Urban health: Access to health care for vulnerable patients in the context of migration and detention

WOLFF, Hans

Abstract

The research presented is within the context of urban health, and its objectives include: (1) To highlight the efforts made in Geneva in improving access to health care for vulnerable and disadvantaged populations, such as undocumented migrants and detainees; (2) To describe the sociodemographic and epidemiologic profile concerning the main morbidities of these populations; and (3) To outline future developments related to the research, generally concerning access to health care for these vulnerable populations in urban centers. Urban health includes two main aspects. One is the description of the health status of urban populations, and two, an understanding of urban health determinants with the aim to implement those interventions that promote good health. Since 2007 the majority of individuals live in cities, which has a major influence on all spheres of life, especially health. In Europe, the rural/urban transition occurred prior to 1950.1 Urban areas have higher proportions of migrants and other vulnerable populations and concentrate social inequalities. Access to health care for all residents is a fundamental human [...]
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“Urban health: Access to health care for vulnerable patients in the context of migration and detention”

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the University of Geneva

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by

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Dedicated to Walter and Neni

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# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>CTI</td>
<td>Chlamydia Trachomatis Infection</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HiAP</td>
<td>Healthy in All Policies</td>
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<tr>
<td>HUG</td>
<td>Geneva University Hospitals</td>
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<tr>
<td>ICPC</td>
<td>International classification for primary care</td>
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<td>LTBI</td>
<td>Latent tuberculosis infection</td>
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<td>NGO</td>
<td>Non-Government Organizations</td>
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<tr>
<td>Pap test</td>
<td>Cervical Smear (Papanicolaou) tests</td>
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<tr>
<td>PPP</td>
<td>Purchasing power parity</td>
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<tr>
<td>OR</td>
<td>Odds Ratio</td>
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<td>SD</td>
<td>Standard deviation</td>
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<td>STD</td>
<td>Sexually Transmitted Disease</td>
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<tr>
<td>TB</td>
<td>Tuberculosis</td>
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<tr>
<td>Umsco</td>
<td>Unité Mobile de Soins Communautaires</td>
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<tr>
<td>VZV</td>
<td>Varicella zoster virus</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Summary

The research presented is within the context of urban health, and its objectives include: (1) To highlight the efforts made in Geneva in improving access to health care for vulnerable and disadvantaged populations, such as undocumented migrants and detainees; (2) To describe the sociodemographic and epidemiologic profile concerning the main morbidities of these populations; and (3) To outline future developments related to the research, generally concerning access to health care for these vulnerable populations in urban centers.

Urban health includes two main aspects. One is the description of the health status of urban populations, and two, an understanding of urban health determinants with the aim to implement those interventions that promote good health. Since 2007 the majority of individuals live in cities, which has a major influence on all spheres of life, especially health. In Europe, the rural/urban transition occurred prior to 1950.1 Urban areas have higher proportions of migrants and other vulnerable populations and concentrate social inequalities. Access to health care for all residents is a fundamental human right. Its realization for vulnerable populations helps to increase social justice thereby serving not only the vulnerable but the entire community.

Switzerland’s cities have a substantial number of undocumented migrants, i.e., migrants without a legal residency permit. In the beginning of the 1990’s they had no structured access to health care. In 1996 the creation of the “Unité Mobile de Soins Communautaires (UMSCO)”, a mobile health care unit attached to the Division of Primary Care of the Geneva University Hospitals (HUG), markedly improved access to health care for undocumented migrants in Geneva. Additionally, this unit improved our epidemiologic knowledge concerning this hard-to-reach and easy-to-miss population. Compared to the urban population with a residency permit, this undocumented population was found to have high rates of unintended pregnancy (odds ratio (OR) 8.0), delayed prenatal care (>12 weeks of amenorrhea) (OR 10.8), increased episodes of violence during pregnancy (OR 8.6), and elevated prevalence of chlamydia (5.8%) or chagas disease (*Trypanosoma cruzi* prevalence 12.8%). Undocumented Latin American migrants had a greater than fivefold risk (OR 5.5) of TB-related fibrotic signs on chest X-ray. From the perspective of infectious disease control it is particularly important for the urban community to have structures which are in contact with hard-to-reach populations.
Another vulnerable population treated in Geneva is that group detained in prison. Geneva has ten detention facilities for a total of approximately 800 detainees, as well as Switzerland’s largest pre-trial prison. Detainees are generally of a low socioeconomic status and present with a high rate of most illnesses, characterized by generic primary care problems (57.6%), high rates of illicit drug use (40.2%), and mental health issues (32.6%). Eight percent of detainees report episodes of violence during police arrest.

Organized prison health care helps to improve the respect of fundamental human rights by assuring: (1) Access to health care for all detainees; (2) Equivalence of health care as compared to the general community; (3) Respect for confidentiality and informed consent; and (4) Independence of medical decision-making. Close collaboration and good communication between all partners is required in such a complex structure as a prison. Nevertheless, dual loyalty conflicts are frequent when the role of each partner is not clarified or respected.

Health care for disadvantaged urban populations helps to identify weaknesses in the social security system. Societies where vulnerable populations lack fundamental human rights, such as access to health care or respect for confidentiality, may also neglect these rights for other groups. From this point of view it is important to carefully examine the situation of disadvantaged urban populations.

This epidemiologic research serves as an indicator of the respect for basic human rights of society as a whole, and helps to improve the overall well-being of the population.

Further developments concern research on the efficacy of prevention measures among these populations, and strengthen the training of healthcare professionals as to specific aspects of urban health by stimulating an interdisciplinary approach and permitting contact with disadvantaged populations.
Introduction

"Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care and necessary social services,..."

(Art.25 Universal Declaration of Human Rights, 1948)

Urban health

The world's population continues to grow, accelerating exponentially since the 1950’s. This demographic evolution is mainly due to a decrease in mortality in developing countries and is strongest in Asia and Africa (Figure 1).

Figure 1: Percentage of population living in urban areas

It took 123 years to double the world’s population from one to two billion (1804-1927), but only 32 years to effect an increase from two to four billion (1927-1959). Currently, seven billion
human beings live on planet Earth. Parallel to this exponential increase we have observed a rural/urban shift. Beginning in 2007 the number of people living in urban areas exceeded those living in rural areas (Figure 1). In 2000, 2.9 billion people lived in cities, and in 2030 this will increase to five billion. Population growth is dramatic in developing countries, and the majority of new megacities (>10 million inhabitants) will be in Asia (Table 1). While the population of London increased from 1 to 8 million over the course of 130 years, it took 45, 37 and 25 years in Bangkok, Dhaka and Seoul, respectively. Such rapid evolution leads to a change in social balance, with higher proportions of migrants and vulnerable populations located in urban settings with the frequent occurrence of slums and social inequality.

<table>
<thead>
<tr>
<th>1950 (population, millions)</th>
<th>2025 (population, millions)</th>
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<tr>
<td>1. New York 12.3</td>
<td>1. Tokyo 36.4</td>
</tr>
<tr>
<td>2. Tokyo 11.2</td>
<td>2. Mumbai 26.4</td>
</tr>
<tr>
<td>3. London 8.7</td>
<td>3. Delhi 22.5</td>
</tr>
<tr>
<td>5. Moscow 5.4</td>
<td>5. Mexico City 21.0</td>
</tr>
<tr>
<td>7. Rhine-Rhur (North) 5.2</td>
<td>7. Calcutta 20.6</td>
</tr>
<tr>
<td>8. Buenos Aires 5.1</td>
<td>8. Shanghai 19.4</td>
</tr>
<tr>
<td>9. Chicago 5.0</td>
<td>9. Lagos 15.8</td>
</tr>
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Table 1: World’s top-ten Megacities, 1950 and 2025

In Europe, the rural/urban transition occurred during the 1940’s. At present, 74% of the Swiss population lives in urban areas, as compared to 57% in 1980. Growth in Switzerland between 1999 and 2009 was dominated by suburban municipalities, such as Grand Sàconnex/GE (+37%), Opfikon/ZH (+32%), Gland/VD (+21%) and Versoix/GE (+23%). Among the cities, Lausanne (+9.9%) and Zurich (+9.5%) grew faster than the Swiss average (+8.7%).

Urban settings have a growing influence on all spheres of human life. This reality led to the creation of the Urban Health movement with two main aspects of purpose: (1) The description of the health of urban populations; and (2) An understanding of urban health determinants with the aim to implement health-promoting interventions.
Public Health was forced to adapt to the consequences of the rapid demographic shift towards urban centers. In 1978, the Alma-Ata Declaration highlighted social justice and equality, focusing on “health care for all”. The Ottawa Charter for Health Promotion of 1986 defined those fundamental conditions and resources for health (peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice, and equity) and incorporated primary health care within a broader framework of a “new public health”. It defined health promotion as “the process of enabling people to increase control over, and to improve, their health”. The demographic shift to urban centers motivated the World Health Organization (WHO) in Europe to launch the WHO Healthy Cities movement in 1988. The objective was to promote equity, sustainability, intersectoral cooperation, and solidarity, as declared in 1998 in the Athens declaration: “The vast health inequalities between and within cities and between gender and ethnic groups are not only an affront to human dignity but also a risk to social stability and a brake on economic performance. We pledge our political commitment to reducing the health gap between and within our cities, making health more accessible to all and substantially improving the health of populations at risk.”

Direction of the research

Vulnerable populations, such as undocumented migrants and detainees, are concentrated in urban centers. Their access to quality health care is an essential aspect of urban health. The aims of this research are (1) To highlight the efforts in Geneva to improve access to health care for vulnerable and disadvantaged populations; (2) To describe the sociodemographic and epidemiologic profiles concerning the main morbidities of these populations; and (3) To outline future developments related to research, generally concerning access to health care for these vulnerable populations in urban centers.
Health of undocumented migrants

“It is no measure of health to be well adjusted to a profoundly sick society”

Krishnamurti

Geneva’s mobile health care unit

The “Unité Mobile de Soins Communautaires (UMSCO)”, a mobile health care unit, was launched in 1996 by the University Hospitals of Geneva. The objective was to offer access to health care for vulnerable populations in Geneva, particularly undocumented migrants (defined as migrants without a legally mandatory residency permit). Undocumented migrants generally arrive in Switzerland as tourists, but do not leave the country as tourists are required to do after a maximum stay of three months. The restrictive Swiss immigration policy makes it almost impossible for low-qualified migrants from countries outside the European Union to receive a legal residency permit. Most undocumented migrants are attracted by the working opportunities in urban centers, and this is also the case in Switzerland. Those present in Geneva do not have health insurance and lack access to health care. The mobile health care unit has served not only to satisfy the aims of the healthy cities movement, but has also been an opportunity to improve epidemiologic knowledge about this hard-to-reach and easy-to-miss population.

Sociodemographic characteristics

In 2000, an estimated 8,000 to 12,000 undocumented migrants lived in the canton of Geneva, representing 1.8% to 2.9% of the 440,982 resident population. Most undocumented migrants were female (75%), of Latin American origin (75%) and young (mean age, 30 years). Because of difficult living conditions, separation from their families, frequent exploitation by employers, permanent threat of being caught by the police, and exclusion from the usual health care system, undocumented migrants were considered an increased risk for poor health.

See: “Inégalités sociales et santé: l’expérience de l’Unité mobile de soins communautaires à Genève”
Inégalités sociales et santé : l’expérience de l’Unité mobile de soins communautaires à Genève

Les professionnels de soins sont confrontés à la diversité sociale de leurs patients. Le statut social détermine la morbidité et la mortalité de manière importante. À Genève, l’Unité mobile des soins communautaires (UMSCO) a été créée en 1996 pour faciliter l’accès aux soins des plus démunis. Cet article résume le fonctionnement de l’UMSCO et décrit les caractéristiques sociodémographiques et les problèmes de santé principaux des populations cibles : les sans-papiers et grands précaires. En outre, nous proposons à tout acteur de santé des outils, des connaissances et des attitudes lui permettant de répondre au mieux aux besoins spécifiques des patients précaires.

«Toute personne a droit à un niveau de vie suffisant pour assurer sa santé, son bien-être, et ceux de sa famille...» (Art.23 Déclaration universelle des droits de l’homme, 1948)

INÉGALITÉS SOCIALES ET SANTÉ

Même dans les pays les plus riches, il existe un lien étroit entre le statut social, la morbidité et la mortalité. Plus on se situe en haut de la hiérarchie sociale, plus on jouit d’une longue vie en bonne santé et sans invalidité. Les inégalités sociales et la différence d’espérance de vie entre riches et pauvres s’accentuent de façon inquiétante depuis les années 50. La Suisse n’est pas épargnée par ce phénomène : l’espérance de vie à la naissance est de 44 ans plus élevée dans les professions libérales et scientifiques (classe I) que chez les ouvriers peu ou pas qualifiés (classe VI). Si l’on analyse le lien entre le statut social et l’invalidité, on observe des phénomènes similaires. Ainsi en 1992, on recense 25% d’invalides chez des ouvriers peu ou pas qualifiés à l’âge de 65 ans, mais seulement 2,1% dans les professions libérales et scientifiques.

La proportion de survivants sans invalidité est de 85% pour les architectes, ingénieurs et techniciens, mais seulement de 60% pour les manœuvreurs d’usines et de 57% pour les travailleurs du bâtiment. Donc, non seulement on meurt plus tôt en bas de l’échelle sociale, mais la qualité de vie est aussi moins bonne.

CRÉATION DE L’UMSCO

En 1996, le Département de médecine communautaire a été interpellé par les autorités sanitaires cantonales et des associations caritatives qui s’inquiétaient des difficultés d’accès aux soins pour les personnes les plus défavorisées à Genève. L’Unité mobile de soins communautaires, ci-après nommée «UMSCO» a été créée pour favoriser l’accès aux soins des populations défavorisées de Genève.

MISSION DE L’UMSCO

L’action de cette unité s’inscrit dans la Convention des droits de l’homme et
se base sur l’article 12 de la Constitution suisse qui garantit à chaque personne en détresse le droit fondamental à des conditions minimales d’existence.

La mission englobe les tâches suivantes: 1) faciliter l’accès aux soins pour les personnes en situation précaire; 2) coordonner les actions de soins et favoriser l’intégration dans les réseaux de soins et sociaux existants; 3) former les soignants et autres membres du réseau de précarité et 4) mener des recherches sur des sujets liés à la précarité.

**FONCTIONNEMENT DE L’UMSCO**

L’UMSCO est composée d’une équipe multidisciplinaire et marquée par les spécificités suivantes:

- concept de l’accès aux soins de type «bas-seuil»: adaptation du niveau d’accès à un niveau suffisamment bas pour atteindre les populations cibles (accès facile, gratuit ou faible prix des soins, délais d’attente raisonnables);
- travail interdisciplinaire entre infirmières, médecins et travailleurs sociaux et collaboration étroite avec le réseau de précarité à Genève;
- concept de gate-keeping: infirmier et médical;
- prévention concernant les problèmes les plus prévalents et/ou pour lesquels existe une demande de la part des bénéficiaires;
- adaptation continue des activités aux réalités et besoins;
- efficacité dans l’utilisation des ressources à disposition.

**Trois niveaux d’accès aux soins**

Le lien entre soignant et soigné est la base de toute action thérapeutique.

Ainsi, trois différents niveaux d’accès aux soins ont été établis:

- le *seuil le plus bas* a pour but d’atteindre les personnes fréquentant les lieux d’accueil. Pour cela, les infirmières y assurent des permanences régulières. Une collaboration étroite avec les responsables et les bénévoles des lieux a permis d’instaurer un travail qui s’inscrit dans une continuité et une relation de confiance;
- un *niveau d’accès intermédiaire*: des consultations infirmières avec ou sans rendez-vous sont effectuées au centre de soins. Un médecin y est généralement présent. Le centre est situé à l’extérieur des HUG afin de faciliter l’accès aux soins des personnes précaires qui n’osent souvent pas franchir le seuil de l’hôpital cantonal;

**Concept du gate-keeping**

Le fonctionnement de l’UMSCO est caractérisé par l’application de deux filtres d’accès aux soins (gate-keeping) (figure 1).

La consultation infirmière est ouverte à toute personne. Les infirmières, qui effectuent 6000 consultations/an, «filtrent» l’accès à la consultation médicale: le gate-keeping in-

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**Figure 1. Le parcours du patient et le modèle du gate-keeping de l’UMSCO**

A noter que le patient bénéficie souvent d’un suivi et d’une évaluation multidisciplinaire par l’infirmière, le médecin et l’assistant social. La dimension sociale prend une part importante dans le gate-keeping infirmier et médical.

