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EDITORIAL

THE TIME ELEMENT IN TUBERCULOSIS CONTROL

It has been emphasized in recent years that the most effective method of controlling tuberculosis is by means of chest X-ray examinations of the adult population in a definite period of time. In an attempt to achieve this objective, the United States Public Health Service is assisting State and local health departments with equipment, personnel, and consultation. Indeed, through demonstration of the effectiveness of community-wide mass X-ray surveys, the people of the nation now realize the seriousness of the tuberculosis problem in their communities and are initiating action to stamp out the disease.

The action prompted by this new technique has often been interrupted by confusion of public-health principles, a condition occasioned by varying approaches to tuberculosis control.

One group believes that the single technique of examining contacts of known cases will discover all the new cases in the community. Another group advocates an annual tuberculin test of every person as the sole means of discovering all cases of tuberculosis. A third group, mostly epidemiologists, emphasizes the damage done by hidden cases of tuberculosis and by their many unknown contacts, and urges a total assault on the disease by means of (1) community-wide X-ray surveys done within a deliberately limited period of time; (2) the concurrent establishment of adequate follow-up facilities and the examination of contacts of previously known and newly discovered cases; and (3) tuberculin testing of samples of the population at stated intervals.

Family studies and careful follow-up work in some of the best health

This is the sixteenth of a series of special issues of PUBLIC HEALTH REPORTS devoted exclusively to tuberculosis control, which will appear the first week of each month. The series began with the Mar. 1, 1946 issue. The articles in these special issues are reprinted as extracts from the PUBLIC HEALTH REPORTS. Effective with the July 5, 1946 issue, these extracts may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 10 cents a single copy. Subscriptions are obtainable at $1.00 per year; $1.25 foreign.

departments in the country have shown that examination of contacts discovers only about 25 percent of new cases reported each year. In other words, only one out of four new cases is found by examining contacts of previously known cases. Three out of four are new cases from the apparently healthy population, about whom there has been no previous record. Moreover, the principle of examining the adult population in a limited time, which is so important in the control of tuberculosis, cannot be effectively applied in a program which examines the contacts of known cases only. Too large a portion of the population is not reached at all. Unless contact examination is reinforced by other case-finding services, intense and continuous exposure of the public to hidden cases will occur. In addition, this method, if used alone, is prodigal of time, personnel, and money and can at best be only partially effective.

Annual tuberculin testing of the entire population of the United States, accompanied by X-ray examination of reactors, has been shown to be impracticable. Particularly, in large cities the major proportion of the adults are reactors to tuberculin and little is gained by tuberculin testing before X-ray examination. Tuberculin testing of sample groups of the community at intervals is extremely useful in determining changes in the infection rate from year to year. After the spreaders of the disease have been identified, treated and isolated, and contacts supervised, it might be desirable to test those whole communities where the infection rate is low. The tuberculin test, moreover, is a most efficient tool in helping to establish the diagnosis of tuberculosis after the X-ray examination.

The Tuberculosis Control Division has a limited number of demonstration units for assisting selected cities, especially those of 100,000 population and over, in surveying the majority of adults in the population, and by such means it can show that even the larger population groups in the country can be surveyed in less than 3 years. In cities under 100,000 less than 3 months is required.

The Division is prepared to provide, within the limits of its resources, expert consultation, loan of personnel and equipment to districts, States, and local communities. X-ray film of all sizes, radiology service, public health nursing, medical social work, and health education, are further aids which the Public Health Service can provide temporarily if the local health department has inadequate resources. Tuberculosis associations can give expert guidance and material support in health education, which communities must use if a successful program is to be realized. Participation of the local medical societies in diagnosis, treatment, and medical supervision constitute an additional source of aid to the community. By such means, every community can develop time-plans for tuberculosis control.

With full use of resources heretofore unrealized and with a resolute determination to wipe out tuberculosis as a social and personal problem, the large and small communities of the entire United States could be covered by mass radiography teams in less than 5 years' time.

This modern method, combined with efficient clinical and laboratory procedures for exact diagnosis, will give communities a precise knowledge of the local tuberculosis problem and will form the basis for realistic plans to remove the danger of tuberculous infection and disease. Adequately aided by money, trained personnel, laboratory, and other medical facilities, every aroused community can bring about the defeat of tuberculosis among its citizens.

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THE CONTROL OF TUBERCULOSIS IN THE AMERICAS

By THOMAS PARRAN, *Surgeon General, United States Public Health Service*

With every year our social and cultural horizon includes an expanding sphere of awareness and activity. In the field of health we have come a long way. Not many years ago, health was a matter of individual concern; but as the world became smaller, men more mobile, cities larger, and nations more closely connected, health slowly but surely became the concern of the whole community of mankind. Not only the shrinking and hastening world, but war and its devastations emphasize the universal scope of health problems. Now, in this place and time, we face the consequences of destruction. Moral failure, economic collapse, and political confusion contribute to our frustrations when we attempt to deal with the public health of our day. In the long run, we must perceive that little can be done until cooperation supersedes individualism, and unity—world unity—becomes our final spirit of approach.

In the terrible years just passed, the deaths of young men, the devastation of homes, the destruction of those things held to be good and desirable, have been sacrifices to decency and the fine dream of freedom. Yet disease is the final victor. Epidemics arrive, the starving die, the hearty fall. Malnutrition, exposure, and lack of sanitation provide the physical soil; as terror, despair, and sickness of heart compose the spiritual territory for the flourishing of disease.

Among the diseases that are now epidemic in war stricken areas, tuberculosis, which in days of peace had very nearly come under effec-

[1] A paper presented to the XII Pan American Sanitary Conference, Caracas, Venezuela, January 20, 1947.

tive control, has become again a fearful problem. Yet happily we know that tuberculosis can be, even under unfavorable circumstances, controlled and eventually eliminated. Experiences of the United States and the Scandinavian countries point the way and leave no doubt that the concentrated effort of many men and agencies in case finding, medical care and isolation, in chemotherapy and, perhaps, vaccination, can defeat a disease that takes a greater toll of lives than does the most disastrous war.

It is commonplace to observe that disease is not hampered by geographic or ethnologic barriers. Given the speed and ease of travel, the frequent movement and congress of peoples throughout the world, it is unlikely that tuberculosis can be controlled in one country if it is epidemic in another. It is in the self-interest of relatively healthy and well-fed nations to prevent the supremacy of tuberculosis in any area. But such action has a more important motive than mere self-interest, for deeply engrained in the culture of the western world is the common sympathy that man has for man, without which democracy is meaningless and ethical principles absurd.

The United States has been more fortunate than many other nations. War did not touch its soil; bombs did not reach its cities. Indeed, through the war years, the mortality rate of tuberculosis continued to decline. We cannot, however, assume that such happy circumstance is the consequence wholly of our fortunate situation. As recently as 1890 the tuberculosis death rate in the United States was 245 per 100,000 population. This is comparable to the present estimated death rate of Venezuela, which is 233 per 100,000 and that of Brazil which is 250.

From 1882, when Koch announced his discovery of the tubercle bacillus, to the year 1892, when Flick organized the Pennsylvania Society for the Prevention of Tuberculosis, there was in the United States a struggle, which must be encountered everywhere at the beginning of a control program, to establish the concept of the contagiousness of tuberculosis, as against the old and still widely accepted idea of the hereditary transmission of "consumption."

As control programs gained in force in the United States and when, by 1904, the National Tuberculosis Association was organized and the whole movement given unity of action and purpose, the death rate from tuberculosis began to decline. To be sure, many other factors, most of them inscrutable, contributed to this decline in the tuberculosis death rate. However, it must be said that the largest measure of credit should go to organized control programs.

In 1904 there were only 6 tuberculosis control programs in the United States and only 100 tuberculosis sanatoria and hospitals. In this year the tuberculosis death rate was 200 per 100,000 population.

Only 10,000 beds were available. There were no dependable means for the early diagnosis of the disease. When tuberculosis was discovered, it was far advanced and death soon followed. Little was done to isolate the tuberculous, and people by the thousands were brought in close contact with virulent organisms. Every year tuberculosis claimed the lives of thousands of children. Young men and women, who had arrived at that period of life when one is most productive, faced certain death when a diagnosis of tuberculosis was made. Because little was done to slaughter tuberculous cattle, bovine tuberculosis attacked our citizens, and extrapulmonary tuberculosis was widespread.

Between the years 1905 and 1935, the public health and clinical aspects of tuberculosis control underwent gradual but confident development. Methods of diagnosis, treatment, surgery, and health education were refined in technique, extended in application, and improved in quality. Epidemiological studies and surveys were instituted and completed; research projects were undertaken and significant advances were made.

It was in the decade between 1936 and 1946 that all control methods came to their highest peak of development. Mass radiography, with the development of the photofluorograph and the automatic phototimer; experiments in chemotherapy and antibiotics; greatly expanded research in epidemiology; health education; the development of an official national control program; and the expansion of control methods in industry, general hospitals, and the armed forces, marshalled the power of science and shaped the knowledge and understanding of men in the fight against tuberculosis. In spite of the rigors of wartime, the death rate from tuberculosis in the United States in 1945 was down to 40.1 per 100,000 population.

Until the year 1944, tuberculosis control was the job of private voluntary agencies, and the extraordinary achievements of tuberculosis control in my country is, in large measure, the result of vigorous efforts of the National Tuberculosis Association. However, it became apparent as early as World War I that official agencies were needed to guide, complement, and to cooperate in control activities. In 1919 the National Tuberculosis Association adopted a resolution urging the establishment of a division of tuberculosis control in the United States Public Health Service. It was not possible to create such a division at that time, but with the advent of World War II the National Tuberculosis Association appointed a War Emergency Committee to consider what should be done to bring about more unity in the campaign against tuberculosis. The United States Public Health Service at this time became actively engaged in this field, and soon after Pearl Harbor the Public Health Service established a small Tuberculosis Control Section in one of its Divisions. Throughout 1943 and

early 1944 the agitation continued, and, as a result of concerted effort, a comprehensive bill was introduced to Congress. That legislative body acted affirmatively, and on July 1, 1944, the Tuberculosis Control Division of the United States Public Health Service was established.

Since the inception of the Tuberculosis Control Division, the United States Public Health Service has gone forward, and has made many advances toward a realization of the objective of all agencies in this field—the eradication of tuberculosis in the United States. From the beginning we have had four major objectives in the fight against tuberculosis: (1) case finding; (2) medical care and isolation; (3) after care and rehabilitation; and (4) protection of the tuberculous patient and his family against economic distress. These objectives have been guiding principles which have produced useful findings and have created policies and procedures for the future.

In case finding, the miniature film X-ray machine has been the major tool. It permits the examination of large population groups. Before this instrument was brought to its present state of refined development, only individuals and families could be easily reached by standard X-ray equipment. Now the X-ray goes to the people, examines them in large groups, and discovers tuberculosis, mostly, in its minimal stage. The importance of this finding is made clear by the fact that in former years only 10 percent of admissions to tuberculosis hospitals were minimal cases. Today, with modern case finding techniques, 70 percent of all new cases found are minimal. Tuberculosis is at last being found when it can be relatively easily arrested.

When it began operation, the Division put special emphasis on case finding. The purpose of case finding is to discover hidden cases of tuberculosis. Such effort, in the past, was directed toward the family members of known infectious cases. Since the introduction of mass radiography, case finding has had a much greater range. It has been aimed at large population groups. The two sizeable portions of the population which can be quickly reached by mass radiography are persons admitted to general hospitals and persons employed in the industries of the nation. This second group, at the beginning of nation-wide activities, was one of the chief interests of the Tuberculosis Control Division.

It is estimated that by the end of 1946 more than 25 million persons in the United States, 16 years of age and older, will have had chest X-ray examinations through the resources of the armed forces, health departments, industry, and voluntary tuberculosis associations.

Industrial workers as a group will continue to loom large in future mass radiography plans; however, a program is already under way, through the cooperative efforts of the American Hospital Association, the National Tuberculosis Association, and the Public Health Service,

to have all general hospitals participate in case-finding projects. Such undertaking will provide for the routine X-ray examination of all patients and employees coming to general hospitals, and their out-patient departments.

