

# Undocumented Migrants in Switzerland: Geographical Origin Versus Legal Status as Risk Factor for Tuberculosis

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**Abstract** Undocumented migrants, meaning migrants without a legal residency permit, come to Geneva from countries with high tuberculosis (TB) incidence. We estimate here whether being undocumented is a determinant of TB, independently of origin. Cross-sectional study including undocumented migrants in a TB screening program in 2002; results were compared to 12,904 age and frequency matched participants in a general TB screening program conducted at various workplaces in Geneva, Switzerland from 1992 to 2002. A total of 206 undocumented migrants (36% male, 64% female, mean age 37.8 years (SD 11.8), 82.5% from Latin America) participated in the TB screening program. Compared to legal residents, undocumented migrants had an adjusted OR for TB-related fibrotic signs of 1.7 (95% CI 0.8;3.7). The OR of

TB-related fibrotic signs for Latin American (vs. other) origin was 2.7 (95% CI 1.6;4.7) among legal residents and 5.5 (95% CI 2.8;10.8) among undocumented migrants. Chest X-ray screening identified a higher proportion of TB-related fibrotic signs among Latin Americans, independently of their residency status.

**Keywords** Tuberculosis · Screening · Immigrants · Undocumented migrants

## Introduction

Geneva is a common destination of undocumented migration, that is migration without a legal residence permit. An estimated 8,000–12,000 undocumented migrants live and work in the canton of Geneva, representing 1.4–3.5% of the 434,500 resident population [1]. Since 1996, a mobile outpatient unit has offered free health care to undocumented migrants in Geneva and is well known among this population. The socio-demographic profile of undocumented migrants seen at the unit is similar to other surveys of undocumented migrants performed in Geneva [2–4]. They are mostly females (70–80%), aged between 25 and 44 years (75%), coming from 5 Latin-American countries: Brazil, Colombia, Bolivia, Peru and Ecuador [2–4], where the prevalence of tuberculosis (TB) is 5 to 50-fold higher than in Switzerland [5, 6]. A survey of this difficult-to-reach population concerning all TB-notifications between 1994 and 1998 in Geneva showed that first consultation was often delayed. Only 5% of undocumented migrants with active TB saw a health care professional during the first month of symptoms, compared to 30% patients with TB and a legal status. Furthermore, 66% of the undocumented migrants declared having lost their job as a consequence of TB [7].

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In most European countries more than half of all TB cases occur among foreign-born individuals [8]. Undocumented migrants represent 5–30% of immigrants and 5–10% of TB cases in low- or intermediate-incidence countries [9]. Latent tuberculosis infection (LTBI) is frequent in undocumented migrants. In Italy, El Hamad found a prevalence of 39% of LBTI in undocumented migrants originating mainly from Africa and Asia [10]; in Switzerland, Bodenmann found that 19% of undocumented migrants from Latin America had LBTI [11]. Nevertheless, these screenings were performed in health care centres and represent a selection of ill undocumented migrants. Several studies have shown that TB is mainly due to reactivation of infections acquired abroad but that transmission to other people in the host country is rare [12–15]. Therefore, screening for tuberculosis among immigrants is performed in many developed countries, with the aim of detecting and treating active disease [16, 17] or LTBI [18, 19].

The present study focused on undocumented migrants who were selected in the community, outside of medical practices, to determine whether residency status determines the risk of TB, independently of origin. The association with TB was assessed by the relative odds ratio (OR) of chest X-rays suggestive of either active TB or TB-related fibrotic signs (a known risk factor for subsequent TB reactivation) among undocumented migrants and legal residents in Geneva, Switzerland.

## Methods

### Study Design

The association between legal residency status and positive chest X-ray exams suggestive of TB was assessed in 206 out of an estimated 400 undocumented migrants invited to have X-rays in 2002. A control group comprised 12,904 persons (6,538 women and 6,366 men) participating from 1992 through 2002 in a chest X-ray TB screening program conducted at various Geneva workplaces. Both groups participated on a voluntary basis. The control group had occupations that the undocumented migrants could have applied for if they had been legal residents and therefore allowed for an optimal comparison.