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**Access aux médicaments et financement**

De multiples partenaires participent au financement de l’UMSCO: des médicaments sont offerts par des firmes pharmaceutiques et l’association des «Pharmacies du Cœur» met à disposition les médicaments non périmés que les patients leur retournent. En plus, les patients eux-mêmes payent fréquemment une partie des soins.

La majeure partie des frais est néanmoins supportée par les HUG, donc le canton de Genève. Le service social de la ville de Genève (SSVG) participe également en mettant à disposition les locaux du centre de soins.
LES POPULATIONS ET LEURS PROBLÈMES DE SANTÉ

On distingue deux populations cibles de l’Umsco : les « grands précaires » et les « sans-papiers ».

La population des « grands précaires » vit en marge de la société et fréquente les différents lieux d’accueil à Genève. Ce sont essentiellement des hommes (80%) entre 20 et 60 ans avec des comorbidités psychiatriques et une forte prévalence d’ethylo-tabagisme. Même s’ils ont un accès théorique aux soins (30% sont des Suisse), ils ne consultent souvent pas, même en présence de graves problèmes de santé. Cette catégorie compte environ 300-400 personnes à Genève.10,11

Les « sans-papiers » sont définis comme les personnes se jouant en Suisse sans permis de séjour régulier et qui ont l’intention d’y rester. Leur nombre est estimé à 8-12 000 à Genève et à 80-100 000 en Suisse.12 Depuis 2002, une directive de l’Office fédéral des assurances sociales oblige les caisses-maladie à accepter toute demande d’affiliation des sans-papiers. Malgré ce droit, moins de 10% des patients détiennent une assurance maladie. Ils sont incapables de payer les primes en raison de leur bas salaire qui se situe en moyenne à 1 200 CHF/mois.10,11 À Genève, les sans-papiers sont essentiellement des femmes (75%) d’origine latino-américaine (75%), travaillant majoritairement dans le secteur de l’économie domestique (80-90%) et y se jouendant en moyenne 2-3 ans avant de retourner dans leur pays. Elles vivent sous forte pression et dans la crainte permanente de la police. Les maladies dont elles souffrent ont, à part une plus grande prévalence des problèmes de dépression, comparables à celles de la population générale (rhumatologiques, digestives, cardiovasculaires et infectieuses). D’importantes sous-utilisations de mesures préventives ou ont pu être constatées : ainsi 87% des grossesses des femmes sans-papiers sont non planifiées et 70% d’entre elles n’utilisent aucune mesure de contraception.13 Seulement 44% des femmes ont effectué un test de dépistage du cancer du col utérin (Papanicolaou) durant les trois dernières années. Ce paramètre, tout comme un taux vaccinal plus bas pour la rubéole, témoignent de la difficulté d’avoir un accès aux soins.9,14

COMPÉTENCES DU PROFESSIONNEL DE SANTÉ

Les professionnels de santé sont de plus en plus en contact avec des personnes vivant dans des situations sociales difficiles, et ce en raison de :

1. L’augmentation des inégalités sociales et de la pauvreté. En Suisse, de nombreuses personnes vivent sous le seuil de pauvreté : en 2003 le taux était de 13% (11,2% en 1992).15,16 La proportion des working poor, soit des personnes qui, malgré un emploi, ne parviennent pas à obtenir un revenu suffisant à les préserver de la pauvreté, était de 7,4% en 2003 (6,4% en 1992).15

Le professionnel de santé et en particulier le médecin de premier recours a un contact annuel avec 77% de la population.18 Ainsi, il est confronté à tout l’éventail des classes sociales et à leurs problèmes de santé. Issus de l’expérience de l’Umsco, les connaissances de base, les outils et attitudes proposés ci-dessous peuvent être utiles à tout acteur de santé.

Connaissances de base
1. Connaître les inégalités sociales et leurs répercussions sur la santé. En s’intéressant au statut social, le soignant est sensibilisé à certaines formes de fragilité face à la santé. Par exemple, dans le domaine du travail, le contrôle que l’individu a sur l’organisation de son travail et le degré de liberté dont il dispose pour organiser son quotidien professionnel sont importants pour sa santé. En effet, ces facteurs augmentent la prévalence des maladies telles que les lombalgies et les maladies cardiovasculaires ainsi que l’absentéisme.5 Les patients qui ont un faible niveau de contrôle sur leur travail ont un risque de souffrir d’une maladie coronarienne 2,4 fois supérieur à celui des personnes avec un haut niveau de contrôle. Le chômage et des conditions de travail instables augmentent le risque d’altération de leur santé et particulièrement de leur santé mentale.19
2. Connaître les acteurs du réseau social : ces connaissances sont indispensables pour situer le patient dans son contexte social et orienter le soignant dans le but d’éviter de perdre l’adhésion du patient et sa confiance en sa santé. Les besoins spécifiques, les problèmes sociaux et les ressources disponibles doivent faire une place importante dans l’action thérapeutique.

Outils
1. Identifier le statut social et juridique du patient : éducation, profession, statut dans l’entreprise, salaire et revenu, mariage, divorcé, charges familiales, couverture médicale, franchise de l’assurance maladie. Une étude récente, effectuée avec des patients souffrant d’une maladie chronique qui ne prenaient pas leur traitement en raison du coût de la médication, révèle que 39% des patients n’en parlaient jamais à leur médecin ou infirmière. Les raisons évoquées étaient : 1) on ne m’a jamais interrogé à ce sujet (63%); 2) 58% pensaient que leur soignant ne pouvait de toute façon rien y changer et 3) 48% étaient trop gênés pour en parler.20 Cette étude relève aussi que les patients étaient reconnaissants si leur soignant se préoccupait de leur situation financière et de leur possibilité de pouvoir acheter des médicaments.
2. Rendre l’action thérapeutique plus efficiente : apprendre à utiliser mieux les moyens à disposition pour obtenir un résultat de qualité. Ainsi, le professionnel peut prescrire des médicaments génériques moins onéreux, utiliser des échantillons gratuits et constituer un réseau de techniciens qui, dans certaines situations, sont d’accord de faire des rabais considérables : prothésistes dentaires, orthésistes, oculistes, etc.

Attitudes
1. Reconnaître l’importance du lien thérapeutique : le lien avec le patient est la condition sine qua non de tout acte théra-
Cela est particulièrement vrai pour les personnes vivant en marge de la société qui ont vécu de multiples situations de rupture éthiques fondamentales de chaque soignant. Le comité d'éthique national a récemment rappelé à tout médecin le devoir de soigner toute personne en détresse en Suisse.  

Pour l'acteur de santé

1. Le lien amélioré avec le patient va aboutir à une plus grande efficience et satisfaction au travail.  
2. Le fait de favoriser l'accès aux soins des plus démunis des plus démunis situations de rupture éthiques fondamentales de chaque soignant.  
3. Le docteur d'éthique national a récemment rappelé à tout médecin le devoir de soigner toute personne en détresse en Suisse.

Pour le système de santé

1. Le système de santé sera mieux utilisé et l'accès aux soins amélioré. Cela permettra d'offrir une médecine de qualité et des soins de base au plus grand nombre de personnes.  
2. Les acteurs de santé travailleront de manière plus efficace, en contribuant à une meilleure distribution des ressources.

3. Les maladies des plus démunis seront détectées à un stade plus précoce, évitant ainsi des complications qui peuvent s'avérer coûteuses en termes humains et financiers.

4. Les services d'urgence seront ainsi déchargés.

CONCLUSION

Les acteurs de santé doivent relever un grand défi en contribuant à couvrir les conséquences néfastes des inégalités sociales sur la santé. L'Umisco est une réponse institutionnelle à ce problème et a sensiblement contribué à améliorer l'accès aux soins des populations défavorisées. Néanmoins, le problème est si vaste que tout acteur du système de santé devait être davantage sensibilisé à l'importance du contexte social de ses patients, et développer des outils et des attitudes l'aidant à mieux répondre aux besoins spécifiques de chaque patient.

Remerciements

Nous remercions les services de la Ville de Genève pour la mise à disposition des locaux du centre de soins ainsi qu'à tous les partenaires du réseau socio-santé à Genève. Nous tenons également à remercier Annie Thiebaut-Nahleh pour la lecture critique d'une partie de ce document et à nos collègues de l'Umisco sans lesquels ce travail ne serait pas possible : Joël Berret, Odile Colombo-Musset, Grégoire Humbert, Martine Locatelli, Edith Métraux et Viviane Rolles-Davidiau.

Implications pratiques

- Le statut social est un des plus puissants facteurs de risque pour la santé et devrait être déterminé pour chaque patient.  
- Tout professionnel de santé devrait acquérir des compétences et des connaissances pour se prémunir contre les problèmes sociaux spécifiques à chaque patient.

- L'Umisco offre un accès aux soins pour toute personne vivant en précarité à Genève, en particulier aux « sans-papiers » et « urgences précaires ». Son fonctionnement est caractérisé par un accès de type bas seuil et un système de gate-keeping sur deux niveaux et comprendre les actions ciblées.

Bibliographie

* à lire
** à lire absolument
Pregnancy, birth and exposure to violence

The majority of undocumented migrants in Geneva were young females, and thus women’s health was of major importance. Pregnancy can be of particular concern for undocumented migrants as it may result in loss of work and income just when these resources are sorely needed to pay for medical care. In 2000, no study existed in Switzerland concerning pregnancy outcomes among undocumented migrants. The international literature was controversial regarding health outcomes of pregnant migrants. Some studies showed that lack of health insurance, illegal status, and low income increased maternal and newborn morbidity. On the other hand, a “healthy migrant effect” had been postulated to explain the lower prevalence of low birth-weight newborns in foreign-born compared to United States (U.S.)-born women.

Our studies permitted us to improve the sociodemographic description of this hard-to-reach population and to provide detailed information regarding health status during pregnancy, birth outcomes, violence exposure, and health behavior of undocumented migrant women living in an urban setting. Furthermore, access to health care was improved by implementing scientific studies. As an example, the Swiss Federal Office of Public Health’s “Migrant Friendly Hospitals” project agreed to finance the studies on women’s health under the condition that the Geneva University Hospitals guaranteed the sustainability of access to health care for undocumented pregnant migrants. This scientific work helped to improve sustainable access to health care for this vulnerable population.

Compared to women with a legal residency permit, undocumented pregnant migrants had more unintended pregnancies (75.2% vs. 20.6%; OR 8.0). International comparisons showed large differences concerning prevalence of unintended pregnancies: 10% to 31% in Great Britain, 16% to 20% in France, and 49% in the U.S. Known factors associated with unintended pregnancies, including delayed prenatal care, not being married, or exposure to violence, were also observed in our studies.

Prenatal care was delayed (first pregnancy visit at week 12.6 vs. 8.0) and preterm births were more frequent in undocumented migrants (9% vs. 4%). Nevertheless, health outcomes such as complications during pregnancy, delivery, and post-partum were similar in both groups, and neonatal outcomes even tended to be slightly better in the undocumented. These relatively
good health outcomes might be explained by a selection of the fittest women during migration, which has been conceptualized under the “healthy migrant effect”. Exposure to violence has frequently been reported, particularly during pregnancy and among women with unintended pregnancies. Undocumented migrants in Geneva reported a high exposure to violence with 11.2% reporting sexual, psychological or physical violence during pregnancy, compared to 1.3% of the women with a residency permit (OR 8.6).

Sexual and reproductive behaviors: risk and prevention

A recent study in 2011 of undocumented migrants showed them to have high sexual and reproductive risk behaviors. Unprotected intercourse, lack of adequate contraception, and a history of multiple sexual partners were frequent among these Latin American single and well-educated undocumented migrants. One-third had not used any method of contraception during their last sexual intercourse and approximately one-half had not used a condom in the past year. Seventy-nine percent of women who delivered, but declared that their pregnancies were unintended, did not use any (48%) or used unreliable (31%) contraceptive measures, and 61% were unaware of emergency contraception (Levonorgestrel) which can prevent pregnancy up to 72 hours after intercourse and can be obtained without a medical prescription in Geneva. Compared to women with a residency permit, undocumented migrants had a greater than 15-fold risk of knowing nothing about emergency contraception. The major difficulties concerning knowledge, access, and use of preventive measures are also illustrated by the underutilization of cervical smear (Pap) tests (OR 5.7) and breast examination (OR 9.6). Pap test underuse corresponded to a lack of lifetime screening in many Latin American countries and underscores the need for language- and culturally-appropriate education.

A major barrier to health care is related to its cost since more than 90% of undocumented migrants in Geneva lack basic health insurance because they cannot afford the premiums. Other barriers experienced by undocumented migrants include fear of deportation, insufficient healthcare-related knowledge, and communication barriers. The results of our studies highlight the need for specific programs delivered to this vulnerable urban population, providing appropriate education on contraception, family planning, and risks of transmission of sexually transmitted diseases.
See: “Health care and illegality: A survey of undocumented pregnant immigrants in Geneva”, \textsuperscript{20} “Pregnant undocumented migrants need access to prevention and pregnancy care”, \textsuperscript{15} and “Sexual and reproductive health behaviors of undocumented migrants in Geneva: a cross sectional study”\textsuperscript{22}
Health care and illegality: a survey of undocumented pregnant immigrants in Geneva

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Abstract

Little is known about the conditions of life and the specific health problems of pregnant, undocumented immigrants. This study describes the socio-demographic characteristics and health problems encountered during pregnancy among uninsured, undocumented immigrants in Geneva, Switzerland. A socio-demographic questionnaire was completed by 134 pregnant and undocumented women (mean age 27.8 years) who attended a free antenatal facility between October 2002 and October 2003. The first control of pregnancy was at a median of 10.5 weeks (range 5–33) of amenorrhea. They were mostly Latino-American (78%), had a median 12 years of education but almost exclusively performed domestic work (91%) after an average residence in Geneva of 18 months. Half of the 62 mothers had left at least one child in their home country. One out of three had never had a cervical smear test and 13% were not immune to rubella. Unintended pregnancies (83%), mostly resulted from lack of contraception (70%). All but one delivery were simple, with a median maternity inpatient stay of 5 days (range 2–10). This population of undocumented pregnant immigrants comprised highly educated, young, Latino-American women living in poor housing conditions and wages below the legal minimum. The study identified the high proportion of unintended pregnancies as a major health issue. Future research should target these issues and programs addressing lack of access to preventive measures. As well as this, the specific needs of this hard-to-reach population, such as contraception advice, rubella vaccination and cervical cancer screening, should be supported.

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Keywords: Undocumented immigrants; Pregnancy; Switzerland; Illegal migrant

Background

Geneva (Switzerland), as most wealthy areas of the world, is a common target of illegal migration. These migrants are “labour migrants” and leave their home country in general because of difficult economic conditions. An estimated 6000–15,000 undocumented persons live and work in the Canton Geneva, representing 1.4–3.5% of the 434,500 resident population (Simoes &
The midwife administered a socio-demographic questionnaire for which the women gave their oral consent. They were informed that the answers were treated anonymously. The questionnaire included 19 questions about: health insurance, nationality, marital status, children, presence of a family member, housing conditions, duration and aim of the stay in Geneva, education, occupation and major difficulties of life. The latter were evaluated by the open question: “which is actually the most important difficulty in your life?” Health problems during pregnancy, contraceptive history, causes of pregnancy, and cervical cancer screening history (Pap test use) were assessed by the midwife. Rubella and toxoplasma gondii immunity status (IgG and IgM) was assessed by blood test. All women presenting to the midwife and the women who delivered before October 2003 were included in the analysis. Data analysis was performed on SPSS for Windows (version 11.0, SPSS Inc, USA).

Standard statistical tests (t-test, \( \chi^2 \)) were used to compare means for continuous variables or proportions for categorical variables. Health events during delivery and the health status of the newborn were compared to the data of the general population of the Woman’s hospital in 2002.

**Methods**

All pregnant undocumented women presenting to a free and anonymous health care facility between October 2002 and October 2003 were systematically oriented towards a midwife providing free pregnancy follow up in collaboration with the Woman’s University Hospital, which is the only public woman’s hospital in the Canton Geneva, Switzerland. This hospital is well known and frequented by about 70% of the general population of Geneva. In general, women with higher socio-economic status and private insurance coverage deliver at private clinics.

The midwife provided the follow-up for normal pregnancies. When medical problems occurred, she referred the women to the woman’s hospital for continuation of care. Women who decided to abort were not oriented to the midwife and not included in the study.

During 1 year (10/2002–10/2003) 134 women were referred to the midwife; none had a valid health insurance for Switzerland at the first visit. Sixty-three women (47%) had already delivered, 22 (16%) did not deliver until October 2003. Four (3%) had a spontaneous abortion. Forty-five (34%) were lost of follow-up for various reasons: 24 announced their departure from Geneva (18% of the total), 21 (16%) acquired a health insurance and chose a private gynaecologist.

