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REPORT NO. 1

THE TRANSMISSION OF TUBERCLE BACILLI

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ITS TREND IN A HUMAN POPULATION

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one version — the English version. This report of the TSRU is published in *French* in the Bulletin of the WHO, with the exception of the appendix, which consists entirely of tables. The appendix appears in the present number of the Bulletin of the Union in both French and English.

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THE TRANSMISSION OF TUBERCLE BACILLI

ITS TREND IN A HUMAN POPULATION

Tuberculosis Surveillance Research Unit*

The work was carried out and the report prepared by

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SYNOPSIS

Extensive information is available from tuberculin surveys in the Netherlands on the prevalence of tuberculous infection at various ages in a number of calendar years. A technique has been developed for converting this information on prevalence into a smooth series of annual risks of tuberculous infection. The series of infection risks for the Netherlands, when applied to the population cohorts born since 1910, reproduced the observed prevalence figures satisfactorily. The series was then used to make a comprehensive study of the incidence and prevalence of tuberculous infection for cohorts born in that country between 1910 and 1960 up to the age of 50 years.

The main advantages of expressing prevalence data in terms of a series of annual risks of tuberculous infection in this way are: (1) To obtain meaningful indices of the present and past impact of tuberculosis on a community — mortality no longer representing a valuable measure; (2) To assess comprehensively the likely future prevalence of infection and the incidence of fresh infections, at different ages; and thereby (3) To assist the planning of programmes for tuberculosis control in developing countries or for eradication in developed countries.

The possibility of applying the same methods to the results of representative tuberculin surveys in other countries should be explored. The present report includes some tables to make this easier, especially in circumstances where the data are much less extensive than in the Netherlands.

INTRODUCTION

The study of the epidemiology of tuberculosis and the need for a rational approach to the problem of tuberculosis control require a sound knowledge of the risk of transmission of tuberculous infection from host to host. This knowledge is required to-day both in countries with a high prevalence and in those with a low prevalence of the disease. Dependable information on the transmission of tuberculous infection, and of the trends in the risk in recent years, would enable a developing country to assess the magnitude of its tuberculosis problem and to plan and execute an effective anti-tuberculosis programme; the same information for a technically advanced country would enable it to assess the relevance of current tuberculosis control measures in what is probably a rapidly changing situation, and to plan for the eventual eradication of the disease.

The risk of transmission of tuberculous infection in a given community during a particular period of time is most reliably expressed numerically in terms of a series of average annual risks of acquiring a tuberculous infection (referred to below as infection risks) in successive calendar years. The infection risk indicates the proportion of the population which will be primarily infected, or reinfected, with tubercle bacilli in the course of one year, and is usually expressed as a percentage or as a rate.

In nearly every country the data on the past transmission of tuberculous infection are far from complete because tuberculin testing has not been performed regularly or systematically in representative samples of the population. Even where there has been extensive testing, the methods of testing have often varied, differing tuberculins have been used, and differing criteria employed for distinguishing between persons infected and persons not infected with tubercle bacilli.

The results of tuberculin testing surveys are usually presented only in the form of *prevalence* figures for past tuberculous infection. Prevalence figures do not indicate when in the past the first infections occurred, and it may be thought that no information on this point can be obtained from prevalence data. This is correct if the only results available are from a single tuberculin

survey at one specific age. If, however, the survey covers a range of ages, and especially if several surveys of the same population have been made at different times (using similar techniques, so that the results may be combined), the results do contain useful information, which can be recovered, on the incidence of tuberculous infection during the period since the birth of the surveyed subjects. As will be shown in detail below, it is possible to derive, from data on the prevalence of past infection, a series of estimates of the *incidence* or risk of tuberculous infection in successive calendar years. These estimates may be regarded as an alternative method of presentation of the results of tuberculin surveys, which supplements the usual method of presentation in terms of the prevalence of past infection.

The best opportunity to study the transmission of tuberculous infection is found in those countries where BCG vaccination has not been performed on a large scale, because of the difficulty of differentiating reliably between post-infection and post-vaccinal allergy. In many countries allowance must also be made for infections with atypical mycobacteria, which may lead to tuberculin sensitivity in individuals who have not had a first infection with tubercle bacilli.

The material from the Netherlands seems to be particularly valuable in this connection, as in this country less than 5 percent of the child population has ever been BCG-vaccinated, and mycobacterial infections other than tuberculosis are not nearly as frequent as in many tropical or subtropical countries. The available data on tuberculin sensitivity consist of the results of a series of annual surveys in male recruits (aged about 19 years) which started in 1954, and a series of annual surveys in schoolchildren of both sexes (aged about 12 to 18 years), which started in 1961, both series covering the whole country; the same tuberculin testing technique was used throughout these surveys. In addition, there are results of four earlier surveys in children aged 1 to 14 years in Amsterdam, viz. in about 1926, 1934, 1939 and 1947, using a different testing technique.

The epidemiological advantages of the approach explored in this report, when applied to the data for the Netherlands, are fully illustrated and discussed. In addition, a special section of the report indicates how the analytical technique developed here may be used on similar data from other countries. Suggestions are given for planning future tuberculin surveys in such a way that they may contribute to a better understanding of the tuberculosis problem in a country, as well as influencing the measures for the control and eventual eradication of the disease.

I. METHODS

A derivation of the mathematical formula which expresses the relationship between the prevalence of past tuberculous infection in a population group of a particular age, and the incidence of tuberculous infection during the period since the birth of the group, is given in the Appendix, together with a technical description of the application of this formula to the data for the Netherlands. It is, however, necessary here to indicate in general terms how these measures are related, so that the non-mathematical reader will appreciate how it is possible to 'translate' the information on the prevalence of past infection into a series of annual incidence rates, and will realize what difficulties have to be overcome in the process.

Suppose a group, or 'cohort', of children is considered, all of whom were born at the beginning of year b, and they are followed until they are all aged exactly a years. If their risk of acquiring tuberculous infection was known for each of the a years through which they had lived, it would clearly be possible to calculate the proportion who had been infected at least once by the age of a. If $p_b, p_{b+1}, p_{b+2}, \ldots p_{b+(a-1)}$ represent the risks of infection in the a successive years b, $b+1$, $b+2$, ... $b+(a-1)$, and $P_{a,b}$ represents the proportion who have been infected by age a, then the algebraic formula for calculating $P_{a,b}$ (see Appendix) is:

$$P_{a,b} = 1-(1-p_b)\cdot(1-p_{b+1})\cdot(1-p_{b+2})\ldots(1-p_{b+(a-1)}).$$

If $Q_{a,b}$ is written for $(1-P_{a,b})$, q_b for $(1-p_b)$, and so on, then the formula becomes:

$$Q_{a,b} = q_b \cdot q_{b+1} \cdot q_{b+2} \cdots q_{b+(a-1)} \qquad (1)$$

The interpretation of the formula in this simpler form is that the proportion of the children who have *escaped* tuberculous infection by age a $(Q_{a,b})$ is equal to the product of the separate risks of escaping tuberculous infection in the a successive years.

As indicated, if the various values of q were known, the value of $Q_{a,b}$ could be calculated quite simply from the formula. The problem here, however, is the reverse. The value of $Q_{a,b}$ is known from a tuberculin survey,

and the problem is to calculate the various values of q. Clearly there are many possible sets of values of q which will satisfy the formula, and the problem is to discover the set of values which is closest to the actual epidemiological situation. This cannot be done unless some other values of Q are available, either for different ages, or for children born in different years, or both. The method used for constructing the series of annual risks of tuberculous infection in the Netherlands will be illustrated in the next section in relation to the actual data.

Before proceeding to this analysis, one technical decision has to be made. In all the surveys of tuberculin sensitivity in the Netherlands from 1959, a single intracutaneous (Mantoux) test was made on each subject with 0.00002 mg of RT 23 (1 TU) in 0.1 ml of a buffer containing Tween 80 (from 1954 to 1958 the dose was 5 TU of RT 22 without Tween 80, which is equivalent to the later dose). The transverse diameter of induration was measured after about 72 hours. This is the current standard WHO tuberculin test (WHO, 1963; IUAT, 1964). To assess the frequency of past infection with tubercle bacilli from the findings of this test it is necessary to decide what critical diameter of induration discriminates best in the Netherlands between subjects infected and subjects not infected with tubercle bacilli. The critical diameter has been taken between 7 mm and 8 mm for two main reasons:

(1) It accords with the findings of the most recent surveys of 'specific' and 'non-specific' tuberculin sensitivity in the Netherlands (Bleiker, personal communication). A lower critical diameter — say between 5 mm and 6 mm — would appear to include too many 'non-specific' reactions, and a higher critical diameter — say between 9 mm and 10 mm — would appear to exclude too many 'specific' reactions.
(2) In Britain, a Mantoux test with 0.1 ml of a 1:3000 dilution of Old Tuberculin (3 TU) in a buffer not containing Tween 80 (which has been found in a small study to give similar results to the standard WHO tuberculin test) has been used extensively in serial testing of the same individuals. Subjects originally without any reaction to 3 TU (or 100 TU), who later showed 8 or 9 mm induration to 3 TU, had a substantially higher subsequent incidence of clinical tuberculosis than those who later showed 5 to 7 mm induration to 3 TU (Sutherland, personal communication).

Throughout the rest of this report, therefore, those with 0-7 mm induration to the standard WHO tuberculin test will be regarded as having escaped tuberculous infection, and those with 8 mm induration or more will be regarded as having been infected at some time in the past with tubercle bacilli.

It is important to realize that the prevalence of tuberculin positivity at a particular age will underestimate the prevalence of past tuberculous infection if a proportion of those infected later 'revert' to tuberculin negativity. More precisely, therefore, the risks of infection which are estimated below are risks of 'infection minus reversion', and these may underestimate the true risks of infection to a small extent.

II. ESTIMATION OF THE ANNUAL RISK OF TUBERCULOUS INFECTION IN THE NETHERLANDS

(1) *Use of the information from army recruits tested from 1954 to 1966*

The series of annual tuberculin surveys of male recruits aged about 19 years has been used as the basis for estimating the annual risk of tuberculous infection in the Netherlands during the post-war period. These surveys cover about 50 percent of the male population of this age in the Netherlands each year (Bleiker, Griep and Beunders, 1964) but, because only those accepted for army service are tested, the surveys may underestimate slightly the prevalence of tuberculous infection. The tuberculin testing and reading techniques have been uniform throughout, and because the surveys have been undertaken annually since 1954, they give information on the annual infection risks over a considerable period of time. However, the information from the 1954 and 1955 surveys has not been used, partly because the surveys in these first two years were on rather smaller numbers (and were therefore perhaps less representative) than the later surveys, and partly because the results according to the 8 mm criterion for tuberculous infection were not readily available for these years. The data from 1956 to 1966 are summarised in Table 8.

The surveys for these years therefore provide a series of values of $Q_{a,b}$, all for the same value of a (which has been taken to be $19\frac{1}{2}$ years), and for 11 successive cohorts of male subjects. The surveys are regarded as if they were made in the middle of each year, so that the 11 cohorts may be regarded as having been born on average at the beginning of each of the 11 years from 1937 to 1947. That is, there are values of $Q_{19.5,b}$ for $b = 1937, 1938 \ldots 1947$.

The first step is to derive an average value for the risk of infection during the lifetime of each of these cohorts. This may be done by considering a modification of formula (1). If there was no trend in the incidence of infection during the lifetime of a cohort, all the values of q in this formula would be equal, and the formula would become:

$$Q_{a,b} = q^a \qquad (2)$$

Thus an average value for q (the annual risk of escaping infection) during the lifetime of a cohort may be obtained by extracting the 'a'th root of $Q_{a,b}$;

$Q_{a,b} = q^a$

$(Q_{a,b})^{\frac{1}{a}} = \bar{q}$ $\quad \Rightarrow \quad \bar{p} = 1 - (Q_{a,b})^{\frac{1}{a}}$

TABLE 1

Estimates of the average annual risk of tuberculous infection during the lifetime of 11 cohorts of male army recruits aged $19\frac{1}{2}$ years, The Netherlands

Cohort (born on average on Jan. 1) (b)	Year of survey (mid-year)	Percentage of recruits with 8 mm induration or more to 1 TU (100 $P_{19.5,b}$)	Proportion who had escaped infection by age $19\frac{1}{2}$ ($Q_{19.5,b}$)	Average annual chance of escaping tuberculous infection ($\bar{q}_b$)	Average annual risk of tuberculous infection (percent) during lifetime of cohort (100 $\bar{p}_b$)
1937	1956	21.5	0.785	0.98766	1.234
1938	1957	18.5	0.815	0.98955	1.045
1939	1958	17.2	0.828	0.99038	0.962
1940	1959	14.7	0.853	0.99188	0.812
1941	1960	12.9	0.871	0.99292	0.708
1942	1961	11.8	0.882	0.99355	0.645
1943	1962	9.9	0.901	0.99468	0.532
1944	1963	8.3	0.917	0.99555	0.445
1945	1964	7.5	0.925	0.99600	0.400
1946	1965	6.9	0.931	0.99635	0.365
1947	1966	6.0	0.940	0.99682	0.318

this can be done quite easily with the aid of logarithms. This average may be written $\bar{q}_b$.

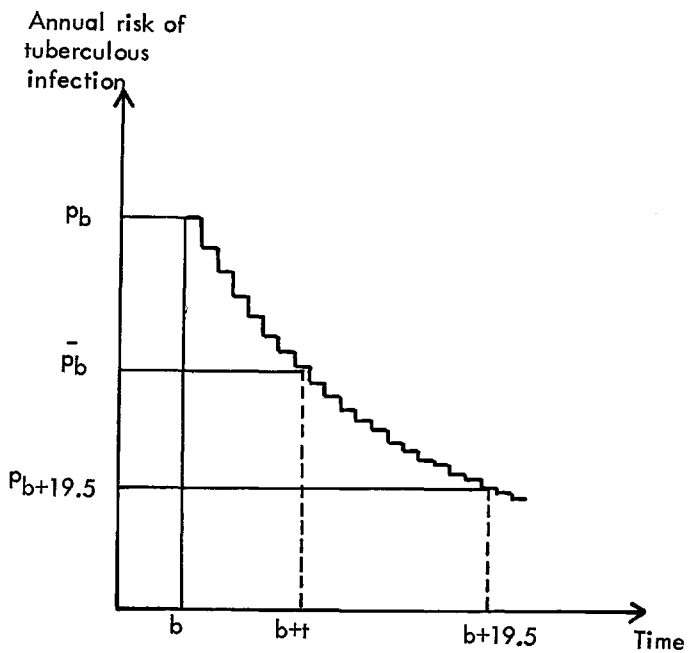
Table 1 shows the observed percentages of recruits with 8 mm induration or more to the standard tuberculin test at each of the surveys (that is, the values of 100 $P_{19.5,b}$), together with the associated values of $Q_{19.5,b}$, and the values of $\bar{q}_b$ and 100 $\bar{p}_b$ calculated from formula (2). There is a steep downward trend in the values of $\bar{p}_b$ for successive cohorts. Each value of $\bar{p}_b$ will correspond to the annual risk of infection at some time between the time of birth of the cohort (b) and the time of the survey ($b+19\frac{1}{2}$). Figure 1 illustrates this point diagrammatically for one cohort. It is not obvious to which intervening time $b+x$ the value $\bar{p}_b$ refers. This time will depend on the way in which the risk of infection has changed during the lifetime of the cohort, and will not necessarily be halfway between b and $b+19\frac{1}{2}$. Moreover, it will not necessarily correspond exactly to a particular calendar year. The next problem is therefore to estimate $b+x$ from the information given by the 11 surveys.

(2) *Assignment of average annual risks of tuberculous infection to specific calendar years*

In formula (1) above, the risk of infection is regarded as being constant

FIG. 1

A diagram to show that the average annual risk of infection during a period may not correspond to the annual risk at the middle of the period



throughout a calendar year. Since it is clear that in the Netherlands there must have been a steep downward trend in risk of infection in the years since the Second World War, it would be more realistic to regard the risk of infection as being a continuously changing quantity. Thus, in Figure 1, the series of steps would be replaced by a curve. This involves a modification of formula (1) and the other mathematical formulae derived from it in the Appendix, but the relationship between prevalence and incidence remains essentially the same as in formula (1). With the modified formula, however, it becomes simpler to deal with times and intervals which do not correspond exactly to calendar years, and this modification is therefore important in relation to an accurate estimation of x.

As stated above, $\bar{p}_b$ represents an estimate of the annual risk of tuberculous infection at some time $b+x$ during the lifetime of the cohort born at time b; this annual risk may be written p_{b+x}. Here we have information from 11 cohorts born at annual intervals, and all examined at the same age, and it

has therefore been assumed, as a first approximation, that x will be the same for all of them. Thus the values of $\bar{p}_{1937}, \bar{p}_{1938}, \cdots \bar{p}_{1947}$ are a series of 11 estimates of $p_{1937+x}, p_{1938+x}, \cdots p_{1947+x}$. In other words, the final column of Table 1 indicates the downward trend in annual infection rate during a period in the Netherlands, which is x years *later* than the period 1937 to 1947.

The next step was to 'fit' a smooth curve to the values of $100\bar{p}_b$ in the final column of Table 1, which closely described their trend, and which could be extended in both directions in time. In the course of the calculations for Table 1, it had been noticed that the 11 values of $\log(-\log q_b)$ lay very nearly on a straight line. A straight line was therefore fitted to these values, using the standard linear regression technique, and regarding all the 11 values as of equal 'weight'. (This line corresponds very closely to an exponential downward trend in the risk of infection; the reasons for choosing this particular line are given in the Appendix). This line was extended in both directions, and, when expressed in terms of p, provided the required smooth curve to describe the downward trend of the risk of tuberculous infection in the Netherlands army recruits. The original and the smoothed values of $100\bar{p}_b$ are shown in the second and third columns of Table 2, and it will be seen that the smooth curve agrees closely with the original values.

The smooth curve was then used to determine the value of x. For example, the value of 1.227% for the average risk for the cohort born in 1937 was derived from recruits examined in 1956, but corresponds to the risk of infection at an earlier time, when the members of the cohort were younger, namely aged x years. The value of x for this cohort was found by moving the smooth curve describing the downward trend of infection risks to a new position. This new position was such that $19\frac{1}{2}$ years of the infection rates given by the curve, when combined according to the modified version of formula (1), gave a prevalence of past infection at age $19\frac{1}{2}$ years of 21.5 percent, the same as was observed at that age for this cohort (Table 1). The new position for the curve gives a value of 1.227% at an age of 7.719 years (see Appendix), which is thus the required value of x for this cohort.

The series of estimates of x for the 11 cohorts are given in the fourth column of Table 2. They show no systematic variations, and this confirms that x is apparently the same for all the cohorts; the average of the 11 estimates is 7.683 years. Thus, on average, the smoothed values of the average annual infection rates in the third column of Table 2 represent the infection rates at the time when each of the cohorts of children was aged 7.683 years. The final column of the table shows the values of the annual infection rates on the same smooth curve *at the date of birth* of each of the cohorts, given in the first column. A comparison of the last four values in the final column of the table, with the first four in the third column, shows that

TABLE 2

Derivation of annual risks of tuberculous infection in The Netherlands from 1937 onwards from information from 11 cohorts of male army recruits

Cohort (born on average on Jan. 1)	Average annual risk of tuberculous infection (percent.) during lifetime of cohort	Smoothed value of average annual risk	Age in years to which this smoothed value applies (to reproduce observed prevalence at $19\frac{1}{2}$ years)	Estimated annual risk of tuberculous infection (percent.) at date of birth of the cohort*
(b)	($100\bar{p}_b$)	($\equiv 100p_{b+x}$)	(x)	(p_b)
1937	1.234	1.227	7.719	3.28
1938	1.045	1.070	7.499	2.86
1939	0.962	0.933	7.915	2.49
1940	0.812	0.814	7.672	2.17
1941	0.708	0.709	7.651	1.90
1942	0.645	0.618	7.960	1.66
1943	0.532	0.539	7.612	1.45
1944	0.445	0.469	7.271	1.27
1945	0.400	0.409	7.505	1.10
1946	0.365	0.356	7.878	0.97
1947	0.318	0.311	7.839	0.83

* Using the average of the column of values of x (namely 7.683) for all the cohorts.

the former curve has been moved between 7 and 8 years, compared with the latter.

This smooth curve of annual infection rates, of which only the portion for the years from 1937 to 1947 is shown in the last column of Table 2, has been derived from information on male recruits which relates to the whole period from 1937 to 1966, and for this reason may be regarded as providing a reliable indication of the change in risk of tuberculous infection in the Netherlands during the whole of this calendar period. The information obtained in the tuberculin surveys of schoolchildren provides a valuable means of testing the adequacy of this curve of annual infection rates, and of seeing whether it needs to be modified to include females as well as males.

(3) *Use of the information from schoolchildren aged 12 to 18 years tested from 1961 to 1966*

The information from the annual tuberculin surveys of schoolchildren has been used partly to confirm the validity of the series of annual risks of tuberculous infection obtained from the information for army recruits, and partly to assess whether the risks are different for boys and girls.

From 1962 onwards the surveys in schoolchildren have covered each year about 50 percent of the population of the Netherlands aged 13 to 16 years (about 70 percent of those aged 14 years), and smaller proportions of those aged 12, and 17 or more (many of the older children having left school). The findings may be regarded as reasonably representative of the whole school population. The tuberculin testing and reading techniques have been uniform throughout, and they are also the same as the techniques used for the army recruits, although the teams making the surveys are distinct. The information from the 1961 survey has not been used here, because the numbers tested were smaller (and the survey was therefore perhaps less representative); however the information at ages 12, 17 and 18 years from the later surveys has been retained, despite the smaller numbers, because they provide a valuable link, in terms of age, with the recruits. The data from 1962 to 1966 are summarised in Table 7.

The results of the analysis of the data for the schoolboys aged $12\frac{1}{2}$ to $18\frac{1}{2}$ years are given in Table 3 with corresponding information for the five most recent cohorts of recruits aged $19\frac{1}{2}$ years. The curve of annual infection rates derived from the 11 cohorts of recruits (part of which was given in the final column of Table 2) was applied to each cohort of schoolboys. The number of years by which this curve had to be shifted, either forwards (+) or backwards (−), to reproduce the observed prevalence of tuberculous infection at each survey (see Appendix), is shown in Table 3.

Most of the shifts are small, and negative, and this corresponds to a slightly lower level of annual risks of infection among the schoolboys than among the recruits. The average shifts are shown for each age-group at the foot of the table, together with the annual risk of infection at the beginning of 1950 for each age-group. There is no definite trend with age, and it therefore seems that there is little variation in the risk of tuberculous infection during adolescence. This point is examined in greater detail in the Appendix. The slightly higher rate for the recruits may perhaps reflect a tendency for this group to have been drawn from a rather different section of the population from the schoolchildren, or there may have been slightly different 'levels' of performance of the test, and of reading the results, in the two sets of surveys.

Table 4 gives corresponding information for the schoolgirls aged $12\frac{1}{2}$ to $18\frac{1}{2}$ years. The shifts in the curve of annual infection rates are all (with one exception) negative, and larger on average than for the schoolboys. It would therefore appear that the risk of tuberculous infection was uniformly lower for girls than for boys throughout this age-range.

Omitting those aged $12\frac{1}{2}$ and those aged $18\frac{1}{2}$, because of the relatively small

TABLE 3

Extent of the shift in the basic curve of annual risk of tuberculous infection which is required to reproduce observed prevalence of tuberculous infection for schoolboys aged 12½ to 18½ years and recruits aged 19½ years, tested from 1962 to 1966

	Age at survey in years							
	12½		13½		14½		15½	
Year of survey (mid-year)	Cohort (born on average on Jan. 1)	Req. shift (yrs)	Cohort	Req. shift	Cohort	Req. shift	Cohort	Req. shift
1962	1950	−0.27	1949	−0.50	1948	−0.11	1947	−0.05
1963	1951	−0.16	1950	−0.62	1949	−0.39	1948	−0.36
1964	1952	−0.79	1951	−0.25	1950	−0.90	1949	−0.84
1965	1953	−1.53	1952	+0.41	1951	+0.81	1950	−0.34
1966	1954	−1.55	1953	−1.94	1952	−1.59	1951	+1.06
Average shift		−0.86		−0.58		−0.44		−0.11
Corresponding annual risk at 1950 (percent.)		0.49		0.51		0.52		0.54

	Age at survey in years							
	16½		17½		18½		19½	
Year of survey (mid-year)	Cohort (born on average on Jan. 1)	Req. shift (yrs)	Cohort	Req. shift	Cohort	Req. shift	Cohort	Req. shift
1962	1946	−0.33	1945	−0.82	1944	−0.09	1943	−0.07
1963	1947	−0.07	1946	−0.47	1945	−0.39	1944	−0.41
1964	1948	−0.61	1947	−0.16	1946	−0.48	1945	−0.18
1965	1949	−0.28	1948	−0.18	1947	+0.32	1946	+0.20
1966	1950	−0.39	1949	−0.58	1948	−0.63	1947	+0.15
Average shift		−0.34		−0.44		−0.26		−0.06
Corresponding annual risk at 1950 (percent.)		0.53		0.52		0.53		0.55

TABLE 4

Extent of the shift in the basic curve of annual risk of tuberculous infection which is required to reproduce the observed prevalence of tuberculous infection for schoolgirls aged 12½ to 18½ years tested from 1962 to 1966

	Age at survey in years							
	12½		13½		14½		15½	
Year of survey (mid-year)	Cohort (born on average on Jan. 1)	Req. shift (yrs)	Cohort	Req. shift	Cohort	Req. shift	Cohort	Req. shift
1962	1950	−0.58	1949	−0.75	1948	−1.00	1947	−0.70
1963	1951	−0.48	1950	−1.08	1949	−0.63	1948	−0.75
1964	1952	−2.05	1951	−0.97	1950	−1.80	1949	−1.43
1965	1953	−2.87	1952	−0.98	1951	+0.03	1950	−1.16
1966	1954	−2.51	1953	−3.02	1952	−2.07	1951	−0.30
Average shift		−1.70		−1.36		−1.09		−0.87
Corresponding annual risk at 1950 (percent.)		0.44		0.46		0.48		0.49

	Age at survey in years					
	16½		17½		18½	
Year of survey (mid-year)	Cohort (born on average on Jan. 1)	Req. shift (yrs)	Cohort	Req. shift	Cohort	Req. shift
1962	1946	−0.68	1945	−1.04	1944	−0.98
1963	1947	−0.60	1946	−0.83	1945	−0.84
1964	1948	−1.23	1947	−1.25	1946	−0.94
1965	1949	−0.23	1948	−0.46	1947	−0.99
1966	1950	−0.92	1949	−0.61	1948	−0.87
Average shift		−0.73		−0.84		−0.92
Corresponding annual risk at 1950 (percent.)		0.50		0.49		0.49

numbers tested at these ages, the average shift of the curve of annual infection rates was −0.343 years for boys aged 13½ to 17½ years, and −0.995 years for girls aged 13½ to 17½. The curve of annual infection rates derived from the 11

TABLE 5

Annual risks of tuberculous infection in The Netherlands from 1910 to 1969, derived from the findings of tuberculin surveys, with possible alternative risks for the period 1933 to 1947

Year	Annual risk of tuberculous infection (%)	Possible alternative risk* (%)	Year	Annual risk of tuberculous infection (%)	Possible alternative risk* (%)
1910	11.31		1940	2.08	1.72
11	10.74		41	1.82	1.70
12	10.20		42	1.58	1.72
13	9.68		43	1.38	1.78
14	9.18		44	1.20	1.90
1915	8.72		1945	1.05	2.10
16	8.27		46	0.92	1.45
17	7.85		47	0.80	1.00
18	7.44		48	0.70	
19	7.06		49	0.61	
1920	6.69		1950	0.53	
21	6.35		51	0.46	
22	6.02		52	0.40	
23	5.71		53	0.35	
24	5.41		54	0.30	
1925	5.13		1955	0.265	
26	4.86		56	0.231	
27	4.61		57	0.202	
28	4.37		58	0.176	
29	4.14		59	0.153	
1930	3.92		1960	0.133	
31	3.72		61	0.116	
32	3.52		62	0.101	
33	3.34	3.09	63	0.088	
34	3.16	2.72	64	0.077	
1935	2.99	2.42	1965	0.067	
36	2.84	2.18	66	0.058	
37	2.69	2.00	67	0.051	
38	2.55	1.87	68	0.044	
39	2.41	1.78	69	0.038	

* A smoothed series derived from the mortality rates from tuberculous meningitis in children aged 0-4 years (in Table 14); the consequences of this alternative series are examined in Section III.

cohorts of recruits was therefore shifted by half the difference between the shifts for the boys and the girls (−0.326 years) to give a curve of annual infection rates which would be appropriate for a group with equal numbers of the two sexes. This new curve has been adopted as a standard curve of estimated annual tuberculous infection rates for the Netherlands, covering the period from 1940 onwards. The reason why it has not been extended further back in time will become apparent below. The percentages infected during each year, according to this standard curve, are shown on the right hand side of Table 5.

(4) *Use of the information from children up to 13 years of age tested in four surveys between 1926 and 1947*

Four surveys of tuberculin sensitivity, in children stated not to be in contact with tuberculosis at home, were made by the Amsterdam Chest Clinic in 1925-27, 1933-35, 1938-40 and 1946-48 (Heynsius van den Berg, 1962). Each survey included children throughout the age-range 0-14 years; the method of testing was the von Pirquet test (without adrenalin), and the result of the test was recorded simply as 'positive' or 'negative'. The percentages positive at different ages in these four surveys are shown in Table 6. The figures were read from the published graph, the original data from these surveys no longer being available. It is not possible to discover how representative these findings are, but they can provide a good indication of the trend in the risk of infection in the Netherlands during the period up to the second World War.

There are two difficulties in using this information to extend the curve of annual tuberculous infection rates for the Netherlands backwards in time. One is the lack of exact knowledge how closely a positive result to a von Pirquet test corresponds to an induration of 8 mm or more to the standard tuberculin test in the Netherlands in the more recent surveys. It appears from the studies summarised by Hart (1932) and also from that undertaken by Madsen and Holm (1935) that these two tests are probably nearly equivalent, and it will be assumed below that this is so, and consequently that a positive result to the von Pirquet test is indicative of a past tuberculous infection.

The second difficulty in using the information is the very high prevalence of positivity to the von Pirquet test, in each survey, among those aged less than 2 years, suggesting that the risk of tuberculous infection was much greater under the age of 2 years than among older children. There are two possible explanations for this. One is that the von Pirquet test may at each age have given a proportion of positive results in children who had *not* had a past tuberculous infection; if this was so, the largest effect would be observed among the youngest groups, because the proportions genuinely infected with tubercle bacilli in these groups would be small. Moreover, the effect would

be to inflate the percentage found to be positive at each age above the true value for the percentage infected. This effect would explain an inconsistency between the findings of the 1946-48 survey and the later findings among the recruits. For example, those aged $10\frac{1}{2}$ in 1946-48 (24.4 percent positive to the von Pirquet test — Table 6) represent the same cohort as those aged $19\frac{1}{2}$ in 1956 (only 21.5 percent positive to the Mantoux test at the 8 mm criterion — Table 8).

The other explanation is that the risk of tuberculous infection under the age of 2 years was genuinely higher than among older children, as a result of infection with bovine tubercle bacilli from unpasteurised milk. Bovine tuberculosis was common in the Netherlands before the second World War and obligatory pasteurisation of milk was introduced only in 1940. To overcome this difficulty, only the information at ages $2\frac{1}{2}$ years and more has been used when estimating the annual risks of infection from the four surveys.

The method used was very similar to that used above for the later period. The aim was first to obtain a smooth curve of annual infection rates and then to discover an appropriate position for this on the time scale, by moving it to the position in which it best reproduced the observed prevalence figures.

The smooth curve of annual infection rates was obtained as follows. Each of the four surveys provides a series of values of $Q_{a,b}$. For example, the survey in 1925-27 may be regarded as having been made on average in the middle of 1926 (and will henceforth be referred to as the 1926 survey). Those aged $2\frac{1}{2}$ (i.e. in their third year of life) at the survey will on average have been born at the beginning of 1924, those aged $3\frac{1}{2}$ at the beginning of 1923, and so on. These tests made in 1926 therefore provide values of $Q_{2.5,1924}$, $Q_{3.5,1923}$, $Q_{4.5,1922}$, ... $Q_{13.5,1913}$.

Using formula (1) and making an appropriate adjustment for the half year of age, we may write:

$$Q_{3.5,1923} = q_{1923} \cdot q_{1924} \cdot q_{1925} \cdot \sqrt{q_{1926}}$$

and

$$Q_{2.5,1924} = q_{1924} \cdot q_{1925} \cdot \sqrt{q_{1926}}$$

Therefore $Q_{3.5,1923}$ divided by $Q_{2.5,1924}$ gives an estimate of q_{1923}. Similarly $Q_{4.5,1922}$ divided by $Q_{3.5,1923}$ gives an estimate of q_{1922}, and so on. From these ratios of successive prevalence figures from age $2\frac{1}{2}$ to age $13\frac{1}{2}$, each survey therefore provides estimates of the values of q_b for a series of 11 consecutive years, and the four surveys together provide 44 estimates of q_b for four different, but overlapping, 11-year periods.

The 44 values of $\log(-\log q_b)$ appeared to lie approximately on a straight line (it will be recalled that this also applied to the corresponding values

from the surveys of recruits) and so a straight line was fitted to these values, using the standard linear regression technique, and regarding all 44 values as of equal 'weight'. This line was extended in both directions, and, when expressed in terms of p, provided the required smooth curve to describe the downward trend of the risk of tuberculous infection in Amsterdam schoolchildren in the years before and during the second World War.

