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A Sociological Study of Awareness of Symptoms among Persons with Pulmonary Tuberculosis *

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In 39 randomly selected villages and towns in Tumkur District, South India, approximately 2000 persons, tuberculosis cases and matched controls, were interviewed in order to determine how many had symptoms suggestive of tuberculosis. Approximately 70% of the bacteriologically confirmed cases and over half the radiologically active or probably active cases had at least one major symptom. The authors discuss these findings in the light of the results of certain other studies they have carried out—for example, on present action-taking among tuberculosis sufferers. They conclude that under present circumstances in India, it is epidemiologically and economically justified to base tuberculosis control programmes on the persons who seek assistance because of worry over symptoms. Only when services satisfying the needs of the already worried tuberculosis sufferers are well developed, may mass case-finding be considered as an additional measure.

INTRODUCTION

Public health authorities occasionally refer to an entity they call " the problem of tuberculosis " in a given country or area. The problem of pulmonary tuberculosis is, in the final analysis, the total sum of all the suffering, discomfort and economic dislocation directly or indirectly brought about by the tubercle bacillus destroying human lung tissue. Until recently, the measurement of the tuberculosis problem was usually in the form of mortality and morbidity figures based on notification to public health authorities. Over the last few years more precise estimates of the tuberculosis problem are being obtained through epidemiological sample surveys. In these surveys the measurements are usually in terms of the numbers and proportions of persons with large reactions to tuberculin skin tests, of persons with shadows on chest photofluorograms judged to represent lung lesions caused by tubercle bacilli, and of persons with tubercle bacilli that can be isolated by a variety of techniques. In justifiable enthusiasm over mastering the more precise measurements of the epidemiological surveys, tuberculosis research workers have sometimes lost sight of the true problem of tuberculosis, as defined above. The presence of the bacilli in the sputum, X-ray shadows of various categories and tuberculin sensitivity of various levels are of crucial importance for determining epidemiological trends and for choosing the epidemiologically most effective control measures. The measurement of the extent of suffering in terms of the symptoms experienced by persons who harbour the disease provides an additional dimension for assessing the problem of pulmonary tuberculosis in a community as a problem of human suffering. The economic consequences of the problem can be assessed by evaluating the influence of such suffering on the economic life of the individual, of the family or of the community. A quantitative estimation of the suffering caused by the disease, when viewed in the context of the epidemiological features as assessed by the various symbols, provides the social planner in health with a valuable additional index for estimating the intensity of action called for in dealing with the problem. Also, an estimation

* The field work was carried out, under the direction and supervision of the authors, by the following social investigators: Miss Susy Mathews, Mr. Munikrishnappa, Mrs G. Lalitha Pratap, Miss M. A. Seetha, Mr. M. K. Viswanath. In sampling and in analysis of material, assistance was given by the Statistical Section of the National Tuberculosis Institute (NTI), headed by Dr M. V. Jambunathan, Statistical Officer, and Mr H. T. Waaler, WHO Senior Statistician.

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of the prevalence of symptoms among persons with pulmonary tuberculosis in the community provides vital information for planning and organizing a national tuberculosis control programme. If a substantial proportion of persons with tuberculosis are symptomatic at a given point of time, a control programme based on symptomatic sufferers seeking treatment might prove to be economical, practical and yet effective. Finally, data on the prevalence of symptoms may help in developing cheaper epidemiological methods. Thus, if nearly all sputum-positive persons have a certain symptom or set of symptoms, selection for bacteriological examination of sputum might be based on the results of questioning as to symptoms instead of on the very expensive X-ray examination.

Such a sociological approach to a public health problem is a relatively new field of investigations. When symptom questioning has been used in the past, it has more often than not been considered a less desirable alternative to investigations using more precise diagnostic means. Health surveys consisting in interviews of people on their state of health were a useful means of getting preliminary information, but they became only truly valuable when supplemented by survey methods using more objective tools than the interview. In tuberculosis the situation has in recent years been the reverse: the relatively objective tuberculin test, X-ray examination and bacteriological examinations have completely dominated the field; in practically none of the more recent surveys has the information been supplemented by an interview. One exception in India is the survey carried out in Delhi and New Delhi by Sikand & Raj Narain (1957). In this survey, interviews were conducted to ascertain how many of the tuberculosis cases found were " known ". The result of the interviewing was that only 27% of the radiologically active cases and 42% of the bacteriologically positive cases were found to be known—that is, known to the, in this case, relatively efficient tuberculosis service. The authors conclude from these findings that consciousness of the disease is not sufficiently widespread for control measures to be based on it, and that the " unknown " cases constitute a major public health hazard.

It is the contention of this paper that there is a need for clearer distinctions and definitions in this field than those employed in the above-mentioned paper. With such sharper definitions and better defined research techniques, far more interesting and meaningful results may be obtained leading—as will be shown—to very different views on the potentiality of various approaches to tuberculosis control.

The present study was planned with the object of assessing the awareness of symptoms among persons with pulmonary tuberculosis diagnosed in an epidemiological survey in Tumkur District, Mysore State. A certain amount of theoretical consideration and several preliminary investigations for evolving a suitable design were necessary before the study could be carried out. These aspects are dealt with in the section " Methods " below. The results are largely given in the form of detailed tables which will permit the reader to perform his own analysis and draw his own conclusions. Finally, in the section " Practical implications " an attempt is made to draw some provisional conclusions as to the consequences of the findings for the planning of tuberculosis programmes in India.

METHODS

General

An appropriate design and an appropriate interviewing technique had to be developed before the study proper could be undertaken. Particularly it was felt that after the principle of the interviewing techniques had been agreed upon, there was a need for determining the fullest possible details of the interview and for standardizing this technique in the hand of the interviewer (pre-pilot phase). At the same time, there was a need for determining at what time and in what population, in relation to the other survey investigations, the interview should take place (pilot study).

For the purpose of the present study it is assumed that there are various levels of consciousness or awareness of symptoms and that varying interviewing techniques may elicit response corresponding to these levels:

(*a*) mere consciousness of the presence of one or more symptoms, hereafter called " consciousness ";

(*b*) awareness of one or more symptoms as a source of worry, hereafter called " worry awareness ";

(*c*) awareness of symptoms which leads to action, hereafter called " action ".

All three levels are presumably influenced partly by factors of institutional nature, and partly by factors of pathological and psychological nature; and through the three levels—from consciousness to action—the institutional factors play an increasing role. The frequency of consciousness is almost

entirely determined by the pathological and psychological characteristics of the individuals concerned, whereas the frequency of action-taking is decisively influenced by the existence, proximity, reputation, etc. of institutions which can satisfy the desire for action-taking.

It appears to be important to discover the frequency of awareness in the studied population at all these levels. The present action-taking, with existing health facilities, is the baseline from which developmental work must start, whereas the frequency of mere consciousness must be considered the highest attainable ceiling beyond which action-taking on the grounds of personal worry is theoretically excluded. The level between the baseline and the ceiling defines an intermediate goal for developmental work: the frequency of worry awareness presumably corresponds to the highest achievable number of action-takers, if a good service can be established at a " reasonable " distance and with a " reasonable " reputation.