The socio-demographic characteristics are shown in Table 1: 78% of the women came from Latin America (Bolivia 20%, Ecuador 19%, Colombia 16% and Brazil 14%, others 9%), Europe 8%, Africa 8%, Asia 5% and North America 1%.

Overall, 92 women (69%) lived with their partner. Forty-one women (30%) lived separated from the father of their future child: 14 singles and one widow (11%) declared having been abandoned by the father of the child to bear at the beginning of pregnancy, 17 (13%) did not give a reason and nine (7%) had their partner living in the home country. Information was missing for three women. Seventy-eight women (59%) had at least one family member in Geneva.

Sixty-two women (46%) had children (Table 2): The reported motive for migration was mainly economic (64%), but also educational to study French (5%),
familial to join a husband or relative (10%) or others (political, tourism) (8%). Eighteen women (13%) did not specify their motive.

More than half of the women (58%) shared a single room, 29% lived in apartments with more than one bedroom and 10% lived alone in a room at their workplace. Education level was high, 44% had a high school degree. Eighty-two women (61%) were employed, mostly (91%) in the domestic sector (child and housekeeping) (Table 3).

To the open question “which is actually the most important difficulty in your life?” 26% answered illegality, 17% housing, 16% to find work, 11% homesickness, 7% declared having no difficulties and 6% answered that the language (French) was their main difficulty. Other points were loneliness, access to health care and cultural difference (17%).

### Table 1
Socio-demographic characteristics of undocumented, pregnant women

<table>
<thead>
<tr>
<th>Undocumented pregnant women (n = 134)</th>
<th>Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>27.4 (17–45)</td>
</tr>
<tr>
<td>Age at arrival in Geneva (years)</td>
<td>25.3 (15–37)</td>
</tr>
<tr>
<td>First control of pregnancy (weeks of amenorrhoea)</td>
<td>10.5 (5–33)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital status</th>
<th>%</th>
<th>(n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>69.4</td>
<td>(93)</td>
</tr>
<tr>
<td>Married</td>
<td>20.9</td>
<td>(28)</td>
</tr>
<tr>
<td>Widowed</td>
<td>3.0</td>
<td>(4)</td>
</tr>
<tr>
<td>Divorced</td>
<td>3.0</td>
<td>(4)</td>
</tr>
<tr>
<td>No information available</td>
<td>3.7</td>
<td>(5)</td>
</tr>
</tbody>
</table>


### Table 2
Number and age of the children of undocumented, pregnant women

<table>
<thead>
<tr>
<th>Undocumented women with children only in Geneva (n = 27)</th>
<th>With children only in the home country (n = 34)</th>
<th>Without children (n = 72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td>Children &lt; 6 years (%)</td>
<td>15*</td>
<td>10*</td>
</tr>
<tr>
<td>Children ≥ 6 years (%)</td>
<td>15*</td>
<td>27*</td>
</tr>
<tr>
<td>Age mean (SD)</td>
<td>28.9 (3.9)*</td>
<td>30.6 (5.1)*</td>
</tr>
<tr>
<td></td>
<td>25.8 (5.2)*</td>
<td></td>
</tr>
</tbody>
</table>

Geneva, Switzerland, October 2002–October 2003. One woman had: 2 children in Geneva (4 and 23 years) and 1 in the home country (25 years).

*p < 0.01.

*Odds ratio 2.7, 95% CI 0.97 ; 7.48, p = 0.055.

### Pregnancy and contraception

Most pregnancies (83%) were unintended, 17% planned. Significant differences between these two groups were: education, presence of their children in Geneva and cervical smear testing. The characteristics are presented in Table 4. Moreover, most (79%) of the women with unintended pregnancies didn’t use contraceptive measures, and this for the following reasons: 26% stopped contraception (run out of pills, side effects, lack of money), 16% believed they were infertile, 14% because of infrequent intercourse. Other reasons noted to explain the absence of contraception were: “didn’t think about it”, “latent wish for pregnancy but planned for later” and “presumed sterility of the partner” (14%).

As shown in Table 4, there was a significant under-utilisation of the cervical smear test (Pap test) in women with unintended compared to women with intended pregnancies. When considering the whole population (n = 134), 59 women (44%) had had a cervical smear test within the last 3 years, forty-one (31%) had never had one in their life, 12 (9%) had had one more than 3 years ago and 19 (14%) did not remember if they ever had such a test. Information is missing for three (2%).

Seventeen women (13%) were not immune to rubella. Seroprevalence of anti-Toxoplasma gondii IgG was 55%, no seroconversion was observed during follow-up.

### Health problems during pregnancy and delivery

During the study, 63 undocumented women (47%) delivered at the Woman’s University Hospital. The median in-patient time was 5 days (range 2–10). Compared to the women with legal residential permit
Table 3
Housing, length of stay, education and occupation of undocumented, pregnant women

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons per room (women living in one-room-apartments)</td>
<td>3</td>
<td>(1–11)</td>
</tr>
<tr>
<td>Change of housing-place/year</td>
<td>1</td>
<td>(0–96)</td>
</tr>
<tr>
<td>Length of stay in Geneva (months)</td>
<td>18</td>
<td>(1–130)</td>
</tr>
<tr>
<td>Years of schooling</td>
<td>12</td>
<td>(2–18)</td>
</tr>
<tr>
<td>Hours of work/week(^a)</td>
<td>27.5</td>
<td>(3–98)</td>
</tr>
<tr>
<td>Salary (CHF/month(^b))</td>
<td>1000</td>
<td>(250–3000)</td>
</tr>
<tr>
<td>Salary/hour (CHF(^c))</td>
<td>10.2</td>
<td>(1.7–28.4)</td>
</tr>
</tbody>
</table>


\(^a\)Of those who work (\(n = 82\)). \(^b\)1 CHF \(\approx\) 0.62€.

Table 4
Characteristics of undocumented women with unintended vs. intended pregnancies

<table>
<thead>
<tr>
<th></th>
<th>Unintended ((n = 107))</th>
<th>Intended ((n = 22))</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean/SD)</td>
<td>27.8/5.7</td>
<td>28.9/5.2</td>
<td>0.39</td>
</tr>
<tr>
<td>Latin American origin (%)</td>
<td>77.6</td>
<td>72.7</td>
<td>0.41</td>
</tr>
<tr>
<td>Married (%)</td>
<td>19.4</td>
<td>33.3</td>
<td>0.16</td>
</tr>
<tr>
<td>Length of stay in months (median)</td>
<td>18</td>
<td>21</td>
<td>0.78</td>
</tr>
<tr>
<td>Main difficulty in life (%)</td>
<td>Illegality (28.1)</td>
<td>Housing (26.3)</td>
<td>0.17</td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of schooling (mean/SD)</td>
<td>11.7/3.1</td>
<td>13.1/2.8</td>
<td>0.07</td>
</tr>
<tr>
<td>(&lt;)12 years of schooling (%)</td>
<td>37.2</td>
<td>10.1</td>
<td>0.03</td>
</tr>
<tr>
<td>No high school degree but (\geq) 12 years of schooling (%)</td>
<td>26.7</td>
<td>66.7</td>
<td>0.049</td>
</tr>
<tr>
<td>High school degree (%)</td>
<td>45.8</td>
<td>68.4</td>
<td>0.07</td>
</tr>
<tr>
<td>Children in Geneva (%)</td>
<td>23.1</td>
<td>47.1</td>
<td>0.046</td>
</tr>
<tr>
<td>Cervical smear testing (&lt;3 years)</td>
<td>41</td>
<td>68.2</td>
<td>0.02</td>
</tr>
<tr>
<td>Cervical smear testing—never in life</td>
<td>32.4</td>
<td>18.2</td>
<td>0.18</td>
</tr>
<tr>
<td>Rubella IgG (%)</td>
<td>84.8</td>
<td>90.5</td>
<td>0.72</td>
</tr>
<tr>
<td>Toxoplasma gondii IgG (%)</td>
<td>53.3</td>
<td>54.5</td>
<td>0.81</td>
</tr>
</tbody>
</table>


delivering at the Hospital, there were no significant differences with respect to sex, birth weight, delivery at term, instrumented delivery and Apgar-score.

Of the 63 parturient women, 36 (57%) had complications during pregnancy: 14 (22%) had vaginal or urinary infection, 11 (17%) late delivery (>40 weeks); three (5%) each had hyperemesis gravidarum or anaemia and two (3%) diabetes. Other complications were: condylomata acuminata, venous varicosis of the legs, lumbar back pain and oligoamnion.

During delivery, 33 women (52%) had complications, which were, except for one (major bleeding), of minor importance: 21 (33%) had fumicolar complication, five (8%) foetal macrosomia, four (6%) meconial liquid, two (3%) atonal haemorrhagic uterus and one (2%) arterial hypertension. All 63 women and their newborn were in good general health when leaving the hospital.

Discussion

This is the first description of the socio-demographic characteristics and health problems during pregnancy of undocumented immigrants in Switzerland.

This population comprised mostly highly qualified, young and Latino-American women. The proportion of Latino-Americans found in the present survey was 78%. The pregnant women were living in poor housing conditions. Their median income was less than the half of the minimal statutory income for Geneva, which is 20 CHF/hour (13 €) and 3300 CHF/month (2085 €) for a full time employee.

These women reported being forced to migrate for economic reasons but did not plan to stay definitely in Switzerland after having achieved their aim (i.e. financing high school for their children, saving money for a
house or as basic capital for a business). Indeed, the median length of stay was only 18 months. Their high educational background also indicates that families may send abroad their brightest members.

Several reasons make the authors believe that this study reached a substantial proportion of pregnant, undocumented women in Geneva: (1) The free medical care unit is well known by this hard-to-reach population. (2) The proportion of Latin-Americans (78%) is similar other sources: by investigation of the origin of undocumented workers, the local trade union found recently 76% Latin Americans in Geneva (SIT, 2003). (3) In order to achieve optimal participation, undocumented women were enrolled in collaboration with the Woman’s University Hospital, which is the only public obstetrical hospital in the Canton Geneva and the only place where uninsured and undocumented women can deliver at low cost. Nevertheless, the study sample may still differ from the whole undocumented population of Geneva, which is by definition unknown. For example, the women who had health insurance before pregnancy could not be identified by the present study. Sixteen percent of the undocumented women were able to take health insurance (about 230 €/month) and therefore be treated by a private gynecologist. In the whole undocumented population of Geneva, the estimations are lower; approximately only 10% may be insured.

Four out of five pregnancies resulting in live births were unintended. As women wanting to abort were excluded, even a higher rate of unintended pregnancies could be expected when considering all pregnancies. The number of voluntary abortions in this population is unknown, but seems to be high. In Lausanne, another Swiss urban center located 60 km away from Geneva, the centre of birth control gives estimates of nine out of 10 pregnancies of undocumented immigrants being unintended and 60% of the pregnancies leading to abortion (Valli, 2003). The present project did not include women who chose to abort. This issue requires a specific research project.

Rates of live births resulting from unintended pregnancy are unknown in the general population of Switzerland, but was estimated to be 16–20% in France (Bajos, Leridon, Goulard, Oustry, & Job-Spira, 2003), and 30–49% in the USA, with important differences between the states (Dietz, Adams, Spitz, Morris, & Johnson, 1998; Dietz, Adams, Spitz, Morris, & Johnson, 1999; Trussell & Vaughan, 1999). The high prevalence of unintended pregnancies (83%) and the absence of contraception in two out of three women highlights an important public health issue. Furthermore sexual abuse may have played an important part, as is frequently reported in the general population with prevalence estimates ranging from 4% to 26% (Castro, Peek-Asa, & Ruiz, 2003; Hedin, Grimstad, Moller, Schei, & Janson, 1999; Martin, Mackie, Kupper, Buescher, & Morocco, 2001). As the undocumented women have a low socio-economic position and are bare of any social or legal protection, the prevalence of sexual, physical and emotional abuse might be even higher in this group.

Even though 57% of the women had health problems during pregnancy, no local population data exist to compare this finding with. The seroprevalence of anti-Toxoplasma gondii IgG was 53.4%, which is similar to the findings for the Swiss general population (46%) (Jacquier, Hohlfeld, Vorkauf, & Zuber, 1995), and also to the situation in Latin America (Zuber & Jacquier, 1995). Only 86% of the undocumented women had IgG Antibodies for rubella virus, compared to 96% in the Swiss women aged 17–45 years in 1991–1992 (Matter, Germann, Bally, & Schopfer, 1997). Bartoloni found similar low seroprevalence of rubella (88%) among a rural population of women in childbearing age in Bolivia (Bartoloni et al., 2002). Seroprevalence is known to vary across countries, with lower rates in Latin America (Cutts, Robertson, Diaz-Ortega, & Samuel, 1997), where congenital rubella syndrome is an under-recognised public health problem (Cutts & Vynnuck, 1999).

This study confirms the under-utilisation of cervical cancer screening in undocumented Latinas: only 44% had a Pap test within the last 3 years, 31% had never had one in their life. Hubbell found self-reported participation in cervical cancer screening in 68% of Latina immigrants compared to US-born Latinas (94%) and Anglos (98%). Predictors of low Pap use were lack of health insurance, marital status (not married), low education, absence of regular source of care and no prior cancer prevention screening (Zambrana, Breen, Fox, & Gutierrez-Mohamed, 1999; Hubbell, Chavez, Mishra, & Valdez, 1996).

The under-utilisation of cervical cancer screening was striking for women with unintended pregnancies. As the Pap use indicates, this group has little contact with health care professionals and does not benefit from preventive measures such as vaccination or health education in concerns of contraception.

The present study indicates that undocumented immigrants lack access to important preventive measures. The main health issues were unintended pregnancies, insufficient rubella immunisation and lack of cervical cancer screening. Future research should target these issues and programs addressing the specific needs of this hard-to-reach population should be supported.

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References


Undocumented migrants lack access to pregnancy care and prevention

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Abstract

Background: Illegal migration is an increasing problem worldwide and the so-called undocumented migrants encounter major problems in access to prevention and health care. The objective of the study was to compare the use of preventive measures and pregnancy care of undocumented pregnant migrants with those of women from the general population of Geneva, Switzerland.

Methods: Prospective cohort study including pregnant undocumented migrants presenting to the University hospital from February 2005 to October 2006. The control group consisted of a systematic sample of pregnant women with legal residency permit wishing to deliver at the same public hospital during the same time period.

Results: 161 undocumented and 233 control women were included in the study. Mean ages were 29.4 y (SD 5.8) and 31.1 y (SD 4.8) (p < 0.02), respectively. 61% of undocumented women (controls 9%) were unaware of emergency contraception (OR 15.7 (8.8:28.2) and 75% of their pregnancies were unintended (controls 21%; OR 8.0 (4.7:13.3)). Undocumented women consulted for an initial pregnancy visit more than 4 weeks later than controls and only 63% had their first visit during the first trimester (controls 96%, p < 0.001); 18% had never or more than 3 years ago a cervical smear test (controls 2%, OR 5.7 (2.0:16.3)). Lifetime exposure to violence was similar in both groups, but undocumented migrants were more exposed during their pregnancy (11% vs 1%, OR 8.6 (2.4:30.6)). Complications during pregnancy, delivery and post-partum were similar in both groups.

Conclusion: Compared to women who are legal residents of Geneva, undocumented migrants have more unintended pregnancies and delayed prenatal care, use fewer preventive measures and are exposed to more violence during pregnancy. Not having a legal residency permit therefore suggests a particular vulnerability for pregnant women. This study underscores the need for better access to prenatal care and routine screening for violence exposure during pregnancy for undocumented migrants. Furthermore, health care systems should provide language- and culturally-appropriate education on contraception, family planning and cervical cancer screening.
Background
An estimated 8,000 to 12,000 undocumented migrants live and work in the canton of Geneva, representing 1.8 to 2.9% of the 440,982 resident population [1,2]. These so-called undocumented migrants live in Geneva without a legally mandatory residence permit. Undocumented migrants arrive in Switzerland in general as tourists but do not leave Switzerland, which ordinary tourists are required to do after a maximum stay of three months. The restrictive Swiss immigration policy makes it almost impossible for low-qualified migrants from countries outside the European Union to receive a legal residency permit. Because of difficult living conditions, separation from their families, frequent exploitation by employers, permanent threat of being caught by the police, and exclusion from the usual health care system, undocumented migrants are at increased risk of poor health. Pregnancy can be of particular concern, as it may imply loss of work and of income just when these resources are sorely needed to pay for medical care.

