

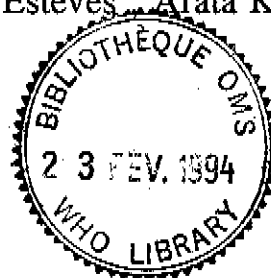


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TUBERCULOSIS TRENDS IN EASTERN EUROPE AND THE FORMER USSR

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Abstract

The aim of this paper is to assess trends in tuberculosis morbidity and mortality in the countries of Eastern Europe and the former USSR.

Data on morbidity and mortality were obtained from reports of the Ministries of Health, a 1992 WHO questionnaire, national tuberculosis associations, and other sources.

The quality of surveillance of tuberculosis cases differs widely between countries. Ranging from 19 to 80 per 100,000 population in 1990-1992, tuberculosis notification rates of most Eastern European and former USSR countries are higher than those of Western European countries. The lowest tuberculosis notification rate is reported in the Czech Republic, while the highest are reported in Romania and Kazakhstan.

While in Albania, Croatia, and Slovenia notification rates have continued to decline, in the remaining countries of Eastern Europe the declining trend has recently stopped. Nevertheless, countries such as the Czech Republic, Hungary, Poland, and the Slovak Republic have experienced a distinct rate decrease when the 3-year average rate around 1985 is compared to that around 1990, despite the very recent levelling off or increase. In Romania, the previous decline in notification rate ended in 1985 and in the period 1986-1992 an average 5.4% annual increase was observed. In this country, two thirds of all cases still occur among young adults.

Among the Baltic countries of the former USSR, the declining trend continues in Estonia, whereas in Latvia and Lithuania notification rates decreased less markedly from 1985 to 1990 than in the first half of the 1980s. Among the other European countries of the former USSR, Russia and Ukraine had a slow decline in the first half of the 1980s and a more pronounced one from 1985 to 1990. During the latter period of time, in Belarus and Moldova the decrease has been steeper. In the Caucasian countries of the former USSR, where under-reporting and low case finding are recognized, case rates have stabilized in Armenia, while in Azerbaijan and Georgia there was a decrease from 1985 to 1990. Among the Asian countries of the former USSR, Kazakhstan and Tajikistan reported a lower decline in case rates from 1985 to 1990 than from 1980 to 1985. Kyrgyzstan, Turkmenistan, and Uzbekistan reported increases in notification rates from 1985 to 1990: in Turkmenistan an average 5.5% annual increase in rate was observed between 1987 and 1991.

Tuberculosis mortality is steadily increasing in Romania, Armenia, Kyrgyzstan, Latvia, Lithuania, Moldova, and Turkmenistan, while no decline is seen in most of the other countries of Eastern Europe and the former USSR. With the exception of the Czech Republic, the Slovak Republic, and Slovenia, mortality rates in all countries remain higher than those of Western Europe.

HIV infection and immigration have not contributed importantly to the epidemiological situation in Eastern Europe and the former USSR. Only a few countries report the use of rifampicin containing regimens for infectious cases and none the retreatment regimen which are recommended by WHO. In several countries drug supply is insufficient and/or erratic.

While the post-war tuberculosis situation was grave, progress in tuberculosis control allowed some countries to substantially reduce the public health impact of the disease. However, malnutrition and poor living conditions in some countries favour reactivation of pre-existing latent infection. Lack of crucial antituberculosis drugs, such as rifampicin and pyrazinamide, results in inadequate treatment which causes increased mortality and prevalence of the disease. While adequate chemotherapy will result in a decrease of tuberculosis incidence in a country with a low prevalence of HIV infection, it is difficult to predict the future trend of

tuberculosis incidence if treatment remains inadequate and the prevalence of HIV infection low.

The main steps to be taken in Eastern Europe and the former USSR are to find the necessary resources to secure an un-interrupted supply of essential drugs, and to introduce WHO recommended short-course chemotherapy for new and retreatment cases, particularly for the infectious ones. Where necessary, inefficient national programmes will need structural adjustments and increased training activities for health care providers to allow for a better understanding of relevant issues in tuberculosis control.

Introduction

The recent political, social, and economic changes in Eastern European countries and the former USSR are necessarily accompanied by a profound impact on the health systems. These changes may call for some restructuring to allow for an adequate function under new conditions. Therefore, it is important to examine whether the previously observed downward trend of tuberculosis incidence will be affected. Indeed, history seems to show that the severity of the disease reflects the complexity of disturbances brought about in the community as a whole by most forms of social upheavals, be they abrupt changes in the ancestral habits, rapid industrialization, or wars (1).

Previous information from Eastern Europe showed that in 1987 tuberculosis notifications and rates of new cases were decreasing compared to 1986 in all of the eight countries studied, except in Romania and Yugoslavia (2). The notification rate of bacteriologically confirmed cases was highest in Romania (40.3 per 100,000 population), while rates were considered relatively high (varying between 15.0 and 26.5 per 100,000) in four of the remaining seven countries surveyed. Nevertheless, the decreasing trends of tuberculosis morbidity and mortality seen in all countries following the second world war were reassuring, despite the level of tuberculosis reported at that time (2).

In recent years, a reversed trend or a levelling off in tuberculosis notifications has been observed in some industrialized countries of Western Europe, North America, and Oceania (3-5, and Canadian Centre for Health Information). The limited information available on the recent tuberculosis situation indicates that in certain countries of Eastern Europe and the former USSR, tuberculosis remains an important health problem. The main purpose of this article is to review trends in the recent case notification and mortality rates of tuberculosis in Eastern Europe and the former USSR, to identify the countries with an unsatisfactory decrease in the rates, and try to identify specific factors responsible for the deficiencies in order to define populations at risk to whom intervention strategies should be preferably targeted.

Methods

Notification data were obtained from national statistical reports produced by the Ministries of Health, from a WHO questionnaire survey on National Tuberculosis Control Programmes worldwide in 1992, from reports of national tuberculosis and respiratory diseases associations, published literature and personal communications. Some countries provided data covering several years or the entire period since the establishment of a national programme of tuberculosis surveillance, while others for the two recent decades. Data from some of the republics of the former USSR were obtained from the Scientific Association of Phthysiologists, Moscow, from reports prepared by the Central Institute for Research in Tuberculosis of the Russian Academy of Medical Sciences, Moscow, Russia. Rates (per 100,000 population) were obtained from official reports by some countries. If officially unavailable, rates were calculated using the most recent population estimates by the United Nations ("World Population Prospects: The 1992 Revision" - in press). This source also provided demographic estimates for 1992 for the newly independent states of the former USSR; extrapolation to 1991 and 1990 was made by assuming that all new states had experienced an equal annual population increase of 1%. Data from the former German Democratic Republic were included among those of Western Europe in a recent review (3) and were omitted from this analysis.

Mortality information was obtained from national reports produced by the Ministries of Health, from the aforementioned WHO questionnaire, from reports of national tuberculosis associations, published literature and personal communications. Data on tuberculosis mortality in the republics of the former USSR were obtained in part from the Scientific Association of Phthysiologists, Moscow, from reports prepared by the Central Institute for Research in Tuberculosis of the Russian Academy of Medical Sciences, Moscow, Russia. Data were also obtained from the Global Health Situation Assessment and Projection Unit, Division of Epidemiological Surveillance and Health Situation and Trend Assessment, WHO, Geneva.

Age standardized mortality rates were calculated by adjusting age-specific mortality rates for each country to the age distribution of the former USSR population in 1990.

For this review, a case of tuberculosis was defined as a case officially notified in the country studied. When possible, case definitions were summarized in the text.

Results

All old and new countries existing in the geographical region in early 1993 were studied. Eastern Europe includes the previously independent Albania, Bulgaria, Hungary, Poland, and Romania; the newly created republics previously part of the former Czechoslovakia (Czech Republic and Slovak Republic) and the former Yugoslavia (Croatia and Slovenia). As no separate data from the Federal Republic of Yugoslavia (Serbia and Montenegro), Bosnia and Herzegovina, and Macedonia were available, data from these countries were combined. The estimated total population of the above Eastern European countries was 124 million in 1991. The former USSR includes the Baltic countries (Estonia, Latvia, Lithuania) with an estimated total population of 8 million in 1991; the other European countries (Belarus, Moldova, Russia, Ukraine) with an estimated total population of 211 million in 1991; the Caucasian countries (Armenia, Azerbaijan, and Georgia) with an estimated total population of 16 million in 1991; and the other Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) with an estimated total population of 49 million in 1991. The total population of these countries was estimated to be approximately 408 million persons in 1992.

1. Annual risk of tuberculosis infection

Estimates on the annual risk of tuberculosis infection (ARI) are available only from some Eastern European countries. The results of two extensive tuberculin surveys carried out by WHO in several European countries between 1938 and 1951 allowed an estimation of the ARI for the period 1948-1951 (6). While the trend in the risk of tuberculosis infection between 1938 and 1948 is not accurate, since there were no tuberculin surveys carried out in the late 1930s, estimates of the risk of infection resulting from the 1948-1951 surveys are reliable. Based on the data from the 15-year-olds and assuming a 5% annual decrease of the ARI from 1938, it was estimated that in the former Czechoslovakia the ARI was approximately 2.7% in 1948 compared with 0.7% in the Netherlands (6). Assuming a 10% annual decrease of the ARI in the period 1948-1979 and a 5% annual decrease after 1979 (as it may be assumed from comparing the incidence decline in Czechoslovakia with that of other countries), the current ARI in the former Czechoslovakia is probably as low as 0.05%, compared with 0.01% in the Netherlands. The current low ARI is in agreement with a recent study on discontinuation of BCG vaccination in the Czech Republic (7). Consequently, while the prevalence of tuberculosis infection among the 15 year-olds was 47.5% in 1948, 58.9% of subjects in this cohort born in 1933 were infected at the age of 60 years in 1993. In those aged 19 years in 1948, the prevalence of tuberculosis infection was 66.8%. The estimated prevalence of infection for this cohort at the age of 64 years in 1993 is 74%. Consequently, there should be at present a substantial decrease in the incidence of tuberculosis in the age group 55-64 years because the proportion of individuals with remote infection has been decreasing considerably in recent years, and this trend is expected to continue for a number of years. It is also expected that a more pronounced decrease will be observed in those aged 65-74 years, since an increasing number of cohorts will be less infected in a few years than in the past, when the prevalence of infection was nearly 100%.

In Poland the ARI in 1948 was estimated to be 4.1%, and in the former Yugoslavia 3.5% (4.2% in Serbia and 1.7% in Slovenia) (6). As a consequence, those born in these countries in 1933 at age 15 years in 1948 had a prevalence of tuberculosis infection of 67% in Poland and 59% in the former Yugoslavia. In Poland the ARI was estimated to be 0.2% in 1991, *i.e.*, four times higher than that of the former Czechoslovakia. In Romania the current ARI might be as high as 0.35% (8).

2. Case notifications

Overall, tuberculosis notification rates of all countries combined showed an average annual decline of 3.3% in the recent years, decreasing from 72.7 per 100,000 in 1975 to 41.8 per 100,000 in 1991 (upper part of Figure 1). It should be emphasized that data on tuberculosis notifications are not always comparable. Several countries combine reports of new cases and relapses, others changed criteria during the period under study (for instance, introducing stricter criteria for bacteriologically unconfirmed cases), and at least one country reports new cases, relapses, and chronic cases combined. Available information on reporting criteria is provided in the analysis of the respective country.

2.1 Eastern European countries not including the former USSR

Tuberculosis notifications and notification rates per 100,000 population are shown in Tables 1 and 2. The lowest rates were found in Albania and the Czech Republic and the highest in Romania.