### Study Samples

#### *Undocumented Migrants*

In order to reach as many undocumented migrants as possible and to motivate them to participate in chest X-ray screening for TB, an awareness and informational campaign about pulmonary diseases (particularly TB) and

smoking, including interactive workshops and lectures followed by discussion groups, was conducted in collaboration with four major charitable associations in Geneva: C.A.R.E. (Caritas), Square-Hugo (Social Service of the City of Geneva), Emmaüs, and Cœur des Grottes (Salvation Army). We also informed community leaders about the project, as well as other associations, trade unions, and public social services dealing with undocumented migrants. Written information in the form of leaflets was available in French, Spanish, English, and Portuguese, which covers the languages spoken by more than 90% of undocumented migrants in Geneva [2]. As the study was conducted during 2 months in autumn, free influenza vaccination was offered as an additional incentive to participate. On the basis of participation at the workshops and the number of patients receiving information about the study at the mobile unit, we estimate that approximately 400 undocumented migrants were informed about the TB screening program.

Every undocumented migrant aged 18 years or over and willing to provide written consent to participate in the study was included. We excluded persons aged <18 years, pregnant women, and persons intoxicated by alcohol or drugs who were unable to provide informed consent.

### Control Group

Controls were selected from a total of 24,496 adults (12,208 women and 12,288 men) who underwent chest X-rays as part of a TB screening program between 1992 and 2002 at different Geneva workplaces. All workers aged 18 years or more were invited to participate. Workers aged <18 years and pregnant women were excluded. All control group participants were legally registered residents in Geneva.

To improve comparability and control for confounding factors, we further restricted the control group sample using gender, age, and country of origin (Latin America or other) frequency matching to undocumented migrant “cases” [20]. Specifically, for each undocumented migrant “case” we selected all control group persons of the same sex, age and country of origin.

### Questionnaire

Socio-demographic data (age, gender, nationality) were collected by questionnaire for all participants by 2 nurses in a face-to-face interview.

### Chest X-rays and Follow-up

Chest X-rays were performed either in a mobile clinical unit of the Geneva University Hospital, or at Geneva

University Hospital. All chest X-rays (cases and controls) were analyzed by the same (unblinded) experienced pulmonologist. Any occurrence of an abnormal X-ray was communicated to control group patients and to their general practitioner who determined if an abnormal finding was TB-related and informed us of the final diagnosis. The undocumented migrants were informed about their X-ray results. If the X-ray was abnormal, any further investigations, medical follow-up, and treatment were offered free of charge for those patients without insurance coverage.

#### Outcome Definition

Chest X-rays were classified as: (A) normal; (B) abnormal without signs suggestive of TB; or (C) abnormal with signs suggestive of TB. TB-suggestive X-rays were further classified into two groups: (C1) fibrotic signs suggestive of previous TB *without* signs of activity; or (C2) suggestive of active TB. C1 or C2 X-rays were scored as “TB+”, while X-rays classified as A or B were scored as “TB–”.

#### Statistical Analyses

Univariate comparisons of undocumented migrants (“cases”) and employees in Geneva workplaces (controls) were made with the  $\chi^2$  or Fisher’s exact test for categorical variables or with Student’s *t*-test for continuous variables, using a significance threshold of 5%. We used Yates continuity correction by adding 1 to all cells in case one of the cell had 0 observations.

Associations were estimated by OR with 95% confidence intervals (95% CI) obtained using multiple logistic regression analysis with undocumented migrant/control group status as dependent variable and TB+ versus TB– as the main independent variable. Potential confounding

factors (age, gender, and Latin American origin or other) were also included as independent variables in the logistic model, and analyses including two-way interaction terms between the factors were also performed. Statistical analysis was performed using SPSS 15.0 for Windows software.

#### Ethical Considerations

This study was approved by the Geneva University Hospital Ethics Committee (protocol N° 02-010).

#### Results

A total of 217 undocumented migrants agreed to participate, but 11 of them refused to have an X-ray (they agreed only to have an influenza-vaccination) and hence were excluded from the analyses. The 206 remaining undocumented migrants were compared to 12,904 frequency matched controls (6,538 women and 6,366 men).

The sociodemographic characteristics and radiographic results for undocumented migrants and controls are presented in Table 1. No case of active TB was detected among undocumented migrants; 3 (0.02%) cases were detected in controls.

Undocumented migrants had a higher proportion of chest X-rays with TB-related fibrotic changes than controls (4.9% vs. 1.2%,  $P < 0.001$ ). Compared to legal residents, undocumented migrants had a crude odds of 4.2 (95% CI 2.2;8.1) of having TB-related fibrotic signs (Table 2). Age and sex-adjustment decreased the OR to 3.9 (95% CI 2.0;7.5), and additional adjustment for Latino American origin to 1.7 (95% CI 0.8;3.7).