For the purpose of this paper the hypothesis was formulated that a response corresponding to worry awareness could be elicited by an interview characterized as follows:

(*a*) the person himself or herself is interviewed, not a family associate or other proxy (Trussel, Elinson & Levin, 1952);

(*b*) a very good interview situation is established (see, for example, Hyman, 1954);

(*c*) the questions asked are general, that is, they never suggest the words of the possible answer;

(*d*) the probing goes on as long as there is any chance at all of eliciting a response;

(*e*) the form is free, that is, the interview is not based on a questionnaire but on the interviewer's own concept of the individual situation (see, for example, Moser, 1958).

In brief: a personal, satisfactory-situation, non-suggestive, deep-probing, free-form interview. The validity of the hypothesis that such an interview elicits worry awareness was not tested in the work reported here. It remains a hypothesis to be tested through the various tuberculosis control programmes applied by the National Tuberculosis Institute. It will be seen in the section " Discussion " below that hypotheses have also been formulated with regard to interview techniques corresponding to the other levels of consciousness and awareness; in that section small pilot studies undertaken to discover the frequency of such awareness are briefly reported upon.

Pre-pilot phase : developing the interview technique and training of interviewers

Five social investigators, who had been very carefully selected from a considerable number of applicants, underwent five months' training in conducting field investigations under the close supervision of the authors. These investigators interviewed a large number of villagers in Mysore State on health problems, on symptoms of tuberculosis, on migration (Andersen & Banerji, 1962) and related subjects. During this period of training the authors also experimented with various interviewing techniques and, together with the investigators, gradually developed approaches to villages and villagers which allowed the creation of the all-important good interview situation with the individual respondent. The most essential conditions for a good interview situation were found to be : (*a*) that both interviewer and respondent should sit down (usually on the floor or on a mat) during the conversation, if at all possible inside the house or hut; and (*b*) that no outsider and only the nearest of kin should be present during the interview (this condition, however, was often impossible to fulfil). It is also important that the respondent's attention should not be distracted by thoughts of work to be done (cooking, taking cattle home from the field, taking care of children) and—perhaps most important of all—that his mind should, at the earliest possible moment, be set at rest with regard to the purpose of the interview. Introductory sentences may be general, and should always be friendly, but the interviewer must very soon come to the matter at hand. The villager, on the whole, likes to speak about his health and is glad to feel that someone takes an interest. The interviewers had already acquired, before the start of the present study, a good understanding of how to deal with these problems, in addition to the indispensable ability to conduct themselves with modesty and politeness.

A number of interpretation problems in connexion with the above-mentioned definition of the interview were also solved. For example, the non-suggestive character of the interview involved difficult judgements. The following questions illustrate what came to be considered permissible under the provision " non-suggestive, but deep-probing ": " How are you? Have you any disease? Have you had diseases in the past from which you still have

effects? Are you completely fit? Have you no discomfort or pain in any part of the body? Do you have a good appetite? Do you sleep well? Do you not feel excessively tired after your work?" If the respondent started to give some indications of ill-health, the permissible probing within the area indicated became freer. For example, after the mention of a cough by the respondent, the following types of question were permissible: "How long have you had that cough? Is it a light or severe kind of cough? Do you have the cough at a particular time of the day? Is your cough accompanied by any spitting? (but not permissible: Do you have pain in the chest?)." If spitting was admitted: "What is it like? What colour does it have?"

Pilot study

Two major problems of the design of the main study were: which population to include, and at what time, in relation to other investigations, to conduct the interview. The ideal design would seem to consist in interviewing a total population and thereafter surveying the same population with X-ray and other examinations. However, with approximately 2 % radiologically active disease in the population this would be a very costly procedure, since it would involve the interviewing and examination of 50 non-tuberculous persons for every active tuberculosis case discovered. The double danger of making the survey first and thereafter interviewing the patients was (*a*) that the interviewer would be influenced by his knowledge that the respondent was suffering from tuberculosis and (*b*) that the survey itself might interfere with the awareness levels. The first problem could presumably be dealt with by the inclusion of a suitable number of non-tuberculous persons among the persons interviewed. But it was felt that a pilot investigation was needed to throw light on the importance of the second problem.

The design of the pilot study was as follows: 12 villages with a total population of 7500, randomly selected among all villages in Nelamangala, Magadi, Devanahalli and Channapatna taluks of Bangalore District, were allocated at random to three combinations of interview and X-ray survey:

(*a*) Interview of the total population over 20 years of age, followed by a survey with tuberculin testing, X-ray and bacteriological examinations;

(*b*) Survey with tuberculin testing, X-ray and bacteriological examinations, followed by interview of the total population above 20 years of age;

(*c*) Survey with tuberculin testing, X-ray and bacteriological examination, followed by interview of all persons found to have active or probably active or inactive disease plus a group of non-tuberculous persons twice as large as the group of tuberculous persons. The non-tuberculous group was matched with the tuberculous group in respect of age, sex and community (Adikarnatakas and non-Adikarnatakas).

This pilot study was carried out between May and July 1960, and the results were analysed before the main study was carried out. In Table 1 the main findings of the pilot study are shown. For the purpose of simple analysis, the following symptoms were considered the principal symptoms of pulmonary tuberculosis: cough for one month or more; fever for one month or more; pain in chest; and blood in sputum. For the classification in Table 1, persons reporting one or more of the above-mentioned symptoms were considered symptomatic.

It is apparent that the study population in the pilot study was insufficient to give a positive answer to the question whether the survey influenced the awareness level or whether confining the interviewing to a selected group of persons rather than interviewing the total population made a difference to the results. However, it appears from the table that at least the negative conclusion can be drawn that, in this study, the possible influence of a previous survey or of concentrating the interviewing did not exceed the influence of other factors inherent in such an investigation, especially the interviewer effect.

On the basis of the pilot study and, it must be admitted, on the practical grounds of research economy, it was decided to carry on with the main study according to the method used in the third group of villages in the pilot study. It was even decided to reduce the number of non-tuberculous persons interviewed, because with the radiologically inactive cases already included in the study population, a very large proportion of the respondents would not have symptoms. It was considered that a single age-sex-community matched control for each of the radiologically active and inactive cases would be adequate.

Summary of survey methods; selection of matched controls

The epidemiological survey was carried out in Tumkur District between August 1960 and February 1961 by two NTI survey teams (Raj Narain et al., 1962). Sixty-two villages were selected at random from among all the villages in the District, and four towns were likewise selected from among all the

TABLE 1

PILOT STUDY: PERCENTAGE OF ACTIVE OR PROBABLY ACTIVE CASES, INACTIVE CASES AND "NON-CASES" WITH AT LEAST ONE SYMPTOM, BY INTERVIEWER, IN THE THREE GROUPS OF VILLAGES