Section 1 of Table 3 shows average notification rates (per 100,000) in Eastern Europe for the periods 1974-76, 1979-81, 1984-86, and 1989-91, and the percentage decrease between each of these periods, as well as from 1975 to 1990. It is evident that, despite recent levelling off or increasing trend in some countries, the decrease in rate was higher in the period 1985-1990 than in 1980-1985 in all countries except Bulgaria and Romania. In particular, the Czech Republic, Hungary, Poland, and the Slovak Republic experienced a distinct decrease during the period 1985-1990 despite rates have either levelled off or slightly increased in the very recent period 1988-1992. In Romania, an increase of 18.1% in notification rate was observed from 1985 to 1990.

Notifications of tuberculosis cases have continued to decline in Albania, Croatia, and Slovenia (Fig.2). In Albania notification rates of all tuberculosis cases decreased regularly between 1960 and 1991 with an average annual decline of 7.8% between 1974 and 1991, whereas notifications of sputum smear positive cases were stable during the past 10 years (rate 5.3 per 100,000 in 1991). The 7.8% decrease in incidence observed in 1974-1991 is very high for 17 consecutive years. Moreover, most cases still occur in young adults and this contrasts with the low rate reported. Reports from Croatia show a regular decrease in rate of all cases during the past 40 years, with an annual decline of 4.5% during 1974-1992. However, in 1991 and 1992 reporting from community tuberculosis services was incomplete due to conflicts in the area. In Slovenia notification rates of all cases have regularly declined during the period 1974-1991 by an annual average of 4.7% (9).

In other countries of Eastern Europe, the previous downward trends of tuberculosis notification rates have become disturbed (Fig.3). In Bulgaria, the proportion of chronic cases, which are included in the notifications, decreased from 75% in 1965 to 32% in the mid-1980s. Rates decreased by an average 3.7% per annum between 1974 and 1991; however, rates have stabilized at around 25-28 per 100,000 during the last seven years. These data are difficult to interpret as chronic cases are included in the notifications. Without a clear delineation of new cases, relapses, and chronic cases, the trend of new cases can not be reliably determined. In the Czech Republic notifications of all cases have declined from an average 159 cases per 100,000 in 1958-1960 to less than 55 per 100,000 in the late 1970s. Later, rates continued to decrease at an average 7.6% per annum between 1975 and 1989, although slight increases have been observed during the past two years. However, stricter criteria for diagnosis of smear negative cases might have influenced the high decrease in the mid-1980s. Rates (per 100,000) of bacteriologically confirmed new pulmonary cases have increased from 10.6 in 1988 to 11.1 in 1991. In Hungary, while the average annual rate for all tuberculosis cases was 315 per 100,000 population in 1953-1957 and 60 in the mid-1970s, during the period 1974-1990 the average rate

decline was 3.8% per year. Over the past 3 years rates have stabilized at 34-38 per 100,000 population, with increases over the previous year in 1991 and 1992 (10). In Poland, between 1974 and 1992, an average 3.4% annual decline was observed; however, reported rates stabilized between 1989 and 1992 after sharp decreases in 1988 and 1989 (11). Finally, after a previously regular decline, bacteriologically proven cases have stabilized around 22 per 100,000 during the last three years (11). In the Slovak Republic, after a regular decline in notification rates (average 5.8% per annum) of all tuberculosis cases during 1974-1990, increases over the previous years were seen in 1991 and 1992.

In Romania tuberculosis case notifications have increased. In this country, 493 cases per 100,000 population of all forms of tuberculosis were notified in 1950, 333 in 1960, and 137 in 1970. Later, the 6.5% average annual decline seen since 1974 ended in 1985, and in the period 1986-1992 an average annual increase of 5.4% was observed (8). Considering rates of bacteriologically confirmed new cases, an average annual increase of 1.6% was noticed during the period 1977-1990, with higher annual increases after 1987 (8).

Finally, data on tuberculosis cases from Bosnia and Herzegovina, Macedonia and the Federal Republic of Yugoslavia have been grouped together due to absence of separate reports. In these three countries, a decline in rate of 4.3% per year was observed between 1974 and 1990. However, recent reports from the new countries of the former Yugoslavia may not be reliable because of the civil war and considerable population movements in this area.

An overview of tuberculosis notifications and trends, and the age distribution of new sputum smear positive cases in recent years is presented in Table 4. In the Czech Republic over two thirds of cases were recently reported among old adults; in this country in 1991, 42% and 27% of all new cases occurred in the elderly over 64 years and adults aged 15-44, respectively, as compared to 23% and 39%, respectively, in 1964, and 9% and 51%, respectively, in 1951. In Croatia, Hungary, Poland and Slovak Republic between 42% and 55% of cases are reported among old adults, whereas in Albania and Romania about two thirds of cases are still reported among young adults. Age and sex specific notification rates in the Czech Republic in 1951, 1964, and 1991 are shown in Figure 4, while those in Romania in 1965, 1975, and 1990 are shown in Figure 5. It is evident that the curves of female patients have a similar pattern in the two countries, although in Romania the decrease in incidence among young women was much slower during the last 25 years than that in the Czech Republic during the last 40 years. On the other hand, in male patients the curves markedly differ: in the Czech Republic there was a profound decrease in all age groups, whereas in Romania an increase in patients aged 30-45 years and a low decrease in the other age groups were seen between 1975 and 1990.

2.2 The former USSR

Overall, in the former USSR the incidence of notifications decreased 10.5 fold in urban population and 3.1 fold in the rural population in the period 1950-1989 (12). The rate of all cases of tuberculosis among both urban and rural populations decreased from 64.7 per 100,000 population in 1976 to 44.7 per 100,000 population in 1989, while that of smear positive pulmonary cases fell from 18.5 in 1976 to 13.5 in 1990. Notifications decreased more rapidly among children than among adults, and rates in males above 40 years of age are still high. Between 1970 and 1988, the highest rate of notifications for both sexes were among the 40-49 year-old patients (12). Except in the case of Lithuania and Tajikistan, relapses are not included in the 1990 figures presented in Tables 1 and 2. Thus, increases observed in some countries in 1991 may not be real.

Due to the vast geographical area covered by these countries and the large ethnic differences of the populations living in the area, the epidemiology of tuberculosis differs from

one region to another. The highest notification rates are reported from Kazakhstan and the Central Asian Republics of Kyrgyzstan, Turkmenistan, and Uzbekistan (Tables 1, 2, and 4).

European countries of the former USSR (Figures 6 and 7).

Among the Baltic countries, Estonia had a relatively low notification rate in 1990, although an increase was observed in 1991 paralleled by an increase of sputum smear positive cases from 12.4 in 1989 to 13.5 per 100,000 in 1991. During the last 15 years rates of all cases decreased rapidly by 6.3% per annum. On the other hand, Latvia and Lithuania had a very low decrease in notification rates from 1985 to 1990 (11.7% and 1.1%, respectively)(Table 3). In Latvia, after a regular decline averaging 5.1% per year until 1990, an increase from 34.1 per 100,000 in 1989 to 35.9 per 100,000 in 1991 has been observed. Rate of sputum positive cases has remained around 11 per 100,000 between 1988 and 1990. In Lithuania, the previous average annual decline of 4.1% since 1974 ended in 1988, and subsequently increased annually by 4.1% between 1989 and 1992. Sputum positive cases have also increased after 1989 and the rate in 1992 was 14.4 per 100,000.

In Russia, the country notifying the largest number of cases in the sub-region, a regular rate decline averaging 2.5% per year was observed during 1976-1991, with a recent decrease in rates of sputum smear positive cases from around 20 per 100,000 in 1976-85 to 14.5 in 1991. In Ukraine, rates of all cases have decreased by an average 2.8% per annum during 1976-1990. Rates of sputum smear positive cases remained fairly constant around 16 per 100,000 until 1987 and decreased recently to 13 per 100,000. In both countries, the decrease in notification rates was slow in the first half of the 1980s, and more pronounced from 1985 to 1990 (Table 3). In Belarus, a regular decline of rates of all cases was observed in 1976-1990 (average 5.9% per annum), although a slight increase was noted in 1991. This increase was paralleled by an increase in rate of sputum smear positive cases from 12.2 in 1989 to 12.8 per 100,000 in 1991. In Moldova, notification rates fluctuated until the mid-1980s due to large year-to-year variations. In the last 3 years, rates have been between 43 and 46 per 100,000. Trends of sputum smear positive cases has been similarly irregular, although recently there was a decline to 12.5 per 100,000 in 1990. Overall, these latter two countries had a distinct steeper decrease in rates than Russia and Ukraine (Table 3).

The age distribution of new sputum smear positive cases in recent years is presented in Table 4. In Estonia two thirds of cases were recently reported among old adults. While in Latvia and Lithuania slightly more cases are reported in the young adult age groups than in the elderly, in Moldova and Russia about two thirds of cases are reported among the young adults.

Caucasian countries of the former USSR (Figures 8)

The Caucasian countries Armenia, Azerbaijan, and Georgia are characterized by relatively low notification rates, but under-reporting and low case-finding are recognized (12). In Armenia, year-to-year variations in rate of all cases were observed. Although there was an average annual decline of 3.8% in the period 1976-1988, an average 5.6% annual increase followed during the recent three years. In addition, an increase in rate of sputum smear positive cases averaging 7.2% per year was observed in 1988-1991. In Azerbaijan, notifications of all cases also show large year-to-year variations; however, while during 1975-1991 there was an average annual decline of 1.8% in rates of all cases, rates of sputum smear positive cases regularly increased in 1976-1987 to stabilize recently around 9 per 100,000. In Georgia, rates of all cases have declined regularly at 4.5% per year during 1975-1990 and rates of sputum smear positive cases have recently stabilized at around 7 per 100,000.

Asian countries of the former USSR (Figure 9)

Among the Asian republics, Kazakhstan and Tajikistan have reported a decline in rates of all cases. However, the decrease in rate was lower in the period 1985-1990 than in the period 1980-1985, suggesting a slowing decline (Table 3). Kazakhstan has the highest rate of tuberculosis cases of all the new states of the former USSR. Although the rate of all cases decreased by 2.7% per year during 1976-1991, that of sputum smear positive cases remained stable during the same period of time at 20-23 cases per 100,000. In 1976 Tajikistan had one of the highest notification rates in the former USSR. However, due to an average annual decline of 5.3%, in 1992 the rate was 30.7 per 100,000. Similarly, the rate of sputum smear positive cases also decreased from 22.8 per 100,000 in 1976 to 11 per 100,000 in 1991. The remaining three Central Asian Republics, Kyrgyzstan, Turkmenistan, and Uzbekistan have reported increases in notification rates from 1985 to 1990 (Table 3). In Kyrgyzstan, after rates were relatively stable until the mid-1980s (average annual decrease of only 1.3%), after 1987 an average 3.8% annual increase was observed. Rates of sputum positive cases have remained unchanged in the past 16 years, but have peaked in 1991 with 18.1 cases per 100,000. In Turkmenistan, rates of all cases have shown a declining trend until 1986 (average 2.1% per annum) and a reversal beginning in 1987 until 1991 (average annual increase of 5.5%). The rate of sputum positive cases remained unchanged during 1976-1991 fluctuating between 11.5 and 14.7 per 100,000. Finally, Uzbekistan has reported fluctuations in rates of all cases during 1975-1991. After a decline until 1985 (average 4.7% per year) and an increasing trend in 1985-1989 (2.7% per annum), recently rates have been around 46-48 per 100,000. Rates of sputum smear positive cases are stable at 14-18 per 100,000.

3. Mortality

Mortality rates for the last few decades are available in some countries (Table 5). In Croatia, the Czech Republic, and Hungary mortality rates were as high as 431, 381, and 380 per 100,000 population, respectively, at the beginning of this century. By the 1950s, just before antituberculosis chemotherapy became widely available, mortality rates had declined by 65% to 80% from these values, ranging from 73 to 145 per 100,000 population in the same area. Following introduction of chemotherapy, a regular decrease was observed up to the 1980s in the following countries: Croatia, Czech Republic, Hungary, Poland, Romania, and Slovenia. In Hungary, tuberculosis deaths accounted for 1.4% of all deaths in 1975, compared with 13% in 1896 and 7% in 1950. No data are available for the remaining countries before the mid-1970s.