**Table 1** Sociodemographic characteristics and radiographic results. Geneva, Switzerland, 2002 (undocumented migrants), 1992–2002 (legal residents)

Variables	Legal residents ( <i>n</i> = 12,904) <i>n</i> (%)	Undocumented migrants ( <i>n</i> = 206) <i>n</i> (%)	<i>P</i>
Age: mean (SD)	36.2 (10.5)	37.8 (11.8)	0.048
Origin			<0.001
Latin America	555 (4.3)	170 (82.5)	
Others	12,349 (95.7)	36 (17.5)	
X-ray results			
(A) Normal	12,233 (94.8)	192 (93.2)	0.38
(B) Pathologic not suggestive of TB	517 (4.0)	4 (1.9)	0.21 <sup>a</sup>
(C1) Fibrotic signs suggestive of TB without signs of activity	151 (1.2)	10 (4.9)	<0.001
(C2) Active TB	3 (0.02)	0 (0.0)	
Total number of X-rays suggestive of TB	154 (1.2)	10 (4.9)	<0.001

TB tuberculosis

<sup>a</sup> Fisher’s exact test

**Table 2** Unadjusted and adjusted odds ratios (OR) of TB-related fibrotic signs on chest X-rays of undocumented migrants versus controls with legal residency status, Geneva, Switzerland, 2002 (undocumented migrants), 1992–2002 (control group)

	Undocumented migrants <i>n</i> = 206 <i>n</i> (%)	Legal residents <i>n</i> = 12,904 <i>n</i> (%)	OR crude (95% CI)	OR adjusted for age and sex (95% CI)	OR adjusted for age, sex and Latin-American origin (95% CI)
Fibrotic signs suggestive of tuberculosis (TB)	10 (4.9)	154 (1.2)	4.2 (2.2;8.1)	3.9 (2.0;7.5).	1.7 (0.8;3.7)
Without fibrotic signs suggestive of tuberculosis (TB)	196 (95.1)	12,750 (98.8)	1.0 (ref)	1.0 (ref)	1.0 (ref)

The effect of undocumented status in participants not originating from Latin America was calculated by using Yates continuity correction. The corresponding OR was 1.6 (95% CI 0.2;12.1).

As 82.5% of the undocumented migrants were of Latin American origin, we performed a subgroup analysis among Latin Americans (*n* = 725: 170 undocumented migrants and 555 controls) in order to determine the effect of residency status on having TB-related fibrotic signs. The corresponding OR was 2.05 (95% CI: 0.9;4.7) (Table 3).

As shown in Table 4, the OR of having TB-related fibrotic signs for subjects with Latin American origin was 2.7 (95% CI 1.6;4.7) for legal residents and 5.5 (95% CI 2.8;10.8) for undocumented migrants.

No significant interactions were found between gender and origin, gender and age, status and age, status and origin or age and origin.

#### TB in Undocumented Migrants

No active case of TB was found in the undocumented migrants. Ten undocumented migrants (7 female and 3 male, 4.8%) were classified as TB+. Three (30% of the TB+) completed treatment for latent tuberculosis infection (LTBI) with isoniazid alone or in combination with rifampicine. Three others (1.4% of the total, 30% of the TB+) could not be contacted.

**Table 3** Unadjusted and adjusted odds ratios (OR) of fibrotic signs suggestive of tuberculosis (TB) on chest X-rays of Latin American undocumented migrants (*n* = 170) versus Latin American controls with legal residency status (*n* = 555), Geneva, Switzerland, 2002 (undocumented migrants), 1992–2002 (control group)

	Undocumented migrants from Latin America <i>n</i> = 170 <i>n</i> (%)	Legal residents from Latin America <i>n</i> = 555 <i>n</i> (%)	OR crude (95% CI)	OR adjusted for age and sex OR (95% CI)
Fibrotic signs suggestive of tuberculosis (TB)	10 (5.9)	15 (2.7)	2.3 (0.99;5.1)	2.05 (0.9;4.7).
Without fibrotic signs suggestive of tuberculosis (TB)	160 (94.1)	540 (97.3)	1.0 (ref)	1.0 (ref)

**Table 4** Prevalences of fibrotic signs suggestive of tuberculosis (TB) on chest X-ray and adjusted odds ratios (OR)\* according to undocumented status and/or Latin-American origin, Geneva, Switzerland, 2002 (undocumented migrants), 1992–2002 (legal residents)

Stratum		Prevalence of fibrotic signs suggestive of TB <i>n</i> (%)	Total <i>n</i>	OR (95% CI) <sup>a,°</sup>
Undocumented status	Latin-American origin			
Yes	Yes	10 (5.9)	170	5.5 [2.8;10.8]
No	Yes	15 (2.7)	555	2.7 [1.6;4.7]
Yes	No	0	36	1.6 [0.2;12.1] <sup>b</sup>
No	No	139 (1.1)	12,349	1.0 (ref)
	Total	164	13,110	

