

# Migration: an opportunity for the improved management of tuberculosis worldwide

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## ABSTRACT

Migration, both within and between countries, has increased worldwide in recent years. While migration in itself need not present a risk to health, it is often characterized by increased stress and individual vulnerability to disease and inequalities in access to care. Migrants from high tuberculosis (TB) prevalence countries may be at risk of TB before leaving their country, during travel and after resettlement. In many high-income countries, more than half of the TB cases emerging today occur in patients born in another country. In less affluent countries, shifts in TB epidemiology associated with population movements are also being reported. Foreign-born persons often face several barriers to care in a new country as a result of inadequate knowledge of, or coverage by, the health care services, differences in culture and language, lack of money, comorbidity, concern about discrimination and fear of expulsion. National authorities apply different policies to screen migrants for TB and to provide preventive or curative treatment, with varying coverage, yield and effectiveness. If screening is to be of use, it needs to fit into a broader national strategy for TB care and management. Appropriate treatment needs to be provided in a manner conducive to its full completion. This is critical both for the individual patient and for public health. We discuss the main associations between TB and migration based on data from recent publications on surveillance, policy and practice.

*Key words: Tuberculosis/epidemiology, Transients and migrants, Diagnosis, Ethics, Prevention and control, Screening*

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## INTRODUCTION

Human migration has become inseparable from globalization and is continually reshaping the demography of many countries. Pressures from the labour market, widening disparities in wealth between and within countries, political persecution and disasters - both natural and man-made - are among the leading "pull" and "push" factors that fuel these global trends. Migration has

increased substantially in recent years, both within and across national borders. Today, there are an estimated 740 million internal migrants worldwide (1). The number of international migrants is smaller but it has increased globally from 155 million to 214 million between 1990 and 2010 (2). Many other migrant workers travel transiently abroad or within their country. The number of irregular migrants is unknown but not negligible.

The impact that in-migration could have on

tuberculosis (TB) epidemiology has preoccupied public health authorities in high-income countries for a long time (3, 4). Many migrants originate from countries where the burdens of TB disease and mortality are high. In the high-income countries of western Europe, North America and Australasia, which host sizeable communities of people who were born abroad, the incidence of TB has been brought down to very low levels over the last decades, and is often less than 10 TB cases per 100 000 population per year (5). A number of these countries have been aspiring to bring the incidence of TB sharply down to below the elimination threshold of 1 case per million population within a foreseeable future (6-8). However, many sense this goal to be elusive as a larger share of their dwindling numbers of TB cases are subject to the uncertainties of immigrant fluxes.

While migration need not necessarily pose a risk to health, it is often characterized by increased individual vulnerability to disease and difficulties in accessing health services. The cumulative effects of deprivation (including malnutrition, under-employment and poverty), health care costs and psychological stress associated with the resettlement process have been cited as barriers to access to health services among migrants with TB (9). Most migrants who develop TB in a host country have reactivated an old infection acquired in the high-prevalence setting from which they originate. The rest progress directly to disease following recent infection (or reinfection) acquired in the country of origin, of transit or of resettlement. Migrants who develop TB generally fall ill in the first years after resettlement although the risk may remain higher than that of the native population for many more years (10-12). Asylum-seekers who develop TB have been reported to fall ill earlier than other migrants (13). Visits to the country of origin by resettled immigrants have at times been associated with an increased risk of developing TB in the years following their return to the host country (14, 15).

We used surveillance reports, policy documents and peer-reviewed journal articles to describe the main trends in migrant-related TB and to identify opportunities for improved care and prevention based on published experience and evidence.

### **TB among foreign-born persons in high-income countries and elsewhere**

Tuberculosis remains a major public health problem in today's world, with an estimated 8.8

million incident TB cases occurring in 2010 and 1.45 million deaths, including 350 000 among people living with HIV (5). The TB patients who were actually notified in 2010 only represent about 65% of the incidence estimate, suggesting suboptimal case detection or lack of notification. While the global incidence of TB has been on the decrease for several years, the rate of this decline differs markedly between the various regions of the world. In some high-income countries there has been a substantial increase in year-on-year notifications of TB driven by cases in foreign-born individuals (16). In many high-income countries, the majority of TB cases detected today occurs in persons who were born outside the country. Origin by birth is often used as a proxy of migration-associated TB, albeit entry into the country may have happened many years before. Many foreign-born TB patients originate from countries with a much higher TB prevalence than the country of resettlement, and where care and prevention of TB are inadequate.