After 1975 data are available for almost all countries of the sub-region. After years of decline increases have been seen lately in Armenia (average annual increase 29% in the period 1988-1991), Kyrgyzstan (6.3% in 1988-1991), Latvia (2.5% in 1988-1991), Lithuania (8.5% in 1986-1992), Moldova (13.6% in 1988-1992), Romania (10.5% in 1985-1991)(8), and Turkmenistan (6.4% in 1987-1991), while rates have slightly decreased or remained stable in all other countries. Trends of mortality are shown in Table 6 and in the lower part of Figure 1. The average annual decline calculated from the sum of the changes each year in these countries was 3.9% between 1976 and 1991.

The lowest mortality rates in the latest reports were in the Slovak Republic (0.4 per 100,000) and in the Czech Republic (1.0 per 100,000), the highest in Kazakhstan (10.7 per 100,000) and Turkmenistan (10.6 per 100,000) (Table 5). With the exception of Albania, Bulgaria, the Czech Republic, the Slovak Republic and Slovenia, mortality rates in Eastern Europe and former USSR were far above those of Western Europe, where the maximum rate in 1990 was in Portugal (2.8 per 100,000) (13).

Age standardized mortality rates (per 100,000) for 1990 were the following: Belarus 4.0, Bulgaria 1.8, former Czechoslovakia 1.5, Hungary 4.2, Poland 3.4, Romania 5.0 (1988), Ukraine 7.7.

4. Tuberculosis associated with human immunodeficiency virus (HIV) infection

The impact of the HIV epidemic on the tuberculosis situation in Eastern Europe has been evaluated only to a limited extent. In a few countries, the HIV seroprevalence among selected samples of tuberculosis patients was recently studied. No HIV seropositive cases were found in Armenia, Azerbaijan, Estonia, Lithuania, Tajikistan, and Turkmenistan. A seroprevalence in tuberculosis patients lower than 0.1% was reported from the Slovak Republic in 1991 (1 case of 1676 tested) and of 0.7% in Slovenia in 1991. The two countries reporting the highest seroprevalence among tuberculosis patients were Poland (3.5% in a non-representative sample in 1991) and Romania (1.6% in adults and 3.1% in children in 1991-1992). These limited data suggest that HIV is not yet an important factor for the epidemiology of tuberculosis in Eastern Europe.

5. Immigrants, refugees, displaced persons, and minorities

Only limited information is available on the contribution of these populations to the overall tuberculosis epidemic in Eastern Europe. In Croatia, preliminary data for 1992 show that refugees and displaced persons constituted 2.4% and 2.7% of all cases, respectively. In the Czech Republic in 1990 the rate of tuberculosis (per 100,000) was 74.5 among gypsies and 17.9 among the others, and nearly 5% of cases were reported among gypsies. The incidence of bacteriologically confirmed pulmonary cases was calculated to be 46.5 per 100,000 among gypsies and 10.9 per 100,000 among the others. By sex and age, the incidence in 45- to 64-year-old gypsies was 8-fold that of the other population of the same age, whereas in females a similar difference was found among those older than 65 years (14). In Hungary, 54 of 3,658 (1.5%) notified cases of tuberculosis in 1991 occurred among immigrants. No specific data are available from Poland, but there are suggestions that notifications might increase due to arrival of immigrants from Romania and the former Soviet republics. In Romania no specific data are available on the fraction of tuberculosis cases occurring among gypsies, except that 28% of the severest forms of paediatric tuberculosis occur among gypsy children. In the Slovak Republic records on tuberculosis available since 1988 show that between 3.2% and 5.6% of all cases occurred among gypsies. In Slovenia between 14% and 22% of all cases of tuberculosis have occurred among immigrants during the period 1982-1991. This fraction was lowest in 1989 and has been increasing since (9).

6. Overview of the situation of tuberculosis control

According to reports to WHO by various countries, estimated case-finding varies widely with the highest coverage in the Czech Republic, Hungary and Poland (over 90%) and the lowest (50% or less) in several countries of the former USSR. However, the methodology used to estimate case finding is not reliable because of the frequently unknown expected incidence of tuberculosis. In addition, results from tuberculin surveys can not be reliably used to estimate the ARI because of a high BCG vaccination coverage.

Table 7 presents an overview of treatment regimens used and drug availability. Regimens reported vary widely in composition and duration. Despite previous estimates of large use of rifampicin and pyrazinamide in most countries of Eastern Europe after 1990 (2), only a few countries, such as the Czech Republic, Poland and the Slovak Republic, report using rifampicin containing chemotherapy as recommended by WHO (15) in the majority of sputum positive pulmonary cases. Others are using rifampicin containing regimens, but to a lesser extent. Armenia and Tajikistan are using regimens without rifampicin and pyrazinamide in sputum

smear positive cases. Belarus, Bulgaria, Estonia, and Moldova do not use pyrazinamide in the initial phase of treatment. In Romania, the initial 4-drug regimen is administered twice weekly also to hospitalized patients. In addition, in a few countries supply of rifampicin and pyrazinamide have been insufficient and erratic. Among these countries are Armenia, Bosnia and Herzegovina, Croatia, Estonia, Moldova, and the Federal Republic of Yugoslavia, while in some of the former USSR republics shortages of drugs have been reported, particularly out of the main cities. Finally, no country is currently using the WHO recommended retreatment regimen (2HRZES/1HRZE/5HRE)(15).

Coverage with BCG vaccination is high in almost all countries with a range that varies from 81% to 100%. In Armenia, due to lack of supplies, BCG coverage in 1991 dropped from 92%-96% in previous years to 55%.

Discussion

For the first time in many years data from Eastern Europe and the former USSR have become available to this extent to the scientific community at large. There have always been some countries which have shared with their colleagues in both east and west data on progress made and problems encountered, but not all have been able in the past to provide such outstanding cooperation as the one that has allowed to comparatively analyze the data in this report.

Although the information is almost complete, the accuracy of reports is difficult to evaluate. However, available data suggest that the magnitude of the tuberculosis problem has been tremendously reduced in Eastern Europe during this century.

In the chemotherapy era, the epidemiological situation of tuberculosis and its trend are best evaluated by the risk of tuberculosis infection and the incidence of disease. Among all parameters to measure the tuberculosis problem in a community, incidence of infection is the theoretically most appealing, because it reflects the extent of transmission in the community. However, it is not practical to measure incidence of infection, and an alternative has been derivation of infection risk from tuberculin surveys. The high coverage with BCG vaccination and revaccination in most of the Eastern European and the former USSR countries during the last four decades makes determination of prevalence of tuberculosis infection unfeasible.

With all the limitations due to poor case-finding reported by some countries, tuberculosis notifications remain the only reasonable proxy for the incidence of tuberculosis. In Eastern Europe and the former USSR, most countries started with systematic collection of tuberculosis data in the early 1950s. Although notification rates were not entirely reliable at the beginning, they were as high as around 500 per 100,000 population in Romania in 1950 and Albania in 1960. Thus, while the post-war tuberculosis situation was grave, progress in tuberculosis control allowed some countries to substantially reduce the public health impact of the disease (2). In addition to the natural decline of the tuberculosis epidemic which occurred not only in Western, but also Eastern Europe, measures such as intensive case-finding among symptomatic patients and in high-risk groups, and adequate treatment and follow-up of cases are all believed to have been fundamental in contributing to lessening the problem (2,16,17). However, recently, some countries have reported a levelling off or even increases in case notifications. In these countries the failure of tuberculosis to decline has been a very recent phenomenon and it remains to be seen whether an important change is in the making. Nevertheless, in Romania, Kyrgyzstan, Turkmenistan, Uzbekistan, and, to a lesser extent, Lithuania tuberculosis has been increasing over several years and the potential for a worsening is apparent in other countries, such as Bulgaria, Latvia, and Kazakhstan, where the decrease in notification rate from 1985 to 1990 was markedly lower than from 1980 to 1985.

In contrast to Western Europe and other industrialized countries (3-5), tuberculosis among immigrants does not seem to play a major role in contributing to the recent increases in notifications seen in some countries. Migrant and mobile populations, such as the gypsies of the Czech and Slovak Republics, and Romania, have a higher than average tuberculosis incidence, but the proportion of cases they contribute is too small to explain the increasing trend seen, for instance, in Romania. Infection with HIV has spread only to a limited extent in Eastern Europe and the former USSR and is not yet an important contributor to overall notifications.

Thus the recent epidemiologic deterioration of the tuberculosis situation in some of these countries finds its most likely explanation in the current political and economic crises which are facing them. Malnutrition and poor living conditions are frequent in countries experiencing ethnic conflicts and civil wars and may favour reactivation of pre-existing latent infection. Lack of crucial antituberculosis drugs results in inadequate treatment which, in turn, produces increased mortality from tuberculosis and increased prevalence of the disease. However, the trend of tuberculosis incidence in the next few years is difficult to predict. If treatment becomes inadequate, the prevalence of sputum smear-positive cases will change considerably within an as short a period as one or two years, whereas changes in the incidence will initially be much smaller (16,17). This can be observed, for instance, in Lithuania and Moldova, where, due to various factors (such as lack of drugs in the case of Moldova), both mortality and prevalence of tuberculosis have increased in recent years. In Romania, tuberculosis mortality and prevalence started to increase in the early 1980s, and case notifications after 1985 (8)(Fig.10).

Similar to trend in Western Europe (3), progress has been most conspicuously reflected in mortality figures. Nevertheless, in contrast to Western Europe where mortality has reached very low levels ranging from 0.3 to 2.8 per 100,000 population (13), mortality rates in most of Eastern Europe (with the notable exceptions of the Czech and Slovak Republics, and Slovenia) and the former USSR remain several-fold higher than in Western Europe. With the introduction of effective chemotherapy, mortality from tuberculosis has become less of an indicator of the magnitude of the tuberculosis problem than one of the quality of treatment (18, 19). In a certain proportion of diagnosed cases mortality is the result of late diagnosis or of failure to diagnose (20). Although the numbers are relatively small and interpretation needs thus to be made with caution, there are indications that in contrast to Western Europe, tuberculosis mortality has failed to decline importantly over the past decade, and in a few countries frank increases in mortality have been reported.

From all available data it is clear that the overall tuberculosis problem has improved in Eastern Europe since the second World War. There are recent indications, however, that past progress might become threatened, as evidenced by increased mortality and changes away from the expected downward trends in case notifications. Romania, for instance, has the highest notification rate among all Eastern European countries and an increase in mortality has been established since the early 1980s. Other countries, such as Armenia, Bosnia and Herzegovina, Croatia, Estonia, Moldova, Yugoslavia will undoubtedly suffer due to the reported shortages of drugs. If drug supply does not improve, the number of cases is likely to increase further.

Proper treatment of tuberculosis has as a pre-requisite a steady supply of essential drugs and the choice of effective and efficient treatment regimens. Several countries suffer from shortages in drugs, while others use regimens that are not cost-effective. For treatment of new cases, industrialized countries recommend to utilize a regimen of six months duration consisting of rifampicin and isoniazid throughout, supplemented by pyrazinamide and ethambutol (or streptomycin) during the first two months (15). The drugs in the continuation phase may be given self-administered on a daily basis or thrice-weekly if treatment is being directly observed. These regimens have been clearly documented to be among the most effective, shortest possible, and acceptable regimens (21). Prolongation of such a regimen beyond six months

adds to cost, but not to efficacy. Hospitalization during the intensive phase is also a waste of resources, if drugs such as rifampicin and pyrazinamide are not available. If funds are limited, intermittent administration of drugs after the initial month of daily therapy would reduce costs without decreasing efficacy. Finally, relapses and other retreatment cases should be treated with the regimens recommended by WHO (15).