Probably the most important single phase in tuberculosis control is medical care and isolation of persons with active infectious disease. Public Health principles dictate a primary interest in prevention of the spread of the disease. The desired results of case finding cannot be realized if treatment is delayed by inadequate sanatorium care. In America we are faced with the problem of providing at least 50,000 additional sanatorium beds. At present, long periods of hospitalization are necessary for the care and treatment of advanced tuberculous patients. However, as mass radiography reaches larger numbers of the population, shorter periods of care will frequently be the rule, since many of the patients will have early disease. If sufficient clinical facilities are established throughout the country, such persons, including those on ambulatory collapse therapy, may be regularly transferred to the chest clinic for treatment and supervision. Others need only enter convalescent homes for the period of transition.

Rehabilitation and aftercare are also important objectives in the frontal attack on tuberculosis. It is well known that tuberculosis is a relapsing and debilitating disease. In his readjustment to self-supporting life, the patient whose disease has become arrested must have competent medical, social, and financial guidance. This is a complex problem which requires the help of many private and public agencies interested in tuberculosis control.

Reports from the American Medical Association show that the cost of sanatorium care of the tuberculous in the United States is close to $100,000,000 each year; but this does not even closely approximate the social and economic losses sustained by tuberculous persons and their families in the same period.

When a patient leaves the sanatorium it is often necessary, because of his invalidism, to protect this person for several years after discharge. Sooner or later it will be necessary to follow the example of such countries as Denmark, and provide invalidism insurance for these unfortunate people during the period of their disability. With the knowledge gained from the social and economic studies of tuberculous families, data will be provided to make possible certain changes in our social security laws that will bring economic relief to our tuberculous families.

The protection of the tuberculous family against economic distress is a special problem in itself. Tuberculosis is a community disease which is important not only in terms of public health but also in terms

of national economy. Once the disease becomes far advanced, the affected person is usually disabled for life, or dies a premature and costly death. The family, broken by a long period of illness or by the death of the breadwinner, is almost invariably thrown on public resources for support. Accordingly, a sound medical program must be complemented by a generous plan of public assistance, particularly for the needy families of the tuberculous. If this is not done, the full benefits of other control activities, especially sanatorium care, cannot be realized. It must be remembered that tuberculosis and poverty are frequently associated. A national plan to provide adequate insurance for the family against loss of wages during the period of prolonged sickness is the only realistic answer to this problem.

In the field of antibiotics repeated and persistent efforts have been made to find a drug that would be effective in the cure of tuberculosis. Men of science in almost every nation of the world have worked through lifetimes to find a lethal agent to defeat a germ that has consistently resisted every attempt against its predatory existence. Over the years, the hopes of the ill have been lifted by such attempts at treatment as tuberculin injections, gold therapy, the application of sulpha drugs, and various vaccines. In every instance the high hopes were dashed by failure. Although investigations continued, few drug cures for tuberculosis were offered until very recently when Waksman isolated a promising compound (streptomycin) from certain species of the soil actinomycetes. Streptomycin has forged ahead, and in laboratory and animal trials, has become the current drug of promise. At the moment streptomycin is being tried on human beings; and, although no extensive controlled experiments have been performed, preliminary results not only give hope of suppressive action, even in meningitis and miliary tuberculosis, but also point the way to further investigation and search for similar antibiotics that may be even safer and more economical.

BCG vaccination on a large scale has not been the practice in the United States as it has been in South America and in Europe. Only in recent years has there been any organized effort to consider the use of BCG in my country. The successful use of this vaccine in South America and in Denmark and controlled studies among American Indians by the Office of Indian Affairs, Department of the Interior, and by the United States Public Health Service, directed the attention of researchers in the field of tuberculosis to BCG vaccine and its possible application in population groups where infection is high and hospital facilities poor. As a consequence of these studies, it was determined that the United States Public Health Service would be responsible for long-range control studies of BCG vaccination. It was determined that a central laboratory be established to produce

the vaccine, and that a large city be utilized for control studies. Within the next few years the United States Public Health Service will be in a position to make recommendations for the use of the vaccine. We feel that further research is necessary in the United States to determine the effectiveness of vaccination and also to develop a vaccine composed of dead bacilli.

We feel that one of the most interesting and significant researches that has been undertaken in the field of tuberculosis for many years is the work in nontuberculous pulmonary calcification, particularly the researches into the occurrence of histoplasmosis. Our studies demonstrated that a mild, subclinical condition, associated with sensitivity to histoplasmin, is widely prevalent in certain States and relatively infrequent in others. In general, those States in which the frequency of reaction to histoplasmin is high are those in which pulmonary calcification is also high. A very high proportion of the pulmonary calcifications observed in roentgenograms of tuberculin-negative persons is due not to tuberculosis, but probably to the agent producing histoplasmin sensitivity. Subsequent studies have confirmed these conclusions and have improved markedly the identifications of pulmonary lesions.

It should be mentioned briefly, although it is a matter of great importance, that health education for the general public, the tuberculous and their families, and professional groups, can encompass the entire field of tuberculosis control. The United States Public Health Service and the National Tuberculosis Association cooperate in the production of health education materials and work constantly day in and day out to inform the public of protective health measures and of the nature of tuberculosis as a family and community disease.

We feel strongly that tuberculosis can be controlled in any nation if control procedures such as those I have described are effectively applied. As the States of the United States work together to defeat this dreaded disease, the nations of the Western Hemisphere, sharing their experiences, facilities, and knowledge, can in concert bring tuberculosis low. We should think in terms of unity against our enemy—disease—as seriously as we think in union against threats to peace.

There is no doubt in our minds that tuberculosis can be eradicated as a plague of the people of the world. The health, the hope, the aspirations of men, now blighted by an insidious and debilitating disease, can be restored to hundreds of thousands of sick persons, so as to make them useful members of our nations. Only then can the forces of mind and spirit, defeated by preventable deaths, and weakened by lingering disease, be fully utilized in the development and maintenance of a healthy and productive world.

HISTOPLASMIN SENSITIVITY AMONG SIBLINGS [1]

By SHIRLEY H. FEREBEE, *Statistician*, and MICHAEL L. FURCOLOW, *Surgeon*, *United States Public Health Service*

Search for the cause of pulmonary calcification in persons who do not react to tuberculin led recently to the finding of a high correlation between such calcifications and reactions to skin tests with histoplasmin. Thus, Christie and Peterson (*1*) and Palmer (*2*, *3*) have shown that, in certain geographic areas, among tuberculin nonreactors, nearly all persons who have pulmonary calcifications are reactors to histoplasmin. The conditions which produce histoplasmin sensitivity are still unknown, but it seems reasonable to assume that reactions to histoplasmin and the associated pulmonary lesions are specific evidence of some kind of infection, even though the mode of transmission, clinical symptoms, and in fact, the entire etiology still remain undetermined. The fact that no definite syndrome has been described indicates that the infection is of a relatively benign nature, producing such mild effects in most instances as to pass unrecognized as an illness more serious than a mild respiratory infection.

The present study is an attempt to obtain further information regarding sensitivity to histoplasmin by determining whether there is a similarity in the skin reactions of members of the same family. If it were demonstrated that the several members of a family react similarly to histoplasmin, the implication would be that the agent producing sensitivity would tend to be present, or absent, among conditions that affect members of a family group. These conditions could be genetic, broad environmental (social, economic, geographic, etc.) or specific environmental factors localized in the home (common food supply, household pets, etc.).

MATERIALS AND METHODS

Material for the present study was taken from a survey of approximately 16,000 Kansas City, Mo., school children who were skin tested with tuberculin and histoplasmin during 1945. The schools selected for the survey were a cross section of nursery, elementary, and high schools, and one junior college, and were representative of the varying socioeconomic levels of the city. The children ranged in age from less than 1 year to 19 years. Detailed description of the age, race, sex, and other characteristics of the group with respect to tuberculin and histoplasmin sensitivity has been reported by Furcolow et al. (*4*).

The survey was a cooperative effort of the Public Schools, the Health Department, and the Tuberculosis Society, of Kansas City, Mo., and the United States Public Health Service. The histoplasmin (H_3)

[1] From the Field Studies Section, Tuberculosis Control Division.

was furnished by Dr. Chester Emmons of the National Institute of Health. The test consisted of the intracutaneous injection of a dose of 0.1 cc. of a dilution of 1 to 1,000 of a broth filtrate of a culture of *Histoplasma capsulatum*. If the induration measured 5 or more millimeters 48 hours after injection, the individual tested was considered a reactor. All others were considered nonreactors.

Since the children tested included many brothers and sisters, it was possible to assemble data on partial family groups from which a study could be made of the similarity of histoplasmin reactions among siblings.

At the outset of the present study, it is necessary to consider certain information now available regarding sensitivity to histoplasmin. Most significant is the fact that there are extreme variations in different parts of the country with respect to prevalence of histoplasmin reactors. In fact, whether an individual does or does not react to histoplasmin depends as much upon his place of residence as upon any other single factor now known. In some geographic areas, for example Colorado and Minnesota, it is rare to find a permanent resident who reacts to histoplasmin. In other areas, such as Missouri and Tennessee, reactors are more common than nonreactors.

A tabulation disregarding residence history of the sibling groups found in the Kansas City school survey would necessarily show that in some families none, or relatively few, of the children are reactors, while in others many or most of the siblings are reactors.

Some children have lived all their lives in Kansas City while others may have very recently moved there from areas where the frequency of reactors is extremely low. It would be expected that all or nearly all of the children in a family which has recently moved to Kansas City from Colorado would not react; while many of the children in a family which has always lived in Kansas City would react. Since families from areas with different levels of histoplasmin sensitivity would reflect the geographic differences in rates, and since the members of these families would tend to resemble each other because of their common residence history, demonstration of a familial factor in siblings in which previous residence is not controlled could be simply a demonstration of a fact already known: that rates of histoplasmin sensitivity differ from one area to another. A more pertinent investigation, therefore, is to determine whether among permanent residents of a single geographic area, there is a similarity among siblings in histoplasmin reaction.

With this objective in mind, the present study was limited to sibling groups who had always lived in Kansas City and its immediate environs. Further, because observed differences in rates of reactors between white and colored children in Kansas City would operate in a

somewhat similar way to that in which the geographic factor applies, it was decided to base the study only on white children.

As family rosters were not available, children who had the same surname were matched and considered siblings if the items of street address, parent's name, family doctor, and residence history were in agreement.

The statistical analysis used in the present study is one which is generally referred to as the index case method. The oldest child tested in each family group was arbitrarily designated as an index case. If the index case reacted to histoplasmin, the younger children in the family were classified as siblings of a reactor and placed in a group designated as S_R. If the index case did not react to histoplasmin, the younger children were classified as members of the S_N group, siblings of a nonreactor. It should be noted that the S_R and S_N groups consist only of younger siblings and do not contain the index cases themselves. The index cases were used only to select two contrasting groups of younger siblings.

Application of this procedure to white lifetime [2] residents among the survey group provided 1,420 family groups in which two or more children were tested. The distribution of these families according to the number of children tested is shown in table 1.

TABLE 1.—*Number of families, index cases, and younger siblings among school children tested in 1945 who were white lifetime residents of metropolitan Kansas City, Mo., according to number of tested siblings per family*

Number of tested siblings per family	Number of families	Number of children				
		Tota	Index	Younger siblings		
				Total	S_R group	S_N group
Total	1,420	3,164	1,420	1,744	766	978
2	1,166	2,332	1,166	1,166	515	651
3	204	612	204	408	194	214
4	37	148	37	111	34	77
5	7	35	7	28	12	16
6	5	30	5	25	5	20
7	1	7	1	6	6	

Each family contained one index case, the oldest child, and one or more younger siblings. For example: each two-child family contained one index case and one younger sibling; each four-child family contained one index case and three younger siblings.

The results reported below compare, in a variety of ways, the proportion of histoplasmin reactors in the two groups of younger siblings—S_R, younger siblings of index cases which reacted, and S_N, younger siblings of index cases which did not react to histoplasmin.

[2] Children were classified as "lifetime residents" of metropolitan Kansas City if they had never resided away from the city or its environs for longer than 6 months at any one time.