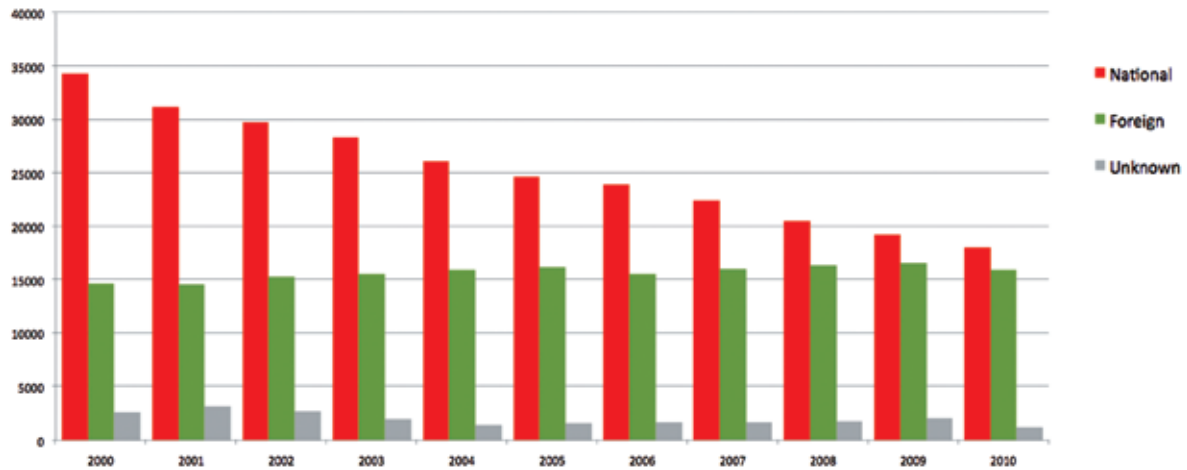
In the European Union (EU) and western Europe, TB notifications in the native populations have decreased sharply over time, while the number of cases among foreign-born patients has remained relatively stable (Figure 1). As a result, the overall proportion of foreign-born TB cases in countries with data for all years has increased from 28% in 2000 to 45% in 2010. The proportion by country, however, differs hugely and ranged from 1% in Hungary to 86% in Norway in 2010 (16). In the EU, about two thirds of cases of foreign origin were from Asia or Africa and 20% from another European country, half of whom were from central or eastern Europe (17) (Figure 2).

A similar picture has been observed in the United States. The rate of TB in the foreign-born as a whole is much higher than the one in the autochthonous population. TB notification rates have decreased between 1993 and 2010 in both U.S.-born and foreign-born persons (18) (Figure 3). The decline in TB notifications in foreign-born persons however has been less pronounced than the one among U.S.-born persons. Consequently, the percentage of tuberculosis cases occurring in foreign-born persons increased from 29% to 60% over the period.

In Canada, annual TB notifications have been relatively flat over the past decade and overall incidence decreased slowly to just under 5.0 cases per 100 000 population by 2009 (19). In 2009, foreign-born individuals accounted for 63% of all reported TB cases. The TB notification rate in foreign-born persons varied from 2.1/100 000

FIG. 1

## TUBERCULOSIS CASES BY GEOGRAPHIC ORIGIN, EUROPE, 2000-2010



Source: European Centre for Disease Prevention and Control (ECDC) and WHO Regional Office for Europe. Including data for all years for European Union and other western European countries: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Portugal, Slovakia, Slovenia, Sweden, Switzerland, and United Kingdom. Excluding countries with incomplete data for any one year or change in criterion of origin: Andorra, Bulgaria, Cyprus, Greece, Luxembourg, Monaco, Poland, San Marino, Spain. Cases from Romania (>23,000 yearly; <0.5% foreign) are not included.

in patients from established market economy countries and central Europe to 34.1 in high HIV-prevalence African countries.

