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Tuberculosis Studies in Muscogee County, Georgia

III. Tuberculosis Mortality Following a Community-Wide X-ray Survey

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As the mortality rate for tuberculosis continues its downward trend, hopes for eventual elimination of the disease are reflected in the changing emphasis placed on various tuberculosis control measures. In the United States in recent years, considerable stress has been placed on photofluorographic chest X-ray surveys of entire communities, and it is probably true that X-ray surveys are more widely advocated and used than any other single tuberculosis control measure. The basic concept of the community-wide X-ray survey is simple, rational, and not radically different from other case-finding procedures long used in tuberculosis prevention programs. The reasoning underlying the use of such procedures is still essentially empirical and largely without specific scientific evidence of immediate or long-range influence on tuberculosis morbidity and mortality.

In an ideal or "perfect" community-wide survey, chest X-ray films of all persons in a community would be made and examined for the purpose of separating the total population into two groups, those who have and those who do not have pulmonary tuberculosis.

Two distinctly different benefits may be expected to accrue from these procedures, both due entirely to the advantages that come because the disease is discovered earlier than it would have been without the survey. First, there is the gain to the newly discovered cases due to the medical supervision and treatment given. Clearly, the value of the survey for the newly found cases depends on the fact that therapeutic procedures appear to be more effective early in the disease in ameliorating the extent of morbidity and in reducing or delaying tuberculosis mortality. Definitive evidence of the extent of

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this effect is exceedingly difficult if not impossible to obtain and it is more or less necessary to assume, on the basis of general experience in the treatment of tuberculosis, that the earlier treatment is begun the more effective it is.

The second and empirically the most important value of mass case-finding procedures should accrue because the newly discovered patients may be prevented at an earlier time from further spreading the disease to others. Present knowledge of the contagiousness of human tuberculosis indicates that effective isolation of known cases should be of great importance in reducing morbidity and mortality. Few would question that this should be a major influence in decreasing the rate of infection and subsequently of disease among infants, children, and young adults. However, because a high proportion of the older members of the population have already had a tuberculous infection, we are uncertain what proportion of new disease arising among them could be prevented by the effective isolation of known cases. This uncertainty is rooted in our lack of knowledge of the proportions of apparently new cases of the disease that arise as primary infection, as exogenous reinfection or endogenously. Until the frequency of endogenous tuberculous disease—that which arises from within an individual as a reactivation of a previous infection—is determined, the value of mass X-ray surveys cannot be fully demonstrated nor the problems of the eventual eradication of tuberculosis accurately appraised.

There are many ways in which present day community-wide X-ray surveys fall substantially short of the ideal. In most programs X-ray films are obtained for only a part of the population and it must be granted that there may be relatively fewer cases, as many, or perhaps even more, among those not X-rayed. Additional cases of tuberculosis must be expected in the population that is continuously moving into most communities in this country. Thus, no survey can claim to have identified every person in a community who might benefit by treatment and every individual capable of spreading the disease. Other practical difficulties further reduce the effectiveness of surveys. Few communities can provide all of the tuberculosis services considered desirable and, in addition, some patients fail to take advantage of what is offered. Isolation of all patients known to be infectious is extremely difficult to attain and even then isolation is rarely complete. Not the least of other practical problems arises because the interpretation of X-ray films, the critical and most technical aspect of X-ray surveys, is subject to large variations (*1, 2, 3*).

If both practical and theoretical limitations of community-wide X-ray surveys are considered, it should not be surprising that so little scientific knowledge is yet available of the effects of such surveys on tuberculosis morbidity and mortality.

This paper represents an attempt to estimate the significance of survey case finding in Muscogee County, Ga., a community of about 100,000 persons, by a study of the tuberculosis deaths during a period of 3½ years following a mass X-ray survey in 1946. The number of tuberculosis deaths in this period is too small to allow extensive analyses or definitive conclusions. Nevertheless the data presented do provoke speculation on the reasons for the continued development of fatal tuberculosis among various groups of the population.

Deaths due to tuberculosis are classified according to the major categories into which the survey subdivided the population. In general, this means a separation of persons dying of tuberculosis into those known to have had the disease before the survey, those diagnosed as tuberculous as a result of the survey, those with negative survey chest films, and those not participating in the program. As could be expected, a substantial proportion of the deaths occurred among previously known patients and those first identified as cases in the survey. The most striking result of the study was the estimate, assuming the survey to have been complete, that more than one-third of all fatal tuberculosis in the 3½-year period would not have been detected by the mass survey technique. There was a marked difference in this estimate for whites and Negroes; in the former less than one-fifth and in the latter almost half of the dead would have had negative survey films. In terms of average annual mortality rates per 100,000 persons, 3 whites, and 39 Negroes with negative survey films died of tuberculosis. These and other results reported in the paper, while obviously not constituting a scientific evaluation of the effects of a community-wide survey, furnish useful information on certain aspects of the problems of tuberculosis control.

Description of Study Program

A research program to study the circumstances associated with the occurrence and spread of tuberculosis in a community was established in Muscogee County, Ga., in 1946, supported by the Muscogee County Health Department, the Georgia State Department of Health and the Division of Chronic Disease and Tuberculosis, Public Health Service. The applicability of this study to a wide variety of problems has been explored in a previous paper (*4*).

Public health tuberculosis work in Muscogee County is unique in that the program represents a cooperative effort to combine an operating tuberculosis service with an extensive investigation of fundamental problems of tuberculosis epidemiology. Service activities of the health department include very careful examination and follow-up of cases and suspected cases; extensive X-ray screening service for the general population; and, most importantly for the research program, a relationship with hospitals and private physicians which insures that almost 100 percent of even suspected cases of tuberculosis in the community come to the attention of the health department. Special tuberculosis programs for the community have included: the mass X-ray survey and a special census of the population in 1946; tuberculin testing and BCG vaccination of the school-age population in the Spring of 1947; and, in 1950, a combined X-ray, tuberculin testing, and BCG vaccination program for the entire population. Records from all of these activities are currently organized in a master filing system which is the basic tool for both services and investigations. All available information bearing on tuberculosis—the results of chest X-rays, bacteriological examinations and skin tests and data on contacts, morbidity and mortality—is brought together both for the individual and the household.

In 1946, the year of the first mass X-ray survey, a special census showed that Muscogee County had a population of 95,638, of which about 30 percent were Negro. Approximately 57,000 persons lived in Columbus, the only city in the county, but the entire county can be considered essentially urban.

The survey, one of the first large community-wide surveys in this country, was a joint venereal disease-tuberculosis program in which each person over 12 years of age was offered a blood test and a 70-mm. chest X-ray. It was carried out during a period of 6 weeks in May and June 1946. The response of the community to the survey and the initial findings of the program have been described in an earlier paper (*5*). Roughly, of the population over 15 years of age, 50 percent of the whites, 90 percent of the Negroes or 60 percent of both races obtained an X-ray during the survey. The response was poorest in the group 20–34 years of age and in those over 60, and relatively poorer for the higher economic groups. All films were read independently by two physicians, one a certified radiologist with long experience in reading chest films, the other an experienced survey film reader. As a result of these two interpretations of the survey films, 461 white persons and 251 Negroes were judged by one or both readers to have sufficient evidence on their X-ray films to warrant systematic follow-up observations for tuberculosis. Of these numbers 5 percent of the whites and 6 percent of the Negroes could be identified as previously known cases of tuberculosis in the case register of the county health department.

From the beginning of the cooperative research program in 1946, careful attention has been directed to checking and verifying all deaths which are or might be due to tuberculosis. This has involved the routine matching of all death certificates of Muscogee County residents with the master tuberculosis index and an investigation of all deaths reported as tuberculosis for which full details are not available in the records of the health department.