The best position for this smooth curve on the time-scale was determined from a comprehensive analysis, similar to that undertaken for the recruits. The amount by which the curve had to be shifted along the time-scale, to reproduce each of the observed prevalence figures of tuberculous infection from age $3\frac{1}{2}$ to age $13\frac{1}{2}$, in each of the four surveys, was determined. These amounts were averaged, and the curve was moved by the average amount. The four surveys cover children born or observed between the years 1913 and 1947, and this new curve has been adopted as a standard curve of annual tuberculous infection rates for the Netherlands, covering the period from 1910 onwards. The percentage infection risks during each year, according to this standard curve, are shown on the left hand side of Table 5. The downward slope of this standard curve is not as steep as that derived from the later surveys of schoolchildren and recruits. The reasons for this will be discussed later in this report. However, because of the difference in slope, the two curves cross between 1939 and 1940. This means that there are two sets of estimated infection rates for the period 1937 to 1939 (the estimates from the later surveys being greater than those from the earlier surveys) and two sets for the period 1940 to 1947 (the estimates from the earlier surveys being the greater). The estimates from the earlier surveys have been preferred for 1937 to 1939, and those from the later surveys for 1940 to 1947.

III. VALIDITY OF THE ESTIMATES OF ANNUAL RISK OF TUBERCULOUS INFECTION

The validity of the set of estimates of the annual risk of tuberculous infection in the Netherlands between 1910 and 1969, given in Table 5, may be checked by investigating whether they reproduce satisfactorily the prevalence figures at different ages in each of the surveys described above. The observed prevalences of tuberculous infection at different ages in the different surveys are shown in Tables 6, 7, and 8, together with the prevalences calculated from the series of annual infection rates (Columns (1) in Table 8). It will be seen that the agreement is in general very close, particularly for the cohorts observed after the second World War. It is therefore evident that the series

TABLE 6

Observed percentage prevalence of tuberculous infection at ages 3½ to 13½ years in four surveys, and the prevalence calculated from the standard series of annual risks of tuberculous infection in Table 5

Age at survey in years	Year of survey							
	1925-27		1933-35		1938-40		1946-48	
	Obs.	Calc.	Obs.	Calc.	Obs.	Calc.	Obs.	Calc.
3½	33.3	33.6	25.4	25.5	18.6	17.8	13.5	13.0
4½	36.9	37.6	26.4	28.4	20.7	20.3	15.1	14.2
5½	39.4	41.6	28.6	31.4	23.5	22.8	16.7	15.5
6½	42.5	45.5	32.2	34.4	25.7	25.4	16.9	17.1
7½	45.3	49.3	35.7	37.4	27.9	28.0	19.6	18.8
8½	47.8	53.1	39.0	40.4	30.3	30.7	21.1	20.7
9½	50.8	56.8	42.1	43.5	32.8	33.4	22.6	22.7
10½	53.9	60.4	44.7	46.5	35.4	36.1	24.4	24.8
11½	57.6	63.8	47.6	49.6	37.5	38.9	25.3	26.9
12½	60.8	67.1	49.6	52.6	40.0	41.7	27.1	29.1
13½	64.4	70.3	52.2	55.6	42.8	44.6	28.5	31.4

Source of observed prevalence: Heynsius van den Berg, M.R. (1962) Leerboek der tuberculosebestrijding. The Hague, K.N.C.V., p. 149. There is no longer any record of the numbers tested in these surveys.

TABLE 7

Observed percentage prevalence of tuberculous infection at ages 12½ to 18½ years from 1962 to 1966 (average for both sexes) and the prevalence calculated from the standard series of annual risks of tuberculous infection in Table 5

Age at survey in years	Year of survey (mid-year)											
	1962			1963			1964			1965			1966		
	Total tested	Percent. prevalence		Total tested	Percent. prevalence		Total tested	Percent. prevalence		Total tested	Percent. prevalence		Total tested	Percent. prevalence	
		Obs.	Calc.		Obs.	Calc.		Obs.	Calc.		Obs.	Calc.		Obs.	Calc.
12½	53,716	3.28	3.32	59,111	2.90	2.90	60,462	2.19	2.53	73,385	1.72	2.21	40,716	1.53	1.93
13½	93,628	3.76	3.91	118,058	3.18	3.41	115,787	2.87	2.98	135,266	2.62	2.60	114,930	1.70	2.27
14½	95,701	4.44	4.58	125,736	3.90	4.00	125,130	3.04	3.49	138,465	3.38	3.05	148,178	2.17	2.66
15½	71,463	5.31	5.34	102,641	4.53	4.67	101,733	3.66	4.08	113,714	3.36	3.56	127,490	3.44	3.11
16½	40,652	6.06	6.21	74,780	5.42	5.43	75,114	4.38	4.75	82,736	4.18	4.15	97,166	3.46	3.62
17½	21,700	6.64	7.19	39,205	6.03	6.29	49,355	5.24	5.51	55,507	4.82	4.81	66,397	4.06	4.21
18½	12,754	8.10	8.31	19,068	7.01	7.28	25,037	6.06	6.37	34,604	5.59	5.57	40,250	4.60	4.87

Source of observed prevalence data: Staatstoezicht op de Volksgezondheid, Tuberculineschoolonderzoek, 1962-'66.

TABLE 8

Observed percentage prevalence of tuberculous infection at ages 19½ years from 1956 to 1966 (males only), and the prevalences (1) calculated from the standard series of annual risks of tuberculous infection for males given (in part) in Table 2; and (2) calculated from the series of possible alternative annual risks given in Table 5

Year of survey (mid-year)	Age 19½ years				Year of survey (mid-year)	Age 19½ years			
	Total tested	Observed prevalence (%)	Calculated prevalence (%)			Total tested	Observed prevalence (%)	Calculated prevalence (%)	
			(1)	(2)				(1)	(2)
1956	40,217	21.5	20.7	20.9	1962	45,124	9.9	10.0	12.5
1957	38,163	18.5	18.7	19.5	1963	44,600	8.3	8.8	11.1
1958	37,365	17.2	16.7	18.2	1964	38,395	7.5	7.7	9.6
1959	41,101	14.7	14.7	16.6	1965	38,999	6.9	6.7	7.9
1960	42,870	12.9	13.0	15.3	1966	42,458	6.0	5.9	6.3
1961	44,918	11.8	11.4	13.9					

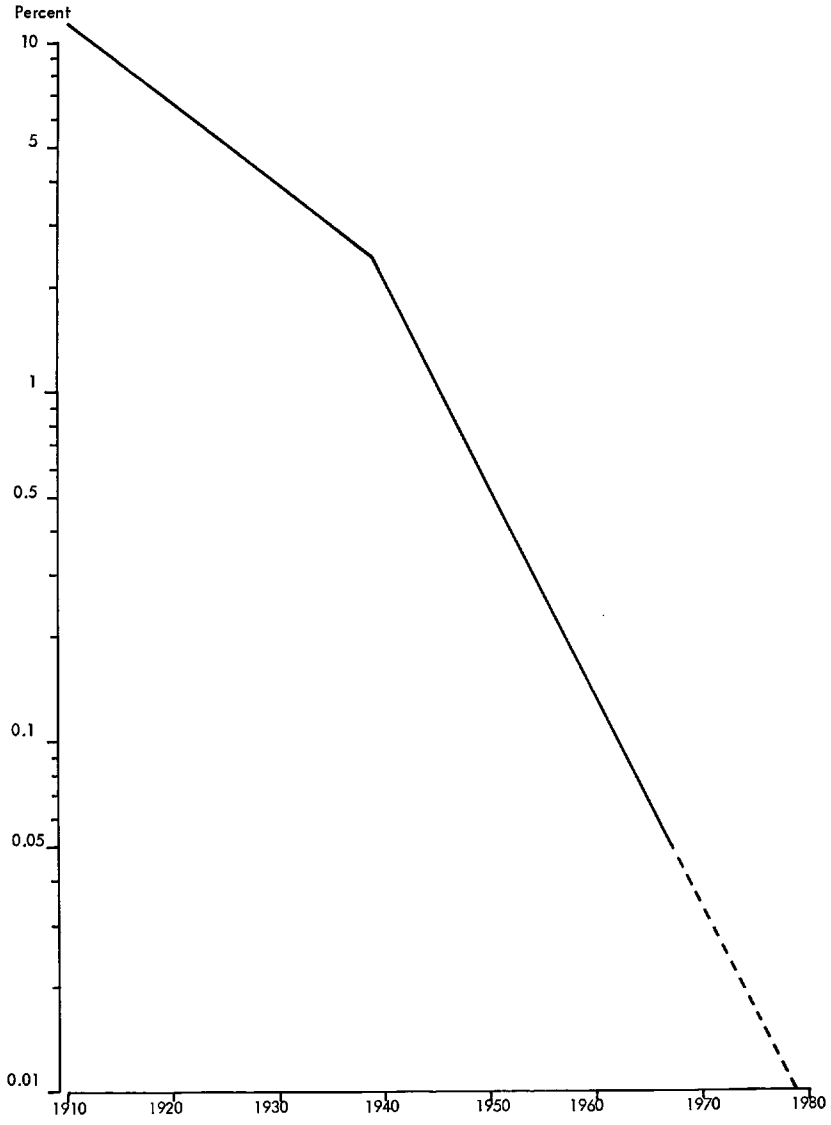
Source of observed prevalence data: Staatstoezicht op de Volksgezondheid, Tuberculineschoolonderzoek, 1962-66.

Calculated prevalence: (1) From the standard series of annual risks of tuberculous infection for males.

(2) From the series of possible alternative risks of tuberculous infection in Table 5.

FIG. 2

Annual risk of tuberculous infection (%), The Netherlands 1910-1980



of rates in Table 5 provides an extremely good indication of the way in which infection rates have changed in the Netherlands during a period of more than fifty years. Indeed, it is surprising that such a simple model, represented by one curve for the period from 1910 to 1939 (for all ages up to $13\frac{1}{2}$ years), and by a second curve for the period from 1940 onwards (for all ages up to $19\frac{1}{2}$ years) should have reproduced so satisfactorily the findings for such a large number of individual cohorts of children examined at different ages.

A feature of this series of rates is that it suggests that there was no interruption in the steady decrease in infection risks in the Netherlands during the second World War. As a further check on the validity of these estimates, therefore, the effect of simulating an interruption in the decrease of infection risks was studied.

Figure 7 shows that the mortality rate from tuberculous meningitis in children aged 0-4 years in the Netherlands, which is likely to be closely related to the risk of tuberculous infection, showed a trend different from that of the series of infection risks between about 1933 and 1947 (after which year the mortality rates are uninformative because of the introduction of chemotherapy). A smooth alternative series of infection risks for these 15 years was therefore derived, which followed the mortality figures for tuberculous meningitis. This alternative series, which is shown in Table 5, was used instead of the original series of infection risks to simulate the effects of an interruption in the steady decrease of infection risk.

The effect of this simulation on the calculated prevalence of tuberculous infection at age $19\frac{1}{2}$ years for the cohorts of recruits (born from 1937 to 1947) is shown in the columns headed (2) in Table 8. Although the prevalences calculated from the alternative series of risks are only slightly higher than the observed prevalences for the first and last cohorts, the values for the intervening cohorts are all substantially higher. For example, for the cohort observed in 1962 the observed prevalence was 9.9 percent, compared with a calculated prevalence of 12.5 percent derived from the modified series of infection risks. However, the calculated prevalence derived from the standard series of infection risks was 10.0 percent, which is much closer to the observed prevalence.

It is evident that the modified series of risks does not adequately reproduce the observed figures. This confirms the essential validity of the set of estimates of annual risks given in Table 5, and indicates that there was no interruption during the war years in the steady decrease in the risk of tuberculous infection.

IV. ESTIMATES OF THE ANNUAL RISK OF INFECTION UP TO THE AGE OF TWENTY YEARS FOR PREDICTION PURPOSES

One of the main aims in deriving the above series of infection risks was, if possible, to predict the likely status of the population in the Netherlands, in relation to new and past tuberculous infection, during the next twenty or thirty years. Because the decrease in the risk of tuberculous infection in the Netherlands since 1940 has been so remarkably regular, a confident estimate of the future trend in the risk of infection can be made by extending the curve in Table 5 onwards from 1969. It has been assumed for prediction purposes that the present trend will continue until 1980, by which time the annual infection risk would be 0.0085% (Figure 2). To guard against the possibility that any further decrease might represent too extreme an assumption, it will be assumed that thereafter the infection risk will remain constant at this value.

With the aid of this extrapolated series of rates it is possible to make comprehensive estimates, both of the prevalence of past infection and the incidence of primary infection in the Netherlands, for each of the cohorts born in the years from 1910 to 1960, up to the age of 50 years. However, the estimated risks of infection were derived from surveys of children and adolescents, and it is not known whether the risks are the same as these above the age of twenty. It is also possible that there may be some increase in the risk of infection during adolescence (see Appendix). It is therefore advisable to examine the consequences of various assumptions about the risk of infection in relation to age, above an age of about thirteen years. As explained in the next section three separate sets of assumptions have been made, and their consequences studied, to give an indication of the limits within which the future tuberculosis situation in the Netherlands is likely to vary.

V. ASSUMPTIONS MADE ABOUT THE RISK OF INFECTION BETWEEN AGES 14 AND 50 YEARS FOR PREDICTION PURPOSES

The results given above suggest that the risk of tuberculous infection in a calendar year may be regarded as being constant at least up to an age of about 13 years. It is widely believed that the risk of tuberculous infection may be greater among adolescents and young adults than among children or older people. There is a little evidence in the present study that there may be some increase of the infection risk during adolescence, but it is not strong, and it relates only to the surveys made during the past few years, when the risk of infection was very low (see Appendix). However, in framing assumptions about the risk of infection, it is necessary to take the possibility of increased risks among adolescents and young adults into account, because they will influence the prevalence and incidence figures from age 14 up to the age of 50 years.

Prevalence and incidence data up to the age of 50 years have therefore been simulated on three different assumptions.

Assumption (A): No increase of the risk of infection with age after 13 years of age.

Assumption (B): An increase of the risk of infection with age after 13 years of age and a subsequent decrease, as follows:

Age (years)	*Ratio of the risk to the risk at 0-13 years*
14	1.1
15	1.2
16	1.3
17	1.4
18-20	1.5
21	1.4
22	1.3
23	1.2
24	1.1
25-50	1.0

This assumption corresponds to an increase in infection risk during adolescence, diminishing again by the age of 25.

Assumption (C): An increase of the risk of infection with age after 13 years of age, and a subsequent decrease, as follows:

Age (years)	*Ratio of the risk to the risk at 0-13 years*
14	1.1
15	1.2
16	1.3
17	1.4
18-25	1.5
26	1.4
27	1.3
28	1.2
29	1.1
30-50	1.0

This assumption corresponds to an increase in infection risk during adolescence, the higher level persisting until the age of 25, and diminishing again by the age of 30.

Appendix Table A shows prevalence and incidence figures per 100,000 population at each age from 0 to 50 years for cohorts from each year from 1910 to 1960, calculated on a computer. The upper two lines for each cohort give the prevalence of tuberculous infection (first line: 0-24 years of age; second line: 25-50 years). The lower two lines give the annual incidence of new infections (third line: 0-24 years; fourth line: 25-50 years).

To facilitate the understanding of Appendix Table A, and to compare the effects of the three assumptions, average prevalence and annual incidence figures were also calculated on the computer for groups of five cohorts, in five-year age-groups. The results of this analysis are given in Tables 9 (prevalence) and 10 (incidence). In each table the figures below the heavy diagonal line correspond to future predictions.

Table 9 shows that *the prevalence figures* at ages 16-20 years for assumptions (B) and (C) are slightly higher than those for assumption (A), but not by more than 1.3 percent. The differences at older ages are more pronounced, but even there they do not exceed 4.0 percent. It is important to note that for the cohorts born in 1940 or later, the prevalence figures up to the age of 50 do not differ by more than 0.5 percent at any age, according to the three assumptions.

Table 10 shows *the annual incidence figures* of primary tuberculous infec-

TABLE 9

Estimated percentage prevalence of tuberculous infection in cohorts born in 1910-14 to 1955-59 in five-year age-groups according to three assumptions on the dependence of the risk of infection on age, The Netherlands

Cohort born in		Age-group (years) 11-15 (1)	(2)	16-20 (1)	(2)	21-25 (1)	(2)	26-30 (1)	(2)	31-35 (1)	(2)	36-40 (1)	(2)	41-45 (1)	(2)	46-50 (1)	(2)
	(A)	64.0		71.6		76.3		79.2		80.9		81.7		82.0		82.2	
1910-14	(B)	64.0	—	72.9	1.3	79.0	2.7	81.9	2.7	83.3	2.4	84.0	2.3	84.3	2.3	84.5	2.3
	(C)	64.0	—	72.9	1.3	79.3	3.0	82.9	3.7	84.4	3.5	85.0	3.3	85.3	3.3	85.5	3.3
	(A)	54.0		61.6		66.4		69.1		70.4		71.0		71.3		71.4	
1915-19	(B)	54.0	—	62.9	1.3	69.4	3.0	72.1	3.0	73.2	2.8	73.8	2.8	74.0	2.7	74.2	2.8
	(C)	54.0	—	62.9	1.3	69.7	3.3	73.1	4.0	74.3	3.9	74.8	3.8	75.1	3.8	75.2	3.8
	(A)	44.6		51.6		55.4		57.3		58.2		58.6		58.8		58.9	
1920-24	(B)	44.6	—	52.8	1.2	58.1	2.7	60.0	2.7	60.8	2.6	61.2	2.6	61.4	2.6	61.5	2.6
	(C)	44.6	—	52.8	1.2	58.3	2.9	60.7	3.4	61.6	3.4	62.0	3.4	62.2	3.4	62.3	3.4
	(A)	36.0		41.1		43.6		44.7		45.3		45.6		45.8		45.8	
1925-29	(B)	36.1	0.1	42.0	0.9	45.4	1.8	46.6	1.9	47.2	1.9	47.5	1.9	47.6	1.8	47.7	1.9
	(C)	36.1	0.1	42.0	0.9	45.5	1.9	47.1	2.4	47.7	2.4	48.0	2.4	48.1	2.3	48.2	2.4
	(A)	27.2		30.3		31.7		32.4		32.8		33.0		33.1		33.1	
1930-34	(B)	27.3	0.1	30.8	0.5	32.8	1.1	33.6	1.2	33.9	1.1	34.1	1.1	34.2	1.1	34.3	1.2
	(C)	27.3	0.1	30.8	0.5	32.9	1.2	33.9	1.5	34.3	1.5	34.5	1.5	34.6	1.5	34.6	1.5
	(A)	18.1		19.8		20.6		21.0		21.3		21.4		21.4		21.5	
1935-39	(B)	18.1	—	20.1	0.3	21.3	0.7	21.7	0.7	21.9	0.6	22.0	0.6	22.1	0.7	22.1	0.6
	(C)	18.1	—	20.1	0.3	21.3	0.7	21.9	0.9	22.1	0.8	22.3	0.9	22.3	0.9	22.3	0.8
	(A)	10.0		10.9		11.4		11.6		11.7		11.8		11.8		11.9	
1940-44	(B)	10.0	—	11.1	0.2	11.7	0.3	12.0	0.4	12.1	0.4	12.2	0.4	12.2	0.4	12.3	0.4
	(C)	10.0	—	11.1	0.2	11.8	0.4	12.1	0.5	12.2	0.5	12.3	0.5	12.3	0.5	12.4	0.5
	(A)	5.1		5.6		5.9		6.0		6.1		6.1		6.2		6.2	
1945-49	(B)	5.1	—	5.7	0.1	6.1	0.2	6.2	0.2	6.3	0.2	6.3	0.2	6.4	0.2	6.4	0.2
	(C)	5.1	—	5.7	0.1	6.1	0.2	6.3	0.3	6.3	0.2	6.4	0.3	6.4	0.2	6.5	0.3
	(A)	2.6		2.9		3.0		3.1		3.1		3.2		3.2		3.2	
1950-54	(B)	2.6	—	2.9	—	3.1	0.1	3.2	0.1	3.2	0.1	3.3	0.1	3.3	0.1	3.4	0.2
	(C)	2.6	—	2.9	—	3.1	0.1	3.2	0.1	3.3	0.2	3.3	0.1	3.3	0.1	3.4	0.2
	(A)	1.3		1.5		1.5		1.6		1.6		1.7		1.7		1.7	
1955-59	(B)	1.3	—	1.5	—	1.6	0.1	1.6	—	1.7	0.1	1.7	—	1.8	0.1	1.8	0.1
	(C)	1.3	—	1.5	—	1.6	0.1	1.6	—	1.7	0.1	1.7	—	1.8	0.1	1.8	0.1

(1) = Estimated percentage prevalence of tuberculous infection.
(2) = Increase of prevalence on assumptions (B) and (C) compared with assumption (A).
(A) = No increase of the risk of infection with age after 13 years of age.
(B) = An increase in the risk of infection between 13 and 25 years of age (see text).
(C) = An increase in the risk of infection between 13 and 30 years of age (see text).

tion under each of the three assumptions. In contrast to the prevalence figures in Table 9, Table 10 shows that the incidence of primary infection among adolescents and young adults is substantially influenced by the assumptions on the risk of infection and age in those cohorts in which the average annual risk of infection is high. In the cohort born in 1910-14, on average 1,230 persons per 100,000 aged 15-19 and 775 persons per 100,000 aged 20-24 would have been infected annually in the Netherlands during the periods 1925-29 and 1930-34 respectively, if the risk of infection did not depend on age. However, in the same cohort some 1,627 persons aged 15-19 and 914 aged 20-24 would have been infected according to assumption (B); and 1,627 and 1,033 subjects respectively according to assumption (C). On the other hand, the numbers of primary infections among those aged 30 years and more would have been slightly lower on assumption (B) and (C) than on assumption (A).

Again for prediction purposes it is important to note that the differences between the three series of incidence data are of little importance for the more recent cohorts, as the absolute numbers infected would be small (see Table 10).

The results of the three series of prevalence and incidence figures in relation to a possible dependence of the infection risk on age in adolescents and young adults therefore reveal that in the Netherlands, with the present trend in the risk of tuberculous infection, the existence of such a dependence would make no important practical difference to future predictions.

In the later sections of this paper we shall therefore present data on the prevalence and incidence of infection based on the assumption that there is *no* increase in the risk of infection with age after 13 years of age.

TABLE 10

Estimated mean annual incidence of primary tuberculous infection per 100,000 population in five-year age-groups for cohorts born in 1910-14 to 1955-59 according to three assumptions on the dependence of the risk of infection on age, The Netherlands

Cohort born in		Age-group (years) 10-14 (1)	10-14 (2)	15-19 (1)	15-19 (2)	20-24 (1)	20-24 (2)	25-29 (1)	25-29 (2)	30-34 (1)	30-34 (2)	35-39 (1)	35-39 (2)	40-44 (1)	40-44 (2)	45-49 (1)	45-49 (2)
1910-14	(A)	2074		1230		775		481		236		113		55		27	
	(B)	2107	+33	1627	+397	914	+139	419	−62	206	−30	98	−15	48	−7	23	−4
	(C)	2107	+33	1627	+397	1033	+258	528	+47	192	−44	92	−21	45	−10	22	−5
1915-19	(A)	1998		1257		782		385		184		90		44		22	
	(B)	2030	+32	1678	+421	952	+170	347	−38	166	−18	81	−9	40	−4	20	−2
	(C)	2030	+32	1678	+421	1074	+292	448	+63	159	−25	78	−12	38	−6	19	−3
1920-24	(A)	1818		1132		559		267		130		64		32		16	
	(B)	1849	+31	1515	+383	702	+143	249	−18	122	−8	60	−4	30	−2	15	−1
	(C)	1849	+31	1515	+383	790	+231	326	+59	119	−11	59	−5	29	−3	14	−2
1925-29	(A)	1500		741		354		173		85		42		21		10	
	(B)	1523	+23	995	+254	456	+102	167	−6	82	−3	41	−1	20	−1	10	—
	(C)	1523	+23	995	+254	515	+161	220	+47	82	−3	40	−2	20	−1	10	—
1930-34	(A)	919		439		215		106		53		26		13		7	
	(B)	933	+14	593	+154	281	+66	104	−2	52	−1	26	—	13	—	7	—
	(C)	933	+14	593	+154	317	+102	138	+32	51	−2	26	—	13	—	7	—
1935-39	(A)	517		253		125		62		31		15		8		7	
	(B)	525	+8	343	+90	165	+40	61	−1	31	—	15	—	8	—	7	—
	(C)	525	+8	343	+90	186	+61	81	+19	31	—	15	—	8	—	6	−1
1940-44	(A)	285		141		70		35		17		9		7		7	
	(B)	289	+4	191	+50	93	+23	35	—	17	—	9	—	7	—	7	—
	(C)	289	+4	191	+50	105	+35	46	+11	17	—	9	—	7	—	7	—
1945-49	(A)	150		74		37		18		10		8		8		8	
	(B)	153	+3	101	+27	49	+12	18	—	10	—	8	—	8	—	8	—
	(C)	153	+3	101	+27	56	+19	25	+7	10	—	8	—	8	—	8	—
1950-54	(A)	77		38		19		10		8		8		8		8	
	(B)	78	+1	52	+14	25	+6	10	—	8	—	8	—	8	—	8	—
	(C)	78	+1	52	+14	29	+10	13	+3	8	—	8	—	8	—	8	—
1955-59	(A)	39		19		10		8		8		8		8		8	
	(B)	40	+1	27	+8	13	+3	8		8	—	8	—	8	—	8	—
	(C)	40	+1	27	+8	16	+6	11	+3	8	—	8	—	8	—	8	—

(1) = Estimated annual incidence of primary tuberculous infection.
(2) = Increase of incidence on assumptions (B) and (C) compared with assumption (A).
(A) = No increase of the risk of infection with age after 13 years of age.
(B) = An increase in the risk of infection between 13 and 25 years of age (see text).
(C) = An increase in the risk of infection between 13 and 30 years of age (see text).

VI. ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION UP TO THE AGE OF 50 YEARS FOR COHORTS BORN FROM 1910 TO 1960

The estimates of prevalence of tuberculous infection in the cohorts born in the year 1910, and subsequently at five-year intervals, for those aged 4, 9, 14 ... 49 years are given in Table 11 and Figure 3. For the individual cohorts each curve is similar in that the curves rise very steeply during childhood. The curve continues to rise less markedly during adolescence, and after about 25 years of age is nearly flat. However, the prevalence at individual ages has changed dramatically during the fifty years. For example, Table 11 shows that the percentage prevalence at age 14 years was 70.0% for the cohort of 1910, but had already decreased to 3.5% for the cohort of 1950, and will have decreased to 0.9% for the cohort of 1960. At age 49 years, the prevalence for the cohort of 1910 was 86.0%, but is likely also to decrease

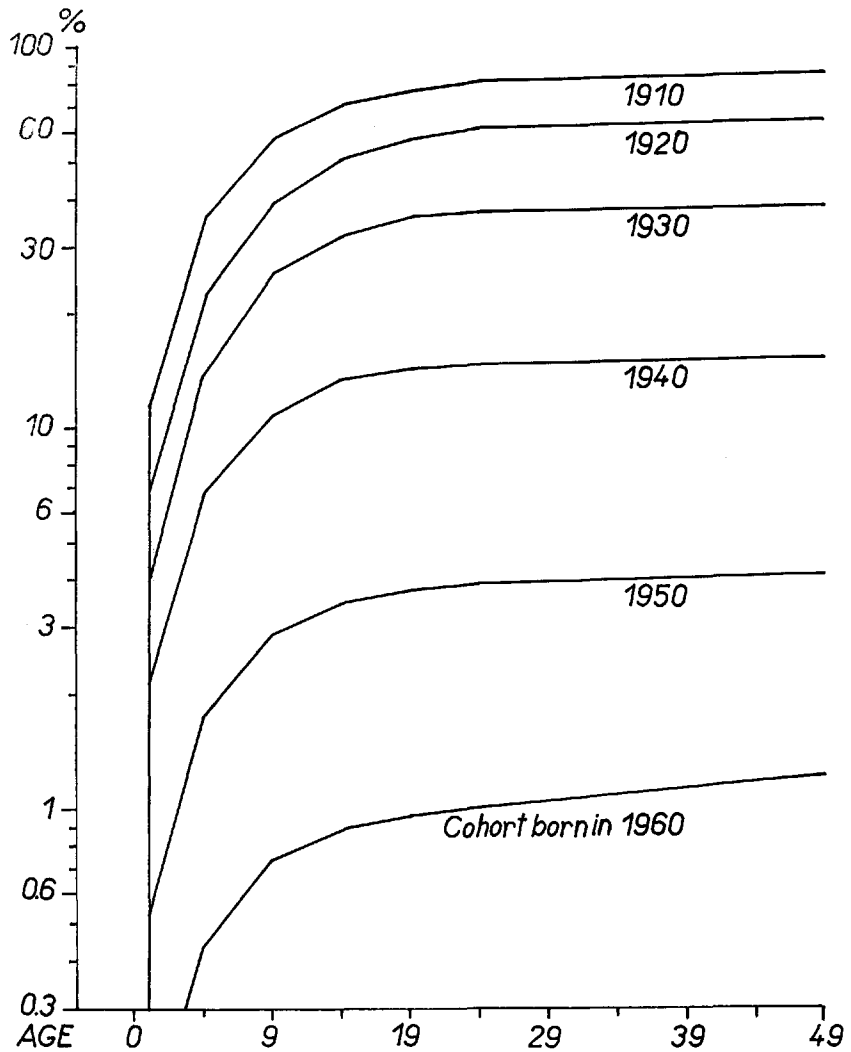
TABLE 11

Estimated prevalence of tuberculous infection per 100,000 population at five-year intervals for cohorts born from 1910 to 1960, The Netherlands (Risk of infection assumed independent of age)

Cohort born in the year	Prevalence of tuberculous infection at age (years)									
	4	9	14	19	24	29	34	39	44	49
1910	35,790	58,352	70,027	76,656	80,694	83,288	84,783	85,481	85,819	85,985
1915	28,578	48,599	59,967	66,892	71,341	73,905	75,101	75,680	75,966	76,108
1920	22,566	39,691	50,123	56,826	60,689	62,490	63,363	63,794	64,008	64,114
1925	17,661	31,903	41,054	46,328	48,788	49,980	50,568	50,860	51,005	51,078
1930	13,727	25,320	32,002	35,119	36,629	37,374	37,743	37,927	38,020	38,066
1935	10,612	18,610	22,341	24,148	25,040	25,482	25,702	25,813	25,869	25,903
1940	6,698	10,975	13,046	14,069	14,575	14,828	14,955	15,019	15,058	15,097
1945	3,419	5,666	6,775	7,325	7,599	7,737	7,807	7,849	7,890	7,932
1950	1,731	2,886	3,458	3,744	3,888	3,960	4,004	4,048	4,091	4,134
1955	873	1,458	1,749	1,896	1,970	2,015	2,059	2,103	2,147	2,191
1960	437	732	880	955	1,000	1,045	1,089	1,134	1,178	1,223

FIG. 3

Estimated percentage prevalence of tuberculous infection in cohorts born from 1910 to 1960 according to age, The Netherlands



steeply for later cohorts. The estimate for the cohort of 1960 at this age (which will be observed in the year 2009) is 1.2%.

The similarity of shape of the curves in Figure 3, in spite of their very different levels, is brought out in Table 12, which shows the prevalence at

TABLE 12

Expected prevalence at ages 4, 9, 14, 19, and 24 years expressed as percentage of the expected prevalence at the age of 50 years for cohorts born from 1910 to 1955, The Netherlands

Cohort born in the year	Relative prevalence reached at age of						Percentage prevalence at age 50
	4 yrs	9 yrs	14 yrs	19 yrs	24 yrs	50 yrs	
1910	42	68	81	89	94	100	86.0
1915	38	64	79	88	94	100	76.1
1920	35	62	78	89	95	100	64.1
1925	35	61	80	91	96	100	51.1
1930	36	67	84	92	96	100	38.1
1935	41	72	86	93	97	100	25.9
1940	44	73	86	93	97	100	15.1
1945	43	71	85	92	96	100	7.9
1950	42	70	84	90	94	100	4.1
1955	40	66	80	86	90	100	2.2
Average	40	67	82	90	95	100	—

ages 4, 9, 14, 19, and 24 years for each cohort, relative to the expected prevalence at age 50 years in the same cohort (which is taken as 100).

In each cohort about 40 percent of all infections up to the age of 50 occur during the first five years of life; at the age of 14 years about 80% of all infections up to the age of 50 years have already happened; and only 5% of individuals are first infected between their 25th and 50th year. These relative percentages are nearly the same throughout a period when the expected prevalence of infection at age 50 decreased from 86.0% to 2.2%.

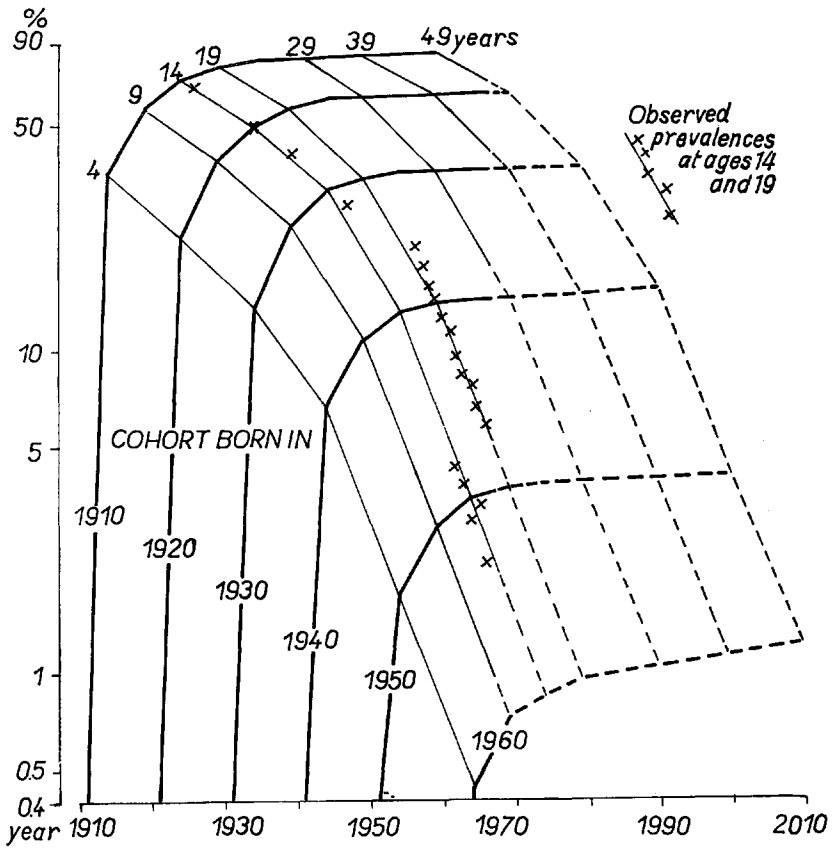
The observed prevalences of infection in the various survey years can be compared with the expected prevalences in Figure 4. This shows the expected prevalence of infection by age, cohort, and calendar year, with the observed figures at ages 14 and 19 indicated by means of crosses.