In Australia, TB incidence has also remained fairly stable for the last two decades at about 6-7 cases per 100 000 population (5). However, the rates in different parts of the country have fluctuated hugely with sharp drops in some places compensated by large increases associated with immigrant fluxes elsewhere (20). In 2007, 86% of TB cases notified were in persons born overseas. Twenty-nine percent of these cases presented within 2 years of arrival in Australia and 80% within 20 years. TB rates among the foreign-born cases peaked in young adulthood while in the Australian-born non-indigenous patients the rates were much lower at any age and peaked in the elderly.

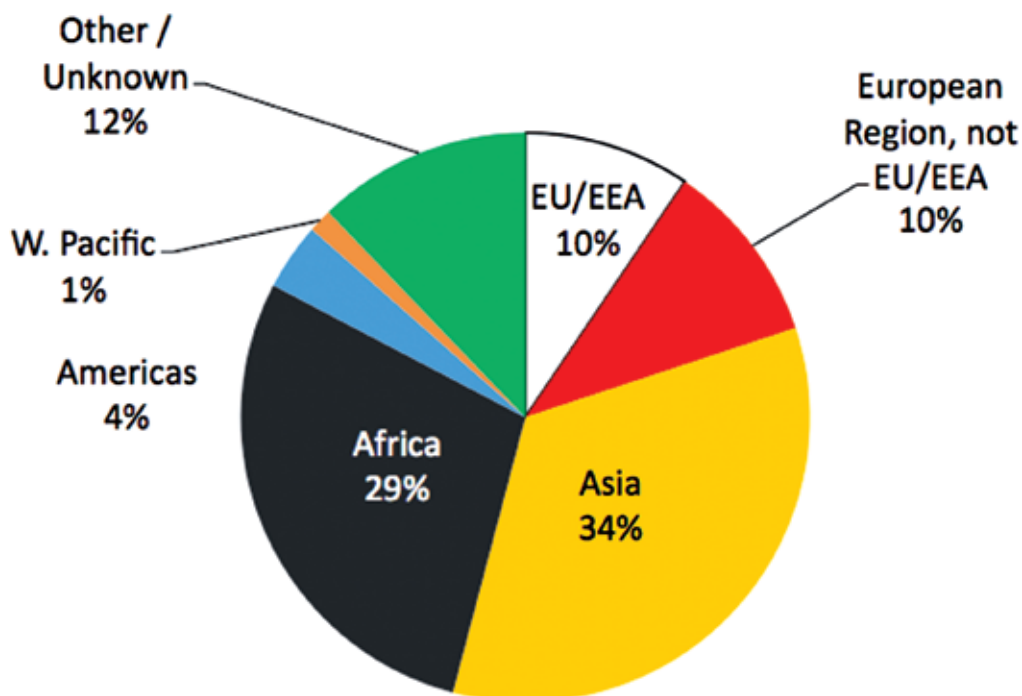
The estimated TB incidence in Saudi Arabia has been stable at around 18 per 100 000 population in recent years (5). Close to a third of the country's population of 27 million are immigrant workers, largely from countries with a much higher TB incidence (21). TB rates in the non-indigenous population were more than twice of those in Saudis in 2005-2009. Some of the non-Saudi TB cases have been observed among pilgrims attending the annual *Hajj*, a mass gathering that attracts millions of people from all over the world (22).

In Japan TB incidence halved in the last two decades (21/100 000 in 2010), but the number of TB cases of foreign origin has increased slowly between 1998 and 2009, as total notifications decreased (23). Only about 4% of TB cases were born outside the country in 2009.