X-ray classification (one reader)	Interviewer A		Interviewer B		Interviewer C		All interviewers	
	No. satisfactorily interviewed	Percentage symptomatic	No. satisfactorily interviewed	Percentage symptomatic	No. satisfactorily interviewed	Percentage symptomatic	No. satisfactorily interviewed	Percentage symptomatic
Group 1: Interview of total population over 20 years before survey								
Active or probably active tuberculosis	3	(33.3)	3	(33.3)	5	(60.0)	11	45.5
Inactive tuberculosis	5	(60.0)	11	(18.2)	8	(12.5)	24	25.0
"Non-cases"	174	(8.0)	240	(9.2)	191	(3.7)	605	7.1
Group 2: Interview of total population over 20 years after survey								
Active or probably active tuberculosis	1	(100.0)	1	(100.0)	1	(100.0)	3	100.0
Inactive tuberculosis	13	(15.4)	8	(37.5)	10	(20.0)	31	22.6
"Non-cases"	200	(5.0)	193	(5.2)	166	(3.0)	559	4.5
Group 3: Interview of cases and matched controls after survey								
Active or probably active tuberculosis	5	(0.0)	3	(66.7)	2	(50.0)	10	30.0
Inactive tuberculosis	10	(20.0)	16	(18.8)	17	(23.5)	43	20.9
"Non-cases"	55	(12.7)	67	(9.0)	64	(3.1)	186	8.1
All groups								
Active or probably active tuberculosis	9	22.2	7	57.1	8	62.5	24	45.8
Inactive tuberculosis	28	25.0	35	22.9	35	20.0	98	22.4
"Non-cases"	429	7.2	500	7.6	421	3.3	1350	6.1

towns, except Tumkur town itself. In the 62 villages the whole population was eligible for the examinations, and in the four towns sub-samples of about 525 persons in each town were selected. The examinations to which the persons thus selected were subjected were:

(*a*) Everyone was given an intradermal tuberculin test with 1 TU of RT 23 (with Tween), which was read after 3-4 days by measurement, in mm, of the longitudinal diameter of the indurated area. No classification into positive and negative was attempted, but during analysis it was subsequently decided, on the basis of the shape of the distribution of the reactions, that reactions between 0 and 9 mm could be considered negative, and those of 10 mm and over positive.

(*b*) All persons aged 10 years and over had a 70-mm chest photofluorogram taken. These photofluorograms were read independently by two NTI epidemiologists and classified according to a code that included extent, location, etiology and activity of lesions. For the purpose of the present study the most important classification was: no tuberculosis lesion; tuberculosis inactive; tuberculosis probably active; tuberculosis active.

(*c*) From all persons with X-ray abnormality, whether judged to be tuberculous or not, a sputum specimen (spot) was collected. The specimen was examined by direct microscopy (Ziehl-Neelsen) and cultured on two Löwenstein-Jensen slopes. This had to be done at the Union Mission Tuberculosis Sanatorium laboratory, about 100 miles (160 km)

away, because NTI's laboratory had not been established at that time.

The over-all results of the survey were that 38.3 % of the population who completed the tuberculin test had reactions larger than 9 mm, 2.5% of the X-rayed population had probably active or active tuberculosis, as judged by at least one of the two readers, and 0.4% of the X-rayed population had acid-fast bacilli in their sputum.

Of the 62 villages, 34 were further selected at random and, together with all the four town blocks, constituted the study population for the awareness study reported here. In the remaining villages, a special " symptoms " investigation was carried out (see section "Discussion"). The selection of respondents in the 34 villages and four town blocks was done as follows:

The cards from the groups covered by the survey teams were received, from time to time, by the NTI's Statistical Section, which combined the cards of a few villages so as to yield a sufficient number of persons (over a thousand) for making the random selection. All persons aged less than 20 years, all those who did not attend for X-ray examination, and also all those whose radiological status was unknown, because both film readers had classified their photofluorogram as technically inadequate, were excluded from the study population. The remaining cards were divided into two groups—those that belonged to Adikarnatakas and those that did not. Each of these groups was dealt with separately for selecting the matched controls.

Persons whose photofluorograms were read as inactive, probably active or active by at least one reader were separated to form the " case " category. The remaining cards formed the " non-case " category. The cases as well as the controls (" non-cases ") were distributed by sex and by age-group (20-29, 30-39, 40-49, 50-59, 60+). For each case card, one " non-case " card was selected at random from among all the cards in the corresponding age and sex group. In some instances, where the cards in a group were too few for matching, the cards were pooled with cards for a higher or lower age-group and a combined set of controls for both groups was drawn.

The selected " non-case " cards and the case cards were arranged according to village, and within each village in household order. The households, with one or more respondents, were allocated at random to the five interviewers A, B, C, D and E (in the later stages only to four, since one of the interviewers (B) had been withdrawn for health reasons). In addition to the name and the location of the village, the following information (and no other) was transferred to the interviewing sheets of the interviewers:

(*a*) individual card number; (*b*) household number; (*c*) name; (*d*) father's/husband's name; (*e*) sex; and (*f*) age.

Table 2 shows the distribution by age and sex of the respondents.

The interviewing was carried out from October 1960 to February 1961. On an average, four weeks

TABLE 2

RESPONDENTS (CASES AND " NON-CASES "), BY AGE AND SEX

Age-group (years)	Active, probably active and inactive cases, by at least one reader			" Non-cases " [a]			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
20-29	73	65	138	79	74	153	152	139	291
30-39	115	62	177	120	76	196	235	138	373
40-49	139	71	210	155	80	235	294	151	445
50-59	149	94	243	170	108	278	319	202	521
60 and above	166	72	238	167	71	238	333	143	476
Total	642	364	1 006	691	409	1 100	1 333	773	2 106

[a] The number of " non-cases " is slightly higher than that of cases, because twice the number of matched controls were interviewed in the first four villages.

elapsed between the survey and the interview. Only in one village did the interview follow as long as 8 weeks after the survey; in many it followed within a fortnight.

RESULTS

Coverage of the interviewing

2106 persons were eligible for interview in this study. Of these some could not be interviewed because they were temporarily absent from the village for one day or more, because they had been only temporarily present during the survey and were absent at the time of the interviews, because they had died or emigrated between the survey and the interviews, or because they were missed by the investigators in spite of all efforts to find them. Furthermore, the investigators, according to instructions, classified interviews as satisfactory or unsatisfactory after they had done their utmost to achieve a satisfactory interview situation, and the unsatisfactory interviews have been excluded from the present analysis. The distribution of the selected persons by these criteria is shown in Table 3.

Of the total number of eligible persons with active or probably active tuberculosis, 79% were satisfactorily interviewed, as compared with a little over 83% of the persons with inactive disease and the radiologically normal persons. This difference was largely due to the fact that, among the former group of persons, there was a higher proportion of persons missed and of persons who were temporarily present at the time of the survey but who were no longer there at the time of the interviews. The proportion of unsatisfactory interviews was actually a little smaller among the " cases " than among the " non-cases ". It is possible that social stigma acted to a small degree in keeping persons with tuberculosis away from the interview, and it seems likely that the survey attracted a few tuberculosis sufferers from other villages who were not present for the interview thereafter. However, it appears reasonable to assume that none of these factors was so important as to vitiate the over-all results, and it appears justifiable to analyse all results on the basis of the satisfactory interviews only.