The observed and estimated infection prevalence figures at 14 years of age are closely similar, in spite of the fact that the 9 tuberculin surveys cover a period of forty years. The same is true for the estimated and observed figures for the 11 consecutive cohorts of recruits aged 19 years.

This agreement (already shown in detail in Tables 6, 7 and 8) confirms the essential reliability of the series of annual infection rates on which the whole of Figure 4 is based, and therefore in particular the reliability of the projections of the prevalence figures for the six cohorts beyond the year 1965 (shown by dashes on the Figure).

FIG. 4

Estimated percentage prevalence of tuberculous infection in cohorts born from 1910 to 1960, The Netherlands



VII. ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION UP TO THE AGE OF 50 YEARS, FOR COHORTS BORN FROM 1910 TO 1960

Data on the estimated incidence of infected individuals for cohorts born in 1910 and at subsequent five-year intervals for those aged 4, 9, 14, ... 49 years are given in Table 13 and Figure 5.

Table 13 and Figure 5 show that the effects of the steady decrease in the average annual risk of infection, from 11.31% in 1910 to 0.13% in 1960 (Table 5), were different at different ages. For instance, the incidence of primary infection at the age of 4 was 5,898 per 100,000 for the cohort born in 1910, and only 77 per 100,000 for the cohort born in 1960. On the other hand, at the age of 49 years the corresponding figures were 21 for the 1910, and 9 for the 1960 cohort. The decrease was very much larger at age 4 than at age 49, and both the incidences at age 49 were low.

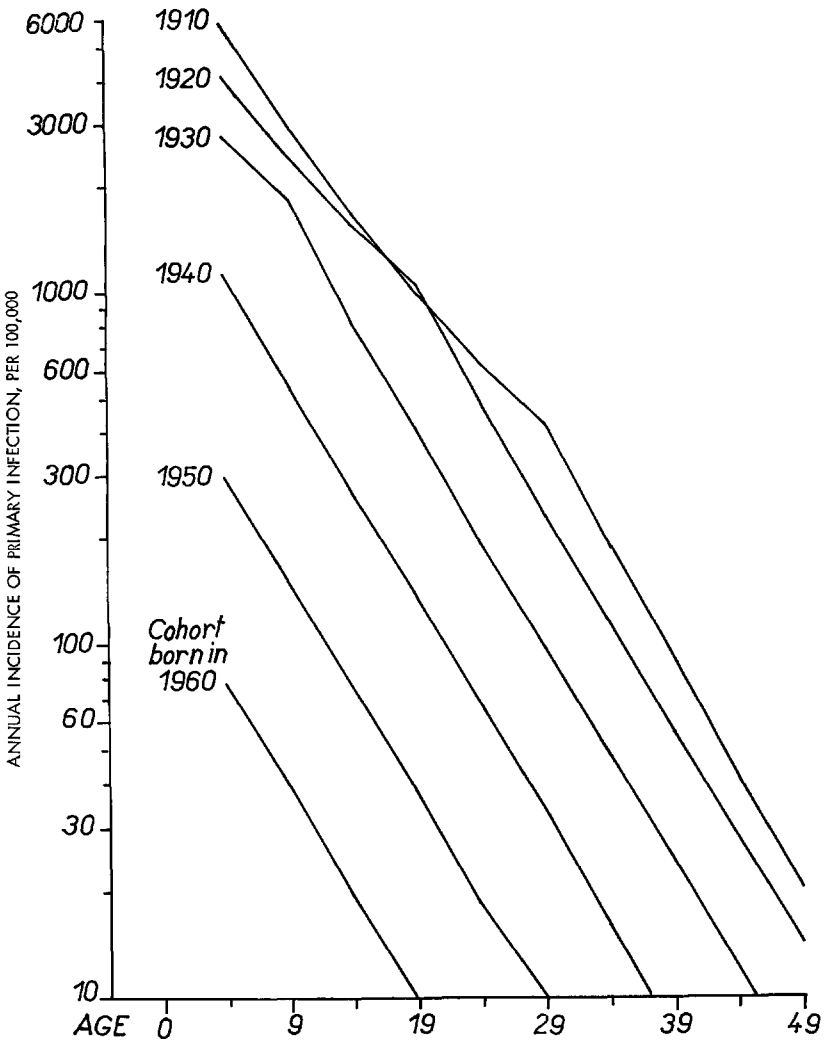
TABLE 13

Estimated annual primary incidence of tuberculous infection per 100,000 population at five-year intervals for cohorts born from 1910 to 1960, The Netherlands
(Risk of infection assumed independent of age)

Cohort born in the year	Estimated annual primary tuberculous infection at age (years)									
	4	9	14	19	24	29	34	39	44	49
1910	5,898	2,940	1,622	966	610	403	184	88	43	21
1915	5,042	2,781	1,657	1,047	691	315	151	74	37	18
1920	4,190	2,496	1,577	1,041	474	228	112	55	28	14
1925	3,408	2,153	1,421	647	311	153	76	38	19	9
1930	2,727	1,801	820	394	193	96	48	24	12	6
1935	2,155	982	471	231	115	57	29	14	7	7
1940	1,125	540	265	131	66	33	16	8	8	8
1945	586	288	143	71	36	18	9	8	8	8
1950	300	149	74	38	18	10	9	9	9	9
1955	152	76	38	19	10	9	9	9	9	9
1960	77	39	19	10	9	9	9	9	9	9

FIG. 5

Estimated annual incidence of primary tuberculous infection in cohorts born from 1910 to 1960, The Netherlands



In the youngest children, the decrease in incidence of primary infection is closely related to the decrease in risk of infection during the fifty years. However, the incidence of primary infection is the product of the risk of infection and the proportion of the population remaining uninfected at a particular age, and for older children and adults the second factor becomes

important. Because the proportions of adults and older children remaining uninfected have increased during the fifty years, the decrease in the incidence of primary infection is much less among adults, and less among older children than among young children.

It is convenient to consider the curves in Figure 5 in three different age-periods:

(a) 0-14 years: There was an extensive, steady decrease in the incidence of primary infections from one cohort to the next.

(b) 15-39 years: There was a similar decrease in the incidence from cohort to cohort after the cohort of 1930, but the incidence figures for the 1910 and 1920 cohorts are very similar between the ages of 15 and 25 years. This is a consequence of the very high annual risks of infection to which these cohorts were subject, and will be examined more closely later in this section.

(c) 40 years and over: The incidence of primary infections in all the cohorts was low above the age of 40 years. It is of particular epidemiological importance that the incidence of primarily infected individuals at this age was low for the 1910 and 1920 cohorts, and will remain low in the future for the later cohorts.

In view of the similar incidence of primary infections between the ages of 15 and 25 for the cohorts of 1910 and 1920, it is of interest to enquire what the situation was for earlier cohorts still. This involves making assumptions about the annual risk of tuberculous infection before 1910. The series of figures for the annual risk in Table 5 has been extended backwards for 15 years, according to two assumptions: (1) The annual risk of infection for the period 1895 to 1909 was constant at 11.31%, i.e. the risk calculated for the year 1910; (2) The annual risk of tuberculous infection decreased between 1895 and 1910 at the same rate as it did from 1910 onwards (5% per year). This corresponds to a steady decrease in the annual risk of infection from 19.0% in 1895 to 11.3% in 1910.

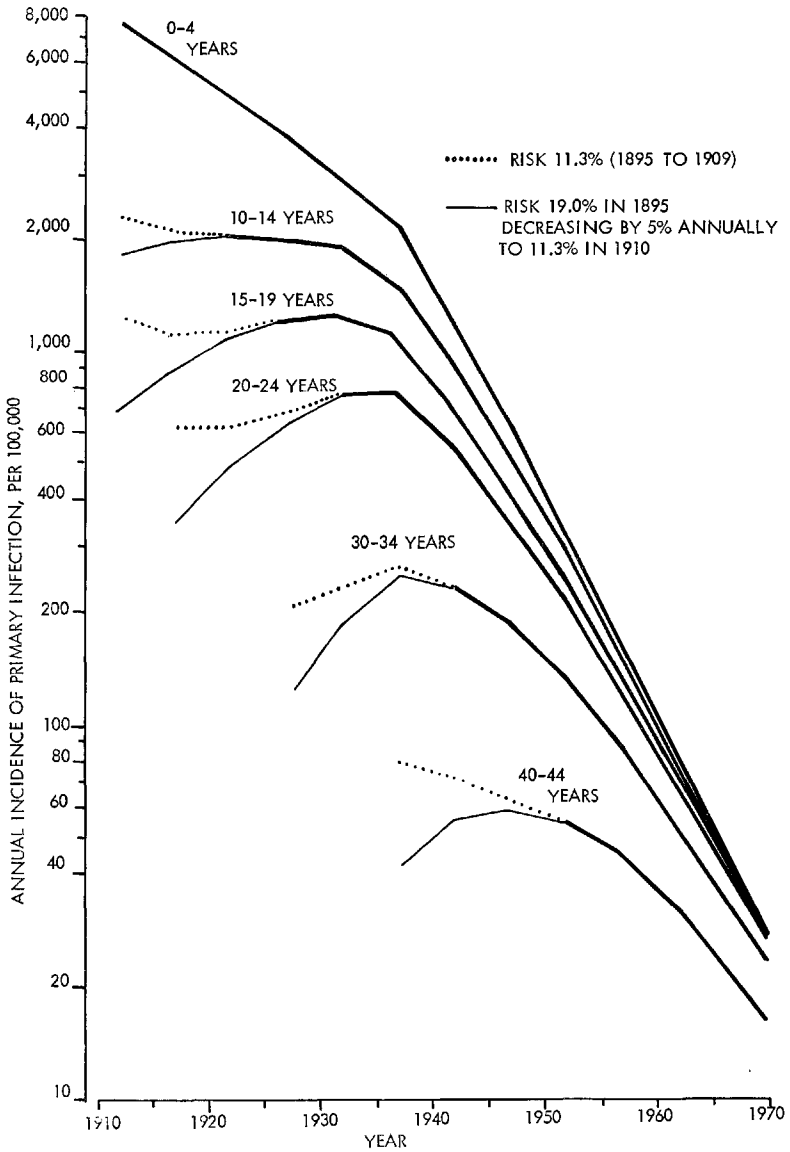
Figure 6 presents the incidence figures according to calendar year instead of by cohorts, for the age-group 0-4, 15-19, 20-24, 30-34, and 40-44 years. Each curve (apart from that for 0-4 years which is complete) has been extended backwards for 15 years along two lines. The upper line corresponds to assumption (1), of a constant annual risk of infection before 1910, and the lower line to assumption (2), of a decreasing risk before 1910.

At ages 0-4 there was a steep decrease in the incidence of primary infections from 1910 onwards, but at ages 10-14 the annual incidence remained nearly constant at a level of about 2,000 per 100,000 from 1910 to 1930 before beginning to decrease.

At ages 15 to 19 and 20 to 24 the trends are of particular interest because of the serious consequences of primary infection at these ages. Despite the

FIG. 6

Estimated annual incidence of primary tuberculous infection according to age, The Netherlands, 1910 to 1970



decrease in annual risk of infection after 1910, the annual incidence of new infections in these two age-groups first increased a little, then remained at a high level (about 1,000 per 100,000 population), and only decreased substantially after 1940.

At ages 30-34 there is also evidence of an initial increase in annual incidence of primary infections, with a peak between 1935 and 1940, but at a lower level, of about 200 per 100,000 population. The position is less clear at ages 40-44 without more information about the annual risk of infection before 1895, but it is clear that the incidence of primary infections at these ages will never have been very high.

VIII. A PRACTICAL METHOD FOR ESTIMATING THE INFECTION RISK IN A PARTICULAR CALENDAR YEAR

The approach used in Sections I to IV of this paper for estimating the average annual risks of tuberculous infection in the Netherlands is complicated, partly because nothing was previously known about the way in which the risk of infection was changing and this had to be carefully assessed, and partly because it was desirable in the process to make comprehensive use of the extensive prevalence data available in that country. As a result of this analysis it has been established that the risk of infection has been decreasing during each of two long periods of time in the Netherlands in a way which closely approximates to an exponential decrease, with different rates of decrease in the two periods. Moreover, there does not appear to have been a strong relationship between age and the risk of infection each year, so that it was reasonable to assign a single estimate of the risk to an individual calendar year.

It is desirable for routine tuberculosis control to have a practical method of estimating annual risks of tuberculous infection in circumstances where there are much less extensive prevalence data than are available in the Netherlands. Such a method may be derived quite simply from the findings of the present study if it is assumed that, as in the Netherlands, any decrease in the risk of infection is nearly exponential, and that the risk does not vary with age.

On these assumptions, equation (6) in the Appendix expresses the mathematical relationship between the proportion of the cohort, born at time b, who have been infected by age a, and the annual risk of infection at a chosen time x. Appendix Table B, which is calculated from equation (6), consists of a series of tables for different ages, enabling the risk of infection to be determined directly from the prevalence figure at the particular age. To use this table, one additional piece of information is needed, namely an estimate of the percentage decrease in the risk of infection each year. For each of the tabulated values of this percentage decrease, Appendix Table B gives the risk of tuberculous infection in the calendar year in which the prevalence was determined, and the risk a few years earlier (5 years earlier for those examined at ages 5-9 years, 10 years earlier for those aged 10-14 and 15 years earlier for those aged 15-19).

The only difficulty in using this table is the prior assessment of the percentage decrease in the risk of infection each year.

(a) If only one measure of the prevalence of infection is available, there is no alternative to guessing the annual percentage decrease in risk of infection. In this connection, the decrease in the annual infection risk in the Netherlands amounted to about 5 percent annually before 1940, and about 13 percent annually since 1940.

(b) If more than one measure of the prevalence of infection is available, but *at different ages*, the best way of proceeding is as follows. Consider one prevalence figure. Using the section of Appendix Table B for the appropriate age, consult the first columns, corresponding to an annual decrease of 1 %, which will provide two estimates of the annual infection risk in different calendar years. Two more estimates, again on the basis of a 1 % decrease, are obtained similarly for each prevalence figure. These estimates are all plotted on logarithmic graph paper (the infection risk along the logarithmic scale and the year along the arithmetic scale). A straight line with a decrease of 1 % per year is then drawn as closely as possible through the points on the graph. The process is repeated for annual decreases of 3, 5, 7, 9, 11 and 13 percent. The best estimate of the percentage decrease each year is provided by the graph for which the points lie closest to the straight line drawn on it, and this line will provide the required estimates of the annual infection risks each year over the period covered by the graph.

(c) If, however, more than one measure of the prevalence of infection is available for subjects *of the same age*, an estimate of the annual percentage decrease may be derived directly from Appendix Table C, by dividing the entry in the table, corresponding to any two of the observed prevalences, by the interval in years between them. If there are several such estimates, they may be averaged.

There are therefore two steps in assessing the annual risks of tuberculous infection from a prevalence figure:

(1) Estimate the percentage decrease in the risk of annual infection
  (a) by guessing, if no other prevalence data are available;
  (b) by trial and error, as just explained, if other prevalence figures are available for subjects of a different age;
  (c) by use of Appendix Table C, if other prevalence figures are available for subjects of the same age.

(2) Using this estimate of the percentage decrease, Appendix Table B will provide direct assessments of the risk of tuberculous infection in two calendar years, namely the year in which the prevalence was determined, and a few years earlier. The table may be used for percentage decreases, or for prevalences, which are not the same as those tabulated, by linear interpolation.

As an example of the use of the method, consider the Dutch male recruits aged 19½ years in 1966, for whom the observed percentage was 6.0. In 1956 the corresponding figure was 21.5 percent. In Appendix Table C the closest entry, corresponding to 22 percent and 6 percent, is 139 and this, when divided by 10, the interval in years, gives an approximate annual percentage decrease in infection risk of 13.9 which has been taken as 13 for convenience.

Appendix Table B gives the annual risks of infection. From the 1966 prevalence figure, these are 0.069 percent for the year 1966 and 0.486 percent, for the year 1951. From the 1956 prevalence figure (by interpolation) the risks are 0.271 percent for 1956 and 1.886 percent for 1941. These may be compared with the smoothed values of 0.07, 0.49, 0.25 and 1.90 respectively for males from the comprehensive analysis in Section II (1) (the last of these figures, for 1941, is given in the final column of Table 2, but the figures for males in the other years are not tabulated). It is thus evident that this method represents a highly satisfactory alternative to the comprehensive approach of Sections I to IV, and would be of considerable practical value in territories with limited prevalence data.

IX. OTHER METHODS FOR ESTIMATING THE RISK OF TUBERCULOUS INFECTION DURING CHILDHOOD IN DIFFERENT CALENDAR YEARS

Extensive data on the prevalence of past infection, as available in the Netherlands, are lacking in most countries. Two other methods for estimating the infection risk during childhood, which may be of value in countries with more limited data, will now be described.

(1) *Direct estimation of the infection risk at a particular age*

A direct measurement of the infection risk may be made by testing the same group of persons on two (or more) occasions. The infection risk is measured by calculating the percentage of persons who show tuberculin *conversion* during the intervening period.

In order to compensate for technical variations in performing the tuberculin test, it would be necessary to adjust this percentage to an unbiased estimate of the infection risk by subtracting from it the percentage of persons who appear to show *reversion* during the period. It might also be necessary to make allowance for the boosting effect of repeated tuberculin testing.

This approach has been used by a number of workers in the past, notably in Denmark (Madsen, Holm and Jensen, 1942) and in Great Britain (Daniels et al., 1948) and is currently used extensively in Norway, both as an epidemiological and as a case-finding procedure (Galtung, personal communication). Unfortunately it is not possible to make direct estimations of the infection risk in the Netherlands as the requisite data are not available (for example, those with 10 mm induration or more at earlier surveys are not retested).

Moreover, it should be noted that in any scheme for direct measurement of the infection risk, information on the prevalence of tuberculous infection will automatically be collected at the same time. By applying the approaches of the present report to this prevalence data, estimates may be made both of the current infection risk and of past infection risks. The direct information on the conversion rate will provide a second estimate of the current risk of infection only, and its additional value is therefore limited.

(2) *Estimation of the risk of infection from the number of cases of tuberculous meningitis in children aged 0-4 years*

The annual risk of infection can be estimated approximately from the number of cases of tuberculous meningitis in children aged 0-4 years (Holm, Radkovský, personal communications).

The estimated average risks of tuberculous infection from 1920 to 1949 are compared with the mortality rates from tuberculous meningitis in children aged 0-4 years in the Netherlands in Table 14 and Figure 7. This comparison shows that during the pre-chemotherapy era there was a close correlation between the risk of infection in a year, and the number of deaths from tuberculous meningitis among children aged 0-4 years in that year. The ratio of the mortality to the risk of infection ranged from 0.7 to 1.0 percent between 1920 and 1939. During the first three years of the second World War it

FIG. 7

Mortality rate from tuberculous meningitis in children aged 0-4 years and annual risk of tuberculous infection, The Netherlands, 1920 to 1949

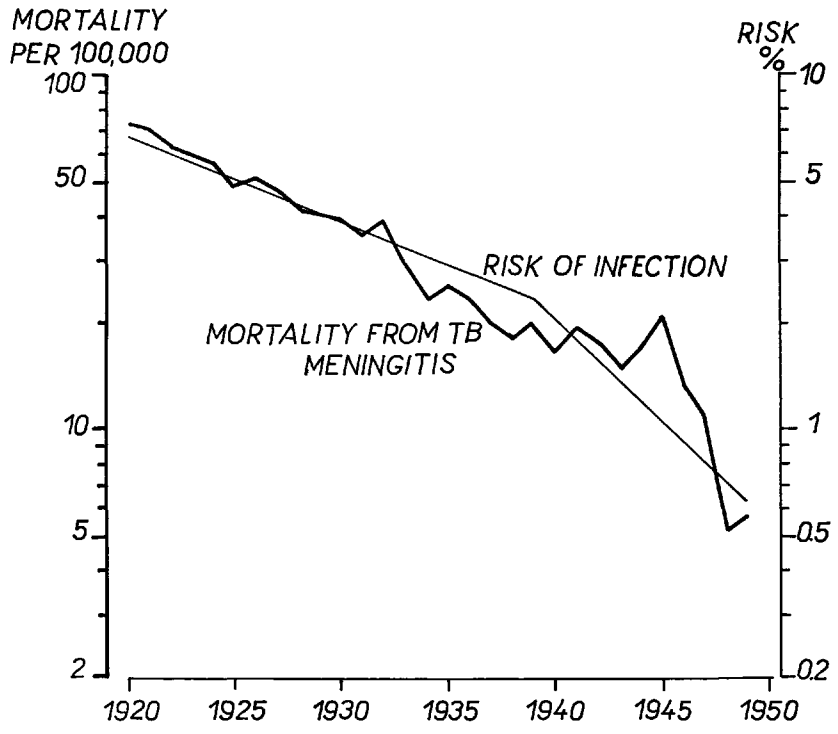


TABLE 14

Mortality rate from tuberculous meningitis in children aged 0-4 in relation to the annual risk of tuberculous infection, The Netherlands, 1920 to 1949

Calendar year	Mortality rate from tuberculous meningitis in children aged 0-4 years; per 100,000	Annual risk of tuberculous infection; per 100,000	Risk of infection as a percentage of tuberculous meningitis mortality
1920	73.16	6,690	1.09
1921	71.47	6,350	1.13
1922	63.46	6,020	1.05
1923	60.00	5,710	1.05
1924	57.01	5,410	1.05
1925	49.28	5,130	0.96
1926	50.47	4,860	1.04
1927	48.38	4,610	1.05
1928	43.21	4,370	0.99
1929	40.68	4,140	0.98
1930	38.50	3,920	0.98
1931	35.61	3,720	0.96
1932	38.92	3,520	1.11
1933	29.52	3,340	0.88
1934	23.56	3,160	0.75
1935	25.15	2,990	0.84
1936	23.38	2,840	0.82
1937	19.99	2,690	0.74
1938	17.90	2,550	0.70
1939	20.35	2,410	0.84
1940	16.26	2,080	0.78
1941	19.68	1,820	1.08
1942	17.19	1,590	1.08
1943	14.98	1,380	1.09
1944	16.88	1,210	1.40
1945	21.00	1,050	2.00
1946	13.47	920	1.46
1947	10.99	800	1.37
1948	5.13	700	0.73
1949	5.76	610	0.94

remained close to 1%. However, in 1945 — the year of the notorious famine in the Netherlands — it rose to 2.0%. From this it can be seen that the ratio under discussion, although relatively stable, is not a biological constant; it may be expected also that it will be higher in countries where socio-economic conditions are less favourable than the peacetime standard in the Netherlands.

This approach may be of special value for estimating the annual risk of infection in a period when no tuberculin surveys were made and no chemotherapy was available. It is suggested that, for the period between the two World Wars in most developed countries, a reasonable estimate would be that the annual mortality from tuberculous meningitis in children aged 0-4 years represents 1% of the annual risk of tuberculous infection. However, this estimate relates to a situation in which both human and bovine infections were occurring in unknown proportions. The estimate might be different in a country where there was little or no bovine infection.

X. DISCUSSION

(1) *The technique of estimating the annual risk of infection*

Although there have been a number of isolated instances where the prevalence of tuberculous infection at a particular age has been interpreted in terms of an average annual risk of primary tuberculous infection, the present report, as far as we are aware, represents the first attempt to make comprehensive use of prevalence data, obtained at tuberculin surveys, to assess the risk of tuberculous infection at a particular time, and to study how this risk has changed over a period of years.

In its application to the information available for the Netherlands, the attempt has proved very successful. It has revealed a surprising regularity in the trend of the risk of primary tuberculous infection over a period of more than 50 years in that country. Moreover, the risk of infection in a particular year does not appear to have varied greatly with age, at least up to the age of 20 years. (The possibility of a higher risk among very young children before the second World War due to bovine tuberculosis infection cannot be resolved with the available data). It is therefore possible to assign a single figure to each calendar year which summarises concisely the impact of tuberculous infection in that year upon the population aged up to 20 years, in a readily understandable form.

The trend in the annual risk of tuberculous infection in the Netherlands, derived from the prevalence data, is uniformly downward. From a risk of infection of 97 per 1,000 population in 1913, the risk decreased steadily by about 5% annually to a rate of 24 per 1,000 in 1939, and then decreased steadily by about 13% annually to a risk of infection of only 0.57 per 1,000 population in 1966. It is of particular interest that over each of these two periods of about 25 years, the trend in the risk of infection in the Netherlands closely followed an exponential decline. These findings would have been essentially similar if (say) a diameter of 6 mm or of 10 mm induration to 1 TU of RT 23 had been adopted, instead of 8 mm, as the lower limit indicating tuberculous infection.

The reliability of this series of estimates of the annual risk of primary

tuberculous infection in the Netherlands is confirmed by the closeness with which it reproduces the observed prevalences of past tuberculous infection at the various tuberculin surveys. These surveys cover the population cohorts born in each year from 1913 to 1954, several of these cohorts being observed at more than one age. The cohorts born from 1947 to 1954 were most recently observed in 1966, so that the reliability of the series of estimates of the risk of tuberculous infection has been confirmed over the entire period from 1913 to 1966. In particular, the prevalence figures indicate that there was no interruption in the steady and steep decline in infection risk during the second World War.

It should be possible to apply this approach, namely to interpret the prevalence of tuberculous infection found at a tuberculin survey in terms of a series of annual infection risks, to other territories which have made reasonably representative tuberculin surveys in unvaccinated subjects at more than one age, or on more than one occasion. The detailed method used in this report was dictated partly by the extent of the material available, partly by the need to discover whether the annual risk of infection varied with age, and partly because it was not known what form the trend in the annual infection risk would take. However, in investigating the application of this approach to another territory, it would be reasonable to assume as a first approximation that the risk of infection in any particular year was independent of age, and that any change in annual risk over the years was exponential in form. With these assumptions, the practical method described in Section VIII above may be used to obtain estimates of both current and past risks of infection. Even if the available information is neither as extensive nor as carefully collected as in the Netherlands, this practical method will give a useful indication, both of the level of the risk of tuberculous infection, and its trend in time.

For periods not covered by tuberculin surveys, or in areas where no such surveys have been made, it may be possible to estimate the annual risk of infection from mortality figures for tuberculous meningitis in young children in the absence of chemotherapy (Section IX), but this approach is likely to be less reliable because the mortality from tuberculous meningitis may not exactly reflect the risk of infection.

If a number of tuberculin surveys have been made at a number of different ages, a more comprehensive analysis of the type outlined in Sections II and III and in the Appendix would be worth undertaking. This would make fuller use statistically of information which will already have been laborious to collect, and it should in addition provide some direct evidence both on the dependence of the risk of infection on age, and on the form of the trend in the annual risk of infection, in the territory concerned.

(2) *The trend of tuberculous infection in the Netherlands without and with special measures; 'self-elimination' of the disease*

Between 1910 and 1940 the risk of tuberculous infection in the Netherlands was falling by about 5% annually; since 1940 the decline has been steeper, namely, about 13% annually. Can anything be said about the causes of this phenomenon, or on factors that contributed to it?

Considering first the period up to the second World War it is possible to *exclude* certain factors from having contributed to the regular decrease of the infection risk. They did not exist at that time, or were not applied in the Netherlands. These are chemotherapy, mass BCG vaccination and mass radiographic surveys.

Nor could this steady decrease in the infection rate up to 1940 in the Netherlands have been caused by a decrease of bovine tuberculosis infection. Table 15 shows that the percentage of slaughtered cattle, rejected because of

TABLE 15

Number of tuberculous cattle among slaughtered animals, The Netherlands, 1928-49

Year	No. of slaughtered cattle	No.	Rejected because of tuberculosis %
1928	498,510	83,570	16.8
1929	485,585	90,104	18.6
1930	389,780	73,396	18.8
1931	352,667	74,815	21.2
1932	435,025	79,753	18.3
1933	539,790	92,524	17.1
1934	492,022	89,959	18.3
1935	470,815	87,519	18.6
1936	414,230	85,701	20.7
1937	365,968	73,980	20.2
1938	378,593	76,873	20.3
1939	463,169	90,554	20.3
1940	491,928	88,558	17.8
1941	579,115	87,451	15.4
1942	561,968	67,947	12.1
1943	296,482	41,075	13.9
1944	221,749	20,801	10.0
1945	244,072	29,999	13.4
1946	346,681	43,509	13.2
1947	462,428	59,993	13.4
1948	237,581	40,245	16.9
1949	279,452	48,030	17.2

tuberculosis, was fairly constant (between 17% and 21%) during the period 1928 to 1940. It is an established fact that during this period a large and constant proportion of tuberculous infections in childhood were caused by oral infections with the bovine tubercle bacillus. The frequency of mesenteric primary foci indicates that, at that time, about one third of young adults had their first contact with the tubercle bacillus by ingesting infected material (Korteweg, 1927; Straub, 1937), which was usually of bovine origin. These enterogenic infections were as frequent in 1937 as they had been in 1927. Only after the enactment of a law on milk pasteurization, in 1940, which was rigorously enforced, was a sharp decrease observed in the bovine tuberculosis infection rate at ages 0-15 years in the Dutch population (Ruys, 1946).

Treatment, including isolation in sanatoria since about 1920, improvements in housing and living conditions (except during the two World Wars and the economic depression of the thirties), and general antituberculosis measures may all have played some part in the decline of tuberculosis up to 1940, but it is not possible to assess their relative contributions, and it is uncertain whether their total effect was sufficient to explain the steady and substantial decline in infection risk (about 5% annually) for a thirty year period.

A similar decline has been observed in many other developed countries during the first half of this century. Moreover, in some the decrease in tuberculosis mortality even antedated the discovery of the tubercle bacillus in 1882. For instance, in England and Wales the reported mortality from tuberculosis was falling by 0.9% annually between 1861-65 and 1876-80 (Wolff, 1926).

Frost (1937) pointed out that "for the eventual eradication of tuberculosis it is not necessary that transmission be *immediately* and *completely* prevented. It is necessary only that the rate of transmission be held permanently below the level at which a given number of infection spreading (*i.e.*, open) cases succeed in establishing an equivalent number to carry on the succession. If, in successive periods of time, the number of infectious hosts is continuously reduced, the end-result of this diminishing ratio, if continued long enough, must be extermination of the tubercle bacillus." Assuming that the prevalence of bacillary cases was diminishing at approximately the same rate as tuberculosis mortality, he concluded "that under present conditions of human resistance and environment the tubercle bacillus is losing ground, and that the eventual eradication of tuberculosis requires only that the present balance against it be maintained." In other words, for tuberculosis to survive as a disease, a bacillary case of tuberculosis must, at the end of its existence, have caused enough infections to ensure that ultimately at least one new bacillary case will develop within the human population. As soon as a

situation is reached in which 100 cavitary cases succeed in regenerating only 98 or 95 such cases, a fundamental downward trend starts to operate. Once this 'breaking point' has been reached the disease is doomed, although it may then take a century or more to disappear.

The results in the present paper do not go sufficiently far back in time to tell us when the breaking point was reached in the Netherlands, except that it must have been before 1910. For this to have happened the number of persons infected by one bacillary source, multiplied by the risk that those infected would develop bacillary tuberculosis in their turn, had to fall below the critical value of 1; but information is lacking on both factors in this product at that time. We hope to comment further on this process of self-elimination of tuberculosis in a later report.

It appears from our analyses that the risk of infection was falling steadily through both the World Wars. In particular, the prevalence data for the cohorts born between 1937 and 1947 are not consistent with the hypothesis that there was any interruption in the decline during the second World War, although tuberculosis mortality and morbidity recorded a steep temporary increase during this period. This fall during the war years was first established by Heynsius van den Berg who in 1946 presented results of tuberculin tests made in 1936-40 and in 1941-43. These showed that the prevalence of infection in individual age groups had continued to fall during this period. He concluded that the increase of tuberculosis among the population had 'not been preceded by a higher infection rate'. In his opinion the numerous cases of tuberculosis which developed during the war were due to a flare-up of latent tuberculous lesions, and not to fresh infections. However, this does not explain the fact that a subsequent higher infection risk, which might have been expected to result from the rise in morbidity during the war years, also failed to materialize.

Figure 7 shows that the decline in risk of infection has been more rapid since 1940 than before, namely 13 percent annually. The immediate large reduction of bovine infection due to pasteurization (Ruys, 1946) seems to have been the main factor responsible, and there is no suggestion of even a temporary interruption during and after the war in the steady annual decline of 13 percent.

This unexpected phenomenon led us to estimate the possible increase in the number of sources of infection during the war. In order to simplify the calculation we supposed that, if the war had not occurred, both the annual numbers of deaths due to tuberculosis and the number of new cases of active tuberculosis from 1940 to 1945 would have remained the same as they were in 1939.

In the Netherlands a total of 3,604 deaths from tuberculosis, and a total

of 8,540 new cases of all forms of tuberculosis, were notified in 1939. The expected number of deaths from tuberculosis during 1940-45 would thus have been 21,624. However, a total of 35,928 deaths was notified; thus the excess mortality equalled 14,304, of which about 10,000 (70%) were deaths from pulmonary tuberculosis and therefore heavy bacillary excretors.

