for other conditions. The nature and obscurity of the disease, therefore, places the responsibility for its initial diagnosis in the hands of general practitioners throughout the Nation.

The publicity which has been given to the disease tends to leave in the public mind the erroneous impression that physicians see a tremendous amount of cancer in their daily practices. Actually, such is not the case. In reality, the average general practitioner sees approximately two or three new cases of cancer annually. In view of this situation, there arises the problem, which falls within the province of cancer control, of keeping the physician alerted to cancer and abreast of the latest developments in the diagnosis of the disease.

Since the initial symptoms are vague and may be confused with other conditions, the confirmation of the diagnosis often requires special skills and experience beyond the ability of the average general practitioner as well as costly equipment which, in view of the small number of cases he sees, the average practitioner could not reasonably be expected to maintain as part of his general diagnostic armamentarium.

So it is that the very obscurity of the disease places the initial steps for its diagnosis within the province of the general practitioner; sets the further requirement that confirmation of diagnosis must often be made by physicians particularly skilled in the field of cancer diagnosis. This is commonly achieved by operating group centers of concentrated diagnostic activity, such as cancer clinics. Thus, from the nature of the disease and the requirements for its diagnosis it can be seen that the development and strategic distribution of adequate cancer services and facilities, and bringing these within the reach of a larger segment of the population, is one of the major responsibilities of cancer control. The funds required for the expansion of existing diagnostic services and the initiation of such services where they are nonexistent is so great the problem becomes one for community action. In encompassing the provision of such services, cancer control bridges the field between preventive and curative medicine, bringing the two fields closer together.

Since diagnosis proper starts in the physician's office, it is necessary to encourage the public to seek medical attention through a widespread educational program which outlines the nature and significance of initial symptoms of the disease which might indicate cancer and stresses the importance of immediate physical examination. Public education as to the nature and significance of cancer is a prerequisite of cancer control.

Through such a program, both the prospective patient and the physician share in the responsibility for discovering cancer in its earliest stage. It is the patient's responsibility to watch for those signs of cancer which can be seen or felt and, if he notes them, to go immediately to a physician. This applies to the discovery of external cancer, since the body surface is easily inspected and examined by the individual, and is particularly applicable to the discovery of breast cancer, since it has been shown that in the majority of such cases the woman herself first finds the mass in her breast. The key to the control of breast cancer lies in the hands of women themselves.

One out of five cancer deaths is due to breast cancer. Many of these deaths can be prevented through a community-wide educational program which offers women instruction in breast self-examination and encourages them to carry out such an examination procedure at monthly intervals. Such an educational measure offers real possibilities for the control of a large number of breast cancers.

Today internal cancer requires the most extensive and costly examination procedure and, in the absence of simple screening techniques, its discovery must remain the sole responsibility of professional groups skilled in cancer diagnosis.

The control of cancer is dependent upon an adequate supply of medical personnel, trained in techniques of cancer diagnosis and treatment. In order that the quality and availability of cancer services may be raised, cancer control must concern itself with the provision of such training.

By virtue of the fact that there is not available at the present time knowledge sufficient to assure complete mass prevention of the onset of cancer and there is not a diagnostic test or screening device which is susceptible to mass application, the control of the disease is based upon early recognition, adequate, accurate methods of examination and effective treatment. To accomplish this requires the simultaneous and coordinated efforts of physicians in many special fields of medicine (pathology, surgery, radiology, internal medicine, etc.) most of whom function outside the traditional public health program. In view of these circumstances, it is quite clear that official health agencies are not yet in a position to be solely responsible for the control of the disease, but must share this responsibility with the medical profession, research and teaching institutions, community hospitals, voluntary agencies, etc. Cancer control is, therefore, a problem of integration, bringing current knowledge of the disease to the ultimate point of application—the cancer patient.

Lastly, cancer control complements but does not supplant the extensive research programs now under way which are so essential if we are to develop a completely acceptable control program. Cancer control translates the findings of investigations and brings about their effective application. Control measures cannot, therefore, be separated from research. In fact, experience indicates clearly that they cannot be successfully separated, but are mutually so closely related that for optimal results in either field, they must be suitably integrated.

In summary, the control of cancer is a significant public health problem which necessitates group action. Today there is available scientific knowledge for the prevention and control of cancer which can be put to practical use; in general, the medical profession is favorably inclined toward the application of this knowledge; there exists a favorable attitude on the part of the public to control of the disease; and funds sufficient to make an initial effort toward cancer control are available. By utilizing the leadership of health agencies in bringing together the many groups and agencies vitally concerned with the cancer problem, it is possible to make substantial headway in controlling the disease. The extent of the cancer problem is so great that even halfway measures will save more lives than would be saved by complete control of many less widespread diseases.

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Trends in Age Distribution of Diphtheria in the United States

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In spite of the marked decline in diphtheria morbidity and mortality in the United States for several decades which has amounted to more than 90 percent since 1915, certain aspects of its occurrence deserve further study. In the past decade an increasing proportion of cases in the older age groups has been noted and some have said that this represents an absolute as well as a relative increase in diphtheria in adults.

The present study has been carried out for the purpose of determining the validity of the statement that diphtheria is actually becoming more common in adults. It was felt that a study of the trends of both morbidity and mortality by age groups over a period of years in certain States and cities would give a fairly accurate estimate of such a change if one actually has occurred. Only a limited number of States and cities have published, or have available, tabulations of reported cases of diphtheria by age groups for a sufficiently long period of time to permit a study of trends. Those with data covering a period of 20 years or more include five northern States, three of which have a high proportion of urban population (Massachusetts, Connecticut, and New Jersey) and two which are predominantly rural (Minnesota and Kansas). Two are typical southern States (North Carolina and Alabama) and one borderline (Maryland). In addition to these, data are available for one western State (California) and for two cities, the District of Columbia and Baltimore. The trend of distribution in upper New York State has been reported by Ingraham and Korns (*1*) and is not repeated here.

The 5-year period ending in 1944 was made the endpoint of the study because there are no dependable estimates of populations by age groups since the 1940 census. No separation was made of cases and deaths by race except for Alabama. Data for Maryland, used in this study, are exclusive of Baltimore. When calculating morbidity rates, all cases of unknown age were distributed according to the percentage distribution of cases of known age. In this report the trend of morbidity and mortality will be emphasized more than any differences in rates in one State as compared with another.

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Percentage Distribution of Cases and Deaths

The proportion of cases and deaths from diphtheria by age groups, as shown in table 1 and figure 1, indicate that variable degrees of change in distribution have occurred in the past two or more decades. In some States, such as Massachusetts, there has been a slight increase in proportion of cases in the group 20 years of age and over, with a correspondingly small decrease in the 5- to 9-year group and little change in the under 5-year and in the 10- to 19-year groups. In New Jersey there was a decrease in percentage of cases in the groups 5 to 9 years of age and an increase in the 10- to 19-year group but little change in the groups under 5 years and 20 years and over. In Minnesota, Kansas, and California, there was a more pronounced increase in proportion of cases in the group 20 years of age and older and a corresponding amount of decrease in the 5- to 9-year group. In the southern States and in the District of Columbia, the trend has been in the direction of a slightly greater proportion of diphtheria cases in the group under 5 years and a decrease in the group 20 years of age and older. Ingraham and Korns reported "relatively little change in age distribution of cases" in upstate New York from 1918 to 1946.

The wide difference in distribution of diphtheria cases by age in the urban and rural sections of the northern States, emphasized by Godfrey (*2*) more than 20 years ago, has remained constant. The continued large proportion of cases under 10 years in such States as

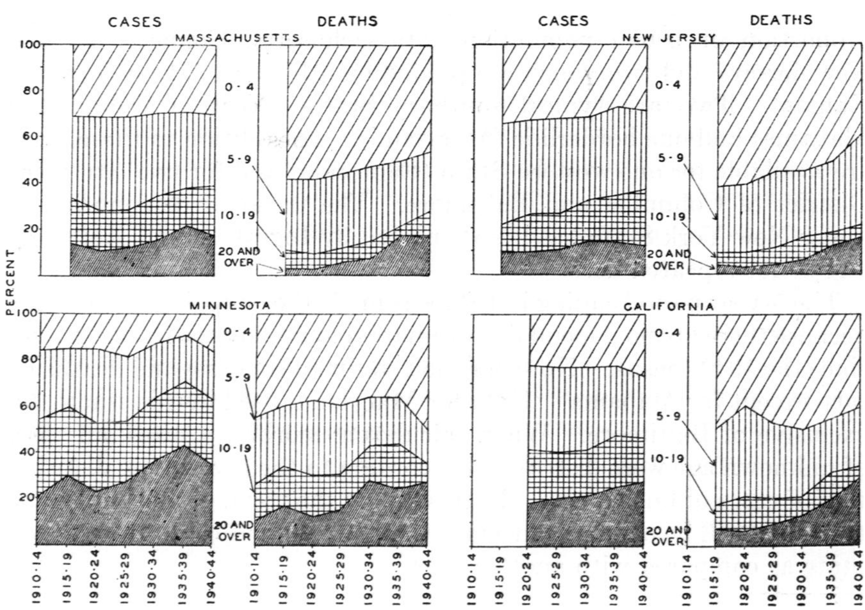

Figure 1. Percentage of diphtheria cases and deaths in four States, 1910–44.