The main migration routes in the world today show that in addition to movements towards high-income countries, important fluxes are also directed towards large, middle-income countries with emerging economies, such as South Africa and the Russian Federation (24). These movements may have an important bearing on TB as well. For instance, mass labour migration in southern Africa contributes to the intense transmission of TB in the countries of the area, which are in the order of 1 000/100 000 population, the highest in the world (25). Many workers in this region are employed in mining and are additionally burdened with silicosis, poor lung function and HIV-infection, making them vulnerable to more severe disease (26). In the Russian Federation, migrants in Moscow were reported to have much higher TB rates than the average, and in 1999-2000 were already reported to form a substantial proportion of newly detected TB cases in the city (27). In addition, internal migration has been implicated in an increased TB prevalence in the areas of resettlement in China (28, 29), while

FIG. 2

## PROVENANCE OF TUBERCULOSIS CASES OF FOREIGN ORIGIN, EUROPE, 2009



Source: European Centre for Disease Prevention and Control (ECDC) and WHO Regional Office for Europe (17). Including TB data reported by countries of the European Union (EU) and European Economic Area (EEA): Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.

reports from different parts of Iran attribute much of their TB caseload to immigrants from confluent regions and neighbouring countries (30-32).

### PREVENTION AND CARE OF TB IN MIGRANT POPULATIONS

Policies about TB prevention and care among migrant populations differ widely between countries. Many countries screen prospective immigrants for TB in the process of entry for long-term residence in the country. Screening tests are employed in order to identify latent TB infection (LTBI) or active disease, usually before the onset of symptoms, in order to institute preventive or curative treatment early on. Tests may be performed before (eg, Australia, Canada, U.S.), or upon/just after arrival (eg, Denmark, Switzerland). High-income countries differ in what methods they employ within their screening algorithms from among clinical examination, chest

radiography, tuberculin skin testing (TST) and interferon gamma release assays (IGRA) (33-35). Many migrant-screening programmes use chest radiography primarily to detect active TB, a much rarer condition than the more widespread LTBI (33). Some also add diagnostic microbiology to their screening routines. TB-screening strategies were shown to have different cost-effectiveness when used in high-income countries to test immigrants from high TB incidence countries and other individuals at increased risk of TB (36). Reliance on TST alone was generally found to be an expensive option to detect infection and prevent disease. Cost-effectiveness improved irrespective of the screening method used when a higher proportion of those detected at screening completed medical follow up and treatment for LTBI (37). The added value of follow-up screening in the months and years after arrival, following testing at entry, has been reported to be low (38). Incentives to new entrants, such as conditional cash transfers, could probably improve the

effectiveness of screening, although there is no strong evidence to support this as yet (39).

Countries differ in how they handle persons who screen positive. Permission to enter the country may be refused even upon the detection of non-specific x-ray abnormalities such as calcification (40). Persons with signs of LTBI may be required to complete prophylactic treatment (39). In some countries, immigration may be possible if active TB is detected and successfully treated before arrival (41, 34).

The prevention of secondary cases of TB still depends very much on the identification and early treatment of infectious patients. The only vaccine which is in use today for TB, the time-honoured Bacille Calmette Guérin (or BCG), has no role in preventing transmission, although it does protect against serious forms of TB, particularly in childhood (42). A number of high-income countries have policies which target BCG vaccination for communities with high frequency of TB infection, including immigrants from high-incidence settings, especially children and newborns (43).

In the United States, the proportion of new TB patients infected with strains resistant to both isoniazid and rifampicin (multidrug-resistance; MDR-TB) at diagnosis is nowadays about three times more frequent in the foreign-born when compared to the U.S.-born patients (Figure 4). While there was a decrease in the overall frequency of MDR-TB in the latter half of the 1990s, the proportion of primary MDR-TB cases in

the US that are attributed to foreign-born persons increased from approximately 25% in 1993 to 82% in 2010. In the European region, TB patients of foreign origin generally have a higher risk of drug-resistant disease, particularly those from countries of the former Soviet Union (44).