The expected number of new cases of all forms of tuberculosis during the same period was 51,240 cases. A total of 90,692 cases was notified, representing an excess of 39,452. According to the data available (Annual Report of the Chief Medical Officer of Public Health), about 75 percent of the patients suffered, at that time, from pulmonary tuberculosis. Among them less than one-third were diagnosed as 'open' tuberculosis cases. Thus, the *excess incidence* of sources of infection (defined as 'open' cases of pulmonary tuberculosis) seems to have amounted during that period to about one-third of 30,000 cases, namely about 10,000 cases.

It follows from this rough calculation that the excess incidence of new sources of infection was approximately balanced by the excess deaths due to pulmonary tuberculosis, and this may explain why no increase in the risk of infection can be detected in the years following the second World War.

This analysis of the data indicates that the process of 'self-elimination' of tuberculous infection in the Netherlands was a very stable phenomenon during the period studied. In particular, it has been shown that the decline in the risk of infection continued even during the very unfavourable conditions of the two World Wars.

(3) *Implications of knowledge of the annual risk of infection*

This analysis has shown that during the past fifty years in the Netherlands tuberculosis has behaved, to a close approximation, as if there was in each year a risk of acquiring a primary tuberculous infection which was the same at all ages up to an age of at least twenty years. This model and the estimates of the annual risks to which it leads have been remarkably successful in reproducing the observations on the prevalence of tuberculous infection at different ages during this period. On the assumption that this simple model, or something very like it, may also be found to hold in other territories, it is of interest to outline certain of its epidemiological consequences.

In the first place, if there is a constant risk of infection, a disproportionately large number of primary tuberculous infections will take place among children, and particularly among young children. For example, if the risk of infection is 2 percent per year, and does not vary from one calendar year to the next, or with increasing age, then, of the total number of primary infections that will take place in a cohort which it observed up to the age of 50 years, about 15 percent will take place during the first five years of life (which

is only 10 percent of the period), and about 41 percent by the age of fifteen years (which is only 30 percent of the period). This disproportion is a consequence of the diminishing numbers of uninfected individuals as the cohort grows older. This disproportion will be greater if the constant risk of infection is greater than 2% and less marked if the constant risk is less than 2%.

However, in countries such as the Netherlands, where the annual risk of tuberculous infection has been decreasing steeply, this tendency for primary tuberculous infections to occur early in the life of a cohort will be very much more marked, because the uninfected individuals in the cohort meet progressively *lower* risks of infection as they grow older. Table 12 showed that in the Netherlands, of all primary tuberculous infections occurring before the age of 50, as many as 40 percent occurred before the age of five years, and about 80 percent by the age of fifteen years. This pattern held for all cohorts born since 1910, despite the very different levels of risk of infection for the earlier and later cohorts. The pattern will be similar in other countries with a decreasing risk of tuberculous infection. This finding may be an important practical consideration affecting the most suitable age for BCG vaccination.

Secondly, the incidence of primary tuberculous infections in a particular age-group is the product of the risk of infection at the time and the proportion of individuals remaining uninfected by that age. For successive cohorts in the Netherlands the former was a decreasing factor and the latter an increasing factor. For the cohorts born in the period 1910 to 1920, the effects of these two opposing trends nearly balanced between the ages of 15 and 25 years (Table 10), with the result that the incidence of primary infections in this age-range remained nearly constant throughout the years 1925 to 1940, and has only since shown a steep decline (Figure 6). This may explain in part the continued high incidence of clinical tuberculosis in young adults during the nineteen thirties in the Netherlands, although the annual risk of tuberculous infection was decreasing steadily throughout the period.

Thirdly, the incidence of primary infections among those aged 40 or more has been low in the Netherlands for all cohorts since 1910, irrespective of the level of the risk of infection. When there was a high risk of infection, for the earlier cohorts, few individuals remained uninfected by the age of 40; when the risk of infection was at a lower level, for the later cohorts, many individuals remained uninfected by age 40, but because of the low risk thereafter, few were infected subsequently. It follows that the great majority of new cases of clinical tuberculosis after the age of 40, that have occurred in the past and are occurring at present in the Netherlands, cannot have closely followed primary infection, but must be attributed to endogenous exacerbation of the disease in those infected previously and/or to superinfection in later life. The respective contributions of these factors, which obviously depend on the risk

of infection, will be considered in a later paper.

The present study indicates that (apart from the possible influence of bovine tuberculosis infection in the first two years of life) there is little or no evidence of variation in the risk of infection at least up to the age of 20 years. There is not much information whether this also applies in other countries. Raj Narain et al. (1966) describe how, in India, the incidence of infection in different age-groups has been estimated from age-specific prevalence rates of infection by Bogen and by Frimodt-Møller as well as by themselves. The incidence rates calculated by Bogen were almost the same for different age-groups, with an average of 5.3 percent per annum. The rates estimated by Frimodt-Møller varied from 0.7 percent to 6.2 percent, and those by Raj Narain et al. from 0.9 percent to 4.4 percent, in different age-groups. Using the direct method (that is by repeating the tuberculin test in the same individual at a subsequent date) Frimodt-Møller concluded that the annual rate of infection with tubercle bacilli in South India was probably about 4 percent in all age groups.

The above epidemiological conclusions are based upon the assumption that the risk of tuberculous infection is independent of age up to an age of 50 years. The sections of the present report which examine the consequences of various hypotheses concerning the risk of infection above the age of puberty are thus of particular interest. Because the great majority of the primary tuberculous infections in each cohort have already occurred by the age of 15 years in the Netherlands, a rise in the risk of infection at higher ages, if it occurs, could only exert a small effect on the absolute numbers of primary infections occurring in adolescence and adult life. Thus, in any country in which the risk of tuberculous infection is falling, as in the Netherlands, it is of no practical importance whether the annual risk of infection increases in adolescence and early life above the level for younger children, or whether it remains constant up to the age of fifty years. It follows that the above consequences of the model of risk of infection, which describes the data for the Netherlands so adequately, are practically unaffected by any variation there may be in the annual risk of infection for those aged over 15 years.

(4) *The practical importance of determining the risk of tuberculous infection*

Tuberculosis being a communicable disease, knowledge of past and present risks of tuberculous infection in a population should be of value in planning a rational tuberculosis control or eradication programme. The level and the trend of the annual infection risk determine the epidemiological development of tuberculosis in the future, both among those at present uninfected and among those already infected. It is therefore of importance to determine the

infection risk in a population, and to make similar determinations at intervals in the future.

In some countries data on the prevalence of tuberculous infection on one or more occasions in the past are already available. From such data, using the approaches described in this paper, it should be possible to estimate the past level of the annual risk of tuberculous infection, and to obtain an indication of past trends in the risk. Even though such estimates may be only approximate because of uncertainties in interpreting the results of the tuberculin tests, or because unrepresentative samples were surveyed, they would provide valuable information to supplement the corresponding interpretation of data from current tuberculin surveys. In planning current surveys, special attention would naturally have to be paid to the selection of a suitably representative sample of the unvaccinated population at an appropriate age or ages, to the use of standardised test materials and techniques, and to the interpretation of the test results in terms of tuberculous or other mycobacterial infection.

In countries where mass vaccination against tuberculosis has not been part of the control programme, there is no special difficulty in making a tuberculin survey of a representative sample of unvaccinated children at any convenient age. Similarly in countries where children are first vaccinated on a mass scale several years after birth, surveys may readily be made on unvaccinated children at any convenient age up to that for mass vaccination. Indeed, in such countries preliminary tuberculin tests are normally made on children at the appropriate age for mass vaccination, and these potentially represent a survey of the prevalence of tuberculous infection at that age which, with proper standardisation of techniques, could provide information regularly on the risk of infection and its trend.

However, difficulties would arise in countries in which the great majority of infants are vaccinated against tuberculosis soon after birth, because there would be no representative sample of unvaccinated children available for a tuberculin survey (unless there was an older unvaccinated cohort born before the introduction of the infant vaccination scheme). In such circumstances it would be appropriate to choose a sample of newborn children at random, and tuberculin test them annually, offering chemoprophylaxis to protect any who acquired a tuberculous infection, and vaccination at the age of (say) 5 years to the remainder, as an alternative to vaccination at birth. This would provide information on the risk of tuberculous infection in the first five years of life, and this would be relevant to a consideration whether to continue vaccinating all newborn children.

The advantage of summarising the tuberculosis position in a country in terms of the risk of tuberculous infection in particular years is that it provides

a readily intelligible measure of the impact of tuberculosis on the community at different times. (Because of chemotherapy, tuberculosis mortality is no longer a valuable index for this purpose). This approach also offers a better means of bringing together, on a similar basis, the results of different tuberculin surveys at different times in the same country, and should facilitate comparisons of the tuberculosis situation in different countries. Moreover, as has been illustrated above with the data from the Netherlands, knowledge of the trend of the risk of infection should enable comprehensive predictions to be made for some years ahead, both of the prevalence of tuberculous infection, and of the expected incidence of primary tuberculous infections at different ages. This would provide guidance on the likely magnitude of the tuberculosis problem in a country during the next ten or fifteen years.

It is hoped in a later report to study the ways in which the development of clinical tuberculosis in a population at diffierent ages is related to the annual risk of tuberculous infection and its trend. The establishment of the relationships between infection with tubercle bacilli and the breakdown to clinical tuberculosis would greatly increase the practical value of knowledge of the risk of infection, as it would then become possible to predict the future pattern of clinical tuberculosis as well as that of tuberculous infection in a community.

APPENDIX

The mathematical relationship between the incidence and the prevalence of tuberculous infection

Consider a group, or cohort, of children, all born at the beginning of year b, who are followed until they are exactly a years old. Let the risk of acquiring a tuberculous infection in a particular calendar year t be p_t.

Then at the end of the year b, the proportion of the cohort which has been infected will be p_b; the proportion remaining uninfected will be $(1-p_b)$. At the end of the year $b+1$,

$p_b \cdot p_{b+1}$ will have been infected in both years,
$p_b \cdot (1-p_{b+1})$ will have been infected in the first year only,
$(1-p_b) \cdot p_{b+1}$ will have been infected in the second year only, and
$(1-p_b) \cdot (1-p_{b+1})$ will have escaped infection in both years.

The proportion of the cohort which will have been infected at least once by the age of two years, which will be written $P_{2,b}$, is therefore the sum of the first three expressions, which is the same as the last expression, subtracted from 1.

$$\therefore P_{2,b} = 1-(1-p_b) \cdot (1-p_{b+1})$$

If we write

$$(1-P_{2,b}) = Q_{2,b},\ (1-p_b) = q_b \text{ and } (1-p_{b+1}) = q_{b+1},$$

then this becomes

$$Q_{2,b} = q_b \cdot q_{b+1}$$

By age a we have, similarly

$$P_{a,b} = 1-(1-p_b) \cdot (1-p_{b+1}) \cdot (1-p_{b+2}) \ldots (1-p_{b+(a-1)}),$$

or more concisely,

$$Q_{a,b} = q_b \cdot q_{b+1} \cdot q_{b+2} \cdots q_{b+(a-1)} \tag{1}$$

$$\therefore \log Q_{a,b} = \sum_{t=b}^{b+(a-1)} \log q_t \tag{2}$$

In these formulae, p_t and q_t are regarded as if they were constant throughout a calendar year. If we replace p_t by a continuously varying annual risk of infection with a value $p(t)$ at time t, and write $q(t) = 1-p(t)$, and $Q(a,b) = Q_{a,b}$, then formula (2) becomes

$$\log Q(a,b) = \int_b^{b+a} \log q(t) \cdot dt \tag{3}$$

This is the fundamental relationship between the prevalence of past tuberculous infection in a cohort born at time b and observed at age a, and the risk of acquiring a primary tuberculous infection between times b and $b+a$.

It should be noted that in formula (3) no assumptions are made about the nature of the relationship between q (or p) and time. In particular, p may depend not only on the calendar time, but also on the age of the cohort at that time.

The estimation of the trend in the risk of tuberculous infection

As will be shown below, considerable use may be made of formula (3) once we have some information on the way in which the risk of infection, p, varies with time, and can express this relationship in an appropriate mathematical form. It is more concise algebraically to continue to work with q, that is $(1-p)$, instead of p. The most satisfactory way of estimating the value of q at different times is by using a modification of formula (3) (or formula (2)). If there was no variation in the risk of infection between the year of birth and the year of observation, then $q(t)$ would be equal to a constant value q in this formula, and we should have

$$\log Q(a,b) = \log q \cdot [t]_b^{b+a} = a \cdot \log q = \log q^a$$

$$\therefore Q(a,b) = q^a \tag{4}$$

Thus, in the situation in which q varies with time, an average value of $q(t) = \bar{q}$ may be obtained by extracting the 'a'th root of $Q(a,b)$. The simplest way to do this is to use the logarithmic equation, that is to divide $\log Q(a,b)$ by a, and take the antilogarithm. If, as is likely, $q(t)$ is increasing (or decreasing) smoothly between time b and time $b+a$, then this average value $\bar{q}$ will represent the value of $q(t)$ at some time t between b and $b+a$; t will at this stage be unknown.

If we have a series of values of $Q(a,b)$ for different cohorts, that is, for different values of b, but for the same value of a, we may calculate a corresponding series of average values of q, and these will be separated by the same time intervals as are the cohorts, although the actual times to which the averages refer will not be known. This series of average values of q will

therefore provide a good indication of the nature of the trend in q, and will form the basis for choosing an appropriate mathematical formula to describe it. The importance of using, for this purpose, values of $Q(a,b)$ which all refer to the same age a is that the series of average values of q will as a result all be affected to a similar extent by any association between the risk of infection and age.

Choice of mathematical relationship to describe the trend of the risk of tuberculous infection in the Netherlands

As explained in the text of the report (page 13) the data for 11 consecutive annual cohorts of male recruits aged $19\frac{1}{2}$ years in the years 1956 to 1966 in the Netherlands were used in this way, and gave a series of 11 annual average values of q. It was noted in the course of these calculations that the 11 annual values of $ln\,(-ln\,q)$ appeared to lie practically along a straight line, which suggested that a straight line relationship between $ln\,(-ln\,q)$ and t might represent an appropriate mathematical model to describe the trend in the risk of infection in the Netherlands.

When any biological measure shows a decrease with time, it is natural also to consider the possibility that the decrease may be exponential. During this period p was clearly a decreasing quantity in the Netherlands. An exponential decrease in p would correspond to a straight-line relationship between $ln\,p$ and t.

At first sight these two mathematical models appear to be very different. However, they are practically the same in the present context, because the annual risk of tuberculous infection p is a small quantity.

For $|p| \leqslant 1$, we have

$$-ln\,q = -ln\,(1-p) = p + \frac{p^2}{2} + \frac{p^3}{3} + \ldots, \text{ which } \doteqdot p, \text{ for small } p.$$

Even if p is as large as 0.1, corresponding to the very high annual risk of primary tuberculous infection of 10%, the value of $-ln\,q$ is only 0.10536, and for smaller values of p the difference between p and $-ln\,q$ is proportionately less. It therefore does not matter which of these two mathematical models is chosen to describe the trend in risk of infection in the Netherlands. The first of the two was chosen, although it looks mathematically more complex, partly because this made it easier to evaluate the integral in formula (3), and partly because the first relationship appeared to describe the trend in infection risks in the Netherlands before the second World War, when the risks were higher, more closely than the second relationship.

We take

$$ln\,(-ln\,q(t)) = c+st$$

$$\therefore\ -ln\,q(t) = e^{c+st} \tag{5}$$

Substituting in formula (3)

$$ln\,Q(a,b) = -\int_b^{b+a} e^{c+st}\cdot dt$$

$$= -\frac{1}{s}\cdot\left[e^{c+st}\right]_b^{b+a}$$

$$= -\frac{1}{s}\cdot e^{c+sb}\cdot(e^{sa}-1)$$

$$= \frac{(e^{sa}-1)\cdot e^{s(b-t)}}{s}\cdot(-e^{c+st})$$

$$= \frac{(e^{sa}-1)\cdot e^{s(b-t)}}{s}\cdot ln\,q(t), \text{ from (5)}$$

$$\therefore\quad ln\,q(t) = \frac{s\cdot ln\,Q(a,b)}{(e^{sa}-1)\cdot e^{s(b-t)}} \tag{6}$$

This formula expresses the mathematical relationship between the value of the risk of tuberculous infection p at any time t and the proportion of individuals, in the cohort born at time b, who will be infected by age a, provided that the trend in the risk of infection is of the form indicated by equation (5).

For particular values of t, we have the following four special forms of equation (6).

(i) $t = b$. This gives the risk of infection at the time of birth of the cohort.

$$ln\,q(b) = \frac{s\cdot ln\,Q(a,b)}{(e^{sa}-1)} \tag{7}$$

(ii) $t = b+a$. This gives the risk of infection at the time when the cohort is observed, namely when the cohort is aged a years.

$$ln\,q(b+a) = \frac{s\cdot ln\,Q(a,b)}{(1-e^{-sa})} \tag{8}$$

(iii) $t = b+x$. This gives the risk of infection at the time when the cohort is aged x years.

$$ln\,q(b+x) = \frac{s\cdot ln\,Q(a,b)}{e^{-sx}(e^{sa}-1)} \tag{9}$$

(iv) $t = b+a-y$. This gives the risk of infection y years before the time when the cohort is observed.

$$ln\ q(b+a-y) = \frac{s \cdot ln\ Q(a,b)}{e^{sy}(1-e^{-sa})} \tag{10}$$

Appendix Table B gives, for various values of a and s, the value of the risk of infection at age a, from formula (8), and the value of the risk of infection a few years earlier, from formula (10), corresponding to a wide range of values of P, the proportion of individuals already infected by age a. This table provides the simplest way of estimating p, the annual risk of tuberculous infection in a particular year, from information on P, the proportion already infected by a certain age. The method of using this table is described fully in Section VIII of the report (page 45).

Formula (9) may also be used to determine the age x at which q takes the average value calculated from formula (4). In formula (4), putting $\bar{q} = q(b+x)$ we have

$$ln\ q(b+x) = \frac{1}{a} \cdot ln\ Q(a,b)$$

and substituting this value in formula (9),

$$\frac{1}{a} \cdot ln\ Q(a,b) = \frac{s \cdot ln\ Q(a,b)}{e^{-sx} \cdot (e^{sa}-1)}$$

$$\therefore\ e^{sx} = \frac{(e^{sa}-1)}{sa}$$

$$x = \frac{1}{s} ln \frac{(e^{sa}-1)}{sa} \tag{11}$$

Thus formula (4) and formula (11) together provide a method of estimating the risk of tuberculous infection from a prevalence figure, and assigning it to a specific time, which is alternative to the use of Appendix Table B. However the advantage of Appendix Table B is that it gives risks of tuberculous infection which are assigned to particular calendar years, whereas in this alternative method the risk of tuberculous infection is assigned to a time which does not necessarily correspond to a calendar year. Both methods are derived directly from equation (6), and therefore both depend on the trend in the risk of infection being of the form indicated by equation (5).

These mathematical formulae may now be used to estimate the annual risks of tuberculous infection in the Netherlands, and also to study whether they vary with age and sex. One way of doing this would be to calculate separate estimates of (say) $q(b)$ from each observed value of $Q(a,b)$, using formula (7), but this would not make the best use of the close agreement which is apparent between the actual trend in the risk of infection and the mathematical relationship of formula (5).

For this reason the series of 11 annual average values of q for male recruits aged $19\frac{1}{2}$ years was taken as a starting point. A straight line was fitted by the standard technique of linear regression to the 11 estimated values of $ln\ (-ln\ q)$, regarding all 11 values as of equal weight. This gave a smoothed series of values of $\bar{q}$ satisfying an equation of the form

$$-ln\ \bar{q}_b = e^{C+sb} \tag{12}$$

in which $C = 0.70978$ and $s = -0.13794$ (b being measured from 1900, and $\bar{q}_b$ being arbitrarily assigned to time b).

In this equation, $\bar{q}_b$ represents the average value of q for the cohort born at time b, and is thus equal to a value of q at some time $(b+x)$ between b and $(b+a)$.

$$\therefore\ -ln\ \bar{q}_b = -ln\ q(b+x)$$

We may determine x by using formulae (12) and (9) on the two sides of this equation, giving

$$e^{C+sb} = \frac{-s\ ln\ Q(a,b)}{(e^{sa}-1) \cdot e^{-sx}}$$

$$\therefore\ e^{sx} = \frac{-e^{C+sb}(e^{sa}-1)}{s\ ln\ Q(a,b)} \tag{13}$$

This equation may be used to estimate x for each of the 11 cohorts from the observed values of $Q(a,b)$, C and s taking the values found when determining the regression line (12). These 11 values of x are given in Table 2.

Substituting from formula (7) in (13)

$$e^{sx} = \frac{-e^{C+sb}}{ln\ q(b)}$$

$$\therefore\ -ln\ q(b) = e^{(C-sx)+sb}$$

But

$$-ln\ q(b) = e^{c+sb} \text{ from formula (5)}$$
$$\therefore\ c = C - sx$$

Thus the curve $-ln\ \bar{q}_b = e^{C+sb}$ may be moved from the arbitrary position in which $\bar{q}_b$ is assigned to time b to a new position $-ln\ q(b) = e^{c+sb}$, where $c = C - sx$ (x being given by equation (13)). In this new position, the curve of infection risks reproduces, by age a, the observed value of $Q(a, b)$ for the cohort born at time b. The new curve is the same as the old curve, shifted x years along the time-scale.

The average of the values of x for the 11 cohorts was 7.683 years. This may be taken as a single value for the curve which will, on average, most closely reproduce the observed values of $Q(a,b)$ for these 11 cohorts.

$$\therefore\ c = 0.70978 - (-0.13794) \times 7.683 = 1.7696$$

The final column of Table 2 was therefore determined by taking as a standard curve equation (5), namely

$$-ln\ q(b) = e^{c+sb}$$

with the above values of c and s, and $b = 37, 38 \ldots 47$.

Variations in the annual risk of infection with sex and age

The series of annual risks of infection for the years from 1937 to 1947 in Table 2 refers to males only, and is derived from information obtained at an age of 19½ years. If the risk of infection varies with the age of the subject, then this series represents *average* annual risks of infection over this age-range. The extent to which the risk of infection depends on age may therefore be assessed by looking at information for cohorts of males observed at a different age. If the same series of annual risks reproduces the observed prevalences, then the risk of infection would appear not to depend on age. If however, the series has to be shifted in time to reproduce the observed prevalences at a different age, this would indicate that the level of the average annual risk over the different age-range was higher (or lower) than that at ages up to 19½ years, and this might indicate an association between the risk of infection and age.

Equally, if a series of annual risks which reproduces observed prevalences for males has to be shifted in time to reproduce observed prevalences for females of the same age, this would indicate different levels of the annual risk in the two sexes.

A shift of the curve by x years along the time-scale corresponds to a reduction of sx in the value of $ln\ (-ln\ q(t))$, or a proportionate reduction of sx in the value of $-ln\ q(t)$. Because $-ln\ q(t)$ is nearly equal to $p(t)$ we may say that a shift of the curve of infection risks by x years corresponds closely to a proportionate reduction in the risk of infection of sx. The proportionate reduction in the risk of infection each year is thus $-s$. For the Netherlands after the second World War the decrease in the risk of infection was therefore about 0.138, or 13.8 percent per year.

Equation (13), with c in place of C, and using the above values of c and s, was therefore applied to the values of $Q(a,b)$ for schoolboys and schoolgirls in the Netherlands aged 12½ to 18½ years, observed from 1962 to 1966. The values of x now obtained represent the number of years by which the standard curve had to be shifted to reproduce the observed prevalences. These values are shown in Tables 3 and 4.

Looking first at the comparison between males and females, and restricting the comparison to ages 13½ to 17½, for reasons given in the text (page 18), the average shift for males was −0.343 years and for females −0.995 years. The difference was 0.652 years. This corresponds to a lower level of annual infection risks in females than in males in the Netherlands, the percentage difference in level being about $0.652 \times 0.138 \times 100$, or about 9.0 percent, during the period covered by the cohorts in the comparison, which is from 1945 to 1966.

The assessment of age-variation is less easy. The negative shifts tend to be rather greater for the younger groups (corresponding to a rise in infection risks with age), but neither in males nor in females is this a steady trend. If two regression lines with the same slope are fitted to the values of x for males and females aged 13½ to 17½, the slope corresponds to a decrease of 0.09 in the value of x for each decrease of one year in the age at the time of observation (that is, a decrease of 0.18 in x for a decrease of one year in the *average* of the age-range). According to these regression lines a value of x of −0.02 would be expected for males aged 19½ years, which is closely similar to the value of −0.06 actually found for the cohorts included in Table 2; this suggests that the small (though non-significant) trend in infection risk with age indicated by the regression lines may be a genuine one. If it is, then the change in x corresponds to a percentage rise in the level of the risk of infection of about $0.18 \times 0.138 \times 100$, or about 2.5 percent, for each year of age during the period covered by the cohorts under study, namely from 1945 to 1966. Partly because the reality of this effect was uncertain, and partly because it was small in comparison with the decrease of 13.8 percent in level of infection risk each calendar year during the same period, the main report is based upon a single series of average annual risks for the age-range 0-19½ years, without any further adjustment for age.

However, the standard curve was adjusted, by shifting it by -0.326 years, to give a series of annual risks of infection which would be appropriate for males and females combined. For this curve $c = 1.7246$, and taking $s = -0.1379$ as before led to the annual risks of tuberculous infection for the years 1940 to 1969 shown in Table 5.

Determination of the series of annual infection risks in the Netherlands before the second World War

For reasons explained in the report (pages 22-23) it was decided not to use the information on prevalence under the age of $2\frac{1}{2}$ years from the four earlier surveys of children in Amsterdam aged up to 13 years of age. Instead the infection risks were estimated from comparisons of the prevalences observed at higher ages. This necessitated the use of a modification of formula (6).

If we have two cohorts born at times b_1 and b_2 and observed at ages a_1 and a_2, we have, from equation (6)

$$ln\, Q(a_1, b_1) = \frac{e^{s(b_1 - t)} \cdot (e^{sa_1} - 1)}{s} \cdot ln\, q(t)$$

$$ln\, Q(a_2, b_2) = \frac{e^{s(b_2 - t)} \cdot (e^{sa_2} - 1)}{s} \cdot ln\, q(t)$$

By subtraction

$$ln\left(\frac{Q(a_1, b_1)}{Q(a_2, b_2)}\right) = \frac{e^{-st} \cdot ln\, q(t)}{s} \cdot \left(e^{sb_1} \cdot (e^{sa_1} - 1) - e^{sb_2} \cdot (e^{sa_2} - 1)\right) \qquad (14)$$

There are three special forms of this equation corresponding to particular situations.

(i) $a_1 = a_2$, $b_1 \neq b_2$. This is the situation when two cohorts are both observed at the same age a.

$$ln\left(\frac{Q(a, b_1)}{Q(a, b_2)}\right) = \frac{e^{-st}\, ln\, q(t)}{s} \cdot (e^{sa} - 1)\,(e^{sb_1} - e^{sb_2}) \qquad (15)$$

(ii) $a_1 \neq a_2$, $b_1 = b_2$. This is the situation when one cohort born at time b is observed at two ages.

$$ln\left(\frac{Q(a_1, b)}{Q(a_2, b)}\right) = \frac{e^{s(b - t)}\, ln\, q(t)}{s} \cdot (e^{sa_1} - e^{sa_2})$$

$$= \frac{ln\, q(b)}{s} \cdot (e^{sa_1} - e^{sa_2}) \qquad (16)$$

(iii) $a_1 + b_1 = a_2 + b_2$. This is the situation when two cohorts are both observed at the same time.

$$ln\left(\frac{Q(a_1, b_1)}{Q(a_2, b_2)}\right) = \frac{e^{-st}\, ln\, q(t)}{s} \cdot (e^{sb_2} - e^{sb_1}) \qquad (17)$$

Further special forms of any of these four equations may be obtained for particular values of t (as in equations (7) to (10)). They all express the mathematical relationship between the risk of tuberculous infection at time t and *two* measures of the proportion of individuals who have been infected by specified ages, provided that, as with the earlier formulae, the trend in the risk of infection is of the form indicated by equation (5).

In the present instance, use is made of equation (17). Regarding b_1 as the earlier birth date, and considering consecutive annual cohorts, we have $b_2 = b_1 + 1$, $a_1 = a_2 + 1$. For $t = (b_1 + b_2)/2 = b_1 + \frac{1}{2}$, equation (17) becomes

$$ln\ \frac{Q(a_1, b_1)}{Q(a_2, b_2)} = ln\, q(b_1 + \tfrac{1}{2}) \cdot \left(\frac{e^{s/2} - e^{-s/2}}{s}\right)$$

$$= ln\, q(b_1 + \tfrac{1}{2}) \cdot (1 + 0(s^2)).$$

Thus to a close approximation, since s is small,

$$q(b_1 + \tfrac{1}{2}) = \left(\frac{Q(a_1, b_1)}{Q(a_2, b_2)}\right) \qquad (18)$$

Application of formula (18) to the information in each of the four surveys at successive ages from $2\frac{1}{2}$ to $13\frac{1}{2}$ years gave the 44 estimates* of q referred to on page 24 of the report, and the values of $ln\,(-ln\, q)$ again appeared to lie approximately on a straight line. (As mentioned on page 64, the slightly different values of $ln\, p$ were not quite so closely fitted by a straight line). A straight line was fitted by the standard technique of linear regression to the 44 estimated values of $ln\,(-ln\, q)$, regarding all 44 values as of equal weight.

This gave $s = -0.05493$ in an equation of the form

$$-ln\, q = e^{C + sb_1}$$

In this equation q represents the average value of $q(t)$ at some time $(b_1 + x)$, that is

$$-ln\, q = -ln\, q(b_1 + x)$$

We may determine x by using formulae (12) and (17) on the two sides of this equation.

$$e^{c + sb_1} = \frac{s\, ln\left(\dfrac{Q(a_1, b_1)}{Q(a_2, b_2)}\right) e^{s(b_1 + x)}}{(e^{sb_2} - e^{sb_1})}$$

* These 44 estimates are not mathematically independent.

$$\therefore \quad e^{sx} = \frac{e^{c}(e^{sb_2} - e^{sb_1})}{s\ ln\left(\frac{Q(a_1, b_1)}{Q(a_2, b_2)}\right)} \tag{19}$$

Taking $a_2 = 2\frac{1}{2}$, and putting a_1 successively equal to $3\frac{1}{2}$, $4\frac{1}{2}$, ... $13\frac{1}{2}$ for each of the four surveys, equation (19) gave 44 values* of x. These were averaged, and the average value $\bar{x}$ was used to define the standard position for the curve, namely

$$-ln\ q(b_1) = e^{c+sb_1}$$

where $c = C - s\bar{x} = -1.5435$, and $s = -0.05493$ as before.

This equation led to the annual risks of tuberculous infection from 1910 to 1939 shown in Table 5. This curve, and the curve for the years from 1940 onwards, intersect at time $T = 39.37$ (measured from 1900).

Validity of the estimates of annual risk of tuberculous infection

Finally the general validity of the complete series of annual risks of tuberculous infection was checked by seeing whether they reproduced satisfactorily the prevalence figures at different ages in each of the above surveys.

The complete series of annual risks consists of two parts

$$-ln\ q(t) = e^{c_1 + s_1 t} \text{ for } t \leq T$$

$$-ln\ q(t) = e^{c_2 + s_2 t} \text{ for } t \geqslant T$$

For early cohorts, for which $b + a \leqslant T$, we have

$$-ln\ Q(a, b) = \frac{e^{c_1 + s_1 b}(e^{s_1 a} - 1)}{s_1} \tag{20}$$

For the later cohorts for which $b \leqslant T \leqslant (b + a)$ the expected prevalence figure has to be calculated from a modification of the basic integration, namely

$$-ln\ Q(a, b) \quad \int_b^T e^{c_1 + s_1 t} \cdot dt + \int_T^{b+a} e^{c_2 + s_2 t} \cdot dt$$

$$= \frac{e^{c_1} \cdot (e^{s_1 T} - e^{s_1 b})}{s_1} + \frac{e^{c_2} \cdot (e^{s_2(b+a)} - e^{s_2 T})}{s_2} \tag{21}$$

For the later cohorts for which $b \geqslant T$

$$-ln\ Q(a, b) = \frac{e^{c_2 + s_2 b}(e^{s_2 a} - 1)}{s_2} \tag{22}$$

* These 44 values are not mathematically independent.

For the cohorts contributing to the four earliest surveys, the expected values of $ln\ Q(a_1, b_1)$ for $a_1 = 3.5, 4.5 \ldots 13.5$ were calculated on the assumption that $ln\ Q(a_2, b_2)$ took the value observed at the same survey for $a_2 = 2.5$, and using the difference between the appropriate pair of equations for $ln\ Q(a_1, b_1)$ and $ln\ Q(a_2, b_2)$ selected from (20), (21) and (22), depending on the values of a and b.

The calculations were made with the following values for c and s:

	c_1	s_1	c_2	s_2
Both sexes (Tables 6 and 7)	−1.5435	−0.05493	1.7246	−0.13794
Males only (Table 8)	−1.5256	−0.05493	1.7696	−0.13794

The value of c_2 for males is that obtained originally for Table 2, and equals $1.7246 - 0.3260 \times (-0.13794)$. The value of c_1 for males was therefore made equal to $-1.5435 - 0.3260 \times (-0.05493)$, on the assumption that there would have been a similar contrast between the risks of infection for males and females before the second World War as was found subsequently.

SUMMARY

A detailed study has been made of the extensive data on the prevalence of tuberculous infection in the Netherlands at different ages during the past 40 years. It was possible to convert this information on prevalence into a series of annual risks of tuberculous infection during the period since 1910, which reproduced the observed prevalence data satisfactorily, and which could then be used to make a comprehensive study of the prevalence of tuberculous infection and the incidence of fresh primary infections for cohorts born between 1910 and 1960 up to the age of 50 years. The Netherlands is a particularly suitable area in which to make a study of this type, because only a small proportion of the child population has been BCG vaccinated, and mycobacterial infections other than tuberculosis are not frequent.