RESULTS

Tabulation of the results of the histoplasmin tests of the two groups of younger siblings discloses that 309 of the 766 S_R siblings, and 239 of the 978 S_N siblings reacted. A crude indication of the familial tendency in histoplasmin sensitivity is shown by the fact that 40.3 percent of the S_R siblings and only 24.4 percent of the S_N siblings were reactors. That is, the frequency of reactors was 15.9 points higher among S_R children, whose older brother or sister (the index case) was a reactor, than among S_N children, whose older brother or sister was a nonreactor, a relative difference of more than 65 percent.

Although the difference between the crude rates of histoplasmin reactors in the two groups, S_R and S_N, is statistically significant, the demonstration of a difference does not necessarily establish the existence of a familial factor. It first becomes necessary to investigate whether other factors may not have produced all or part of the observed difference.

Circumstances or conditions affecting the composition of the two subgroups, S_R and S_N, may be broadly divided into two categories; first, those which are characteristics of the family, either common environment or common genetic factors, and second, those which are characteristics of the individual. Geography and race, factors controlled at the beginning of the analysis, are examples of characteristics common to all members of a family group. Age and sex, on the other hand, are examples of attributes of the individual. Characteristics specific for the individual and not common to all members of a family could produce a similarity in histoplasmin reactions between siblings if the presence or absence of such characteristics affected histoplasmin sensitivity, and if they appeared in unequal proportions in the two groups, S_R and S_N.

It has been shown by Furcolow et al. (*4*) that histoplasmin sensitivity is closely related to age: the percentage of reactors among white lifetime residents of Kansas City increases from 5 at the age of 2 to nearly 70 at the age of 18. Similarly it has been shown (*3*) that there is a slight but consistent difference in histoplasmin sensitivity between the sexes: the percentage of reactors among males is 6 to 8 points higher than among females. It therefore becomes necessary to investigate whether age and sex may have produced all or part of the difference observed in the percentage of reactors among younger siblings (40.3 percent in the S_R group and 24.4 in the S_N group).

The percentage of reactors in the various combinations of S_R and S_N groups by sex of index case and by sex of younger sibling is shown in table 2. It will be seen that although there is a considerable variation in the prevalence of reactors according to the sex combination, the S_R groups are consistently higher than the S_N groups in the percentage of

TABLE 2.—*Number tested and percentage of histoplasmin reactors among S_R and S_N groups according to sex of index case and sex of younger sibling*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Sex		Number tested		Percent reactors			
				Crude rates		Standardized rates [1]	
Index	Younger sibling	S_R group	S_N group	S_R group	S_N group	S_R group	S_N group
Total		766	978	40.3	24.4	37.9	26.9
Male	Male	211	232	44.1	25.9	42.3	30.4
Male	Female	206	240	36.4	22.9	34.5	26.1
Female	Male	177	254	38.4	23.2	35.4	25.4
Female	Female	172	252	42.4	25.8	38.6	28.1

[1] Average rates standardized for age distribution of index cases. The standardized rates used in this paper have been obtained by applying rates for individual age points to a standard population, the total of all children in the Kansas City surveys.

reactors. Whatever the sex of the index case and whatever the sex of the younger sibling, a greater proportion of reactors is found among siblings of index cases which react.[3]

Examination of the sex composition of the two groups, S_R and S_N, discloses that males comprise 50.5 percent of the S_R group and 49.7 percent of the S_N group. Since the sexes are represented almost equally in the two groups and the sex difference in histoplasmin sensitivity is not large among all Kansas City school children, it does not appear that sex could have produced any appreciable part of the observed difference in the frequency of reactors in the S_R and S_N groups.

The ages of the individuals in the family units affect the frequency of reactors in those families, and consequently, in the two groups of younger siblings, S_R and S_N. In this study, the material has been analyzed from two points of view with respect to age. While the simplest and most direct method is not entirely satisfactory, it is necessary to consider it first in some detail.

The initial analysis to take account of the age factor is simply to subdivide both the S_R and S_N groups according to age, calculating for each separate age class the percentage of histoplasmin reactors. The result of this procedure is shown in table 3 and figure 1. From examination of this material it is evident that at all but the earliest ages, the percentage of reactors is higher in the S_R than in the S_N group. After the fourth year, the frequency of reactors in the S_R group is from 7 to 16 points higher than in the S_N group. In other words, when the age of the younger siblings has been controlled by this rather simple procedure, the rate of reactors is higher among siblings of a reactor than among siblings of a nonreactor.

Although straightforward, this method of analysis takes account only of the age of the children composing the two groups, S_R and S_N.

[3] A complete analysis of histoplasmin reactors among the different combinations of siblings according to sex is beyond the scope of this paper. Further investigation with other techniques is planned.

TABLE 3.—*Number tested and percentage of histoplasmin reactors among S_R and S_N groups according to their age*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of younger sibling	Number tested		Percent reactors [1]	
	S_R group	S_N group	S_R group	S_N group
Total	766	978	40.3	24.4
Under 3	2	29	----------	3.4
3-4	20	40	5.0	5.0
5-6	138	276	26.1	10.1
7-8	154	241	29.9	22.4
9-10	155	168	39.4	31.5
11-12	116	101	51.7	40.6
13-14	125	102	56.8	48.0
15-16	53	20	60.4	55.0
17-18	3	1	----------	----------

[1] Rates based on less than 10 children not computed.

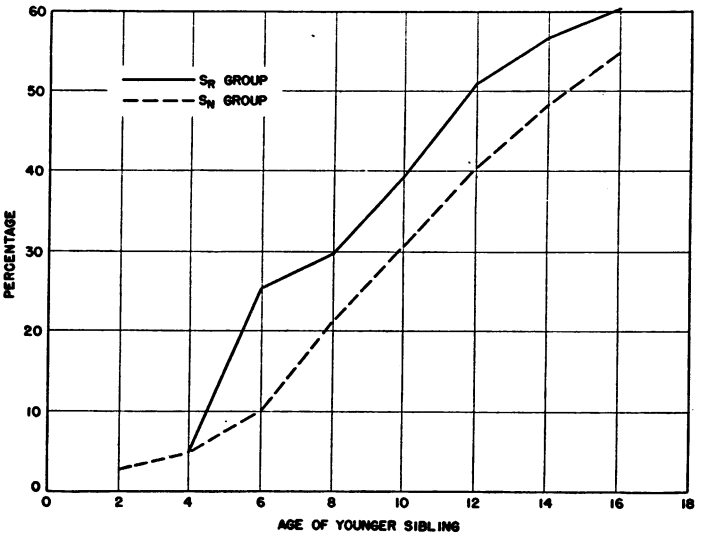

FIGURE 1.—Percentage of histoplasmin reactors among S_R and S_N groups according to their age: White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo. (Rates based on less than 10 children not shown.)

There is, however, another influence which age might have on the results—that produced by the age of the index cases, whose histoplasmin reactions were used to define the two groups S_R and S_N. To make the analysis entirely independent of the age factor, it would be necessary to classify members of the S_R and S_N groups not only by their own age but also by the age of the older brother or sister (the index case) and then to compare the percentage of reactors in the two groups S_R and S_N for each combination of age of index case and age of younger sibling.

Table 4 below shows for the S_R and S_N groups the number of reactors among the number of younger siblings tested, according to the age of the sibling and the age of the index.

TABLE 4.—*Number of histoplasmin reactors and nonreactors among S_R and S_N younger siblings, by age of younger sibling and age of index case*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of index	Histoplasmin reaction of younger sibling	Age of younger sibling: Total	Under 4	4	5	6	7	8	9	10	11	12	13	14	15	16	17
S_R group (766 siblings of index cases which react to histoplasmin)																	
Total	R [1]	309		1	13	23	24	22	25	36	33	27	33	38	22	10	2
	N [2]	457	5	16	46	56	55	53	40	54	26	30	31	23	19	2	1
Under 5	R																
	N																
5	R																
	N	3		1	2												
6	R	3		1	1	1											
	N	7	3	3	1												
7	R	5			4	1											
	N	4		1	2	1											
8	R	6			3	3											
	N	22	1	3	7	10	1										
9	R	12			1	4	5	1	1								
	N	25		2	5	4	10	4									
10	R	18				6	3	6	3								
	N	41		1	9	6	10	9	4	2							
11	R	28				2	4	6	8	7	1						
	N	55	1	2	8	7	10	10	11	5	1						
12	R	25			3	1	4	1	4	7	5						
	N	62			4	12	5	10	8	13	9	1					
13	R	28			1	3	2	2	1	9	8	1	1				
	N	48		1	4	6	4	7	6	11	5	4					
14	R	51				1	4	4	4	6	10	12	9	1			
	N	38		1	2	3	2	3	3	6	4	9	5				
15	R	42				1	1	1	3	3	4	7	11	10	1		
	N	68		1	1	4	6	6	5	9	4	8	15	7	2		
16	R	52						1	1	2	4	4	8	20	10	2	
	N	56			1	2	5	1		7	3	4	10	13	10		
17	R	29					1			2	1	3	3	5	9	5	
	N	26				1	2	3	3	1		4	1	3	5	2	1
18	R	6												1	1	3	1
	N	2													2		
19	R	4											1	1	1		1
	N																
S_N group (978 siblings of index cases which do not react to histoplasmin)																	
Total	R [1]	239	1	2	15	13	18	36	30	23	19	22	21	28	10	1	
	N [2]	739	45	21	136	112	111	76	64	51	41	19	34	19	6	3	1
Under 5	R	1	1														
	N	17	17														
5	R																
	N	30	20	1	9												
6	R	2			1	1											
	N	27	3	7	11	6											
7	R	2			2												
	N	54	3	3	34	14											
8	R	7			2	2	1	2									
	N	62		4	20	23	14	1									
9	R	19			6	4	6	2	1								
	N	74		1	13	18	28	14									
10	R	22		1	2	1	2	11	5								
	N	56	1	1	10	13	14	10	6	1							
11	R	28				2	4	9	8	5							
	N	74	1	2	8	12	10	17	19	4	1						
12	R	19			1		1	3	9	3	2						
	N	94			11	9	18	17	11	16	10	2					
13	R	21				3		5	3	4	2	2	2				
	N	72		2	9	8	12	7	10	12	8	3	1				
14	R	30			1		4	2	1	6	5	7	4				
	N	61			6	5	7	2	9	8	12	5	6	1			
15	R	29		1				1	2	3	5	6	8	2	1		
	N	54			3	2	6	6	5	6	5	1	15	5			
16	R	43								2	1	6	6	22	6		
	N	49			1	2	1	1	3	4	3	7	9	13	3	2	
17	R	12						1	1		3		1	4	2		
	N	14			1		1	1	1		2	1	3		3		1
18	R	4									1	1			1	1	
	N	1														1	
19	R																
	N																

[1] R = Reactor.

[2] N = Nonreactor.

From examination of the data in table 4, it is obvious that to obtain stable rates of the frequency of reactors for an age-by-age comparison would require a much larger number of observations than are available in this material. From these data, however, it is possible to obtain some information which bears on the problem of determining the effect of ages of sibling and of index case on the analysis of familial factors in histoplasmin sensitivity. Table 5 and figure 2 show the average age of the index cases of S_R siblings and S_N siblings according to the age of the sibling. It will be seen that S_R siblings of nearly all ages have older index cases than S_N siblings. The effect

TABLE 5.—*Number and average age of index cases according to the age of the younger siblings in the S_R and S_N groups*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of younger sibling	Number of index cases		Average age of index cases [1]	
	S_R group	S_N group	S_R group	S_N group
Total	766	978		
Under 3	2	29		4.3
3–4	20	40	8.9	7.2
5–6	138	276	10.5	9.3
7–8	154	241	11.9	11.1
9–10	155	168	12.9	12.6
11–12	116	101	14.2	14.3
13–14	125	102	15.6	15.5
15–16	53	20	16.6	16.5
17–18	3	1		

[1] Averages based on less than 10 children not computed.