Symptom patterns among respondents

As the interview was of the non-suggestive type, inquiring about the health of the respondents generally, all types of symptoms—for example, backache, headache, and sore eyes—were reported and recorded on the interview sheets. However, for analysis, only the symptoms that could be associated with pulmonary tuberculosis were considered, and after a preliminary screening of the material it was furthermore decided to include only some major symptoms in the coding for statistical analysis—namely, cough, fever, pain in the chest, general weakness and haemoptysis—and to exclude night sweat, loss of weight, breathlessness, and loss of appetite, which were found to occur less frequently

TABLE 3

SATISFACTORY INTERVIEWS AND UNSATISFACTORY INTERVIEWS AND VARIOUS KINDS OF NON-PARTICIPATION, BY X-RAY CLASSIFICATION

X-ray classification	Satisfactorily interviewed		Unsatisfactorily interviewed or refused		Missed by investigator		Temporarily absent from village		Temporarily present at time of survey, but absent at time of interview		Died		Migrated		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Active or probably active by at least one reader	282	78.8	12	3.4	16	4.5	28	7.8	17	4.7	1	0.3	2	0.6	358
Inactive by at least one reader and not active or probably active by the other	541	83.5	21	3.2	17	2.6	42	6.5	24	3.7	1	0.2	2	0.3	648
" Non-cases "	916	83.3	46	4.2	27	2.5	82	7.5	26	2.4	—	—	3	0.3	1 100
Total	1 739	82.6	79	3.8	60	2.8	152	7.2	67	3.2	2	0.1	7	0.3	2 106

TABLE 4

PREVALENCE OF THE FOUR MAIN SYMPTOMS, BY BACTERIOLOGICAL AND X-RAY CLASSIFICATION

Category	No. satisfactorily interviewed	Total with cough (%)	Total with chest pain (%)	Total with fever (%)	Total with haemoptysis (%)	Presence of at least one of these symptoms (%)
Sputum-positive cases	36	69.4	19.4	33.3	11.1	69.4
X-ray active or probably active cases	282	46.1	22.3	9.2	7.1	51.8
X-ray inactive cases	541	21.8	15.3	3.1	4.3	29.0
" Non-cases "	916	9.4	8.6	2.0	1.0	15.4

and practically always in association with one or more of the major symptoms. The coding also included the period over which the symptoms had been experienced. For further simplification the main analysis was confined to the occurrence of cough for one month or more, fever for one month or more, pain in the chest and haemoptysis, and all combinations of these four symptoms. The Appendix Table (see page 683) shows the occurrence among males and females, sputum-positive cases, radiologically active and radiologically inactive cases, and " non-cases " of all these symptoms and all observed combinations of them.

From the Appendix Table it is clear that cough is by far the most important single symptom. Not only is it the most frequent symptom, alone and in combinations, among the various categories of cases, but it is also relatively less frequent among the " non-cases ", in comparison with the ratio for other symptoms. Table 4 shows the total prevalence of the four symptoms. While nearly 70% of the sputum-positive cases and almost half of the X-ray active or probably active cases had cough, only less than 10% of the " non-cases " had this symptom. Considerably fewer cases had pain in the chest and fever. Pain in the chest is clearly very non-specific, it being only about twice as common among cases as among " non-cases ". Fever for more than a month, on the other hand, occurred only in 2% of the " non-cases ". Haemoptysis occurred at least once among 7-11% of the cases, but in only 1% of the " non-cases ". General weakness, which is the only rather frequent symptom not included in the analysis presented in these tables, occurred in about 25-45% of the cases and about 10% of the " non-cases ", but so far as the cases were concerned it was practically always present in association with one or more of the other symptoms, and it was therefore considered justifiable not to complicate the analysis with this symptom.

It can be seen from Table 4 that 69% of the sputum-positive cases, 52% of the X-ray active or probably active cases, 29% of the inactive cases and 15% of the " non-cases " had at least one of the above-mentioned four major symptoms.

The choice of a definition of " symptomatic " depends on the purpose for which the data are to be utilized. For the purposes of a mass sputum-positive case-finding programme, a considerable reduction in the number of negative sputa examined could be achieved by collecting sputa only from those persons who report cough as a symptom, since all the symptomatic sputum-positive cases are included among such persons. For a mass radiography case-finding programme, on the other hand, it might be more profitable to cover the symptomatics according to a broader definition — for example, persons having one or more of three symptoms, namely, cough, fever and pain in the chest. (Haemoptysis was always associated with cough in the present material.) The latter definition is employed in the analysis below for estimating the proportion of symptomatics among the different categories of cases, as defined by various bacteriological and radiological criteria.

Awareness levels according to different definitions of a case

Bacteriological. Table 5 shows the distribution of the " symptomatics " in the different groups of sputum-positive cases. Of the persons found to be sputum-positive by culture and/or by direct smear,

TABLE 5

PERCENTAGE SYMPTOMATIC, BY BACTERIOLOGICAL CLASSIFICATION

Bacteriological classification	No. satisfactorily interviewed	Percentage symptomatic
Sputum-positive by microscopy and culture	14	71.4
Sputum-positive by microscopy alone	9	88.9
Sputum-positive by culture alone	13	53.8
Sputum-positive by any method	36	69.4

69.4% were symptomatic. For the sub-categories, the number interviewed was too small to allow conclusions to be drawn. However, it is interesting to note in passing that only 5 out of 23 persons whose sputum was smear-positive failed to report symptoms, whereas among persons whose sputum was only culture-positive the proportion was 6 out of 13.

Radiological. The findings of a radiological epidemiological survey provide a more detailed picture of the distribution and character of the disease in the community. However, considerable difficulties have been encountered in properly interpreting the results of mass radiography. Sometimes, the radiological opacities which are classified as tuberculous even by a panel of experienced readers are not, in fact, due to lesions caused by *Mycobacterium tuberculosis*. There are inevitable and pronounced inter- and intra-individual differences in the reading of X-ray films in mass radiography. Two independent readers have interpreted the radiological material obtained in course of the present survey. Of the 282 cases read as active or probably active by at least one reader, the two readers agree in 140 (49.6%) only; of the 85 read as active by at least one reader, the agreement between the two readers is 51.8%, while of the 197 read as probably active by at least one reader (not active by the other), the agreement is 31.5%. Table 6 shows the distribution of the symptomatic cases (one or more of the three symptoms) according to the different radiological definitions.

It is apparent from Table 6 that the presence of symptoms is closely associated with the certainty with which the X-ray readers have made their decisions (this, again, is associated with the extent of the disease). Four-fifths of the cases classified as active by both readers had symptoms, but only three-fifths of those classified as active by only one. "Probably active" is in itself such an uncertain group that it is apparently not very significant whether the readers agree or not. In this category 47% of the cases over which the readers were in agreement and 43% of those considered probably active by only one had symptoms. However, it does not follow that in the less well-defined groups, where the agreement between the readers is poor, the prevalence of symptoms is negligible. This is apparent from Table 7, where the proportion of symptomatics is shown for the following groups: (*a*) probably active by at least one reader (not active by the other); (*b*) active by at least one reader; and (*c*) active or probably active by at least one reader. In Table 7, these three groups are further distributed according to the extent of the disease, in terms of the number of lung zones involved (right and left side combined), the larger number of zones indicated by either of the two readers being accepted. It is remarkable that, even when the readers were less sure about the lesions in a particular group (and hence classified them as probably active), with the lesion extending only to one zone, and where the readers agreed only to the

