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Tuberculosis in the Americas

PART I: EPIDEMIOLOGY

The objectives of the tuberculosis control program in the Americas[1] are: to reduce morbidity and mortality through BCG vaccination and the detection and treatment of cases by the general health services.

BCG vaccination reduces by 80 per cent the vaccinees' risk of contracting the disease. Since it is basically applied to infants under one year of age for the purpose of preventing tuberculous meningitis and other serious (but non-contagious) forms of infant tuberculosis, it has very little effect on the chain of transmission of the disease and on the incidence and general mortality due to tuberculosis. Diagnosis and treatment, especially of active cases (which are the sources of infection), are the principal control methods. The recommended strategy is the detection of active cases through the systematic examination of the sputum of adults with symptoms who present themselves to the general health services for any reason and their out-patient treatment under the supervision of the general health service nearest their home.

Because of operating difficulties, chemotherapy is reserved for special cases such as contacts of active cases or recently infected persons, and is not a practical control measure in most countries, especially those that undertake BCG vaccination activities.

It has been estimated that the maximum impact that could be obtained would be an annual 14 per cent reduction in the problem—as has been achieved in some European countries—through the use of BCG vaccination (1 per cent), diagnosis and treatment (8 per cent) and improvement in economic and social conditions in general (5 per cent). However, in the Americas a 10 per cent annual reduction is believed to be the optimum possible and has already been achieved in some countries and areas where sound programs have been conducted on a sustained basis.

The epidemiological status of tuberculosis in the Region, as well as the trends of the disease, as shown by such indicators as mortality, morbidity, and annual risk of infection, is reviewed below.

[1]The policies and strategies for tuberculosis control in the Region of the Americas were set forth in the *Ten-Year Health Plan for the Americas 1971–1980* (PAHO Official Document 118, 1973) and are described in the *Ninth Report of the WHO Expert Committee on Tuberculosis* (Technical Report Series 552, 1974) and in the *Manual de normas y procedimientos para programas integrados de control de tuberculosis* (Scientific Publication 376, 1979).

Mortality

Data on tuberculosis mortality since the beginning of the century are available in a number of countries and

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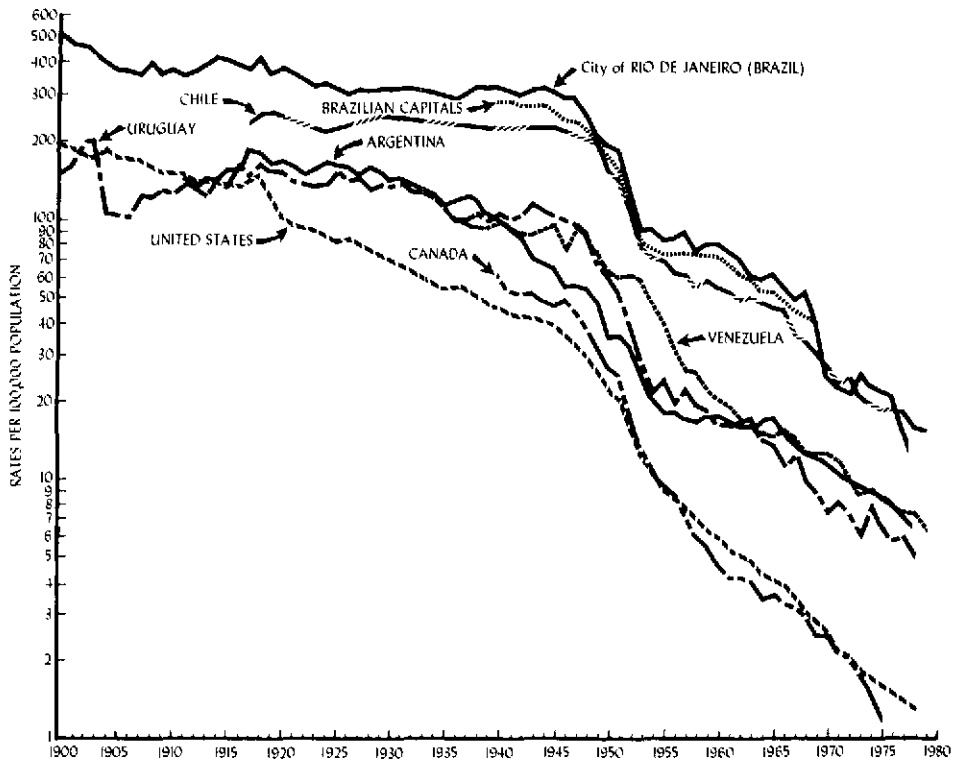
Figure 1. Tuberculosis mortality rates per 100,000 population in selected countries of the Americas since 1900.