The main steps to be taken in Eastern Europe and the new countries of the former USSR are to find the necessary resources to secure an un-interrupted supply of essential drugs, to guarantee adherence to treatment until cure by both patients and physicians, and, if necessary, to further define short-comings in case-finding and health service coverage. Health authorities must ensure that tuberculosis control remains one of the top priorities of public health, and that free diagnostic evaluation and adequate chemotherapy continue to be provided to all patients. Finally, countries with inefficient control programmes will need structural adjustments of their programme. Training activities for health care providers at regional and peripheral level should be organized to allow for a better understanding of relevant issues in tuberculosis control. The person responsible for tuberculosis control at the central level should issue clear instructions to ensure that private physicians treating tuberculosis patients adhere to the regimens recommended by the national programme.

In the Czech Republic considerable improvements were made in the past by adhering to most of these principles. This is reflected in the changing pattern of age-specific notification rates over the past 40 years (Fig. 4). Tuberculosis has shifted progressively from younger to older age groups, indicating that young cohorts with initially high prevalence of infection leading to active tuberculosis are progressively being replaced by cohorts with less and less infection. This suggests that the ultimate disappearance of tuberculosis becomes mainly a matter of time. These patterns resemble those seen in some industrialized countries where tuberculosis has become less and less of a public health problem in the indigenous population (3).

To address and tackle the tuberculosis problem in a cost-effective manner and to counteract its potential and actual recurrence to the point where in some countries the epidemiologic situation has worsened, it is imperative to secure adequate short-course chemotherapy regimens for both new cases and relapses, as recommended by WHO (15). Health authorities should request governments to allocate sufficient funds for treatment of all tuberculosis cases, since the average cost for antituberculosis drugs is less than US\$ 20,000 per 1 million population (or US\$ 0.02 per capita), as estimated from UNICEF prices in 1992 (15) applied to the current regional notification rate. A few countries may need temporary assistance from countries with more resources.

Tuberculosis remains a global problem and increased international migration from high to low incidence areas will increasingly shape the picture of tuberculosis epidemiology in industrialized countries. This is already apparent in several Western European countries where up to 50% of cases are occurring among foreign persons, often among persons from some Eastern European countries (3). Thus, strengthening tuberculosis control in Eastern Europe and former USSR will likely carry indirect positive effects for Europe as a whole and further the goal of tuberculosis elimination from its countries.

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Table 1. Reported number of cases of tuberculosis (all forms) in Eastern European countries

Eastern Europe	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990**	1991	1992
Albania	1919	1899	1527	1352	1152	1075	1050	954	978	891	975	916	989	915	789	695	653	628	
Armenia		952	868	851	826	829	756	924	759	702	774	768	832	766	651	649	590	741	
Azerbaijan		3219	3065	2784	2665	3031	3080	3180	3288	3176	3505	3772	3804	3677	3330	3024	2506		
Belarus		7147	7002	6514	6059	6361	5954	6198	5468	5509	5065	4873	4128	3911	3769	3708	3039	3745	
Bosnia - Herzegovina																			
Bulgaria	4860	4273	4179	3745	3575	3396	3280	3007	2999	2892	2856	2551	2530	2352	2387	2301	2256	2569	
Croatia	4796	4407	4593	4468	4660	4183	3999	4021	3718	3632	3612	3605	3355	3326	2973	2861	2576	2158	2183
Czech Republic	6242	6085	5804	5684	5246	4915	4962	4312	4146	4016	3653	3117	2553	2196	2047	1905	1937	2079	
Estonia		826	777	677	582	608	614	560	563	587	546	541	522	446	471	422	325	406	
Georgia		2819	2700	2868	2681	2388	2098	2124	2106	1891	1855	1822	1833	1810	1598	1609	1537		
Hungary	6728	6333	5790	5431	5509	5120	5412	5322	5191	5028	4472	4582	4522	4125	4016	3769	3588	3658	3960
Kazakhstan		16135	15179	14914	14910	14255	14442	13876	13808	13357	12563	12423	13090	13286	13501	13307	10969	10821	
Kyrgyzstan		2097	2043	2197	2045	2014	2093	2162	2119	2077	2093	2163	2235	2177	2205	2233	2327		
Latvia		1532	1427	1313	1225	1167	1194	1140	1077	1072	1054	977	982	948	938	857	731	963	
Lithuania	2167	2236	2042	1916	1693	1610	1636	1599	1495	1477	1420	1453	1412	1372	1339	1381	1471	1556	1598
Macedonia																			
Moldova		3921	3946	3399	3275	3033	2781	2852	3197	2658	2554	2732	3022	2810	2510	2281	1728	1910	1877
Poland	27433	26255	25070	26796	26801	26857	25807	24087	23685	23411	22527	21650	20603	19757	18537	16185	16136	16497	16551
Romania	25122	23363	20078	17814	14841	14385	13553	13602	13588	13570	12952	12677	12860	13361	14157	14676	16258	15482	18097
Russia	86779	81551	80062	80062	76267	74042	74270	73369	72236	73280	74597	73877	71764	70132	67553	62987	50641	57768	
Slovak Republic	3346	3130	3035	2761	2614	2511	2465	2304	2263	2252	2152	1989	2022	1800	1651	1501	1448	1620	1733
Slovenia	1231	1161	1225	1290	1238	1092	1085	939	982	925	896	923	816	792	760	768	722	583	
Tajikistan		2746	3395	2963	2880	2910	2647	2631	2628	2509	2427	2485	2610	2727	2474	2621	2460	2116	
Turkmenistan		1922	1827	1918	1795	1713	1677	1625	1559	1541	1604	1607	1614	1956	1904	2169	2325	2358	
Ukraine		31835	29600	29112	27111	27073	26095	25646	24710	24216	24356	24058	22946	22145	20744	20182	16465		
Uzbekistan		11195	10723	9555	9518	9767	9163	9682	8697	8817	8544	8717	9427	9794	10134	10632	9414		
Yugoslavia*	15345	15092	13540	13427	12932	12426	11561	11754	12106	11744	12119	11876	11720	11526	10534	9977	8477	4502	
Total	99,189	267,359	250,986	243,814	232,102	226,761	221,674	217,970	215,336	211,420	209,161	206,154	202,191	198,137	190,972	182,700	160,579	132,160	45,999

*Data include all reports from all former republics except Croatia and Slovenia; in 1991 only Federal Republic of Yugoslavia (Serbia & Montenegro)

**For former USSR countries the data reported in 1990 do not include relapse cases, except in the case of Lithuania and Tajikistan

Table 2. Reported number of cases of tuberculosis (all forms) per 100,000 population in Eastern European countries

	1950	1955	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990**	1991	1992
Eastern Europe																								
Albania			541.6	198.0	107.2	81.0	78.3	61.7	53.6	44.8	41.0	39.3	35.0	35.2	31.4	33.6	30.9	29.6	24.1	21.7	21.7	20.1	19.1	
Armenia							33.9	30.3	29.1	27.6	27.2	24.4	29.3	24.7	21.6	23.5	22.9	22.3	18.7	19.7	17.7	17.6	21.5	
Azerbaijan							57.1	53.5	47.8	44.6	49.9	50.0	50.8	51.4	49.2	53.5	56.7	56.3	47.7	42.8	35.2	39.7	39.8	
Belarus							76.4	74.5	69.0	63.6	66.4	61.7	64.0	56.0	56.2	51.2	49.0	41.2	38.8	37.1	36.4	29.7	36.6	
Bosnia - Herzegovina																								
Bulgaria				116.0	80.0	56.0	49.0	47.7	42.5	40.6	38.5	37.0	33.8	33.6	32.3	31.9	28.5	28.2	26.2	26.6	25.6	25.1	28.6	
Croatia	344.0		266.0	241.0	144.0	107.0	98.0	102.0	99.0	102.0	92.0	87.0	87.0	81.0	79.0	78.0	77.0	72.0	71.0	64.0	61.0	54.0	45.0	45.5
Czech Republic			160.1	103.3	76.4	62.5	60.5	57.3	55.9	50.1	47.7	48.1	41.9	40.2	38.8	35.3	30.2	24.7	21.2	19.8	18.5	18.7	20.2	
Estonia							57.7	53.9	46.6	39.9	41.4	41.5	37.6	37.5	38.8	35.8	35.3	33.7	28.5	29.9	28.9	20.6	26.4	
Georgia							57.0	54.2	57.2	53.6	47.5	41.5	41.9	41.4	36.7	35.9	35.1	35.1	34.4	30.2	29.8	27.6		
Hungary		306.0	280.0			64.1	60.0	55.0	51.0	51.0	48.0	51.0	50.0	48.0	47.0	47.0	43.0	43.0	39.0	38.0	36.0	34.0	35.3	38.2
Kazakhstan							113.2	105.3	102.3	102.2	96.5	96.6	91.5	89.9	85.9	79.8	78.0	81.1	81.2	81.6	80.5	65.7	70.0	
Kyrgyzstan							62.9	60.0	63.2	58.5	56.6	57.8	58.7	56.4	54.1	53.2	54.0	54.7	52.0	52.3	52.0	52.7	60.0	
Latvia							61.9	57.0	52.1	48.7	46.2	47.2	45.1	42.4	38.1	40.9	37.6	37.5	35.8	35.1	34.1	27.2	35.9	
Lithuania						66.0	68.0	61.7	57.2	50.3	47.4	47.5	45.7	42.9	42.0	40.0	40.6	39.0	37.5	36.4	37.1	39.6	41.6	42.7
Macedonia																								
Moldova							102.2	102.0	87.1	83.1	76.6	69.8	71.0	80.4	70.3	62.3	66.1	72.5	68.8	59.2	52.5	43.0	46.4	43.0
Poland					128.5	81.4	77.2	73.0	77.2	76.6	76.0	72.5	67.1	65.4	64.0	61.0	58.2	55.0	52.5	48.8	42.8	42.3	43.1	43.1
Romania	492.7 ¹	379.5 ¹	333.4 ¹	184.4	152.1	119.5	110.0	93.8	82.3	67.9	65.2	61.0	60.9	60.5	60.2	57.3	55.8	56.4	58.2	61.3	63.4	70.0	66.8	79.6
Russia							64.6	60.3	58.8	55.6	53.6	53.5	52.6	51.4	51.8	52.3	51.5	49.6	48.1	46.0	42.7	34.2	40.6	
Slovak Republic							71.3	66.0	63.4	57.0	53.4	49.5	45.9	44.8	44.2	42.0	38.5	39.0	35.0	31.4	28.5	27.3	30.5	32.6
Slovenia							68.5	64.2	67.3	70.6	67.2	58.9	58.1	50.0	48.0	46.0	46.0	41.0	40.0	38.0	38.0	36.0	29.0	
Tajikistan							91.7	72.3	85.1	80.5	74.8	66.9	63.9	62.8	57.8	53.5	49.7	48.5	57.3	54.3	60.9	63.5	39.5	
Turkmenistan							75.6	69.9	71.4	65.9	61.4	58.6	55.3	51.8	49.9	50.7	49.7	48.5	57.3	54.3	60.9	63.5	39.5	
Ukraine							65.1	60.2	58.9	54.6	54.3	52.1	51.2	49.1	48.0	48.1	47.3	45.0	43.3	40.5	39.2	31.8	39.0	
Uzbekistan							80.5	75.1	65.2	62.8	62.7	57.4	59.1	51.7	51.0	48.1	47.8	50.2	50.7	51.1	53.2	46.0	48.2	
Yugoslavia*							103.2	100.3	88.9	87.2	83.3	79.0	73.6	74.9	72.1	73.9	72.3	70.5	68.7	62.2	58.7	49.8	42.7	
							85.9	72.7	67.7	65.2	61.5	59.6	56.5	54.9	53.9	52.9	51.7	50.3	49.1	48.1	45.8	38.9	41.8	

* Data include all reports from all former republics except Croatia and Slovenia; in 1991 only Federal Republics of Yugoslavia (Serbia & Montenegro)
In 1991, only Federal Republic of Yugoslavia (Serbia & Montenegro)