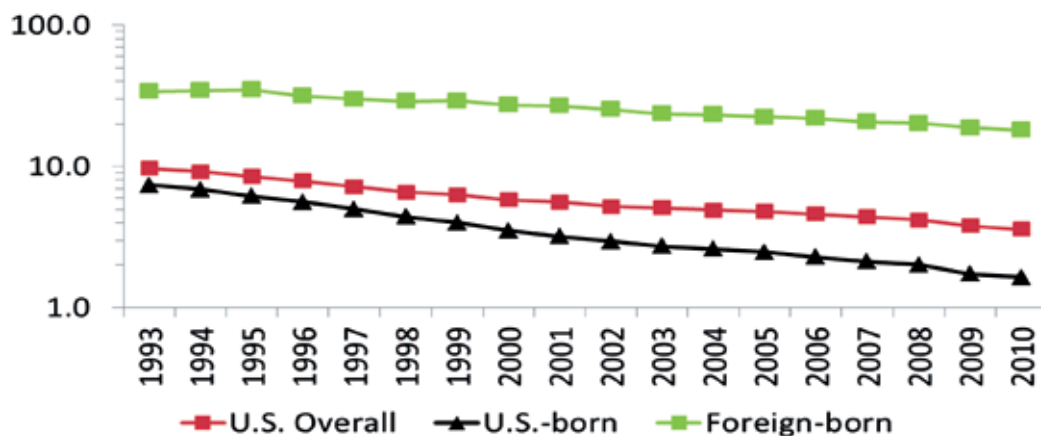
The occurrence of human immune deficiency virus (HIV) infection among TB patients varies greatly by geographic region (5). This association has also been described in persons who develop TB in high-income settings and originate from high HIV-prevalence areas (45, 46).

Migrants with TB sometimes present clinical features which are different from those in native patients (47-49). This may at times be related to delayed diagnosis and it may further complicate the diagnosis in host countries. As TB becomes rarer in many high-income countries, local clinicians may be less prone to think of it in their differential diagnosis (50).

The final outcome of treatment is frequently unknown in TB patients of foreign origin as a result of incomplete follow-up (51). Among internal migrants with TB in China case-holding has also been reported to be problematic (28). In contrast, TB patients of foreign origin have been observed to have a lower likelihood of dying than native patients (Figure 5). This effect remains even when adjustments are made for age, drug-resistance and other possible risk-factors (52). Some authors have attributed this to a "healthy migrant effect", implying that on average foreign patients are in a better physical condition than the

FIG. 3

## TUBERCULOSIS CASE RATES IN U.S.-BORN VS. FOREIGN-BORN PERSONS, UNITED STATES, 1993-2010



Source: Centers for Disease Control, US. Updated as of July 21, 2011 (<http://www.cdc.gov/tb/statistics/surv/surv2010/>; accessed 5 April 2012)

native ones (53). This may reflect better prognosis of treatment as a benefit of earlier detection through migrant screening.

### IS MIGRATION A THREAT OR AN OPPORTUNITY FOR THE PREVENTION OF TB ?

Everything indicates that the trend in human migration is destined to keep growing in future years. As industrialized countries see their indigenous birth rates fall or flatten and their populations getting older, the need for migrant labour will not decrease. Most migrants are in their most productive ages and most stay healthy. However, they are bound to come to represent an ever larger proportion of the TB cases in high-income countries as the elderly, native population who grew up at a time when TB was still rampant diminishes with time. This demographic trend is also influencing TB epidemiological patterns in less affluent countries. When migrants develop TB, diagnostic delays and interruption of treatment are common.

The question is therefore: can we turn around the perception embraced by many national public health authorities that migration is a threat into an opportunity to improve detection and treatment outcomes of TB cases in the world? We know that case detection of TB is suboptimal in many settings. Is the point at which individuals at high risk of TB cross an international border a good moment to improve detection of TB? And can we

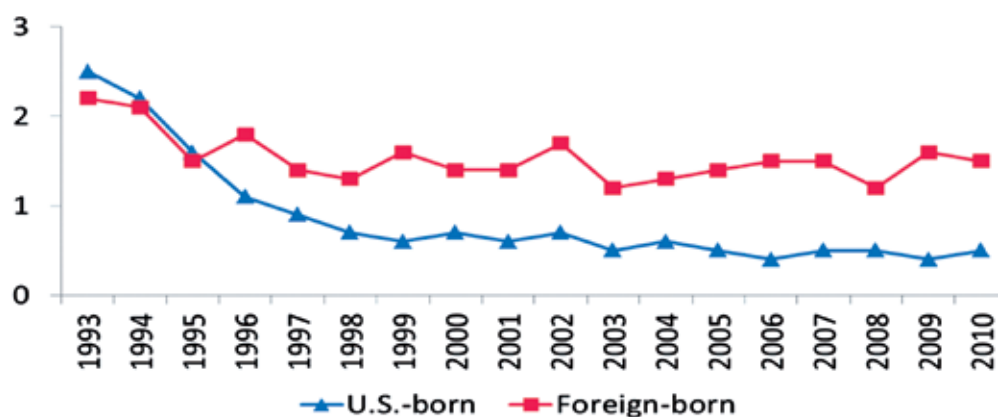
improve our grasp on the global TB epidemic by taking advantage of the motivation which drives one billion or so mobile individuals to seek a better future in today's world?