reflect a decline in the absence of specific control measures (Figure 1). Between 1945 and 1955 the introduction of drugs into tuberculosis treatment produced a sharp fall in mortality. In some Latin American countries, the death rate was stabilized for several years, possibly because of late deaths of chronic patients that had been incorrectly treated. In the past decade, the downward trend has been more marked than in the prechemotherapy era and probably reflects the impact of control programs. However, an analysis of the information available for a group of Latin American countries (Table 1) shows a very moderate downward trend (5 per cent annually) in mortality, which is probably due to the fact that in those countries the problem is more serious, the program less developed, and financial resources limited. Table 2 presents the deaths reported by the countries in the last year for which statistics are available. In some countries such as Bolivia, Brazil, Haiti, Paraguay, and Peru, the use of death certificates is limited and in most of them a substantial proportion of deaths are not medically certified so the data are of limited value.

On the basis of the incomplete information available, it is estimated that in the Region there are about 45,000 deaths from tuberculosis every year (or 7.5 per 100,000 population).

The goal of the Ten-Year Health Plan for the Americas (1971–1980) was to reduce tuberculosis mortality by between 50 and 65 per cent, which implied an annual reduction of 7 to 10 per cent; the data available show that most of the countries did not achieve that goal.

Morbidity

Tuberculosis morbidity can be determined only on the basis of the reported incidence. Disease prevalence studies are too expensive and are not justified. Furthermore, the prevalence of patients under treatment varies according to the duration of the treatment and the updating of the registers; in addition, it is of little use as an epidemiological indicator since those patients do not represent sources of infection.

The recording of incidence on the basis of reports improves as the program increases its coverage and organization. During this process, which is underway in many countries, the reported cases increase every year until a level close to the real incidence that can be diagnosed with the medical resources available is reached. Furthermore, changes in the resources or the intensity of case detection can temporarily change the observed incidence

Table 1. Tuberculosis mortality rates per 100,000 population in countries of the Americas, 1970–1979.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Argentina[a]	12.1		10.2		9.3		8.4		6.7	6.2
Canada	2.5	2.1	2.1	1.8	1.5	1.2	...	1.1	0.9	...
Chile	27.4	23.8	24.6	20.7	19.4	18.8	19.1	18.2	15.8	15.1
Colombia	12.8	...	13.8	13.4	13.3	11.7	10.7	10.0	...	...
Costa Rica	7.1	6.2	7.2	4.7	4.4	5.1	5.2	4.2	3.9	4.2
Cuba	...	5.3	4.6	4.3	3.5	2.6	3.0	2.4	2.4	...
Dominican Republic	6.6	5.7	6.1	7.0	6.7	6.2	6.7	6.2	8.1	...
Ecuador	18.3	18.2	18.8	18.0	18.3	...	17.9	16.7	...	...
El Salvador	11.2	11.1	10.2	9.3	9.2	...	6.7	...	...	5.2
Guatemala	20.9	20.1	...	...	...	18.3	15.4	12.2	13.9	...
Honduras	5.0	6.4	5.7	7.2	6.0	3.9	3.4	5.1	...	...
Mexico	19.2	17.3	16.7	15.8	14.8	14.2	13.2	...	...	...
Nicaragua	...	...	2.3	3.0	2.1	2.6	3.5	1.8	1.1	...
Panama	19.4	16.2	16.1	13.7	13.1	...	...	10.8	8.4	...
Paraguay	23.0	24.1	22.5	22.4	19.6	19.7	16.9	13.6	14.3	...
Peru	37.8	32.5	30.3	31.5	...	...	28.2	22.5	...	...
United States of America	2.6	2.2	2.1	1.8	1.7	1.6	1.5	1.4	1.3	...
Uruguay	7.5	8.1	7.3	6.3	7.8	6.3	5.7	6.0	5.1	...
Venezuela	11.3	10.0	8.7	9.1	8.2	7.8	7.5	7.4	6.4	...