However, there is a striking scarcity of direct evidence on these issues and study results are controversial. Some [3-5], but not all studies show that lack of health insurance, illegal status, and low income increase maternal and newborn morbidity. On the other hand, a ‘healthy migrant effect’ has been postulated to explain the lower prevalence of low-birthweight newborns in foreign-born compared to US-born women [6]. In a previous study on pregnant, undocumented migrant women in Geneva, we found a high percentage of unintended pregnancies (83%), and a low use of important preventive measures, such as rubella immunisation or cervical cancer screening; however, comparison with the general population was difficult because control group data were not available [7].

The objective of the present study was to describe detailed information about contraception, intendedness of pregnancy, health status and behaviour, violence exposure, and birth outcomes of undocumented migrant women and to compare them to those of women having a legal residence permit.

Methods
Setting
In Switzerland, health care insurance is legally mandatory and every legal resident has to arrange for coverage on their own. However, as the cost of health care insurance is high, more than 90% of Geneva’s undocumented migrants lack such insurance. Since 1996, a health care unit has offered medical care for free or at low cost to undocumented migrants in Geneva, where no similar site for free gynaecological or general health care exists. Over the years undocumented migrants have learned to trust the unit which does not transmit information to the police or other official agencies. The consultations in general medicine of the facility reached 10,000 in 2006 for over 3,000 undocumented migrants. Because of its high visibility for the local undocumented population and of the absence of formal administrative requirements, the unit reached the majority of pregnant, undocumented and uninsured women [8,9].

Study plan and population
Pregnant, undocumented migrants (exposed group)
This prospective cohort study included all pregnant, undocumented women presenting to the health care facility between February 2005 and October 2006 as the exposed group. All pregnant women wishing to deliver were included independently of their stage of pregnancy and systematically referred to a coordinating midwife providing free pregnancy care in collaboration with the women’s University Hospital, which is the only public women’s hospital in Geneva. Some pregnant undocumented women who presented directly to that hospital were also referred to the same midwife. The women’s hospital is well known and frequented by the majority of the female population of Geneva. In 2006, 67% of the 5,892 newborns of Geneva were born in this hospital.

Control group
The control group comprised a systematic sample of women with a legal residency permit who were directed by their gynaecologist to the antenatal consultation at the women’s hospital. They were seen by the same midwife as undocumented migrants. These women were selected during predetermined days between November 2005 and May 2006. On each selected day, every woman who saw the midwife was asked to participate in the study.

Exclusion criteria
Women who were unable to provide informed consent were excluded from the study as well as women who decided to have voluntary termination of pregnancy (TOP). No women met the first criterion but 175 undocumented migrants were excluded because of voluntary TOP.

Questionnaire and blood tests
A socio-demographic questionnaire was completed during a face-to-face interview by a fluently Spanish and French-speaking midwife for both groups. The data were collected during pregnancy follow-up (first to third trimester) for undocumented migrants and during the last trimester for control women. The socio-demographic questionnaire included 31 items concerning health insurance, nationality, children, housing and working conditions, duration and aim of the stay in Geneva, education, occupation, social support, major difficulties in daily living and social support, which was evaluated by: civil sta-
tus, presence of a family member in Geneva, and relation of the father with the child. The health questionnaire concerned contraceptive history, health problems during pregnancy and post-partum as well as intendedness of pregnancy, meaning that pregnancies are begun without planning or intent. Cervical and breast cancer screening histories and substance abuse were also assessed. Prenatal aneuploidy screening, cyto-megalovirus (CMV), venereal disease research laboratory test (VDRL), human immunodeficiency virus (HIV) Hepatitis B, as well as rubella and Toxoplasma gondii immunity status were assessed by blood tests. Information concerning delivery and neonatal outcomes was obtained from medical records.

**Main outcomes and potential confounders**

The main study outcomes were unintendedness of pregnancy, knowledge of the emergency pill, cervical and breast cancer screening, delayed prenatal care, violence exposure during pregnancy and complications during pregnancy, delivery and post-partum. As the main confounding factors we considered age, Latin American origin, civil status, education, duration of residence in Geneva, and having emotional support and/or a family member in Geneva.

**Statistical analysis**

In order to investigate the relationship between legal status and the main outcomes we first used 2 × 2 tables and performed Chi-square and Fisher’s exact tests to compare proportions for categorical variables and unpaired student’s t-tests to compare means for continuous variables. Then we performed the same analyses after stratifying for the potential confounding factors. Finally we used multiple logistic regression analysis adjusting systematically for age and those confounding factors that remained statistically significant (p < 0.05) in the models. Women who left the country before delivery were excluded from analyses concerning complications, delivery and post-partum. All analyses were performed using SPSS for Windows (version 15.0).

**Ethical considerations**

The study was approved by the Geneva University Hospitals Ethics Committee (1.2.2005, no 05058-CD). All participating undocumented migrant and control women were informed that their responses would be treated anonymously and provided written consent.

**Results**

During the 20 month study period, 163 undocumented women wishing to deliver were referred to the midwife. None had valid health insurance at time of their first pregnancy visit. Two-hundred-forty-six women with a regular residency permit were selected to participate in the control group. Two undocumented women (age unknown) and 13 controls (mean age 28.5) refused participation for the following reasons: had no time (n = 6); did not want to participate without giving a reason (n = 4); husband didn’t want (n = 2); didn’t want to reply to questions (n = 2); was afraid (n = 1). Thus, the final study group consisted of 161 undocumente women and 233 women with a legal residency permit.

**Missing data and losses to follow-up**

Socio-demographic data were missing in up to 39 undocumented migrants (24.2%) compared to 3 controls (1.3%) and intentional pregnancy status was missing in 12 undocumented women (7.5%) and in no controls. Knowledge of the emergency contraceptive pill was missing in 40 undocumented migrants (24.8%); otherwise preventive aspects, history of voluntary abortion and of violence, or blood tests were missing in less than 10% of all participants. Delivery, post-partum and neonatal information were missing in 54 undocumented women (33.5%) who left Geneva and were considered as lost to follow-up (controls 3 (1.3%)). When comparing undocumented women who delivered at the women’s hospital to those lost to follow-up no statistical difference was found concerning weeks of pregnancy at first consultation, alcohol, tobacco or drug consumption, depression, social support, violence exposure and knowledge, and use of preventive measures. One woman in each group had a late spontaneous abortion (respective weeks 16 and 17), hence were excluded from the delivery, post-partum, and neonatal outcome analyses.

**Nationality, reasons for migration, civil status, and social support**

The large majority (84%) of undocumented migrants came from Latin America. Reported reasons for migration were mainly economical (84%), but also related to family (7%) (to join a husband or a relative), education (2%, to study French), and 7% for political or tourism reasons.

Fifteen percent of the undocumented pregnant migrants indicated lack of emotional support (controls 0.4%, p < 0.001). Furthermore they reported less social support than controls: 71% were single (controls 21%, p < 0.001); 18% lived separately from the father of their future child (controls 4%, p < 0.001); and 8% had no relationship with the father (controls 0.4%, p < 0.001). Twenty-two percent of the undocumented migrants had no or only an occasional relationship with the father of their child (controls 1.3%, p < 0.001). Forty-three percent of the undocumented women with children lived separately from them (controls 1%, p < 0.001). Moreover, only 47% of undocumented women had a family member living in Geneva (controls 68%, p < 0.001).
Housing, education, and occupation
Sixty percent of undocumented women (controls 18%) shared a single room with on average two (controls one) other persons. Over two-thirds (70%) of the undocumented were employed, mostly (95%) in the domestic sector (childcare and house keeping). They worked a mean of 23.9 hours a week (SD 15.8) and earned 13 SFr (SD 8.4; $8 Euro) per hour, which is 40% lower than the minimal mandatory hourly wage in Geneva.

Main difficulties in life
To the open-ended question "which is actually the most important difficulty in your life?", 46% of the undocumented migrant women answered illegality, 25% housing, 14% finding work, 9% the language (French), 5% absence of the family, and 2% other. The control women reported: housing (22.9%), lack of money (22.9%), to find work (15.7%), and language (7.2%). Other sociodemographic characteristics are summarized in Table 1.

Intendedness of pregnancy and contraception
In undocumented women, unintended pregnancies were significantly more frequent and accounted for 75% compared to 21% in the controls (adjusted OR 8.0 (4.7:13.5)). Sixty-one percent of the undocumented migrants were unaware of emergency contraception (Levonorgestrel) compared to 9% among the control group (adjusted OR 15.7 (8.6:28.2)). Moreover, 79% of the undocumented women with unintended pregnancies did not use any (48%) or used unreliable (31%) contraceptive measures, such as condoms, retraction, or the temperature method. Reasons for absence of contraception among undocumented migrants were: infrequent intercourse (25%), believed that they were infertile (18%), and stopped contraception (run out of pills, side effects, lack of money) (12%). Other less frequent reasons were: “didn’t think about it”, “latent wish of pregnancy but planned for later”, "lack of knowledge about contraceptive methods", and "presumed sterility of the partner". Undocumented migrants declared their pregnancies as

Table 1: Sociodemographic characteristics of undocumented pregnant migrants vs. pregnant women with legal residency status (control group) who delivered at the Geneva University Hospital, Switzerland between February 2005 and October 2006.

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented (n = 161)</th>
<th>Missing n (%)</th>
<th>Control group (n = 233)</th>
<th>Missing n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years (SD)</td>
<td>29.4 (5.8)</td>
<td>-</td>
<td>31.1 (4.8)</td>
<td>-</td>
<td>0.02</td>
</tr>
<tr>
<td>Continent (%)</td>
<td>Latin America 83.9, Asia 6.2, Europe 5.6, Africa 4.3</td>
<td>-</td>
<td>Europe 80.3, Latin America 9.0, Africa 7.3, Asia 1.3, N-Amer. 2.1</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nationalities (%)</td>
<td>Bolivia 34.8, Brazil 23.0, Columbia 8.7, Ecuador 6.2, Peru 5.6, Philippines 3.7</td>
<td>-</td>
<td>Switzerland 49.4, Portugal 13.7, France 9.0, Spain 3.4, Brazil 3.0</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Civil status (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>71.4%</td>
<td>-</td>
<td>20.6%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Married</td>
<td>25.5%</td>
<td>-</td>
<td>72.9%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Divorced</td>
<td>6.8%</td>
<td>-</td>
<td>5.2%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Widowed</td>
<td>1.2%</td>
<td>-</td>
<td>1.3%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of schooling (SD)</td>
<td>12.7 (2.7)</td>
<td>39 (24.2)</td>
<td>13.5 (4.2)</td>
<td>3 (1.3)</td>
<td>0.07</td>
</tr>
<tr>
<td>Highest achieved education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Primary school</td>
<td>3.7%</td>
<td>-</td>
<td>2.2%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Secondary school</td>
<td>31.5%</td>
<td>-</td>
<td>47.4%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High school degree</td>
<td>40.7%</td>
<td>-</td>
<td>15.2%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>University</td>
<td>24.1%</td>
<td>-</td>
<td>35.2%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Years living in Geneva (SD)</td>
<td>2.5 (2.2)</td>
<td>39 (24.2)</td>
<td>16.4 (11.8)</td>
<td>18 (7.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Father not living in Geneva</td>
<td>18.2%</td>
<td>39 (24.2)</td>
<td>4.3%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Having a family member in</td>
<td>46.7%</td>
<td>39 (24.2)</td>
<td>67.7%</td>
<td>1 (0.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Geneva</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Having children</td>
<td>41.8% (of whom 56.9% in Geneva)</td>
<td>39 (24.2)</td>
<td>52.8% (of whom 99% in Geneva)</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Absence of emotional support</td>
<td>15.0%</td>
<td>39 (24.2)</td>
<td>0.4%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Living conditions:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Living in a single-room (%)</td>
<td>62.5%</td>
<td>39 (24.2)</td>
<td>18.0%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total number of persons</td>
<td>3.1 (SD 1.8)</td>
<td>-</td>
<td>2.3 (SD 0.83)</td>
<td>-</td>
<td>0.01</td>
</tr>
<tr>
<td>living in a single-room (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moves during the last year (SD)</td>
<td>1.5 (1.2)</td>
<td>0.4 (1.2)</td>
<td>-</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Lack of health insurance</td>
<td>100%</td>
<td>-</td>
<td>0%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Insured during pregnancy</td>
<td>25.2%</td>
<td>-</td>
<td>0%</td>
<td>-</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
unintended 73.2% of the time when asked during the first and 78.8% during the second and third trimesters (p = 0.45).

**Preventive measures and violence exposure**

There was significant under-use of preventive measures such as cervical smear (Pap) test and breast examination by undocumented migrants (Tables 2 and 3): they had more than a six-fold higher risk of under-use of Pap-test screening (never or > 3 years ago) (adjusted OR 5.7 (2.0:16.5) and a ten-fold higher risk of never having had a breast examination by a physician (adjusted OR 9.6: CI:4.5:20.5). When considering alcohol, tobacco, and other substance abuse, undocumented migrants showed a healthier pattern compared to the control group. Lifetime exposure to violence was similar in both groups, but undocumented migrants were more exposed during their pregnancy (11% vs 1%, adjusted OR 8.6 (2.4:30.6)).

**Pregnancy characteristics**

Undocumented migrants had an 11-fold higher risk for delayed prenatal care, meaning that their first pregnancy consultation occurred after the first trimester (adjusted OR 10.8 (CI 4.8:24.2)). Significant differences were also observed for Toxoplasma gondii and CMV immunity (Table 4).

**Health problems at birth and complications**

During the study period 106 undocumented women (66%) delivered at the women's hospital. Fifty four women left Geneva and one had an early abortion (week 16). Mean gestational age was lower in undocumented migrants and preterm births seemed to occur more frequently but lacked statistical significance (p = 0.09). Birth weight was similar in both groups. No significant differences between the exposed and control groups were found for complications during pregnancy, delivery, or post-partum. The main complications during pregnancy among undocumented migrants (controls) were: urinary infection 12% (11%), anaemia 8% (3%), risk of preterm delivery 7% (7%), vaginal bleeding 3% (4%), hypertension 3% (4%), and diabetes 2% (1%). Complications during vaginal delivery were similar in both groups; vaginal tear 11% (controls 18%), retention of the placenta 3% (4%), pre-eclampsia 2% (2%), and fever 1% (2%). Other birth outcomes are shown in Table 5.

---

**Table 2: Preventive aspects and voluntary termination of pregnancy (TOP) history of undocumented pregnant migrants vs. pregnant women with legal residency status (control group) who delivered at the Geneva University Hospital, Switzerland between February 2005 and October 2006.**

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented (n = 161)</th>
<th>Missing n (%)</th>
<th>Control group (n = 233)</th>
<th>Missing n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintendedness of pregnancy (%)</td>
<td>75.2 (12.7)</td>
<td>20.6</td>
<td>-</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Of those with unintended pregnancies:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No contraception</td>
<td>47.7%</td>
<td>33.3%</td>
<td>33.3%</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Insecure contraception (condom calendar, retraction)</td>
<td>31.2%</td>
<td>33.3%</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No knowledge of emergency pill</td>
<td>61.2%</td>
<td>40 (24.8)</td>
<td>9.0%</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Previous voluntary termination of pregnancy (TOP)</td>
<td>27.0%</td>
<td>13 (8.1)</td>
<td>24.0%</td>
<td>4 (1.7)</td>
<td>0.51</td>
</tr>
<tr>
<td>Pap-test:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>13.0%</td>
<td>0%</td>
<td>0%</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>&gt; 3 years ago</td>
<td>4.8%</td>
<td>2.1%</td>
<td>1.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never breast examination by physician</td>
<td>29.7</td>
<td>16 (9.9)</td>
<td>3.9%</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Tobacco never</td>
<td>65.5%</td>
<td>13 (8.1)</td>
<td>48.1%</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Alcohol consumption:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before pregnancy</td>
<td>65.0%</td>
<td>16 (9.9)</td>
<td>73.8%</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>During pregnancy</td>
<td>11.7%</td>
<td>16 (9.9)</td>
<td>30.0%</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Binge drinking (&gt; 4 glasses/occasion):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before pregnancy</td>
<td>6.3%</td>
<td>15.5%</td>
<td>0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During pregnancy</td>
<td>4.2%</td>
<td>0.9%</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other substances abuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure to violence:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifetime</td>
<td>26.4%</td>
<td>16 (9.9)</td>
<td>32.2%</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>During pregnancy</td>
<td>11.2%</td>
<td>16 (9.9)</td>
<td>1.3%</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Type of violence, if exposed to violence:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>53.7%</td>
<td>46.0%</td>
<td>46.0%</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Sexual</td>
<td>24.4%</td>
<td>28.6%</td>
<td>28.6%</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Psychological</td>
<td>53.7%</td>
<td>53.9%</td>
<td>53.9%</td>
<td>0.98</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Unadjusted and adjusted relationships of pregnancy care or preventive aspects of undocumented migrants vs. women with legal residency status (control group) who delivered at the Geneva University Hospital, Switzerland between February 2005 and October 2006.