<sup>°</sup> *P*-value for interaction = 0.99

<sup>a</sup> Sex- and age-adjusted

<sup>b</sup> Computed using Yates continuity correction

## Discussion

This pilot screening study for TB showed that undocumented migrants had a higher proportion of chest X-rays with TB-related fibrotic changes (associated with a higher risk of reactivation of TB) than controls (4.9% vs. 1.2%,  $P < 0.001$ ). The main factor increasing the proportion of TB-related fibrotic changes was Latin American origin. Undocumented migrant status per se did not significantly increase the prevalence of TB-related fibrotic changes. However, there was a statistically significant combined effect (OR 5.5; 95% CI 2.8;10.8) of undocumented migrant status and Latin American origin compared to legal residents of non-Latin America origin.

The prevalence rates found in our study (4.9%) are much lower than those found in previous studies (19–39%) [10, 11]. The difference can be due to the fact that (1) our study sample of undocumented migrants could be healthier because not selected in health care centers but in community centers and (2) the detection method in our study was limited to X-ray screening whereas other studies performed also tuberculin skin testing [10] and interferon- $\gamma$  assays [11] which may increase sensitivity. Tuberculin skin testing was not performed in the present study because needing two contacts which is difficult to realize in a field study concerning undocumented migrants and interferon- $\gamma$  assays were not available in 2002.

Undocumented migrants live in difficult conditions and belong to the lowest socio-economic groups which are known to be more exposed to tuberculosis [21–24]. Our findings suggest that the increased risk of TB-related fibrotic changes is mainly due to Latin American origin and not to undocumented migrant status. This finding is important since several surveys in Switzerland have shown that the majority of undocumented migrants (70% in Geneva and Lausanne, 60% in Zurich) originate from regions of Latin America [2, 3, 25, 26] where the prevalence of tuberculosis is known to be 5- to 50-fold higher than in Switzerland [5, 6].

One important limitation of this study is the relatively small sample size of the undocumented migrants but this pilot study at least provides a first estimation of signs of TB-related fibrotic signs on chest X-rays of undocumented migrants in Geneva, Switzerland. Another limitation concerns the use of X-ray screening which is less likely to pick up extrapulmonary manifestations of TB, which seems to be more common in undocumented migrants than in the general population [7]. Finally, the inclusion period of the undocumented migrants (2002) was not the same as of the controls (1992–2002). We chose this large control group because it was the best available local data source and permitted to include a large number of Latin American controls. Furthermore, even if the TB incidence in

Switzerland decreased continuously between 1995 (12/100,000) and 2002 (9/100,000) [27], it has remained rather stable in Geneva during the study period ( $\approx 20/100,000$  inhabitants/year), which is slightly higher than the national average. The discrepancy between Geneva and Swiss statistics is related to Geneva's population: 45% of foreign-born residents and a high turn-over of immigrants from all over the world; 75–85% of TB cases are foreign-born.

This study illustrates the difficulties in performing a large scale screening for TB in a population of undocumented migrants. Indeed, despite important efforts to motivate undocumented migrants to participate, only 52% of those solicited participated in the project. No case of active TB was detected; only 30% of those screened with LTBI completed treatment. Furthermore, only a small proportion of the undocumented migrants in our area could be reached and solicited. Theoretically, undocumented migrants originating from countries with a high prevalence for TB are high-risk groups and should benefit from systematic TB-screening strategies. However, important barriers to a systematic screening strategy exist: (1) Undocumented migrants live clandestinely and are geographically unstable, often changing residence; (2) Systematic screening through any official institution may be jeopardized by fear—among migrants—of state agencies and deportation. Systematic screening for TB by a health care facility may be associated with the fear of informing public health offices: undocumented migrants may, as a consequence, avoid contact with the health care facility, thereby destroying several years of continuous trust-building work; (3) Cultural barriers and health representations may also compromise adherence to a screening program on a voluntary basis. Thus, it is not realistic to promote systematic screening for TB in this hard-to-reach population.

Policy makers have to take into consideration the fact that active TB disease can develop many years after arrival, mainly as a result of reactivation of LTBI [15]. Local transmission within migrant communities, and primary infection due to return trips abroad to visit family and friends, may also be contributive [28]. Even an ideal initial screening would only have limited impact in reducing the proportion of TB cases in the foreign-born population and particularly among undocumented migrants. Instead of focusing exclusively on screening at arrival, screening must be performed regularly, using language- and culturally appropriate approaches which facilitate participation and access to health services by hard-to-reach migrant groups, such as undocumented migrants.

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