[a]Biennial analysis, National Tuberculosis Institute, Argentina.
... Data not available.

although over extended periods the trend (especially in the youngest groups) is a useful indicator.

The discrepancy between the real trend and case reporting is obvious in a number of countries. In Brazil, for example, 47,797 cases were reported in 1979, whereas 56,484, 64,734, and 72,608 were reported in subsequent years because of better record keeping. The morbidity rate rose from 42.6 to 60.0 per 100,000 population in these years, but in the same period mortality fell without any fundamental changes having taken place in treatment. The incidence in the states in which coverage and notification are adequate was reduced or remained stable.

In other countries notification coverage is low and they have not yet reached the stage of extension. In Mexico, for example, up to 1978 the record keeping system included reports only of bacteriologically confirmed pulmonary cases registered by the official services of the Ministry of Health and Welfare, which represent less than half the patients detected and treated in the country.

An analysis of the reported trend in North America shows that the total incidence of cases fell by about 6 per cent annually up to 1978. Since then it has stabilized in the United States of America, probably because of immigration from countries in which there is a higher risk and prevalence of infection (Figure 2). In Latin America there has been a slow decrease in most of the countries, probably from 3 to 5 per cent annually (Figures 2 and 3).

Taking into account the larger natural growth and the smaller proportion of adults with old infections, the effect of control measures should be more rapid in the de-

Table 2. Deaths from tuberculosis in countries of the Americas, last year available.

Country	Year	Number	Rate per 100,000
Antigua	1978	—	—
Argentina	1978	1,959	7.4
Bahamas	1979	7	3.1
Barbados	1978	2	0.8
Belize	1979	12	7.6
Bermuda	1978	—	—
Canada	1978	220	0.9
Chile	1979	1,648	15.1
Colombia	1977	2,440	10.0
Costa Rica	1979	92	4.2
Cuba	1978	229	2.4
Dominica	1978	5	6.2
Dominican Republic	1978	416	8.1
Ecuador	1977	1,260	16.7
El Salvador	1979	233	5.2
French Guiana	1978	4	6.1
Grenada	1977	6	5.5
Guadeloupe	1978	4	1.2
Guatemala	1978	922	13.9
Guyana	1976	65	8.2
Honduras	1977	168	5.1
Jamaica	1975	63	3.1
Mexico	1976	8,213	13.2
Nicaragua	1978	26	1.1
Panama	1978	154	8.4
Paraguay	1978	231	14.3
Peru	1977	3,688	22.5
Saint Lucia	1978	19	17.0
Suriname	1978	4	1.1
Trinidad and Tobago	1977	27	2.4
United States of America	1978	2,914	1.3
Uruguay	1978	147	5.1
Venezuela	1978	838	6.4

Figure 2. Morbidity rates from tuberculosis as notified in selected countries in North and Middle America, 1970-1980, and curve showing a tendency of 5 per cent annual reduction.