Table 1. ***Percentage distribution of diphtheria cases and deaths by age groups***

Place	Period	Cases: Under 5	Cases: 5-9	Cases: 10-19	Cases: 20 and over	Period	Deaths: Under 5	Deaths: 5-9	Deaths: 10-19	Deaths: 20 and over
Massachusetts	1918-19	30.8	36.0	19.7	13.4	1915-19	57.8	30.5	7.7	3.9
	1920-24	31.3	40.1	17.8	10.7	1920-24	58.1	31.9	6.5	3.4
	1925-29	31.5	39.4	16.5	12.4	1925-29	55.3	32.9	6.3	5.4
	1930-34	29.4	36.3	18.7	15.6	1930-34	51.9	32.4	7.5	8.1
	1935-39	29.1	32.4	15.8	22.7	1935-39	50.0	28.1	4.4	17.5
	1940-44	29.8	31.2	21.1	17.9	1940-44	46.9	24.5	12.2	16.3
Connecticut	1915-19	----	----	----	----	1915-19	60.5	27.6	7.2	4.6
	1921-24	29.3	38.7	17.4	14.5	1920-24	58.2	30.4	7.3	4.0
	1925-29	26.8	36.2	20.9	15.9	1925-29	49.2	33.4	10.9	6.3
	1930-34	29.1	29.5	19.8	21.5	1930-34	49.4	23.6	13.5	13.5
	1935-39	23.6	35.9	22.5	17.9	1935-39	39.1	39.1	12.5	9.4
	1940-44	25.5	24.2	25.5	24.8	1940-44	83.3	0	0	16.6
New Jersey	1916-19	34.7	39.1	12.3	9.6	1915-19	61.9	28.7	5.8	3.5
	1920-24	33.7	39.5	16.9	9.9	1920-24	60.9	29.6	6.8	2.7
	1925-29	33.2	40.2	16.0	10.5	1925-29	55.7	33.0	6.9	4.3
	1930-34	31.6	36.0	17.9	14.5	1930-34	56.5	27.3	9.7	6.5
	1935-39	27.1	38.3	20.2	14.3	1935-39	50.6	31.0	5.7	12.7
	1940-44	28.6	34.0	24.4	12.9	1940-44	39.3	38.3	5.3	16.1
Minnesota	1910-14	16.3	29.5	33.3	20.9	1910-14	44.2	28.8	16.5	10.4
	1915-19	14.9	25.5	29.5	29.9	1915-19	39.6	26.0	16.9	17.4
	1920-24	15.2	31.9	29.7	23.1	1920-34	37.5	32.2	17.7	12.5
	1925-29	18.6	28.0	25.9	27.5	1925-29	39.0	30.6	15.2	15.2
	1930-34	13.2	22.5	27.4	36.7	1930-34	35.6	20.7	15.5	28.1
	1935-39	8.5	19.9	28.4	43.1	1935-39	35.7	20.0	20.0	24.3
	1940-44	16.8	19.5	28.1	35.6	1940-44	49.2	14.7	8.2	27.9
Kansas	1918-21	17.4	35.7	29.2	17.6	1915-19	49.8	33.1	11.9	5.2
	1920-24	----	----	----	----	1920-24	49.7	31.9	12.4	5.9
	1925-29	22.5	29.1	21.9	26.4	1925-29	51.4	24.9	12.3	11.3
	1930-34	19.3	34.1	23.2	23.2	1930-34	47.7	32.9	10.5	8.9
	1935-39	20.0	24.6	24.6	30.8	1935-39	47.0	25.0	11.7	16.2
	1940-44	19.7	20.3	23.7	36.2	1940-44	35.2	33.2	16.7	14.8
California	1915-19	----	----	----	----	1915-19	49.0	33.0	10.1	7.8
	1923-24	21.8	36.9	22.5	18.8	1920-24	39.6	39.3	14.6	6.4
	1925-29	23.1	36.4	20.0	20.4	1925-29	46.7	32.3	10.8	9.4
	1930-34	22.9	35.4	20.0	21.7	1930-34	49.5	28.9	8.4	13.2
	1935-39	22.5	29.9	22.0	25.5	1935-39	44.3	23.4	12.2	20.0
	1940-44	26.7	27.0	19.1	27.2	1940-44	40.2	25.1	5.1	29.4
District of Columbia	1910-14	23.2	31.5	26.2	18.2	1910-14	62.7	27.0	3.4	6.8
	1915-19	18.2	35.1	28.0	18.6	1915-19	50.0	32.4	11.3	6.2
	1920-24	25.8	39.5	22.0	15.6	1920-24	51.8	36.2	7.7	4.1
	1925-29	28.8	39.3	21.3	10.5	1925-29	53.5	27.7	8.2	10.6
	1930-34	34.5	35.1	18.9	11.4	1930-34	63.7	19.6	5.8	10.8
	1935-39	38.5	27.6	14.3	19.6	1935-39	50.0	33.0	10.2	6.8
	1940-44	40.6	28.7	21.3	9.4	1940-44	57.1	42.9	0	0
Baltimore	1908-17	41.4	32.4	14.2	11.9	----	----	----	----	----
	1915-19	----	----	----	----	1915-19	75.6	17.0	2.7	4.6
	1920-24	51.5	35.7	11.8	10.2	1920-24	73.7	19.4	4.1	2.8
	1925-29	39.9	36.6	11.9	11.6	1925-29	65.2	25.0	5.1	4.7
	1930-34	43.6	33.2	13.2	9.9	1930-34	57.7	28.1	9.9	4.2
	1935-39	23.8	41.3	21.7	13.1	1935-39	48.1	18.5	22.2	11.1
	1940-44	24.9	40.8	19.7	14.5	1940-44	26.1	39.1	17.4	17.4
Maryland excluding Baltimore	1908-17	22.1	32.8	28.4	16.7	----	----	----	----	----
	1915-19	----	----	----	----	1915-19	53.9	27.2	11.3	7.5
	1918-24	21.5	31.9	27.9	18.7	1920-24	56.5	26.9	10.4	6.1
	1925-29	22.9	32.0	24.5	20.5	1925-29	51.6	36.9	7.6	3.8
	1930-34	18.5	31.3	27.6	22.5	1930-34	45.4	32.9	10.5	11.2
	1935-39	22.4	30.7	24.8	22.0	1935-39	57.6	22.2	10.1	10.1
	1940-44	24.9	40.8	19.7	14.5	1940-44	39.1	32.6	8.7	19.5
North Carolina	1920-24	----	----	----	----	1920-24	70.8	23.1	4.0	2.1
	1925-29	40.8	34.6	13.6	10.9	1925-29	75.6	19.4	3.0	2.0
	1930-34	44.6	32.5	12.7	10.2	1930-34	77.1	17.3	2.5	3.0
	1935-39	45.4	34.3	12.1	8.1	1935-39	76.5	20.2	1.4	1.8
	1940-44	42.5	35.9	13.8	7.7	1940-44	73.5	19.8	3.3	3.3
Alabama	1925-29	50.4	33.4	9.7	6.5	1925-29	81.7	16.5	1.1	.6
	1930-34	47.3	34.7	11.9	6.1	1930-34	75.1	21.1	1.9	1.7
	1935-39	54.7	29.4	9.5	6.3	1935-39	82.8	12.4	2.3	2.5
	1940-44	59.2	29.0	7.5	4.2	1940-44	85.3	12.4	.9	1.4

Massachusetts and New Jersey, and a contrastingly low proportion in Minnesota in the same age group, are evident in the data shown in figure 1. Part of this difference in distribution in urban and rural areas is probably due to differences in age composition of populations. In table 1 the even greater difference in age distribution in southern as compared with northern States is still evident and has not changed since Doull (*3*) and Fales (*4*) pointed this out many years ago.

In recent years several parts of the United States have experienced an increase in incidence of diphtheria which apparently is a cyclic increase, as Anderson (*5*) has described it. The proportion of reported cases under 5 years increased sharply in Minnesota during the cyclic increase occurring in 1944 and 1945 in that State, and in Baltimore a shift toward the same age group was evident in 1945 and 1946 when the incidence increased sharply. California showed no shift in age distribution from 1944 to 1946, inclusive, when an increase of incidence occurred. On the other hand, in Massachusetts and New Jersey, there was an increase in proportion of cases in persons 20 years of age and over when the disease became more prevalent in 1946 and 1947.

The changes in percentage distribution of deaths from diphtheria have followed the trends of cases in the various States except that the proportion of deaths in the older ages, i. e., 20 and over, has become greater, especially in the last two 5-year periods.