As a result of this work it is possible to state, with considerable confidence in the accuracy and completeness of reporting, that 125 deaths from tuberculosis—45 whites and 80 Negroes—occurred among Muscogee County residents between July 1, 1946, and December 31, 1949. Four deaths officially reported as being due to tuberculosis are not included among the 125, while 6 deaths, not originally reported as tuberculosis, are included. In the total there is only one death, reported as miliary tuberculosis, for which there is some question as to the correctness of the cause of death. Since the number of deaths incorrectly certified as tuberculosis is almost balanced by those which should have been certified as tuberculosis it would appear that the officially reported death rate is reasonably accurate.

Results

Presurvey and postsurvey mortality rates

Tuberculosis mortality in Muscogee County is compared for 3½-year periods, before and after the survey, to determine if the survey and the subsequent study program might have caused a significant decrease. Although a population of only 100,000 may be relatively small as a basis for calculating mortality rates, periods of 3½ years may be sufficiently long to give fairly reliable average annual rates. Such rates for Muscogee County for the periods immediately preceding and following the community-wide survey should be reasonably accurate. A census of the population was made immediately after the survey in 1946, and the interpolations between that census and the 1940 and 1950 official censuses give satisfactory population estimates. A good deal of reliance can be placed on the count of tuberculosis deaths in the period following the survey. Actually the only uncertain figure used for calculating the rates is the number of tuberculosis deaths in the presurvey period. But since the study of certification of tuberculosis deaths in the postsurvey period resulted in relatively few individual changes and almost no change in the total count, the officially reported figure for the earlier period is probably satisfactory. It is possible, however, that as a result of the survey and the study program, the emphasis on tuberculosis may have increased the reporting of tuberculosis as a cause of death and thus may have modified a decrease which might have occurred under circumstances of consistent reporting.

Table 1 indicates that tuberculosis mortality in Muscogee County dropped from 21 to 18 per 100,000 for whites and from 83 to 72 for Negroes, decreases of about 15 percent between the 2 periods. Comparable national averages for the same periods of time dropped from 33 to 25 for whites and from 105 to 81 for nonwhites, a decrease of about 23 percent for each racial group. It is of interest in this con-

Table 1. *Deaths and death rates from tuberculosis in Muscogee County by race, 3½-year periods preceding and following 1946 survey*

Years	Population [1]			Deaths			Average annual death rate per 100,000 population		
	Total	White	Negro	Total	White	Negro	Total	White	Negro
Jan. 1, 1943, to June 30, 1946	90,299	62,305	27,994	126	45	81	39.9	20.6	82.7
July 1, 1946, to Dec. 31, 1949	105,111	73,557	31,554	125	45	80	34.0	17.5	72.4

[1] Estimates based on populations from United States censuses of 1940 and 1950, and a local census in 1946.

nection that tuberculosis mortality rates for the county are relatively low for both races compared with many other parts of the United States.

Mortality among participants and nonparticipants of the survey

One of the unanswered questions frequently raised regarding mass surveys is whether or not the prevalence of unknown tuberculosis is different among those who do and those who do not participate in the program. Information bearing on this question can be obtained from the present study by comparing subsequent mortality rates among the surveyed and nonsurveyed. In order for the comparison to be useful, however, it is necessary to take account of certain factors which rather obviously make the total surveyed group different from the nonsurveyed.

First, it is essential to remove from both groups the deaths of persons known at the start of the survey to be under treatment or active follow-up for tuberculosis. The reason for this is clear, since most persons actually ill with tuberculosis will not be among the surveyed, and the diagnostic services of the survey have little to offer cases already under active follow-up. These cases, referred to in this paper as "known cases" were listed in the working case register of the health department. As a matter of fact, most of them did not participate in the survey program.

Obviously, there could be many additions to this limited group of known cases. Persons might have been told that they had evidence of tuberculosis, and their physicians might have known these facts, without any record of this knowledge in the health department files. Such persons are "known" in the sense of having been diagnosed, but not "known" in the sense of having been reported to the official agency. The number of known cases could also be increased considerably by an exhaustive search of all old health department and hospital records. However, it would be practically impossible to identify all persons in these various categories of known cases, and for many of them, the dividing line between "known" and "unknown" becomes most indefinite. Because of these various considerations, it appeared that the most practical correction would be to exclude from both the surveyed and nonsurveyed only those persons listed in the health department case register.

Second, survey X-ray films were offered only to persons over 12 years of age. In order to take account of this factor it becomes necessary, therefore, to base the mortality rate for the nonsurveyed group on the population and the deaths of nonsurveyed persons who were over 12 years of age in 1946.

The third factor which interferes with a useful comparison of the surveyed and nonsurveyed groups arises because the age, race, and sex distributions of the two populations differ very markedly (*5*). Since the number of deaths is relatively small, it is not practical to attempt a detailed correction for all of these variables. We have had to be content, therefore, with mortality rates for the surveyed and nonsurveyed groups, adjusted only to the race distribution of the total population.

A fourth and most troublesome source of uncertainty in the comparison of the two groups arises because deaths occurring among persons who have moved from the county since the 1946 census undoubtedly are unknown for all practical purposes. There is very little that can be done about this, and it has been necessary simply to assume that they occurred proportionately in both the surveyed and nonsurveyed populations.

The pertinent data from the present study for estimating the difference between the surveyed and nonsurveyed portions of the population are given in table 2. For the white race, over 12 years of age and not known to have had tuberculosis before the survey, the average annual tuberculosis mortality rate was 8 per 100,000 among Muscogee County residents who had a survey film. The comparable rate for those who did not have a survey film was 11. For the Negroes, parallel rates were 57 and 56. The adjusted rates for both races combined were 23 and 24, for the surveyed and nonsurveyed, respectively.

Table 2. *Deaths and death rates from tuberculosis in Muscogee County by race, July 1, 1946, through December 31, 1949, among persons surveyed and not surveyed in 1946*

Survey status	Population [1]			Deaths [2]			Average annual death rate per 100,000 population		
	Total	White	Negro	Total	White	Negro	Total [3]	White	Negro
Surveyed	46,743	27,261	19,482	47	8	39	23.0	8.4	57.2
Not surveyed	36,001	29,336	6,665	24	11	13	24.2	10.7	55.7

[1] Surveyed population includes all who were X-rayed and gave Muscogee County addresses in the survey program in May or June of 1946. Not surveyed population is made up of all persons over 12 years of age who were enumerated in the September 1946 census but for whom there was no evidence that they had a survey film.

[2] Deaths from previously known cases of tuberculosis are excluded from both groups.

[3] Total rates adjusted to race distribution of total population in Muscogee County in 1946.

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It appears that the chance of dying from tuberculosis was not different among the surveyed and the nonsurveyed. More accurate rates might have been obtained for the group not surveyed if it had been possible to match all records for each individual completely and correctly. Undoubtedly, the nonsurveyed population includes some people who had survey films but whose X-ray records could not be matched to their census records. Likewise, death records for the nonsurveyed who were members of the community in 1946 did not all match with the census file. A correction for the latter would decrease the mortality among the nonsurveyed from that shown in table 2.

If one accepts the thesis that the surveyed and the nonsurveyed were not dissimilar in respect to tuberculosis mortality, this conclusion has an important implication with respect to a difference in the prevalence of tuberculous disease among the surveyed and nonsurveyed. Thus it may be argued that since the unknown cases of tuberculosis detected in the survey received medical care more promptly than otherwise would have happened, some of them at least, were prevented from dying from the disease. Comparable cases among the nonsurveyed, since they were not detected and given medical attention as promptly, may have had a higher fatality rate than their counterparts who participated in the survey. Since, in spite of this postulated difference in fatality rates in the two groups, the total mortality rate among surveyed and nonsurveyed was essentially the same, it may then be deduced that the prevalence of the disease was greater among the former than the latter.