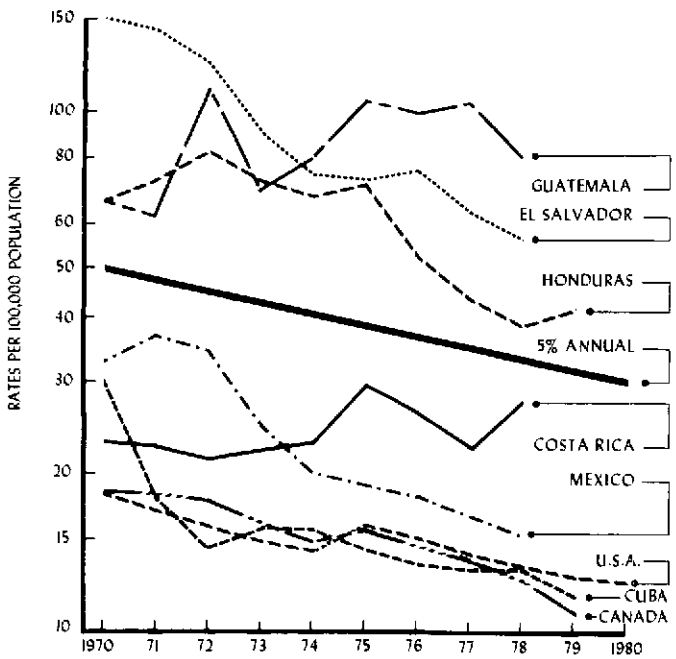


Figure 3. Morbidity rates from tuberculosis as notified by selected countries in South America, and curve showing a tendency of 5 per cent annual reduction.

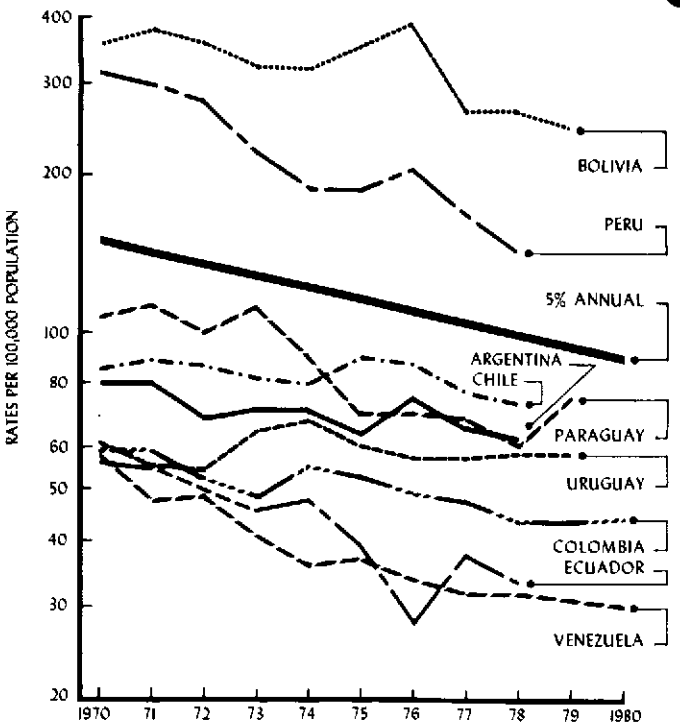


Figure 4. Number and percentage of new cases of tuberculosis by age group and site: pulmonary (PT), pulmonary with positive bacilloscopy (P+), and extrapulmonary (EP), in Middle and South America, 1979-1980.