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintended pregnancy</td>
<td>11.7 (7.2-19.0)</td>
<td>8.0 (4.7-13.5)*</td>
</tr>
<tr>
<td>Delayed prenatal care (&gt; 12 weeks of amenorrhea)</td>
<td>13.3 (6.3-27.9)</td>
<td>10.8 (4.8-24.2)*</td>
</tr>
<tr>
<td>Violence during pregnancy</td>
<td>9.6 (2.7-33.5)</td>
<td>8.6 (2.4-30.6)*</td>
</tr>
<tr>
<td>Pap-test never or more than 3 years ago</td>
<td>9.9 (3.7-26.4)</td>
<td>5.7 (2.0-16.5)*</td>
</tr>
<tr>
<td>Never breast examination by physician</td>
<td>10.5 (4.9-22.3)</td>
<td>9.6 (4.5-20.5)*</td>
</tr>
<tr>
<td>No knowledge of emergency pill</td>
<td>15.9 (8.9-28.3)</td>
<td>15.7 (8.8-28.2)*</td>
</tr>
</tbody>
</table>

* adjusted for age
** adjusted for age and civil status

**Discussion**

Compared to women who are legal residents of Geneva, undocumented migrants had more unintended pregnancies, use preventive measures less frequently, delayed prenatal care, and were exposed to more violence during pregnancy.

Delayed use of prenatal care remains problematic among undocumented migrants in Geneva: the first pregnancy visit occurred more than 4 weeks later than for women with a legal residence permit, and prenatal care began during the first trimester in only 63% of the undocumented compared to 96% of controls. Similar difficulties were observed for undocumented migrant pregnant in Colorado, US [10]. The United Nations has indicated that one high priority "Millennium goal" is to improve maternal health throughout the world [11]. Even if the existence of a free health care unit facilitates access to care, there is clearly a need to find ways to improve use of care and particularly early pregnancy care for undocumented women. In our experience, the cost of health care is a major barrier, particularly in countries like Switzerland where each individual has to arrange and pay for their own health insurance and where over 90% of the undocumented migrants lack health insurance. Improved health care access for undocumented migrants requires creative financial solutions, including being free or of minimal charge, but also language competencies of health care providers and administrative staff. Furthermore, protection has to be guaranteed: undocumented migrants would hardly be likely to contact a health care provider if they feared potential notification of their stay to the police and any other subsequent legal sequelae.

Undocumented pregnant migrants in Geneva were mostly young and single Latin-American women of whom an important percentage lacked social and emotional support. They were living in poor housing conditions and one

Table 4: Pregnancy characteristics of undocumented migrants vs. women with legal residency status (control group) who delivered at the Geneva University Hospital, Switzerland between February 2005 and October 2006.

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented (n = 161)</th>
<th>Missing (%)</th>
<th>Control group (n = 233)</th>
<th>Missing (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks of pregnancy at first control (SD)</td>
<td>12.6 (6.1)</td>
<td>9 (5.6)</td>
<td>8.0 (3.1)</td>
<td>-</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Trimester care began</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>63.2%</td>
<td>96.1%</td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>32.2%</td>
<td>3.4%</td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>4.6%</td>
<td>0.4%</td>
<td>&lt; 0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Toxoplasma gondii immunity</td>
<td>31.2%</td>
<td>57.9%</td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Rubella immunity</td>
<td>10.0%</td>
<td>4.7%</td>
<td>&lt; 0.046</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CMV immunity</td>
<td>7.8%</td>
<td>40.8%</td>
<td>49 (21)</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>VDRL positive</td>
<td>1.3%</td>
<td>0.4%</td>
<td>1 (0.4)</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>HIV positive</td>
<td>1 woman</td>
<td>1 woman</td>
<td>5 (2.1)</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>O'Sullivan test positive</td>
<td>7.8%</td>
<td>7.4%</td>
<td>17 (7.3)</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>HBV (Ag Hbs+)</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCV</td>
<td>0.6%</td>
<td>0.4%</td>
<td>1 (0.4)</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Prenatal screening (p.s.):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without p.s.</td>
<td>17.0%</td>
<td>6.2%</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If p.s., double test (1. trimester):</td>
<td>54.6%</td>
<td>85.5%</td>
<td>&lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double test (2. trimester)</td>
<td>14.5%</td>
<td>7.5%</td>
<td>0.028</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amniocentesis</td>
<td>3.3%</td>
<td>9.7%</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5: Birth outcomes and complications of undocumented migrants vs. women with legal residency status (control group) who delivered at the Geneva University Hospital, Switzerland between February 2005 and October 2006

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented births (n = 106)</th>
<th>Missing n (%)</th>
<th>Control group (n = 229)</th>
<th>Missing n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity (SD)</td>
<td>2.3 (1.4)</td>
<td>-</td>
<td>2.4 (1.4)</td>
<td>-</td>
<td>0.97</td>
</tr>
<tr>
<td>Parity (SD)</td>
<td>1.7 (1.0)</td>
<td>-</td>
<td>1.7 (0.9)</td>
<td>-</td>
<td>0.99</td>
</tr>
<tr>
<td>Mean gestational age (SD)</td>
<td>38.9 (1.9)</td>
<td>-</td>
<td>39.4 (1.4)</td>
<td>-</td>
<td>0.02</td>
</tr>
<tr>
<td>Pre-term births (&lt; 37 weeks)</td>
<td>8.5%</td>
<td>-</td>
<td>3.9%</td>
<td>-</td>
<td>0.09</td>
</tr>
<tr>
<td>Post-term births (&gt; 40 weeks)</td>
<td>15.1%</td>
<td>-</td>
<td>21.0%</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Delivery:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal spontaneous</td>
<td>59.8%</td>
<td>-</td>
<td>63.9%</td>
<td>-</td>
<td>0.14</td>
</tr>
<tr>
<td>Forceps</td>
<td>3.7%</td>
<td>-</td>
<td>4.3%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Vacuum</td>
<td>11.2%</td>
<td>-</td>
<td>10.9%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Cesarean</td>
<td>25.2%</td>
<td>-</td>
<td>20.0%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Complications during pregnancy</td>
<td>31.1%</td>
<td>-</td>
<td>33.6%</td>
<td>-</td>
<td>0.70</td>
</tr>
<tr>
<td>Complications during delivery*</td>
<td>26.3%</td>
<td>-</td>
<td>32.8%</td>
<td>-</td>
<td>0.36</td>
</tr>
<tr>
<td>Complications during post partum</td>
<td>3.7%</td>
<td>-</td>
<td>2.2%</td>
<td>-</td>
<td>0.41</td>
</tr>
<tr>
<td>Sex of the child (male)</td>
<td>50.5%</td>
<td>-</td>
<td>54.6%</td>
<td>(0.4)</td>
<td>0.48</td>
</tr>
<tr>
<td>Health of the child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good health</td>
<td>96.2%</td>
<td>-</td>
<td>95.6%</td>
<td>-</td>
<td>0.53</td>
</tr>
<tr>
<td>Born dead</td>
<td>0.9%</td>
<td>-</td>
<td>0.4%</td>
<td>-</td>
<td>0.58</td>
</tr>
<tr>
<td>Transfer to Neonatology for serious health hazard</td>
<td>3 (2.8%)</td>
<td>-</td>
<td>9 (3.3%)</td>
<td>-</td>
<td>0.44</td>
</tr>
<tr>
<td>Birth weight in g (SD)</td>
<td>3293.9 (521)</td>
<td>-</td>
<td>3380.9 (495)</td>
<td>-</td>
<td>0.15</td>
</tr>
<tr>
<td>Low birth weight (&lt; 2500 g)</td>
<td>4.7%</td>
<td>-</td>
<td>2.6%</td>
<td>-</td>
<td>0.24</td>
</tr>
<tr>
<td>AGAR 1 mean (SD)</td>
<td>8.5 (1.4)</td>
<td>-</td>
<td>8.7 (1.3)</td>
<td>(0.4)</td>
<td>0.43</td>
</tr>
<tr>
<td>AGAR 2 mean (SD)</td>
<td>9.7 (0.8)</td>
<td>-</td>
<td>9.7 (0.6)</td>
<td>(0.4)</td>
<td>0.73</td>
</tr>
<tr>
<td>AGAR 3 mean (SD)</td>
<td>9.9 (0.5)</td>
<td>-</td>
<td>9.9 (0.4)</td>
<td>(0.4)</td>
<td>0.86</td>
</tr>
<tr>
<td>Neonatal Complications</td>
<td>2.8%</td>
<td>-</td>
<td>6.6%</td>
<td>-</td>
<td>0.07</td>
</tr>
</tbody>
</table>

* caesarean section excluded

in five of them had no or only an occasional relationship with the father of their child.

Despite our findings that prenatal care was delayed and preterm births were more frequent in undocumented migrants (9% vs. 4%, p = 0.09), health outcomes such as complications during pregnancy, delivery, and post-partum were similar in both groups, and neonatal outcomes even tended to be slightly better in the undocumented. These relatively good health outcomes might be explained by a selection of the fittest women during migration, which has been conceptualized under the "healthy migrant effect" [6,12]. Alternatively, it could be hypothesized that good birth outcomes might be explained by the fact that women who were lost to follow-up might have had worse risks. Nonetheless, when comparing undocumented women who delivered to those who left the country, no particular risk profile could be identified.

Considering drugs and alcohol abuse, undocumented pregnant migrants showed a healthier pattern than control women. Prenatal alcohol exposure is a major cause of foetal defects and neurodevelopmental problems and the most frequent cause of avoidable mental retardation [13]. In our population, most women stopped their alcohol intake with the onset of pregnancy. Nevertheless, 30% of the control group and 12% of undocumented migrants consumed alcohol during pregnancy with a notable proportion of binge drinking (16% versus 6%). Healthcare professionals must be aware of this major problem.

Seroprevalences in undocumented women corresponded to their countries of origin, mainly Latin-America. They were better immunized against Toxoplasma gondii and CMV but less so against rubella than controls. Toxoplasma immunity prevalence among controls was 42%, similar to what has been found for the Swiss general population (46%) [14], whereas the Toxoplasma immunity prevalence in Latin-America (67%) is similar to that of the undocumented migrants in this study. Seroprevalence of rubella is known to vary across countries, with lower rates in Latin-America [15,16], where congenital rubella syndrome is an under-recognized public health problem [17].

The high prevalence of unintended pregnancies among undocumented migrants (75%) highlights an important public health issue and confirms our previous study where we found a similar rate among undocumented migrants in Geneva [7]. In contrast, the control group reported only 20% of unintended pregnancies. To our knowledge, this is the first time that unintended pregnan-
cies resulting in live births have been studied for women with a legal residency permit in Switzerland. International comparisons show large differences between and uncertainties within countries, which indicates the complexity of measurement of unintended pregnancies [18,19]: 10 to 31% in Great-Britain [20,21], 16 to 20% in France [22], and up to 55% in Colombia resulting in live births [23]. In the US 49% of all pregnancies are estimated to be unintended [24], of which 33% to 49% result in live births, with large differences between the states [25,26]. Known factors associated with unintendedness [23,27,28], such as delayed prenatal care, not being married, or exposure to violence were also observed in our study.

Exposure to violence has frequently been reported, particularly among women with unintended pregnancies and during pregnancy, as was the case for 11% of the undocumented migrants in our study [23,29]. Consequently, it is important to ask pregnant women systematically and repeatedly about violence exposure [30]. It was unexpected that only 1.3% of the controls reported being exposed to violence during pregnancy, which contrasts with 7% found in a survey conducted 10 years before at the same hospital [31]. The latter study investigated violence prevalence as a major outcome, which could have influenced the women’s responses and explain the higher prevalence.

Seventy-nine percent of the women with unintended pregnancies did not use any (48%) or used unreliable (31%) contraceptive measures, and 61% were unaware of emergency contraception (Levonorgestrel) which can prevent pregnancy up to 72 hours after intercourse and can be obtained without medical prescription in Geneva [32,33]. The important difficulties concerning knowledge, access, and use of preventive measures are also illustrated by the under-utilisation of cervical smear (Pap) tests and breast examination. Pap test under-use corresponds to the well-known lack of lifetime screening in many parts in Latin-America and underlines the need for language- and culturally-appropriate education [34,35].

The relationship between residency permit and the main outcomes might be influenced by age, origin, civil status, education, duration of residence in Geneva, and having emotional support and/or a family member in Geneva. Using multiple logistic regression analysis we found that civil status was an important confounder of the relationship between residency status and three main outcomes: unintendedness of pregnancy, delayed prenatal care, and less use of Pap tests by undocumented migrants. Other potential confounders had no significant influence on the main outcome in our study and were therefore not included in the adjusted analyses.

Our study confirms the close relationship between illegality and poverty. Undocumented migrants earned 13 SFr per hour (∼8 Euro) which is 40% lower than the minimal mandatory hourly wage in Geneva. Furthermore, undocumented migrant status is associated with isolation, stigma, and fear. Further research is needed to better elucidate these complex influences in order to implement effective programmatic solutions for the main problems pointed out here.

The present study has several strengths. First, to the best of our knowledge, that pregnancy characteristics have been studied in undocumented migrants and compared to a local control group is unique in Europe. Second, we prospectively included a relatively large systematic sample from this hard-to-reach population. Third, we investigated for the first time unintended pregnancies resulting in live births for women with a legal residency permit in Switzerland.

Some limitations of the present study include: First, fifty-three undocumented women (33%) left Geneva and were considered as lost to follow-up but their baseline characteristics did not differ from women who delivered at the women’s hospital. Socio-demographic variables were missing for up to 24% of the study participants. On the other hand, except for knowledge of the emergency contraceptive pill, other data on preventive measures, histories of voluntary pregnancy termination and violence, as well as blood tests were missing for less than 10% of the study participants. Second, the sample size limits the power of the study. Third, the time of data collection was not identical for both study groups: first to third trimester for undocumented migrants vs. the last trimester for controls. This difference might be neglectable for the large majority of the questions; nevertheless it might have influenced responses concerning unintendedness of pregnancy. However, when comparing unintendedness by trimester, no significant difference was found for undocumented women. Fourth, potential reporting bias has to be considered, as the study group was not blinded and midwives might have been more probing to detect daily-life difficulties among undocumented migrants. However, the two midwives who administered the questionnaire provided the same quality and frequency of clinical follow-up to undocumented migrants as to insured women with a residency permit and they were trained to administer the questionnaires in a precise and neutral way similarly for both groups. Fifth, undocumented women might not be representative of the total undocumented population of Geneva. However, several aspects do lead us to believe that this study reached a substantial proportion of pregnant, undocumented women in Geneva and is therefore representative of them: 1) The free medical care unit is well known by this hard-to-reach population; 2)
The proportion of Latin-Americans (84%) is similar to that found by other sources; for example, in investigating the origins of undocumented workers, the Geneva trade union recently found 76% were Latin-Americans [36,37]. In order to achieve optimal participation, undocumented women were enrolled in collaboration with the woman's hospital, which is the only public obstetrical hospital in Geneva and the only place where uninsured and undocumented women can deliver at low or no cost. Finally, it might still be possible that the study sample still differs from the whole undocumented population of Geneva, which is unknown by definition and thus not officially enumerated. Although our control group was not a random sample from the general population, it was obtained by systematically sampling all the women with valid residence permits who were seen on selected days at the same hospital by the same midwife during the same time period that the sample of undocumented migrants was obtained.

Conclusion

Compared to women who are legal residents of Geneva, undocumented migrants have more unintended pregnancies and delayed prenatal care, use fewer preventive measures and are exposed to more violence during pregnancy. Not having a legal residency permit therefore suggests a particular vulnerability for pregnant women. This study underscores the need for better access to prenatal care and routine screening for violence exposure during pregnancy for undocumented migrants. Furthermore, health care systems should provide language- and culturally-appropriate education on contraception, family planning and cervical cancer screening.

Abbreviations

CI: 95% confidence interval; CHF: Swiss francs; OR: odds ratio; SD: standard deviation; y: years.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

HW conceived of the study, participated in its design and coordination, performed the statistical analysis, interpretation of the data and drafted the manuscript, MF participated in the study design, coordination, interpretation of the data and gave critical contribution to the manuscript. APL participated in the study design, coordination and interpretation of the data, MCC gave critical contribution to the manuscript, IJM and NA contributed substantially to the acquisition of data, IBD and IMG gave critical contribution to the manuscript and OI participated in the study design and coordination and gave critical contribution to the manuscript. All authors read and approved the final manuscript.