Representative surveys were made in male army recruits aged about 19 years from 1956 to 1966, and in schoolboys and schoolgirls aged from about 12 to 18 years from 1962 to 1966. In all these surveys the standard WHO tuberculin test was used. For the purposes of this study, a reaction of 8 mm induration or more at 72 hours to 1 TU of RT 23 (in a buffer containing Tween 80) was regarded as indicating past infection with tubercle bacilli.

With the aid of the mathematical relationship between the annual risks of tuberculous infection and the resulting prevalence of past infection, it was found that since about 1940 the risk of tuberculous infection in the Netherlands closely followed an exponential downward trend, the risk decreasing annually by 13.8 percent. The estimated annual risk of tuberculous infection was 2.08 percent in 1940 and 0.058 percent in 1966.

A comparison of the risks of tuberculous infection in the two sexes showed that the annual risk was about 9 percent greater for boys than for girls in each calendar year. There was no definite association between the annual risk of tuberculous infection and age, up to the age of 20 years, but the figures were consistent with the possibility that there might be a small increase in the risk of tuberculous infection with increasing age.

Four further tuberculin surveys were made in Amsterdam in children aged up to 14 years in the years 1926, 1934, 1939 and 1947, using the von Pirquet test. It was uncertain whether the unduly large prevalence figures during the first two years of life were due to shortcomings of the testing technique or to high risks of infection in the youngest children, and the risk of tuberculous infection was therefore determined from the prevalence data at higher ages. The risk of tuberculous infection in the Netherlands from about 1913 to 1939 also appeared to follow closely an exponential downward trend, the risk decreasing annually by 5.5 percent. The estimated annual risk of tuberculous infection was 9.68 percent in 1913 and 2.41 percent in 1939. The more gradual decrease in the annual risk of tuberculous infection before 1940 is probably related to the high and unchanging risk of bovine tuberculous infection in the Netherlands during this period. Pasteurisation of milk was made compulsory in 1940.

These two series of estimated annual risks of tuberculous infection in the Netherlands were combined, and their validity was checked by confirming that (with the necessary adjustments for sex) they reproduced satisfactorily the prevalence figures obtained in all the surveys referred to above. Moreover, a possible alternative series of infection risks was studied for the years of the second World War, corresponding to an interruption in the steady decline of infection risk, but this did not reproduce the later prevalence figures satisfactorily. The combined series of annual infection risks thus provides an acceptable summary of the way in which tuberculosis has been changing in the Netherlands during a period of more than 50 years. It is of considerable interest that such a simple model should have reproduced so satisfactorily the findings for such a large number of separate generations (or cohorts) of children examined at different ages.

The series of annual infection risks was extended forwards in time by allowing the decrease of 13.8 percent each year to continue until 1980, the risk thereafter being regarded as constant. The consequences of this series of infection risks, both in the past and for the future, have been studied in terms both of the prevalence of tuberculous infection and the incidence of fresh primary infections, by applying them to the cohorts born in each of the years 1910 to 1960, up to an age of 50 years. Three different assumptions were investigated concerning the association of the risk of tuberculous infection and age:

(a) that there was no association;

(b) that the risk of infection increased gradually during adolescence to a level at age 18 which was 50 percent above that at age 13, and then decreased again between age 20 and 25 to the original level, which was maintained until age 50;

(c) that the risk showed a similar increase and decrease, but with the decrease occurring only between age 25 and 30.

However, there were only small differences in the consequences of the three assumptions for the more recent cohorts, and these were not of practical importance. Further analyses were therefore made only on the first assumption, that the risk of tuberculous infection in a particular calendar year did not depend on age.

For each of the cohorts born between 1910 and 1960, the prevalence of tuberculous infection rose very steeply during childhood, less steeply during adolescence and very little above the age of 25 years. This pattern was very similar for each cohort despite the great change in level of the prevalence during the 50-year period; for the cohort born in 1910, the prevalence of tuberculous infection at age 4 was 35.8 percent, but for the cohort born in 1960 the prevalence at the same age was only 3.4 percent. Of all the infections which occurred in each cohort up to the age of 50 years, about 40 percent had occurred by the age of 4 years, and about 80 percent had occurred by the age of 14 years.

The incidence of fresh primary infections under the age of 15 years decreased steeply from cohort to cohort during the 50 years. The incidence at age 9 decreased from 2,940 per 100,000 for the cohort of 1910 to 39 for the cohort of 1960. At ages 15 to 40, the incidence remained at a high level until about 1935, and has since decreased steeply. At ages above 40 the incidence of fresh primary infections was relatively low for the early cohorts (because few individuals survived uninfected to these ages) and has remained low for the later cohorts (because, although a larger proportion now remains susceptible, these individuals will encounter very much lower risks of infection in the future).

On the assumption that in other territories any decrease in the annual risk of tuberculous infection will also be exponential, and that the risk will also be largely independent of age, detailed tables are provided for converting prevalence information obtained from tuberculin surveys to annual risks of tuberculous infection in particular calendar years. To use these tables it is necessary also to have an estimate of the percentage decrease each year in the risk of infection. Such an estimate may readily be obtained if more than one tuberculin survey has been undertaken in the country, or if different ages have been covered, and methods for doing this are given.

In circumstances where no representative tuberculin survey has been made in a country, another method would be to estimate the risk of infection from the mortality of tuberculous meningitis in children aged under 5 years in the absence of chemotherapy. In the Netherlands (where both human and bovine infections occurred) the ratio of this mortality from tuberculous meningitis to the risk of tuberculous infection was about 1 percent.

The methods of the present paper permit a unified presentation of the

results of representative tuberculin surveys in a readily understandable form. They give a direct indication of the magnitude of the tuberculosis problem in a country at particular points of time, and this facilitates comparisons with other countries.

In considering the reasons for the steady decrease in the risk of tuberculous infection in the Netherlands up to 1940, chemotherapy, mass BCG vaccination and mass radiography were not available, or were not applied, and so can have contributed nothing. Nor does there appear to have been any decrease in bovine tuberculosis infection prior to 1940. The decrease appears to have resulted from an environmental situation in which tuberculosis was tending to eliminate itself, by virtue of the fact that each active case of tuberculosis must eventually have led to the development of less than one such case. The more rapid decrease since 1940 seems to have been largely attributable to the immediate decline in bovine tuberculosis as a result of the pasteurization of milk in 1940.

This study has illustrated the practical advantages of assessing the level and the trend in the annual risk of tuberculous infection by means of current representative tuberculin surveys and the use of such similar data as are already available from the past. With this information it is possible to derive a comprehensive indication both of the prevalence of tuberculous infection, and the incidence of new primary infections at different ages during the following few years. Such information should be of value in planning tuberculosis control programmes in developing countries and eradication programmes in developed countries. It is hoped in a later report to carry the analysis a stage further and to establish the links between the acquisition of tuberculous infection and the risks of a subsequent breakdown to clinical tuberculosis. Information on this point would greatly enhance the practical value of determining the level and the trend in the annual risk of tuberculous infection.

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ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION per 100,000 up to the age of 50 years for cohorts born from 1910 to 1919 APPENDIX TABLE A
ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION (The Netherlands)

ESTIMATION DE LA PREVALENCE DE L'INFECTION TUBERCULEUSE pour 100,000 sujets, jusqu'à l'âge de 50 ans, appartenant aux cohortes
ESTIMATION DE L'INCIDENCE DE LA PRIMO-INFECTION TUBERCULEUSE nées de 1910 à 1919 (Pays-Bas)

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50'
1910.		11310	20835	28910	35790	41688	46770	51172	55003	58352	61292	63884	66177	68213	70027	71649	73103	74411	75590	76656	77622	78500	79299	80027	80694	
	81304	81864	82378	82852	83288	83691	84031	84321	84570	84783	84967	85125	85261	85379	85481	85569	85645	85711	85769	85819	85862	85900	85932	85961	85985	86007
	11310	9525	8075	6880	5898	5082	4402	3831	3349	2940	2591	2293	2036	1814	1622	1454	1308	1179	1066	966	878	799	729	666	610	
	560	514	473	436	403	340	290	249	213	184	158	136	118	102	88	76	66	57	50	43	38	33	28	25	21	
1911.		10740	19845	27602	34252	39982	44946	49265	53041	56356	59278	61863	64159	66205	68033	69673	71147	72477	73679	74768	75758	76659	77480	78232	78920	
	79551	80131	80665	81157	81611	81995	82322	82602	82843	83050	83228	83382	83515	83629	83729	83815	83889	83954	84010	84059	84101	84138	84170	84198	84222	84243
	10740	9105	7757	6650	5731	4963	4320	3776	3315	2922	2585	2296	2045	1829	1640	1475	1330	1202	1089	990	901	822	751	688	631	
	580	534	492	454	383	327	280	241	207	178	154	133	115	99	86	75	65	56	49	42	37	32	28	24	21	
1912.		10200	18891	26341	32761	38322	43161	47391	51104	54378	57275	59847	62138	64187	66024	67676	69165	70512	71732	72841	73850	74771	75613	76383	77090	
	77740	78338	78890	79399	79868	80195	80509	80779	81010	81210	81382	81531	81660	81771	81867	81951	82023	82086	82141	82188	82230	82266	82297	82324	82348	82368
	10200	8691	7450	6420	5561	4839	4230	3714	3274	2897	2572	2292	2049	1837	1652	1490	1347	1221	1109	1009	921	842	771	707	650	
	598	551	509	470	367	314	270	232	200	172	149	129	111	96	84	73	63	55	48	41	36	31	27	24	20	
1913.		9678	17974	25123	31316	36705	41415	45551	49196	52422	55286	57838	60119	62165	64004	65663	67162	68521	69756	70880	71905	72842	73701	74488	75212	
	75878	76492	77059	77537	77945	78295	78595	78853	79076	79268	79433	79576	79700	79808	79901	79982	80052	80112	80165	80211	80251	80286	80316	80342	80365	80385
	9678	8296	7149	6192	5389	4710	4136	3645	3226	2864	2552	2281	2045	1840	1659	1500	1359	1235	1124	1025	937	858	787	724	666	
	614	567	478	408	350	300	258	222	192	166	143	124	107	93	81	70	61	53	46	40	35	30	26	23	20	
1914.		9185	17100	23956	29923	35138	39716	43752	47324	50495	53320	55846	58110	60147	61984	63644	65149	66515	67760	68895	69933	70883	71755	72556	73293	
	73973	74600	75130	75582	75969	76302	76588	76834	77046	77229	77388	77525	77644	77747	77837	77914	77982	78040	78091	78135	78174	78207	78236	78261	78283	78302
	9185	7915	6856	5966	5215	4579	4036	3571	3171	2825	2526	2265	2037	1836	1660	1505	1367	1244	1135	1038	950	872	801	737	680	
	628	530	452	387	332	286	246	212	183	158	137	119	103	89	78	67	59	51	44	38	33	29	25	22	19	
1915.		8716	16265	22835	28578	33619	38064	41996	45488	48599	51380	53874	56116	58139	59967	61624	63129	64499	65749	66892	67938	68898	69780	70592	71341	
	72031	72615	73112	73539	73905	74220	74491	74724	74926	75101	75252	75383	75496	75595	75680	75755	75819	75875	75924	75966	76003	76035	76063	76087	76108	76126
	8716	7549	6570	5743	5042	4444	3932	3492	3111	2781	2494	2243	2022	1828	1657	1505	1370	1250	1143	1047	960	882	812	749	691	
	583	498	426	366	315	271	234	202	175	151	131	113	99	85	74	64	56	49	42	37	32	28	24	21	18	
1916.		8270	15467	21758	27281	32150	36458	40283	43691	46738	49470	51926	54142	56144	57959	59608	61109	62479	63730	64877	65928	66895	67784	68604	69361	
	70060	70545	71012	71413	71758	72055	72311	72532	72724	72889	73032	73157	73265	73358	73440	73510	73572	73625	73671	73712	73747	73777	73804	73827	73847	73864
	8270	7197	6291	5523	4869	4308	3825	3408	3047	2732	2457	2215	2003	1815	1649	1501	1369	1252	1146	1052	966	890	820	757	699	
	545	467	401	345	297	256	221	191	165	143	124	108	94	81	71	61	53	46	40	35	30	26	23	20	18	
1917.		7846	14704	20725	26033	30729	34899	38614	41936	44914	47592	50007	52190	54169	55967	57603	59096	60460	61710	62857	63910	64880	65773	66599	67295	
	67890	68399	68836	69212	69535	69815	70056	70264	70445	70601	70737	70854	70955	71045	71122	71189	71247	71298	71342	71380	71413	71442	71467	71489	71508	71525
	7846	6858	6021	5307	4696	4170	3715	3322	2978	2678	2415	2183	1979	1797	1636	1493	1365	1250	1146	1053	970	894	825	696	595	
	509	437	376	324	279	241	208	180	156	136	118	102	89	77	67	58	51	44	38	33	29	25	22	19	17	
1918.		7442	13976	19735	24831	29356	33388	36992	40224	43130	45751	48120	50267	52218	53993	55613	57094	58450	59694	60837	61890	62859	63755	64511	65136	
	65708	66183	66591	66942	67245	67507	67733	67929	68098	68245	68373	68484	68580	68663	68736	68799	68854	68902	68943	68979	69010	69038	69062	69082	69100	69116
	7442	6534	5759	5096	4525	4032	3604	3232	2906	2621	2369	2147	1951	1776	1620	1481	1356	1244	1143	1052	970	895	756	645	553	
	474	408	351	303	262	226	196	170	147	128	111	96	84	73	63	55	48	41	36	31	27	24	21	18	15	
1919.		7059	13281	18787	23676	28032	31926	35418	38558	41389	43940	46268	48376	50294	52044	53644	55109	56453	57688	58825	59873	60841	61657	62354	62951	
	63464	63904	64284	64611	64894	65138	65350	65533	65692	65830	65950	66053	66144	66222	66291	66350	66401	66446	66485	66519	66548	66574	66596	66615	66632	66647
	7059	6222	5506	4889	4356	3894	3492	3140	2831	2560	2320	2107	1918	1750	1600	1465	1344	1235	1137	1048	967	816	697	597	512	
	441	379	328	283	244	212	183	159	138	120	104	90	79	68	59	51	45	39	34	29	26	22	19	17	15	

ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION per 100,000 up to the age of 50 years for cohorts born from 1920 to 1929 APPENDIX TABLE A
ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION (The Netherlands)

ESTIMATION DE LA PREVALENCE DE L'INFECTION TUBERCULEUSE pour 100,000 sujets, jusqu'à l'âge de 50 ans, appartenant aux cohortes
ESTIMATION DE L'INCIDENCE DE LA PRIMO-INFECTION TUBERCULEUSE nées de 1920 à 1929 (Pays-Bas)

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50'
1920.		6695	12619	17879	22566	26756	30513	33891	36937	39691	42187	44455	46519	48402	50123	51700	53146	54475	55698	56826	57866	58745	59495	60137	60689	
	61163	61571	61923	62228	62490	62718	62915	63086	63235	63363	63475	63572	63657	63730	63794	63849	63898	63939	63976	64008	64035	64059	64080	64098	64114	64128
	6695	5924	5260	4687	4190	3757	3378	3046	2754	2496	2267	2064	1883	1721	1577	1446	1329	1223	1127	1041	878	750	642	551	474	
	408	352	304	263	228	197	171	148	129	112	97	85	73	64	55	48	42	36	32	28	24	21	18	16	14	
1921.		6349	11987	17010	21500	25527	29147	32412	35364	38039	40469	42681	44700	46544	48234	49784	51208	52519	53728	54843	55785	56589	57277	57868	58376	
	58814	59191	59517	59799	60043	60254	60438	60597	60735	60854	60958	61049	61128	61196	61256	61307	61352	61391	61425	61455	61480	61503	61522	61539	61554	61567
	6349	5638	5023	4491	4026	3621	3265	2952	2675	2430	2212	2018	1845	1690	1550	1424	1311	1208	1116	942	804	689	591	508	437	
	378	326	282	244	211	183	159	138	120	104	91	79	68	59	52	45	39	34	30	26	22	19	17	15	13	
1922.		6020	11383	16178	20478	24344	27830	30982	33839	36433	38796	40951	42920	44725	46380	47900	49300	50591	51782	52787	53646	54381	55012	55554	56021	
	56425	56773	57074	57334	57560	57756	57925	58073	58200	58312	58408	58492	58565	58629	58684	58732	58773	58810	58841	58869	58893	58913	58932	58948	58962	58973
	6020	5363	4795	4299	3866	3486	3152	2857	2595	2362	2155	1970	1804	1655	1521	1400	1290	1191	1005	858	735	631	543	467	403	
	348	301	261	226	196	170	147	128	111	97	84	73	63	55	48	42	36	32	28	24	21	18	16	14	12	
1923.		5707	10809	15384	19498	23207	26561	29601	32362	34875	37168	39264	41184	42945	44563	46053	47426	48693	49763	50676	51459	52130	52707	53204	53633	
	54004	54324	54601	54841	55050	55230	55387	55523	55641	55744	55834	55911	55979	56037	56088	56133	56171	56205	56234	56260	56282	56301	56318	56333	56345	56357
	5707	5102	4575	4114	3710	3354	3040	2761	2513	2293	2096	1920	1761	1618	1490	1373	1268	1070	913	782	671	577	497	429	370	
	320	277	240	208	181	157	136	118	103	89	78	67	59	51	44	39	34	29	25	22	19	17	15	13	11	
1924.		5411	10262	14626	18560	22116	25340	28268	30933	33365	35588	37624	39492	41208	42788	44244	45588	46722	47691	48521	49233	49845	50372	50827	51220	
	51559	51853	52108	52329	52521	52687	52831	52957	53066	53160	53243	53314	53377	53431	53478	53519	53554	53585	53612	53636	53656	53674	53690	53703	53715	53725
	5411	4851	4363	3934	3557	3224	2928	2666	2432	2223	2036	1868	1716	1580	1456	1344	1134	969	830	712	612	527	455	393	340	
	294	255	221	192	166	144	125	109	95	82	72	62	54	47	41	36	31	27	23	20	18	16	13	12	10	
1925.		5129	9742	13901	17661	21063	24164	26982	29553	31903	34056	36030	37845	39515	41054	42475	43675	44699	45576	46328	46976	47533	48014	48429	48788	
	49099	49368	49602	49804	49980	50133	50265	50381	50481	50568	50644	50709	50767	50816	50860	50897	50930	50959	50983	51005	51024	51041	51055	51068	51078	51088
	5129	4613	4159	3760	3408	3096	2818	2571	2350	2153	1974	1814	1670	1539	1421	1199	1024	877	753	647	557	481	415	359	311	
	269	233	203	176	153	133	115	100	87	76	66	57	50	43	38	33	28	25	22	19	17	14	13	11	9	
1926.		4862	9246	13209	16801	20065	23035	25745	28222	30491	32572	34484	36245	37867	39365	40629	41709	42633	43427	44109	44696	45204	45641	46020	46347	
	46631	46877	47091	47276	47437	47577	47698	47804	47896	47975	48045	48105	48157	48203	48243	48277	48307	48333	48356	48376	48394	48409	48422	48433	48443	48452
	4862	4384	3963	3592	3263	2970	2710	2477	2269	2081	1912	1760	1623	1498	1264	1079	924	793	682	587	507	438	378	328	284	
	246	214	185	161	140	122	106	92	80	69	60	52	46	40	35	30	26	23	20	18	15	13	11	10	9	
1927.		4608	8774	12550	15979	19102	21950	24554	26939	29126	31136	32986	34692	36267	37595	38730	39702	40536	41253	41870	42403	42863	43261	43605	43904	
	44162	44387	44582	44751	44897	45025	45136	45233	45317	45389	45453	45508	45556	45598	45634	45666	45693	45717	45738	45756	45772	45786	45798	45808	45818	45826
	4608	4166	3776	3430	3122	2848	2604	2385	2187	2010	1850	1705	1575	1329	1135	972	834	717	617	533	460	398	344	298	259	
	224	195	169	147	128	111	97	84	73	63	55	48	42	36	32	27	24	21	18	16	14	12	10	9	8	
1928.		4367	8325	11921	15194	18180	20909	23409	25702	27810	29749	31537	33188	34581	35770	36789	37663	38415	39062	39621	40103	40520	40881	41194	41465	
	41700	41904	42082	42236	42370	42486	42587	42675	42751	42819	42876	42926	42970	43008	43041	43070	43095	43117	43136	43153	43167	43180	43191	43200	43209	43216
	4367	3958	3593	3273	2986	2730	2500	2293	2107	1940	1788	1651	1393	1186	1019	874	752	647	559	482	417	361	313	271	235	
	204	177	154	134	116	101	88	76	66	58	50	44	38	33	28	25	22	19	16	15	13	11	10	9	7	
1929.		4139	7899	11321	14444	17298	19912	22310	24513	26541	28411	30137	31594	32837	33902	34817	35603	36279	36864	37368	37804	38182	38509	38792	39038	
	39252	39437	39598	39738	39860	39966	40058	40137	40207	40267	40320	40366	40406	40440	40470	40496	40519	40540	40557	40572	40585	40597	40607	40616	40623	40630
	4139	3760	3422	3122	2854	2614	2398	2203	2028	1870	1726	1457	1244	1065	914	786	677	584	504	436	378	327	283	246	213	
	185	161	140	122	106	92	80	69	60	53	46	40	35	30	26	23	20	17	15	13	11	10	9	8	7	

ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION per 100,000 up to the age of 50 years for cohorts born from 1930 to 1939 APPENDIX TABLE A
ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION (The Netherlands)

ESTIMATION DE LA PREVALENCE DE L'INFECTION TUBERCULEUSE pour 100,000 sujets, jusqu'à l'âge de 50 ans, appartenant aux cohortes
ESTIMATION DE L'INCIDENCE DE LA PRIMO-INFECTION TUBERCULEUSE nées de 1930 à 1939 (Pays-Bas)

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1930.		3922	7492	10749	13727	16454	18955	21254	23370	25320	27120	28840	29937	31048	32002	32822	33528	34138	34664	35119	35513	35854	36149	36406	36629	
	36822	36990	37136	37263	37374	37469	37553	37625	37688	37743	37791	37832	37868	37900	37927	37951	37972	37990	38006	38020	38032	38042	38052	38060	38066	38073
	3922	3570	3257	2977	2727	2501	2298	2116	1950	1801	1520	1297	1111	954	820	706	610	526	455	394	341	296	257	223	193	
	168	146	127	110	96	83	72	63	55	48	42	36	31	27	24	21	18	16	14	12	11	9	8	7	6	
1931.		3716	7106	10205	13044	15647	18039	20242	22271	24145	25727	27077	28234	29226	30080	30815	31449	31997	32470	32880	33235	33543	33810	34042	34243	
	34418	34570	34702	34817	34917	35003	35079	35144	35201	35251	35295	35332	35365	35393	35418	35440	35459	35476	35490	35502	35513	35523	35531	35538	35545	35550
	3716	3390	3099	2838	2603	2392	2202	2030	1874	1582	1350	1157	993	854	735	634	548	473	410	355	308	267	232	201	175	
	152	132	115	100	87	75	66	57	50	43	38	32	28	25	22	19	17	14	12	11	10	8	7	6	6	
1932.		3521	6740	9688	12391	14876	17163	19272	21218	22860	24263	25464	26495	27381	28145	28804	29372	29864	30290	30658	30978	31256	31496	31705	31887	
	32045	32182	32301	32405	32495	32573	32641	32701	32752	32797	32836	32870	32900	32926	32949	32968	32985	33000	33013	33024	33034	33043	33050	33057	33063	33069
	3521	3219	2948	2704	2485	2287	2108	1946	1643	1402	1201	1031	886	763	659	569	492	426	369	320	277	241	209	182	158	
	137	119	104	90	78	68	59	52	45	39	34	30	26	23	19	17	15	13	11	10	9	7	7	6	6	
1933.		3336	6392	9194	11769	14140	16325	18343	20045	21499	22744	23812	24731	25522	26205	26795	27304	27746	28128	28459	28747	28996	29213	29401	29565	
	29707	29831	29938	30031	30112	30183	30244	30298	30345	30385	30420	30451	30478	30501	30522	30540	30555	30568	30580	30590	30599	30607	30614	30620	30626	30633
	3336	3056	2803	2575	2371	2185	2017	1703	1454	1245	1068	919	791	683	590	510	441	382	331	288	249	217	188	164	142	
	124	107	93	81	71	61	54	47	40	35	31	27	24	20	18	15	13	12	10	9	8	7	6	6	6	
1934.		3161	6060	8724	11177	13438	15525	17286	18790	20078	21183	22134	22952	23658	24268	24795	25252	25647	25990	26288	26546	26770	26965	27134	27281	
	27409	27520	27617	27701	27774	27837	27893	27941	27983	28019	28050	28079	28103	28124	28143	28158	28172	28184	28195	28204	28212	28219	28226	28232	28239	28245
	3161	2899	2664	2453	2261	2087	1761	1504	1288	1105	951	818	707	610	527	456	395	343	298	258	224	195	169	147	128	
	111	96	84	73	64	56	48	42	36	32	28	24	21	19	16	14	12	11	9	8	7	6	6	6	6	
1935.		2994	5745	8278	10612	12767	14586	16139	17469	18610	19592	20437	21167	21796	22341	22812	23220	23574	23882	24148	24379	24580	24755	24907	25040	
	25154	25254	25341	25416	25482	25539	25589	25632	25669	25702	25731	25756	25778	25797	25813	25827	25840	25851	25861	25869	25876	25883	25890	25896	25903	25910
	2994	2751	2533	2334	2155	1819	1553	1330	1141	982	845	730	630	544	471	408	354	307	266	231	201	175	152	132	115	
	100	87	75	66	57	50	43	37	33	29	25	22	19	16	14	13	11	10	8	7	7	7	7	7	7	
1936.		2836	5447	7853	10075	11950	13551	14922	16098	17110	17981	18733	19383	19944	20430	20851	21216	21532	21807	22045	22253	22433	22590	22726	22844	
	22947	23036	23114	23182	23241	23292	23337	23375	23409	23439	23465	23487	23507	23524	23538	23551	23563	23573	23581	23589	23595	23602	23609	23616	23623	23630
	2836	2611	2406	2222	1875	1601	1371	1177	1012	871	752	649	561	486	421	365	317	275	238	207	180	157	136	118	103	
	89	78	68	59	51	44	38	34	30	26	22	20	17	15	13	11	10	8	8	7	7	7	7	7	7	
1937.		2687	5164	7450	9380	11027	12438	13649	14691	15587	16361	17030	17607	18107	18540	18916	19242	19525	19770	19983	20169	20330	20471	20592	20698	
	20790	20870	20940	21000	21053	21099	21139	21173	21204	21231	21254	21274	21291	21306	21320	21332	21342	21350	21358	21365	21372	21380	21387	21394	21401	21408
	2687	2477	2287	1930	1647	1411	1211	1041	897	774	668	577	500	433	376	326	283	245	213	186	161	140	122	106	92	
	80	70	61	53	46	39	35	31	27	23	20	17	15	13	12	10	9	8	7	7	7	7	7	7	7	
1938.		2545	4895	6878	8571	10021	11265	12335	13257	14052	14739	15332	15846	16291	16677	17012	17303	17555	17774	17965	18131	18275	18400	18508	18603	
	18685	18756	18819	18873	18920	18961	18997	19028	19056	19079	19100	19118	19133	19147	19159	19170	19179	19187	19194	19201	19209	19216	19223	19230	19238	19245
	2545	2350	1983	1693	1450	1244	1070	921	795	687	593	514	445	386	335	290	252	219	191	166	144	125	109	95	82	
	72	63	54	47	41	36	32	28	23	21	18	15	14	12	11	9	8	7	7	7	7	7	7	7	7	
1939.		2411	4446	6183	7671	8948	10046	10991	11807	12512	13121	13648	14105	14501	14845	15143	15402	15627	15823	15993	16140	16269	16380	16477	16561	
	16635	16699	16755	16803	16845	16881	16914	16942	16966	16988	17006	17022	17036	17048	17059	17068	17076	17084	17091	17099	17106	17114	17121	17129	17136	17144
	2411	2035	1737	1488	1277	1098	945	816	705	609	527	457	396	344	298	259	225	196	170	148	128	111	97	84	73	
	64	56	49	42	37	32	28	24	22	18	16	14	12	11	9	8	7	7	7	7	7	7	7	7	7	

ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION
ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION

per 100,000 up to the age of 50 years for cohorts born from 1940 to 1949 (The Netherlands) APPENDIX TABLE A

ESTIMATION DE LA PREVALENCE DE L'INFECTION TUBERCULEUSE
ESTIMATION DE L'INCIDENCE DE LA PRIMO-INFECTION TUBERCULEUSE

pour 100,000 sujets, jusqu'à l'âge de 50 ans, appartenant aux cohortes nées de 1940 à 1949 (Pays-Bas)

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50'
1940.		2085	3865	5390	6698	7823	8792	9629	10351	10975	11515	11983	12389	12741	13046	13312	13542	13743	13917	14069	14200	14314	14414	14500	14575	
	14641	14698	14748	14790	14828	14861	14890	14915	14937	14955	14972	14986	14999	15010	15019	15028	15035	15043	15051	15058	15066	15074	15081	15089	15097	15104
	2085	1780	1525	1308	1125	969	836	722	624	540	468	406	352	305	265	231	201	174	152	131	114	99	86	75	66	
	57	49	43	37	33	29	25	22	19	16	14	13	11	9	8	8	8	8	8	8	8	8	8	8	8	
1941.		1818	3375	4711	5861	6850	7704	8442	9079	9631	10109	10523	10883	11195	11466	11701	11906	12084	12239	12373	12490	12591	12679	12756	12823	
	12882	12932	12976	13014	13048	13078	13103	13125	13145	13161	13176	13189	13200	13210	13218	13226	13234	13242	13250	13257	13265	13273	13281	13289	13296	13304
	1818	1557	1336	1149	989	854	737	637	552	478	414	360	312	271	236	205	178	155	134	117	102	88	77	67	58	
	51	44	38	34	30	25	23	19	17	15	13	11	10	9	8	8	8	8	8	8	8	8	8	8	8	
1942.		1586	2947	4118	5125	5995	6746	7395	7957	8444	8866	9233	9551	9826	10066	10275	10456	10614	10750	10869	10973	11063	11141	11209	11269	
	11320	11364	11403	11438	11468	11494	11517	11536	11553	11568	11581	11593	11603	11611	11619	11627	11635	11643	11651	11659	11667	11675	11683	11691	11699	11707
	1586	1361	1170	1008	870	751	649	562	487	422	366	318	276	240	209	181	158	137	119	103	90	78	68	59	51	
	44	39	35	30	26	23	19	17	15	13	11	10	9	8	8	8	8	8	8	8	8	8	8	8	8	
1943.		1383	2572	3596	4480	5244	5903	6474	6969	7398	7770	8093	8373	8617	8829	9013	9173	9312	9433	9538	9629	9709	9778	9839	9891	
	9936	9976	10011	10041	10067	10091	10111	10128	10143	10156	10168	10178	10187	10195	10203	10211	10219	10227	10236	10244	10252	10260	10268	10276	10284	10292
	1383	1189	1024	884	763	660	571	495	429	372	323	280	244	212	184	160	139	121	105	91	80	70	60	52	45	
	40	35	31	26	23	20	17	15	13	12	10	9	8	8	8	8	8	8	8	8	8	8	8	8	8	
1944.		1206	2244	3141	3915	4583	5163	5664	6099	6477	6804	7088	7335	7550	7737	7899	8040	8163	8269	8362	8443	8513	8574	8627	8673	
	8713	8749	8780	8806	8830	8850	8867	8883	8897	8908	8918	8927	8936	8944	8952	8960	8968	8977	8985	8993	9001	9009	9018	9026	9034	9042
	1206	1038	896	774	669	579	502	435	377	327	284	247	215	187	162	141	122	107	93	81	70	61	53	46	40	
	36	31	26	24	20	17	15	14	12	10	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
1945.		1051	1958	2742	3419	4005	4513	4953	5335	5666	5954	6204	6422	6611	6775	6918	7042	7149	7243	7325	7396	7458	7512	7558	7599	
	7635	7666	7693	7717	7737	7755	7771	7784	7796	7807	7816	7824	7832	7841	7849	7857	7866	7874	7882	7890	7899	7907	7915	7924	7932	7940
	1051	907	783	677	586	508	440	382	331	288	250	218	189	164	143	124	108	94	82	71	62	54	46	41	36	
	31	27	24	20	18	16	14	12	10	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
1946.		917	1709	2393	2985	3498	3943	4329	4664	4955	5208	5428	5619	5785	5929	6054	6163	6258	6340	6413	6475	6530	6576	6617	6654	
	6686	6713	6737	6757	6775	6791	6805	6817	6827	6837	6845	6853	6862	6870	6879	6887	6895	6904	6912	6920	6929	6937	6946	6954	6962	6971
	917	792	684	592	513	445	386	335	291	253	220	191	166	144	125	109	95	82	72	63	54	47	41	36	32	
	27	24	21	18	16	14	12	10	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
1947.		799	1489	2087	2605	3054	3444	3782	4075	4331	4553	4745	4913	5059	5185	5295	5390	5474	5546	5610	5664	5712	5753	5790	5822	
	5849	5874	5894	5912	5928	5942	5955	5965	5974	5983	5991	6000	6008	6017	6025	6034	6042	6051	6059	6067	6076	6084	6093	6101	6110	6118
	799	690	598	518	449	390	338	293	255	222	193	168	145	126	110	96	83	73	63	55	47	41	37	32	27	
	24	21	18	16	14	12	10	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
1948.		696	1299	1821	2274	2666	3007	3303	3560	3784	3978	4147	4294	4421	4532	4628	4712	4786	4849	4905	4952	4994	5031	5063	5091	
	5116	5136	5154	5171	5185	5197	5208	5217	5226	5234	5243	5251	5260	5268	5277	5285	5294	5302	5311	5319	5328	5336	5345	5353	5362	5370
	696	603	522	453	393	341	296	257	224	194	169	147	127	111	96	84	73	64	55	48	42	37	32	28	25	
	21	18	16	14	12	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1949.		607	1133	1589	1984	2327	2625	2884	3109	3305	3475	3623	3751	3863	3960	4044	4118	4183	4238	4286	4328	4365	4398	4426	4451	
	4472	4490	4506	4520	4533	4543	4553	4561	4570	4579	4587	4596	4604	4613	4621	4630	4639	4647	4656	4664	4673	4682	4690	4699	4707	4716
	607	526	456	396	343	298	259	225	196	170	148	128	112	97	85	74	64	56	48	42	37	33	28	25	21	
	18	16	14	12	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	