Further speculation as to the interpretation of these findings could include the discussion of a wide range of important factors which may have influenced the mortality of the two groups. However, the number of deaths in this study is too limited to allow analyses of the effects of other variables.

Proportional Distribution of Tuberculosis Deaths

The most significant findings of the present study are obtained because it is possible to subdivide total tuberculosis mortality according to the four major groups of the population from which the deaths came. These were:

1. Previously known tuberculous patients. This group comprises the persons who were listed in the tuberculosis case register before the survey. It includes a few persons who had survey films.

2. Surveyed persons, further subdivided as: (a) "Positives," and (b) "negatives." The group as a whole excludes only previously known cases. "Positives" in this group were those who, on the basis of their 70-mm. survey films, 14″ x 17″ follow-up film and clinic examination were regarded as having either evidence of pulmonary

tuberculosis or sufficient suspicion of it, to warrant systematic observation for tuberculosis. "Negatives" were all others among the surveyed.

3. Nonsurveyed persons, further subdivided as: (a) Members of community during survey, and (b) newcomers to community. The group consists of adults not known to have the disease but who presumably could have had a survey film, plus those who could have participated had they been in the community at the time of the survey.

4. Ineligible persons. This is a relatively small group. It includes all persons who were less than 12 years old in 1946, and thereby ineligible for the survey, plus a group of Muscogee County residents who were inmates of the State Mental Hospital at Milledgeville, Ga.

Contributions from each of the above four groups to the total tuberculosis mortality cannot be determined as precisely as would be desirable. The principal reason for this is the practical difficulty of taking account of migration into and out of the county during the 3½-year observation period. For example, some Muscogee County residents undoubtedly moved away and died of the disease and in order to compensate for the loss of such deaths, it was finally considered necessary simply to include the deaths of new residents of the county as a separate subdivision of the group designated as nonsurveyed.

A fairly detailed allocation of the 125 tuberculosis deaths is given in table 3 according to the origin of the deaths from the above groups of the population. About one-fourth of the deaths occurred among cases known before the survey and about one-seventh among persons first discovered as tuberculous through the survey. These two proportions, while informative of the local situation, are dependent on the extent of previous case-finding procedures and the completeness

Table 3. *Observed distribution of deaths from tuberculosis in Muscogee County, by survey status and race, July 1, 1946, through Dec. 31, 1949*

Survey status	Total		White				Negro			
			Total		Male	Female	Total		Male	Female
	Number	Percent	Number	Percent			Number	Percent		
Total	125	100	45	100	20	25	80	100	43	37
Known cases	*29*	*23*	*12*	*27*	*5*	*7*	*17*	*21*	*10*	*7*
Surveyed	*47*	*38*	*8*	*18*	*2*	*6*	*39*	*49*	*21*	*18*
Positive X-ray	18	15	5	11	1	4	13	16	5	8
Negative X-ray	29	23	3	7	1	2	26	33	16	10
Not surveyed	*34*	*27*	*15*	*33*	*9*	*6*	*19*	*24*	*10*	*9*
Members of community	24	19	11	24	7	4	13	16	6	7
New to community	10	8	4	9	2	2	6	8	4	2
Ineligible	*15*	*12*	*10*	*22*	*4*	*6*	*5*	*6*	*2*	*3*
Under 12 years of age	8	6	5	11	1	4	3	4	1	2
Hospitalized in mental institutions	7	6	5	11	3	2	2	2	1	1

of the survey. They must not be viewed as being representative of surveys in general. For example, if case finding in a community is very extensive before a survey, proportionately fewer cases would be available for discovery by the community-wide program, and it would be expected that the contribution of known cases to subsequent mortality would be larger. If, on the other hand, only a small proportion of the cases in a community are known before the survey, deaths among survey-discovered cases might be expected to be a larger proportion of all tuberculosis deaths. Another important factor which would influence the proportion of deaths among survey-discovered cases is, of course, the completeness of the survey.

Deaths among persons classified as nonsurveyed, either because they did not choose to have a survey film or were newcomers to the community, totaled one-quarter of all tuberculosis deaths. Again, this proportion is applicable to the Muscogee County program and might differ markedly in other communities.

About one-eighth of the deaths came from segments of the population which are more or less outside the scope of survey activities. Thus, 6 percent of the tuberculosis deaths were in the unsurveyed child population and an additional 6 percent in the special small group institutionalized for mental illness. To some extent it may be reasonable to view this proportion of tuberculosis mortality as an estimate of what might be found generally in other community groups.

The last, and perhaps the most significant finding presented in table 3, is that 29 or one-fourth of all tuberculosis deaths occurred among persons who actually had a survey X-ray film but were advised that they were free of the disease. A very marked difference between whites and Negroes is apparent: less than one-tenth of the white deaths, but one-third of the Negro deaths occurred in the population actually surveyed and reported as having negative films. Part of this apparent difference is obviously created by the fact that a much higher proportion of the Negro than the white population had survey films.

The question may be raised as to whether inaccuracies in the interpretation of the 70-mm. survey films might account for the finding of such a large number of deaths so soon after the survey, among those reported as having negative films. This question was investigated by a careful review of the 70-mm. survey films of the 29 cases. For 25 films, retrospective study, even with the knowledge of the location of the lesions which appeared on later films, failed to reveal any evidence of abnormality. In 4 of the 29 survey films, however, lesions suggestive of tuberculosis were observed, 2 of which were quite definite. It must be admitted that these 4 films represent positive cases which were missed by two experienced film readers.

The significance of reporting these 4 films as negative should be judged in terms of the number of fatal cases found among those with positive films. As shown in table 3, 18 of that group died of tuberculosis and, together with the 4 missed cases, make a total of 22 deaths among actually positive survey cases. Obviously, this is not a large experience from which to draw general conclusions, but in this instance at least, about 20 percent of disease serious enough to be fatal in a relatively short time was missed on two independent readings of the survey films.

Contributions to mortality of potential survey positives and negatives

As indicated in previous sections of the paper, contributions to tuberculosis mortality of the various component parts of the observed surveyed and nonsurveyed groups are highly interrelated and furnish findings which primarily apply only to the particular situation and survey in Muscogee County. By making certain assumptions, however, it is possible to rearrange and summarize these findings in such a way as to furnish a very much more generalized evaluation of the effects of the community-wide survey technique. The essence of this generalization is to estimate the potential amount of tuberculosis mortality that might have been included in survey positive cases and survey negative cases had the entire adult population of the community been surveyed. To express it somewhat differently, an attempt is made to estimate the amount of fatal tuberculosis in the following 3½ years, that would, and would not, have been identified by a complete community-wide survey. From the data already presented it would appear that there might be a very significant difference between whites and Negroes in this respect, pointing to a marked difference for the two races in the efficiency of the community-wide survey in detecting rapidly fatal tuberculosis.

Table 4 presents a hypothetical distribution of tuberculosis mortality into three component parts according to the population from which it arises—persons regarded as ineligible for the survey, "potential positives" and "potential negatives." The "potential positives" include cases known before the survey, positives observed among the surveyed, and an estimate of the positives among the nonsurveyed.