TABLE 6

PERCENTAGE SYMPTOMATIC, BY X-RAY CLASSIFICATION

X-ray classification by two independent readers	No. satisfactorily interviewed	Percentage symptomatic
Active by both	44	81.8
Active by at least one	85	71.8
Active by only one	41	61.0
Probably active by both	62	46.5
Probably active by at least one and not active by the other	197	43.1
Probably active by only one and not active by the other	135	41.5
Active or probably active by both	140	59.3
Active or probably active by at least one	282	51.8
Active or probably active by only one	142	44.4
Inactive by at least one and not active or probably active by the other	541	29.0

TABLE 7

PERCENTAGE SYMPTOMATIC, BY NUMBER OF LUNG ZONES AFFECTED AND BY DEGREE OF AGREEMENT BETWEEN TWO INDEPENDENT X-RAY READERS

Number of lung zones affected	Probably active by at least one reader and not active by the other		Active by at least one reader		Active or probably active by at least one reader		
	No. satisfactorily interviewed	Percentage symptomatic	No. satisfactorily interviewed	Percentage symptomatic	No. satisfactorily interviewed	Percentage symptomatic	Agreement between the two readers (%)
1	96	34.4	5	60.0	101	35.6	24.8
2	61	45.9	14	42.9	75	45.3	49.3
3 or 4	37	59.5	43	74.4	80	67.5	67.5
5 or 6	3	66.7	23	87.0	26	84.6	92.3
Total	197	43.1	85	71.8	282	51.8	49.6

extent of 25%, the prevalence of symptomatics was 34%. In this group there is no doubt a considerable proportion of " cases " which are not in fact cases and would therefore be expected to manifest symptoms much less frequently. The prevalence of symptoms among the actual cases of lesions due to *Myco. tuberculosis* may well be very high indeed. The higher proportion of symptomatics among the cases with a single zone lesion that were classified as active, where the agreement between the readers was better, further strengthens such a concept. It is also not unexpected to find a gradual increase in the proportion of symptomatics with the increase in the number of zones involved, and with a strikingly similar increase in the degree of agreement between the two readers.

Tuberculin sensitivity. A large reaction to an intradermal tuberculin test usually signifies infection with *Myco. tuberculosis*, and X-ray diagnosis of pulmonary tuberculosis can therefore often be usefully qualified by a tuberculin test. The hypothesis was formulated that symptoms would occur more frequently among X-ray positive/tuberculin-positive than among X-ray positive/tuberculin-negative persons. Table 8 shows the result of testing this hypothesis: among persons classified by photofluorogram as having active, probably active, or inactive tuberculosis, tuberculin-negative and tuberculin-positive persons showed virtually the same prevalence of symptoms. If anything, the tuberculin-negative persons appeared to have slightly higher proportions of symptomatics than the tuberculin-positive persons.

TABLE 8

PERCENTAGE SYMPTOMATIC, BY TUBERCULIN SENSITIVITY STATUS

X-ray classification	Tuberculin test result	No. of persons satisfactorily interviewed and completing test	Percentage symptomatic [a]
Active or probably active by at least one reader	Tuberculin-positive (≥ 10 mm)	216	50.9
	Tuberculin-negative (≤ 9 mm)	58	53.4
Inactive by at least one reader and not active or probably active by the other	Tuberculin-positive (≥ 10 mm)	352	28.7
	Tuberculin-negative (≤ 9 mm)	153	32.0
" Non-cases "	Tuberculin-positive (≥ 10 mm)	545	15.2
	Tuberculin-negative (≤ 9 mm)	311	16.4

[a] These figures do not tally with others in this report, because they include only those persons whose tuberculin tests were read.

There is no doubt, therefore, that the above-mentioned hypothesis must be rejected. In a further analysis, not given in Table 8, it was also found that there was no association, among cases, between prevalence of symptoms and medium-sized tuberculin reactions (non-specific tuberculin sensitivity).

The significance of these findings is not clear. It would appear possible that the non-specificity of the tuberculin test, especially among the relatively old persons concerned, the uncertainty of the X-ray diagnosis in general, as well as the possibility that lung conditions other than tuberculosis bring about symptoms just as often as does tuberculosis, may all have contributed towards the unexpected results.

Further analysis of prevalence of symptoms

For further analysis of the results the respondents were classified into three groups:

(*a*) Active or probably active by at least one reader.

(*b*) Inactive by at least one reader, but not active or probably active by the other.

(*c*) " Non-cases " (not active, probably active or inactive by either reader).

This classification is not necessarily the most important for case-finding or epidemiological investigations, but as it provided a reasonably large uumber in all groups, it was considered to be most practical for further analysis.

Interviewer difference. Table 9 shows figures for the prevalence of symptoms obtained by each interviewer. Interviewers A, B and D are female, while C and E are male. Interviewers B aud C seem to have obtained a lower percentage of symptoms

TABLE 9

PERCENTAGE SYMPTOMATIC, BY INTERVIEWER

X-ray classification	Interviewer [a]	Total no. satisfactorily interviewed			Percentage symptomatic		
		Male	Female	Total	Male	Female	Total
Active or probably active by both readers	A	26	14	40	73.1	35.7	60.0
	B	14	2	16	28.6	50.0	31.2
	C	18	11	29	66.7	36.4	55.2
	D	31	4	35	74.2	50.0	71.4
	E	17	3	20	70.6	33.3	65.0
Active or probably active by at least one reader	A	48	26	74	58.3	42.3	52.7
	B	23	9	32	39.1	44.4	40.6
	C	39	22	61	51.3	36.4	45.9
	D	49	21	70	63.3	47.6	58.6
	E	32	13	45	65.6	30.8	55.6
Inactive by at least one reader and not active or probably active by the other	A	76	50	126	32.9	26.0	30.2
	B	33	23	56	15.2	17.4	16.1
	C	74	44	118	18.9	15.9	17.8
	D	92	53	145	38.0	39.6	38.6
	E	55	41	96	40.0	26.8	34.4
" Non-cases "	A	132	82	214	15.2	15.9	15.4
	B	56	39	95	14.3	12.8	13.7
	C	115	83	198	12.2	3.6	8.6
	D	169	95	264	21.3	18.9	20.5
	E	101	44	145	17.8	13.6	16.6

[a] Interviewers A, B and D are female; interviewers C and E are male.

among the respondents than interviewers A, D and E.

However, the prevalence figures from interviewers B and C do not follow similar patterns in the different categories. Thus, interviewer C obtained almost the same prevalence of symptoms among the radiologically active cases as interviewers A, D and E, but in the inactive group and in the controls, his prevalence figures were only about half the average figures for the other three interviewers. In other words, the proportion of active cases among the total persons found symptomatic is maximum in the case of interviewer C.

The prevalence figures obtained by interviewer B among the females are, on the whole, comparable to the figures obtained by the other three interviewers (A, D and E); but her prevalence figures for the male respondents were markedly lower amongst the active or inactive cases, and the percentage of symptomatics was also on the low side amongst the " non-cases ". Within a few weeks of starting the study she had to withdraw on maternity leave. In the light of the prevalence levels obtained by her in the pilot study, the peculiar sex distribution of the symptomatics among her respondents could, to some extent, be attributed to her condition.

An interesting feature is the general tendency for male interviewers to show in their results a more pronounced sex difference in the prevalence of symptomatics than the female interviewers.