ESTIMATED PREVALENCE OF TUBERCULOUS INFECTION
ESTIMATED INCIDENCE OF NEW TUBERCULOUS INFECTION

per 100,000 up to the age of 50 years for cohorts born from 1950 to 1960 (The Netherlands) APPENDIX TABLE A

ESTIMATION DE LA PREVALENCE DE L'INFECTION TUBERCULEUSE
ESTIMATION DE L'INCIDENCE DE LA PRIMO-INFECTION TUBERCULEUSE

pour 100,000 sujets, jusqu'à l'âge de 50 ans, appartenant aux cohortes nées de 1950 a 1960 (Pays-Bas)

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50'
1950.		529	988	1386	1731	2030	2291	2518	2715	2886	3034	3163	3276	3373	3458	3533	3597	3653	3702	3744	3781	3814	3842	3867	3888	
	3906	3923	3937	3950	3960	3970	3979	3987	3996	4004	4013	4022	4030	4039	4048	4056	4065	4074	4082	4091	4099	4108	4117	4125	4134	4143
	529	459	398	345	300	261	227	197	171	149	129	112	98	85	74	65	56	48	42	38	33	28	25	21	18	
	16	14	12	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1951.		461	861	1208	1509	1771	1999	2197	2369	2519	2648	2761	2860	2945	3020	3085	3141	3189	3232	3270	3303	3331	3356	3377	3395	
	3412	3426	3439	3450	3459	3468	3477	3485	3494	3503	3511	3520	3529	3537	3546	3555	3563	3572	3581	3589	3598	3607	3615	3624	3633	3641
	461	400	347	301	262	228	198	172	149	130	113	98	85	75	65	56	48	43	38	33	28	25	21	18	16	
	14	13	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1952.		402	751	1053	1317	1545	1744	1917	2067	2198	2311	2410	2496	2571	2636	2692	2741	2784	2822	2855	2883	2908	2930	2948	2965	
	2979	2992	3002	3012	3021	3030	3038	3047	3056	3064	3073	3082	3091	3099	3108	3117	3125	3134	3143	3152	3160	3169	3178	3186	3195	3204
	402	349	303	263	229	199	173	150	130	113	99	86	75	65	56	49	43	38	33	28	25	21	18	16	15	
	13	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1953.		350	654	918	1148	1348	1521	1672	1803	1917	2016	2102	2177	2243	2300	2348	2391	2430	2463	2491	2516	2538	2556	2573	2587	
	2600	2611	2621	2629	2638	2647	2656	2664	2673	2682	2691	2699	2708	2717	2726	2734	2743	2752	2761	2769	2778	2787	2796	2804	2813	2822
	350	304	264	230	200	174	151	131	114	99	86	75	66	57	49	43	38	33	28	25	21	19	17	15	13	
	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1954.		305	570	801	1001	1175	1327	1458	1572	1672	1758	1834	1900	1956	2006	2049	2087	2120	2148	2174	2195	2214	2231	2245	2258	
	2269	2279	2287	2296	2305	2314	2323	2331	2340	2349	2358	2366	2375	2384	2393	2402	2410	2419	2428	2437	2446	2454	2463	2472	2481	2489
	305	265	231	200	174	151	131	114	99	87	76	66	57	49	43	38	33	28	25	22	19	17	15	13	11	
	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1955.		266	497	698	873	1025	1156	1271	1371	1458	1533	1599	1657	1706	1749	1787	1821	1849	1875	1896	1915	1932	1946	1959	1970	
	1980	1988	1997	2006	2015	2024	2033	2041	2050	2059	2068	2077	2085	2094	2103	2112	2121	2129	2138	2147	2156	2165	2173	2182	2191	2200
	266	231	201	175	152	132	115	100	87	76	66	57	49	43	38	33	28	26	22	19	17	15	13	11	10	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1956.		232	434	609	761	893	1008	1108	1195	1271	1337	1394	1444	1487	1525	1559	1587	1613	1635	1653	1670	1685	1698	1708	1718	
	1727	1736	1745	1754	1762	1771	1780	1789	1798	1807	1815	1824	1833	1842	1851	1860	1868	1877	1886	1895	1904	1913	1921	1930	1939	1948
	232	202	175	152	132	115	100	87	76	66	57	49	43	38	33	29	26	22	19	17	15	13	11	10	9	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1957.		202	378	530	662	778	878	965	1041	1108	1165	1214	1258	1296	1330	1359	1384	1406	1425	1441	1456	1469	1480	1490	1498	
	1507	1516	1525	1534	1543	1552	1561	1569	1578	1587	1596	1605	1614	1623	1631	1640	1649	1658	1667	1676	1684	1693	1702	1711	1720	1729
	202	176	152	132	115	100	87	76	66	57	49	43	39	34	29	26	22	19	17	15	13	11	10	9	9	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1958.		176	329	461	577	677	765	841	907	965	1014	1058	1097	1130	1159	1185	1206	1225	1242	1257	1269	1280	1290	1299	1308	
	1317	1326	1335	1344	1352	1361	1370	1379	1388	1397	1406	1415	1423	1432	1441	1450	1459	1468	1477	1485	1494	1503	1512	1521	1530	1539
	176	153	133	115	100	87	76	66	57	50	44	39	34	29	26	22	19	17	15	13	11	10	9	9	9	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1959.		153	286	401	502	590	666	733	790	840	884	922	956	985	1010	1032	1051	1068	1083	1095	1106	1116	1125	1134	1143	
	1152	1161	1170	1178	1187	1196	1205	1214	1223	1232	1241	1250	1258	1267	1276	1285	1294	1303	1312	1321	1330	1338	1347	1356	1365	1374
	153	133	116	101	88	77	67	58	50	44	39	34	29	26	22	19	17	15	13	11	10	9	9	9	9	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
1960.		133	249	350	437	514	581	638	688	732	770	804	833	859	880	899	916	931	944	955	965	974	982	991	1000	
	1009	1018	1027	1036	1045	1054	1063	1072	1080	1089	1098	1107	1116	1125	1134	1143	1152	1161	1169	1178	1187	1196	1205	1214	1223	1232
	133	116	101	88	77	67	58	50	44	39	34	29	26	22	19	17	15	13	11	10	9	9	9	9	9	
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 5.5 YEARS (5 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 5.5 ANS (5 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant
0.2	0.035	0.037	0.033	0.039	0.032	0.041	0.030	0.042	0.028	0.044	0.026	0.046	0.025	0.048
0.4	0.071	0.074	0.067	0.078	0.063	0.081	0.060	0.085	0.056	0.088	0.053	0.092	0.050	0.096
0.6	0.106	0.112	0.101	0.117	0.095	0.122	0.090	0.127	0.085	0.133	0.080	0.138	0.075	0.143
0.8	0.142	0.149	0.134	0.156	0.127	0.163	0.120	0.170	0.113	0.177	0.106	0.184	0.100	0.191
1.0	0.178	0.187	0.168	0.195	0.159	0.204	0.150	0.212	0.141	0.221	0.133	0.230	0.125	0.239
1.5	0.267	0.281	0.252	0.293	0.238	0.306	0.225	0.319	0.212	0.333	0.200	0.346	0.188	0.360
2.0	0.357	0.375	0.337	0.392	0.319	0.409	0.301	0.426	0.283	0.444	0.267	0.462	0.251	0.481
2.5	0.447	0.470	0.422	0.491	0.399	0.512	0.377	0.534	0.355	0.556	0.334	0.579	0.315	0.602
3.0	0.537	0.565	0.508	0.590	0.480	0.616	0.453	0.642	0.427	0.669	0.402	0.696	0.378	0.724
3.5	0.628	0.660	0.594	0.690	0.561	0.720	0.530	0.751	0.499	0.782	0.470	0.814	0.443	0.846
4.0	0.719	0.756	0.680	0.790	0.643	0.825	0.607	0.860	0.572	0.896	0.539	0.932	0.507	0.969
4.5	0.811	0.852	0.767	0.891	0.725	0.930	0.684	0.969	0.645	1.010	0.607	1.051	0.572	1.092
5.0	0.903	0.949	0.854	0.992	0.807	1.035	0.762	1.079	0.718	1.124	0.676	1.170	0.637	1.216
5.5	0.996	1.046	0.942	1.093	0.890	1.141	0.840	1.189	0.792	1.239	0.746	1.289	0.702	1.340
6.0	1.088	1.144	1.029	1.195	0.973	1.247	0.918	1.300	0.866	1.354	0.815	1.409	0.767	1.465
6.5	1.182	1.242	1.118	1.297	1.056	1.354	0.997	1.412	0.940	1.470	0.885	1.530	0.833	1.590
7.0	1.276	1.340	1.206	1.400	1.140	1.461	1.076	1.523	1.015	1.587	0.956	1.651	0.899	1.716
7.5	1.369	1.439	1.295	1.503	1.224	1.569	1.155	1.636	1.090	1.703	1.026	1.772	0.966	1.842
8.0	1.464	1.538	1.385	1.607	1.308	1.677	1.235	1.748	1.165	1.821	1.097	1.894	1.033	1.969
9.0	1.654	1.738	1.565	1.816	1.479	1.895	1.396	1.975	1.316	2.057	1.240	2.140	1.167	2.224
10.0	1.846	1.940	1.747	2.026	1.651	2.114	1.558	2.204	1.470	2.295	1.385	2.388	1.303	2.481
11.0	2.040	2.143	1.930	2.239	1.824	2.336	1.722	2.435	1.624	2.535	1.530	2.637	1.440	2.741
12.0	2.236	2.349	2.115	2.453	1.999	2.559	1.887	2.668	1.780	2.778	1.677	2.889	1.579	3.003
13.0	2.433	2.556	2.302	2.670	2.176	2.785	2.054	2.903	1.938	3.022	1.826	3.144	1.719	3.267
14.0	2.632	2.765	2.491	2.888	2.354	3.013	2.223	3.140	2.097	3.269	1.976	3.400	1.860	3.533
15.0	2.833	2.977	2.681	3.108	2.535	3.243	2.393	3.379	2.258	3.518	2.128	3.659	2.003	3.802
16.0	3.037	3.190	2.874	3.331	2.717	3.475	2.565	3.621	2.420	3.769	2.281	3.920	2.147	4.073
17.0	3.242	3.405	3.068	3.556	2.900	3.709	2.739	3.865	2.584	4.023	2.436	4.184	2.293	4.346
18.0	3.449	3.623	3.264	3.782	3.086	3.945	2.915	4.111	2.750	4.279	2.592	4.450	2.440	4.622
19.0	3.658	3.842	3.463	4.012	3.274	4.184	3.092	4.359	2.918	4.538	2.750	4.718	2.589	4.901
20.0	3.870	4.064	3.663	4.243	3.463	4.425	3.271	4.610	3.087	4.799	2.910	4.989	2.740	5.182
22.0	4.299	4.515	4.070	4.713	3.849	4.915	3.636	5.120	3.431	5.328	3.234	5.539	3.046	5.753
24.0	4.736	4.975	4.486	5.192	4.242	5.414	4.008	5.640	3.783	5.869	3.566	6.101	3.359	6.335
26.0	5.186	5.445	4.911	5.682	4.645	5.924	4.389	6.171	4.143	6.420	3.906	6.673	3.679	6.929
28.0	5.644	5.925	5.345	6.183	5.057	6.446	4.779	6.713	4.511	6.983	4.254	7.258	4.007	7.535
30.0	6.113	6.417	5.790	6.695	5.478	6.979	5.178	7.267	4.888	7.559	4.610	7.855	4.343	8.154
32.0	6.594	6.920	6.246	7.219	5.910	7.524	5.587	7.834	5.275	8.148	4.975	8.466	4.688	8.787
34.0	7.086	7.435	6.713	7.756	6.353	8.082	6.006	8.414	5.671	8.750	5.350	9.090	5.042	9.434
36.0	7.590	7.963	7.192	8.306	6.807	8.654	6.436	9.008	6.078	9.367	5.735	9.730	5.405	10.10

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 6.5 YEARS (6 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 6.5 ANS (6 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected / Pourcentage de sujets déjà infectés	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant
0.2	0.030	0.031	0.028	0.032	0.026	0.033	0.024	0.035	0.023	0.036	0.021	0.037	0.020	0.038
0.4	0.060	0.063	0.056	0.065	0.052	0.067	0.049	0.069	0.045	0.071	0.042	0.073	0.039	0.075
0.6	0.090	0.094	0.084	0.097	0.078	0.101	0.073	0.104	0.068	0.107	0.063	0.110	0.059	0.113
0.8	0.120	0.126	0.112	0.130	0.105	0.134	0.098	0.138	0.091	0.143	0.085	0.147	0.079	0.151
1.0	0.150	0.157	0.140	0.163	0.131	0.168	0.122	0.173	0.114	0.178	0.106	0.183	0.098	0.188
1.5	0.225	0.236	0.210	0.244	0.197	0.252	0.183	0.260	0.171	0.268	0.159	0.276	0.148	0.283
2.0	0.300	0.316	0.281	0.327	0.263	0.337	0.245	0.348	0.228	0.358	0.213	0.368	0.198	0.378
2.5	0.376	0.396	0.352	0.409	0.329	0.422	0.307	0.436	0.286	0.449	0.266	0.461	0.248	0.474
3.0	0.453	0.476	0.423	0.492	0.396	0.508	0.369	0.524	0.344	0.539	0.320	0.555	0.298	0.570
3.5	0.529	0.556	0.495	0.575	0.463	0.594	0.432	0.612	0.403	0.631	0.375	0.648	0.348	0.666
4.0	0.606	0.637	0.567	0.659	0.530	0.680	0.495	0.701	0.461	0.722	0.429	0.743	0.399	0.763
4.5	0.683	0.718	0.639	0.743	0.598	0.767	0.558	0.791	0.520	0.814	0.484	0.837	0.450	0.860
5.0	0.761	0.800	0.712	0.827	0.666	0.854	0.621	0.880	0.579	0.907	0.539	0.932	0.501	0.957
5.5	0.839	0.882	0.785	0.912	0.734	0.941	0.685	0.971	0.638	0.999	0.594	1.028	0.552	1.055
6.0	0.917	0.964	0.858	0.997	0.802	1.029	0.749	1.061	0.698	1.093	0.650	1.123	0.604	1.154
6.5	0.996	1.047	0.932	1.082	0.871	1.117	0.813	1.152	0.758	1.186	0.706	1.220	0.656	1.252
7.0	1.075	1.130	1.006	1.168	0.940	1.206	0.878	1.243	0.818	1.280	0.762	1.316	0.708	1.352
7.5	1.154	1.213	1.080	1.254	1.010	1.295	0.943	1.335	0.879	1.375	0.818	1.413	0.760	1.451
8.0	1.234	1.297	1.155	1.341	1.080	1.384	1.008	1.427	0.940	1.470	0.875	1.511	0.813	1.551
9.0	1.394	1.465	1.305	1.515	1.220	1.564	1.139	1.613	1.062	1.661	0.989	1.707	0.919	1.753
10.0	1.557	1.636	1.457	1.691	1.362	1.746	1.272	1.800	1.186	1.853	1.104	1.905	1.026	1.956
11.0	1.720	1.808	1.611	1.869	1.506	1.929	1.406	1.989	1.311	2.048	1.220	2.105	1.134	2.162
12.0	1.885	1.981	1.765	2.048	1.651	2.114	1.541	2.180	1.437	2.244	1.338	2.307	1.244	2.369
13.0	2.052	2.156	1.922	2.229	1.797	2.301	1.678	2.372	1.564	2.442	1.456	2.511	1.354	2.578
14.0	2.221	2.333	2.080	2.412	1.945	2.490	1.816	2.567	1.693	2.642	1.576	2.716	1.466	2.789
15.0	2.391	2.512	2.239	2.597	2.094	2.680	1.955	2.763	1.823	2.844	1.697	2.924	1.578	3.002
16.0	2.563	2.692	2.400	2.783	2.244	2.873	2.096	2.961	1.954	3.048	1.820	3.133	1.692	3.217
17.0	2.736	2.875	2.563	2.971	2.397	3.067	2.238	3.161	2.087	3.254	1.944	3.345	1.808	3.434
18.0	2.912	3.059	2.727	3.162	2.551	3.263	2.382	3.364	2.222	3.462	2.069	3.559	1.924	3.653
19.0	3.089	3.245	2.893	3.354	2.706	3.461	2.528	3.568	2.357	3.672	2.195	3.774	2.042	3.874
20.0	3.268	3.433	3.061	3.548	2.863	3.662	2.675	3.774	2.495	3.884	2.323	3.992	2.161	4.098
22.0	3.632	3.815	3.403	3.942	3.183	4.069	2.973	4.193	2.774	4.315	2.583	4.435	2.403	4.552
24.0	4.004	4.205	3.752	4.345	3.510	4.484	3.279	4.621	3.059	4.756	2.850	4.887	2.651	5.016
26.0	4.384	4.604	4.109	4.757	3.844	4.909	3.592	5.059	3.351	5.206	3.122	5.349	2.905	5.490
28.0	4.774	5.012	4.474	5.179	4.187	5.344	3.912	5.506	3.651	5.666	3.401	5.822	3.165	5.974
30.0	5.172	5.430	4.848	5.610	4.538	5.789	4.241	5.964	3.957	6.136	3.688	6.305	3.431	6.470
32.0	5.581	5.858	5.232	6.052	4.897	6.244	4.577	6.433	4.272	6.618	3.981	6.800	3.705	6.977
34.0	6.000	6.297	5.625	6.505	5.266	6.711	4.923	6.913	4.595	7.112	4.283	7.306	3.986	7.496
36.0	6.429	6.748	6.029	6.970	5.645	7.189	5.278	7.406	4.927	7.618	4.593	7.826	4.275	8.028

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 7.5 YEARS (7 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 7.5 ANS (7 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected / Pourcentage de sujets déjà infectés	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant	Risk this year / Risque cette année-là	Risk 5 years ago / Risque 5 ans auparavant
0.2	0.026	0.027	0.024	0.028	0.022	0.028	0.020	0.029	0.019	0.029	0.017	0.030	0.016	0.030
0.4	0.051	0.054	0.048	0.055	0.044	0.057	0.041	0.058	0.037	0.059	0.034	0.060	0.032	0.060
0.6	0.077	0.081	0.072	0.083	0.066	0.085	0.061	0.087	0.056	0.088	0.052	0.089	0.047	0.091
0.8	0.103	0.108	0.095	0.111	0.088	0.113	0.081	0.115	0.075	0.118	0.069	0.119	0.063	0.121
1.0	0.129	0.136	0.119	0.139	0.110	0.142	0.102	0.144	0.094	0.147	0.086	0.149	0.079	0.151
1.5	0.194	0.204	0.180	0.209	0.166	0.213	0.153	0.217	0.141	0.221	0.130	0.225	0.119	0.228
2.0	0.259	0.272	0.240	0.279	0.222	0.285	0.205	0.290	0.188	0.295	0.173	0.300	0.159	0.304
2.5	0.325	0.341	0.301	0.349	0.278	0.357	0.256	0.364	0.236	0.370	0.217	0.376	0.199	0.381
3.0	0.390	0.410	0.361	0.420	0.334	0.429	0.308	0.437	0.284	0.445	0.261	0.452	0.240	0.458
3.5	0.456	0.480	0.423	0.491	0.391	0.501	0.361	0.511	0.332	0.520	0.305	0.528	0.280	0.536
4.0	0.523	0.549	0.484	0.562	0.448	0.574	0.413	0.586	0.380	0.596	0.350	0.605	0.321	0.614
4.5	0.589	0.620	0.546	0.634	0.505	0.648	0.466	0.660	0.429	0.672	0.394	0.682	0.362	0.692
5.0	0.656	0.690	0.608	0.706	0.562	0.721	0.519	0.735	0.478	0.748	0.439	0.760	0.403	0.771
5.5	0.724	0.761	0.670	0.778	0.620	0.795	0.572	0.811	0.527	0.825	0.484	0.838	0.444	0.850
6.0	0.791	0.832	0.733	0.851	0.678	0.869	0.625	0.886	0.576	0.902	0.530	0.916	0.486	0.929
6.5	0.859	0.903	0.796	0.924	0.736	0.944	0.679	0.962	0.625	0.979	0.575	0.995	0.528	1.008
7.0	0.927	0.975	0.859	0.997	0.794	1.019	0.733	1.039	0.675	1.057	0.621	1.074	0.570	1.089
7.5	0.996	1.047	0.923	1.071	0.853	1.094	0.787	1.115	0.725	1.135	0.667	1.153	0.612	1.169
8.0	1.065	1.119	0.986	1.145	0.912	1.170	0.842	1.192	0.775	1.213	0.713	1.233	0.654	1.250
9.0	1.204	1.265	1.115	1.294	1.031	1.322	0.952	1.348	0.877	1.371	0.806	1.393	0.740	1.412
10.0	1.344	1.412	1.245	1.445	1.151	1.476	1.062	1.504	0.979	1.531	0.900	1.555	0.826	1.576
11.0	1.485	1.561	1.376	1.597	1.272	1.631	1.174	1.663	1.082	1.692	0.995	1.718	0.913	1.742
12.0	1.628	1.711	1.508	1.750	1.395	1.788	1.288	1.822	1.186	1.854	1.091	1.883	1.001	1.909
13.0	1.772	1.862	1.642	1.905	1.519	1.946	1.402	1.984	1.292	2.018	1.188	2.050	1.090	2.078
14.0	1.918	2.015	1.777	2.062	1.644	2.106	1.517	2.146	1.398	2.184	1.286	2.218	1.180	2.249
15.0	2.065	2.170	1.914	2.220	1.770	2.267	1.634	2.311	1.506	2.351	1.385	2.388	1.271	2.421
16.0	2.214	2.326	2.052	2.380	1.898	2.430	1.752	2.477	1.615	2.520	1.485	2.560	1.363	2.595
17.0	2.364	2.484	2.191	2.541	2.027	2.595	1.871	2.645	1.724	2.691	1.586	2.733	1.456	2.771
18.0	2.516	2.643	2.332	2.704	2.157	2.761	1.992	2.815	1.836	2.864	1.689	2.908	1.550	2.949
19.0	2.669	2.804	2.474	2.869	2.289	2.930	2.114	2.986	1.948	3.038	1.792	3.086	1.645	3.128
20.0	2.824	2.967	2.618	3.035	2.422	3.100	2.237	3.159	2.062	3.214	1.897	3.264	1.742	3.309
22.0	3.140	3.298	2.911	3.374	2.693	3.445	2.487	3.511	2.293	3.572	2.110	3.628	1.937	3.678
24.0	3.462	3.637	3.210	3.720	2.971	3.798	2.744	3.871	2.530	3.938	2.327	4.000	2.138	4.054
26.0	3.792	3.983	3.517	4.074	3.255	4.160	3.007	4.239	2.772	4.313	2.551	4.380	2.343	4.440
28.0	4.130	4.337	3.830	4.436	3.546	4.530	3.276	4.616	3.020	4.696	2.780	4.768	2.553	4.834
30.0	4.476	4.700	4.152	4.808	3.844	4.908	3.551	5.002	3.275	5.088	3.014	5.167	2.769	5.237
32.0	4.831	5.072	4.482	5.188	4.150	5.296	3.834	5.397	3.536	5.490	3.255	5.575	2.991	5.650
34.0	5.195	5.454	4.820	5.578	4.464	5.695	4.125	5.803	3.805	5.902	3.503	5.993	3.219	6.074
36.0	5.569	5.846	5.168	5.979	4.786	6.103	4.424	6.219	4.081	6.325	3.757	6.422	3.453	6.509

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 8.5 YEARS (8 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 8.5 ANS (8 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant
0.2	0.023	0.024	0.021	0.024	0.019	0.024	0.017	0.024	0.016	0.025	0.014	0.025	0.013	0.025
0.4	0.045	0.047	0.041	0.048	0.038	0.049	0.035	0.049	0.031	0.049	0.028	0.049	0.026	0.049
0.6	0.068	0.071	0.062	0.072	0.057	0.073	0.052	0.074	0.047	0.074	0.043	0.074	0.039	0.074
0.8	0.090	0.095	0.083	0.096	0.076	0.097	0.069	0.098	0.063	0.099	0.057	0.099	0.052	0.099
1.0	0.113	0.119	0.104	0.121	0.095	0.122	0.086	0.123	0.079	0.123	0.071	0.124	0.065	0.124
1.5	0.170	0.179	0.156	0.181	0.143	0.183	0.130	0.184	0.118	0.185	0.107	0.186	0.097	0.186
2.0	0.227	0.239	0.208	0.242	0.191	0.245	0.174	0.247	0.158	0.248	0.144	0.248	0.130	0.249
2.5	0.285	0.300	0.261	0.303	0.239	0.306	0.218	0.309	0.198	0.311	0.180	0.311	0.163	0.312
3.0	0.343	0.360	0.314	0.365	0.287	0.369	0.262	0.371	0.238	0.373	0.216	0.375	0.196	0.375
3.5	0.401	0.421	0.367	0.427	0.336	0.431	0.306	0.434	0.279	0.437	0.253	0.438	0.229	0.438
4.0	0.459	0.483	0.421	0.489	0.385	0.494	0.351	0.498	0.319	0.500	0.290	0.502	0.262	0.502
4.5	0.518	0.544	0.474	0.551	0.434	0.557	0.396	0.561	0.360	0.564	0.327	0.566	0.296	0.566
5.0	0.576	0.606	0.528	0.614	0.483	0.620	0.441	0.625	0.401	0.628	0.364	0.630	0.330	0.631
5.5	0.636	0.668	0.583	0.677	0.533	0.683	0.486	0.689	0.442	0.693	0.401	0.695	0.364	0.695
6.0	0.695	0.731	0.637	0.740	0.582	0.747	0.531	0.753	0.483	0.757	0.439	0.760	0.398	0.760
6.5	0.755	0.793	0.692	0.803	0.633	0.811	0.577	0.818	0.525	0.822	0.477	0.825	0.432	0.825
7.0	0.815	0.856	0.747	0.867	0.683	0.876	0.623	0.883	0.567	0.888	0.515	0.890	0.466	0.891
7.5	0.876	0.920	0.802	0.931	0.733	0.941	0.669	0.948	0.609	0.953	0.553	0.956	0.501	0.957
8.0	0.936	0.983	0.857	0.996	0.784	1.006	0.715	1.014	0.651	1.019	0.591	1.022	0.535	1.023
9.0	1.057	1.111	0.969	1.125	0.886	1.137	0.809	1.146	0.736	1.152	0.668	1 155	0.605	1.156
10.0	1.181	1.241	1.082	1.256	0.990	1.269	0.903	1.279	0.822	1.286	0.746	1.290	0.674	1.291
11.0	1.305	1.371	1.196	1.389	1.094	1.403	0.998	1.414	0.909	1.421	0.825	1.426	0.747	1.427
12.0	1.431	1.503	1.312	1.522	1.200	1.538	1.095	1.550	0.996	1.558	0.905	1.563	0.820	1.564
13.0	1.557	1.637	1.428	1.657	1.306	1.674	1.192	1.687	1.085	1.696	0.985	1.701	0.893	1.703
14.0	1.686	1.771	1.546	1.794	1.414	1.812	1.290	1.826	1.174	1.836	1.067	1.841	0.966	1.843
15.0	1.815	1.907	1.665	1.931	1.523	1.951	1.390	1.956	1.265	1.977	1.149	1.983	1.041	1.984
16.0	1.946	2.045	1.785	2.070	1.633	2.091	1.490	2.108	1.356	2.119	1.232	2.126	1.116	2.127
17.0	2.078	2.184	1.906	2.211	1.744	2.234	1.591	2.251	1.449	2.263	1.316	2.270	1.192	2.272
18.0	2.212	2.324	2.029	2.353	1.856	2.377	1.694	2.395	1.542	2.408	1.401	2.416	1.270	2.418
19.0	2.347	2.466	2.153	2.497	1.970	2.522	1.798	2.542	1.637	2.555	1.487	2.563	1.347	2.565
20.0	2.484	2.610	2.278	2.642	2.085	2.669	1.903	2.690	1.733	2.704	1.574	2.712	1.426	2.714
22.0	2.762	2.901	2.534	2.937	2.318	2.967	2.116	2.990	1.927	3.006	1.751	3.015	1.587	3.018
24.0	3.044	3.200	2.795	3.240	2.558	3.272	2.335	3.297	2.127	3.315	1.932	3.325	1.751	3.328
26.0	3.337	3.505	3.062	3.549	2.803	3.584	2.559	3.612	2.331	3.631	2.118	3.642	1.920	3.645
28.0	3.635	3.818	3.336	3.865	3.054	3.904	2.789	3.934	2.540	3.955	2.308	3.967	2.093	3.970
30.0	3.941	4.138	3.617	4.190	3.311	4.232	3.024	4.264	2.755	4.287	2.504	4.300	2.270	4.303
32.0	4.254	4.467	3.905	4.522	3.576	4.568	3.266	4.603	2.976	4.627	2.705	4.641	2.452	4.645
34.0	4.574	4.804	4.201	4.864	3.847	4.912	3.514	4.950	3.202	4.976	2.911	4.991	2.640	4.995
36.0	4.904	5.151	4.505	5.215	4.126	5.267	3.770	5.307	3.435	5.335	3.123	5.351	2.832	5.355

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 9.5 YEARS (9 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 9.5 ANS (9 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago	Risk this year	Risk 5 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant	Risque cette année-là	Risque 5 ans auparavant
0.2	0.020	0.021	0.018	0.021	0.016	0.021	0.015	0.021	0.013	0.021	0.012	0.021	0.011	0.020
0.4	0.040	0.042	0.036	0.042	0.033	0.042	0.030	0.042	0.027	0.042	0.024	0.041	0.021	0.041
0.6	0.060	0.063	0.055	0.064	0.049	0.064	0.045	0.063	0.040	0.063	0.036	0.062	0.032	0.061
0.8	0.081	0.085	0.073	0.085	0.066	0.085	0.060	0.084	0.053	0.084	0.048	0.083	0.043	0.082
1.0	0.101	0.106	0.091	0.106	0.083	0.106	0.074	0.106	0.067	0.105	0.060	0.104	0.054	0.103
1.5	0.152	0.159	0.137	0.160	0.124	0.159	0.112	0.159	0.101	0.158	0.090	0.156	0.081	0.154
2.0	0.203	0.213	0.184	0.213	0.166	0.213	0.150	0.212	0.134	0.211	0.120	0.209	0.108	0.206
2.5	0.254	0.267	0.230	0.267	0.208	0.267	0.187	0.266	0.168	0.264	0.151	0.262	0.135	0.258
3.0	0.305	0.321	0.277	0.321	0.250	0.321	0.225	0.320	0.203	0.318	0.182	0.315	0.162	0.311
3.5	0.357	0.375	0.324	0.376	0.293	0.375	0.264	0.374	0.237	0.371	0.212	0.368	0.190	0.363
4.0	0.409	0.430	0.371	0.431	0.335	0.430	0.302	0.428	0.272	0.425	0.243	0.421	0.217	0.416
4.5	0.461	0.485	0.418	0.485	0.378	0.485	0.341	0.483	0.306	0.480	0.274	0.475	0.245	0.469
5.0	0.513	0.540	0.466	0.541	0.421	0.540	0.379	0.538	0.341	0.534	0.306	0.529	0.273	0.522
5.5	0.566	0.595	0.513	0.596	0.464	0.596	0.418	0.593	0.376	0.589	0.337	0.583	0.301	0.576
6.0	0.619	0.651	0.561	0.652	0.508	0.651	0.458	0.649	0.411	0.644	0.369	0.638	0.329	0.630
6.5	0.672	0.706	0.610	0.708	0.551	0.707	0.497	0.704	0.447	0.700	0.400	0.693	0.358	0.684
7.0	0.726	0.763	0.658	0.764	0.595	0.763	0.536	0.760	0.482	0.755	0.432	0.748	0.386	0.738
7.5	0.779	0.819	0.707	0.821	0.639	0.820	0.576	0.817	0.518	0.811	0.464	0.803	0.415	0.793
8.0	0.833	0.876	0.756	0.877	0.683	0.877	0.616	0.873	0.554	0.867	0.496	0.859	0.444	0.848
9.0	0.942	0.990	0.854	0.992	0.773	0.991	0.697	0.987	0.626	0.980	0.561	0.971	0.502	0.959
10.0	1.052	1.105	0.954	1.107	0.863	1.106	0.778	1.102	0.699	1.094	0.627	1.084	0.560	1.070
11.0	1.163	1.222	1.055	1.224	0.954	1.223	0.860	1.218	0.773	1.210	0.693	1.198	0.619	1.183
12.0	1.275	1.339	1.156	1.342	1.046	1.341	0.943	1.335	0.848	1.326	0.760	1.313	0.679	1.297
13.0	1.388	1.458	1.259	1.461	1.139	1.460	1.027	1.454	0.923	1.444	0.828	1.430	0.740	1.412
14.0	1.502	1.578	1.363	1.582	1.233	1.580	1.112	1.574	0.999	1.563	0.896	1.548	0.801	1.528
15.0	1.618	1.700	1.468	1.703	1.328	1.701	1.197	1.695	1.077	1.683	0.965	1.667	0.863	1.646
16.0	1.734	1.822	1.574	1.826	1.424	1.824	1.284	1.817	1.154	1.805	1.035	1.787	0.925	1.765
17.0	1.852	1.946	1.681	1.950	1.521	1.948	1.371	1.941	1.233	1.927	1.106	1.909	0.988	1.885
18.0	1.972	2.072	1.789	2.076	1.619	2.074	1.460	2.066	1.313	2.051	1.177	2.032	1.052	2.006
19.0	2.092	2.198	1.899	2.203	1.718	2.200	1.550	2.192	1.394	2.177	1.250	2.156	1.117	2.129
20.0	2.214	2.326	2.010	2.331	1.818	2.329	1.640	2.320	1.475	2.304	1.323	2.281	1.183	2.253
22.0	2.462	2.587	2.235	2.592	2.022	2.589	1.825	2.579	1.641	2.562	1.472	2.537	1.316	2.505
24.0	2.716	2.853	2.466	2.859	2.232	2.856	2.013	2.845	1.811	2.826	1.624	2.799	1.452	2.764
26.0	2.976	3.126	2.702	3.132	2.446	3.129	2.207	3.117	1.985	3.096	1.781	3.066	1.592	3.028
28.0	3.243	3.406	2.944	3.413	2.665	3.409	2.405	3.396	2.164	3.373	1.941	3.341	1.736	3.299
30.0	3.516	3.693	3.193	3.700	2.891	3.696	2.609	3.682	2.347	3.657	2.106	3.622	1.884	3.577
32.0	3.796	3.987	3.448	3.994	3.122	3.990	2.818	3.975	2.536	3.948	2.275	3.910	2.035	3.862
34.0	4.084	4.288	3.710	4.297	3.359	4.293	3.033	4.276	2.729	4.247	2.449	4.207	2.191	4.155
36.0	4.378	4.599	3.979	4.608	3.604	4.603	3.254	4.585	2.928	4.554	2.628	4.511	2.351	4.455