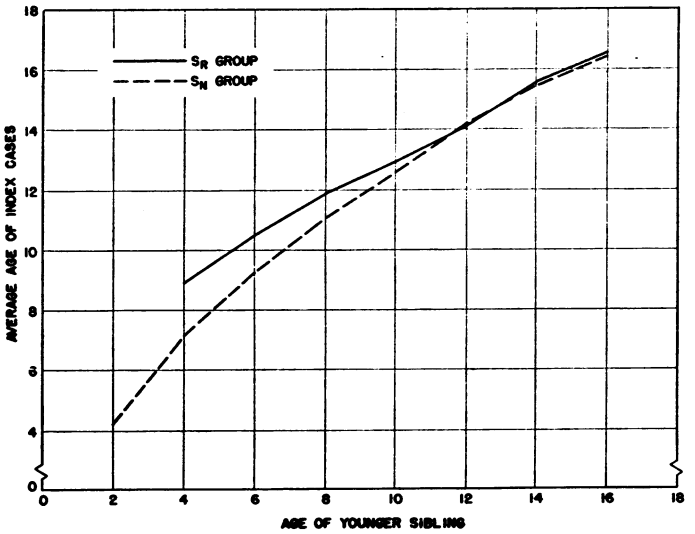

FIGURE 2.—Average age of index cases according to the age of the younger siblings in the S_R and S_N groups: White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo. (Averages based on less than 10 children not shown.)

of such differences in ages of the index cases on the proportion of histoplasmin reactors in the S_R and S_N groups is difficult to evaluate. It is clear, however, that any possible influence of the age of the index case is not fully controlled when, as in table 3 and figure 1, the S_R and S_N groups are compared according to age of the siblings.

Another method of analysis, which more adequately controls the ages both of siblings and their index cases, is presented. The method involves the comparison of the S_R and S_N groups through the subdivision of the sibling groups according to the ages of the index cases. Examination of table 6 and figure 3, which give the average ages of

TABLE 6.—*Number and average age of the younger siblings in the S_R and S_N groups according to the age of the index case*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of index case	Number of younger siblings		Average age of younger siblings [1]	
	S_R group	S_N group	S_R group	S_N group
Total	766	978		
Under 7	13	77	4.0	3.4
7–8	37	125	5.3	5.5
9–10	96	171	6.8	6.7
11–12	170	215	8.1	8.0
13–14	165	184	9.7	9.0
15–16	218	175	11.9	11.8
17–18	63	31	13.2	12.4
19–20	4			

[1] Averages based on less than 10 children not computed.

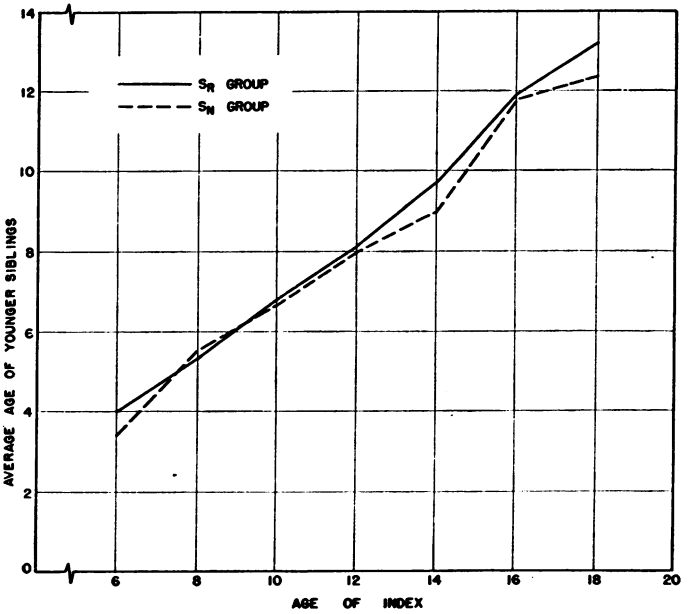

FIGURE 3.—Average age of S_R and S_N younger siblings according to age of index case: White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo. (Averages based on less than 10 children not shown.)

younger siblings of reactor and nonreactor index cases, shows that in every age class, the S_R and S_N siblings have very nearly the same average age. It appears that the histoplasmin sensitivity of the index cases has no differential effect on the ages of their younger siblings; that is, the younger siblings of a reactor have practically the same age distribution as the younger siblings of a nonreactor. Comparison of figures 2 and 3 reveals that there is very much closer agreement between the average ages of S_R and S_N siblings according to the age of their index cases than there is between the average ages of index cases according to the age of their S_R and S_N siblings.

The foregoing investigation of the age factor in the comparison of the S_R and S_N groups leads to the conclusion that subdivision of the two groups according to the age of index case would come closer to the complete control of the age factor than does the more direct method of simply classifying the two groups of S_R and S_N children according to their own ages. Therefore, the 766 younger siblings in the S_R group and the 978 younger siblings in the S_N group have been subdivided according to the age of their index cases and the percentages of reactors among siblings have been calculated. The results of this analysis are presented in table 7 and figure 4.

TABLE 7.—*Number tested and percentage of histoplasmin reactors in the S_R and S_N groups according to the age of the index case*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of index case	Number tested		Percent reactors [1]	
	S_R group	S_N group	S_R group	S_N group
Total	766	978	40.3	24.4
Under 7	13	77	23.1	3.9
7–8	37	125	29.7	7.2
9–10	96	171	31.3	24.0
11–12	170	215	31.2	21.9
13–14	165	184	47.9	27.7
15–16	218	175	43.1	41.1
17–18	63	31	55.6	51.6
19–20	4			

[1] Rates based on less than 10 children not computed.

The percentage of reactors is higher at all ages among the S_R group than among the S_N group. Examination of table 7 and figure 4 shows that among siblings of an index case which reacts, the percentage of reactors rises from 23.1 for siblings of an index case under 7 years of age to 55.6 for siblings of an index case of the age group 17–18 years. Among siblings of an index case which does not react, the percentage of reactors increases from 3.9 for siblings of an index case under 7 years to 51.6 for siblings of an index case of 17 or 18 years of age.

The differences between the two groups decrease rather markedly

with increasing age of the index case. For siblings of index cases under 7 years of age, there is a difference of 19.2 points between the S_R and S_N groups, while for siblings of index cases of 17 or 18 years of

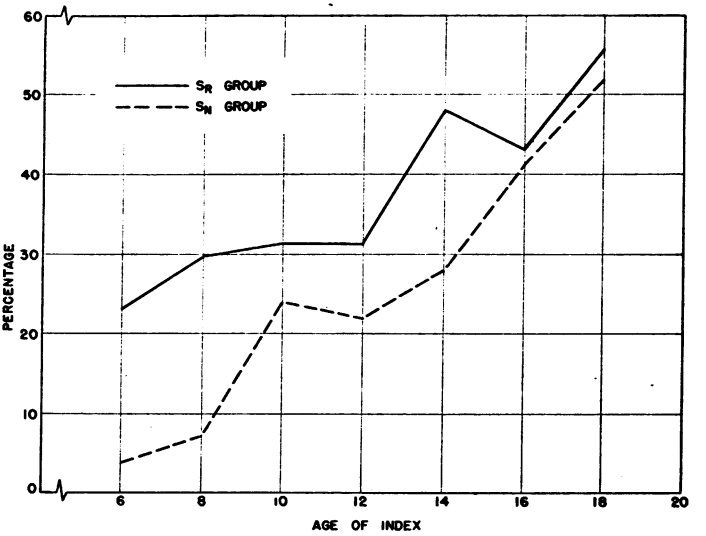

FIGURE 4.—Percentage of histoplasmin reactors among S_R and S_N groups of siblings according to the age of the index case: White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo. (Rates based on less than 10 children not shown.)

age, the difference between the S_R and S_N groups is only 4 points.

The fact that differences in the percentage of positive reactors are greatest at the younger ages becomes even more striking when the difference between the S_R and S_N groups whose index cases are less than 9 years old is compared with the difference between the two groups whose index cases are 15 or more years of age. When the index case is less than 9 years old, the percentage of histoplasmin reactors is almost 4 times (or 375 percent) higher in the S_R than in the S_N group, while when the index case is 15 or more years old, the percentage is only 9 percent higher in the S_R than in the S_N group.

The data may be used to bring out further details of the similarity of histoplasmin reactions among siblings by consideration of the effect of the interval between the ages of the index case and the younger sibling. It is possible to subdivide the S_R and S_N groups according to the age-interval between the index case and the younger sibling. Table 8 and figure 5 show the percentage of reactors among the younger siblings in the S_R and S_N groups, first where the age interval between the index case and the younger sibling was no longer than 2 years, and second where the interval was longer than 2 years. While the subdivision of the data in this way reduces the number of cases in each age group to the point where percentages are less stable, there are apparently greater differences between the S_R and S_N groups when the

comparison is made for brothers and sisters who are less than 2 years apart in age. After rates have been standardized for age, there is a difference of 16.9 points between the S_R and S_N groups when the age interval is no more than 2 years, while the comparable difference between the two groups is 6.9 points if more than 2 years in age separates the index case and his sibling. That is, there is greater similarity in histoplasmin reactions of siblings when the ages of the children are closer.

TABLE 8.—*Number tested and percentage of histoplasmin reactors in the S_R and S_N groups, according to the age of the index case and the interval between ages of sibling and index case*

[White school children tested in 1945 who were lifetime residents of metropolitan Kansas City, Mo.]

Age of index case	Number of years between ages of index case and siblings							
	No longer than two years				Longer than two years			
	Number tested		Percent reactors [1]		Number tested		Percent reactors [1]	
	S_R group	S_N group	S_R group	S_N group	S_R group	S_N group	S_R group	S_N group
Total	328	432	[2] 44.4	[2] 27.5	438	546	[2] 25.4	[2] 18.5
Under 7	10	59	33.3	5.1	3	18	----	0.0
7–8	22	93	36.4	7.5	15	32	20.0	6.3
9–10	45	84	35.6	29.8	51	87	27.5	18.4
11–12	68	70	41.2	25.7	102	145	24.5	20.0
13–14	55	41	58.2	41.5	110	143	42.7	23.8
15–16	101	77	53.5	50.6	117	98	34.2	33.7
17–18	26	8	69.2	----	37	23	45.9	56.5
19–20	1	----	----	----	3	----	----	----

[1] Rates based on less than 10 children not computed.
[2] Average rate standardized for age distribution of index cases.

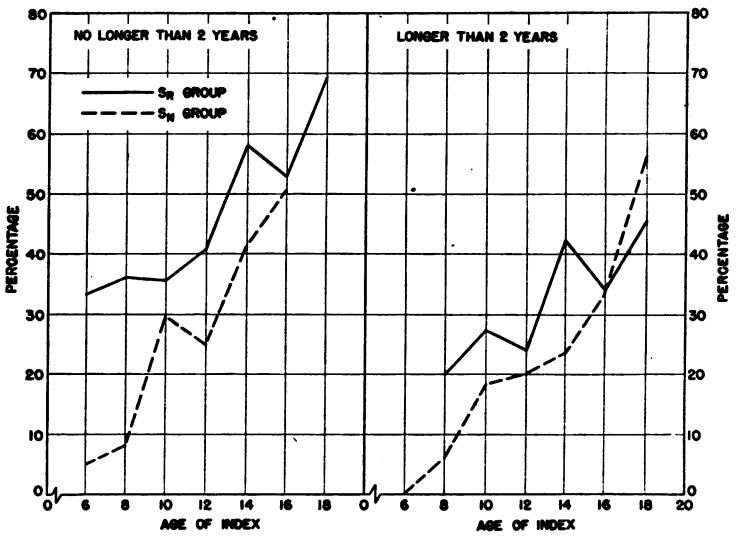

FIGURE 5.—Percentage of histoplasmin reactors among S_R and S_N groups of younger siblings according to the age of the index case and the interval between the ages of sibling and index.

The influence of the number of years between the ages of the index case and the sibling is reflected in the material shown in table 7 and figure 4. It is evident that when the index case (the older sibling) is only 6 years of age, the younger siblings must necessarily be closer in age to the index case than when the index case is, for instance, 16 years of age. Since the evidence in table 8 and figure 5 is that the difference in percentage of reactors in the S_R and S_N groups tends to become less with an increase in the number of years between the ages of index case and the younger sibling, it may well be that the convergence of the S_R and S_N curves in figure 4 is in part a result of the increase in the interval between the ages of the index case and the younger sibling. However, even when the index case and younger sibling are no more than 2 years apart in age, the differences in percentage of reactors in the S_R and S_N groups decrease with increasing age of index case.

DISCUSSION AND SUMMARY

The present paper, based on an analysis of histoplasmin skin tests of siblings found among white children who were lifetime residents of the metropolitan area of Kansas City, Mo., is an attempt to determine whether there is a similarity in histoplasmin reactions among children in the same family. The method of analysis involves a comparison of the percentage of histoplasmin reactors in two groups of younger brothers and sisters, those who have an older sibling who reacts to histoplasmin and those who have an older sibling who does not react to histoplasmin.