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References


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Sexual and Reproductive Health Behaviors of Undocumented Migrants in Geneva: A Cross Sectional Study

Paul Sebo · Yves Jackson · Dugmar M. Haller · Jean-Michel Gaspoz · Hans Wolff

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Abstract Undocumented migrants face major barriers in accessing prevention and health care. Whereas the association between low socioeconomic status and poor health is well documented only few studies have addressed specific health issues in undocumented migrants. The aim of the present study is to describe sexual and reproductive health behaviors of undocumented migrants in Geneva. This descriptive cross sectional study included consecutive undocumented migrants presenting from November 2007 to February 2008 to a health facility offering free access to health care to this population. Following informed consent, they completed a self administered questionnaire about their socio-demographic profile and sexual and reproductive health behaviors. A total of 384 patients were eligible for the study. 313 (82%) agreed to participate of which 77% (241 patients) completed the survey. Participants were mainly young, Latino-American, single, well-educated and currently working women. They had multiple partners and reported frequently engaging in sexual intercourse. Use of contraceptive methods and strategies of prevention against sexually transmitted infections (STI) were rare. Nearly half of the women had had at least one induced abortion and 40% had had an unplanned pregnancy. One in four participants reported a current or past STI or other genital infection. The results of our study suggest that undocumented migrants engage in frequent and high risk sexual intercourse with insufficient use of contraceptive methods and suboptimal strategies of prevention against STI. Our study underlines the real need for specific sexual and reproductive educational programs targeting this hard to reach population.

Keywords Sexual behavior · Contraception · Sexually transmitted diseases · Illegal migrants

Introduction

Undocumented migrants leave their country above all because of difficult economic conditions, but also to improve the educational future of their children and provide financial support for their families [1, 2]. Geneva hosts between 8,000 and 12,000 undocumented migrants (migrants without legal residency permit) representing 1.8–2.8% of the local population [3]. Economic difficulties in the context of low paying and unsteady jobs, language limitations, separation from family, discrimination and cultural barriers render the immigration process difficult and stressful [2, 4]. Difficult living conditions, exclusion from the health care system due to lack of medical insurance coverage and fear of immigration authorities contribute to an increased risk of poor health in this population [2, 5].

The association between low socioeconomic status and poor health is well documented and several studies have shown that physical and mental health problems are highly prevalent in vulnerable populations, such as asylum seekers, refugees, homeless and detainees [6–13]. Only few studies have addressed specific health issues in undocumented migrants. This is probably due the transient and clandestine nature of this hard-to-reach population. Studies to date suggest a higher risk of mental health problems,
Chlamydia trachomatis infection and latent tuberculosis infection [14–19]. Undocumented women have been shown to lack knowledge in family planning and contraceptive methods, with a higher rate of unintended pregnancies and delayed prenatal care [20–22]. Both their experience in their home country and their present situation with poor access to preventive health care are incriminated in the high rate of premature voluntary termination of pregnancy, unintended pregnancies and delayed prenatal care observed in the receiving country. Studies are conflicting concerning the magnitude of complications during pregnancy, delivery and post-partum [20–22].

Higher prevalence of sexually transmitted infection and unintended pregnancy could be related to high risk sexual behaviors. Yet, this remains a hypothesis as to our knowledge no previous study has described the sexual and reproductive health behaviors of undocumented migrants. As a result, the aim of the present study was to explore and better describe these behaviors in undocumented migrants living in Geneva.

Methods

Study Design and Population

Despite mandatory universal insurance coverage in Switzerland, more than 90% of Geneva’s undocumented migrants remain uninsured [23]. Since 1996, this population can access free or low cost care in Geneva through the “community mobile unit” of Geneva University Hospitals. The unit provides primary care for around 3,000–3,500 undocumented migrants each year.

This descriptive cross sectional study included all consecutive undocumented migrants who presented from November 2007 to February 2008 to the mobile unit and agreed to participate in a related study estimating the prevalence of Chlamydia trachomatis infection in this population [17].

Inclusion criteria were: capacity to provide formal consent and to communicate in French, English, Spanish or Portuguese, age ≥ 18, absence of a legal residency permit, and the absence of treatment for Chlamydia trachomatis infection in the past 3 months.

Procedure

Following informed consent, participants were asked to complete a self administered questionnaire about socio-demographic profile (sex, age, civil status, origin, parity for women, type of household, education, occupation) and sexual and reproductive health behaviors (type and frequency of use of contraceptive methods including condom use, age at first sexual intercourse, frequency of sexual intercourses, number of sexual partners, number of sexual intercourses with sex workers, urogenital complaints, past or current sexually transmitted infections (STI) and other genital infections, induced abortions and unplanned pregnancies). According to other authors, we defined a cut-off of six lifetime sexual partners as high risk exposure. [24–26] Questionnaires were available in French, English, Spanish and Portuguese. The original was written in French, translated and back-translated by a trilingual gynecologist (English, Portuguese, French) and a bilingual primary care physician (Spanish, French) and then pre-tested in all four languages with 20 patients each time. A multilingual investigator was available onsite to provide help in answering the questionnaires.

Statistical Analysis and Ethical Considerations

We performed Chi-square and Fisher’s exact tests to compare proportions of sexual characteristics in men and women for categorical variables, and unpaired student t-tests to compare means for continuous variables. All analyses were performed using Stata version 10 (Stata Corp LP).

All undocumented migrants gave written consent after having received detailed oral and written explanations. The study was approved by the ethics committee of Geneva University Hospitals (protocol number 06-134).

Results

Of 384 patients eligible to participate in the related study on the prevalence of Chlamydia trachomatis infection, 313 (82%) agreed to participate, of which 241 (77%) completed the questionnaire (73.9% women, mean age 32.6, SD 8.0, min 18, max 50).

Lack of time was the most common reason for not completing the questionnaire.

Table 1 summarizes the socio-demographic characteristics of the 241 participants by gender. 91% of undocumented women (vs. 70% of the undocumented men, P < 0.01) came from South and Central America, mainly from Bolivia and Brazil. They were mostly single, and less than 20% lived alone. They had a relatively high level of education and 70% of women (vs. 48% of men, P < 0.01) were currently employed. None of the undocumented migrants has been excluded due to recent treatment for CT infection.

Table 2 presents the sexual and reproductive health behaviors of participants by gender. All but one participant (99.6%) were sexually active and mean age at first sexual intercourse with penetration was slightly higher for women
Table 1: Socio-demographic characteristics by gender of 241 undocumented migrants attending the “community mobile care unit” for undocumented migrants in Geneva, Switzerland

<table>
<thead>
<tr>
<th></th>
<th>Women (N = 178)</th>
<th>Men (N = 63)</th>
<th>P value for the difference between men and women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 and less</td>
<td>27</td>
<td>15.2</td>
<td>15</td>
</tr>
<tr>
<td>25–29</td>
<td>34</td>
<td>19.1</td>
<td>13</td>
</tr>
<tr>
<td>30-34</td>
<td>44</td>
<td>24.7</td>
<td>12</td>
</tr>
<tr>
<td>35-39</td>
<td>34</td>
<td>19.1</td>
<td>9</td>
</tr>
<tr>
<td>40 and more</td>
<td>39</td>
<td>21.9</td>
<td>14</td>
</tr>
<tr>
<td>Civil status^a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>84</td>
<td>47.5</td>
<td>40</td>
</tr>
<tr>
<td>Married</td>
<td>53</td>
<td>29.9</td>
<td>13</td>
</tr>
<tr>
<td>Divorced</td>
<td>19</td>
<td>10.7</td>
<td>4</td>
</tr>
<tr>
<td>Separated</td>
<td>17</td>
<td>9.6</td>
<td>4</td>
</tr>
<tr>
<td>Widow</td>
<td>4</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South and Central America</td>
<td>162</td>
<td>91.0</td>
<td>44</td>
</tr>
<tr>
<td>(78)</td>
<td>(43.8)</td>
<td>(19)</td>
<td>(30.2)</td>
</tr>
<tr>
<td>Brazil</td>
<td>(37)</td>
<td>(20.8)</td>
<td>(14)</td>
</tr>
<tr>
<td>Ecuador</td>
<td>(16)</td>
<td>(9.0)</td>
<td>(3)</td>
</tr>
<tr>
<td>Colombia</td>
<td>(15)</td>
<td>(8.4)</td>
<td>(4)</td>
</tr>
<tr>
<td>Other</td>
<td>(16)</td>
<td>(9.0)</td>
<td>(4)</td>
</tr>
<tr>
<td>Africa</td>
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<td>5.6</td>
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<td>Asia</td>
<td>3</td>
<td>1.7</td>
<td>2</td>
</tr>
<tr>
<td>Europe</td>
<td>3</td>
<td>1.7</td>
<td>3</td>
</tr>
<tr>
<td>Parity^b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>61</td>
<td>35.1</td>
<td>NA</td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>21.3</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>19.0</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>16.1</td>
<td>NA</td>
</tr>
<tr>
<td>4 or more</td>
<td>15</td>
<td>8.6</td>
<td>NA</td>
</tr>
<tr>
<td>Living conditions^c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With family member(s)</td>
<td>23</td>
<td>12.9</td>
<td>3</td>
</tr>
<tr>
<td>With friend(s) or housemate(s)</td>
<td>51</td>
<td>28.7</td>
<td>20</td>
</tr>
<tr>
<td>With spouse or sexual partner(s)</td>
<td>69</td>
<td>38.8</td>
<td>25</td>
</tr>
<tr>
<td>Alone</td>
<td>33</td>
<td>18.5</td>
<td>11</td>
</tr>
<tr>
<td>Other^d</td>
<td>2</td>
<td>1.1</td>
<td>2</td>
</tr>
<tr>
<td>Highest school degree^e</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No degree</td>
<td>15</td>
<td>8.7</td>
<td>3</td>
</tr>
<tr>
<td>Primary school</td>
<td>22</td>
<td>12.7</td>
<td>6</td>
</tr>
<tr>
<td>Primary school and then vocational training</td>
<td>26</td>
<td>15.0</td>
<td>6</td>
</tr>
<tr>
<td>Secondary school</td>
<td>69</td>
<td>39.9</td>
<td>26</td>
</tr>
<tr>
<td>University and equivalent</td>
<td>41</td>
<td>23.7</td>
<td>18</td>
</tr>
<tr>
<td>Professional status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>125</td>
<td>70.2</td>
<td>30</td>
</tr>
<tr>
<td>Unemployed</td>
<td>20</td>
<td>11.2</td>
<td>14</td>
</tr>
<tr>
<td>Housewife</td>
<td>10</td>
<td>5.6</td>
<td>1</td>
</tr>
<tr>
<td>Student or professional training</td>
<td>6</td>
<td>3.4</td>
<td>3</td>
</tr>
<tr>
<td>None of the above</td>
<td>17</td>
<td>9.6</td>
<td>15</td>
</tr>
</tbody>
</table>

^a Missing data for one woman and two men
^b Missing data for four women
^c Missing data for two men
^d One man lived with family member(s) and friend(s), and three persons (two women and one man) with friend(s) and spouse or sexual partner(s)
^e Missing data for five women and four men

NA non applicable
Table 2  Sexual and reproductive health characteristics by gender of 241 undocumented migrants attending the “community mobile care unit” for undocumented migrants in Geneva, Switzerland

<table>
<thead>
<tr>
<th>Type of contraception during last sexual intercourse with penetration(^{ab})</th>
<th>Women ((N = 178))</th>
<th>Men ((N = 63))</th>
<th>(P) value for the difference between men and women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male condom</td>
<td>37</td>
<td>21.1</td>
<td>24</td>
</tr>
<tr>
<td>Pill</td>
<td>33</td>
<td>18.9</td>
<td>10</td>
</tr>
<tr>
<td>Intra-uterine device</td>
<td>23</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td>Implant</td>
<td>12</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Injectable contraceptive</td>
<td>9</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Other(^d)</td>
<td>14</td>
<td>8.0</td>
<td>2</td>
</tr>
<tr>
<td>No contraception</td>
<td>58</td>
<td>33.1</td>
<td>24</td>
</tr>
<tr>
<td>Condoms’ frequency of use during the last year(^d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>94</td>
<td>54.3</td>
<td>27</td>
</tr>
<tr>
<td>Less than half the time</td>
<td>18</td>
<td>10.4</td>
<td>8</td>
</tr>
<tr>
<td>Half the time</td>
<td>25</td>
<td>14.5</td>
<td>14</td>
</tr>
<tr>
<td>Every time</td>
<td>36</td>
<td>20.8</td>
<td>11</td>
</tr>
<tr>
<td>Age of the first sexual intercourse with penetration(^d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 and younger</td>
<td>2</td>
<td>1.1</td>
<td>8</td>
</tr>
<tr>
<td>14–15</td>
<td>28</td>
<td>15.8</td>
<td>17</td>
</tr>
<tr>
<td>16–17</td>
<td>48</td>
<td>27.1</td>
<td>18</td>
</tr>
<tr>
<td>18–19</td>
<td>45</td>
<td>25.4</td>
<td>12</td>
</tr>
<tr>
<td>20–21</td>
<td>27</td>
<td>15.3</td>
<td>2</td>
</tr>
<tr>
<td>22 and older</td>
<td>27</td>
<td>15.3</td>
<td>5</td>
</tr>
<tr>
<td>Frequency of sexual intercourse with penetration(^f)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1×/month</td>
<td>34</td>
<td>19.5</td>
<td>15</td>
</tr>
<tr>
<td>1×/month</td>
<td>24</td>
<td>13.8</td>
<td>9</td>
</tr>
<tr>
<td>1×/week</td>
<td>43</td>
<td>24.7</td>
<td>13</td>
</tr>
<tr>
<td>&gt;1×/week</td>
<td>73</td>
<td>42.0</td>
<td>25</td>
</tr>
<tr>
<td>Number of sexual partners during lifetime(^d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>45</td>
<td>25.7</td>
<td>9</td>
</tr>
<tr>
<td>2–5</td>
<td>102</td>
<td>58.3</td>
<td>22</td>
</tr>
<tr>
<td>6 or more</td>
<td>27</td>
<td>15.4</td>
<td>30</td>
</tr>
<tr>
<td>Number of sexual partners in the last year(^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>13</td>
<td>7.5</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>125</td>
<td>71.8</td>
<td>40</td>
</tr>
<tr>
<td>2 or more</td>
<td>36</td>
<td>20.7</td>
<td>17</td>
</tr>
<tr>
<td>Number of new sexual partners in the last 3 months(^c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>134</td>
<td>76.1</td>
<td>43</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>22.7</td>
<td>14</td>
</tr>
<tr>
<td>2 or more</td>
<td>2</td>
<td>1.1</td>
<td>5</td>
</tr>
<tr>
<td>Number of sexual intercourse with penetration with a sex worker during lifetime(^d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>169</td>
<td>96.0</td>
<td>44</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>3.4</td>
<td>9</td>
</tr>
<tr>
<td>2 or more</td>
<td>1</td>
<td>0.6</td>
<td>8</td>
</tr>
<tr>
<td>Uro-genital complaints in the last week(^k)(^x)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Abdominal pain</td>
<td>62</td>
<td>35.2</td>
<td>4</td>
</tr>
<tr>
<td>Pollakiuria</td>
<td>34</td>
<td>19.3</td>
<td>10</td>
</tr>
<tr>
<td>Unusual vaginal discharge</td>
<td>40</td>
<td>22.7</td>
<td>NA</td>
</tr>
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</table>
Table 2 continued

<table>
<thead>
<tr>
<th></th>
<th>Women (N = 178)</th>
<th>Men (N = 63)</th>
<th>P value for the difference between men and women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Algueria</td>
<td>31</td>
<td>17.6</td>
<td>7</td>
</tr>
<tr>
<td>Unusual pain during the last menstrual period</td>
<td>24</td>
<td>13.6</td>
<td>NA</td>
</tr>
<tr>
<td>Pain or bleeding during or after intercourse</td>
<td>21</td>
<td>11.9</td>
<td>NA</td>
</tr>
<tr>
<td>Discharge from penis</td>
<td>NA</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>No complaints</td>
<td>61</td>
<td>34.7</td>
<td>44</td>
</tr>
<tr>
<td>Past or current sexually transmitted infection(s)(^a)</td>
<td>46</td>
<td>26.3</td>
<td>6</td>
</tr>
<tr>
<td>Yes</td>
<td>88</td>
<td>50.3</td>
<td>38</td>
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<tr>
<td>No</td>
<td>41</td>
<td>23.4</td>
<td>18</td>
</tr>
<tr>
<td>Does not know</td>
<td>81</td>
<td>45.8</td>
<td>NA</td>
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<tr>
<td>Previous induced abortion(^b)</td>
<td>70</td>
<td>40.2</td>
<td>NA</td>
</tr>
</tbody>
</table>

\(^a\) Missing data for three women and five men

\(^b\) Taking missing data into account, numbers do not add to 241 because more than one type of contraception or more than one uro-genital complaint possible by undocumented migrant

\(^c\) Other types of contraception: sterilization (n = 7), contraceptive patch (3), vaginal ring (2), calendar (Ogino) (2), emergency pill (1), do not know (1)

\(^d\) Missing data for five women and three men

\(^e\) Missing data for one woman and one man

\(^f\) Missing data for four women and one man

\(^g\) Missing data for three women and two men

\(^h\) Missing data for four women and two men

\(^i\) Missing data for two women and one man

\(^j\) Missing data for two women and two men

\(^k\) Missing data for two women and two men

\(^l\) Missing data for three women and one man

\(^m\) Missing data for one woman

\(^n\) Missing data for four women

than for men (18.6, SD 3.7 vs. 16.4, SD 3.1, P < 0.01). Nearly 40% reported more than one sexual intercourse per week, without significant gender differences. Men generally reported higher sexual risk behaviors than women with nearly half of them having had 6 or more sexual partners in their lifetime (women: 15%, P < 0.01), 8% of men reporting 2 or more sexual partners in the past 3 months (women: 1.1%, P = 0.02), and 28% indicating they had had sex with a sex-worker at least once in their lifetime (women: 4%, P < 0.01). Only 19% of women used the contraceptive pill and nearly 80% of them did not use a condom during the last sexual intercourse. In contrast, 41% of men reported using a condom during the last sexual intercourse with penetration. More than one-third of participants reported not having used any contraceptive method during last sexual intercourse; approximately 50% had not used a condom during the last year and only 20% reported using a condom during each intercourse, without significant gender differences. Finally, nearly 50% of women reported having had at least one induced abortion and 40% reported having had an unplanned pregnancy.