Morbidity and Mortality Rates by Age

The trends of morbidity rates per 100,000 population have been very uniform in each of the States as shown in table 2 and figure 2. In these graphs the trend lines have been superimposed as nearly as possible in order to demonstrate the similarity in trends for all of the age groups of each State.

In all of the areas for which data are available prior to the 1920–24 period, morbidity rates increased some time between 1915 and 1924 which represents a periodic increase in incidence characteristic of the disease. Following the 5-year period, 1920–24, the morbidity rates for each of the age groups declined at a fairly rapid rate. The remarkably uniform rate of decrease in the four age groups can be seen in figure 2. The downward trend was most marked in northern States with a preponderance of urban population, somewhat less in rural areas of the same section, and least in the southern States. There has been a slower decline in morbidity in the South in recent years in spite of the fact that a relatively large proportion of children have been immunized as reported by Collins (*6*).

The trend of mortality has been similar in the three age groups under 20, and in most instances the mortality trend lines of the

Table 2. ***Mean annual diphtheria morbidity and mortality rates per 100,000 population by age groups***

Place	Period	Cases				Period	Deaths			
		Under 5	5–9	10–19	20 and over		Under 5	5–9	10–19	20 and over
Massachusetts	1918–19	603	790	220	41	1915–19	104.7	59.9	8.2	1.1
	1920–24	693	911	224	35	1920–24	89.8	50.4	5.7	.8
	1925–29	368	431	96	18	1925–29	42.1	23.5	2.4	.5
	1930–34	162	180	46	9.9	1930–34	17.4	9.8	1.1	.3
	1935–39	24	24	5.2	1.9	1935–39	3.7	2.9	.1	.1
	1940–44	16	16	4.4	.9	1940–44	1.6	.8	.2	<.1
Connecticut						1915–19	91.4	46.1	7.1	1.2
	1921–24	423	765	150	42	1920–34	75.2	43.1	5.6	.8
	1925–29	260	327	97	20	1925–29	32.6	20.5	3.5	.5
	1930–34	77	67	21	6.2	1930–34	6.9	3.0	.8	.2
	1935–39	34	47	12	2.5	1935–39	4.3	4.0	.6	.1
	1940–44	8.4	7.4	3.1	.7	1940–44	.9	0	0	<.1
New Jersey	1916–19	458	550	131	21	1915–19	96.1	47.2	5.5	.9
	1920–24	657	766	185	29	1920–24	94.0	45.5	5.8	.7
	1925–29	508	554	116	21	1925–29	66.6	35.8	3.9	.7
	1930–34	189	188	4.5	10	1930–34	24.0	10.1	1.7	.3
	1935–39	60	73	16	3.0	1935–39	6.0	3.2	.2	.1
	1940–44	24	26	7.4	.9	1940–44	1.7	1.5	.5	<.1
Minnesota	1910–14	175	329	193	42	1910–14	61.8	41.7	12.5	2.7
	1915–19	185	328	206	68	1915–19	37.4	25.7	9.0	3.0
	1920–24	248	524	264	65	1920–24	31.9	27.8	8.3	1.8
	1925–29	173	245	119	40	1925–29	20.0	14.6	3.8	1.2
	1930–34	39	63	38	15	1930–34	4.1	2.2	.9	.4
	1935–39	13	30	20	8.4	1935–39	2.2	1.2	.6	.2
	1940–44	18	22	14	4.8	1940–44	2.6	.8	.2	.2
Kansas	1918–21	357	741	328	64	1915–19	46.7	31.9	6.1	.9
						1920–24	62.8	40.0	8.3	1.2
	1925–29	123	148	60	22	1925–29	18.6	8.3	2.2	.6
	1930–34	96	153	54	16	1930–34	17.8	11.2	1.8	.5
	1935–39	53	62	29	10	1935–39	8.7	4.4	.9	.4
	1940–44	29	29	15	.6	1940–44	2.8	2.5	.5	.1
California						1915–19	50.3	34.0	5.7	.9
	1921–24	725	1,154	390	69	1920–24	78.5	73.3	15.0	1.4
	1925–29	318	450	114	29	1925–29	34.2	20.8	3.8	.7
	1930–34	152	214	62	16	1930–34	19.2	10.2	1.5	.6
	1935–39	80	118	39	9.4	1935–39	10.8	5.7	1.3	.4
	1940–44	58	61	18	5.3	1940–44	7.2	4.7	.4	.5
District of Columbia	1910–14	389	550	220	34	1910–14	52.9	23.7	1.4	.6
	1915–19	513	1,003	379	52	1915–19	87.7	54.3	9.7	1.1
	1920–24	546	821	221	31	1920–24	65.1	44.7	4.6	.5
	1925–29	745	951	262	25	1925–29	57.0	27.4	4.2	1.1
	1930–34	493	475	125	14	1930–34	38.1	11.1	1.6	.6
	1935–39	635	473	107	27	1935–39	23.1	15.8	2.1	.3
	1940–44	71	54	16	1.3	1940–44	2.0	1.6	0	0
Baltimore	1908–17	666	593	144	30					
						1915–19	99.3	23.8	1.9	.9
	1921–24	833	721	128	28	1920–24	93.7	25.2	2.8	.5
	1925–29	572	487	84	21	1925–29	58.7	20.8	2.2	.5
	1930–34	200	136	27	5.2	1930–34	13.1	5.7	1.0	.1
	1935–39	58	94	22	3.2	1935–39	4.5	1.6	.8	.1
	1940–44	45	69	14	2.4	1940–44	2.1	3.1	.5	.1
Maryland exclusive of Baltimore	1908–17	206	305	143	31					
						1915–19	61.0	29.6	6.6	1.6
	1918–24	265	375	178	41	1920–24	54.1	24.7	5.1	1.0
	1925–29	166	212	89	25	1925–29	23.9	15.6	1.8	.3
	1930–34	149	231	107	28	1930–34	17.2	11.4	1.9	.6
	1935–39	70	92	35	9.4	1935–39	14.1	5.2	1.1	.3
	1940–44	53	90	27	6.0	1940–44	4.4	3.6	.4	.3
North Carolina						1920–24	71.7	22.9	2.3	.6
	1925–29	377	300	68	25	1925–29	61.3	14.8	1.3	.4
	1930–34	300	201	43	15	1930–34	44.1	9.2	.7	.4
	1935–39	261	190	33	9.3	1935–39	34.0	8.7	.3	.2
	1940–44	122	101	18	4.1	1940–44	14.0	3.7	.3	.1
Alabama (white)	1925–29	397	256	42	12	1925–29	74.5	14.6	.6	.1
	1930–34	362	257	47	9.8	1930–34	56.2	15.3	.8	.3
	1935–39	250	133	21	5.4	1935–39	33.9	5.1	.5	.2
	1940–44	154	75	9.2	1.7	1940–44	19.8	2.9	.1	.1