Table 4. *Theoretical distributions of deaths from tuberculosis in Muscogee County, by survey status and race, July 1, 1946, through Dec. 31, 1949, assuming 100 percent participation of the eligible population*

Survey status	Total		White		Negro	
	Number	Percent	Number	Percent	Number	Percent
Total	125	100	45	100	80	100
Ineligible for X-ray	*15*	*12*	*10*	*22*	*5*	*6*
Eligible for X-ray	*110*	88	*35*	78	*75*	*94*
Potential positives	64	51	27	60	37	46
Potential negatives	46	37	8	18	38	48

"Potential negatives" then become those found to be negative when surveyed plus the estimated number of negatives among the nonsurveyed. The critical problem in obtaining these numbers is, of course, the subdivision of deaths among the nonsurveyed into those who would be expected to have positive and negative films had they been surveyed. We have done this by assuming that deaths among the nonsurveyed would have been divided between "positives" and "negatives" in the same proportion as was observed in the surveyed group. This assumption is strengthened by the fact that mortality was essentially the same among the surveyed and the nonsurveyed. Actually, 62 percent of the deaths among the surveyed whites and 33 percent of those among the surveyed Negroes had positive films in the survey, and these were the proportions applied to the nonsurveyed population to estimate the "positives."

The resulting theoretical distribution brings out the potentialities of locating subsequently fatal tuberculosis by a complete X-ray survey of a community. Approximately 12 percent of the deaths, as previously shown, occurred in that part of the population which was ineligible for the mass program. Just over half of the deaths would be expected among persons defined as having positive survey films while 37 percent would have been judged to be free of the disease.

Table 4 also shows a marked difference between whites and Negroes in the proportion of deaths occurring among potentially negative cases. Assuming complete examination of both races, about one-fifth of all white tuberculosis deaths can be expected to come from the group of persons with negative chest X-rays. Among Negroes, however, one-half of all of those who died of tuberculosis would have had negative survey films.

Special Tuberculosis Death Rates

In the previous sections of this paper, tuberculosis mortality has been presented in terms of the proportion of deaths that arise from different subgroups of the population. This method of analysis was adopted, rather than the more usual one of determining group-specific mortality rates, because of the difficulty of obtaining population counts for the different subgroups. Reasonably satisfactory population figures are available, however, for the groups designated as survey positives and negatives. Table 5 provides the data for a comparison of whites and Negroes. The deaths recorded there exclude cases known before the survey. Populations for the survey negatives are simply the counts of persons whose films were interpreted as negative. Populations for the survey positives include those persons considered to be in need of observation for definite or suspected tuberculosis, based on the findings of the initial clinic examination. No cases have been discharged from follow-up except for definite evidence on subsequent examinations that the initially observed abnormality was not tuberculous. Such persons as have been discharged during the 3½-year post survey period have also been excluded from the survey positive population as given in table 5.

Table 5. *Deaths and death rates from tuberculosis in Muscogee County by race, July 1, 1946, through Dec. 31, 1949, in selected groups of the surveyed population*

Survey status and race	Population	Deaths	Average annual death rate per 100,000 population
Survey positive:			
White	377	5	380
Negro	189	13	1,970
Survey negative:			
White	26,860	3	3
Negro	19,277	26	39

As might be expected, the death rates for survey positive cases are very high—almost 400 per 100,000 for whites and nearly 2,000 for Negroes. In one sense, these are crude tuberculosis fatality rates and, although based on very small numbers of deaths, give some indication of the effectiveness of the services rendered survey-discovered cases. While it is not possible to determine how much larger the rates might have been without the survey, it is obvious that not all cases can be prevented from dying.

The mortality rate among survey negative cases is very low for whites—3 per 100,000 persons per year. This finding certainly indicates that rapidly fatal tuberculosis very rarely occurs among those who have a survey film that is reported as being negative. In striking contrast, the Negro rate is 39, 13 times that for the whites. For both the presurvey and the postsurvey periods, the total Negro death rate from tuberculosis is only 4 times that for the whites; for the populations not surveyed, and for the survey positives, the Negro death rate is only 5 times greater. Because of the small number of deaths occurring in some of these groups, it is not possible to demonstrate statistically significant differences. It would appear, however, that it is in the negative group that Negro tuberculosis mortality compares least favorably with the white.

The fatal cases among the persons with negative films must have resulted from tuberculous disease arising either from within an individual as endogenous disease, from outside sources, resulting in exogenuous reinfection or progressive primary disease. One would not expect the Negroes with negative films to have been exposed to any more infectious cases than the whites, since the survey program of identification and isolation appeared to have been more effective for the Negroes. Three-quarters of the adult Negroes but only half of the whites were surveyed. It may be assumed then that, of the contagious cases, more Negroes than whites were identified. The achievement of complete isolation of all infectious cases is a practical problem in most large communities because of the reluctance of patients to accept medical recommendations and treatment. For about two-thirds of the cases in this county, hospitalization was provided, a record that probably compares favorably with most other large communities. This proportion of known infectious cases hospitalized and consequently fairly well isolated has been maintained throughout the postsurvey period. Estimates would indicate that a higher proportion of Negro than white contagious cases was isolated. Although the white cases left in the community could expose some Negroes, and vice versa, yet for practical purposes the contagious cases are most likely to expose members of their own race. Consequently, it is difficult to see how there could be more unisolated sources to infect Negroes than the whites.

There are other possible explanations for this situation. It may be that the contacts of the unisolated Negro cases had more intense infection, and because of this greater dosage of infection, they were more prone to develop fatal disease. It is also possible that the Negro contacts who did develop the disease ran a much more rapid clinical course, and that insufficient time has elapsed for more chronic cases to appear in the mortality statistics. General clinical experience indicates that whites are more likely to have slowly progressive tuberculosis than Negroes, and because of this it may be that 3½ years is insufficient time to demonstrate fatal disease among the whites. Or, finally, it may well be that endogenous tuberculosis is of greater significance among Negroes than whites. Further studies, more extensive in both numbers and time, will be required to elucidate why the Negroes with previously negative films appear to compare less favorably with their white counterparts than do those with X-ray evidence of tuberculosis.

If future experience should demonstrate that the marked race difference in mortality among persons with negative survey films is not due to the relatively short period of observation, these findings will have enormously important implications for tuberculosis control, as Davies (*6*) and his coworkers (*7*) have pointed out. For whites, a single complete survey of the entire population might possibly reduce tuberculosis control for a considerable period of time almost entirely to the task of providing adequate medical care and follow-up service for cases that can be identified by the mass survey procedure. For Negroes, such a program as carried out at the present time would apparently not be sufficient. But whether improvements could be effected through much more prompt and effective isolation for Negroes, through more extensive and frequent postsurvey case finding, or through measures designed to decrease the likelihood of endogenous disease, cannot be answered at this time. However, by means of such intensive studies as are being continued in Muscogee County of the conditions under which persons with negative survey films acquire rapidly fatal disease, it may be possible to discover the critical elements that are still lacking in our understanding of the natural history of tuberculosis, and through this knowledge to suggest more effective methods of its control.

Summary

In 1946, a community-wide chest X-ray survey was carried out in Muscogee County, Ga., in which 60 percent of the population over 12 years of age was examined. On the basis of a census taken shortly after the survey and a careful study of tuberculosis in the county since the survey, it has been possible to allocate tuberculosis deaths which occurred in a 3½-year postsurvey period into three major groups—those among cases known prior to the survey, those examined in the survey, and those not examined in the survey. Although the number of tuberculosis deaths in this period is too small to allow extensive analyses, or conclusions which are as definitive as might be desirable, the results would appear to warrant careful consideration. Among these results are the following:

1. Tuberculosis mortality rates for the county decreased slightly in the 3½-year period following the survey.

2. Tuberculosis mortality among the surveyed and nonsurveyed populations is not significantly different. Since part of the surveyed cases had treatment earlier in their disease than the nonsurveyed cases, their fatality may have been somewhat decreased. This suggests that the nonsurveyed population had proportionately fewer cases of tuberculosis than the surveyed; and the fact that the death rate was not more markedly decreased cannot be explained on the basis of undiscovered cases alone.

3. If one assumes that all eligible persons in the community were X-rayed in the survey, it can be estimated that three-eighths of all deaths would have occurred among persons with negative survey films. One-fifth of all white deaths and one-half of Negro deaths would not have shown X-ray evidence of tuberculosis at the time of the survey.