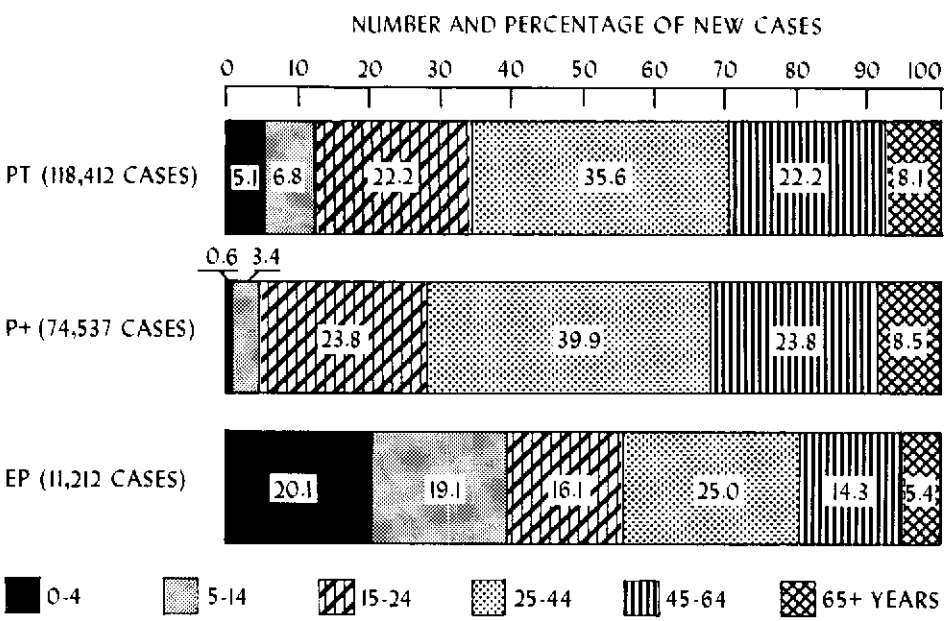


Table 3. Tuberculosis morbidity rates in countries of the Americas, 1970-1979.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Argentina	80.3	79.3	67.9	71.4	71.6	63.8	75.5	66.0	61.7	62.0	63.5
Bolivia	360	379	361	324	322	349	395	267	267	248	...
Brazil	39.1	37.7	36.7	44.8	31.9	30.8	47.7	42.6	48.5	54.0	60.0
Canada	18.4	18.3	17.9	16.1	14.9	15.6	...	13.7	12.5	...	...
Chile	86	88.5	86.5	82.4	79.9	90.7	87.4	76.9	74.2	...	...
Colombia	59.4	59.5	51.9	48.3	55.2	52.9	49.6	47.4	43.4	42.9	...
Costa Rica	23.1	22.7	21.4	22.2	23.1	29.9	26.4	22.3	27.6	...	...
Cuba	31.2	17.8	14.5	15.7	15.6	14.3	13.4	13.1	13.0	11.6	...
Ecuador	57.4	55.7	...	45.9	48.2	39.5	28.1	37.8	33.5	...	...
El Salvador	153.0	144.3	123.3	90.6	74.9	71.7	77.2	62.4	56.2	...	...
Guatemala	67.6	62.8	110.2	69.9	81.0	104.2	99.2	104.0	80.8	...	...
Honduras	68.2	73.3	84.7	73.7	68.5	72.0	51.3	43.2	38.4	41.0	...
Mexico	33.0	37.1	34.5	24.6	20.0	19.0	18.2	16.6	15.2	...	...
Paraguay	115.1	124.2	103.0	124.9	91.2	71.0	71.4	69.2	51.3	75.7	...
Peru	317.0	299.8	...	223.6	191.8	189.8	206.0	169.7	144.9	...	...
Uruguay	60.4	56.3	55.4	64.9	68.6	61.3	58.0	57.9	59.1	58.9	...
United States of America	18.3	17.1	15.8	14.8	14.2	15.9	15.0	13.9	13.1	...	...
Venezuela	58	48	49	41	36	37	34	32	32	31	30

... Data not available.

veloping countries than in the developed countries. However, there are a number of factors that mask or limit that effect on incidence. First, there is the expansion of the coverage of health services, the greater demand for services by the population, the integration of case detection activities and of resources for the diagnosis of infant and extra-pulmonary forms of the disease, and the gradual improvement in the reporting, registration, and epidemiological surveillance systems. Among the factors that limit the effect of control measures are the socioeconomic conditions of the population and the limited accessibility, scarce resources, and inadequate organization of the health services.

It is estimated that about 250,000 new cases are diagnosed in the Region each year: 12 per cent of them in North America (with a rate of 13.0 per 100,000 population) and 88 per cent in Middle America and South America (with a rate of 67.0 per 100,000 population). The ratio between reported incidence and tuberculosis mortality is 10 to 1 in North America and 5 to 1 in the rest of the Region, probably because of lower levels of case detection and registration and a higher case fatality rate among the detected cases in less developed countries.

Figures 4 and 5 present information for South America and Middle America on notifications by age group and site (pulmonary-extrapulmonary), and according to method of diagnosis. The percentages depend on the age composition of the population, the ability to diagnose extrapulmonary and infant forms of the disease (radiological resources, pediatric clinic, chemical laboratory, culture methods, pathological anatomy examinations), the compulsory reporting of these forms and its enforcement, and the activity and coverage of the program as regards the detection of pulmonary cases by bacilloscopy. Table 3 shows the reported morbidity rates in the countries of the Americas between 1970 and 1980.