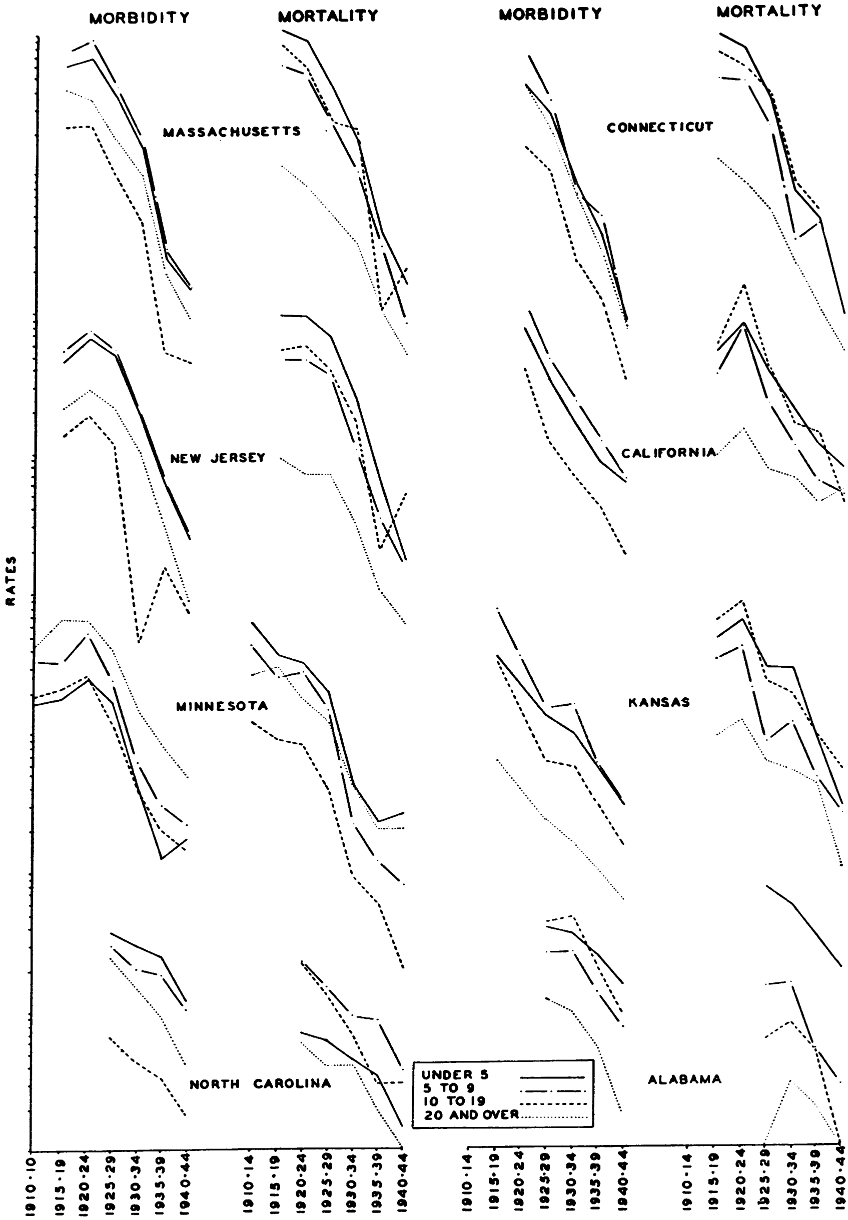

Figure 2. Trend lines of diphtheria morbidity and mortality rates per 100,000 population in eight States, 1910–44. (See table 1 for actual rates.)

younger groups resemble the morbidity trend. In the group 20 years of age and over, mortality has declined more slowly in many States, namely, California, Connecticut, Massachusetts, Maryland, and New Jersey, and likewise in the city of Baltimore. Mortality data which were tabulated for various other States not included in the study because of a lack of morbidity data show that diphtheria mortality declined more slowly in persons 20 years of age and over than in those under 20 in Indiana, Montana, Vermont, Washington, and Wisconsin. This slower decline of mortality in the older age group was not evident in Alabama or North Carolina, nor in other southern States not included in the study, such as Mississippi, South Carolina, and Virginia.

Case Fatality Rates

As indicated in table 3 and figure 3, diphtheria case fatality rates have shown a considerable amount of variation. For instance, in California, Connecticut, and Kansas, the fatality rate in the group under 5 years old has declined very little, while in New Jersey and Baltimore, it has decreased steadily over the years in this age group. However, the most significant change has been a rise in fatality in persons 20 years of age and over in nearly all States.

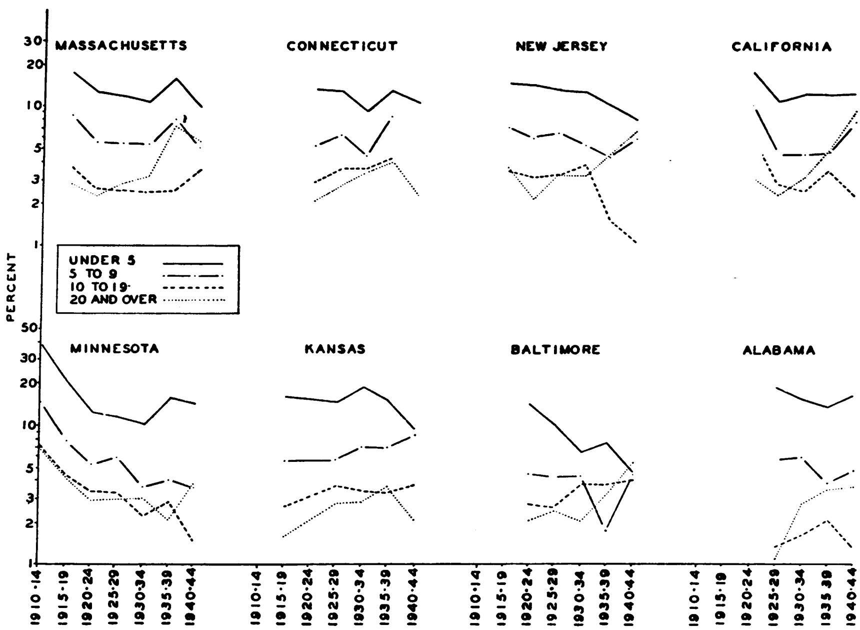

Figure 3. Diphtheria case fatality rates (percent) in eight States, 1910–44.

Comment

The data which have been presented indicate that changes in the percentage distribution of diphtheria cases have not occurred uniformly, although in several States there has been an increase in proportion of reported cases in the age group 20 years old and over. A more pronounced increase in proportion of deaths in the older age group has occurred in northern States but little in the two southern States.

A very rapid decline in diphtheria morbidity rates followed the 1920–24 period in all age groups in the northern States for which data are available; a much less rapid decline occurred in the southern States. Morbidity declined about equally in all age groups in individual States but declined more rapidly in some northern States where urban populations predominate. This difference is not striking.

Table 3. ***Diphtheria case fatality rates (percent) by age groups***

Period	Under 5	5–9	10–19	20 and over
MASSACHUSETTS				
1918–19	17.7	8.4	3.7	2.8
1920–24	12.9	5.5	2.6	2.2
1925–29	11.4	5.4	2.5	2.8
1930–34	10.8	5.4	2.4	3.1
1935–39	16.0	8.0	2.5	7.2
1940–44	9.9	5.0	3.6	5.7
NEW JERSEY				
1916–19	15.2	7.1	3.4	3.7
1920–24	14.3	5.9	3.1	2.2
1925–29	13.1	6.4	3.3	3.2
1930–34	12.7	5.3	3.8	3.2
1935–39	10.0	4.3	1.5	4.7
1940–44	7.9	5.9	1.1	6.4
KANSAS				
1918–21	16.7	5.6	2.7	1.6
1925–29	15.1	5.7	3.7	2.8
1930–34	18.4	7.3	3.4	2.9
1935–39	16.3	7.0	3.3	3.6
1940–44	9.4	8.7	3.7	2.1
DISTRICT OF COLUMBIA				
1910–14	13.8	4.4	0.6	1.9
1915–19	17.1	5.7	2.5	2.1
1920–24	11.9	5.4	2.1	1.5
1925–29	9.0	3.2	1.9	3.3
1930–34	7.7	2.3	1.3	3.9
1935–39	3.6	3.3	2.0	.9
1940–44	2.8	2.9	0	0
MARYLAND excluding BALTIMORE				
1920–24	14.8	4.8	2.1	1.8
1925–29	14.4	7.3	1.9	1.2
1930–34	11.5	4.9	1.8	2.3
1935–39	20.2	5.7	3.2	3.6
1940–44	8.4	4.1	1.5	4.8
ALABAMA				
1925–29	18.7	5.7	1.3	1.1
1930–34	15.5	5.9	1.6	2.8
1935–39	13.5	3.8	2.1	3.5
1940–44	16.1	4.8	1.3	3.6
CONNECTICUT				
1921–24	13.0	5.3	2.9	2.1
1925–29	12.5	6.2	3.5	2.7
1930–34	9.1	4.4	3.6	3.3
1935–39	12.8	8.4	4.3	4.0
1940–44	10.9	0	0	2.2
MINNESOTA				
1910–14	39.3	14.1	7.3	7.1
1915–19	20.2	7.8	4.3	4.4
1920–24	12.9	5.3	3.3	2.9
1925–29	11.4	5.9	3.2	3.0
1930–34	10.5	3.6	2.2	3.0
1935–39	16.9	4.0	2.8	2.1
1940–44	14.4	3.6	1.4	3.8
CALIFORNIA				
1922–24	17.7	10.0	6.0	3.1
1925–29	10.7	4.6	2.8	2.4
1930–34	12.6	4.6	2.4	3.1
1935–39	12.1	4.8	3.4	4.8
1940–44	12.4	7.7	2.2	9.1
BALTIMORE				
1920–24	14.0	4.4	2.8	2.1
1925–29	10.2	4.2	2.6	2.5
1930–34	6.5	4.2	3.7	2.1
1935–39	7.7	1.7	3.8	3.2
1940–44	4.8	4.4	4.0	5.5
NORTH CAROLINA				
1925–29	16.2	4.2	1.9	1.5
1930–34	14.8	4.6	1.7	2.5
1935–39	12.9	4.5	.9	1.7
1940–44	11.5	3.6	1.6	2.8

Mortality rates have declined about equally in all age groups under 20 years in individual States, but in the group over the age of 20, the decline has been less rapid except in Minnesota and Kansas. The reasons for the apparent increase in fatality rates in the age group 20 and over in some States cannot be determined from the data at hand. It is possible that reporting of cases in older persons may have become less complete. Also, as the disease becomes less prevalent, the existence of diphtheria in adults may not be recognized until late in the course of the disease with consequent delays in diagnosis and treatment. These factors might account for increasing fatality rates. A third possible explanation is that with a general reduction in incidence of clinically recognizable and inapparent infections, older persons, because they no longer, or infrequently, have contact with the organism, are more vulnerable when they develop clinical diphtheria. However, there should be similar changes in morbidity if lack of contact with the organism is the only reason for an increasingly higher mortality.