** For former USSR countries, data reported in 1990 do not include relapse cases, except in the cases of Lithuania and Tajikistan.
¹ only new cases

Table 3. Average TB notification rates per 100,000 and trends in notifications in Eastern Europe and former USSR, 1974-1991

	Average 1974-76	Average 1979-81	%Change 75->80	Average 1984-86	%Change 80->85	Average 1989-91	%Change 85->90	%Change 75-90
(1): Eastern Europe								
Albania	73.5	38.4	-47.8	32.4	-15.6	20.3	-37.4	-72.4
Bulgaria	50.9	36.4	-28.4	29.5	-18.9	26.4	-10.5	-48.1
Croatia	102.3	88.6	-13.4	75.7	-14.6	53.3	-29.6	-47.9
Czech Republic	60.1	45.9	-23.6	30.1	-34.4	19.1	-36.5	-68.2
Hungary	59.7	49.4	-17.3	42.5	-13.9	34.3	-19.2	-42.5
Poland	77.2	71.9	-6.8	58.1	-19.3	42.6	-26.6	-44.8
Romania	107.6	62.4	-42.0	56.5	-9.5	66.7	18.1	-38.0
Slovak Republic	72.6	48.7	-32.9	39.8	-18.2	28.8	-27.6	-60.3
Slovenia	66.7	55.7	-16.5	44.3	-20.4	34.3	-22.5	-48.5
Yugoslavia*	96.8	75.7	-21.7	72.2	-4.7	54.2	-24.9	-44.0
(1): Eastern Europe	80.9	62.3	-23.1	52.9	-15.1	44.0	-16.8	-45.6
(2.1): Baltic ex-USSR								
Estonia	55.8	40.1	-28.0	34.9	-13.0	26.2	-25.0	-53.1
Latvia	59.6	46.0	-22.8	38.4	-16.5	33.9	-11.7	-43.1
Lithuania	65.0	47.0	-27.6	39.8	-15.3	39.4	-1.1	-39.4
(2.1): Baltic ex-USSR	61.3	45.3	-26.1	38.4	-15.3	34.9	-9.0	-43.0
(2.2): European ex-USSR								
Belarus	75.4	64.0	-15.1	47.1	-26.4	36.5	-22.5	-51.6
Moldova	102.1	72.5	-29.0	67.0	-7.5	47.7	-28.8	-53.3
Russia	62.4	53.2	-14.8	51.1	-4.0	41.7	-18.5	-33.3
Ukraine	62.6	52.5	-16.1	46.8	-10.9	39.2	-16.2	-37.4
(2.2): European ex-USSR	63.9	54.0	-15.5	50.2	-7.0	40.9	-18.4	-35.9
(2.3): Caucasian ex-USSR								
Armenia	32.1	27.0	-15.9	23.6	-12.4	20.6	-12.8	-35.7
Azerbaijan	55.3	50.2	-9.1	55.5	10.5	42.8	-22.9	-22.6
Georgia	55.6	43.6	-21.5	35.4	-18.9	29.8	-15.7	-46.4
(2.3): Caucasian ex-USSR	50.5	42.9	-15.1	41.6	-2.9	33.6	-19.1	-33.4
(2.4): Asian ex-USSR								
Kazakhstan	109.2	94.8	-13.2	79.6	-16.0	75.4	-5.3	-30.9
Kyrgyzstan	61.4	57.7	-6.0	54.0	-6.5	54.9	1.7	-10.6
Tajikistan	87.3	68.4	-21.6	53.6	-21.6	44.4	-17.2	-49.2
Turkmenistan	72.7	58.4	-19.7	49.6	-15.0	62.7	26.3	-13.8
Uzbekistan	77.8	59.7	-23.2	48.7	-18.4	53.2	9.2	-31.6
(2.4): Asian ex-USSR	88.8	73.0	-17.8	60.4	-17.2	57.8	-4.4	-34.9
(1): Eastern Europe	80.9	62.3	-23.1	52.9	-15.1	44.0	-16.8	-45.6
(2): Total ex-USSR	66.8	56.1	-16.0	51.1	-8.9	43.3	-15.3	-35.2
Grand Total	71.1	58.0	-18.5	51.6	-10.9	43.5	-15.8	-38.8

Table 4. Overview of tuberculosis case notifications in Eastern Europe and former USSR and its trend

Country	Latest case notification			Lowest number of cases ever*	Most recent trend	Age distribution of new sputum positive pulmonary cases (%)		
	Year	Number	Rate			Year	Younger adults	Older adults
Albania	1991	628	19.1	1991	down	1991	62.8 ¹	36.6
Armenia	1991	741	21.5	1990	stable/up			
Azerbaijan	1990	2506	35.2	1990	down			
Belarus	1991	3745	36.6	1990	stable/down			
Bosnia & Herz.								
Bulgaria	1991	2569	28.6	1990	stable			
Croatia	1992	2183	45.5	1991	down	1991	46.2 ²	52.6
Czech Rep.	1991	2079	20.2	1989	stable/up	1991	27.4 ²	72.4
Estonia	1991	406	26.4	1990	down	1991	73.2 ³	26.8
Georgia	1990	1537	27.6	1990	down			
Hungary	1992	3960	38.2	1990	stable/up	1991	56.8 ¹	42.8
Kazakhstan	1991	10821	70.0	1991	down			
Kyrgyzstan	1990	2327	52.7	1987	up	1991	68.5 ²	29.8
Latvia	1991	963	35.9	1990	stable	1991	52.8 ²	46.9
Lithuania	1992	1598	42.7	1988	up	1991	56.0 ²	43.9
Macedonia								
Moldova	1992	1877	43.0	1990	stable/down	1991	61.7 ²	37.9
Poland	1992	16551	43.1	1990	stable	1990	44.5 ²	55.2
Romania	1992	18097	79.6	1985	up	1991	65.4 ²	33.7
Russia	1991	57768	40.6	1990	down	1990	65.7 ¹	33.7
Slovak Rep.	1992	1733	32.6	1990	stable/up	1991	32.3 ²	55.5
Slovenia	1991	583	29.2	1991	down	1991	56.8 ²	42.1
Tajikistan	1991	2116	39.5	1991	down			
Turkmenistan	1991	2358	63.5	1983	up			
Ukraine	1990	16465	31.8	1990	down			
Uzbekistan	1990	9414	46.0	1990	up			
Yugoslavia	1991	4502	42.7		down			

¹ Age cut-off 49 years.² Age cut-off 45 years.³ Age cut-off 54 years.

*With the exception of Lithuania and Tajikistan, for former USSR countries the data reported in 1990 do not include relapse cases

Table 5. Reported tuberculosis mortality rates (per 100,000 population) in Eastern European countries in selected years

Country	1900	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Albania			145.0	30.5	7.4			3.6	3.4	2.8	2.5	3.0	2.7	2.1	2.4	2.4	2.4	2.3	2.5	1.8	2.7	3.4	3.8	
Armenia								15.2	16.4	15.4	14.2	14.0	11.1	10.6	9.8	9.5	9.8	9.2	9.9	8.2	7.6	4.6	5.5	
Azerbaijan								9.1	9.0	7.6	8.1	8.6	6.3	6.2	5.8	5.3	4.9	4.0	4.0	4.0	4.0	4.1	4.4	
Belarus																								
Bosnia - Herzegovina																								
Bulgaria			30.0 ¹				7.1	6.5	5.7	5.4	5.4	3.9	3.9	3.8	3.8	3.4	2.9	2.7	2.6	2.8	2.6	2.3	2.5	
Croatia		431.0 ²	144.7	40.1	21.1	16.2	11.3	8.7	9.3	11.0	10.3	11.3	10.3	8.4		8.6	7.8	8.3	9.0	9.0	10.0	8.6		
Czech Republic		381.4	135.1	73.4	25.1	7.9	5.6	5.7	5.0	4.4	4.6	4.4	1.6	1.3	1.4	1.2	1.0	1.2	1.1	1.0	1.1	0.9	1.0	
Estonia								9.4	8.4	9.0	8.9	7.4	6.6	7.0	6.7	6.0	6.2	4.7	4.0	3.7	3.4	5.1	5.0	
Georgia								8.5	6.7	4.9	5.7	5.9	5.9	5.9	5.4	6.1	6.0	6.1	5.8	6.2	6.4	5.4		
Hungary		380.0	140.0	80.0	31.0	15.0						11.6		8.8			7.8	7.6	7.2	6.3	7.0	6.7		
Kazakhstan								19.8	18.2	16.6	17.0	19.0	15.2	14.4	13.5	13.7	12.7	11.1	10.6	10.8	9.9	9.5	10.7	
Kyrgyzstan								11.7	11.9	9.4	10.2	10.3	8.0	9.0	8.6	7.4	7.2	7.1	6.7	6.5	6.7	7.2	7.8	
Latvia								10.3	10.3	8.6	9.2	8.5	8.0	6.0	6.7	6.7	6.7	5.2	6.2	5.3	5.9	6.9	5.5	
Lithuania						11.0		11.0	11.0	10.0	9.0	9.0	8.5	8.0	7.0	7.0	8.5	5.0	6.0	6.4	6.1	6.9	8.1	8.0
Macedonia																								
Moldova								7.5	7.7	7.5	8.5	6.0	6.2	6.3	5.5	5.5	5.8	5.4	4.7	3.8	4.5	4.6	6.0	6.2
Poland		150.0 ³	105.8	39.2	25.3	13.8	12.9	12.1	11.5	11.1	9.8	8.3	7.1	6.6	6.3	5.6	5.5	4.6	4.3	3.7	3.6	3.5	3.6	
Romania		149.8	146.0	35.1	18.5	7.7	6.7	5.6	5.0	4.2	3.9	3.7	3.7	3.6	3.9	3.7	4.2	4.5	4.7	5.1	5.6	6.9	7.4	
Russia								13.0	12.3	11.8	11.9	11.8	10.4	9.9	9.7	10.0	9.8	8.0	7.9	7.6	7.7	6.9	7.0	
Slovak Republic								5.8	4.4	5.2	2.3	3.2	2.1	1.6	1.1	1.2	1.6	2.0	1.5	0.4	0.2	0.5	0.3	0.4
Slovenia								3.0	5.0	4.0	3.0	3.0	5.0	2.0	2.0	2.0	2.0	1.0	2.0	1.0	1.0	1.0	2.0	
Tajikistan								16.2	13.4	12.0	11.2	10.1	8.2	6.8	4.9	4.8	4.4	4.2	4.2	3.2	3.2	3.2	3.5	3.0
Turkmenistan						19.0		16.7	10.9	13.0	13.8	16.0	12.2	10.8	9.8	10.1	11.4	10.7	8.3	8.9	9.0	9.5	10.6	
Ukraine								12.6	12.1	11.2	11.7	10.9	10.4	10.0	9.9	10.5	10.2	8.5	8.7	8.0	7.8	7.9	8.6	
Uzbekistan								15.3	15.3	13.6	13.8	13.4	10.3	10.3	9.4	8.4	8.2	8.2	7.6	6.6	6.7	5.6	5.8	
Yugoslavia*						11.3	9.6	11.9	11.3	10.6	10.1	10.3	8.9	8.3	8.2	8.2	8.0	5.0	6.0	6.4	6.4	6.1	6.4	5.3
Calculated rates																								

¹Bulgaria reported 30.0 for 1954²Croatia reported 431.0 for 1911³Poland reported 150.0 for 1938

*Yugoslavia: Includes data from all former republics

Table 6. Overview of tuberculosis mortality in Eastern Europe and former USSR and its trend.