The analysis of 1,744 children, 766 of whom have an older sibling who reacts to histoplasmin and 978 of whom have an older sibling who does not react to histoplasmin, shows:

1. That there is a similarity in the histoplasmin reaction between children in the same family: The percentage of reactors is higher among children whose older sibling is a reactor than among children whose older sibling does not react.

2. That the similarity grows less marked as the children grow older: The difference in the percentage of reactors between children with an older sibling who reacts and children with an older sibling who does not, decreases with increasing age of the older child.

3. That the closeness in age of siblings influences the degree of similarity, as shown by the fact that the differences in percentage of reactors among siblings of a reactor and of a nonreactor are greater when there is no more than 2 years difference in age between the two children.

4. That, after the similarity between siblings produced by the known factors affecting the frequency of histoplasmin reactors

(geography, age, sex, and race) has been eliminated, there is still present some factor which makes siblings of a reactor more likely to react to histoplasmin than siblings of a nonreactor.

5. That the determination, by further detailed study, of the nature of the differences between siblings of a reactor and siblings of a nonreactor might well disclose other factors causing variation in levels of histoplasmin sensitivity.

While the analysis of the data given here clearly reveals a similarity between histoplasmin reactions of children in the same family in metropolitan Kansas City, it should be noted that there is not a high degree of concentration of reactors in some families and of nonreactors in other families. This suggests that the agent producing histoplasmin sensitivity is not likely to be confined to that type of factor which would be found within the common familial environment in some families and entirely lacking in the familial environment of others. Rather, there is implied a factor broader, and less localized, than one limited by familial environment.

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Abstract[1] of

DIAGNOSTIC DEMONSTRATION OF TUBERCLE BACILLI[2]

Demonstration of the presence of tubercle bacilli remains the surest means of detecting tuberculosis. Indeed, there is greater need for such demonstration as other diagnostic methods find increasing employment. Direct microscopic examination for tubercle bacilli does not suffice, and broad experience has taught that two other demonstration techniques are more reliable—cultivation and the inoculation of guinea pigs. For specimens with very few bacilli, the latter technique is generally preferred.

The State Serum Institute, Copenhagen, however, has found cultivation to be better as a rule than the guinea pig test. Jensen, Lester and Tolderlund presented evidence of the superiority of cultivation in

[1] From the Office of the Chief, Tuberculosis Control Division, United States Public Health Service.

[2] By Johannes Holm and Vera Lester, Tuberculosis Department, State Serum Institute, Copenhagen, Denmark; Acta Tuberculosea Scandinavica, vol. XVI, Fasc. pp. 3–4 (1941).

a report [3] on the examinations made in the Tuberculosis Department of the Institute from January 1, 1937, to June 1, 1938.

Changes have since been made in the technique of cultivation employed in this department. The present study, based on plentiful material, compares the yielding capacity of the guinea pig test with that of cultivation as now practiced.

NATURE OF THE MATERIAL

In the extended examination for tubercle bacilli in man, the Tuberculosis Department of the Institute serves as a central laboratory for the entire state of Denmark. Specimens of various kinds are received—gastric lavage, expectorate, pleural tissue, spinal fluid, urine, etc. Some are sent in for verification of positive findings and for typing of the bacteria. Most of the expectorates contain relatively few tubercle bacilli, undetected by repeated microscopy.

From June 1, 1938, to February 28, 1941, the department examined 40,956 specimens, of which 20,090 were tested simultaneously by cultivation and guinea pig inoculation. The presence of tubercle bacilli was demonstrated in 3,731 of the specimens that were examined by both techniques. These positive findings are the basis of the following comparison.

COMPARISON OF THE RESULTS OF CULTIVATION AND GUINEA PIG INOCULATION

In comparing the two techniques, the types of tubercle bacilli found in the specimens must be considered. The bovine type is much harder to cultivate than the human type, and in demonstrations of the former, the guinea pig test is superior to cultivation. Typing was possible for every positive specimen. The 3,731 positive findings, tabulated as to demonstration technique and type of organism, are presented in table 1.

TABLE 1.—*Comparison of cultivation and guinea pig inoculation as techniques for demonstrating tubercle bacilli, based on 3,731 positive specimens*

Type of tubercle bacilli	Number of specimens				
	Guinea pig test		Cultivation		Total positive: (1) and (3)
	(1) Positive	(2) Failed	(3) Positive	(4) Failed	
Human	2,500	773	3,026	247	3,273
Bovine	402	56	382	76	458
Total	2,902	+ 829 or	3,408	+ 323 =	3,731

[3] Acta Tuberculosea Scandinavica, vol. XIV, p. 124 (1940).

In addition to positive findings, table 1 gives the number of specimens for which either method failed. Naturally the number is minimal, since only those failures are included that were proved by the other test. The guinea pig test was said to have failed if no sign of tuberculosis was discovered at autopsy, either 6 weeks after inoculation or upon death of the animal before the 6 weeks had passed. Cultivation failed if no colony of tubercle bacilli appeared *in vitro* 6 weeks after inoculation, or if the cultures were "contaminated"—overgrown with bacteria other than tubercle bacilli.

Table 1 indicates that cultivation is considerably more sensitive on the whole than guinea pig inoculation. While cultivation failed in 323 instances (8.6 percent of 3,731), the guinea pig test failed in 829 (22.2 percent).

In the demonstration of bovine tubercle bacilli, the guinea pig method was superior. Guinea pig inoculation failed for 56 (12.2 percent) of the 458 bovine-positive specimens, while cultivation failed for 76 (16.6 percent).

The relation of cultivation failures to kind of specimen is shown in table 2.

TABLE 2.—*Distribution of cultivation failures by kind of specimen, showing proportion of failures to total specimens positive*

Kind of specimen	Total specimens positive	Cultivation failed (guinea pig test positive)	
		Number	Percent
Gastric lavage	1,371	95	7
Expectorate	543	21	4
Pleural exudate	247	24	10
Spinal fluid	96	6	6
Urine	886	135	15
Pus, tissue, etc	888	42	7
Total	3,731	323	8.6

The success of the guinea pig test depends largely upon whether the inoculum is homogenized. Specimens used for guinea pig inoculation were tested in the native state, unless judged to contain numerous microbes pathogenic for animals. The best results of inoculation were obtained with urine specimens, tested in the native state in most instances. Nearly all specimens were homogenized for cultivation, though even gentle homogenization so damaged the organisms that the results were adversely affected.

Colony count was used to estimate the bacillary content of cultures, which varied considerably with the kind of specimen. The larger the content, the greater the probability of a positive guinea pig test. When cultivation yielded more than 100 colonies of tubercle bacilli per tube, a guinea pig inoculated with that specimen rarely failed to

show tuberculosis; and when the number of colonies was five or less, the inoculation failed in about half the tests—more often with human tubercle bacilli than with bovine.

An established procedure in this department has been to divide each specimen equally for inoculation and cultivation. Even so, it might be assumed that an absence of tubercle bacilli from the portions used for inoculation is responsible for the increasing failures as the bacillary content falls. The assumption, however, can hardly be accepted as a full explanation of the increase in failures when the amount of increase is considered.

It is concluded that a certain minimal number of tubercle bacilli capable of propagation is required for the production of tuberculosis in guinea pigs. This number probably depends on several conditions. Doubtless the initial virulence of the bacilli and the degree of attenuation from homogenization are significant. The variable resistance of the guinea pigs is an important factor.

FAILURES OF THE TESTS

Throughout the study period, 122 cultures were contaminated and 136 guinea pigs died from causes other than tuberculosis. These failures showed a pronounced seasonal variation. A distribution of the data by months (combined—e. g., June 1938–40 data under "June") is presented in table 3.

TABLE 3.—*Distribution, by months, of failures from contaminated cultures and guinea pig deaths (nontuberculous), based on 3,731 positive specimens*

Month (June 1, 1938–Feb. 28, 1941)	Total positive specimens	Failures			
		Contaminated cultures		Guinea pig deaths	
		Number	Percent	Number	Percent
January	350	8	2.3	23	6.6
February	333	6	1.8	16	4.8
March	277	5	1.8	12	4.3
April	247	7	2.8	13	5.3
May	288	14	4.9	16	5.5
June	366	14	3.8	12	3.3
July	315	16	5.1	5	1.6
August	320	19	5.9	3	.9
September	279	8	2.9	7	2.5
October	321	10	3.1	5	1.6
November	369	11	3.0	11	3.0
December	266	4	1.5	13	4.9
Total	3,731	122	3.3	136	3.7

The percentage of contaminated tubes was highest in the summer months, May–August. This may be explained by the fact that during transit to the Institute the contaminating microbes have an opportunity for multiplication, to which heat is conducive.

The seasonal variation in failures from guinea pig deaths, more

frequent in winter and spring, may be associated with the general resistance of the animals. Infection with type 19 pneumococci caused the great majority of nontuberculous deaths. Nearly all the guinea pigs were carriers, and experiment showed that many died from pneumococcal infection when resistance was lowered by change of diet. During the months when most deaths occurred, the diet of the animals had less sufficiency.

Attempts were made to determine whether general resistance was a factor in the incidence of tuberculosis. Further comparisons of the results of testing by the two methods revealed that the sensitivity of inoculation did not increase as general resistance fell. The conclusion must be that seasonal variations in diet did not alter the resistance of the guinea pigs to infection with tubercle bacilli.

DISCUSSION

On the basis of the present material, it is reasonable to conclude that the guinea pig test could safely be omitted for a large proportion of specimens. Of 20,090 specimens tested by cultivation and guinea pig inoculation, 3,731 were found to contain tubercle bacilli. If cultivation alone had been used, tubercle bacilli would have been missed in only 323 instances of demonstrable presence. For each failure of cultivation, 62 guinea pigs were employed.

The Tuberculosis Department has adopted the procedure of only using the guinea pig test for examination of urine and a few other specimens, such as tissue that cannot be readily divided for cultivation. (See table 2.) Rather than examine one specimen by both techniques, the department will examine two specimens from the same patient by cultivation alone.

When cultivation alone is used, the examiner must be highly skilled. The work involves the danger of mistaking saprophytes for tubercle bacilli, and only great experience enables one to distinguish with certainty between colonies of the two groups. Even the expert will sometimes be doubtful, and he must then test the suspected colony on guinea pigs. Intracutaneous inoculation is particularly suitable, since it permits the testing of as many as four cultures on one animal. Results are obtained earlier by this method than by intraperitoneal or subcutaneous inoculation.

Cultivation offers other than economic advantages over the guinea pig technique. Typing is made possible through direct observation of the colonies. Again, a positive diagnosis can usually be obtained in 3 or 4 weeks, whereas 6 weeks is required for the guinea pig test.

The technique of cultivation as now practiced in the Tuberculosis Department of the State Serum Institute, Copenhagen, is described below. [The passage is quoted from the original article.]

CULTIVATION OF TUBERCLE BACILLI

The two most important factors in good culture results are a suitable culture medium and proper treatment of the material that is to be examined; and this requires a well-trained personnel under continual control.

The culture medium employed by this department for the last 10 years is a modification of Löwenstein's medium as given by K. A. Jensen (Centralbl. f. Bact. I Abt. Orig. p. 125, 1932) but since modified somewhat. It now is made up as follows:

Löwenstein's Medium

	Percent	*1 flask*	*4 flasks*
Salt solution:			
Monopotassium phosphate	0.4	2.4 g.	9.6 g.
Magnesium sulphate	0.04	0.24 g.	0.96 g.
Magnesium citrate	0.1	0.6 g.	2.4 g.
Asparagin	0.6	3.6 g.	14.4 g.
Glycerine (twice distilled)	2	12 cc.	48 cc.
Redistilled water		600 cc.	2400 cc.
Potato flour	5	30 g.	4 X 30 g.
Eggs		1 l. = 1⅝ kg.	4 l. = 5½ kg.
Malachit-green 2 percent sol.		20 cc.	80 cc.

The salt solution is heated in a pot till all is dissolved; then it is poured into flasks, 612 cc. into each flask, and "koched" for 2 hours. Next day 30 g. of potato flour is added to each flask.