The simultaneous decline in diphtheria morbidity and mortality rates in all age groups of individual States located in different sections of the country, which began after a cyclic increase in incidence between 1915 and 1925, suggests the operation or influence of other factors besides, or in addition to, artificially induced immunity. Studies such as that included in the 1930 White House Conference on Child Health and Protection (*7*) indicated that immunization programs were reaching a relatively large proportion of children in some areas or cities and a very low proportion in others, as late as 1930. In spite of this wide variation, both morbidity and mortality began to decline rapidly after 1925 in all States simultaneously. Lucia (*8*) in 1936 showed similarities in the trend of diphtheria morbidity and mortality in two cities, one in which an active campaign of immunization had been in operation for some time, Providence, R. I., and the other, San Francisco, Calif., where only some immunization had been carried out. Similarly, when the trend of diphtheria mortality in the group under 5 years old in large cities reported by the 1930 White House Conference to have immunized one-third or more of preschool children was compared with the trend in cities reported to have immunized one-fifth or less, there was only one city in the former group in which the trend was significantly different from that in the latter (*9*).

These statements are not intended to be interpreted as arguments against immunization but rather to suggest that Frost's (*10*) concept, first expressed about 20 years ago, that natural forces, such as a diminished infection frequency and a smaller ratio of cases to infections which are described by others as secondary epidemiological factors, also have influenced the decline of diphtheria morbidity. Schuman

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and Doull (*11*) stated more recently that "it is more likely that causes other than immunization have been a significant factor" in reduction of diphtheria morbidity and mortality. The cyclic increase in diphtheria during the past decade in various parts of the country where immunization apparently has not been neglected such as that reported by Mattison (*12*) in New York State appears to constitute further evidence of the influence of natural forces on the incidence of the disease.

Since morbidity has declined at a satisfactory rate in all age groups, while States have immunized only, or principally, those under 10 years of age, there does not appear to be any good reason for extending immunization on a mass scale to adults just because cases merely are proportionately more frequent in older persons. However, if further studies indicate that the increasing fatality rate in older ages is real and due to loss of protective antibodies, artificial immunization might be indicated beyond the age of 20.

Summary

The age distribution of diphtheria cases has shown some shift toward older age groups in some States. The proportion of deaths in older age groups has increased more than cases. Morbidity rates have declined equally in all age groups in individual States, but death rates among persons over the age of 20 years have declined more slowly than in persons under 20. Case fatality has increased in older age groups in many States. Other factors in addition to immunization appear to have caused the downward trend of diphtheria incidence.

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Tularemia in Man From a Domestic Rural Water Supply

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An explosive water-borne epidemic of tularemia in the Union of Soviet Socialist Republics in 1935 was reported by Karpoff and Antonoff (*1*). Over 43 cases were observed in a group of farm laborers who used water from one stream which was found to be contaminated with *Pasteurella tularensis*. The portal of entry of infection appeared to be the tonsils and buccal mucosa and in some cases the conjunctiva. The anginal form of the infection predominated, but typhoidal and oculoglandular forms were present. Cultures were isolated from some experimental animals injected with tissues from a patient and from others injected with water from the suspected stream. Twenty-one patients were tested after the thirty-fifth day of illness for agglutinins against *P. tularensis*, and all were positive.

Contamination of natural waters in Montana with *P. tularensis* was reported by Parker, Jellison, Kohls, and Davis (*2*); Jellison, Kohls, Butler, and Weaver (*3*); and by Parker, Steinhaus, and Kohls (*4*). Since 1942 contamination of numerous streams at one time or another, often persisting for months, has been repeatedly demonstrated at the Rocky Mountain Laboratory. In most instances, the presence of the organism in water has been associated with the occurrence of tularemia in beavers and muskrats inhabiting the streams or ponds concerned. Many cases of tularemia have been contracted by persons who skinned or handled such diseased animals, but to the present there has been little evidence of human infection resulting from direct contact with contaminated water.

The occurrence in Gallatin County, Mont., of four cases of tularemia associated with one domestic water supply under circumstances which appear to preclude other likely sources of infection is the subject of the present report.

In the summer of 1949, two cases of tularemia, in which the portal of entry appeared to be the throat, were treated by one of the authors (Epler). Neither patient exhibited an external initial lesion of any kind, and neither gave a history of close contact with wild rodents,

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wild rabbits, or other animals that would be likely sources of infection. Both were rural residents who, while working in their gardens, had some exposure to soil and weeds contaminated by mice. Both had used potatoes from a mouse-infested storage cellar. The patients were related and visited each other frequently. As they also experienced similar clinical courses except for the time of onset, a common source of infection in food or water supply was suspected.

It was demonstrated that the water supply at the residence of one of the patients, N. ranch, was contaminated. This water supply had remained practically unchanged for 20 years. When a survey was made of users of this water, it was found that two previous residents, both patients of Epler, had experienced severe and persistent sore throats and protracted illness of undiagnosed etiology. Both exhibited a positive agglutination titer for *P. tularensis* in November 1949. Three others gave significantly positive agglutination titers but recalled no episode of illness suggestive of tularemia. One other former resident showed a low titer of doubtful significance. Two domestic animals on the farm also had significant titers for *P. tularensis*.

Human Cases

The following four human cases are listed in the order in which diagnosis was established and not in the chronological order of their occurrence. Each had a clinical illness consistent with tularemia when infection results from ingestion of the organism.

CASE 1. L. C. moved to the N. ranch with her husband in November 1948, and was taken ill in June 1949 with a severe sore throat. When seen by her physician there were ulcers present on the tonsils, and the cervical lymph nodes were enlarged. There was no evidence of an external lesion as the possible site of infection. One of the cervical lymph nodes was incised and drained. The incision was very slow in healing and was still conspicuous when seen October 8. Fourteen grams of chloromycetin were used in treatment of the patient for 7–10 days, beginning August 15, and then a course of dihydrostreptomycin therapy was given. The patient's recovery was uneventful but slow and when visited in October she complained of tiring easily and of muscular weakness.

Agglutination tests on serum samples from this patient gave the following reactions:

July 16, 1949	Complete agglutination at 1:640.
July 28, 1949	Complete agglutination at 1:320.
Aug. 31, 1949	Complete agglutination at 1:1280.

CASE 2. I. W. is a sister-in-law of L. C. (case 1) and lives some 10 miles distant. She was a frequent visitor at the L. C. home on the N. ranch. In August 1949, she developed a sore throat with involvement of the right cervical lymph nodes. She was treated with streptomycin and recovered promptly.

Agglutination tests on serum samples gave the following reactions:

Aug. 16, 1949	Complete agglutination at 1:80.
Sept. 7, 1949	Complete agglutination at 1:640.

I. W. had not experienced direct contact with wild rodents, wild rabbits, or game animals. She had worked in a garden where mice were present. She had no history of tick or insect bite. She had visited the L. C. residence about the time L. C. was ill and at other times had used potatoes from a storage cellar at the L. C. residence.

CASE 3. The E. M. family lived at the N. ranch for about 1 year just before its occupancy by the L. C. family. While living at the ranch, E. M. experienced a severe illness and was treated by Epler. Onset was November 15, 1948, with a severe sore throat and with symptoms of a cold. She was confined to bed for 2 weeks. When seen again, November 29, her throat was better, but she was still ill. She was quite ill again in December and phoned her physician, but since the roads were badly blocked with snow the patient was not seen at that time E. M. was well when visited 1 year later, December 1949. A blood sample taken at this time was positive for tularemia, giving complete agglutination at 1:40.

CASE 4. D. N. was a member of the family who owned the ranch and had lived there for many years, but moved to Bozeman early in 1948. In November 1945 she experienced a sore throat. This infection was persistent and severe, as she recalls. She received a course of treatment with sulfanilamide but did not feel well the remainder of the winter, although there were no prominent symptoms. D. N. was well when visited December 12, 1949. A blood sample taken at this time was positive for tularemia, giving complete agglutination at a dilution of 1:80

The four following individuals, all previous residents at the same ranch, were found to have some titers against *P. tularensis*. Although no history of illness indicative of tularemia was elicited at the time they were interviewed, the agglutination titers suggest an infection some years previously with consequent loss of titer.

CASE 5. K. N., aged 20, is a student at Montana State College, Bozeman. She had lived on the N. ranch until early 1948 and had visited there several times since then. She had no recollection of serious illness while at the ranch or later. While living at the ranch, she had helped her brothers skin muskrats and mink on several occasions. A blood sample taken December 14, 1949, was weakly positive, giving complete agglutination at a dilution of 1:20 for *P. tularensis*.