In the United States the proportion of cases is lower among young persons (12.6 in persons under age 25) and higher among persons over 65 years of age (28.6 in 1978). As for the diagnostic method, 80.6 per cent of the pulmonary cases proved to be positive on bacteriological examination, 12.4 per cent negative, and for 7 per cent no information was available.

Reliable information is, unfortunately, not available in the Region on cases of tuberculous meningitis in children, which is a good epidemiological indicator as well as an indicator of the impact of BCG vaccination.

Figure 5. Percentage of new cases of pulmonary tuberculosis according to the diagnostic method in Middle and South America, 1979-1980.

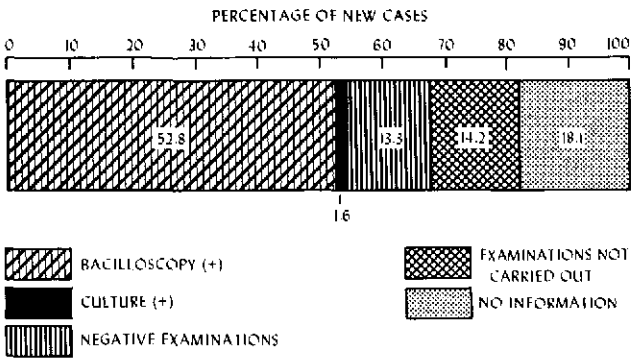


Table 4. Prevalence of reactions of 10 mm and more to the tuberculin test in countries of the Americas.

Country	Year	Age	Prevalence per 100
Argentina	1974-1978	6-7	3.6
Brazil (capitals)	1970-1973	6-10	12.8
Brazil (Belém)	1970-1973	6-10	26.5
Brazil (Rio Grande do Sul)	1971-1974	6-8	2.7
Chile (Santiago)	1969-1970	5-9	9.2
Costa Rica (urban)	1967	6	8
Costa Rica (rural)	1967	5-9	4
Peru (Lima)	1973	6-7	13.5
United States of America	1949-1951	17-21 (19,2)	9.1
United States of America	1961	17-21	4.1
United States of America	1968	17-21	3.1

Annual Risk of Infection

Little information is available about the risk and prevalence of the disease at the regional level. Although prevalence studies are common, the groups studied are usually not representative of the population at large. BCG vaccination and internal migration also interfere with the conduct and comparability of prevalence studies that are carried out at an interval of several years and are necessary for estimating the risk of infection and its trend.

Table 4 presents the information available on the prevalence of reactions of 10 mm or more to the tuberculin test in certain countries for which data are available. In none of them was information on the trend of the risk obtained. However, estimates based on prevalence of infection data that reflect a 3 to 5 per cent annual reduction would indicate for 1980 annual risks of less than 0.5 per cent in Argentina, 0.9 per cent in Brazil, 2 per cent in Peru, and 0.1 per cent in the United States.

If the population samples included in the tuberculin studies are representative and the trends are sustained, these estimates should be correlated with the incidence of new cases since there are approximately 50-60 active cases per 100,000 population for every 1 per cent of risk of infection.

Conclusions

The problem of tuberculosis is slowly but gradually declining in the Americas, with mortality falling somewhat more rapidly than the annual risk of infection and incidence.

Given the present trend (5 per cent annual reduction) and the expected increase in the population, it is estimated that there will be more than 150,000 new cases a year by the end of the century. The aggregate number of cases expected in the next 20 years is more than 2 million.

Since the simple technical resources for prevention, diagnosis, and treatment are available, tuberculosis control should be included among the priority activities of the short- and medium-term health plans of the countries.

The next issue of the *Epidemiological Bulletin* will contain Part II of this report and deal with the present status of tuberculosis control programs in the Americas.

(*Source*: Tuberculosis Control Program, Communicable Disease Unit, Division of Disease Prevention and Control, PAHO.)