4. Crude fatality rates for the survey positive cases are rather high, averaging annually to almost 400 per 100,000 for the whites, and slightly less than 2,000 for the Negroes.

5. Mortality rates among survey negatives show even more striking race differences. The white rate is only 3 per 100,000; the Negro rate is 39, or 13 times as large. However, Negro mortality among those with evidence of disease on the survey film and among the general

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population is only 4 to 5 times as great as the white. The reasons for the greater difference between races in mortality among those with no evidence of tuberculosis at the time of the survey are unknown. Since a larger proportion of the Negroes were X-rayed in the survey and thereby more cases were identified and isolated it seems unlikely that more contagious cases were left as sources of infection among the Negroes than the whites.

If future studies confirm these findings, it appears that a complete survey in a white population followed by adequate isolation might be so effective that for some time the tuberculosis control program in the community would consist chiefly of the provision of medical care and follow-up services to persons identified as tuberculous in the survey. For Negroes, it would seem that this would not be sufficient. Studies are being continued to ascertain the reasons for the striking difference in mortality between the two races, to improve our understanding of this disease, and to increase thereby the effectiveness of tuberculosis control.

ACKNOWLEDGMENT

The authors are indebted to Dr. C. E. Palmer, Chief, Field Research Branch, Division of Chronic Disease and Tuberculosis, Public Health Service, for his invaluable guidance and assistance in the preparation of the manuscript.

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APPENDIX

Table A. *Deaths from tuberculosis in Muscogee County, by age, race, and sex, July 1, 1946, through Dec. 31, 1949*

Age at death	Total	White			Negro		
		Total	Male	Female	Total	Male	Female
Total	125	45	20	25	80	43	37
Under 15 years	8	5	1	4	3	1	2
15–24	12	3	------	3	9	5	4
25–34	33	6	2	4	27	11	16
35–44	31	9	7	2	22	15	7
45–64	35	18	8	10	17	9	8
65 and over	6	4	2	2	2	2	------

Table B. *Deaths from tuberculosis in Muscogee County, July 1, 1946, through Dec. 31, 1949, among persons with negative survey films in 1946 by age, race, and sex*

Age at death	Total	White			Negro		
		Total	Male	Female	Total	Male	Female
Total	29	3	1	2	26	16	10
15–24	5	2	------	2	3	------	3
25–34	8	------	------	------	8	4	4
35–44	13	1	1	------	12	9	3
45–64	2	------	------	------	2	2	------
65 and over	1	------	------	------	1	1	------

Table C. *Deaths from tuberculosis in Muscogee County, July 1, 1946, through Dec. 31, 1949, among persons with negative survey films in 1946, by year when disease was first diagnosed, and race*

Year of diagnosis	Race		
	Total	White	Negro
Total	29	3	26
1946	3	------	3
1947	8	2	6
1948	10	1	9
1949	8	------	8

Table D. *Deaths from tuberculosis in Muscogee County, July 1, 1946, through Dec. 31, 1949, by year of death, survey status in 1946, and race*

Year of death	Total			Survey negatives			Survey positives			Known before survey			Remainder not X-rayed		
	Total	White	Negro	Total	White	Negro	Total	White	Negro	Total	White	Negro	Total	White	Negro
Total	125	45	80	29	3	26	18	5	13	29	12	17	49	25	24
1946	11	4	7	------	------	------	------	------	------	6	3	3	5	1	4
1947	35	10	25	7	1	6	10	2	8	10	1	9	8	6	2
1948	36	17	19	9	1	8	3	1	2	8	5	3	16	10	6
1949	43	14	29	13	1	12	5	2	3	5	3	2	20	8	12

Secondary Radiation Limits in Photofluorography

By Willard W. Van Allen, B. Sc.*

In establishing standards for the protection of personnel subjected to general X-radiation, the National Advisory Committee on X-ray and Radium Protection, National Bureau of Standards, in 1949 recommended a maximum tolerance dosage of 0.3 roentgen (300 milliroentgens) per week (*1*). Although this standard is generally observed at the present time, there are many who feel that the recommended radiation dosage limit is too high, especially under operating conditions where particularly susceptible parts of a technician's body may be exposed to X-rays. Several generations must elapse before this limit, or any other for that matter, can be proved entirely safe. Therefore, in the absence of definite proof of safety, it must be the aim of all concerned with radiation protection not merely to keep the personnel dosage rate below the arbitrary level of 300 mr. per week, but rather, to keep it as low as possible.

It should follow, therefore, that there can be no justification for operating an X-ray unit at higher personnel radiation dosage levels than those encountered on other similar installations, even though all dosages are within the 300 mr. per week limit. In other words, the criterion for radiation safety should be represented by the radiation dosage conditions encountered in the installation affording the most nearly complete protection. Thus, if a photofluorographic unit can operate at a personnel exposure level of 40 mr. per 1,000 exposures, any other unit which may be operating at twice this dosage level can justifiably be criticized for its inadequate protection of personnel, even with a total weekly dosage under existing load conditions of less than 300 mr.

What, therefore, are realistic limits for radiation exposure dosage in the operation of photofluorographic machines? In an attempt to answer this question, the Electronics Laboratory of the Division of Chronic Disease and Tuberculosis, measured the radiation levels encountered in a wide variety of photofluorographic equipment used by the Division in mass chest X-ray surveys, and prepared radiation field maps on the basis of this information (*2*). These maps indicated the amount of radiation exposure sustained by personnel working in each type of X-ray installation. Two of these field maps are pre-

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sented in figures 1 and 2. The former shows the radiation intensity in the various regions surrounding a typical portable photofluorograph, while the latter gives the same information for a typical mobile installation. These two examples have been chosen not because they necessarily represent ideal protective conditions, but rather the best conditions found in the study. At the same time, they are the most commonly used installation plans.

In each of these typical installations, a technician should be able to limit his radiation dosage to approximately 40 mr. per 1,000 exposures. Clerks in the mobile installation (fig. 2) should receive no more than 30 mr. per 1,000 exposures, while those in the portable unit (fig. 1), should receive even less than this dosage if reasonable care is taken to locate them at positions affording maximum protection.

In the experience of the Division of Chronic Disease and Tuberculosis, these radiation exposure dosage limits of 40 mr. per 1,000

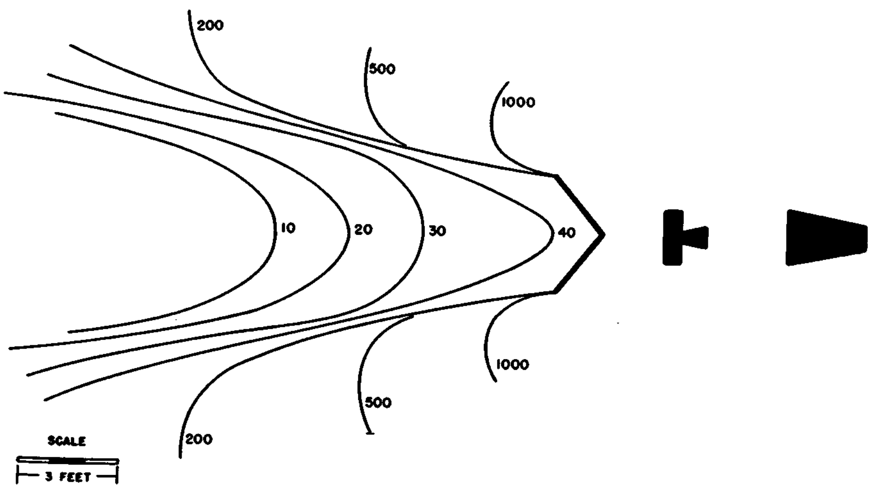

Figure 1. Radiation intensities (in milliroentgens per 1,000 exposures) surrounding a typical portable photofluorograph.