CASE 6. J. N., aged 18, who is also a student at Montana State College, had essentially the same history as her sister K. N. (case 5). She could not recall having experienced any serious illness but had lived at the ranch until 1948. A blood sample taken December 14, 1949, was positive for tularemia, giving complete agglutination at a dilution of 1:160.

CASE 7. M. N., aged 36, was raised on the N. ranch and worked there frequently until 1948. When interviewed in December 1949, he could not recall having had any serious illness. A blood sample taken at this time was weakly positive for tularemia, giving complete agglutination at a titer of only 1:20.

CASE 8. W. N., aged 42, is now a resident of DeSmet, Idaho. He was requested to submit a blood specimen. This specimen tested at this laboratory showed an agglutination of 3+ at 1:20 and 2+ at 1:40, a weak reaction of doubtful significance, which may indicate an infection some years previously. No history of unusual illness was obtained from W. N.

Most of the serum samples from these individuals were also tested for agglutination against *Brucella abortus*. In no instance did it appear that the observed titer was due to *B. abortus* infection rather than *P. tularensis*.

These individuals with respective titers for *P. tularensis* and *B. abortus* are summarized as follows:

Patient	Residence at N. ranch	Illness	Agglutination titer, 1949	
			P. tularensis	*B. abortus*
D. N	Until 1948	Severe sore throat November 1945.	4+, 1:80	2+, 1:20
J. N	do	No history of illness	4+, 1:160	0, 1:20
K. N	do	do	4+, 1:20	Negative
M. N	do	do	4+, 1:20	Negative
W. N	Visited ranch 2 weeks, 1945.	do	3+, 1:20	Negative
E. M	1948	Severe sore throat November 1948.	4+, 1:40	Negative
L. C	Fall 1948 to December 1949.	Severe sore throat June 1949.	4+, 1:1280	4+, 1:80
I. W	Frequent visitor 1949	Severe sore throat August 1949.	4+, 1:640	Negative

Infection in Animals

There were two dogs on the N. ranch on October 8. An old dog, very ill, probably from mechanical injuries, was destroyed a few days later. A blood sample taken from it was tested for agglutinins and found negative. The other dog, a young animal, was not known to have been ill. He was bled October 27 and again December 14; both samples gave complete agglutination of *P. tularensis* at a dilution of 1:80.

A sow and her litter of 10 pigs, about 3 months old, that had been raised on the ranch were bled December 14. No illness had been observed in these animals. One of the young pigs gave a definitely positive agglutination reaction and four others showed low-titer agglutinations for *P. tularensis* as follows:

Pig No.	*Agglutination titer* 1:20	1:40	1:80	1:160	1:320
1	3+	2+	0	0	0
2	3+	3+	2+	0	0
6	2+	0	0	0	0
7	4+	4+	4+	3+	2+
9	2+	0	0	0	0

Blood samples from the other young pigs and sow were entirely negative at dilutions of 1:20 and higher. In January 1950, pig No. 7, which showed the highest agglutination titer, was autopsied and numerous tissue samples were saved in a frozen condition for later testing. These tissues have not yet been tested.

The main herd of cattle usually kept on the ranch had been removed to winter range near Logan, but four animals, two cows and two calves, were bled on December 14. Agglutination tests on these samples were entirely negative.

The dogs, pigs, and cattle had access to water from the marshy area which was the source of the domestic water supply. The possibility exists that the dogs and pigs had eaten infected rodents.

In December an attempt was made to trap mice in the vicinity of the water source, but none were taken. A few house mice, *Mus musculus*, and one deer mouse, *Peromyscus*, were trapped in the farm buildings but exhibited no evidence of tularemia infection.

Infection in the Domestic Water Supply

The domestic water supply of the N. ranch comes from a marshy, spring area along a small stream about 350 yards south of the residence. This area, 48 feet wide and 126 feet long, was fenced to keep out livestock and as a result was grown over with water cress, weeds, and grass. The water surface of the pond was entirely covered by vegetation. There was evidence of field-mouse and pocket-gopher activity around the water source, and there was abundant opportunity for contamination of the water by these rodents. The lower edge of the marsh was blocked by a low dam into which was fitted the intake end of a water pipe. The water flowed through pipe by gravity into an open concrete chamber in the basement of the house from which it was pumped into a pressure tank for distribution to the upper floors. The basement receiving chamber, while open at the top, was clean and not a likely source of contamination. This water system was installed in 1930, replacing a well on the premises.

On October 8, when the first visit was made to the N. ranch, a single water sample was taken from the kitchen faucet. This was kept refrigerated until tested on October 10. Two guinea pigs, Nos. 25300 and 25301, were each injected intraperitoneally with 10 cc. of water. On October 23, 13 days later, guinea pig No. 25300 was observed to be moribund late in the evening. A heart-blood sample was taken for culture and the animal was autopsied. Lesions typical of tularemia were observed. Heart-blood cultures on glucose cystine agar yielded a pure culture of *P. tularensis* which was further confirmed by agglutination with known positive serum. Transfers of tissue from No. 25300 to guinea pigs and mice produced typical infections with characteristic gross lesions, and additional cultures were isolated. The other test animal, No. 25301, survived and was normal when sacrificed and autopsied 48 days later. These experimental animals were kept in large buckets in laboratory rooms and were well isolated from any known tularemia-infected animals. The possibility of laboratory infection in animal No. 25300 is extremely remote.

On October 27, the domestic water supply at the N. ranch was again sampled. Four samples were taken as follows: No. 1, kitchen tap; No. 2, basement pump box; No. 3, intake at spring; No. 4, mud from intake reservoir at the spring. Sample No. 1, from the kitchen tap, again produced tularemia in one of two test guinea pigs, as confirmed by autopsy, culture, and agglutination of culture with known positive serum. The samples from the basement pump box, the intake at the spring, and mud from the intake reservoir gave negative results.

Infection in Other Streams and Water Supplies

While certain tularemia cases were being investigated in Gallatin County, Mont., in March 1949, water samples were taken from 12 streams and tested for the presence of *P. tularensis* by injecting them into guinea pigs.

Ten cc. from each sample were injected into each of two guinea pigs. Infection was demonstrated in four of these samples as follows: (1) from Dry Creek, about 10 miles north of Belgrade; (2) from Spring Creek, about 4 miles north of Belgrade; (3) from a roadside stream near Gallatin Gateway; and (4) from a roadside stream near Bozeman Hot Springs.

Two of four stream samples taken October 5 to 8 were positive for tularemia by animal injection. The positive samples were from Smith Creek 5 miles north of Belgrade, and Spring Creek from the same station that was found positive with the March sample.

Six streams were sampled on October 27, three of which proved positive. These were (1) a roadside stream near Bozeman Hot Springs which was positive in March 1950; (2) a small stream on the campus of Montana State College; and (3) an irrigation ditch on the M. farm in Bridger Canyon.

On December 14 to 16, additional water samples were taken from 12 streams in Gallatin County, and when tested by animal injection, two were positive for *P. tularensis*. These were (1) a stream near the E. O. residence in Bridger Canyon, and (2) the stream on the Montana State College campus which was found positive when sampled on October 27.

During the course of these studies and with the cooperation of the county health officer, Dr. Jerome Andes, water samples were collected from 75 domestic rural water supplies in Gallatin County. These included deep and shallow wells, springs, and small streams. Some of these came from households where recent tularemia cases had occurred without obvious source of infection. All these samples were tested by injection into guinea pigs. Usually four guinea pigs, each injected with 10 cc., were used on each sample. No evidence of infection was demonstrated in any of the samples.

Incidence of Tularemia in Gallatin County

Twelve cases of tularemia were reported in Gallatin County, Mont., for 1949 by the Montana State Health Department—more than for any other county in the State. Some of these, however, had occurred in previous years and were confirmed by serological test during 1949.