One initial step is to move away from the widely-held view that migrants may increase risk of TB in a community towards one which accentuates their "vulnerability", or predisposition to adverse outcomes of ill-health. Reports from different high-income countries with well-performing screening and treatment systems have shown that foreign-born TB patients do not contribute importantly to TB transmission in the native population (54-57), a finding that is important to stress in an effort to de-stigmatize these individuals and promote adaptive methods. Patient-sensitive health care systems should be employed and the health beliefs of individuals from other cultural backgrounds understood. The migrant status of a TB patient should be positioned within the broader framework of all the social determinants which create inequities in a patient's contact with the health services (58). A number of countries have successfully implemented migrant-friendly models of care and these practices need to be studied and emulated elsewhere to the benefit of both the TB patient and the community where she or he functions (59). Providing migrants affected with TB and their families with simply-worded information in different languages may reinforce counseling efforts (60).

Migrants often face several barriers to care in a new country as a result of inadequate knowledge

FIG. 4

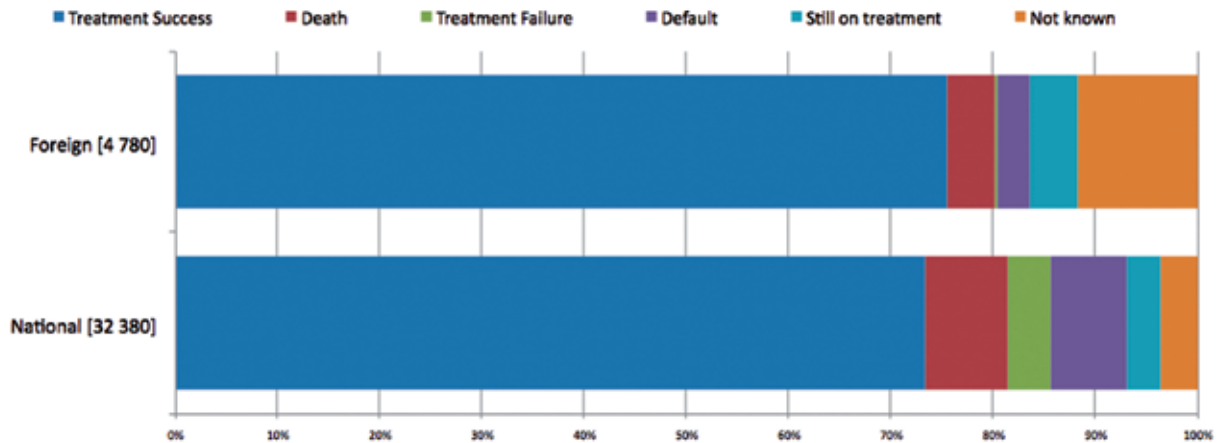
PERCENTAGE OF INITIAL ISOLATES FROM PATIENTS WITH NO PREVIOUS HISTORY OF TUBERCULOSIS SHOWING RESISTANCE TO ISONIAZID AND RIFAMPICIN (MULTIDRUG RESISTANCE) IN U.S.-BORN VS. FOREIGN-BORN PERSONS, UNITED STATES, 1993-2010



Source: Centers for Disease Control, US. Updated as of July 21, 2011 (<http://www.cdc.gov/tb/statistics/surv/surv2010/>; accessed 5 April 2012)

FIG. 5

## TREATMENT OUTCOMES IN CULTURE-CONFIRMED PULMONARY TUBERCULOSIS CASES STARTING TREATMENT IN 2007, BY GEOGRAPHIC ORIGIN, EUROPE