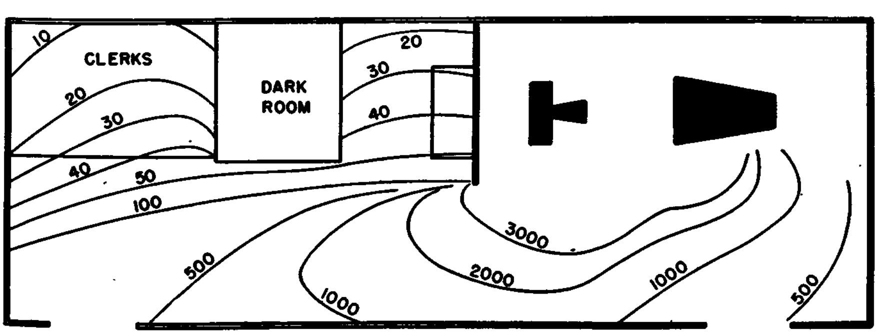

Figure 2. Radiation intensities (in milliroentgens per 1,000 exposures) surrounding a typical mobile photofluorograph.

exposures for technicians and operators and 30 mr. per 1,000 for clerks are not only practicable, but entirely tenable under actual operating conditions. Radiation monitoring by means of dental film badges in the recent Los Angeles County chest X-ray survey showed this to be true by revealing weekly average dosage levels of 47 mr. per 1,000 exposures for technicians, and 30 mr. per 1,000 for clerks. Both of these actual figures were in excellent agreement with predicted values, and both resulted in total weekly dosages under existing load conditions of well below 300 mr. Installations which operate at higher radiation dosages than these should therefore give cause for concern, since they expose personnel to more radiation than necessary.

Radiation monitoring programs, utilizing either ionization chambers or dental film badges and taking into consideration weekly unit exposure loads, are most useful in determining not only how well operating personnel are observing safety rules, but also how effective the protective devices themselves are. It should be reemphasized, however, that monitoring should serve not only as a check against dosages exceeding 300 mr. per week, but, more important, against dosages in excess of 40 mr. per 1,000 exposures for technicians, and 30 mr. per 1,000 for clerks. By tabulating the results of such monitoring programs, a clear picture of the entire radiation exposure situation may be had at a glance.

In the Los Angeles County chest X-ray survey, in which U. S. Public Health Service personnel participated, monitoring tables were kept for 150 employees assigned to 40 photofluorographic units over the course of 26 weeks of operation. Selected portions of these tables are presented in tables 1 and 2. Table 1 shows part of the monitoring record for individual technicians according to the units to which they were assigned. The figures shown in this table represent the factors by which monitored radiation, as recorded on the dental film badges, exceed 40 mr. per 1,000 exposures; only those factors which are greater than 1.5 are recorded. As indicated in the table, technician B received more than "normal" amounts of radiation on several different units. Other technicians working on these same units, however, did not receive overdoses. Obviously, this is compelling presumptive evidence of technician B's carelessness.

On unit 5, on the other hand, it will be noted that several technicians received radiation dosages ranging from three to five times the "normal" amount, some of them repeatedly. This is equally convincing evidence of the inadequacy of protective measures employed on this particular unit. At the very least, it is evident that personnel protection on this unit was inferior to that of other units, so that investigation was distinctly warranted.

Table 2 presents overdose factors recorded for individuals assigned to a given unit each week. Here again, only dosages which exceed the

Table 1. *Extent of radiation in excess of 40 mr. per 1,000 exposures received by technicians at various operating units*

Technician	Excess factor [1]							
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
A					3.0 4.9			
B	3.0		5.2	2.0			2.5	
C					4.5			
D					3.2 3.7 4.8			
E								
F					3.9			

[1] Factor by which radiation exceeds 40 mr. per 1,000 exposures; only factors greater than 1.5 are shown.

Table 2. *Extent of radiation in excess of 40 mr. per 1,000 exposures*

Week	Excess factor [1]							
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
1					5.9 7.2			
2	1.5				6.3 2.1			
3					7.4			
4							2.1	
5					5.5			
6								2.2
7		3.1 7.4 6.7			4.7 13.3			
8		4.6		2.0				
9		12.0 4.0 6.5						2.0
10					11.2			
11		5.0 4.2			5.2			
12		3.9			6.5			

[1] Factor by which radiation exceeds 40 mr. per 1,000 exposures; only factors greater than 1.5 are shown.

"normal" by a factor of more than 1.5 are shown. As indicated, units 1, 3, 4, 6, and 7 appear to be adequately protected, while unit 5 shows a consistent record of overdosages, as it does in table 1. In the case of unit 2, it is evident that something happened after the sixth week of operation to reduce the effectiveness of protective measures. Investigation following these tabulations revealed the causes for these "failures," so that recommendations for improvement of protective techniques could be made.

Since it is possible to establish exposure "norms" for all types of operating personnel and all types of installations, it should be obvious that the calculation of individual radiation dosages on a "per 1,000" basis is far more valuable than the mere determination of whether the weekly dose is less than 300 mr. or not. All results calculated on this basis, however, must be interpreted with due regard for the possibility of occasional accidents. Dental film badges may be forgotten by the technicians, so that low radiation readings may result. Furthermore, the badges may inadvertently be left in areas subject to radiation, so that it is possible to encounter excessive readings even in cases where a technician has been off duty for a day or two.

Summary

1. Radiation protection programs should be based on limiting exposure to the lowest practical level within the maximum tolerance dosage of 300 mr. per week.

2. Studies show that radiation exposure of personnel employed in most types of photofluorographic installations can readily and practicably be limited to 40 mr. per 1,000 exposures for technicians and 30 mr. per 1,000 for clerks. At the higher figure, 7,500 exposures per week could be made within the limits of the maximum tolerance dose of 300 mr.; this load is very rarely approached in practice.

3. Personnel monitoring, through the use of ionization chambers or dental film badges, should be conducted not only to assure personnel radiation dosages of less than 300 mr. per week, but also to maintain *maximum* protection below this level.

4. Radiation monitoring reports should be interpreted against maximum dosages of 40 mr. per 1,000 exposures for technicians and 30 mr. per 1,000 for clerks. Dosages in excess of these levels should be investigated and steps taken to correct the causes of excessive exposure, even though total radiation is less than 300 mr. per week.

5. Tabular records of radiation exposure levels should be kept for individual employees and individual units as a means of indicating failures in the protective program. These records should indicate the extent to which the levels recommended in the preceding paragraph are exceeded.

6. Protective devices and techniques which do not afford *maximum* protection should be discarded even though their use assures radiation dosages below the tolerance level of 300 mr. per week.

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Incidence of Disease

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

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UNITED STATES

Reports From States for Week Ended May 12, 1951

Three cases of anthrax were reported for the current week, two in Pennsylvania and one in California. A case of psittacosis was reported in Maywood, Cook County, Ill.

The incidence of poliomyelitis has remained stationary for several weeks. A total of 71 cases was reported for the current week as compared with 58, 71, 52, 73, and 70 for the previous 5 weeks. A total of 101 cases was reported for the week ended May 13, 1950.

Epidemiological Reports

Erythema Infectiosum

Dr. J. W. R. Norton, North Carolina Health Officer, has reported an epidemic of a disease tentatively diagnosed as erythema infectiosum (Fifth Disease) among children in several schools located in Buncombe County near Asheville. It is estimated that 100 to 200 children have been affected with a very mild disorder in which there was a transient erythema and macular rash lasting 2 to 7 days. A few cases had a low grade fever and gastro-intestinal symptoms. No specific control measures were instituted since school attendance was not seriously affected.