Fifty-two undocumented migrants (women: 26%, men: 10%, P = 0.03) reported one or more current or past STI or other genital infections (cervicitis, endometritis or salpingitis (n = 6), genital herpes (5), genital ulcer (4), Hepatitis B (4), gonococcus (4), HPV (3), condyloma (2), urethritis (2), Hepatitis C (2), dysplasia of the uterine cervix, vulva or vagina (2), Chlamydia (1), other infections (25).

65% of women (men 28%, P < 0.01) reported uro-genital complaints in the last week, mainly lower abdominal pain (35%), unusual vaginal discharge (23%), pollikiuria (19%) and dysuria (18%). Men reported pollikiuria (16%), dysuria (12%) and lower abdominal pain (7%). Only one man reported discharge from the penis.
Discussion

Main Findings and Comparisons with Other Studies

This study highlights the high sexual and reproductive risk behaviors of a population of undocumented migrants. In this population of mainly young, Latino-American, single and well-educated participants, unprotected intercourse, lack of adequate contraception and history of multiple partners were common. One-third had used no contraceptive method during last sexual intercourse and approximately half had not used a condom in the past year.

In view of this it is not surprising that nearly half the women reported having had at least one induced abortion in their lifetime, 40% had had an unplanned pregnancy, 65% reported uro-genital symptoms in the past week and 25% of participants had a current or past STI or other genital infection.

Surprisingly few previous studies provide information on the sexual and reproductive health of undocumented migrants. In a study conducted among female sex workers in Hong Kong, 30% of which were undocumented migrants, condom use with non-commercial partners was similarly low and reports of previous STI were high as in our study [27]. With the exception of two studies on obstetric care, the few other studies that provide information on sexual and reproductive health characteristics of undocumented migrants have all, to our knowledge, been conducted in the same setting as the present study, i.e., the “community mobile unit” of Geneva University Hospitals [18, 20–22, 28].

In a prospective cohort of pregnant women undergoing induced abortion, participants were almost twice as likely not to use any contraception if they were undocumented migrants compared to women with a legal residency permit (23% vs. 15%) [18]. Moreover, 48% of pregnant undocumented women with unintended pregnancies but wishing to deliver did not use any contraception (vs. 33% in a control group consisting of a sample of pregnant women with legal residency permit wishing to deliver) [22]. Our study also confirms the high rate of unintended pregnancies highlighted in two previous studies: 75 and 83% in two samples of undocumented pregnant women wishing to deliver (vs. 21% in the control group) [21, 22]. These results probably also reflect the inappropriate use of contraceptive methods in this population.

The comparison of our findings with those from studies of legal residents in Switzerland further emphasizes the high sexual and reproductive risk behaviors in our sample of undocumented migrants. In a prospective study of contraceptive use among 103 women (mean age: 27, non Swiss: 48%) in Geneva 6 months after termination of pregnancy, 84% used contraception (69% oral contraception), as opposed to 69% (19% oral contraception) 1–3 weeks before termination of pregnancy (compared to 67% who used contraception, of which 19% oral contraception, in our sample of undocumented migrants) [29, 30]. Therefore, in terms of contraceptive use, our population of illegal immigrants was similar to that of legal residents in Switzerland requesting termination of pregnancy.

The rate of induced abortions was clearly higher in undocumented migrants than in the general population: 46% compared to 1–3% for Swiss and foreign legal residents in Switzerland [31–33].

The mean number of lifetime sexual partners (2–5) was similar to that reported by residents in Switzerland in a telephone survey conducted between 1987 and 1994 [34]. Caution is needed when comparing our findings with these old data however, as sexual attitudes and behaviors are likely to have evolved during this period and sexual characteristics may be underreported in telephone surveys [35]. AIDS prevention campaigns in Switzerland may have led to a reduction in the mean number of reported lifetime sexual partners in the overall population since 1994. In a recent study in which 517 young Swiss men undergoing compulsory military recruitment (18–26 years) were asked to complete a questionnaire on sexual behaviors, 13% reported not having ever had a sexual partner vs. 0% in our sample of illegal residents and 60% reported having had two or more partners vs. 85% for men in our study [36].

Condom use was much higher in these Swiss men compared to the men involved in our study (always: 33% vs. 18%, never: 15% vs. 45%). However, comparison is difficult because the study participants were younger than those in our study. In the study conducted by Dubois-Arber et al., condom use in 1994 was also higher with 56% of 17–30 years-old respondents and 42% of 31–45 years-old respondents reporting constant use [34].

Finally, a higher proportion of undocumented migrant men reported having had sex with a sex-worker compared to legal residents (30% compared to 21.5% for men aged 31–45 and 26% compared to 11.5% for men aged 17–30) [37]. On this subject underreporting is likely but the extent to which this may have affected both Jeannin et al.’s tele- phone survey and our own study is unknown. It is of note that in the study by Dubois-Arber et al., only 1–3% reported sex with prostitutes both in 1987 and 1994 [34].

To our knowledge, the current study is the first to identify significant gender differences in the sexual and reproductive behaviors of undocumented migrants. In our sample of 241 participants, undocumented men reported having sex since a younger age than women. They had more sexual partners and were more likely to have sexual intercourse with sex workers, but reported less past or current STI and less uro-genital complaints. In view of the
fact that STI are frequently asymptomatic in men, further research should inform the need for specific STI screening programs in this high risk male population [38]. However, the related study showed Chlamydia infection was more frequent among undocumented males in Geneva than in the general population yet the prevalence of this infection (4%) did not seem high enough to warrant systematic screening [17, 36]. By contrast, there were no significant differences between men and women in relation to the frequency of sexual intercourse.

The results of this study highlight the need to further develop sexual and reproductive preventive services in this population. This is a challenge as this population remains difficult to reach and is not frequently in contact with health professionals.

The cost of health care is a major barrier to reaching this population since more than 90% of undocumented migrants lack health insurance (it is expensive and they have to pay themselves). Another important barrier to accessing this population is the language barrier. Cultural and social factors additionally complicate communication between local health providers and undocumented migrants [39]. The “community mobile unit” in Geneva partially addresses these barriers yet the results of our study highlight the need for specific programs delivered to this vulnerable population, providing language and culturally appropriate education on contraception, family planning and risks of transmission of STI.

Strengths and Limitations of the Study

To our knowledge, this is the first study exploring in detail the sexual and reproductive health behaviors in this hard-to-reach population. Another strength is the prospective and systematic inclusion of a relatively large number of participants. Finally, participation rate was high (nearly 80%) despite the sensitive nature of the topic under study. In addition, there were only few missing data. A self-administered questionnaire was probably the best choice in this situation, in order to promote more truthful responses to sensitive questions as compared to face-to-face interviews [35].

Our study shows also some limitations. First, undocumented migrants participating in our study may not be representative of the total undocumented population in Geneva because of the predominance of Latin American women in our sample and recruitment of participants within a health care facility. The proportion and the age and gender distribution of Latin Americans in our study was however similar to that described in other sources [40]. In addition, the “community mobile unit” is the only point of care for this population in Geneva. Second, our study rests entirely on the answers to a questionnaire, without confirmation by biological measurements (for current or past infections for example), medical records (for induced abortions or unplanned pregnancies for example), physical examination (for some current infections) or proxy respondents (family members, friends, sexual partners). As social bias would tend to favor underreporting of sexual and reproductive risk behaviors, use of this questionnaire may have provided more conservative estimates of the prevalence of risk behaviors in this population. Finally, no control group was included in our study limiting the possibilities of comparing results with that of legal residents in Geneva.

Conclusion

The results of this study highlight the high rates of sexual and reproductive risk behaviors in this population of mainly young, Latino-American, single, well-educated and currently employed women. They underline the need for specific and culturally accepted educational programs targeting this hard-to-reach population.

Acknowledgments This study was supported by institutional grants from the Geneva University Hospitals (R&D fund) and the General directorate of health, Department of economy and health, Geneva Canton.

Conflict of interest statement The authors declare no conflict of interest.

References

Termination of pregnancy

Undocumented migrants who chose to interrupt their pregnancy had difficulty in gaining access to health care. They had their initial contact with a healthcare professional one week later than women with a residency permit (8.0 vs. 6.9 weeks of pregnancy, p <0.001). Compared to women with a residency permit, almost twice as many undocumented women did not use any contraceptive method (OR 1.8), and only half of them used the contraceptive pill during the month of conception (OR 2.1). The reasons given for lack of contraception in undocumented migrants were: infrequent intercourse, 22%; short term contraception interruption (ran out of pills, pill side effects, or lack of money to buy pills), 20%; believed to be infertile, 16%; partner refused to use condoms, 10%; lack of knowledge concerning contraceptive methods, 6%; and not knowing where to get contraceptive devices, 6%. Other reasons noted to explain the absence of contraception were: “I didn’t think about it”, “latent wish of pregnancy but planned for later”, and “presumed sterility of the partner”.

Chlamydia trachomatis infection

Infectious diseases do not respect geographic borders and spread rapidly in densely populated urban centers. Thus, public health professionals and general practitioners (GPs) need to know which infectious diseases accompany these migrants and how these illnesses can be detected and treated.

*Chlamydia trachomatis* is the most frequently diagnosed bacterial sexually transmitted disease (STD) in both men and women in the Western world. *Chlamydia trachomatis* infection (CTI) is frequently asymptomatic, but may have serious sequelae if untreated, such as chronic pelvic pain, ectopic pregnancy, and pelvic inflammatory disease with subsequent risk of infertility.

Surveillance data from Swiss national laboratory reports revealed an increase in the number of diagnosed CTI by approximately 50% between 1999 and 2005. A prevalence study among Swiss gynecologists which included 772 sexually active women found a CTI prevalence of 2.8%. This study revealed a substantial degree of under-reporting by the national laboratory which is the only source of national data on CTI in Switzerland. In Europe, CTI prevalence is estimated at 3.4% in asymptomatic women and 5% to 12% for women undergoing termination of pregnancy. Studies in Latin America, the origin of most undocumented migrants in Geneva, show CTI
prevalence rates of 1.9% to 4.5% in Chile, Peru, Brazil, and Mexico$^{46-48}$ and 12.2% in women attending family planning clinics.$^{47,49}$

Among undocumented migrants in Geneva, genital CTI (5.8%) was found in slightly higher prevalence rates than in western countries or in Latin America.$^{23}$ Among undocumented migrant women undergoing termination of pregnancy CTI prevalence was three times higher (12.8%) than in controls (4.4%, OR 3.2).$^{21}$ The lower use of contraception and the fact that over one-third of women reported to have casual sex without a stable partner may partially explain the high prevalence of CTI (12.8%) in this group.

Chlamydia trachomatis prevalence in undocumented migrants undergoing voluntary termination of pregnancy: a prospective cohort study

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Abstract

**Background:** Chlamydia trachomatis infection (CTI) is the most frequent sexual transmitted disease (STI) in Switzerland but its prevalence in undocumented migrants is unknown. We aimed to compare CTI prevalence among undocumented migrants undergoing termination of pregnancy (ToP) to the prevalence among women with residency permit.

**Methods:** This prospective cohort study included all pregnant, undocumented women presenting from March 2005 to October 2006 to the University hospital for ToP. The control group consisted of a systematic sample of pregnant women with legal residency permit coming to the same hospital during the same time period for ToP.

**Results:** One hundred seventy five undocumented women and 208 women with residency permit (controls) were included in the study. Mean ages were 28.0 y (SD 5.5) and 28.2 y (SD 7.5), respectively (p = 0.77). Undocumented women came primarily from Latin-America (78%). Frequently, they lacked contraception (23%, controls 15%, OR 1.8, 95% CI 1.04:2.9). Thirteen percent of undocumented migrants were found to have CTI (compared to 4.4% of controls; OR 3.2, 95% CI 1.4:7.3).

**Conclusion:** This population of undocumented, pregnant migrants consisted primarily of young, Latino-American women. Compared to control women, undocumented migrants showed higher prevalence rates of genital CTI, which indicates that health professionals should consider systematic screening for STI in this population. There is a need to design programs providing better access to treatment and education and to increase migrants' awareness of the importance of contraception and transmission of STI.
Background
Geneva (Switzerland), as one of the wealthiest areas of the world, is a common target of illegal migration. Most of these undocumented migrants, also called "illegals" or "clandestines", leave their home country because of difficult economic conditions. An estimated 8,000 to 12,000 undocumented migrants, who lack legal residential permit, live and work in the canton of Geneva [1], representing 1.4 to 3.5% of the 434,500 resident population. Because of their difficult living conditions, separation from their families, permanent threat of being caught by the police, and exclusion from the health care system, it is reasonable to believe that undocumented migrants are in poor health. Since undocumented migrants do not have any social protection, unintended pregnancy may place them at risk when associated with loss of work and income. Previous studies of undocumented migrants delivering in Geneva found a high rate of unintended pregnancies (75 to 83%) and inadequate contraceptive use [2,3].

Chlamydia trachomatis infection (CTI) is the principal cause of sexually transmitted infections (STI) in the developed world [4]. CTI is frequently asymptomatic but may have serious sequelae if untreated, such as chronic pelvic pain, ectopic pregnancy, and pelvic inflammatory disease with subsequent risk of infertility.

Surveillance data based on declaration of the Swiss national laboratory reports showed an increase in the number of CTI diagnosed by approximately 50% between 1999 and 2005 [5]. Nevertheless, the precise burden of disease remains unclear. A prevalence study among Swiss gynaecologists including 772 sexually active women found a CTI prevalence of 2.8% [6]. This study revealed an important degree of underreporting by the national laboratory reports, which are the only source of national data on CTI in Switzerland. In Europe, CTI prevalence is estimated at 3.4% in asymptomatic women [7] and 5 to 12% for women undergoing termination of pregnancy (ToP) [7-9]. Studies in Latin America show CTI prevalence rates of 1.9% to 4.5% in Chile, Peru, Brazil, and Mexico [4,10,11] and 12.2% in women attending family planning clinics [4,12].

The aim of the present study is to compare the prevalence of CTI in women with and without legal residency permit undergoing ToP in Geneva, Switzerland.

Methods
Voluntary ToP in Switzerland
In Switzerland, termination of pregnancy up to 12 weeks after onset of amenorrhea is available at women’s request when performed by a trained gynaecologist in an authorised public or private clinic. ToP must be declared anony-

mously to health authorities and medical expenses are covered by general mandatory health insurance.

Health care facility offering free access to health care
Since 1996, a health care facility offers medical care for free or at low cost to undocumented migrants in Geneva. It has no formal administrative requirements and has a high visibility among the local migrant population, reaching the majority of pregnant, undocumented, and uninsured women [13]. The health care facility refers all undocumented women to the Woman’s University Hospital where they can receive free care.