Country	Latest mortality data		Lowest mortality ever	Most recent trend
	Year	Rate		
Albania	1989	2.1		
Armenia	1991	3.8	1988	up
Azerbaijan	1991	5.5	1990	down
Belarus	1991	4.4	1986-89	stable
Bosnia & Herz.				
Bulgaria	1991	2.5	1990	stable
Croatia	1990	8.6	1985	stable
Czech Rep.	1991	1.0	1990	stable
Estonia	1991	5.0	1989	stable
Georgia	1990	5.4	1978	stable
Hungary	1990	6.7	1988	stable
Kazakhstan	1991	10.7	1990	stable
Kyrgyzstan	1991	7.8	1988	up
Latvia	1991	5.5	1986	up
Lithuania	1992	8.0	1986	up
Macedonia				
Moldova	1992	6.2	1988	up
Poland	1991	3.6	1990	stable
Romania	1991	7.4	1982	up
Russia	1991	7.0	1990	stable
Slovak Rep.	1992	0.4	1989	stable
Slovenia	1991	2.0	1988-90	stable
Tajikistan	1992	2.9	1992	down
Turkmenistan	1991	10.6	1987	up
Ukraine	1991	8.6	1989	stable
Uzbekistan	1991	5.8	1990	down
Yugoslavia*	1990	3.6	1990	down

* Data from the former Socialist Republic of Yugoslavia

Table 7. Treatment regimens used and drug availability in Eastern Europe and former USSR.

Country	Current first-line regimen for new S(+) cases	% new S(+) on SCC	Retreatment regimen as per WHO	Year introduction R/RZ	Possibly lacking first-line drugs
Albania	3 HRZE(S)/6-9 HR		no		N.A.
Armenia	3-5 HSE/7-9 HE	<5	no		All
Azerbaijan	not specified		no		N.A.
Belarus	HRS		no		N.A.
Bosnia & Herz.	2 HRE(S)/7 H ₂ R ₂				All
Bulgaria	2 HRE(S)/7 HR		no	1975/never	Z
Croatia	2 HRZ(E)/4 HR(E)		n.a.	early'70/mid'80	All
Czech Rep.	2 HRZE(S)/4 HR	90	no	late'70/mid'80	none
Estonia	3 HRS/3 HRE/4 HE		no		Z (S)
Georgia					
Hungary	2-3 HRZ(S)/6 HR(E)		no	early'80	none
Kazakhstan	HRSE	20	no		N.A.
Kyrgyzstan					
Latvia	not specified		n.a.		
Lithuania	2 HRZS/4 HR	19	no		N.S.
Macedonia					
Moldova	12 HRS(E)		no		H R Z
Poland	2 HRZE(S)/4-9 HRE	80	no	1976/1982	none
Romania	3 H ₂ R ₂ Z ₂ S ₂ (E)/3 H ₂ R ₂	100	no	early '80	R Z
Russia	2 HRZS(E)/4 HR (H ₃ R ₁)		no		N.A.
Slovak Rep.	2 HRZE/6 H ₂ R ₂	70	no	late'70/mid'80	none
Slovenia	2 HRZ/4 HR	75	no		none
Tajikistan	3 HES/3 HRE(P)/ HE	22	no		N.S.
Turkmenistan	6-9 HRZE	15	no		N.A.
Ukraine					
Uzbekistan					
Yugoslavia	2 HRZS/4 HR		no		All

Abbreviations: H = isoniazid, R = rifampicin, Z = pyrazinamide, E = ethambutol, S = streptomycin, P = protonamide

N.A. = not assessed; N.S. = drugs lacking, but not specified

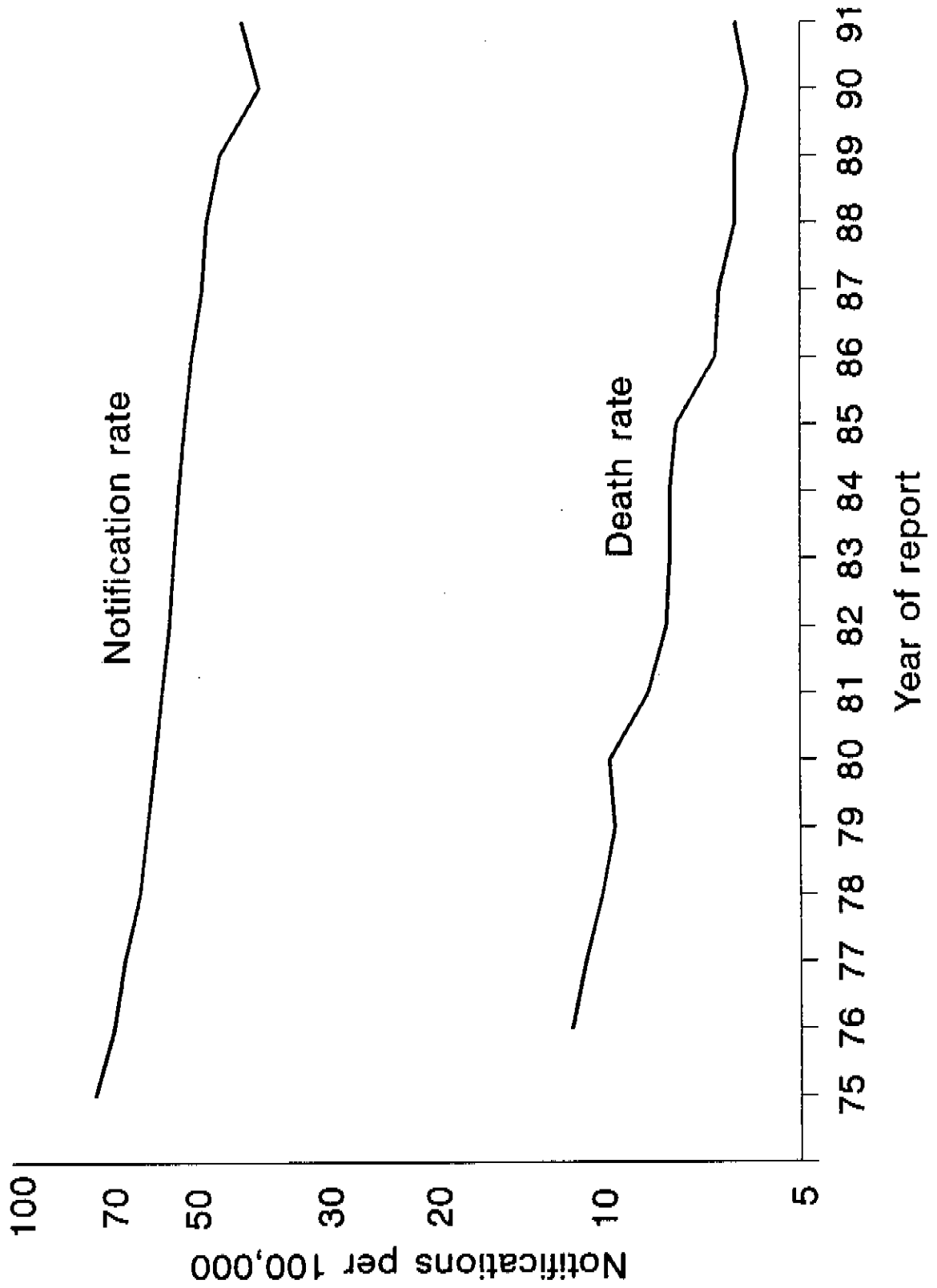
S(+) = sputum positive pulmonary cases

SCC = short course chemotherapy

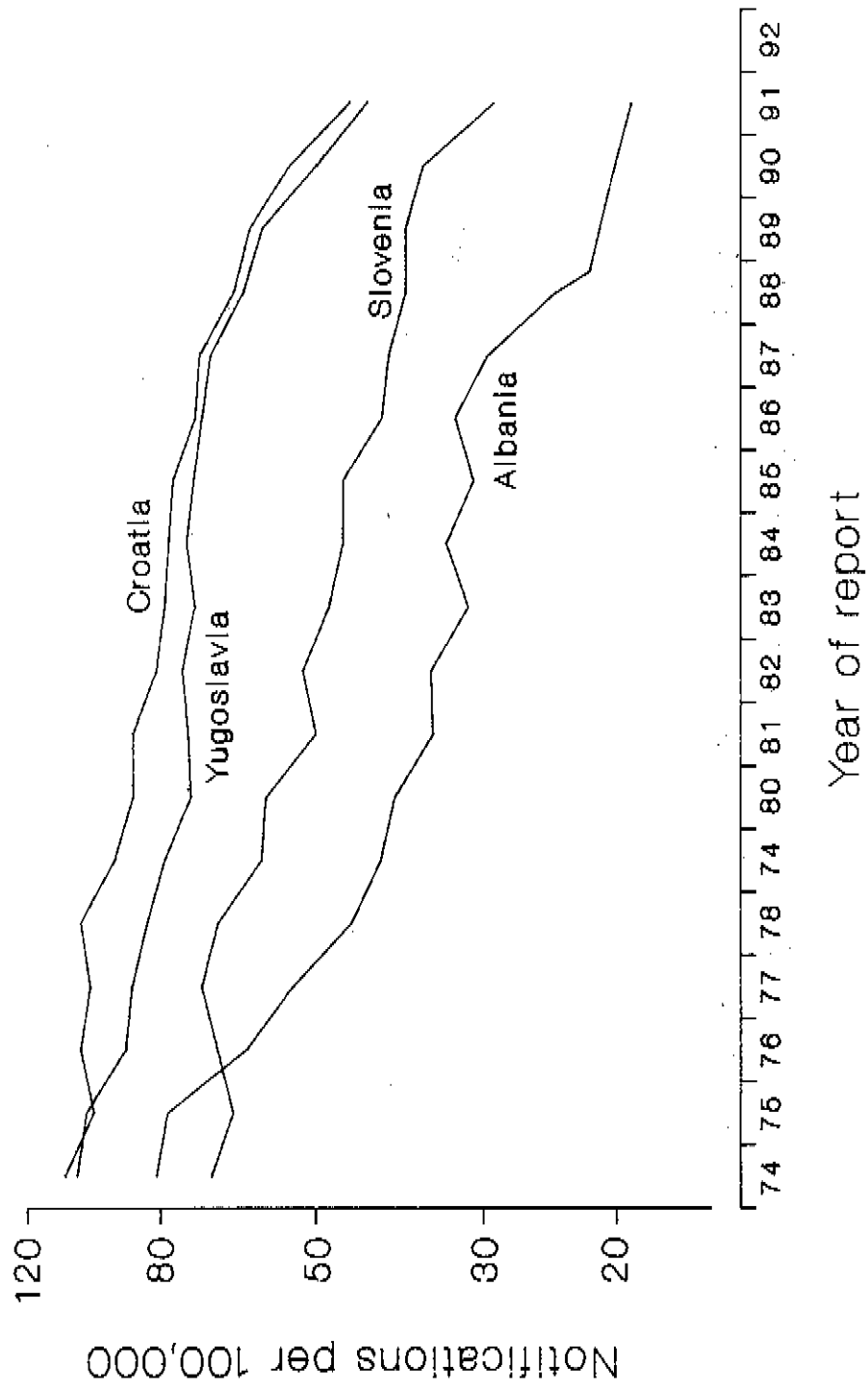
Figures

- Figure 1. Reported tuberculosis case and death rates in countries of Eastern Europe and former USSR combined, 1975-1991.
- Figure 2. Reported tuberculosis notification rates in selected countries of Eastern Europe, logarithmic scale, 1974-1992.
- Figure 3. Reported tuberculosis notification rates in selected countries of Eastern Europe, logarithmic scale, 1974-1992.
- Figure 4. Age and sex specific notification rates (per 100,000 population) of new cases of tuberculosis. Czech Republic, 1951, 1964, 1991. Lines smoothed over age groups.
- Figure 5. Age and sex specific notification rates (per 100,000 population) of new cases of tuberculosis. Romania, 1965, 1975, 1990. Lines smoothed over age groups.
- Figure 6. Reported tuberculosis notification rates in the Baltic countries of the former USSR, logarithmic scale, 1974-1991.
- Figure 7. Reported tuberculosis notification rates in the European countries of the former USSR, logarithmic scale, 1975-1992.
- Figure 8. Reported tuberculosis notification rates in the Caucasian countries of the former USSR, logarithmic scale, 1975-1991.
- Figure 9. Reported tuberculosis notification rates in the Asian countries of the former USSR, logarithmic scale, 1974-1992.
- Figure 10. Tuberculosis notifications, prevalence, and mortality. Romania, 1974-1992.