Infectious Hepatitis

Dr. J. W. R. Norton has reported an outbreak of infectious hepatitis among children in Columbus County which is located in the southeastern part of North Carolina. The attack rate was sufficiently high in one or two instances to require the temporary closing of certain grades in a school, but the infection did not appear to involve a very wide area of the county.

Epidemic Jaundice

Dr. J. R. McDowell, Colorado Department of Public Health, has reported an extensive epidemic of epidemic jaundice in Montrose, Colo. Cases have been occurring in the community since October

1950. The illness has been characterized by fever (102° to 104°), abdominal pain, and jaundice. Some of the clinical as well as epidemiological findings suggest the possibility of leptospirosis. One group of multiple cases in a family was reported to have followed the death of a dog that had jaundice.

Tularemia

Dr. R. M. Albrecht, New York State Department of Health, has reported three cases of tularemia in Cayuga County. In the investigation conducted by Dr. Walter Levy, it was found that two cases were in a man and his wife who were engaged in skinning muskrats. Both had the ulceroglandular type of infection. The third case was in a muskrat trapper in an adjoining area. Three previous cases in persons trapping and skinning muskrats were reported from nearby Wayne County in 1942 and two in Oswego County in 1930.

Anthrax

Dr. W. L. Halverson, California Director of Public Health, has reported a fatal case of anthrax in an 11-year-old boy who left Missouri April 25 by automobile with his parents to visit in California. The first night of the trip was spent in Oklahoma at which time the boy was scratched or bitten on the hip by an insect. It was not brought

Comparative Data For Cases of Specified Reportable Diseases: United States

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

Disease	Total for week ended—		5 year median 1946–50	Seasonal low week	Cumulative total since seasonal low week		5-year median 1945–46 through 1949–50	Cumulative total for calendar year—		5-year median 1946–50
	May 12, 1951	May 13, 1950			1950–51	1949–50		1951	1950	
Anthrax (062)	3	1	1	([1])	([1])	([1])	([1])	31	12	18
Diphtheria (055)	82	75	141	27th	4504	6894	9,961	1,597	2,623	3,603
Encephalitis, acute infectious (082)	15	12	12	([1])	([1])	([1])	([1])	290	248	168
Influenza (480–483)	1,027	1,404	768	30th	125,958	144,408	144,408	111,416	133,824	125,049
Measles (085)	24,190	15,507	26,551	35th	346,952	195,453	398,781	318,251	176,323	363,835
Meningitis, meningococcal (057.0)	77	80	75	37th	2,937	2,695	2,643	1,976	1,781	1,671
Pneumonia (490–493)	1,147	1,593	([2])	([1])	([1])	([1])	([1])	[3] 36,033	46,842	([2])
Poliomyelitis, acute (080)	71	101	84	11th	482	551	435	1,694	1,682	842
Rocky Mountain spotted fever (104)	6	7	8	([1])	([1])	([1])	([1])	19	31	31
Scarlet fever (050)[4]	1,772	1,395	1,957	32d	57,976	48,529	71,544	42,285	32,090	48,964
Smallpox (084)	------	1	2	35th	13	42	65	5	21	44
Tularemia (059)	14	24	16	([1])	([1])	([1])	([1])	264	387	387
Typhoid and paratyphoid fever (040, 041)[5]	39	108	69	11th	[6] 321	398	404	[6] 756	908	908
Whooping cough (056)	1,662	2,867	1,965	39th	[7] 50,772	71,513	71,513	[7] 29,170	49,977	40,341

[1] Not computed.
[2] Data not available.
[3] Additions—week ended May 5: Florida, 17 cases and West Virginia, 29.
[4] Including cases reported as streptococcal sore throat.
[5] Including cases reported as salmonellosis.
[6] Deductions: Arkansas, weeks ended Mar. 3 and 31, 1 and 2 cases, respectively.
[7] Deduction: Pennsylvania, week ended Apr. 28, 828 cases.

to the attention of the parents until 4 days later when they arrived in California. A large ulcerated area on the thigh and meningitis were noted when he was hospitalized on May 2. He died May 3. Anthrax bacilli were cultured from spinal fluid and confirmed by animal inoculation.

Rabies in Animals

Dr. A. L. Gray, Mississippi Board of Health, has reported an outbreak of rabies in wild foxes, cattle, and dogs in the northern part of Smith County and the southern part of Scott County, which are adjoining areas. The outbreak apparently started in wild foxes of which 12 have died or have been killed and were suspected of having rabies. One fox head was confirmed by laboratory examination. Eighteen cattle and two dogs have died of rabies. Another small outbreak has occurred in the city of Natchez in Adams County, consisting of four rabid dogs.

Dr. E. A. Belden, Missouri Division of Health, has reported that the rapid rise in the number of cases of rabies in animals in recent weeks has been due to the existence of a rabies epidemic in the city and county of St. Louis, and also to accumulated reports which had not previously been made.

In Iowa, Minnesota, Nebraska, North Dakota, and South Dakota, rabies in skunks, or civet cats, is a current problem.

Reported Cases of Selected Communicable Diseases: United States, Week Ended May 12, 1951

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

Area	Diphtheria (055)	Encephalitis, infectious (082)	Influenza (480–483)	Measles (085)	Meningitis, meningococcal (057.0)	Pneumonia (490–493)	Poliomyelitis (080)
United States	**82**	**15**	**1,027**	**24,190**	**77**	**1,147**	**71**
New England	**2**		**9**	**836**	**5**	**29**	
Maine	1		8	47		7	
New Hampshire				9		2	
Vermont				76			
Massachusetts	1			459	5		
Rhode Island				5		1	
Connecticut			1	240		19	
Middle Atlantic	**6**	**4**	**11**	**4,061**	**6**	**169**	**9**
New York	1		[1] 5	1,733	3	42	8
New Jersey	1	4	6	704	1	55	1
Pennsylvania	4			1,624	2	72	
East North Central	**12**	**6**	**27**	**4,089**	**18**	**119**	**8**
Ohio				685	6		
Indiana	4	1	20	255		11	
Illinois	7	2	5	630	7	62	3
Michigan	1	3	2	655	1	46	2
Wisconsin				1,864	4		3
West North Central	**2**		**42**	**1,400**	**8**	**96**	**2**
Minnesota			2	104	2	15	
Iowa	1			290	3		1
Missouri			1	221	3	1	
North Dakota			39	64		76	
South Dakota				28		1	1
Nebraska				41			
Kansas	1			652		3	
South Atlantic	**24**		**397**	**1,856**	**14**	**139**	**10**
Delaware				17			
Maryland			3	221		53	
District of Columbia			3	63		24	
Virginia	5		317	756	8	42	1
West Virginia	4			168	1		1
North Carolina	9			172			1
South Carolina	4		42	47	1	14	
Georgia			32	226	4	6	2
Florida	2			186			5
East South Central	**5**	**4**	**54**	**746**	**4**	**90**	**6**
Kentucky	1			316	1	3	2
Tennessee	2	3	45	115	2		
Alabama	1			281	1	60	2
Mississippi	1	1	9	34		27	2
West South Central	**10**	**1**	**293**	**4,043**	**11**	**366**	**20**
Arkansas			236	333	1	53	1
Louisiana			4	50	1	41	6
Oklahoma	3	1	53	477		24	
Texas	7			3,183	9	248	13
Mountain	**13**		**158**	**1,489**	**3**	**70**	**6**
Montana			17	72		1	2
Idaho				145	1		
Wyoming				308		2	
Colorado	11		15	253		24	1
New Mexico	1		2	144		15	
Arizona	1		124	510	2	28	3
Utah				54			
Nevada				3			
Pacific	**8**		**36**	**5,670**	**8**	**69**	**10**
Washington			6	1,258	3	1	3
Oregon	2		16	585		28	
California	6		14	3,827	5	40	7
Alaska			22				
Hawaii			4	12		1	

[1] New York City only. *Anthrax:* California, 1 case; Pennsylvania, 2 cases.