An analysis of variance was carried out on the interviewer variation. It was found that when all interviewers were included in the analysis the difference between interviewers was statistically significant. When interviewer B was excluded from the analysis, however, no significant difference was found; the total variation in the material, in other words, was of such an order that the differences between A, C, D and E could have occurred by chance. However, while the interviewer variation thus calculated was statistically insignificant, there is no doubt that it contributed rather heavily to the total variation in the material and, when viewing the study in retrospect, one might be tempted to question the wisdom of having adopted the informal non-questionnaire technique of interviewing. However, the authors feel convinced that, with a subject such as this, the increased uniformity that might have been gained by using more formal techniques could have been achieved only at the cost of a very considerable loss of validity. The average degree of truthfulness of the response obtained was, it is believed, high, though variation round this average was somewhat large; with a less personal and less individual approach the variation might have been narrowed, but round a lower average degree of truthfulness.

Age-sex distribution. Table 10 shows the distribution of the symptomatic persons among the different groups of the respondents according to their age and sex.

In all the groups of respondents, cases or " non-cases ", the proportion with symptoms was higher among the males than among the females. With regard to age, among the active cases in both males and females, the prevalence of symptoms in the middle age-groups was higher than that observed among the younger or the very old respondents. This age variation was more marked among the females.

The pattern of the age-sex distribution was similar, though less marked, in the group of inactive cases. Among the " non-cases," lower levels were observed, in both sexes, in the younger age-groups than in the middle age-groups, but in the oldest age-group there was a rise among the females and a slight fall among the males in comparison with the middle age-groups; the total prevalence levels (that is, the levels for males and females combined) among the " non-cases " thus do not manifest any marked dip in the highest age-group.

The finding that men report symptoms more often than women raises the question whether women actually had less symptoms than men or whether it was more difficult for the interviewers to elicit a truthful response from women. The answer is probably that the latter factor at least played a role; the young and the very old women were no doubt the most difficult to establish contact with, and they were the ones who showed the lowest prevalence of symptoms, both among the cases and among the " non-cases ". However, it may well be a contributory factor that fewer females, classified as " cases ", were actually cases. This was indicated by the somewhat lower rate of bacteriological confirmation obtained among the female cases than among the male cases. A similar conclusion may be drawn with regard to a comparison between the old and the young: the older cases were far less often confirmed bacteriologically *and* had a somewhat lower prevalence of symptoms.

Community differences. The whole material was analysed in respect of whether persons belonged to Adikarnatakas (scheduled castes) or non-Adikar-

TABLE 10
PERCENTAGE SYMPTOMATIC, BY AGE AND SEX

X-ray classification	Age-group (years)	No. satisfactorily interviewed			Percentage symptomatic		
		Male	Female	Total	Male	Female	Total
Active or probably active by at least one reader	20-29	11	16	27	36.4	25.0	29.6
	30-39	34	15	49	58.8	33.3	51.0
	40-49	38	21	59	68.4	42.9	59.3
	50-59	57	21	78	56.1	61.9	57.7
	60 and above	51	18	69	52.9	33.3	47.8
Inactive by at least one reader and not active or probably active by the other	20-29	48	35	83	18.8	17.1	18.1
	30-39	56	38	94	30.4	23.7	27.7
	40-49	75	43	118	33.3	34.9	33.9
	50-59	63	56	119	34.9	32.1	33.6
	60 and above	88	39	127	31.8	20.5	28.3
" Non-cases "	20-29	71	58	129	14.1	6.9	10.9
	30-39	97	66	163	11.3	9.1	10.4
	40-49	125	66	191	20.0	18.2	19.4
	50-59	138	88	226	21.0	11.4	17.3
	60 and above	142	65	207	14.8	20.0	16.4

natakas (all others). No difference in the prevalence of symptoms was found between the two groups.

Prevalence of symptoms in the community

The reason for including the control group was partly to minimize interviewer bias and partly to obtain an estimate of the number of persons who would have to be examined by X-ray or bacteriological techniques, if questioning on symptoms were used as a basis for case-finding or epidemiological surveys. While the prevalence of the active and inactive cases represented the total number of cases in a randomly selected population, the prevalence among the controls, age- and sex-matched as they were, could not be assumed to represent the situation in the total " non-case " population. For obtaining the figure for the total population, the age-sex specific prevalences observed in the cases plus the matched controls were weighted according to the actual age-sex distribution of the total population, as obtained from a house-to-house census of the study population. It was found that the prevalence of symptoms (one or more of the four symptoms) in the total adult population after standardization was practically the same as in the control group.

On the basis of the thus estimated prevalence of symptoms in the total adult population it was possible to calculate the proportion of cases among persons with various symptoms. Table 11 shows the results of such a calculation. For every 100 persons over 20 years of age who admit to cough for more than a month, 20 are likely to be classified as tuberculous by X-ray examination—11 as active or probably active, 9 as inactive. Of 100 persons with cough and haemoptysis, 14 are likely to have active or probably active tuberculosis, and 15 inactive. But only two out of 100 persons with chest pain and no other symptom are likely to be found suffering from active or probably active tuberculosis.

DISCUSSION

In this investigation, which was designed on the basis of a series of pilot studies, awareness of symptoms was found by a specific interview technique to exist in approximately 70% of sputum-positive persons with tuberculosis and in approximately 80% of persons whose photofluorogram was

TABLE 11

ESTIMATED PERCENTAGES OF ACTIVE OR PROBABLY ACTIVE AND INACTIVE CASES AMONG PERSONS WITH VARIOUS SYMPTOMS

Symptom	Active or probably active tuberculosis	Inactive tuberculosis	" Non-cases "
Cough alone	9	9	82
Cough in any combination	11	9	80
Chest pain alone	2	6	92
Chest pain in any combination	6	7	87
Fever alone	7	3	90
Fever in any combination	11	6	83
Cough and haemoptysis alone	7	8	85
Cough and haemoptysis in any combination	14	15	71

judged to show active tuberculosis by both of two independent X-ray readers.

It may in the first instance appear surprising that the awareness of symptoms among persons with pulmonary tuberculosis should be so much more widespread than other workers have reported, for example, Yamaguchi et al. (1959). Part of the explanation of this difference may be found in the quality of the interviewing, and the fact that the definition of awareness is narrower in other studies also plays a significant role. There may, however, also be a true difference in the prevalence of symptoms. One major reason for such a difference may be the relative lack of medical facilities in Tumkur District, as compared with the countries and areas from which most information is available. Lack of adequate treatment facilities leads to lack of opportunity for patients to become asymptomatic. In countries with highly developed national health services, many or even most symptomatic cases are cured or are at least treated to such an extent that they are rendered asymptomatic. Compared with other districts in India, Tumkur District, however, is quite favourably placed with regard to medical and public health facilities. It may therefore perhaps be assumed that the prevalence of symptoms among persons with pulmonary tuberculosis in other districts of India is not very much lower than that observed in the present study. Further evidence to support this generalization is found in the fact that the prevalence of symptoms did not appear to be closely related to the varying prevalence of disease found in different parts of Tumkur District.