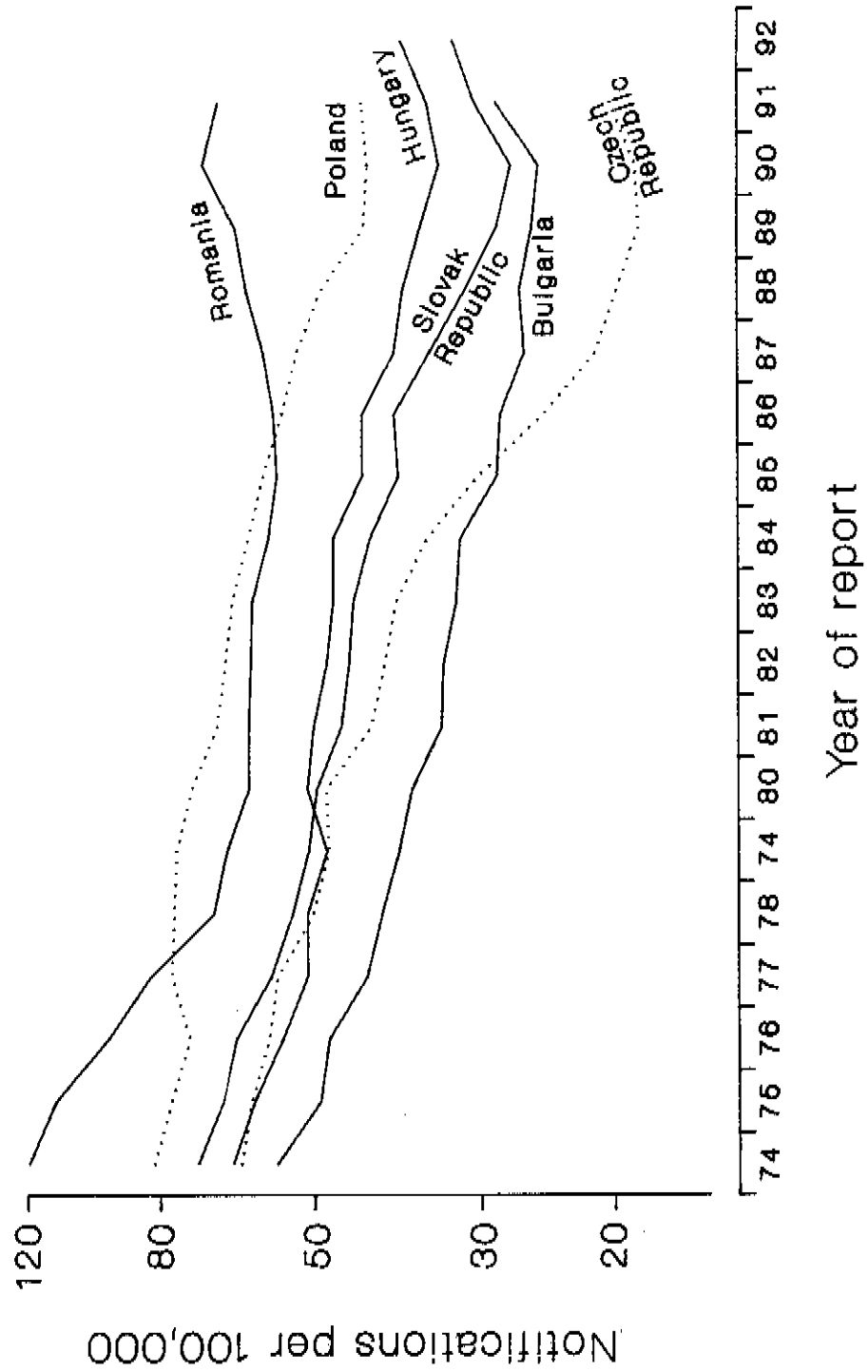
Tuberculosis Case Notification and Death Rates in Countries of Eastern Europe and the Former USSR, 1975-1991



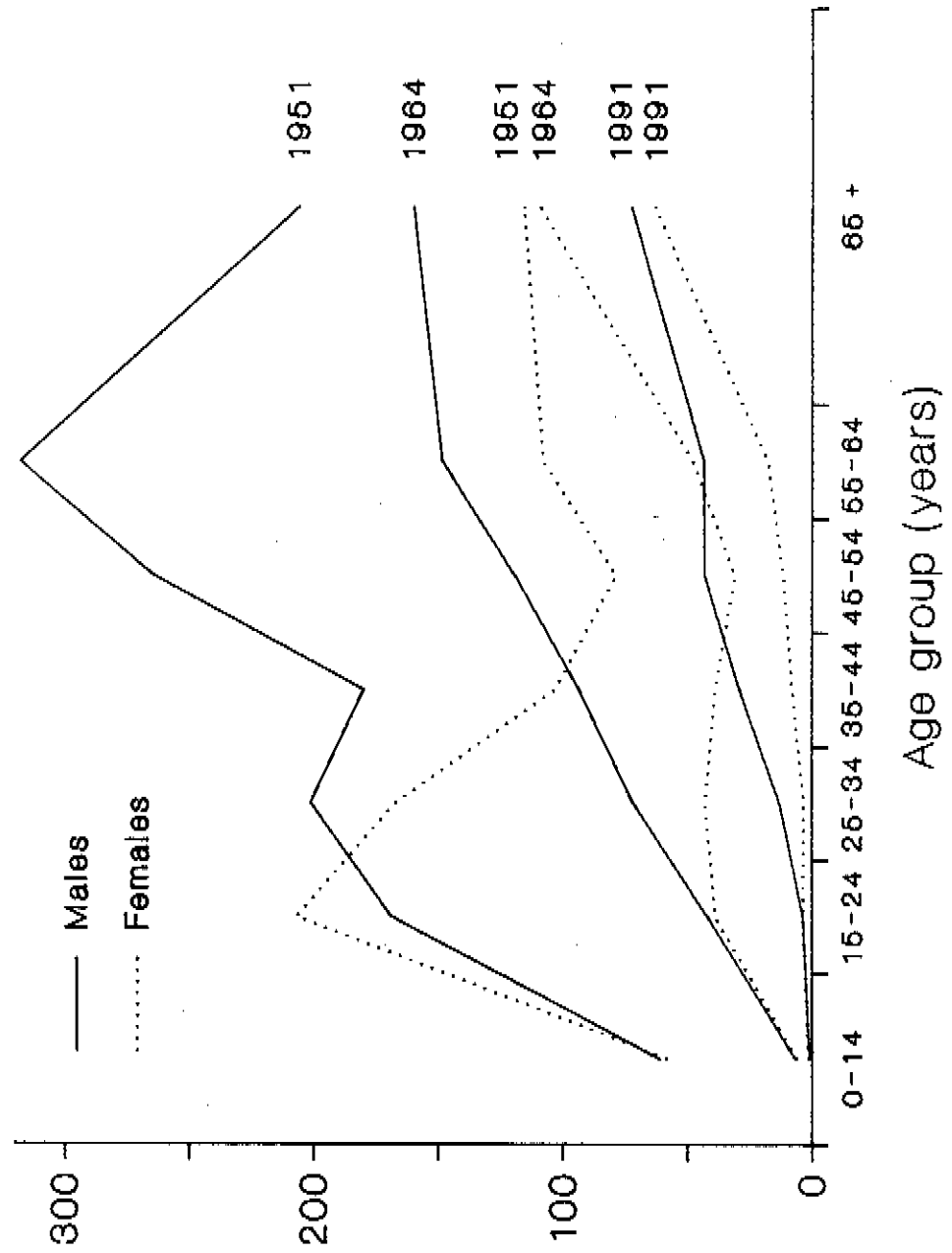
Reported Tuberculosis Case Rates in Selected Countries of Eastern Europe, 1974-1992



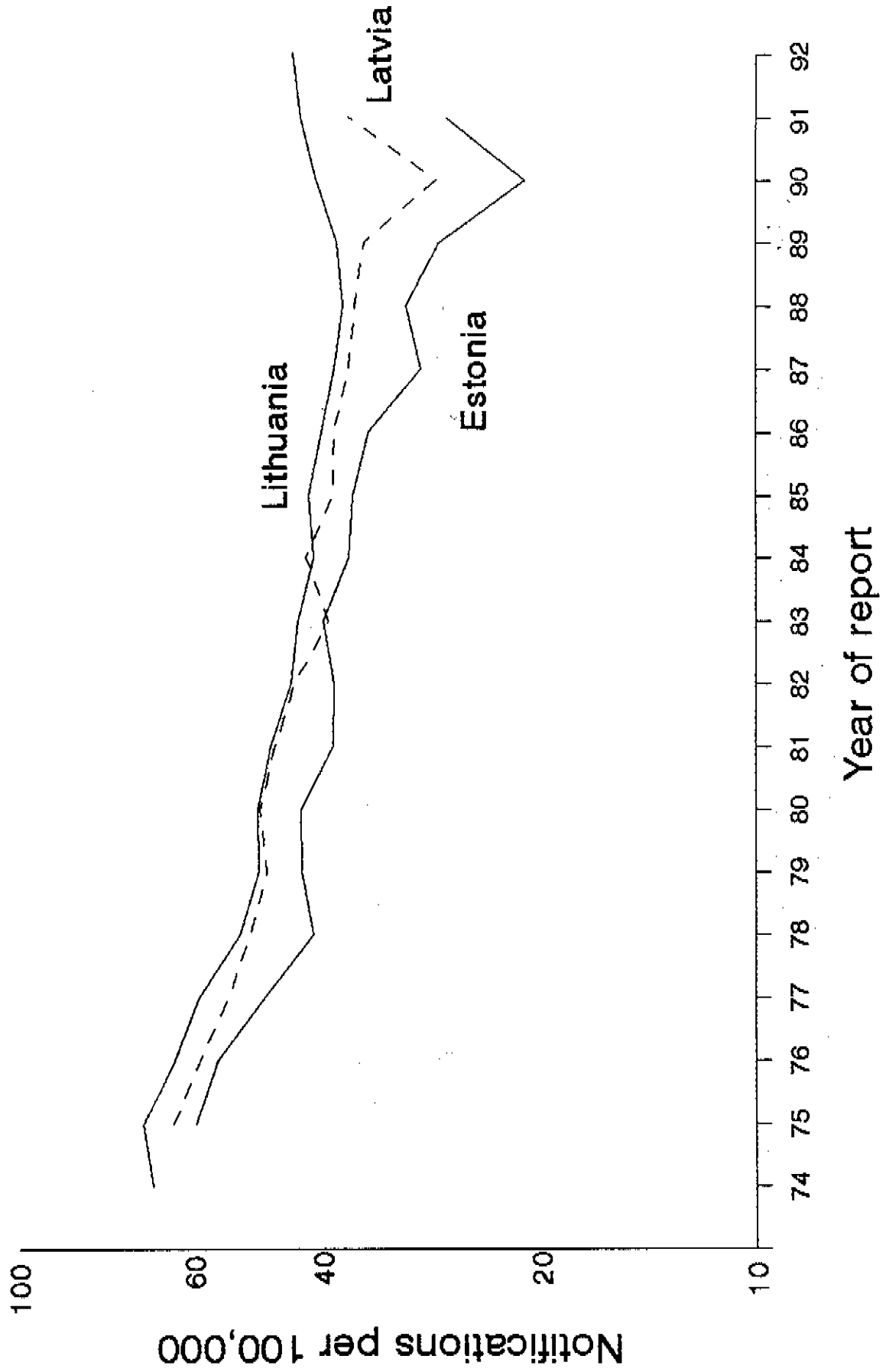
Reported Tuberculosis Case Rates in Selected Countries of Eastern Europe, 1974-1992