Reported Cases of Selected Communicable Diseases: United States, Week Ended May 12, 1951—Continued

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

Area	Rocky Mountain spotted fever (104)	Scarlet fever (050)	Small-pox (084)	Tularemia (059)	Typhoid and paratyphoid fever [1] (040, 041)	Whooping cough (056)	Rabies in animals
United States	**6**	**1,772**		**14**	**39**	**1,662**	**191**
New England		**165**			**2**	**76**	
Maine		23				33	
New Hampshire		([2])					
Vermont		2					
Massachusetts		112			2	36	
Rhode Island		11				3	
Connecticut		17				4	
Middle Atlantic		**305**			**6**	**181**	**8**
New York		[2] 172			1	59	1
New Jersey		41			3	47	
Pennsylvania		92			2	75	7
East North Central		**600**			**7**	**166**	**22**
Ohio		124			1	27	3
Indiana		42			1	33	15
Illinois		49			4	9	1
Michigan		333			1	56	3
Wisconsin		52				41	
West North Central		**74**		**1**	**2**	**80**	**83**
Minnesota		15			1	12	3
Iowa		5				7	8
Missouri		24		1	1	8	71
North Dakota		2				28	
South Dakota		2				4	
Nebraska		4				2	1
Kansas		22				19	
South Atlantic	**1**	**109**			**9**	**195**	**24**
Delaware		1				2	
Maryland		19				12	
District of Columbia		7				3	
Virginia	1	14				54	4
West Virginia		23					2
North Carolina		31			3	53	
South Carolina		3				4	13
Georgia					6	29	4
Florida		[2] 11				38	1
East South Central		**28**		**3**	**5**	**122**	**29**
Kentucky		12			3	15	11
Tennessee		7			1	18	14
Alabama		8		1	1	52	
Mississippi		1		2		37	4
West South Central		**79**		**9**	**4**	**434**	**25**
Arkansas		2		2	2	72	2
Louisiana		5			1	3	
Oklahoma		16				16	2
Texas		56		7	1	343	21
Mountain	**5**	**109**		**1**		**327**	
Montana				1		8	
Idaho		22				3	
Wyoming	3	1				206	
Colorado	1	11				39	
New Mexico						21	
Arizona		16				42	
Utah		[2] 59				4	
Nevada	1					4	
Pacific		**303**			**4**	**81**	
Washington		33				15	
Oregon		35				6	
California		[2] 235			4	60	
Alaska		1				1	
Hawaii					1		

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

Psittacosis: Illinois, 1 case.

FOREIGN REPORTS

CANADA

Reported Cases of Certain Diseases—Week Ended April 28, 1951

Disease	Total	New found-and	Prince Ed-ward Island	Nova Scotia	New Bruns-wick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Al-berta	Brit-ish Co-lum-bia
Brucellosis	4					2	2				
Chickenpox	941	1		21	1	268	452	39	13	48	98
Diphtheria	4					4					
Dysentery, bacillary	8						2				6
Encephalitis, infectious	1							1			
German measles	484	1		108		43	234	1	20	28	49
Influenza	47			6	10			13			18
Measles	1,375			39	11	266	757	71	25	112	94
Meningitis, meningococcal	1										1
Mumps	767			4	2	284	221	40	59	76	81
Scarlet fever	285					92	48	29	15	45	56
Tuberculosis (all forms)	231	3		4	12	137	21	11	5		38
Typhoid and paratyphoid fever	11					7	2				2
Venereal diseases:											
Gonorrhea	252	2		7	7	48	44	28	5	43	68
Syphilis	104	3		11	5	35	23	5	4	3	15
Primary	7					2		1	2		2
Secondary	10			3	3	3	1				
Other	87	3		8	2	30	22	4	2	3	13
Other forms	2										2
Whooping cough	133			5	1	12	50	2	5	39	19

JAMAICA

Reported Cases of Certain Diseases—4 Weeks Ended April 28, 1951

Disease	Total	Kingston	Other localities
Chickenpox	189	34	155
Diphtheria	9	4	5
Dysentery, unspecified	3	2	1
Leprosy	3		3
Ophthalmia neonatorum	1		1
Scarlet fever	1	1	
Tuberculosis, pulmonary	84	41	43
Typhoid fever	57	8	49
Typhus fever (murine)	4	2	2

MADAGASCAR

Reported Cases of Certain Diseases and Deaths—February 1951

Disease	Aliens		Natives	
	Cases	Deaths	Cases	Deaths
Beriberi			80	
Bilharziasis			30	
Diphtheria	2		3	1
Dysentery :				
Amebic	3		147	3
Bacillary			89	1
Erysipelas			15	1
Influenza	10		1,931	8
Leprosy			13	
Malaria	156	2	25,866	84
Measles	7		141	1
Meningitis, meningococcal			1	
Mumps			80	
Paratyphoid fever			2	
Plague			23	16
Pneumonia (all forms)	3	2	314	33
Puerperal infection			4	
Tuberculosis, respiratory	6	1	72	12
Typhoid fever	8		18	4
Whooping cough			242	3

CEREBROSPINAL MENINGITIS

Anglo-Egyptian Sudan. A total of 4,701 cases of cerebrospinal meningitis was reported for the week ended April 28 as compared with 3,730 for the previous week. These cases were chiefly in the provinces of Blue Nile and Kordofan. Approximately 27,800 cases have have been reported since January 1, 1951.

French Equatorial Africa. A large outbreak of cerebrospinal meningitis has been in progress in the Chad territory. During March 9,588 cases were reported as compared with 232 for February.

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

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

Cholera

Indonesia. Two cases of cholera have been reported in Viet Nam, one for the week ended April 28, 1951, and one for week ended May 5.

Plague

Ecuador. During the period March 16–31, 1951, four cases (one death) of plague were reported in Loja Province.

Indonesia. For the week ended April 21, 1951, 12 cases (four deaths) of pneumonic plague were reported in Timbang, Madura.

Smallpox

Burma. During the week ended May 5, 1951, smallpox was reported in ports as follows: Akyab, one case; Moulmein, one; and Rangoon, seven.

Indochina. During the week ended May 5, 1951, smallpox was reported in Viet Nam as follows: Haiphong 72 cases, Hanoi 30, and Saigon 1.

Korea. During February, 156 cases (33 deaths) of smallpox were reported compared with 39 (4 deaths) for January.

Typhus Fever

Korea. Typhus fever has been reported in Korea as follows: For February—Pusan, 18 cases and Kunsan, 5; for January—Pusan, 4 cases.

Jamaica. For the week ended April 28, 1951, two cases of murine typhus fever were reported in Kingston.

Yellow Fever

Gold Coast. During the week ended April 28, 1951, suspected cases of yellow fever were reported as follows: Aboadzi, Sekondi, and Tarkwa, one case each.

Plague in Wild Rodents in Santa Fe County, N. Mex.

Dr. V. B. Link, Western Communicable Disease Center Laboratory, San Francisco, reports that the specimen N. M. 6140–6141, consisting of 8 fleas, *Monopsyllus wagneri*, from 2 white-footed mice, *Peromyscus truei*, trapped 14 miles southeast of Santa Fe City limits on U. S. Highway 85 on April 18, 1951, was positive for plague. This is the first time that wild rodent plague has been demonstrated in Santa Fe County, New Mexico. The only previous indication of plague in this county was July 1950, when a resident of Glorieta died of plague. The rodents being reported upon were trapped about 3 miles from the residence of the 1950 victim.