The flasks are boiled under continual shaking, on water-bath, till the content is clear; then boiling for 15 minutes whereafter the flasks are left standing in water-bath for 1 hour at 56°.

Only fresh eggs are employed—eggs laid by hens fed on greens.

The eggs are washed in a 5 percent soda and soap solution for 30 minutes; then they are placed in running cold water (till this water is perfectly clear); then they are broken into a sterile flask, shaken well and filtered through sterile gauze.

Two liters of egg are mixed with 2 flasks of salt solution and to this is added 40 cc. of malachit-green. The mixture is left standing for 1 hour before tubing into tubes of Jena glass, in a layer of about 5½ cm. in height. The medium is solidified in slanting tubes at 88°–85° for 40 minutes. The cotton stoppers are trimmed and paraffined.

As tubercle bacilli of bovine type grow more rapidly and readily on media containing no glycerine, another batch of this medium is made up after the same recipe with omission of glycerine.

For each specimen 5 culture tubes are employed, 3 with glycerine and 2 without.

It is very important that the preparation of the culture medium follow closely the given directions, as even small changes may jeopardize the result. It is advisable to keep the culture medium at cellar temperature, not exposed to drying or sunshine. The medium should be used fairly soon after its preparation. In most of our cases the medium has been only a few days old, and very seldom has it been more than 1–2 weeks old.

As contamination of the cultures is the reason for a high percentage of the failures, it is important in every way to take precautions against this possibility. For this reason, as far as possible, the specimens are taken under treatment as soon as they arrive at the institute; or they are placed at once in a refrigerator, where they are left till they can be dealt with. This applies especially to the gastric lavage specimens, which are received in 300 cc. flasks and left standing overnight for sedimentation.

For the same reasons, care is taken that only sterilized instruments and utensils come in contact with the specimens. Hence the institute supplies the physicians and hospitals with sterile mailing tubes for transport of the specimens.

The glasses, pipettes, dishes, rubber stoppers and rubber caps, homogenization fluids, and water used for the specimens are sterilized, and great care is taken not to expose them to contamination in the many manipulations.

The treatment of the specimens takes place in centrifuge tubes with a capacity of about 12 cc. During the homogenization, which requires energetic shaking of the specimen, the tubes are stoppered with a reversed rubber stopper; otherwise they are sealed with a tight-fitting rubber cap—for instance during the centrifuging, which is done at a rate of 3,000 revolutions per minute for 15 minutes.

The homogenization is carried out either with 6 percent H_2SO_4 at room temperature for 10 minutes, or with 4 percent NaOH at 37° for 15 minutes, depending on the nature and consistency of the specimen.

Acid homogenization is used for all the specimens which contain no solid, tough, or very slimy elements (most specimens of gastric lavage and urine, clear pleural exudate, ascitic fluid. spinal fluid, and synovial fluid, without any large clots, besides a few specimens of sputum and pus). All liquid specimens are first centrifuged for 15 minutes, and the sediment is used for the examination. Of the more solid specimens (sputum, pus, etc.) about 2 cc. is withdrawn for examination. Such a sample is mixed with about 2 cc. 6 percent H_2SO_4, and the mixture is shaken energetically, left standing at room temperature in the dark for 10 minutes during which it is repeatedly shaken vigorously. Then the tube is filled with distilled water, and it is centrifuged. Culture tubes are inoculated with the sediment (not neutralized).

Alkali homogenization is employed for the other specimens, especially the ones that are fairly solid or very slimy, on which a marked mixed infection is suspected (most specimens of expectorate and pus, very slimy sediment from gastric lavage, 24-hour urine, feces, tissues, turbid or clotting exudates). A sample of 1–2 cc. of the specimen is transferred to a centrifuge tube, which then is filled two-thirds with 4 percent NaOH, whereafter it is shaken vigorously. The tube is incubated at 37° for 20 minutes, during which it is repeatedly shaken vigorously. After centrifuging, the sediment is neutralized with 1–2 drops of 2 n HCl (without indicator) and used for inoculation of the culture tubes.

In nearly every instance the cultures are made with homogenized material. But with clear specimens of pleural exudate, ascitic fluid, spinal fluid and exudate from synovial cavities, 1–2 culture tubes are inoculated with non-homogenized sediment from the first centrifuging.

The culture tubes are inoculated by means of a Pasteur pipette, and all the available sediment is used for the cultures. Immediately before the inoculation of a culture tube, all the condensation water is poured off from the tube.

The inoculated tubes are sealed carefully with paraffin and incubated for 6 weeks at 37°. All the tubes are inspected once a week, the first time 2 weeks after inoculation.

In cultures with vigorous growth, the growth may become macroscopically visible after 14 days. In a majority of cultures the growth becomes macroscopically visible within 4 weeks. From every specimen that gives macroscopically visible colonies, a smear is made that is stained after the Ziehl-Neelsen method. If necessary, the tubes are kept under further observation till a reliable type diagnosis may be made. If required, a subculture is made and tests carried out for estimation of the animal pathogenicity of the strain, partly in order to establish the typing if the colonies look somewhat atypical, partly to avoid that acid- and alcohol-fast saprophytes are mistaken for tubercle bacilli.

If the cultures show no macroscopic growth after 6 weeks, the result of the cultivation is regarded as negative without any further examination. No microscopic examination is made of smears from such cultures.

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 ENDED MAY 17, 1947

Summary

Of the total of 39 cases of poliomyelitis reported for the week (last week 34), 15 occurred in California and 4 in New York. No other State reported more than 2 cases. For the corresponding week last year 83 cases were reported, and the 5-year (1942–46) median is 36. The total for the year to date is 894, as compared with 811 for the same period last year and a 5-year median of 519. The figure for the 9-week period since the approximate average week of seasonal low incidence (ended March 15) is 267, as compared with 344 for the corresponding period last year and a 5-year median of 217. States reporting more than 4 cases since March 15 are California (83), New York (29), Texas (18), Florida (14), Illinois (12), Louisiana (10), Michigan (9), Nebraska (9), Missouri (8), North Dakota (8).

Of the total of 9 cases of smallpox reported (last week 7, 5-year median 11), 3 occurred in Indiana, the only State reporting more than 1 case. One fatal case was reported in Ohio (see p. 861). The total for the year to date is 127, as compared with 206 for the same period last year and a 5-year median of 234.

Current and cumulative figures for measles, meningococcus meningitis, scarlet fever, typhoid and paratyphoid fever, and typhus fever are well below the respective corresponding medians. Similar figures for whooping cough are considerably above those of the past 3 years. To date, 621 cases of tularemia have been reported (356 same period last year), and 2,102 cases of undulant fever (1,684 same period last year).

Of 18 cases of Rocky Mountain spotted fever reported currently, 9 occurred in the South Atlantic area, 2 in the East North Central, 1 in New Jersey, 1 in Oklahoma, and 5 in the Mountain area. The total to date is 46, as compared with 56 for the same period last year.

Deaths recorded for the week in 93 large cities of the United States totaled 9,331, as compared with 9,190 last week, 8,901 and 9,202, respectively, for the corresponding weeks of 1946 and 1945, and 8,906 for the 3-year (1944–46) median. The total for the year to date is 198,445, as compared with 196,267 for the corresponding period last year.

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Telegraphic morbidity reports from State health officers for the week ended May 17, 1947, and comparison with corresponding week of 1946 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	May 17, 1947	May 18, 1946		May 17, 1947	May 18, 1946		May 17, 1947	May 18, 1946		May 17, 1947	May 18, 1946	
NEW ENGLAND												
Maine	2	2	0	-------		2	146	318	69	1	0	0
New Hampshire	0	0	0	-------	-------	-------	4	43	43	0	0	1
Vermont	0	0	0	-------	-------	-------	158	83	83	1	0	0
Massachusetts	8	5	5	-------	-------	-------	490	2,338	1,219	[5] 0	1	7
Rhode Island	0	0	0	-------	-------	-------	243	64	44	2	0	1
Connecticut	0	3	1	2	2	2	955	411	438	1	1	2
MIDDLE ATLANTIC												
New York	14	25	15	[1] 2	[1] 4	[1] 4	671	4,125	1,316	9	12	26
New Jersey	10	12	2	3	5	5	577	3,893	1,261	1	0	10
Pennsylvania	23	12	10	(2)	[2] 1	[2] 1	286	2,573	1,591	5	11	11
EAST NORTH CENTRAL												
Ohio	7	10	7	10	7	7	834	727	469	7	3	13
Indiana	5	2	2	-------	16	6	131	483	103	2	3	3
Illinois	3	8	17	1	4	4	227	868	536	5	7	14
Michigan [3]	5	7	6	-------	2	2	112	1,407	661	4	8	8
Wisconsin	1	3	3	20	25	31	680	2,812	2,271	2	2	4
WEST NORTH CENTRAL												
Minnesota	8	5	3	-------	-------	-------	655	66	388	1	2	2
Iowa	3	1	3	1	-------	-------	155	352	185	1	1	2
Missouri	5	3	3	3	5	1	28	188	201	2	5	5
North Dakota	0	1	2	3	-------	-------	91	10	67	1	0	0
South Dakota	0	7	1	-------	-------	-------	81	29	29	0	0	0
Nebraska	0	4	3	8	5	5	14	280	264	1	1	0
Kansas	6	22	5	11	1	1	10	344	352	2	0	2
SOUTH ATLANTIC												
Delaware	1	1	1	-------	-------	-------	-------	23	23	0	0	0
Maryland [3]	5	14	13	5	-------	1	63	683	369	0	1	7
District of Columbia	0	0	0	-------	-------	1	11	332	119	1	1	2
Virginia	3	10	4	333	100	103	269	779	376	2	4	6
West Virginia	0	1	3	8	-------	-------	16	100	97	2	1	1
North Carolina	10	10	8	-------	-------	-------	162	542	402	7	0	2
South Carolina	8	5	5	310	157	175	151	264	213	1	0	2
Georgia	4	3	3	8	3	8	87	234	90	2	3	3
Florida	0	7	3	22	3	3	65	183	93	0	2	5
EAST SOUTH CENTRAL												
Kentucky	1	0	1	1	-------	2	69	71	75	0	3	3
Tennessee	4	2	2	33	17	15	49	191	150	3	1	6
Alabama	5	3	3	88	14	23	208	154	114	1	0	7
Mississippi [3]	2	3	3	23	-------	-------	19	-------	-------	1	0	1
WEST SOUTH CENTRAL												
Arkansas	7	3	2	53	14	17	61	189	112	[5] 0	1	1
Louisiana	3	7	4	5	6	4	34	100	76	6	1	2
Oklahoma	2	6	3	79	22	22	3	223	180	0	3	1
Texas	17	25	23	416	415	415	394	1,577	733	5	6	6
MOUNTAIN												
Montana	0	0	0	5	1	2	43	182	118	0	0	0
Idaho	0	0	0	5	6	1	2	83	56	0	0	0
Wyoming	0	4	0	-------	-------	-------	8	77	52	0	1	0
Colorado	5	2	6	14	6	14	72	897	315	0	0	1
New Mexico	2	1	1	1	6	2	72	65	41	0	0	0
Arizona	8	3	0	52	43	54	134	120	116	0	0	0
Utah [3]	1	0	0	-------	1	3	5	353	253	0	0	0
Nevada	0	0	0	-------	-------	-------	-------	4	5	0	0	0
PACIFIC												
Washington	2	7	2	12	-------	2	13	490	386	1	3	5
Oregon	1	1	1	10	3	11	11	322	115	0	0	2
California	14	9	18	12	13	51	214	2,665	2,665	6	5	19
Total	205	259	201	1,559	909	1,100	8,783	32,317	22,881	86	93	175
20 weeks	5,217	6,929	5,439	294,233	184,505	74,496	125,498	486,655	396,365	[5] 1,760	3,379	4,522
Seasonal low week [4]	(27th) July 5–11			(30th) July 26–Aug. 1			(35th) Aug. 30–Sept. 5			(37th) Sept. 13–19		
Total since low	12,783	18,573	14,192	327,208	546,753	110,358	148,386	512,779	434,378	[5] 2,732	4,883	6,974

[1] New York City only. [2] Philadelphia only. [3] Period ended earlier than Saturday.
[4] Dates between which the approximate low week ends. The specific date will vary from year to year.
[5] Delayed reports: Meningitis, Arkansas, weeks ended February 8 and February 15, 1 case each week, Massachusetts, week ended April 19, 1 case; (figures included in cumulative totals only).