Source: European Centre for Disease Prevention and Control (ECDC); data published in Table 2 of (51). Including TB data reported by countries of the European Union (EU) and European Economic Area (EEA): Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Iceland, Ireland, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, and United Kingdom.

of, or coverage by, the health care services (61), lack of knowledge about TB (9), differences in culture and language, lack of money, comorbidity, concern about discrimination and fear of expulsion. Irregular migrants may avoid the public health services, resulting in missed or delayed treatment (62). In contrast, the opportunity to be screened for tuberculosis was valued by immigrants in one setting where awareness of TB was fairly good and where testing was offered on voluntary basis, alongside other support (63). Apart from the ethical issues raised by the forced expulsion of a sick person with a treatable and transmissible condition, such policies are destined to be short-sighted and counter-productive as they will discourage individuals who feel unwell from seeking care. Partially-treated TB engenders chronicity and drug-resistance. The same patients who are expelled may well trace their way back into the country irregularly later on.

The Working Group on Trans-border Migration and TB of the International Union Against Tuberculosis and Lung Disease (The UNION) concluded in 2008 that “undocumented migrants represent a considerable proportion ... of the tuberculosis patients in many countries” (64). The group cited examples from the Netherlands and Norway where regulations have been introduced to ensure that such TB patients do not have their treatment disrupted by deportation. The full care and treatment of TB should be guaranteed

regardless of the provenance and legal status of patients. When it comes to TB prevention, native and foreign people should have equal rights, but also similar obligations to complete treatment and help reduce transmission (65, 66).

### FRAMING EFFECTIVE TB PREVENTION AND CARE IN MIGRANTS

In 2008, the World Health Assembly approved a Resolution with a clear message about the need to promote migrant-sensitive health policies (67). In the two years following the Resolution, the World Health Organization (WHO), as well as other partners including the European Commission, the International Organization for Migration, and the governments of Portugal, Spain and other countries, have organized two key consultations on migrant health (68, 69). A framework to improve the management of TB among migrants is now being proposed which articulates the four main thematic rubrics proposed by the 2010 consultation to basic principles espoused by WHO’s Stop TB Strategy (70)

*1. Monitoring migrant health:* the standardization and appropriate gathering of data is necessary to plan TB care services and to ensure that access for migrants is monitored and inequalities are not created. Better documentation of good practices in

the provision of TB care, including the use of enablers, which can be replicated elsewhere is needed. In concrete terms this will imply a stronger culture of collection of minimal data on diagnosis and treatment of patients. Complementary operational research – such as the profiling of “hot spots” of TB in space and time – would be important to target action more precisely.

2. *Policy and legal framework*: adapting international standards for TB care (71, 72) into the local policies is an important step in upholding the rights of all individuals for TB treatment regardless of origin. As members of the community, migrants have a responsibility to observe the regulatory framework within which TB control operates. Basic TB care should be provided free of charge and kept outside any scheme which requires that the patient pays, regardless of legal status.
3. *Migrant sensitive health systems*: the health provider has to ensure that TB care is delivered in an ethical manner which facilitates access and does not discriminate against the sick person. If policies on TB screening and contact tracing are to be effective they will need to respect cultural differences. Screening needs to be coupled with a treatment plan for patients detected with TB. Countries need to study which screening methods are best suited to their

situation (capacity and resources) and whether to focus on the diagnosis and management of latent or active TB. The use of direct observation of treatment and incentives or enablers may help adherence.

4. *Partnerships, networks and multi-country frameworks*: permit a broader exchange of technical information between professionals and policy-makers (73, 74). The Assisting Migrants and Communities (AMAC) project, supported by the EC Health Programme, was one example which fostered engagement from policy-makers to tackle public health issues linked to migrants in the European Union (68). A need for stronger links between industry, such as the mining sector, and government has been identified as a way to improve continuity of care across borders (26).

In conclusion, equitable provision in TB prevention and care is a means to reduce disease among migrant populations at increased risk of TB and also benefits the rest of the community and the health services.

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**NOTE:** the previous on-line version of this paper contained a mistake in the first author's name. Please note the correct spelling included in this version.