Before studying the possible application of this new knowledge it is felt that there is a need to examine the results in the context of the three levels of awareness of symptoms enumerated in the introduction to this paper. No attempt has so far been made to check the validity of the hypothesis that the interviewing technique employed elicits the level that was termed " worry awareness " (the level used in the main study). Certain minor studies have, however, been carried out to throw light on the two other levels of awareness. These other studies were neither so extensive nor so carefully prepared and designed as the main study. But with due reservation for the various shortcomings, the results are most illuminating. A summary of the findings is given in Table 12. The second column in the table summarizes the results of the main study; the first and the fourth columns show the results of a small pilot study carried out by the Sociological Section in the 28 randomly selected villages from the survey not covered by the main study.

The social investigators questioned all cases, but no controls, as to symptoms. But in this study they suggested each individual symptom to the patient, expecting only the answer yes or no. And again, they probed deeply and therefore presumably brought out even the merest consciousness of symptoms. In this same population group the investigators asked all the patients whether they had taken any action on the basis of their symptoms. The percentages given in Table 12 for " action-taking " relate only to persons who sought assistance from government dispensaries, health centres and hospitals; persons who sought assistance from practitioners of indigenous medicine have been excluded.

The percentages for " mere consciousness " were for all categories of cases higher than the corresponding percentages for " worry awareness " found in the main study; and for all categories the percentages of persons who had taken action were lower than those for worry awareness. It is indeed thought-provoking that sputum positivity has apparently led to symptoms in almost all of the cases and to action-taking, with existing health services, in half of them, and perhaps equally important that

more than three-quarters of cases, by even the most liberal definition, were at least conscious of symptoms and that more than a third of these took action on account of their symptoms.

It may be objected to all these findings, particularly to those concerning consciousness and worry awareness, that they cannot easily be translated into practical control policies, in that the levels of response in this study were closely associated with the interviewers being highly trained and highly specialized personnel. In an endeavour to throw some light on this problem, one further investigation was carried out, the results of which are shown in the third column of Table 12. This investigation was carried out simultaneously with the main epidemiological survey in the same 28 villages that were later taken up for the " consciousness and action-taking " study.

In these villages, census takers from the epidemiological team filled up a questionnaire for all persons over 14 years of age that included the following questions: " Do you have a cough? " If no: " Don't you cough? ". If yes, to either the first or the second question: " When you cough, do you get sputum? "; then: " When you cough do you get blood in the sputum? ", and " Do you get fever daily ? ". These questions were asked among many others and no more than average attention was paid to this particular subject. Moreover, no special effort was made by the census taker to create a good interview situation. The census takers were very good at their job, but received no special training for this extra work.

A comparison of the results of this special investigation with those of the main study shows that the qualifications and training of the social investigators are certainly of some consequence, and indicates also that a deep-probing as opposed to a superficial approach may be a more important elaboration of the interview technique than suggestive as opposed to non-suggestive questioning. Yet, more important from the practical point of view, the investigation has shown that quite high figures for the prevalence of symptoms can be obtained from a simple type of questioning, carried out by non-specialized personnel. Furthermore, the difference in interviewing techniques plays a less important role the more definite the diagnosis of the case. Where the case is sputum-positive or found active by both readers of the photofluorogram, the type of interview technique is apparently of little importance; but in the group of cases found active or probably active by at least one reader, the deep-probing by the special interviewer increased the proportion found to have symptoms by approximately 50%.

A rather considerable part of the present paper

TABLE 12

AWARENESS LEVELS IN VARIOUS CATEGORIES OF CASES, BY DIFFERENT INTERVIEW TECHNIQUES

Presumed level of awareness	Mere consciousness		Worry awareness				Action-taking	
Type of interview	Suggestive, deep-probing		Non-suggestive, deep-probing		Suggestive, superficial		Direct questioning	
Interviewers	Social investigators		Social investigators		Census takers		Social investigators	
	No. interviewed	Percentage aware	No. interviewed	Percentage aware	No. interviewed	Percentage aware	No. interviewed	Percentage taken action
Bacteriologically positive cases	21	95.2	36	72.2	20	75.0	21	52.4
Radiologically active cases, judged by two independent readers:								
Active by both readers	16	100.0	44	81.8	15	80.0	16	68.7
Active by at least one reader	33	87.9	80	73.8	37	59.5	33	48.5
Active or probably active by both readers	69	81.1	140	60.0	85	44.6	69	33.3
Active or probably active by at least one reader	126	77.8	282	52.8	116	35.5	126	34.1

has dealt with the methodology employed. This has appeared necessary because the measuring instrument in these investigations depended on the human factor rather than on a tuberculin syringe or a laboratory instrument. Shyness, fear, stigmata, inability to express themselves, suspicion of motives and other such feelings among the respondents no doubt contributed to keeping down the proportion found to have symptoms. On the other hand, the figures may also have been pushed upwards by respondents exaggerating, guessing the motives of the interviewers and thus seeking to please, and also dramatizing in the hope of moving the interviewer to help provide relief. From the description of the methodology the reader may form his own judgement of the influence of such factors; but it may not be improper to record in this connexion that both the interviewers and the authors have gradually formed the subjective opinion that, in the large majority of cases, such a relaxed atmosphere was created between the interviewer and the respondent that most of the above-mentioned motivations became relatively unimportant. As already mentioned in the section " Results ", there may be an exception to this in the case of the very young and the very old women; that such an exception existed was also quite apparent to the authors during field work.

By and large, therefore, the authors feel convinced that it can be concluded that a considerable proportion of persons with tuberculosis—among sputum-positive and other practically definite tuberculosis cases, a substantial majority—are aware of symptoms of the disease. The practical implications that follow are based on this conclusion.

PRACTICAL IMPLICATIONS

This study was carried out to obtain some vital data required for planning tuberculosis control programmes in India. While several points in the results are still subject to further study and confirmation, it would appear justifiable already to suggest various practical implications of the findings.

The problem of pulmonary tuberculosis in India in terms of human suffering

The estimate of the prevalence of symptoms (as a cause of worry) among persons with pulmonary tuberculosis in a randomly selected population is an index of the physical suffering caused by the disease in the community. The prevalence of the same symptoms in the non-tuberculous population provides an estimate of the suffering caused by similar symptoms due to conditions other than pulmonary tuberculosis. The Sociological Section of the National Tuberculosis Institute has carried out another investigation, in which the economic consequences of such suffering are estimated. The findings of this study have been provisionally reported upon (Andersen, 1962). All these indices are of decisive importance in planning nation-wide health programmes for the country. However, such data will have even greater significance if similar indices are available for other major diseases of national importance—for example, water-borne diseases, malnutrition, leprosy, etc. In submitting the first data regarding the problem of pulmonary tuberculosis in India as a problem of physical and economic suffering, the authors are expecting to set a pattern for investigators working with other major public health problems. Such information regarding the social and economic implications of the major health problems of the country might go a long way towards evolving an increasingly rational approach to the allocation of resources for the various health problems of the society.

As the first provisional answer to the question of how many of India's tuberculosis patients *suffer* from their disease, one may be justified in stating that probably more than half the 5-7 million cases estimated by the National Sample Survey (Indian Council of Medical Research, 1957) have symptoms that cause them worry. With more strict definitions of cases than that employed in the National Sample Survey, the proportion with such symptoms becomes considerably higher. If Tumkur District is reasonably typical of the rest of the nation, it can also be stated that while there may be about three million people with active or probably active tuberculosis in the country who have long-term cough, there are probably nearly ten times as many people with long-term cough who do not have tuberculosis.