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 10.5 YEARS (10 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 10.5 ANS (10 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant
1.0	0.091	0.100	0.081	0.110	0.073	0.120	0.065	0.130	0.057	0.141	0.051	0.153	0.045	0.164
1.5	0.136	0.151	0.122	0.165	0.109	0.180	0.097	0.196	0.086	0.212	0.076	0.229	0.067	0.247
2.0	0.182	0.201	0.164	0.221	0.146	0.241	0.130	0.262	0.116	0.284	0.102	0.307	0.090	0.330
2.5	0.228	0.252	0.205	0.277	0.183	0.302	0.163	0.328	0.145	0.356	0.128	0.384	0.113	0.413
3.0	0.275	0.304	0.246	0.333	0.220	0.363	0.196	0.395	0.174	0.428	0.154	0.462	0.136	0.497
3.5	0.321	0.355	0.288	0.389	0.258	0.424	0.229	0.462	0.204	0.500	0.180	0.540	0.159	0.581
4.0	0.368	0.407	0.330	0.445	0.295	0.486	0.263	0.529	0.233	0.573	0.206	0.619	0.182	0.666
4.5	0.415	0.459	0.372	0.502	0.333	0.548	0.296	0.596	0.263	0.646	0.233	0.697	0.205	0.750
5.0	0.462	0.511	0.415	0.559	0.371	0.611	0.330	0.664	0.293	0.719	0.259	0.777	0.228	0.836
5.5	0.510	0.563	0.457	0.617	0.409	0.673	0.364	0.732	0.323	0.793	0.286	0.856	0.252	0.921
6.0	0.557	0.616	0.500	0.674	0.447	0.736	0.398	0.800	0.353	0.867	0.313	0.936	0.275	1.007
6.5	0.605	0.669	0.543	0.732	0.486	0.799	0.432	0.869	0.384	0.941	0.339	1.016	0.299	1.094
7.0	0.653	0.722	0.586	0.791	0.524	0.863	0.467	0.938	0.414	1.016	0.367	1.097	0.323	1.180
7.5	0.702	0.775	0.630	0.849	0.563	0.926	0.501	1.007	0.445	1.091	0.394	1.178	0.347	1.267
8.0	0.750	0.829	0.673	0.908	0.602	0.991	0.536	1.077	0.476	1.167	0.421	1.259	0.371	1.355
9.0	0.848	0.937	0.761	1.026	0.681	1.120	0.606	1.217	0.538	1.319	0.476	1.423	0.420	1.531
10.0	0.947	1.046	0.850	1.146	0.760	1.250	0.677	1.359	0.601	1.472	0.532	1.589	0.469	1.709
11.0	1.047	1.157	0.940	1.266	0.840	1.382	0.749	1.502	0.665	1.627	0.588	1.756	0.518	1.888
12.0	1.148	1.268	1.030	1.388	0.921	1.515	0.821	1.646	0.729	1.783	0.645	1.924	0.568	2.070
13.0	1.250	1.381	1.122	1.512	1.003	1.649	0.894	1.792	0.794	1.941	0.702	2.095	0.619	2.253
14.0	1.353	1.494	1.215	1.636	1.086	1.785	0.968	1.940	0.859	2.100	0.760	2.266	0.670	2.437
15.0	1.457	1.609	1.308	1.762	1.170	1.922	1.043	2.088	0.926	2.261	0.819	2.440	0.722	2.624
16.0	1.563	1.725	1.403	1.889	1.255	2.060	1.118	2.239	0.993	2.424	0.878	2.615	0.774	2.812
17.0	1.669	1.843	1.498	2.017	1.340	2.200	1.194	2.391	1.061	2.588	0.938	2.793	0.827	3.002
18.0	1.777	1.962	1.595	2.147	1.427	2.342	1.272	2.544	1.129	2.754	0.999	2.971	0.881	3.194
19.0	1.886	2.082	1.693	2.278	1.514	2.484	1.350	2.699	1.199	2.922	1.061	3.152	0.935	3.389
20.0	1.995	2.203	1.792	2.411	1.603	2.629	1.429	2.856	1.269	3.092	1.123	3.335	0.990	3.585
22.0	2.216	2.450	1.993	2.681	1.783	2.923	1.589	3.175	1.412	3.437	1.249	3.706	1.102	3.983
24.0	2.440	2.702	2.199	2.957	1.968	3.223	1.754	3.501	1.558	3.789	1.379	4.086	1.216	4.390
26.0	2.683	2.961	2.410	3.240	2.157	3.531	1.923	3.835	1.708	4.149	1.512	4.474	1.334	4.807
28.0	2.924	3.226	2.627	3.529	2.351	3.846	2.096	4.176	1.862	4.518	1.648	4.871	1.454	5.232
30.0	3.170	3.498	2.849	3.826	2.550	4.169	2.274	4.526	2.020	4.896	1.788	5.277	1.578	5.668
32.0	3.424	3.777	3.076	4.130	2.754	4.500	2.456	4.885	2.183	5.283	1.932	5.694	1.705	6.114
34.0	3.684	4.063	3.311	4.443	2.964	4.840	2.644	5.253	2.350	5.680	2.080	6.121	1.834	6.572
36.0	3.951	4.357	3.551	4.764	3.180	5.189	2.837	5.631	2.521	6.088	2.233	6.559	1.970	7.041
38.0	4.224	4.660	3.799	5.094	3.402	5.548	3.036	6.019	2.698	6.507	2.390	7.009	2.109	7.523
40.0	4.500	4.971	4.054	5.434	3.632	5.917	3.241	6.418	2.881	6.937	2.552	7.471	2.252	8.017
45.0	5.257	5.793	4.728	6.329	4.237	6.889	3.782	7.470	3.363	8.070	2.980	8.687	2.630	9.317
50.0	6.060	6.685	5.461	7.301	4.896	7.943	4.372	8.608	3.889	9.295	3.446	10.00	3.043	10.72

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 11.5 YEARS (11 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 11.5 ANS (11 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant
1.0	0.082	0.091	0.073	0.099	0.065	0.107	0.057	0.114	0.050	0.122	0.043	0.131	0.038	0.138
1.5	0.124	0.137	0.110	0.148	0.097	0.160	0.086	0.172	0.075	0.184	0.065	0.196	0.057	0.208
2.0	0.166	0.183	0.147	0.198	0.130	0.214	0.114	0.230	0.100	0.246	0.087	0.262	0.076	0.278
2.5	0.208	0.229	0.184	0.249	0.163	0.268	0.143	0.288	0.125	0.308	0.109	0.328	0.095	0.348
3.0	0.250	0.276	0.222	0.299	0.196	0.323	0.172	0.347	0.151	0.371	0.132	0.395	0.114	0.419
3.5	0.292	0.323	0.259	0.350	0.229	0.377	0.201	0.405	0.176	0.434	0.154	0.462	0.134	0.490
4.0	0.334	0.369	0.297	0.400	0.262	0.432	0.231	0.464	0.202	0.497	0.176	0.529	0.153	0.561
4.5	0.377	0.417	0.335	0.452	0.296	0.487	0.260	0.523	0.228	0.560	0.199	0.597	0.173	0.633
5.0	0.420	0.464	0.373	0.503	0.329	0.543	0.290	0.583	0.254	0.624	0.222	0.664	0.193	0.705
5.5	0.463	0.512	0.411	0.555	0.363	0.598	0.320	0.643	0.280	0.688	0.244	0.732	0.212	0.777
6.0	0.506	0.560	0.450	0.606	0.397	0.654	0.350	0.703	0.306	0.752	0.267	0.801	0.232	0.850
6.5	0.550	0.608	0.488	0.658	0.431	0.710	0.380	0.763	0.333	0.816	0.290	0.870	0.252	0.922
7.0	0.594	0.656	0.527	0.711	0.466	0.767	0.410	0.824	0.359	0.881	0.313	0.939	0.272	0.996
7.5	0.638	0.704	0.566	0.763	0.500	0.824	0.440	0.885	0.386	0.946	0.337	1.008	0.293	1.069
8.0	0.682	0.753	0.605	0.816	0.535	0.881	0.471	0.946	0.413	1.012	0.360	1.078	0.313	1.143
9.0	0.771	0.852	0.684	0.923	0.605	0.995	0.532	1.069	0.467	1.144	0.407	1.218	0.354	1.292
10.0	0.861	0.951	0.764	1.030	0.676	1.111	0.595	1.194	0.521	1.277	0.455	1.360	0.395	1.442
11.0	0.952	1.051	0.845	1.139	0.747	1.229	0.657	1.320	0.576	1.411	0.503	1.503	0.437	1.594
12.0	1.043	1.153	0.927	1.249	0.819	1.347	0.721	1.447	0.632	1.547	0.551	1.647	0.479	1.747
13.0	1.136	1.255	1.009	1.360	0.892	1.466	0.785	1.575	0.688	1.684	0.601	1.793	0.522	1.902
14.0	1.230	1.358	1.092	1.472	0.966	1.587	0.850	1.704	0.745	1.823	0.650	1.941	0.565	2.058
15.0	1.325	1.463	1.176	1.585	1.040	1.709	0.916	1.835	0.803	1.963	0.701	2.090	0.609	2.216
16.0	1.420	1.569	1.262	1.699	1.116	1.832	0.982	1.968	0.861	2.104	0.751	2.240	0.653	2.375
17.0	1.517	1.675	1.348	1.815	1.192	1.957	1.049	2.101	0.920	2.247	0.803	2.392	0.698	2.537
18.0	1.615	1.783	1.435	1.932	1.269	2.083	1.117	2.237	0.979	2.391	0.855	2.546	0.743	2.699
19.0	1.714	1.893	1.523	2.050	1.347	2.210	1.186	2.373	1.039	2.537	0.907	2.701	0.789	2.864
20.0	1.814	2.003	1.612	2.169	1.425	2.339	1.255	2.511	1.100	2.685	0.961	2.858	0.835	3.030
22.0	2.018	2.228	1.793	2.413	1.586	2.601	1.397	2.792	1.224	2.985	1.069	3.177	0.929	3.368
24.0	2.227	2.458	1.979	2.661	1.750	2.869	1.541	3.080	1.352	3.292	1.180	3.503	1.026	3.714
26.0	2.440	2.694	2.169	2.916	1.919	3.144	1.690	3.374	1.482	3.606	1.294	3.837	1.126	4.067
28.0	2.659	2.935	2.364	3.177	2.091	3.425	1.842	3.675	1.616	3.927	1.411	4.179	1.227	4.429
30.0	2.884	3.183	2.564	3.445	2.269	3.713	1.999	3.984	1.753	4.257	1.531	4.529	1.331	4.799
32.0	3.115	3.437	2.769	3.720	2.452	4.008	2.159	4.301	1.894	4.595	1.654	4.888	1.439	5.179
34.0	3.352	3.698	2.980	4.002	2.638	4.312	2.324	4.626	2.039	4.941	1.781	5.256	1.549	5.569
36.0	3.596	3.966	3.198	4.292	2.831	4.624	2.494	4.960	2.189	5.297	1.912	5.634	1.663	5.968
38.0	3.846	4.242	3.421	4.590	3.029	4.944	2.670	5.303	2.342	5.663	2.046	6.023	1.780	6.379
40.0	4.105	4.527	3.651	4.897	3.233	5.275	2.850	5.656	2.501	6.040	2.185	6.422	1.901	6.801
45.0	4.787	5.277	4.260	5.707	3.773	6.145	3.327	6.587	2.921	7.032	2.553	7.474	2.222	7.913
50.0	5.520	6.092	4.922	6.586	4.362	7.089	3.847	7.597	3.379	8.106	2.954	8.613	2.571	9.115

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 12.5 YEARS (12 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 12.5 ANS (12 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant
1.0	0.075	0.083	0.066	0.089	0.058	0.095	0.050	0.101	0.043	0.107	0.037	0.112	0.032	0.117
1.5	0.113	0.125	0.100	0.134	0.087	0.143	0.076	0.152	0.065	0.161	0.056	0.169	0.048	0.177
2.0	0.152	0.168	0.133	0.180	0.116	0.192	0.101	0.203	0.087	0.215	0.075	0.226	0.064	0.236
2.5	0.190	0.210	0.167	0.225	0.146	0.240	0.127	0.255	0.109	0.269	0.094	0.283	0.081	0.296
3.0	0.228	0.253	0.201	0.271	0.175	0.289	0.152	0.306	0.132	0.324	0.113	0.340	0.097	0.356
3.5	0.267	0.295	0.235	0.317	0.205	0.338	0.178	0.358	0.154	0.378	0.133	0.398	0.113	0.416
4.0	0.306	0.338	0.269	0.363	0.235	0.387	0.204	0.411	0.176	0.433	0.152	0.455	0.130	0.476
4.5	0.345	0.381	0.303	0.409	0.265	0.436	0.230	0.463	0.199	0.489	0.171	0.514	0.147	0.537
5.0	0.384	0.425	0.338	0.455	0.295	0.486	0.256	0.516	0.222	0.544	0.191	0.572	0.163	0.598
5.5	0.424	0.468	0.372	0.502	0.325	0.536	0.283	0.568	0.244	0.600	0.210	0.631	0.180	0.659
6.0	0.464	0.512	0.407	0.549	0.356	0.586	0.309	0.622	0.267	0.656	0.230	0.690	0.197	0.721
6.5	0.503	0.556	0.442	0.596	0.386	0.636	0.336	0.675	0.290	0.713	0.250	0.749	0.214	0.783
7.0	0.544	0.601	0.477	0.644	0.417	0.687	0.362	0.729	0.313	0.769	0.270	0.808	0.231	0.845
7.5	0.584	0.645	0.513	0.691	0.448	0.737	0.389	0.783	0.337	0.826	0.290	0.868	0.248	0.908
8.0	0.624	0.690	0.548	0.739	0.479	0.789	0.416	0.837	0.360	0.883	0.310	0.928	0.265	0.970
9.0	0.706	0.780	0.620	0.836	0.542	0.891	0.471	0.946	0.407	0.999	0.350	1.049	0.300	1.097
10.0	0.788	0.871	0.692	0.933	0.605	0.995	0.526	1.056	0.455	1.115	0.391	1.171	0.335	1.225
11.0	0.871	0.963	0.765	1.032	0.669	1.100	0.581	1.167	0.503	1.232	0.433	1.295	0.371	1.354
12.0	0.955	1.055	0.839	1.131	0.733	1.206	0.638	1.280	0.552	1.351	0.475	1.419	0.407	1.484
13.0	1.040	1.149	0.914	1.232	0.799	1.314	0.694	1.394	0.601	1.471	0.517	1.545	0.443	1.616
14.0	1.126	1.244	0.990	1.333	0.865	1.422	0.752	1.508	0.650	1.592	0.560	1.672	0.480	1.749
15.0	1.213	1.340	1.066	1.436	0.932	1.531	0.810	1.624	0.701	1.715	0.603	1.801	0.517	1.883
16.0	1.301	1.437	1.143	1.540	0.999	1.642	0.869	1.742	0.751	1.838	0.647	1.931	0.554	2.019
17.0	1.390	1.535	1.221	1.645	1.067	1.754	0.928	1.860	0.803	1.963	0.691	2.062	0.592	2.156
18.0	1.479	1.634	1.300	1.751	1.136	1.867	0.988	1.980	0.855	2.090	0.736	2.195	0.631	2.294
19.0	1.570	1.734	1.380	1.858	1.206	1.981	1.049	2.101	0.908	2.217	0.781	2.329	0.669	2.434
20.0	1.662	1.835	1.461	1.966	1.277	2.096	1.110	2.223	0.961	2.347	0.827	2.464	0.709	2.576
22.0	1.849	2.041	1.625	2.187	1.421	2.331	1.236	2.473	1.069	2.609	0.921	2.740	0.789	2.864
24.0	2.040	2.252	1.793	2.413	1.568	2.572	1.364	2.728	1.180	2.878	1.016	3.022	0.871	3.159
26.0	2.236	2.468	1.966	2.644	1.719	2.818	1.495	2.989	1.294	3.153	1.115	3.311	0.955	3.460
28.0	2.437	2.690	2.143	2.881	1.874	3.071	1.630	3.256	1.411	3.435	1.215	3.607	1.042	3.769
30.0	2.643	2.917	2.324	3.125	2.033	3.330	1.769	3.530	1.531	3.724	1.319	3.910	1.130	4.086
32.0	2.856	3.150	2.511	3.374	2.196	3.595	1.911	3.812	1.655	4.021	1.425	4.221	1.222	4.410
34.0	3.073	3.390	2.703	3.631	2.364	3.868	2.058	4.101	1.782	4.325	1.535	4.540	1.316	4.744
36.0	3.296	3.637	2.900	3.894	2.537	4.149	2.208	4.398	1.912	4.638	1.648	4.868	1.412	5.086
38.0	3.527	3.890	3.103	4.165	2.715	4.437	2.364	4.703	2.047	4.960	1.764	5.205	1.512	5.438
40.0	3.764	4.151	3.312	4.445	2.899	4.734	2.524	5.017	2.186	5.291	1.884	5.552	1.615	5.800
45.0	4.391	4.841	3.865	5.182	3.384	5.518	2.947	5.846	2.553	6.164	2.201	6.467	1.888	6.753
50.0	5.073	5.591	4.467	5.983	3.913	6.369	3.409	6.746	2.954	7.111	2.547	7.458	2.185	7.787

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 13.5 YEARS (13 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 13.5 ANS (13 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant
1.0	0.070	0.077	0.060	0.081	0.052	0.086	0.045	0.090	0.038	0.094	0.032	0.097	0.027	0.100
1.5	0.105	0.115	0.091	0.123	0.078	0.129	0.067	0.135	0.057	0.141	0.049	0.146	0.041	0.151
2.0	0.140	0.154	0.121	0.164	0.105	0.173	0.090	0.181	0.077	0.188	0.065	0.195	0.055	0.201
2.5	0.175	0.193	0.152	0.205	0.131	0.216	0.113	0.227	0.096	0.236	0.082	0.245	0.069	0.252
3.0	0.211	0.233	0.183	0.247	0.158	0.260	0.135	0.273	0.116	0.284	0.098	0.294	0.083	0.303
3.5	0.246	0.272	0.214	0.289	0.185	0.304	0.158	0.319	0.135	0.332	0.115	0.344	0.097	0.355
4.0	0.282	0.312	0.245	0.331	0.212	0.348	0.182	0.365	0.155	0.381	0.131	0.394	0.111	0.406
4.5	0.318	0.351	0.276	0.373	0.239	0.393	0.205	0.412	0.175	0.429	0.148	0.445	0.125	0.458
5.0	0.354	0.391	0.308	0.415	0.266	0.438	0.228	0.459	0.195	0.478	0.165	0.495	0.139	0.510
5.5	0.391	0.432	0.339	0.458	0.293	0.483	0.251	0.506	0.215	0.527	0.182	0.546	0.154	0.563
6.0	0.427	0.472	0.371	0.501	0.320	0.528	0.275	0.553	0.235	0.576	0.199	0.597	0.168	0.615
6.5	0.464	0.513	0.403	0.544	0.348	0.573	0.299	0.601	0.255	0.626	0.216	0.648	0.182	0.668
7.0	0.501	0.553	0.435	0.587	0.376	0.619	0.322	0.648	0.275	0.675	0.233	0.700	0.197	0.721
7.5	0.538	0.594	0.467	0.630	0.404	0.664	0.346	0.696	0.296	0.725	0.251	0.752	0.212	0.774
8.0	0.575	0.636	0.500	0.674	0.432	0.710	0.370	0.745	0.316	0.776	0.268	0.804	0.226	0.828
9.0	0.650	0.719	0.565	0.762	0.488	0.803	0.419	0.842	0.357	0.877	0.303	0.908	0.256	0.936
10.0	0.726	0.802	0.631	0.851	0.545	0.897	0.468	0.940	0.399	0.979	0.339	1.014	0.286	1.045
11.0	0.803	0.887	0.698	0.941	0.603	0.992	0.517	1.039	0.442	1.082	0.375	1.121	0.316	1.155
12.0	0.881	0.973	0.765	1.031	0.661	1.087	0.567	1.139	0.484	1.187	0.411	1.229	0.347	1.267
13.0	0.960	1.059	0.833	1.123	0.720	1.184	0.618	1.240	0.527	1.292	0.448	1.339	0.378	1.379
14.0	1.038	1.147	0.902	1.216	0.779	1.281	0.669	1.343	0.571	1.399	0.485	1.449	0.409	1.493
15.0	1.118	1.235	0.972	1.309	0.839	1.380	0.721	1.446	0.615	1.506	0.522	1.560	0.441	1.608
16.0	1.199	1.324	1.042	1.404	0.900	1.480	0.773	1.550	0.660	1.615	0.560	1.673	0.473	1.724
17.0	1.281	1.415	1.113	1.500	0.962	1.581	0.826	1.656	0.705	1.725	0.598	1.787	0.505	1.841
18.0	1.364	1.506	1.185	1.597	1.024	1.683	0.879	1.763	0.751	1.836	0.637	1.902	0.538	1.960
19.0	1.447	1.598	1.258	1.695	1.087	1.786	0.933	1.871	0.797	1.949	0.676	2.018	0.571	2.079
20.0	1.532	1.692	1.332	1.794	1.151	1.890	0.988	1.980	0.844	2.062	0.716	2.136	0.605	2.201
22.0	1.704	1.882	1.482	1.995	1.280	2.102	1.100	2.202	0.939	2.294	0.797	2.376	0.673	2.447
24.0	1.881	2.077	1.635	2.201	1.413	2.319	1.214	2.430	1.037	2.530	0.880	2.621	0.743	2.700
26.0	2.062	2.276	1.793	2.413	1.550	2.542	1.331	2.663	1.137	2.773	0.965	2.872	0.815	2.958
28.0	2.247	2.481	1.954	2.629	1.688	2.770	1.451	2.901	1.240	3.021	1.053	3.129	0.889	3.223
30.0	2.438	2.690	2.120	2.851	1.833	3.004	1.575	3.146	1.345	3.276	1.142	3.393	0.965	3.494
32.0	2.633	2.906	2.291	3.079	1.980	3.244	1.702	3.397	1.454	3.538	1.235	3.663	1.043	3.773
34.0	2.834	3.127	2.466	3.314	2.132	3.491	1.832	3.656	1.565	3.806	1.330	3.941	1.123	4.059
36.0	3.041	3.355	2.646	3.555	2.288	3.744	1.967	3.921	1.680	4.082	1.427	4.227	1.204	4.353
38.0	3.253	3.589	2.831	3.803	2.449	4.005	2.105	4.194	1.799	4.366	1.528	4.520	1.291	4.655
40.0	3.473	3.831	3.023	4.058	2.615	4.274	2.248	4.475	1.921	4.659	1.632	4.823	1.379	4.966
45.0	4.052	4.468	3.528	4.733	3.053	4.984	2.626	5.217	2.244	5.430	1.907	5.621	1.612	5.787
50.0	4.682	5.162	4.079	5.467	3.531	5.755	3.038	6.023	2.598	6.258	2.208	6.487	1.866	6.679

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 14.5 YEARS (14 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 14.5 ANS (14 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago	Risk this year	Risk 10 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant	Risque cette année-là	Risque 10 ans auparavant
1.0	0.064	0.071	0.055	0.075	0.047	0.078	0.040	0.080	0.034	0.083	0.028	0.085	0.023	0.086
1.5	0.097	0.107	0.083	0.112	0.071	0.117	0.060	0.121	0.051	0.124	0.042	0.127	0.035	0.129
2.0	0.129	0.143	0.111	0.150	0.095	0.156	0.080	0.162	0.068	0.166	0.057	0.170	0.047	0.172
2.5	0.162	0.179	0.139	0.188	0.119	0.196	0.101	0.203	0.085	0.208	0.071	0.213	0.059	0.216
3.0	0.195	0.215	0.168	0.226	0.143	0.236	0.121	0.244	0.102	0.251	0.085	0.256	0.071	0.260
3.5	0.228	0.252	0.196	0.264	0.167	0.275	0.142	0.285	0.119	0.293	0.100	0.299	0.083	0.304
4.0	0.261	0.289	0.224	0.303	0.192	0.316	0.162	0.327	0.137	0.336	0.114	0.343	0.095	0.348
4.5	0.295	0.326	0.253	0.342	0.216	0.356	0.183	0.368	0.154	0.379	0.129	0.387	0.107	0.392
5.0	0.328	0.363	0.282	0.380	0.241	0.396	0.204	0.410	0.172	0.422	0.144	0.431	0.119	0.437
5.5	0.362	0.400	0.311	0.419	0.265	0.437	0.225	0.452	0.189	0.465	0.158	0.475	0.132	0.482
6.0	0.396	0.437	0.340	0.459	0.290	0.478	0.246	0.495	0.207	0.508	0.173	0.519	0.144	0.527
6.5	0.430	0.475	0.369	0.498	0.315	0.519	0.267	0.537	0.225	0.552	0.188	0.564	0.156	0.572
7.0	0.464	0.513	0.399	0.538	0.340	0.560	0.288	0.580	0.243	0.596	0.203	0.609	0.169	0.618
7.5	0.498	0.551	0.428	0.578	0.365	0.602	0.310	0.623	0.261	0.640	0.218	0.654	0.181	0.663
8.0	0.533	0.589	0.458	0.618	0.391	0.643	0.331	0.666	0.279	0.684	0.233	0.699	0.194	0.709
9.0	0.603	0.666	0.518	0.698	0.442	0.728	0.375	0.753	0.315	0.774	0.254	0.790	0.219	0.802
10.0	0.673	0.743	0.578	0.780	0.494	0.812	0.418	0.841	0.352	0.864	0.295	0.882	0.245	0.896
11.0	0.744	0.822	0.639	0.862	0.546	0.898	0.463	0.929	0.389	0.955	0.326	0.976	0.271	0.990
12.0	0.816	0.901	0.701	0.945	0.599	0.985	0.507	1.019	0.427	1.047	0.357	1.070	0.297	1.086
13.0	0.888	0.981	0.764	1.030	0.652	1.072	0.553	1.110	0.465	1.140	0.389	1.165	0.324	1.182
14.0	0.962	1.063	0.827	1.114	0.706	1.161	0.598	1.201	0.504	1.235	0.421	1.261	0.350	1.280
15.0	1.036	1.144	0.891	1.200	0.760	1.250	0.645	1.294	0.543	1.330	0.454	1.358	0.377	1.378
16.0	1.111	1.227	0.955	1.287	0.815	1.341	0.691	1.387	0.582	1.426	0.487	1.456	0.405	1.478
17.0	1.187	1.311	1.020	1.375	0.871	1.432	0.739	1.482	0.622	1.523	0.520	1.555	0.433	1.578
18.0	1.264	1.396	1.087	1.464	0.928	1.525	0.786	1.577	0.662	1.621	0.554	1.656	0.461	1.680
19.0	1.341	1.481	1.153	1.554	0.985	1.618	0.835	1.674	0.703	1.721	0.588	1.757	0.489	1.783
20.0	1.420	1.568	1.221	1.644	1.042	1.713	0.884	1.772	0.744	1.821	0.623	1.860	0.518	1.887
22.0	1.580	1.744	1.358	1.829	1.160	1.905	0.984	1.971	0.829	2.026	0.693	2.068	0.577	2.099
24.0	1.743	1.925	1.499	2.019	1.280	2.102	1.086	2.175	0.915	2.235	0.766	2.282	0.637	2.316
26.0	1.911	2.110	1.644	2.213	1.404	2.304	1.191	2.384	1.003	2.449	0.840	2.501	0.698	2.538
28.0	2.083	2.300	1.792	2.412	1.531	2.511	1.299	2.598	1.094	2.669	0.916	2.726	0.762	2.766
30.0	2.260	2.495	1.944	2.616	1.661	2.724	1.409	2.817	1.187	2.895	0.994	2.956	0.827	3.000
32.0	2.441	2.695	2.101	2.825	1.795	2.942	1.523	3.043	1.283	3.126	1.074	3.192	0.893	3.239
34.0	2.628	2.900	2.261	3.040	1.932	3.166	1.640	3.274	1.382	3.364	1.157	3.435	0.962	3.486
36.0	2.820	3.111	2.427	3.262	2.074	3.396	1.760	3.513	1.483	3.609	1.242	3.685	1.033	3.739
38.0	3.017	3.329	2.597	3.490	2.220	3.634	1.884	3.758	1.588	3.861	1.330	3.942	1.106	4.000
40.0	3.221	3.553	2.773	3.725	2.370	3.878	2.012	4.010	1.696	4.120	1.420	4.206	1.182	4.268
45.0	3.759	4.146	3.238	4.345	2.768	4.523	2.351	4.677	1.982	4.805	1.660	4.905	1.382	4.977
50.0	4.345	4.791	3.744	5.020	3.203	5.225	2.720	5.402	2.294	5.549	1.922	5.664	1.600	5.747

APPENDIX TABLE B

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 15.5 YEARS (15 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 15.5 ANS (15 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant
2.0	0.120	0.140	0.102	0.160	0.086	0.183	0.072	0.206	0.060	0.231	0.049	0.257	0.040	0.284
2.5	0.151	0.175	0.128	0.201	0.108	0.229	0.090	0.258	0.075	0.289	0.062	0.322	0.051	0.355
3.0	0.182	0.211	0.154	0.242	0.130	0.275	0.109	0.310	0.090	0.348	0.074	0.387	0.061	0.427
3.5	0.212	0.247	0.180	0.283	0.152	0.322	0.127	0.363	0.106	0.407	0.087	0.452	0.071	0.500
4.0	0.243	0.282	0.207	0.324	0.174	0.368	0.146	0.416	0.121	0.466	0.100	0.518	0.082	0.572
4.5	0.274	0.319	0.233	0.365	0.196	0.415	0.164	0.469	0.136	0.525	0.112	0.584	0.092	0.645
5.0	0.305	0.355	0.260	0.407	0.219	0.463	0.183	0.522	0.152	0.585	0.125	0.651	0.103	0.718
5.5	0.337	0.391	0.286	0.449	0.241	0.510	0.202	0.576	0.168	0.645	0.138	0.717	0.113	0.792
6.0	0.368	0.428	0.313	0.491	0.264	0.558	0.221	0.630	0.183	0.705	0.151	0.784	0.124	0.866
6.5	0.400	0.465	0.340	0.533	0.287	0.606	0.240	0.684	0.199	0.766	0.164	0.852	0.134	0.940
7.0	0.432	0.502	0.367	0.575	0.309	0.654	0.259	0.738	0.215	0.827	0.177	0.919	0.145	1.015
7.5	0.464	0.539	0.394	0.618	0.332	0.702	0.278	0.793	0.231	0.888	0.190	0.987	0.156	1.090
8.0	0.496	0.576	0.422	0.660	0.356	0.751	0.297	0.848	0.247	0.949	0.204	1.055	0.167	1.165
9.0	0.561	0.651	0.477	0.747	0.402	0.849	0.336	0.958	0.279	1.073	0.230	1.193	0.188	1.317
10.0	0.626	0.727	0.532	0.834	0.449	0.948	0.376	1.070	0.312	1.198	0.257	1.332	0.210	1.470
11.0	0.693	0.804	0.589	0.922	0.497	1.048	0.415	1.183	0.345	1.324	0.284	1.472	0.233	1.625
12.0	0.760	0.882	0.646	1.011	0.545	1.149	0.456	1.297	0.378	1.452	0.312	1.613	0.255	1.781
13.0	0.827	0.960	0.703	1.101	0.593	1.251	0.496	1.412	0.412	1.580	0.340	1.756	0.278	1.938
14.0	0.894	1.040	0.761	1.191	0.642	1.355	0.537	1.528	0.446	1.710	0.368	1.901	0.301	2.098
15.0	0.965	1.120	0.820	1.283	0.692	1.459	0.579	1.645	0.481	1.842	0.396	2.047	0.324	2.258
16.0	1.035	1.201	0.880	1.376	0.742	1.564	0.621	1.764	0.516	1.975	0.425	2.194	0.348	2.421
17.0	1.105	1.283	0.940	1.470	0.793	1.671	0.663	1.884	0.551	2.109	0.454	2.343	0.372	2.585
18.0	1.177	1.366	1.001	1.565	0.844	1.778	0.706	2.006	0.587	2.244	0.484	2.494	0.396	2.751
19.0	1.249	1.450	1.062	1.661	0.896	1.887	0.750	2.128	0.623	2.382	0.514	2.646	0.421	2.918
20.0	1.322	1.534	1.124	1.758	0.949	1.998	0.794	2.252	0.660	2.520	0.544	2.799	0.445	3.088
22.0	1.471	1.707	1.251	1.955	1.056	2.222	0.884	2.505	0.734	2.802	0.605	3.112	0.496	3.432
24.0	1.624	1.884	1.381	2.157	1.165	2.451	0.976	2.763	0.811	3.090	0.668	3.432	0.547	3.784
26.0	1.780	2.065	1.514	2.365	1.278	2.686	1.070	3.027	0.889	3.386	0.733	3.759	0.600	4.144
28.0	1.940	2.251	1.651	2.577	1.393	2.927	1.167	3.298	0.969	3.688	0.800	4.094	0.655	4.512
30.0	2.106	2.441	1.791	2.795	1.512	3.174	1.266	3.576	1.052	3.998	0.868	4.437	0.711	4.890
32.0	2.274	2.637	1.935	3.018	1.634	3.427	1.368	3.861	1.137	4.316	0.938	4.789	0.768	5.276
34.0	2.448	2.838	2.084	3.248	1.759	3.688	1.473	4.153	1.225	4.642	1.010	5.150	0.827	5.673
36.0	2.627	3.045	2.236	3.485	1.888	3.955	1.582	4.454	1.315	4.977	1.085	5.520	0.889	6.080
38.0	2.811	3.258	2.393	3.728	2.021	4.231	1.693	4.763	1.408	5.321	1.161	5.901	0.951	6.498
40.0	3.001	3.478	2.555	3.978	2.158	4.514	1.808	5.091	1.503	5.676	1.241	6.293	1.014	6.928
45.0	3.503	4.058	2.984	4.640	2.521	5.262	2.113	5.921	1.757	6.610	1.450	7.325	1.188	8.060
50.0	4.056	4.690	3.452	5.360	2.917	6.075	2.446	6.832	2.034	7.623	1.680	8.442	1.377	9.283
55.0	4.651	5.383	3.966	6.149	3.353	6.966	2.812	7.828	2.340	8.729	1.932	9.661	1.584	10.62
60.0	5.319	6.152	4.537	7.023	3.838	7.952	3.220	8.930	2.681	9.951	2.214	11.01	1.816	12.08