Some of the cases were found as a result of our studies on tularemia in that area. As a measure of the incidence of the disease in the general population, agglutination tests were made on all serum samples received from Gallatin County for Wassermann tests at the State Hygienic Laboratory during January and February 1950. Of the 224 serum samples received, 214 were completely negative for *P. tularensis* agglutination at 1:20 and higher dilutions; 9, or 4.0 percent, gave agglutination (2+, 3+, or 4+) at dilutions of 1:20 to 1:40; only one with a titer of 4+ at 1:40 could be considered positive without supporting clinical evidence. The results on these sera were:

Serum No.	*Agglutination titer* 1:10	1:20	1:40	1:80
1	4+	4+	4+	0
2	4+	4+	0	0
3	4+	4+	0	0
4	4+	2+	0	0
5	4+	2+	0	0
6	4+	1+	0	0
7	4+	0	0	0
8	3+	2+	0	0
9	3+	2+	0	0
10	2+	0	0	0

In the survey of residents and contacts at the N. ranch, 23 individuals were tested for tularemia, including the observed clinical cases. Of these, 7, or 30 percent, had agglutination titers of 4+ at 1:20 or higher. Sixteen had no demonstrable titers for *P. tularensis*. This is in contrast to the 4 percent observed in the general population. The people tested in this survey who showed any degree of agglutination at 1:20 or higher dilutions are listed below:

Patient	*Agglutination titer* 1:20	1:40	1:80	1:160	1:320	1:640	1:1280
L. C	4+	4+	4+	4+	4+	4+	4+
I. W	4+	4+	4+	4+	4+	4+	0
J. N	4+	4+	4+	4+	2+	0	0
D. N	4+	4+	4+	2+	0	0	0
E. M	4+	4+	3+	2+	1+	0	0
K. M	4+	3+	1+	0	0	0	0
M. N	4+	2+	0	0	0	0	0
W. N	3+	2+	0	0	0	0	0

Summary

The diagnosis of tularemia, with primary infections in the tonsils and buccal mucosa, in a rural housewife and her sister-in-law suggested a common source of infection in contaminated food or water. The domestic water supply at one residence was shown to be contaminated with *P. tularensis* in two consecutive tests. A survey of the previous residents revealed that two of the housewives had experienced similar clinical illnesses and now gave positive agglutination reactions. Three others gave significantly positive agglutination tests but recalled no previous suggestive illness. Still another resident gave a low titer agglutination test of doubtful significance. Other individuals so far tested who were using, or had used, this same water showed no evidence of tularemia infection by serological test.

The instance reported here, involving 4 clinical and 4 probable cases, differs from the spontaneous epidemic cited (*1*) in the Union of Soviet Socialist Republics of 43 or more cases. Here only a few people were using the water supply at any one time. Contamination obviously persisted for a period of years, as the first observed clinical case occurred in November 1945 and the last in August 1949.

ACKNOWLEDGMENTS

The writers are indebted for assistance in this investigation to: Dr. L. J. Lull, former epidemiologist of the Montana State Board of Health, who referred information on the first diagnosed cases to the Rocky Mountain Laboratory; Dr. Jerome Andes, health officer for the city of Bozeman and Gallatin County, who collected many samples from domestic water supplies in Gallatin County, and assisted in other ways; Dr. Lee Seghetti, veterinary pathologist, Agricultural Experiment Station, Bozeman, Mont., who secured blood samples from domestic animals; Lillian Glesne, biological aid, who performed agglutination tests at the Rocky Mountain Laboratory; and Byron Thrailkill, technologist, who tested the numerous water samples.

Dr. R. R. Parker, late Director of the Rocky Mountain Laboratory, was intensely interested in tularemia and especially in its occurrence in water and semiaquatic animals. The present study is a continuation of a broad research program which he initiated.

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Incidence 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 Ending September 2, 1950

For the current week, new cases of acute poliomyelitis reported in the Nation numbered 1,627, a 0.6 percent increase over the 1,617 cases reported last week. This is the fifteenth consecutive week of increase over the preceding week. However, the rate of increase continues to slacken as this is the lowest percentage increase over the preceding week during the 15-week period. For the corresponding week last year, 3,193 cases were reported.

The cumulative total (12,356) for the current "disease" year was below the corresponding total (22,809) for last year, the highest on record. The "disease" year for acute poliomyelitis begins with the twelfth week of the calendar year. The cumulative total for the calendar year was 13,490, compared with the total of 23,724 for the corresponding period last year.

Comparative Data for Cases of Specified Reportable Diseases: United States

[Numbers after diseases are International List numbers, 1948 revision]

Disease	Total for week ended		5-year median 1945–49	Seasonal low week	Cumulative total since seasonal low week		5-year median 1944–45 through 1948–49	Cumulative total for calendar year		5-year median 1945–49
	Sept. 2, 1950	Sept. 3, 1949			1949–50	1948–49		1950	1949	
Anthrax (062)	------	------	(1)	(1)	(1)	(1)	(1)	29	38	(1)
Diphtheria (055)	82	120	153	27th	545	818	1,092	3,673	4,586	7,389
Acute infectious encephalitis (082)	60	28	28	(1)	(1)	(1)	(1)	594	445	363
Influenza (480–483)	626	548	617	30th	3,650	2,787	2,844	249,909	78,654	142,483
Measles (085)	701	571	680	35th	307,301	640,911	586,282	288,171	588,518	551,414
Meningococcal meningitis (057.0)	36	40	43	37th	3,630	3,265	3,534	2,717	2,421	2,562
Pneumonia (490–493)	769	704	------	(1)	(1)	(1)	------	62,131	57,298	------
Acute poliomyelitis (080)	1,627	3,193	1,505	11th	[2] 12,356	22,809	11,967	[2] 13,490	23,724	12,434
Rocky Mountain spotted fever (104)	14	15	16	(1)	(1)	(1)	(1)	383	483	461
Scarlet fever (050)	264	214	402	32d	766	658	1,149	40,936	58,324	63,252
Smallpox (084)	------	------	------	35th	46	51	201	26	41	147
Tularemia (059)	16	19	14	(1)	(1)	(1)	(1)	679	842	701
Typhoid and paratyphoid fever (040, 041)[3]	96	99	108	11th	1,821	2,157	2,157	2,331	2,645	2,645
Whooping cough (056)	1,683	1,309	1,970	39th	111,542	50,933	94,320	90,006	40,900	68,302

[1] Not computed. [2] Delayed reports: Iowa, 17 August cases, not allocated to specific weeks; Arkansas, week ended June 3, 1 case. Deduction: Michigan, week ended July 1, 1 case. [3] Including cases reported as salmonellosis.

For the current week, reported cases of acute poliomyelitis decreased from the preceding week in four of the total of nine geographic divisions. These decreases ranged from 62 (271 to 209) cases reported in the South Atlantic States to 7 (129 to 122) cases in the Pacific States. The remaining two divisions reporting decreases were the East South Central and the West South Central. The four divisions increasing over the preceding week ranged from 55 cases (314 to 369) in the Middle Atlantic States to 15 (59 to 74) in the New England States. The remaining two divisions reporting increases were the East North Central and the West North Central. The Mountain States reported 34 cases which was no change from the number reported for the preceding week.

For the current week, the States reporting the largest numbers of cases were: New York (286), Illinois (122), Michigan (116), Texas (102), Ohio (98), Iowa (95), and California (65).

The total number of cases of infectious encephalitis reported for the week was 60 compared with 28 reported for the corresponding period last year. For the calendar year a total of 594 cases was reported, the highest total in the past 5 years.

No smallpox was reported in the United States. The current week ends the "disease" year for smallpox with a total of 46 cases compared with a corresponding total of 51 cases for the previous year. This is the lowest total number reported for the past 9 years.

The "disease" year for reported cases of measles also ends with the current week. A total of 701 cases was reported for this week. The cumulative total for the "disease" year was 307,301. The 5-year (1945–49) median was 586,282.

Deaths During Week Ended September 2, 1950

	Week ended September 2, 1950	*Corresponding week, 1949*
Data for 94 large cities of the United States:		
Total deaths	8, 278	8, 245
Median for 3 prior years	8, 470	----------
Total deaths, first 35 weeks of year	323, 715	324, 344
Deaths under 1 year of age	631	603
Median for 3 prior years	672	----------
Deaths under 1 year of age, first 35 weeks of year	21, 736	22, 956
Data from industrial insurance companies:		
Policies in force	69, 627, 042	70, 196, 573
Number of death claims	10, 815	11, 630
Death claims per 1,000 policies in force, annual rate	8. 1	8. 6
Death claims per 1,000 policies, first 35 weeks of year, annual rate	9. 4	9. 3

Reported Cases of Selected Communicable Diseases: United States, Week Ended September 2, 1950

[Numbers under diseases are International List numbers, 1948 revision]