Telegraphic morbidity reports from State health officers for the week ended May 17, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median	Week ended—		Median	Week ended—		Median	Week ended—		Median
	May 17, 1947	May 18, 1946	1942–46	May 17, 1947	May 18, 1946	1942–46	May 17, 1947	May 18, 1946	1942–46	May 17, 1947 [6]	May 18, 1946	1942–46
NEW ENGLAND												
Maine	0	0	0	15	32	32	0	0	0	0	0	0
New Hampshire	0	0	0	0	0	6	0	0	0	0	0	0
Vermont	0	1	0	2	5	11	0	0	0	0	0	0
Massachusetts	0	1	0	121	235	357	0	0	0	4	0	2
Rhode Island	0	0	0	6	10	17	0	0	0	0	0	0
Connecticut	1	0	0	34	69	69	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	4	4	2	331	572	567	0	0	0	3	3	4
New Jersey	0	0	1	100	165	146	0	0	0	0	4	2
Pennsylvania	0	1	0	193	336	336	0	0	0	3	4	4
EAST NORTH CENTRAL												
Ohio	0	1	1	206	357	357	1	0	0	3	6	5
Indiana	1	0	0	55	46	59	3	7	1	0	1	1
Illinois	2	3	1	78	182	182	0	2	1	1	1	1
Michigan [3]	1	0	0	90	230	230	0	0	0	0	2	3
Wisconsin	0	0	0	68	100	203	1	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	1	0	69	48	69	0	0	0	0	0	0
Iowa	1	0	0	25	55	44	1	0	0	0	0	0
Missouri	1	1	0	37	53	53	0	0	0	0	1	1
North Dakota	0	0	0	11	11	11	0	0	0	0	3	0
South Dakota	0	0	0	1	6	22	1	0	0	0	0	0
Nebraska	2	0	0	8	24	24	0	0	0	0	0	0
Kansas	0	1	1	30	53	51	0	0	0	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	6	8	8	0	0	0	0	1	0
Maryland [3]	0	2	0	26	200	155	0	0	0	1	1	1
District of Columbia	0	0	0	6	14	14	0	0	0	0	0	0
Virginia	1	1	1	19	63	46	0	0	0	1	2	2
West Virginia	0	0	0	18	23	23	0	0	0	0	0	1
North Carolina	0	2	0	17	31	27	0	0	0	1	0	1
South Carolina	1	0	3	3	6	6	0	0	0	0	5	5
Georgia	0	2	1	8	11	11	0	0	0	3	3	5
Florida	2	18	0	3	6	6	0	0	0	0	0	1
EAST SOUTH CENTRAL												
Kentucky	1	1	1	17	12	48	0	0	0	0	1	3
Tennessee	0	0	0	31	18	28	0	0	0	2	1	3
Alabama	1	0	0	1	19	10	0	0	0	0	0	2
Mississippi [3]	0	1	1	3	5	6	0	0	0	4	1	1
WEST SOUTH CENTRAL												
Arkansas	1	0	0	4	4	4	0	0	0	4	5	2
Louisiana	0	5	2	2	5	7	0	0	0	2	7	7
Oklahoma	1	0	0	4	9	10	1	0	0	0	5	2
Texas	2	10	4	21	46	46	0	0	0	8	4	10
MOUNTAIN												
Montana	0	0	0	8	20	20	0	0	0	1	0	0
Idaho	1	0	0	6	10	13	1	0	0	0	2	0
Wyoming	0	0	0	1	11	11	0	0	0	0	0	0
Colorado	0	11	0	39	45	56	0	0	0	0	1	0
New Mexico	0	2	0	8	14	14	0	0	0	0	1	1
Arizona	0	0	0	2	16	16	0	0	0	0	1	1
Utah [3]	0	0	0	21	20	20	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	0	3	1	26	25	30	0	2	0	1	1	1
Oregon	0	0	0	17	43	22	0	0	0	1	2	0
California	15	11	8	100	148	148	0	0	0	3	4	4
Total	39	83	36	1,897	3,421	3,686	9	11	11	47	73	85
20 weeks	894	812	519	50,861	69,924	79,410	127	206	234	936	1,029	1,184
Seasonal low week [4]	(11th) Mar. 15–21			(32nd) Aug. 9–15			(35th) Aug. 30–Sept. 5			(11th) Mar. 15–21		
Total since low	267	344	217	77,547	108,495	117,731	181	282	351	451	554	583

[3] Period ended earlier than Saturday.
[4] Dates between which the approximate week ends. The specific date will vary from year to year.
[6] Including paratyphoid fever reported separately, as follows: Massachusetts 4 (salmonella infection); Virginia 1; Georgia 1; Texas 4; California 2.

Telegraphic morbidity reports from State health officers for the week ended May 17, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Whooping cough			Week ended May 17, 1947							
	Week ended—		Median 1942–46	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	May 17, 1947	May 18, 1946		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	26	27	23	-----	-----	-----	-----	-----	-----	-----	-----
New Hampshire	2	6	1	-----	-----	-----	-----	-----	-----	-----	-----
Vermont	13	13	13	-----	-----	-----	-----	-----	-----	-----	4
Massachusetts	120	147	147	-----	2	-----	-----	-----	-----	-----	[7] 4
Rhode Island	46	21	21	-----	-----	-----	-----	-----	-----	-----	-----
Connecticut	49	35	56	1	-----	-----	-----	-----	-----	-----	2
MIDDLE ATLANTIC											
New York	184	155	213	3	1	-----	1	-----	-----	1	7
New Jersey	242	171	171	1	-----	-----	-----	1	-----	-----	-----
Pennsylvania	194	110	186	-----	-----	-----	-----	-----	-----	-----	1
EAST NORTH CENTRAL											
Ohio	-----	81	144	1	-----	-----	-----	-----	-----	-----	-----
Indiana	39	25	25	-----	-----	-----	-----	1	-----	-----	-----
Illinois	82	107	100	6	-----	-----	-----	1	1	-----	7
Michigan [3]	182	158	158	-----	-----	-----	-----	-----	-----	-----	5
Wisconsin	93	90	90	-----	-----	-----	-----	-----	-----	-----	7
WEST NORTH CENTRAL											
Minnesota	49	13	13	-----	-----	-----	-----	-----	-----	-----	4
Iowa	27	32	20	-----	-----	-----	-----	-----	-----	-----	-----
Missouri	31	12	15	-----	-----	1	-----	-----	2	-----	2
North Dakota	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----
South Dakota	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----
Nebraska	9	7	6	-----	-----	-----	-----	-----	-----	-----	22
Kansas	48	24	42	1	-----	-----	-----	-----	-----	-----	5
SOUTH ATLANTIC											
Delaware	4	2	2	-----	-----	-----	-----	1	-----	-----	-----
Maryland [3]	100	12	59	-----	-----	2	-----	3	-----	-----	-----
District of Columbia	5	13	9	-----	-----	-----	-----	-----	-----	-----	-----
Virginia	73	51	63	1	-----	87	-----	5	1	-----	1
West Virginia	19	40	12	-----	-----	-----	-----	-----	-----	-----	-----
North Carolina	151	100	110	1	1	-----	-----	-----	-----	3	-----
South Carolina	166	49	105	2	24	-----	4	-----	-----	1	1
Georgia	54	6	9	-----	2	-----	-----	-----	2	4	6
Florida	92	23	13	4	-----	-----	1	-----	-----	4	2
EAST SOUTH CENTRAL											
Kentucky	18	14	38	-----	-----	-----	-----	-----	-----	-----	-----
Tennessee	45	22	30	1	-----	-----	-----	-----	-----	1	1
Alabama	108	12	32	-----	-----	-----	-----	-----	-----	-----	1
Mississippi [3]	18	-----	-----	3	1	-----	-----	-----	3	1	4
WEST SOUTH CENTRAL											
Arkansas	68	1	13	8	1	-----	-----	-----	7	1	2
Louisiana	13	12	10	9	-----	-----	-----	-----	2	-----	-----
Oklahoma	16	11	15	8	-----	-----	-----	1	9	-----	-----
Texas	824	182	247	5	289	21	-----	-----	2	17	11
MOUNTAIN											
Montana	7	8	8	-----	-----	-----	-----	2	-----	-----	-----
Idaho	5	22	4	-----	-----	-----	-----	-----	-----	-----	1
Wyoming	-----	-----	2	-----	-----	-----	-----	1	1	-----	-----
Colorado	36	32	32	-----	-----	-----	-----	2	-----	-----	1
New Mexico	48	21	16	-----	-----	-----	-----	-----	-----	-----	-----
Arizona	41	9	13	-----	-----	31	-----	-----	-----	-----	[7] 1
Utah [3]	16	16	53	-----	-----	-----	-----	-----	-----	-----	3
Nevada	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PACIFIC											
Washington	25	35	25	-----	-----	-----	-----	-----	-----	-----	-----
Oregon	27	24	21	-----	-----	-----	-----	-----	-----	-----	-----
California	386	75	357	6	4	-----	2	-----	1	-----	4
Total	3,801	2,026	2,550	61	325	142	8	18	31	33	109
Same week, 1946	2,026	-----	-----	59	607	118	10	14	17	52	131
Median, 1942–46	2,550	-----	-----	32	382	114	8	10	17	52	[8] 125
20 weeks: 1947	55,715	-----	-----	952	5,861	3,955	135	46	621	749	[7] 2,102
1946	37,026	-----	-----	763	6,254	2,107	166	56	356	909	1,684
Median, 1942–46	49,852	-----	-----	595	4,875	1,432	166	56	344	909	[8] 1,722

[3] Period ended earlier than Saturday.

[7] Delayed reports: Undulant fever, Massachusetts, week ended Apr. 26, 3 cases; Arizona, month of April, 10 cases (figures included in cumulative total only).

[8] 2-year average, 1945–46. *Anthrax:* New York 1 case. *Leprosy:* Ohio 1 case.

WEEKLY REPORTS FROM CITIES [1]

City reports for week ended May 10, 1947

This table lists the reports from 88 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
New Hampshire:												
Concord	0	0	------	0	------	0	1	0	0	0	0	------
Vermont:												
Barre	0	0	------	0	2	0	0	0	0	0	0	1
Massachusetts:												
Boston	6	0	------	1	77	0	14	0	26	0	0	25
Fall River	0	0	------	0	49	0	1	0	4	0	0	7
Springfield	0	0	------	0	29	0	1	0	3	0	0	4
Worcester	0	0	------	0	11	0	3	0	2	0	0	7
Rhode Island:												
Providence	1	0	------	0	144	0	1	0	4	0	0	17
Connecticut:												
Bridgeport	0	0	------	0	32	0	3	0	5	0	0	2
Hartford	0	0	4	0	111	0	1	0	0	0	0	1
New Haven	0	0	------	0	58	0	0	0	7	0	0	9
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	2	2	7	0	8	0	0	1
New York	13	0	1	0	366	1	66	0	97	0	3	87
Rochester	0	0	------	0	------	2	2	0	12	0	0	6
Syracuse	0	0	------	0	------	0	0	0	5	0	0	5
New Jersey:												
Camden	1	0	------	0	2	0	1	0	0	0	0	2
Newark	0	0	1	0	13	1	0	0	15	0	0	34
Trenton	1	0	------	0	8	0	3	0	1	0	0	1
Pennsylvania:												
Philadelphia	5	0	1	0	17	0	15	0	52	0	1	50
Pittsburgh	0	0	1	1	18	1	5	0	30	0	0	11
Reading	0	0	------	0	3	0	3	0	1	0	0	1
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	0	0	1	1	2	1	2	0	6	0	0	11
Cleveland	1	0	2	0	211	0	7	0	26	0	1	45
Columbus	2	1	------	0	117	0	0	0	9	0	0	15
Indiana:												
Fort Wayne	0	0	------	0	17	0	1	0	2	0	0	------
Indianapolis	0	0	------	0	2	2	1	0	6	0	0	25
South Bend	0	0	------	0	27	0	0	0	4	0	0	------
Terre Haute	0	0	------	0	2	0	0	0	0	0	0	1
Illinois:												
Chicago	0	0	------	0	10	5	18	0	31	0	0	29
Springfield	0	0	------	0	22	0	0	0	1	0	0	1
Michigan:												
Detroit	5	1	2	0	1	1	8	0	46	0	0	105
Flint	0	0	------	0	4	1	3	0	3	0	0	------
Grand Rapids	0	0	------	0	5	0	0	0	3	0	0	11
Wisconsin:												
Kenosha	0	0	------	0	1	0	0	0	0	0	0	2
Milwaukee	0	0	------	0	26	0	2	0	14	0	0	42
Racine	0	0	------	0	1	0	0	0	16	0	0	7
Superior	0	0	------	0	------	0	0	0	1	0	0	------
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	------	0	0	0	2	0	0	4
Minneapolis	1	0	------	0	12	1	3	0	26	0	0	9
St. Paul	1	0	------	0	489	0	3	0	5	0	0	23
Missouri:												
Kansas City	1	0	------	0	------	2	10	0	9	0	0	9
St. Joseph	0	0	------	0	------	0	0	0	0	0	0	2
St. Louis	2	0	1	0	26	1	10	0	11	0	0	22

[1] In some instances the figures include nonresident cases.