Awareness data for planning a national tuberculosis control programme for India

A high prevalence of symptoms among the various bacteriological and radiological categories of cases was one outstanding finding of the present study. No less important was the finding that, even with the present extremely limited and inadequate facilities available for the diagnosis and treatment of the disease, over half of the sputum-positive persons and over one-third of the persons with radiologically active disease have actually sought assistance at govern-

ment medical institutions, motivated by their symptoms. The provision of elementary diagnostic facilities, such as a district referral miniature X-ray unit and staining and microscopy facilities at primary health centres, and the distribution, on a domiciliary/ambulatory basis, of suitable chemotherapeutic drugs would make it possible to treat a sizeable number of cases. The cost and problems of organizing such a tuberculosis programme would be almost negligible in comparison with those involved in providing a system based on sanatorium treatment of similar magnitude or in combing the whole country with hundreds and hundreds of mobile X-ray units. A nation-wide network of district tuberculosis centres, destined to act as the pacemakers for the development of an extensive tuberculosis control programme as an integral part of the improvement of national health through primary health centres, is already provided for in the third Five Year Plan, and plans are being developed by the National Tuberculosis Institute for the organization of such district programmes (Piot, 1962). In the initial stages, the district programmes would deal only with those persons who seek treatment on their own initiative. With increasing experience and with the increase in available resources, the district programme would, through the extension of its activities, be capable of attracting all those among whom symptoms of pulmonary tuberculosis are a cause of worry. In later phases, given the expected rise in the standard of living and a corresponding increase in the level of health consciousness in society, it is possible that today's " mere consciousness " of symptoms might turn into " awareness of symptoms as a cause of worry leading to definite action ". Furthermore, a district programme should be flexible enough to incorporate any form of mass campaign within its framework, if at an advanced stage of socio-economic development it is felt economically and epidemiologically worth while to invest resources for more intensive search for non-symptomatic cases on a mass scale. A district programme, as conceived by the National Tuberculosis Institute, is therefore not only comparatively very economical and practical, evolving in harmony with the plans for the development of the basic health services in the country, but by virtue of its direct approach to the problem of tuberculosis as a problem of human suffering, attains a high place for its direct contribution towards the alleviation of human misery.

Awareness data for evolving a cheap epidemiological technique

An interesting off-shoot of the investigation is the potentialities discovered for developing cheaper epidemiological methods. Most of the sputum-positive persons detected in the course of an epidemiological survey were found to be symptomatic by direct questioning. If such a finding is repeatedly confirmed in other surveys, it would become possible to visualize the development of a cheap survey technique, involving direct questioning of the total population and the collection of sputa from symptomatic persons only. The number of sputa to be examined per thousand of the population would be unlikely to be much higher than the number that would be collected in the course of a full-scale survey, where the screening for bacteriological examination is based on X-ray photofluorograms. This approach would obviate the problem of the cost, personnel, organization and time involved in conducting mass radiography of the total population. This possibility will be further studied in course of future research programmes of the National Tuberculosis Institute.

RÉSUMÉ

Les auteurs présentent les résultats d'une enquête qui avait pour objet d'établir la fréquence des symptômes suggérant la tuberculose pulmonaire parmi des cas avérés et dans la population en général.

1066 cas de tuberculose active, probablement active, ou inactive, dépistés au cours d'une enquête épidémiologique systématique dans la population d'un échantillon de villages et villes du district de Tumkur (Inde méridionale), ainsi qu'un groupe témoin de non-tuberculeux appariés avec les cas selon l'âge et le sexe, ont été interviewés sous la direction des auteurs par des enquêteurs spécialisés appartenant à la section sociologique de l'Institut national de la Tuberculose. La technique de l'enquête faisait appel à un interview de forme libre, approfondi mais non suggestif. Les méthodes d'échantillonnage et d'analyse statistique ont été établies en collaboration avec la section statistique du même Institut.

Environ 70 % des cas de tuberculose pulmonaire confirmés bactériologiquement, et un peu plus de 50 % des cas diagnostiqués « actifs ou probablement actifs » sur

la base d'une seule micro-radiophotographie rapportent spontanément — sans nécessairement en reconnaître la signification — au moins un symptôme suggérant la tuberculose: toux ou fièvre durant plus d'un mois, douleur thoracique ou hémoptysie.

Les auteurs discutent ces résultats en relation avec ceux de quelques autres enquêtes du même type, l'une notamment sur l'initiative prise par les répondants pour remédier à leurs symptômes ; celle-ci avait démontré qu'entre un tiers et la moitié des sujets tuberculeux avaient conçu assez d'inquiétude au vu de leurs symptômes pour consulter un médecin de dispensaire général des services de santé.

Les auteurs concluent que dans les circonstances actuelles en Inde il est épidémiologiquement et économiquement justifié de fonder le programme de contrôle de la tuberculose sur l'initiative que prennent les patients inquiets au sujet de leurs symptômes. Ils considèrent qu'il n'est pas justifié d'envisager la possibilité d'un dépistage systématique avant que les services de santé ne soient suffisamment développés pour faire face à tous les cas qui les consultent sous l'influence de l'anxiété que leur causent leurs symptômes.

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APPENDIX TABLE

OCCURRENCE AMONG SPUTUM-POSITIVE CASES, ACTIVE OR PROBABLY ACTIVE CASES, INACTIVE CASES AND "NON-CASES" OF THE FOUR MAIN SYMPTOMS, ALONE AND IN ALL OBSERVED COMBINATIONS

	Sex	Total no. of satis-factory inter-views	Cough alone	Cough and chest pain	Cough and fever	Cough, haemop-tysis and chest pain	Cough, haemop-tysis and fever	Cough, chest pain and fever	Cough, haemop-tysis, chest pain and fever	Total with cough	Chest pain alone	Chest pain and fever	Total with chest pain	Fever alone	Total with fever	Cough and haemop-tysis alone	Total with haemop-tysis
Sputum-positive cases	Male	29	7	4	7	—	1	2	—	22	—	—	6	—	10	1	2
	Female	7	1	—	—	—	1	—	1	3	—	—	1	—	2	—	2
	Total	36	8	4	7	—	2	2	1	25	—	—	7	—	12	1	4
Radiologically active or probably active cases	Male	191	48	22	9	7	2	4	1	96	9	—	43	4	20	3	13
	Female	91	12	13	1	2	1	1	2	34	2	—	20	1	6	2	7
	Total	282	60	35	10	9	3	5	3	130	11	—	63	5	26	5	20
Radiologically inactive cases	Male	330	38	16	4	11	—	2	—	76	24	—	53	1	7	5	16
	Female	211	21	9	3	4	—	2	3	42	12	—	30	2	10	—	7
	Total	541	59	25	7	15	—	4	3	118	36	—	83	3	17	5	23
"Non-cases"	Male	573	28	19	5	4	—	—	—	61	31	1	55	3	9	5	9
	Female	343	17	4	1	—	—	3	—	25	15	2	24	3	9	—	—
	Total	916	45	23	6	4	—	3	—	86	46	3	79	6	18	5	9