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 16.5 YEARS (16 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 16.5 ANS (16 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

Percentage already infected / Pourcentage de sujets déjà infectés	1		3		5		7		9		11		13	
	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant
2.0	0.113	0.131	0.095	0.148	0.079	0.167	0.065	0.186	0.053	0.205	0.043	0.225	0.035	0.244
2.5	0.141	0.164	0.119	0.186	0.099	0.209	0.081	0.233	0.067	0.257	0.054	0.282	0.044	0.306
3.0	0.170	0.197	0.143	0.223	0.119	0.251	0.098	0.280	0.080	0.309	0.065	0.339	0.052	0.368
3.5	0.198	0.230	0.167	0.261	0.139	0.294	0.115	0.327	0.094	0.362	0.076	0.396	0.061	0.431
4.0	0.227	0.264	0.191	0.299	0.159	0.337	0.131	0.375	0.108	0.414	0.087	0.454	0.070	0.493
4.5	0.256	0.298	0.215	0.338	0.179	0.379	0.148	0.423	0.121	0.457	0.098	0.512	0.079	0.556
5.0	0.284	0.332	0.240	0.376	0.200	0.423	0.165	0.471	0.135	0.520	0.110	0.570	0.088	0.619
5.5	0.315	0.366	0.265	0.415	0.220	0.466	0.182	0.519	0.149	0.573	0.121	0.628	0.097	0.683
6.0	0.344	0.400	0.289	0.453	0.241	0.510	0.199	0.568	0.163	0.627	0.132	0.687	0.107	0.747
6.5	0.374	0.434	0.314	0.492	0.262	0.553	0.216	0.616	0.177	0.681	0.144	0.746	0.116	0.811
7.0	0.404	0.469	0.339	0.532	0.283	0.597	0.233	0.666	0.191	0.735	0.155	0.805	0.125	0.875
7.5	0.434	0.504	0.364	0.571	0.304	0.642	0.251	0.715	0.205	0.789	0.167	0.865	0.134	0.940
8.0	0.464	0.539	0.390	0.611	0.325	0.686	0.268	0.764	0.220	0.844	0.178	0.925	0.144	1.005
9.0	0.524	0.609	0.441	0.690	0.367	0.776	0.303	0.864	0.248	0.954	0.202	1.045	0.162	1.136
10.0	0.586	0.680	0.492	0.771	0.410	0.866	0.339	0.965	0.277	1.065	0.225	1.167	0.181	1.268
11.0	0.647	0.752	0.544	0.852	0.454	0.958	0.375	1.067	0.307	1.178	0.249	1.290	0.201	1.402
12.0	0.710	0.824	0.597	0.935	0.497	1.050	0.411	1.169	0.336	1.291	0.273	1.414	0.220	1.537
13.0	0.773	0.898	0.650	1.018	0.542	1.143	0.447	1.273	0.366	1.406	0.298	1.540	0.240	1.673
14.0	0.837	0.972	0.704	1.102	0.587	1.238	0.484	1.378	0.397	1.522	0.322	1.666	0.260	1.811
15.0	0.902	1.047	0.758	1.187	0.632	1.333	0.522	1.484	0.427	1.639	0.347	1.794	0.280	1.950
16.0	0.967	1.123	0.813	1.273	0.678	1.429	0.560	1.591	0.458	1.757	0.372	1.924	0.300	2.090
17.0	1.033	1.200	0.869	1.359	0.724	1.527	0.598	1.700	0.490	1.876	0.398	2.055	0.321	2.232
18.0	1.100	1.277	0.925	1.447	0.771	1.625	0.637	1.809	0.522	1.997	0.424	2.187	0.341	2.376
19.0	1.168	1.355	0.982	1.536	0.819	1.725	0.676	1.920	0.554	2.119	0.450	2.320	0.363	2.521
20.0	1.236	1.435	1.040	1.626	0.867	1.826	0.716	2.032	0.586	2.243	0.476	2.455	0.384	2.667
22.0	1.375	1.596	1.157	1.809	0.964	2.031	0.797	2.260	0.653	2.494	0.530	2.730	0.427	2.965
24.0	1.518	1.762	1.277	1.996	1.065	2.241	0.880	2.494	0.721	2.751	0.585	3.011	0.472	3.270
26.0	1.664	1.931	1.400	2.188	1.168	2.456	0.965	2.732	0.790	3.015	0.642	3.299	0.518	3.582
28.0	1.815	2.105	1.527	2.384	1.273	2.676	1.052	2.977	0.862	3.284	0.700	3.594	0.565	3.902
30.0	1.969	2.284	1.657	2.586	1.382	2.902	1.142	3.229	0.936	3.561	0.760	3.896	0.613	4.229
32.0	2.127	2.467	1.790	2.793	1.493	3.134	1.234	3.486	1.011	3.845	0.822	4.206	0.663	4.565
34.0	2.290	2.655	1.927	3.006	1.608	3.373	1.329	3.751	1.089	4.136	0.885	4.524	0.714	4.909
36.0	2.457	2.849	2.069	3.225	1.726	3.618	1.427	4.023	1.169	4.436	0.950	4.851	0.766	5.263
38.0	2.630	3.049	2.214	3.451	1.847	3.870	1.527	4.303	1.252	4.744	1.018	5.186	0.821	5.627
40.0	2.807	3.254	2.364	3.683	1.973	4.130	1.631	4.591	1.337	5.061	1.087	5.532	0.877	6.001
45.0	3.278	3.798	2.761	4.297	2.305	4.817	1.907	5.362	1.563	5.897	1.271	6.444	1.025	6.987
50.0	3.790	4.390	3.194	4.964	2.667	5.563	2.207	6.179	1.810	6.804	1.472	7.432	1.188	8.055
55.0	4.354	5.040	3.671	5.697	3.067	6.381	2.538	7.084	2.082	7.797	1.694	8.512	1.367	9.221
60.0	4.979	5.762	4.201	6.509	3.511	7.287	2.907	8.085	2.386	8.894	1.941	9.705	1.567	10.51

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 17.5 YEARS (17 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 17.5 ANS (17 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

Percentage already infected / Pourcentage de sujets déjà infectés	1		3		5		7		9		11		13	
	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant	Risk this year / Risque cette année-là	Risk 15 years ago / Risque 15 ans auparavant
2.0	0.106	0.123	0.088	0.138	0.072	0.153	0.059	0.168	0.047	0.183	0.038	0.197	0.030	0.211
2.5	0.132	0.154	0.110	0.172	0.090	0.191	0.074	0.210	0.059	0.229	0.048	0.247	0.038	0.265
3.0	0.159	0.185	0.132	0.207	0.109	0.230	0.089	0.253	0.072	0.276	0.057	0.298	0.045	0.318
3.5	0.186	0.216	0.155	0.242	0.127	0.269	0.104	0.296	0.084	0.322	0.067	0.348	0.053	0.372
4.0	0.213	0.248	0.177	0.278	0.146	0.308	0.119	0.339	0.096	0.369	0.077	0.399	0.061	0.426
4.5	0.240	0.279	0.200	0.313	0.164	0.348	0.134	0.382	0.108	0.416	0.086	0.449	0.069	0.481
5.0	0.268	0.311	0.223	0.349	0.183	0.387	0.149	0.426	0.120	0.464	0.096	0.501	0.076	0.536
5.5	0.295	0.343	0.245	0.385	0.202	0.427	0.165	0.470	0.133	0.511	0.106	0.552	0.084	0.590
6.0	0.323	0.375	0.268	0.421	0.221	0.467	0.180	0.514	0.145	0.559	0.116	0.603	0.092	0.646
6.5	0.351	0.407	0.292	0.457	0.240	0.507	0.195	0.558	0.158	0.607	0.126	0.655	0.100	0.701
7.0	0.379	0.440	0.315	0.493	0.259	0.548	0.211	0.602	0.170	0.656	0.136	0.707	0.108	0.757
7.5	0.407	0.473	0.338	0.530	0.278	0.588	0.227	0.647	0.183	0.704	0.146	0.760	0.116	0.813
8.0	0.435	0.505	0.362	0.567	0.298	0.629	0.242	0.691	0.196	0.753	0.157	0.812	0.124	0.869
9.0	0.492	0.571	0.409	0.641	0.337	0.711	0.274	0.782	0.221	0.851	0.177	0.918	0.140	0.982
10.0	0.549	0.638	0.457	0.715	0.376	0.794	0.306	0.873	0.247	0.950	0.198	1.025	0.157	1.097
11.0	0.607	0.705	0.505	0.791	0.416	0.878	0.339	0.965	0.273	1.051	0.219	1.133	0.173	1.213
12.0	0.666	0.774	0.554	0.867	0.456	0.963	0.372	1.058	0.300	1.152	0.240	1.243	0.190	1.329
13.0	0.726	0.842	0.603	0.944	0.497	1.048	0.405	1.152	0.327	1.254	0.261	1.353	0.207	1.447
14.0	0.786	0.912	0.653	1.022	0.538	1.135	0.438	1.247	0.354	1.358	0.283	1.465	0.224	1.567
15.0	0.846	0.982	0.704	1.101	0.579	1.222	0.472	1.343	0.381	1.462	0.305	1.577	0.242	1.687
16.0	0.908	1.054	0.755	1.181	0.621	1.311	0.506	1.440	0.409	1.568	0.327	1.691	0.259	1.809
17.0	0.970	1.126	0.806	1.262	0.664	1.400	0.541	1.538	0.437	1.674	0.349	1.806	0.277	1.932
18.0	1.032	1.198	0.859	1.343	0.707	1.490	0.576	1.638	0.465	1.782	0.372	1.923	0.295	2.056
19.0	1.094	1.272	0.911	1.426	0.750	1.582	0.612	1.738	0.494	1.892	0.395	2.040	0.313	2.182
20.0	1.160	1.346	0.965	1.509	0.794	1.674	0.648	1.840	0.523	2.002	0.418	2.159	0.332	2.309
22.0	1.291	1.498	1.074	1.679	0.884	1.862	0.721	2.046	0.582	2.227	0.466	2.401	0.369	2.568
24.0	1.425	1.653	1.185	1.853	0.976	2.055	0.796	2.258	0.643	2.456	0.514	2.649	0.408	2.832
26.0	1.562	1.813	1.300	2.031	1.070	2.253	0.873	2.474	0.705	2.692	0.564	2.903	0.447	3.103
28.0	1.703	1.976	1.417	2.214	1.167	2.455	0.952	2.696	0.769	2.933	0.615	3.162	0.488	3.381
30.0	1.848	2.144	1.538	2.401	1.267	2.663	1.033	2.924	0.834	3.191	0.668	3.429	0.530	3.665
32.0	1.996	2.316	1.662	2.594	1.369	2.876	1.117	3.158	0.902	3.435	0.722	3.702	0.573	3.957
34.0	2.149	2.493	1.789	2.792	1.474	3.095	1.203	3.398	0.971	3.696	0.778	3.983	0.617	4.257
36.0	2.307	2.675	1.920	2.995	1.583	3.321	1.291	3.645	1.043	3.954	0.835	4.272	0.663	4.565
38.0	2.469	2.862	2.056	3.205	1.694	3.553	1.382	3.899	1.117	4.240	0.894	4.569	0.709	4.881
40.0	2.634	3.056	2.195	3.421	1.809	3.792	1.476	4.161	1.193	4.524	0.955	4.874	0.758	5.207
45.0	3.078	3.567	2.564	3.992	2.114	4.423	1.726	4.853	1.395	5.274	1.117	5.680	0.887	6.067
50.0	3.550	4.123	2.967	4.613	2.447	5.110	1.998	5.604	1.615	6.089	1.294	6.556	1.027	7.000
55.0	4.080	4.735	3.410	5.296	2.814	5.863	2.298	6.428	1.859	6.981	1.489	7.514	1.182	8.020
60.0	4.678	5.414	3.903	6.053	3.222	6.698	2.633	7.341	2.130	7.959	1.707	8.573	1.356	9.147

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 18.5 YEARS (18 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 18.5 ANS (18 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant
2.0	0.099	0.115	0.082	0.128	0.066	0.140	0.053	0.152	0.042	0.164	0.033	0.174	0.026	0.183
2.5	0.125	0.145	0.102	0.160	0.083	0.176	0.067	0.191	0.053	0.205	0.042	0.218	0.033	0.229
3.0	0.150	0.174	0.123	0.193	0.100	0.212	0.080	0.230	0.064	0.246	0.050	0.262	0.039	0.276
3.5	0.175	0.203	0.144	0.226	0.117	0.247	0.094	0.268	0.075	0.288	0.059	0.306	0.046	0.322
4.0	0.201	0.233	0.165	0.259	0.134	0.284	0.108	0.308	0.086	0.330	0.067	0.351	0.053	0.369
4.5	0.226	0.263	0.186	0.292	0.151	0.320	0.122	0.347	0.097	0.372	0.076	0.396	0.059	0.417
5.0	0.252	0.293	0.207	0.325	0.168	0.356	0.135	0.386	0.108	0.415	0.085	0.441	0.066	0.464
5.5	0.278	0.323	0.228	0.358	0.186	0.393	0.149	0.426	0.119	0.457	0.093	0.486	0.073	0.512
6.0	0.304	0.353	0.250	0.392	0.203	0.429	0.163	0.466	0.130	0.500	0.102	0.531	0.080	0.559
6.5	0.330	0.384	0.271	0.425	0.221	0.466	0.177	0.506	0.141	0.543	0.111	0.577	0.087	0.607
7.0	0.356	0.414	0.293	0.459	0.238	0.503	0.191	0.546	0.152	0.586	0.120	0.623	0.094	0.656
7.5	0.383	0.445	0.315	0.493	0.256	0.541	0.206	0.587	0.164	0.630	0.129	0.669	0.101	0.704
8.0	0.409	0.476	0.337	0.527	0.274	0.578	0.220	0.627	0.175	0.673	0.138	0.715	0.107	0.753
9.0	0.463	0.538	0.381	0.596	0.309	0.654	0.249	0.709	0.198	0.761	0.156	0.809	0.122	0.851
10.0	0.517	0.601	0.425	0.666	0.346	0.730	0.278	0.792	0.221	0.850	0.174	0.903	0.136	0.951
11.0	0.572	0.664	0.470	0.736	0.382	0.807	0.307	0.875	0.244	0.940	0.193	0.998	0.150	1.051
12.0	0.627	0.728	0.516	0.807	0.419	0.885	0.337	0.960	0.268	1.030	0.211	1.095	0.165	1.152
13.0	0.683	0.793	0.562	0.879	0.456	0.964	0.367	1.045	0.292	1.122	0.230	1.192	0.179	1.255
14.0	0.739	0.859	0.608	0.952	0.494	1.044	0.397	1.132	0.316	1.214	0.249	1.290	0.194	1.358
15.0	0.797	0.925	0.655	1.025	0.533	1.124	0.428	1.219	0.341	1.308	0.268	1.390	0.209	1.463
16.0	0.854	0.992	0.703	1.100	0.571	1.205	0.459	1.307	0.365	1.402	0.288	1.490	0.225	1.568
17.0	0.913	1.060	0.751	1.175	0.610	1.288	0.491	1.396	0.391	1.498	0.308	1.592	0.240	1.675
18.0	0.972	1.128	0.799	1.251	0.650	1.371	0.523	1.486	0.416	1.595	0.328	1.694	0.256	1.783
19.0	1.032	1.198	0.848	1.327	0.690	1.455	0.555	1.577	0.442	1.692	0.348	1.798	0.271	1.892
20.0	1.092	1.268	0.898	1.405	0.730	1.540	0.587	1.670	0.468	1.791	0.368	1.903	0.287	2.003
22.0	1.215	1.410	1.000	1.563	0.813	1.713	0.654	1.857	0.520	1.993	0.410	2.117	0.320	2.227
24.0	1.341	1.557	1.104	1.725	0.898	1.891	0.722	2.050	0.575	2.199	0.453	2.335	0.353	2.457
26.0	1.471	1.707	1.210	1.891	0.984	2.072	0.792	2.246	0.630	2.410	0.497	2.559	0.388	2.693
28.0	1.604	1.861	1.320	2.062	1.073	2.259	0.864	2.448	0.687	2.626	0.542	2.789	0.423	2.934
30.0	1.740	2.019	1.432	2.236	1.165	2.450	0.937	2.655	0.746	2.848	0.588	3.024	0.459	3.182
32.0	1.880	2.181	1.547	2.416	1.259	2.647	1.013	2.868	0.807	3.076	0.636	3.266	0.496	3.436
34.0	2.024	2.348	1.666	2.601	1.356	2.849	1.091	3.087	0.869	3.310	0.685	3.514	0.535	3.697
36.0	2.172	2.519	1.788	2.790	1.456	3.056	1.172	3.311	0.933	3.551	0.735	3.770	0.574	3.965
38.0	2.325	2.696	1.914	2.986	1.558	3.270	1.254	3.543	0.999	3.798	0.787	4.032	0.615	4.241
40.0	2.482	2.878	2.044	3.187	1.664	3.491	1.340	3.781	1.067	4.054	0.841	4.303	0.657	4.526
45.0	2.899	3.360	2.388	3.720	1.945	4.073	1.566	4.411	1.248	4.727	0.984	5.017	0.768	5.276
50.0	3.353	3.885	2.764	4.300	2.252	4.707	1.814	5.096	1.445	5.460	1.140	5.793	0.890	6.091
55.0	3.853	4.463	3.177	4.938	2.589	5.402	2.086	5.847	1.663	6.264	1.312	6.644	1.025	6.984
60.0	4.400	5.104	3.637	5.645	2.966	6.174	2.390	6.680	1.906	7.154	1.504	7.586	1.175	7.972

ANNUAL PERCENTAGE RISKS OF TUBERCULOUS INFECTION CORRESPONDING TO THE PERCENTAGE ALREADY INFECTED BY THE AGE OF 19.5 YEARS (19 YEARS AT LAST BIRTHDAY)

RISQUES ANNUELS (EN %) D'INFECTION TUBERCULEUSE EN FONCTION DU POURCENTAGE DE SUJETS DEJA INFECTES A L'AGE DE 19.5 ANS (19 ANS LORS DE LEUR PLUS RECENT ANNIVERSAIRE)

Approximate percentage decrease in risk of infection each year

Pourcentage approximatif de la diminution, chaque année, du risque d'infection

	1		3		5		7		9		11		13	
Percentage already infected	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago	Risk this year	Risk 15 years ago
Pourcentage de sujets déjà infectés	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant	Risque cette année-là	Risque 15 ans auparavant
2.0	0.094	0.109	0.076	0.119	0.061	0.129	0.048	0.139	0.038	0.147	0.029	0.153	0.023	0.159
2.5	0.118	0.137	0.095	0.150	0.077	0.162	0.061	0.174	0.048	0.184	0.037	0.192	0.029	0.199
3.0	0.141	0.164	0.115	0.180	0.092	0.195	0.073	0.209	0.057	0.221	0.044	0.231	0.034	0.239
3.5	0.166	0.192	0.134	0.211	0.108	0.228	0.085	0.244	0.067	0.258	0.052	0.270	0.040	0.280
4.0	0.190	0.220	0.154	0.241	0.124	0.261	0.098	0.280	0.077	0.296	0.060	0.310	0.046	0.321
4.5	0.214	0.248	0.174	0.272	0.139	0.295	0.110	0.315	0.087	0.334	0.067	0.349	0.052	0.362
5.0	0.238	0.276	0.193	0.303	0.155	0.328	0.123	0.351	0.096	0.372	0.075	0.389	0.057	0.403
5.5	0.262	0.305	0.213	0.334	0.171	0.362	0.136	0.387	0.106	0.410	0.082	0.429	0.063	0.444
6.0	0.287	0.333	0.233	0.366	0.187	0.396	0.148	0.424	0.116	0.448	0.090	0.469	0.069	0.486
6.5	0.312	0.362	0.253	0.397	0.203	0.430	0.161	0.460	0.126	0.487	0.098	0.509	0.075	0.527
7.0	0.336	0.391	0.273	0.429	0.220	0.464	0.174	0.497	0.136	0.525	0.106	0.550	0.081	0.569
7.5	0.361	0.420	0.294	0.460	0.236	0.499	0.187	0.533	0.147	0.564	0.114	0.590	0.087	0.611
8.0	0.387	0.449	0.314	0.492	0.252	0.533	0.200	0.570	0.157	0.603	0.122	0.631	0.093	0.654
9.0	0.437	0.508	0.355	0.557	0.285	0.603	0.226	0.645	0.177	0.682	0.137	0.714	0.105	0.739
10.0	0.488	0.567	0.397	0.622	0.319	0.673	0.253	0.720	0.198	0.762	0.154	0.797	0.118	0.825
11.0	0.540	0.627	0.439	0.687	0.352	0.744	0.279	0.796	0.219	0.842	0.170	0.881	0.130	0.912
12.0	0.592	0.687	0.481	0.754	0.386	0.816	0.306	0.873	0.240	0.923	0.186	0.966	0.143	1.000
13.0	0.645	0.749	0.524	0.821	0.421	0.889	0.334	0.951	0.262	1.006	0.203	1.052	0.156	1.089
14.0	0.698	0.811	0.568	0.889	0.456	0.962	0.361	1.029	0.283	1.089	0.220	1.139	0.169	1.179
15.0	0.752	0.873	0.611	0.957	0.491	1.036	0.389	1.109	0.305	1.173	0.237	1.227	0.182	1.270
16.0	0.807	0.936	0.656	1.027	0.527	1.111	0.418	1.189	0.328	1.257	0.254	1.315	0.195	1.362
17.0	0.862	1.000	0.701	1.097	0.563	1.187	0.446	1.270	0.350	1.343	0.271	1.405	0.208	1.455
18.0	0.917	1.065	0.746	1.168	0.599	1.264	0.475	1.352	0.373	1.430	0.289	1.496	0.222	1.549
19.0	0.974	1.131	0.792	1.239	0.636	1.342	0.505	1.435	0.396	1.518	0.307	1.588	0.236	1.644
20.0	1.031	1.197	0.839	1.312	0.673	1.420	0.534	1.519	0.419	1.606	0.325	1.680	0.249	1.740
22.0	1.147	1.332	0.933	1.460	0.750	1.580	0.595	1.690	0.466	1.787	0.362	1.869	0.278	1.935
24.0	1.267	1.470	1.030	1.611	0.828	1.744	0.657	1.865	0.515	1.972	0.399	2.063	0.307	2.136
26.0	1.389	1.612	1.130	1.766	0.908	1.912	0.720	2.045	0.565	2.162	0.438	2.261	0.336	2.341
28.0	1.514	1.757	1.232	1.925	0.990	2.084	0.786	2.229	0.616	2.356	0.478	2.464	0.367	2.551
30.0	1.643	1.906	1.337	2.089	1.074	2.261	0.853	2.417	0.669	2.555	0.519	2.672	0.398	2.767
32.0	1.775	2.060	1.445	2.257	1.161	2.442	0.922	2.611	0.723	2.760	0.561	2.886	0.431	2.988
34.0	1.911	2.217	1.556	2.429	1.250	2.629	0.993	2.810	0.779	2.971	0.604	3.106	0.464	3.216
36.0	2.051	2.379	1.670	2.607	1.342	2.820	1.066	3.015	0.836	3.187	0.649	3.332	0.498	3.450
38.0	2.196	2.547	1.788	2.789	1.437	3.018	1.141	3.226	0.895	3.410	0.695	3.565	0.534	3.690
40.0	2.345	2.719	1.909	2.978	1.535	3.222	1.219	3.444	0.957	3.640	0.742	3.805	0.570	3.938
45.0	2.738	3.174	2.231	3.476	1.794	3.760	1.425	4.019	1.119	4.246	0.868	4.439	0.667	4.594
50.0	3.168	3.671	2.582	4.019	2.077	4.346	1.650	4.644	1.296	4.906	1.006	5.128	0.773	5.306
55.0	3.644	4.217	2.968	4.616	2.389	4.990	1.899	5.331	1.491	5.631	1.158	5.884	0.890	6.088
60.0	4.166	4.824	3.399	5.278	2.737	5.705	2.176	6.093	1.709	6.434	1.328	6.722	1.020	6.954

APPENDIX TABLE C

DECREASES IN INFECTION RISK CORRESPONDING TO VARIOUS PERCENTAGES INFECTED BY THE SAME AGE AT TWO DIFFERENT SURVEYS

DIMINUTION DU RISQUE D'INFECTION CORRESPONDANT A DES POURCENTAGES DIFFERENTS DE SUJETS DEJA INFECTES A UN MEME AGE LORS DE DEUX ENQUETES DIFFERENTES

(Divide the entry in the table by the interval between the surveys in years to obtain the approximate annual percentage decrease for use in Appendix Table B)

(Diviser le chiffre d'entrée dans le présent tableau par l'intervalle en années entre les deux enquêtes pour obtenir le pourcentage annuel approximatif de diminution du risque d'infection à utiliser pour lire le tableau annexe B)

Percentage of persons already infected at the time of the later survey.

Pourcentage de sujets déjà infectés lors de la seconde enquête considerée.

Percentage of persons already infected at the time of the earlier survey

Pourcentage de sujets déjà infectés lors de la première enquête considerée

	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.4	69														
0.6	110	41													
0.8	139	70	29												
1.0	161	92	51	22											
1.5	202	133	92	63	41										
2.0	231	162	121	92	70	29									
2.5	254	184	144	115	92	52	23								
3.0	272	203	162	133	111	70	41	18							
3.5	288	218	178	149	127	86	57	34	16						
4.0	302	232	191	163	140	99	70	48	29	14					
4.5	314	244	203	175	152	111	82	60	41	26	12				
5.0	324	255	214	185	163	122	93	71	52	36	23	11			
5.5	334	265	224	195	173	132	103	80	62	46	33	21	10		
6.0	343	274	233	204	182	141	112	89	71	55	42	30	19	9	
6.5	351	282	241	212	190	149	120	98	79	63	50	38	27	17	8
7.0	359	290	249	220	198	157	128	105	87	71	58	45	35	25	16
7.5	366	297	256	227	205	164	135	112	94	78	65	53	42	32	23
8.0	373	304	263	234	212	171	142	119	101	85	71	59	49	39	30
9.0	385	316	275	246	224	183	154	132	113	97	84	72	61	51	42
10.0	396	327	286	257	235	194	165	143	124	108	95	83	72	62	53
11.0	406	337	296	267	245	204	175	153	134	119	105	93	82	72	63
12.0	416	346	306	277	254	214	184	162	143	128	114	102	91	82	73
13.0	424	355	314	285	263	222	193	170	152	136	123	111	100	90	81
14.0	432	363	322	293	271	230	201	178	160	144	131	119	108	98	89
15.0	440	370	330	301	278	238	208	186	167	152	138	126	115	106	97
16.0	447	377	337	308	285	245	216	193	174	159	145	133	122	113	104
17.0	453	384	343	314	292	251	222	200	181	165	152	140	129	119	110
18.0	460	390	350	321	298	257	228	206	187	172	158	146	135	126	117
19.0	466	396	356	327	304	263	234	212	193	178	164	152	141	132	123
20.0	471	402	361	332	310	269	240	218	199	183	170	158	147	137	128
22.0	482	413	372	343	321	280	251	228	210	194	181	169	158	148	139
24.0	492	423	382	353	331	290	261	238	220	204	191	179	168	158	149
26.0	501	432	391	362	340	299	270	248	229	213	200	188	177	167	158
28.0	510	441	400	371	349	308	279	256	238	222	209	196	186	176	167
30.0	518	449	408	379	357	316	287	265	246	230	217	205	194	184	175
32.0	526	457	416	387	365	324	295	272	254	238	225	213	202	192	183
34.0	534	464	423	395	372	331	302	280	261	246	232	220	209	199	190
36.0	541	471	431	402	379	339	310	287	268	253	239	227	216	207	198
38.0	548	478	437	409	386	345	316	294	275	260	246	234	223	213	204
40.0	554	485	444	415	393	352	323	300	282	266	253	241	230	220	211
45.0	570	501	460	431	409	368	339	316	298	282	268	256	246	236	227
50.0	585	515	475	446	423	383	354	331	312	297	283	271	260	251	242
55.0	599	529	489	460	438	397	368	345	327	311	297	285	275	265	256
60.0	613	543	503	474	451	410	381	359	340	325	311	299	288	278	270

DECREASES IN INFECTION RISK CORRESPONDING TO VARIOUS PERCENTAGES INFECTED BY THE SAME AGE AT TWO DIFFERENT SURVEYS

DIMINUTION DU RISQUE D'INFECTION CORRESPONDANT A DES POURCENTAGES DIFFERENTS DE SUJETS DEJA INFECTES A UN MEME AGE LORS DE DEUX ENQUETES DIFFERENTES

(Divide the entry in the table by the interval between the surveys in years to obtain the approximate annual percentage decrease for use in Appendix Table B)

(Diviser le chiffre d'entrée dans le présent tableau par l'intervalle en années entre les deux enquêtes pour obtenir le pourcentage annuel approximatif de diminution du risque d'infection à utiliser pour lire le tableau annexe B)

Percentage of persons already infected at the time of the later survey.

Pourcentage de sujets déjà infectés lors de la seconde enquête considerée.

Percentage of persons already infected at the time of the earlier survey

Pourcentage de sujets déjà infectés lors de la première enquête considerée

	6.5	7.0	7.5	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0
7.0	8														
7.5	15	7													
8.0	22	14	7												
9.0	34	26	19	12											
10.0	45	37	30	23	11										
11.0	55	47	40	33	21	10									
12.0	64	57	49	43	30	19	9								
13.0	73	65	58	51	39	28	18	9							
14.0	81	73	66	59	47	36	26	17	8						
15.0	88	81	73	67	54	43	33	24	15	7					
16.0	95	88	80	74	61	50	40	31	22	14	7				
17.0	102	94	87	80	68	57	47	38	29	21	14	7			
18.0	108	101	93	87	74	63	53	44	35	27	20	13	6		
19.0	114	107	99	93	80	69	59	50	41	33	26	19	12	6	
20.0	120	112	105	98	86	75	65	56	47	39	32	25	18	12	6
22.0	131	123	116	109	97	86	76	66	58	50	42	35	29	22	16
24.0	141	133	126	119	107	96	86	76	68	60	52	45	39	32	26
26.0	150	142	135	128	116	105	95	86	77	69	62	55	48	42	36
28.0	159	151	144	137	125	114	104	94	86	78	70	63	57	50	44
30.0	167	159	152	145	133	122	112	103	94	86	79	72	65	59	53
32.0	175	167	160	153	141	130	120	110	102	94	86	79	73	66	60
34.0	182	174	167	161	148	137	127	118	109	101	94	87	80	74	68
36.0	189	182	174	168	155	144	134	125	116	108	101	94	87	81	75
38.0	196	189	181	175	162	151	141	132	123	115	108	101	94	88	82
40.0	203	195	188	181	169	158	148	139	130	122	115	107	101	95	89
45.0	219	211	204	197	185	174	164	154	146	138	130	123	117	110	104
50.0	233	226	219	212	199	188	178	169	160	153	145	138	131	125	119
55.0	247	240	233	226	214	203	192	183	175	167	159	152	146	139	133
60.0	261	254	246	240	227	216	206	197	188	180	173	166	159	153	147

	20	22	24	26	28	30	32	34	36	38	40	45	50	55
22.0	11													
24.0	21	10												
26.0	30	19	9											
28.0	39	28	18	9										
30.0	47	36	26	17	8									
32.0	55	44	34	25	16	8								
34.0	62	51	41	32	23	15	7							
36.0	69	59	49	39	31	22	15	7						
38.0	76	65	55	46	38	29	21	14	7					
40.0	83	72	62	53	44	36	28	21	14	7				
45.0	99	88	78	69	60	52	44	36	29	22	16			
50.0	113	103	93	83	75	66	59	51	44	37	31	15		
55.0	127	117	107	98	89	81	73	65	58	51	45	29	14	
60.0	141	131	121	111	103	94	87	79	72	65	58	43	28	