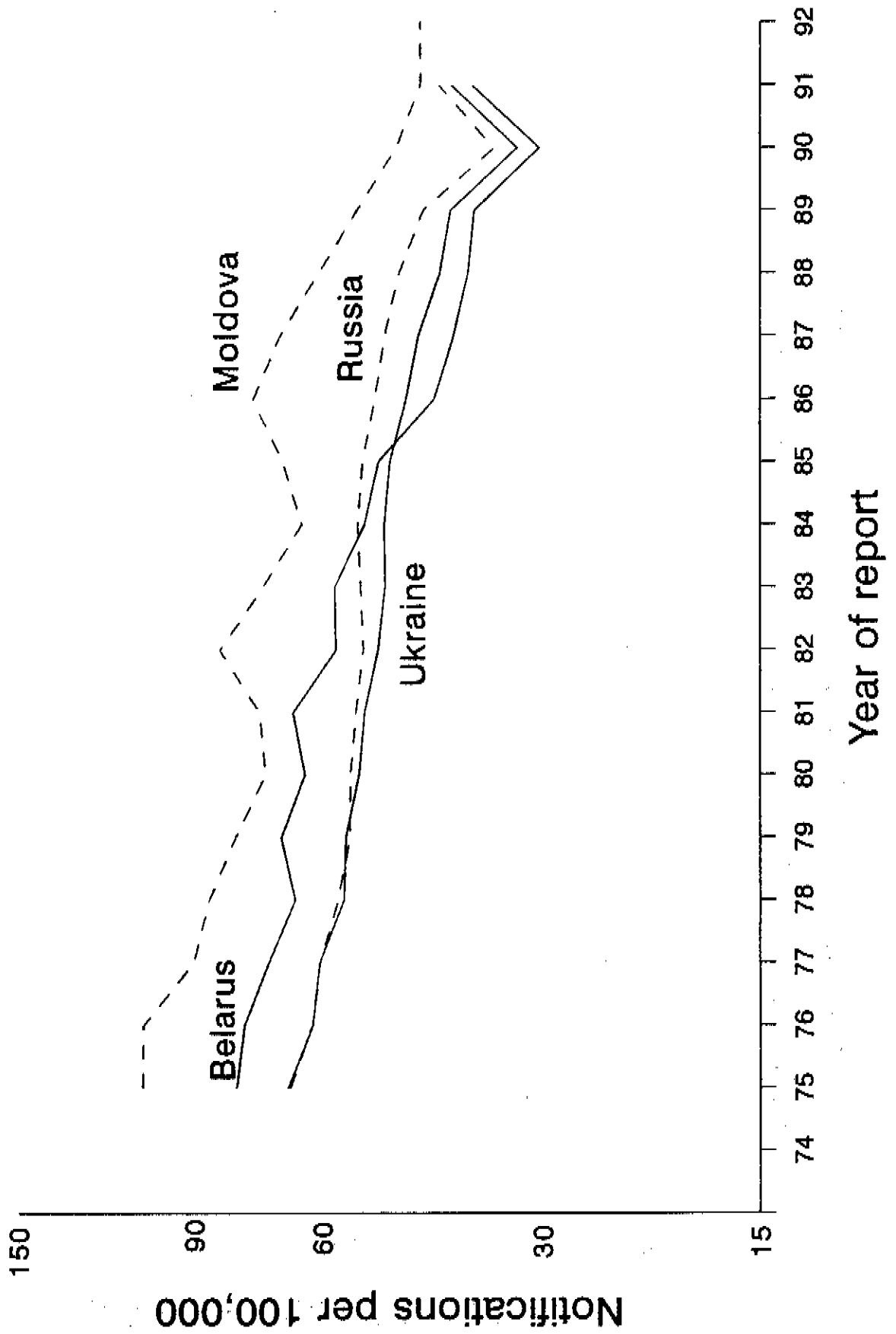
New Cases of Tuberculosis in the Czech Republic By Age and Sex, 1951, 1964, 1991



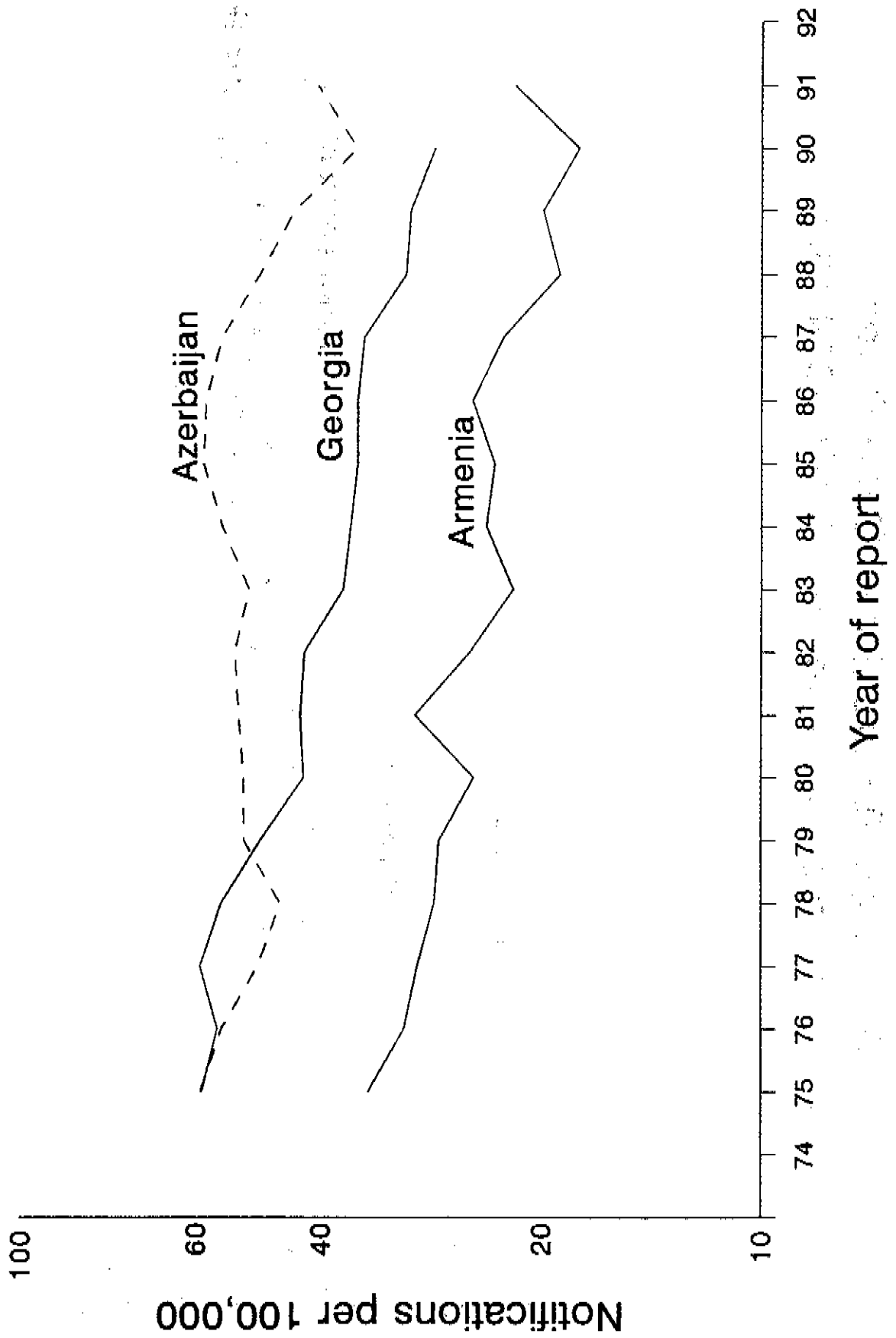
Reported Tuberculosis Case Rates Baltic Countries of the former USSR, 1974-1992



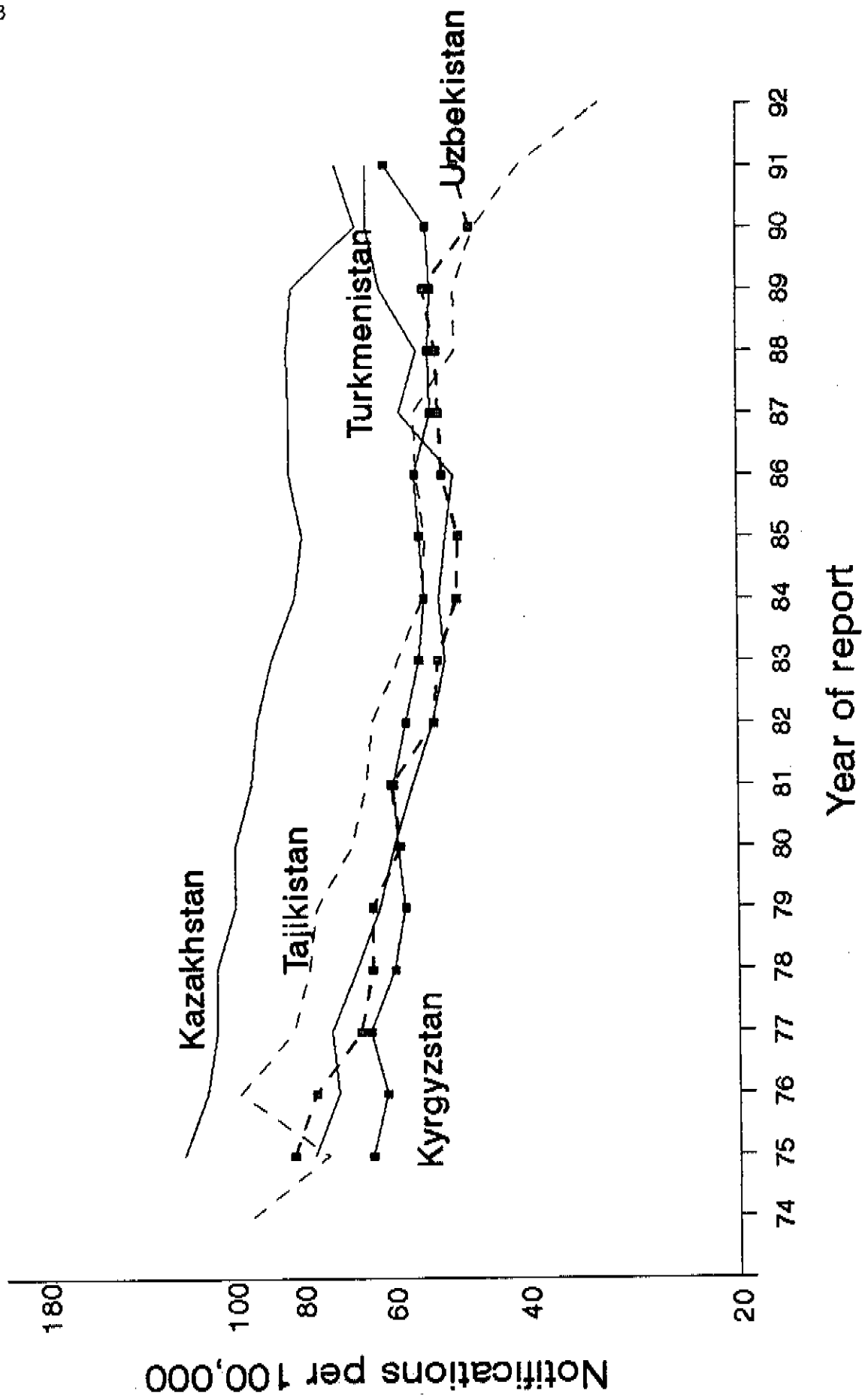
Reported Tuberculosis Case Rates European Countries of the former USSR, 1975-1992



Reported Tuberculosis Case Rates Caucasian Countries of the former USSR, 1975-1991



Reported Tuberculosis Case Rates Asian Countries of the former USSR, 1974-1992



Tuberculosis notifications, prevalence and mortality Romania, 1974 - 1992