Area	Diphtheria (055)	Encephalitis, infectious (082)	Influenza (480–483)	Measles (085)	Meningitis, meningococcal (057.0)	Pneumonia (490–493)	Poliomyelitis (080)
United States	**82**	**60**	**626**	**701**	**36**	**769**	**1,627**
New England	**2**		**1**	**52**	**2**	**19**	**74**
Maine				2			3
New Hampshire							
Vermont							1
Massachusetts	2			37			33
Rhode Island			1	3	1	2	5
Connecticut				10	1	17	32
Middle Atlantic	**6**	**9**	**1**	**182**	**7**	**122**	**369**
New York	6	8	(1)	80	4	84	286
New Jersey			1	56		14	34
Pennsylvania		1		46	3	24	49
East North Central	**4**	**3**	**25**	**126**	**9**	**46**	**409**
Ohio					3		98
Indiana	1			9			18
Illinois		2		36	4	32	122
Michigan	3	1		26	2	8	116
Wisconsin			25	55		6	55
West North Central	**4**	**5**	**2**	**25**	**2**	**36**	**186**
Minnesota	1	4		4		4	27
Iowa	3			1		1	95
Missouri			2	10	1	8	16
North Dakota		1		4		21	1
South Dakota				1			7
Nebraska							16
Kansas				5	1	2	24
South Atlantic	**32**	**2**	**153**	**64**	**5**	**231**	**209**
Delaware				2			3
Maryland	2	2		2		14	37
District of Columbia				2		13	15
Virginia	5		128	28		7	48
West Virginia	3			1	1	2	9
North Carolina	14			22	1		49
South Carolina	6		8			7	17
Georgia	2		17	5	3	184	14
Florida				2		4	17
East South Central	**15**		**2**	**24**	**2**	**61**	**72**
Kentucky	3				1	5	28
Tennessee	1			14	1	17	23
Alabama	6		2	3		21	8
Mississippi	5			7		18	13
West South Central	**15**	**2**	**401**	**99**	**6**	**209**	**152**
Arkansas	2		58	2	2	4	15
Louisiana	1				2	9	16
Oklahoma	1		11	6		10	19
Texas	11	2	332	91	2	186	102
Mountain	**2**		**30**	**61**	**1**	**19**	**34**
Montana			13	2			3
Idaho			3	1			8
Wyoming							
Colorado	1		4	29		9	7
New Mexico				7		2	5
Arizona			10			6	11
Utah	1			22	1	2	
Nevada							
Pacific	**2**	**39**	**11**	**68**	**2**	**26**	**122**
Washington				8			41
Oregon			8	12		8	16
California	2	39	3	48	2	18	65
Alaska						1	
Hawaii			38	2			

[1] New York City only.

Reported Cases of Selected Communicable Diseases: United States, Week Ended September 2, 1950—Continued

[Numbers under diseases are International List numbers, 1948 revision]

Area	Rocky Mountain spotted fever (104)	Scarlet fever (050)	Smallpox (084)	Tularemia (059)	Typhoid and paratyphoid fever[1] (040, 041)	Whooping cough (056)	Rabies in animals
United States	**14**	**264**		**16**	**96**	**1,683**	**122**
New England		**14**		**1**	**5**	**191**	
Maine		1				20	
New Hampshire							
Vermont		1				11	
Massachusetts		9		1	4	89	
Rhode Island					1	31	
Connecticut		3				40	
Middle Atlantic		**33**			**8**	**287**	**29**
New York		[2] 27			4	136	24
New Jersey		4				67	
Pennsylvania		2			4	84	5
East North Central	**3**	**55**		**1**	**13**	**438**	**30**
Ohio		22			6	70	5
Indiana	1	1			1	20	22
Illinois	2	13		1	4	42	
Michigan		14			1	204	3
Wisconsin		5			1	102	
West North Central	**2**	**13**		**3**	**1**	**95**	**4**
Minnesota		2				21	
Iowa		3				20	4
Missouri	1	2		2	1	38	
North Dakota		1				9	
South Dakota							
Nebraska		2					
Kansas	1	3		1		7	
South Atlantic	**7**	**47**		**1**	**16**	**182**	**15**
Delaware						7	
Maryland		4				18	
District of Columbia		2				9	
Virginia	2	5			4	42	
West Virginia		1			1	5	1
North Carolina	5	29			1	76	
South Carolina		1			2	8	8
Georgia		4			8	15	6
Florida		1		1		2	
East South Central	**1**	**40**			**10**	**32**	**23**
Kentucky		8			4	2	15
Tennessee		26			5	16	5
Alabama	1	4				12	2
Mississippi		2			1	2	1
West South Central	**1**	**20**		**6**	**24**	**261**	**18**
Arkansas	1	3		5	9	18	1
Louisiana					3		
Oklahoma		3		1	2	6	4
Texas		14			10	237	13
Mountain		**5**		**4**	**5**	**110**	**3**
Montana				1	1	10	
Idaho					1	15	
Wyoming							
Colorado		3			2	17	3
New Mexico					1	49	
Arizona						17	
Utah		2		3		2	
Nevada							
Pacific		**37**			**14**	**87**	
Washington		10				32	
Oregon		5				20	
California		22			14	35	
Alaska				1			
Hawaii						2	

[1] Including cases reported as salmonellosis.
[2] Including cases reported as streptococcal sore throat.

FOREIGN REPORTS

CANADA

Reported Cases of Certain Diseases—Week Ended August 12, 1950

Disease	New-found-land	Prince Ed-ward Island	Nova Scotia	New Bruns-wick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Al-berta	Brit-ish Co-lum-bia	Total
Brucellosis					3	1	2			1	7
Chickenpox			13		25	71	12	24	19	39	203
Diphtheria					5	1					6
Dysentery, bacillary					4		2			61	67
Encephalitis, infectious						1					1
German measles			3		2	39		8	13	7	72
Measles	2		4		71	158	16	10	3	36	300
Meningitis, meningococcal								2			2
Mumps			2		28	68	15	41	49	24	227
Poliomyelitis	1				3	19	1	1	7		32
Scarlet fever	1		1	2	7	8	2		10	3	34
Tuberculosis (all forms)	6		3	11	55	21	21	13		18	148
Typhoid and paratyphoid fever			1		4	1		2	1		9
Venereal diseases:											
Gonorrhea	2		11	7	96	43	50	24	45	65	343
Syphilis	2		5	5	66	19	1	10	1	9	118
Whooping cough	1		11		49	51	3		1	19	135

FINLAND

Reported Cases of Certain Diseases—June 1950

Disease	Cases	Disease	Cases
Diphtheria	39	Scarlet fever	713
Malaria	1	Typhoid fever	7
Meningitis, meningococcal	3	Venereal diseases:	
Paratyphoid fever	42	Gonorrhea	536
Poliomyelitis	17	Syphilis	28

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently. A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Cholera

Burma. During the week ended August 12, 1950, 28 cases of cholera, with 27 deaths, were reported.

India (French). Cholera has been reported in French India as follows: In Pondicherry, January 1–April 1, 1950, 30 cases, 24 deaths;

April 2–July 1, 177 cases, 83 deaths; July 2–29, 231 cases, 118 deaths; in Karikal, January 1–April 1, 381 cases, 199 deaths.

Plague

China. Reports of plague in China have been received as follows: January 1–31, 1950, Chekiang Province 4 cases, Fukien Province 51 cases, 23 deaths; February 1–28, Chekiang Province 10 cases (including 4 cases of pneumonic plague), 4 deaths, Fukien Province 56 cases, 52 deaths; March 1–31, Fukien Province 103 cases, 43 deaths; April 1–30, Chekiang Province 2 cases, 1 death, Fukien Province 263 cases, 95 deaths; May 1–31, Chekiang Province 7 cases, 3 deaths, Fukien Province 200 cases, 70 deaths; June 1–30, Chekiang Province 3 cases, Fukien Province 23 cases, 11 deaths.

Peru. Plague has been reported in Peru as follows: June 1–30, 1950, at Caral Farm, Chancay Province, Lima Department, 2 cases; July 1–31, in Trujillo City suburbs, Trujillo Province, Libertad Department, 1 case, and at Luya Farm, Chiclayo Province, Lambayeque Department, 1 case.

Smallpox

Arabia. On August 8, 1950, two cases of smallpox were reported in the port of Ummsaid, Qatar.

British East Africa. On July 23, 1950, three cases of smallpox were reported in the port of Minkindani, Tanganyika.

China. In Swatow, during the period January 1–March 31, 1950, 236 cases of smallpox, with 96 deaths, were reported, and 19 cases, 9 deaths were reported during the month of April. Numbers of cases reported in Shanghai since the beginning of the current year are as follows: January 1–April 29, 138 (1 death); May 20–June 24, 67; July 1–29, 47.

Yellow Fever

Gold Coast. During the period August 10–11, 1950, 1 death from suspected yellow fever was reported in the port of Accra.

Sierra Leone. The suspected fatal case of yellow fever reported at Pendembu, Kailahun District, August 1–8, 1950 (see PUBLIC HEALTH REPORTS for September 15, 1950, p. 1200) was not confirmed.

Training Course in Rat-Borne Disease

The 11th semi-annual field training course in rat-borne disease prevention and control will be held by the Communicable Disease Center, Public Health Service, in Atlanta October 2–20.

Rat-control personnel of the armed forces are especially invited, officials of the Center announced. The dangers of rat-borne disease to military personnel in our expanding military commitments make this type of training more important than ever before.

The course is designed for rat control specialists including personnel of large city and county health departments, State health departments, and the Public Health Service.

"Rat-Borne Disease Prevention and Control," a new Communicable Disease Center manual, is the basic handbook for the course.

Following the 3-week training period in rat-borne disease, the Center will give a 1-week concentrated field training course in the control of flies, mosquitoes, and other insect vectors of disease. Personnel interested in both rat and insect control may attend both courses.

Environmental sanitation is stressed as one of the most important methods of both rat and insect control.

Applications for the courses may be sent to the Medical Officer in Charge, Communicable Disease Center, 605 Volunteer Building, Atlanta, Ga. Attention: Chief, Training Services.