City reports for week ended May 10, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	0	------	0	5	0	0	0	3	0	0	------
Kansas:												
Topeka	0	0	------	0	------	0	0	0	5	0	0	2
Wichita	0	0	------	0	1	0	1	0	0	0	0	12
SOUTH ATLANTIC												
Delaware:												
Wilmington	1	0	------	0	1	0	2	0	2	0	0	------
Maryland:												
Baltimore	6	0	2	1	9	1	6	0	14	0	1	71
Cumberland	0	0	------	0	------	0	0	0	0	0	0	------
Frederick	0	0	------	0	------	0	0	0	0	0	0	------
District of Columbia:												
Washington	0	0	------	0	8	2	3	0	9	0	0	8
Virginia:												
Lynchburg	0	0	------	0	------	0	1	0	0	0	0	------
Richmond	0	0	------	0	70	0	1	0	4	0	0	3
Roanoke	0	0	------	0	38	0	0	0	2	0	0	------
West Virginia:												
Charleston	0	0	------	0	------	0	0	0	0	0	0	------
Wheeling	0	0	------	0	1	0	1	0	0	0	0	------
North Carolina:												
Raleigh	0	0	------	0	2	1	0	0	0	0	0	------
Wilmington	0	0	------	0	9	0	0	0	0	0	0	------
Winston-Salem	0	0	------	0	32	0	0	0	2	0	0	1
South Carolina:												
Charleston	0	1	4	0	38	0	3	0	1	0	0	------
Georgia:												
Atlanta	0	0	1	1	8	2	0	0	0	0	0	7
Brunswick	0	0	------	0	3	0	0	0	0	0	0	2
Savannah	0	0	------	0	3	0	0	0	0	0	0	------
Florida:												
Tampa	1	0	------	0	4	0	2	0	3	0	1	5
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	2	1	6	1	17	0	1	0	1	10
Nashville	0	0	------	0	------	0	3	0	2	0	0	4
Alabama:												
Birmingham	0	0	8	0	19	0	6	0	1	0	1	------
Mobile	0	0	------	0	21	0	0	1	0	0	0	12
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	------	0	0	0	0	0	0	6
Louisiana:												
New Orleans	1	0	5	------	15	1	------	1	0	0	0	7
Shreveport	0	0	------	0	------	0	5	0	0	0	0	------
Oklahoma:												
Oklahoma City	0	0	1	0	1	1	5	0	0	0	0	5
Texas:												
Dallas	3	0	2	2	188	1	0	0	4	0	0	6
Galveston	0	0	------	0	------	0	1	0	0	0	0	------
Houston	1	0	------	1	3	0	3	0	2	0	0	9
San Antonio	3	0	------	0	4	0	3	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	1	0	3	0	0	0	1	------
Great Falls	2	0	------	0	13	0	1	0	0	0	0	------
Helena	0	0	------	0	2	0	0	0	0	0	0	------
Missoula	0	0	------	0	25	0	0	0	0	0	0	------
Colorado:												
Denver	7	0	1	1	36	0	2	0	12	0	1	5
Pueblo	0	0	------	0	------	0	0	0	2	0	0	------
Utah:												
Salt Lake City	1	0	------	0	2	0	2	0	4	0	0	2

City reports for week ended May 10, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza cases	Influenza deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
PACIFIC												
Washington:												
Seattle	1	0	------	1	7	2	2	0	0	0	0	10
Spokane	0	0	------	0	7	0	2	0	0	0	0	------
Tacoma	0	0	------	0	1	0	0	0	2	0	0	2
California:												
Los Angeles	2	0	5	0	7	2	3	3	23	0	0	61
Sacramento	2	0	------	0	2	0	1	0	0	0	3	4
San Francisco	1	0	3	0	5	1	7	0	10	0	0	------
Total	73	3	48	[4]11	2,514	36	[4]281	5	602	0	14	889
Corresponding week, 1946*	68	------	30	12	9,561	------	285	------	1,092	0	9	438
Average 1942–46*	64	------	50	[2]15	[3]5,948	------	[2]318	------	1,436	1	14	781

[2] 3-year average, 1944–46.
[3] 5-year median, 1942–46.
[4] Exclusive of New Orleans.

*Exclusive of Oklahoma City.
Dysentery, amebic.—Cases: New York 4; Chicago 2; Memphis 1; Nashville 1; New Orleans 1.
Dysentery, bacillary.—Cases: Chicago 1; Los Angeles 1.
Dysentery, unspecified.—Cases: Cincinnati 4; Baltimore 1; Houston 1; San Antonio 4.
Tularemia.—Cases: Springfield, Mass., 1; New Orleans 3.
Typhus fever, endemic.—Cases: Tampa 2; New Orleans 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 88 cities in the preceding table (latest available estimated population, 34,500,500)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza case rates	Influenza death rates	Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
New England	19.0	0.0	10.9	2.7	1,395	0.0	68.0	0.0	139	0.0	0.0	198
Middle Atlantic	9.3	0.0	1.9	0.5	199	3.2	47.2	0.0	102	0.0	1.9	92
East North Central	4.9	1.2	3.0	0.6	272	6.1	25.5	0.0	102	0.0	0.6	179
West North Central	12.1	0.0	2.0	0.0	1,072	8.0	54.3	0.0	123	0.0	0.0	167
South Atlantic	13.1	1.6	11.4	3.3	369	9.8	31.1	0.0	60	0.0	3.3	159
East South Central	0.0	0.0	59.0	5.9	271	5.9	153.5	5.9	24	0.0	11.8	153
West South Central	20.3	0.0	20.3	[4]10.3	536	7.6	[4]58.1	2.5	18	0.0	0.0	86
Mountain	82.6	0.0	8.3	8.3	653	0.0	66.1	0.0	149	0.0	16.5	58
Pacific	9.5	0.0	12.7	1.6	46	7.9	23.7	4.7	55	0.0	4.7	122
Total	11.1	0.5	7.3	[4]1.7	381	5.5	[4]43.2	0.8	91	0.0	2.1	135

[4] Exclusive of New Orleans.

SMALLPOX IN THE UNITED STATES

Of the 9 cases of smallpox reported in the United States during the week ended May 17, one was a fatal case in Fostoria, Ohio. This case was in a Mexican male, 73 years of age, who left Alice, Texas, on April 16 or 17, traveling by truck, and arrived in Fostoria on April 25. Diagnosis of smallpox was made on May 10, and death occurred 3 days

later. No secondary cases had been reported in Fostoria up to May 17.

Up to May 17 no cases had been reported in New York City or State since the week ended May 3, when 2 cases were reported in the city, bringing the total in the city to that date to 10 cases, with 2 deaths, and 4 cases up-State (in Millbrook).

The vaccination histories of the 12 cases reported in New York City and Millbrook during March and April show that 9 of the patients had never been vaccinated and 3 had been vaccinated not more recently than 40 years prior to attack.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (in ectoparasites).—Plague infection in a pool of 32 fleas, collected on March 20, 1947, from 59 rats (trapped), has been reported in District 3C, Kapulena area, Honokaa, Hamakua District, Island of Hawaii, T. H.

* * *

DEATHS DURING WEEK ENDED MAY 10, 1947

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended May 10, 1947	Corresponding week 1946
Data for 93 large cities of the United States:		
Total deaths	9,190	9,144
Median for 3 prior years	9,144	
Total deaths, first 19 weeks of year	189,114	187,366
Deaths under 1 year of age	769	619
Median for 3 prior years	588	
Deaths under 1 year of age, first 19 weeks of year	15,064	11,605
Data from industrial insurance companies:		
Policies in force	67,282,120	67,197,338
Number of death claims	14,611	12,357
Death claims per 1,000 policies in force, annual rate	11.3	9.6
Death claims per 1,000 policies, first 19 weeks of year, annual rate	10.1	10.8

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 26, 1947.—During the week ended April 26, 1947, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		24		164	330	19	21	61	116	735
Diphtheria		3		26	3	1		1		34
German measles		1		36	45		1	1	6	90
Influenza		27			6	1			2	36
Measles		78	3	54	93	215	44	48	356	891
Meningitis, meningococcus				4		1			2	7
Mumps		20		62	51	48	163	19	241	604
Scarlet fever		2	6	58	75	5	1	10	4	161
Tuberculosis (all forms)		5	9	125	24	18	19	56	66	322
Typhoid and paratyphoid fever				6	4			1		11
Undulant fever					4			1	1	6
Venereal diseases:										
Gonorrhea	2	13	6	134	89	24	34	32	79	413
Syphilis	3	6	14	102	90	16	8	7	36	282
Other forms									2	2
Whooping cough			1	43	63	49	5	12	62	235

CUBA

Habana—Communicable diseases—4 weeks ended April 26, 1947.—During the 4 weeks ended April 26, 1947, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chickenpox	15		Scarlet fever	1	
Diphtheria	13		Tuberculosis	11	4
Measles	12		Typhoid fever	15	

Provinces—Notifiable diseases—4 weeks ended April 26, 1947.—During the 4 weeks ended April 26, 1947, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cerebrospinal meningitis				1			1
Cancer	5	10	12	11	4	21	63
Chickenpox		16	5	1	30	2	54
Diphtheria	1	14	2	2		2	21
Hookworm disease		38					38
Leprosy		5				2	7
Malaria	3				4	184	191
Measles		16	1	3	21	3	44
Poliomyelitis		1		1	2	2	6
Scarlet fever		1					1
Tuberculosis	27	48	57	55	24	40	251
Typhoid fever	24	39	3	37	10	26	139
Typhus fever (murine)		1				1	2
Whooping cough		20					20

[1] Includes the city of Habana.

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

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during recent months. 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

India—Calcutta.—For the week ended May 3, 1947, 232 cases of cholera, with 71 deaths, were reported in Calcutta, India.

Plague

Indochina (French)—Annam.—For the period April 21–30, 1947, 14 cases of plague, with 11 deaths, were reported in Annam, French Indochina.

Smallpox

China—Shanghai.—For the week ended April 26, 1947, 133 cases of smallpox were reported in Shanghai, China.

Colombia.—For the month of April 1947, 326 cases of smallpox, with 5 deaths, were reported in Colombia.

Ecuador.—For the month of April 1947, 50 cases of smallpox were reported in Ecuador.

Great Britain—England and Wales.—During the week ended May 10, 1947, 1 case of smallpox was reported in Coseley and 1 case in Sheffield, England.

India—Calcutta.—For the week ended May 3, 1947, 120 cases of smallpox, with 89 deaths, were reported in Calcutta, India.

Typhus Fever

Colombia.—For the month of April 1947, 130 cases of typhus fever, with 2 deaths, were reported in Colombia.

Ecuador.—For the month of April 1947, 51 cases of typhus fever, with 3 deaths, were reported in Ecuador.

Yugoslavia.—For the month of February 1947, 23 cases of typhus fever, with 4 deaths, were reported in Yugoslavia.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Caldas Department—La Dorado, January 1–31, 1947, 1 death; La Dorado, Barroblanco, March 12, 1947, 1 death; Santander Department—Simacota, January 1–31, 1947, 3 deaths.