Study plan and population
Undocumented migrants
Between March 2005 and October 2006, this prospective cohort study included all undocumented pregnant women requesting ToP and presenting to the Woman’s University Hospital, which is the only public woman’s hospital in Geneva. In 2003, 74% of the 1,413 ToPs in Geneva were performed in this hospital. All women requesting ToP, including those presenting directly to the hospital, met with two coordinating nurses.

Control group
The control group consisted of a systematic sample of women with legal residency permit and mandatory health insurance undergoing ToP at the Woman’s University Hospital. The undocumented migrants and the control group were assigned to the same nurses. Patient sampling occurred during predetermined days, from November 2005 to May 2006. In each pre-selected day, all women were asked to be included in the study.

Exclusion criteria
We excluded women who could not communicate in French, Spanish, or English. Women attending the free health care facility but not considered to be undocumented migrants (e.g. tourists) were excluded.

Questionnaire and blood tests
Two specially trained nurses speaking all three study languages administered a socio-demographic questionnaire in a face-to-face interview. The questionnaire included 21 questions about age, health insurance, nationality, education, civil status, duration of stay in Geneva, and contraceptive methods. CTI was assessed by polymerase chain reaction (PCR) performed on cervical swabs.

Ethical considerations
All undocumented migrants and controls gave written consent. The study was approved by the ethical research committee of the Geneva University Hospitals (no 05058-CD),

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Main outcomes and potential confounders
The main study outcome was CII. The main potential confounding factors were considered to be age, Latin American origin, civil status, and education.

Statistical analysis
In order to investigate the relationship between legal status and the main outcome, we first used 2 x 2 tables and performed Chi-square and Fisher’s exact tests to compare proportions for categorical variables and unpaired student’s t-tests to compare means for continuous variables. We performed the same analyses after stratifying for potential confounding factors. Finally, we used multiple logistic regression analysis adjusting systematically for age and those confounding factors that remained statistically significant (p < 0.05) in the models. All analyses were performed using SPSS for Windows (version 15.0).

Missing data
Missing data are indicated in the tables. Only those study participants who had relevant complete data were included in the statistical analyses.

Results
During 20 months (from March 2005 to October 2006), 1596 adult women underwent ToP at the Woman’s University Hospital, of which 255 were undocumented migrants. One hundred seventy-five (67%) accepted participation in the study, and 208 (85%) of 244 controls were selected for the study. As illustrated in Figure 1, 80 undocumented women (33% mean age 32.3 years, range 17–47) and 36 controls (15%, mean age 29.4 years, range 18–46) refused participation, mainly because of lack of time.

Socio-demographic characteristics
The socio-demographic characteristics are summarized in Table 1. Age was similar in both study groups (28 years, p = 0.77). Seventy-eight percent of the undocumented women came from Latin America and had lived in Geneva for approximately 4 years. The control group was primarily composed of Europeans (82%). Years of education were similar in both groups (12.3 vs 12.8 years, p = 0.19).

Contraception and ToP
As shown in table 2, undocumented migrants had their first contact with a health professional one week later than controls (6.0 vs. 6.9 weeks of pregnancy, p < 0.001). Insecure contraceptive methods (condoms, withdrawal, calendar) were frequent in both study groups, used by 83.6% of the undocumented migrants and 75.7% of the controls. No difference between the study groups could be observed concerning condom use and withdrawal (coitus interruptus). However, undocumented migrants more frequently used the calendar method (29.9% vs 17%, OR 2.2, 95% CI 1.3;3.8). Furthermore, compared to controls, almost twice as many undocumented women did not use any contraceptive method (OR 1.8, CI:1.0;2.9), and only half of them used the contraceptive pill during the month of conception (OR 2.1, 95% CI 1.1;3.8). Stated reasons for absence of contraception in undocumented migrants were: infrequent intercourse, 22%; short term contraception interruption (running out of pills, pill side effects, or lack of money to buy pills), 20%; belief of being infertile, 16%; partner had refused to use condoms. 10% lacking knowledge on contraceptive methods, 6%; and not knowing where to get contraception, 6%. Other reasons noted to explain the absence of contraception were: ‘I didn’t think about it’, ‘late wish of pregnancy but planned for later’, and ‘presumed sterility of the partner’.

Chlamydia trachomatis infection (CTI)
CTI was three times more frequent in undocumented migrants (12.8%) than in controls (4.4%, crude OR 3.2 (95% CI 1.4;7.1)). The OR adjusted for age was 3.2 (95% CI 1.4;7.3).

Stratification by origin (Latin American vs. not of Latin American origin) showed a similar increase of CTI prevalence among undocumented migrants: 5.8% (95% CI -9.9;21.5) vs.6.7% (95% CI -2.7;16.2).

Discussion
The prevalence of genital CTI in women requesting ToP was threefold higher in undocumented migrants than in women with legal residency permit (OR 3.2 (95% CI 1.4;7.3)). Insecure contraceptive methods (condoms, withdrawal, calendar) were frequent in both study groups. Compared to the control group, undocumented migrants used less hormonal contraception and were twice as likely to not use any contraception. The lesser use of contraception and the fact that over one third of women reported to have occasional partners may partially explain the high prevalence of CTI (12.8%) in this group.

There are no population studies on CTI prevalence in Switzerland. However, data from sentinel populations and laboratory findings have shown an overall prevalence of CTI of 2.8 to 4% [6,14], which corresponds to the findings in our control group (4.4%) and is three times lower than the prevalence found here in undocumented migrants (12.8%). In a recent study conducted in women screened for ToP in Liverpool, the prevalence of CTI was 7.3%, mostly affecting women from 20 to 24 years of age [15]. Studies in Latin America show CTI prevalence rates of 1.9% to 4.5% in Chile, Peru, Brazil, and Mexico [4,10,11] and a rate of 12.2% in women attending family planning clinics [4,12]. A study in Italy offered free screening for STI to female migrant sex workers and found a CTI prevalence of 14% [16]. The highest prevalence rates were
Figure 1
Flow-chart illustrating the selection of undocumented migrants vs. women with legal residency status (control group) who had voluntary termination of pregnancy (ToP) at the Geneva University Hospital, Switzerland between March 2005 and October 2006.
### Table 1: Sociodemographic characteristics of undocumented migrants vs. women with legal residency status (control group) who had voluntary termination of pregnancy (ToP) at the Geneva University Hospitals, Switzerland between March 2005 and October 2006

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented (n = 175)</th>
<th>Missing n (%)</th>
<th>Control group (n = 208)</th>
<th>Missing n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years (SD)</td>
<td>28.0 (5.5)</td>
<td>0</td>
<td>28.2 (7.5)</td>
<td>0</td>
<td>0.77</td>
</tr>
<tr>
<td>Continent of origin (%)</td>
<td>Latin America 78.2, Europe 0.6, Asia 8.0, Africa 13.2</td>
<td>1 (0.6)</td>
<td>Europe 82.0, Lat.-Americas 7.3, Africa 8.7, Asia 1.5, Australia 0.5</td>
<td>2 (1.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nationality (%)</td>
<td>Bolivia 43.3, Brazil 13.7, Equator 9.1, Cameroon 6.3, Mongolia 4.0, Philippines 2.3, Colombia 2.9</td>
<td>1 (0.6)</td>
<td>Switzerland 51.9, Portugal 11.1, France 5.8, Brazil 3.4, Spain 2.9</td>
<td>2 (1.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Civil status:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>69.5%</td>
<td>1 (0.6)</td>
<td>79.9%</td>
<td>6 (2.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Married</td>
<td>17.2%</td>
<td>1 (0.6)</td>
<td>19.8%</td>
<td>6 (2.9)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>12.6%</td>
<td>1 (0.6)</td>
<td>0.5%</td>
<td>6 (2.9)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>0.6%</td>
<td>1 (0.6)</td>
<td>0%</td>
<td>6 (2.9)</td>
<td></td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education years (SD)</td>
<td>12.3 (3.3)</td>
<td>12 (6.9)</td>
<td>12.8 (3.5)</td>
<td>2 (1.0)</td>
<td>0.19</td>
</tr>
<tr>
<td>Highest achieved education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Primary school</td>
<td>5.5%</td>
<td>12 (6.9)</td>
<td>1.5%</td>
<td>2 (1.0)</td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td>40.5%</td>
<td>12 (6.9)</td>
<td>56.3%</td>
<td>2 (1.0)</td>
<td></td>
</tr>
<tr>
<td>High school degree</td>
<td>34.4%</td>
<td>12 (6.9)</td>
<td>24.3%</td>
<td>2 (1.0)</td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>19.6%</td>
<td>12 (6.9)</td>
<td>18.0%</td>
<td>2 (1.0)</td>
<td></td>
</tr>
<tr>
<td>Years living in Geneva (SD)</td>
<td>3.8 (7.4)</td>
<td>4 (2.3)</td>
<td>14.8 (10.6)</td>
<td>3 (1.4)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

### Table 2: Access to care, contraception, chlamydia trachomatis infection, history and type of voluntary pregnancy interruption (ToP) of undocumented pregnant migrants vs. pregnant women with legal residency status (control group) who had ToP at the Geneva University Hospitals, Switzerland between March 2005 and October 2006

<table>
<thead>
<tr>
<th>Characteristic or measurement</th>
<th>Undocumented migrants (n = 172)</th>
<th>Missing n(%)</th>
<th>Control group (n = 208)</th>
<th>Missing n(%)</th>
<th>Mean difference (CI95%) or OR (CI95%)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity (SD)</td>
<td>2.8 (1.6)</td>
<td>1 (0.6)</td>
<td>2.4 (1.4)</td>
<td>6 (2.9)</td>
<td>0.4 (0.1-0.7)**</td>
</tr>
<tr>
<td>Parity (SD)</td>
<td>1.2 (1.2)</td>
<td>0</td>
<td>0.8 (0.9)</td>
<td>0</td>
<td>0.4 (0.2-0.6)**</td>
</tr>
<tr>
<td>Weeks of pregnancy at first contact with a health professional (SD)</td>
<td>8.0 (2.6)</td>
<td>0</td>
<td>6.9 (2.1)</td>
<td>0</td>
<td>1.2 (0.7-1.6)**</td>
</tr>
<tr>
<td>Delayed first contact with a health professional (10+ weeks of amenorrhea)</td>
<td>14.9%</td>
<td>0</td>
<td>5.8%</td>
<td>0</td>
<td>2.9 (1.4-5.8)**</td>
</tr>
<tr>
<td>(&gt;12 weeks of amenorrhea)</td>
<td>4.0%</td>
<td>0</td>
<td>1.4%</td>
<td>0</td>
<td>2.9 (0.7-11.7)**</td>
</tr>
<tr>
<td>Chlamydia trachomatis infection: (CTI)</td>
<td>12.8%</td>
<td>3 (1.7)</td>
<td>4.4%</td>
<td>2 (1.0)</td>
<td>3.2 (1.4-7.3)**</td>
</tr>
<tr>
<td>CTI by type of contraception:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom use</td>
<td>7.0%</td>
<td>3 (1.7)</td>
<td>3.8%</td>
<td>2 (1.0)</td>
<td>1.9 (0.4-9.0)**</td>
</tr>
<tr>
<td>Other means of contraception</td>
<td>15.7%</td>
<td>3 (1.7)</td>
<td>4.8%</td>
<td>2 (1.0)</td>
<td>3.7 (1.4-9.7)**</td>
</tr>
<tr>
<td>Contraception the month of conception:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No contraception</td>
<td>23.4%</td>
<td>0</td>
<td>14.9%</td>
<td>0</td>
<td>1.8 (1.0-4.2)**</td>
</tr>
<tr>
<td>Insecure contraception (of those with contraception)</td>
<td>83.6%</td>
<td>0</td>
<td>75.7%</td>
<td>0</td>
<td>1.6 (0.9-2.9)**</td>
</tr>
<tr>
<td>Condom</td>
<td>42.5%</td>
<td>0</td>
<td>46.3%</td>
<td>0</td>
<td>1.4 (0.9-2.1)**</td>
</tr>
<tr>
<td>Calendar (Ovino)</td>
<td>29.9%</td>
<td>0</td>
<td>17.0%</td>
<td>0</td>
<td>2.2 (1.3-3.8)**</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>11.2%</td>
<td>0</td>
<td>12.4%</td>
<td>0</td>
<td>1.1 (0.6-2.3)**</td>
</tr>
<tr>
<td>Secure contraception (of those with contraception):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pill</td>
<td>12.7%</td>
<td>0</td>
<td>21.5%</td>
<td>0</td>
<td>2.1 (1.1-3.8)**</td>
</tr>
<tr>
<td>Others</td>
<td>3.7%</td>
<td>0</td>
<td>2.8%</td>
<td>0</td>
<td>1.6 (0.4-5.8)**</td>
</tr>
</tbody>
</table>

*Mean difference for continuous data (if value 0 included in CI95% then p > 0.05).
**Age-adjusted OR for categorical data (if value 1 included in CI95% then p > 0.00).
observed in sex workers from Eastern Europe and, although not directly comparable, it suggests that undocumented migrant women in our study may actually be engaging in high risk sexual behaviours, whether on a voluntary basis or not. In any case, the encountered high prevalence rates of CII and the availability of single-dose antibiotic treatment urges health professionals to consider systematic STI screening.

To the best of our knowledge, this is the first time in a Europe, that ToP characteristics were studied in undocumented migrants and compared to a local control group. Another strength of the study is the prospective and systematic inclusion of a relatively large number of this hard-to-reach population.

Limitations of the current study concern the representativeness of our sample from this hard-to-reach population and from the general population of pregnant women. Nevertheless, several aspects lead us to believe that this study reached a substantial proportion of pregnant, undocumented women requesting ToP in Geneva and is therefore representative of them: 1) The free medical care unit is well known by this hard-to-reach population; 2) The proportion of Latin Americans (78%) is similar to that found by other sources: by investigation of the origin of undocumented workers, the Geneva trade union recently found 76% were Latin Americans [17]; 3) In order to achieve optimal participation, undocumented women were enrolled in collaboration with the Woman's University Hospital, which is the only public Women’s hospital in the Canton of Geneva. Finally, it is possible that the study sample still differs from the whole undocumented population of Geneva, which is, by definition, unknown. Although our control group was not a random sample from the general population, it was obtained by systematically sampling all the women with valid residence permits who were seen on selected days at the same hospital by the same nurse during the same time period that the sample of undocumented migrants was obtained.

Conclusion
This population of undocumented, pregnant migrants consisted primarily of young, Latino-American women. Compared to control women, undocumented migrants showed higher prevalence rates of genital CII, which indicates that health professionals should consider systematic STI screening. There is a need for programs providing better access to treatment and education and to increase the migrants’ awareness of the importance of contraception and transmission of STIs.

Abbreviations
CII: chlamydia trachomatis infection; STI: sexually transmitted infection; CI: confidence interval; OR: odds ratio; SD: standard deviation; ToP: voluntary termination of pregnancy.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
HW conceived the study, participated in its design and coordination, performed the statistical analysis, interpretation of the data, and drafted the manuscript. APL and ME participated in the study design, coordination, interpretation of the data, and gave critical contribution to the manuscript. PB participated in the interpretation of the data and gave critical contribution to the manuscript. MJ and NA contributed substantially to the acquisition of data. OI and JMG gave critical contribution to the manuscript and IBD participated in the study design and coordination and gave critical contribution to the manuscript. All authors read and approved the final manuscript.

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Prevalence and Associated Factors for Chlamydia trachomatis Infection Among Undocumented Immigrants in a Primary Care Facility in Geneva, Switzerland: A Cross-Sectional Study

Yves Jackson · Paul Sebo · Gaelle Aebi · Patrick Bovier · Beatrice Ninet · Jacques Schrenzel · Philippe Sudre · Dagmar Haller · Jean-Michel Gaspoz · Hans Wolff

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Abstract Chlamydia trachomatis infection (CTI) is the most frequent sexually transmitted infection in western countries. Its prevalence in undocumented immigrants, a rapidly growing vulnerable population, remains unknown. We aimed to document the prevalence of CTI and associated factors at the primary health care level. This cross-sectional study included all undocumented immigrants attending a health care facility in Geneva, Switzerland. Participants completed a questionnaire and were tested for CTI by PCR assay. Three-hundred thirteen undocumented immigrants (68.4% female, mean age 32.4 (SD 8) years) agreed to participate. CTI prevalence was 5.8% (95% CI 3.3–8.4). Factors associated with higher prevalence were age ≥25 (OR 3.9, 95% CI 1.3–12.2) and having had two or more sexual partners during the precedent year (OR 4.5, 95% CI 1.5–13.7). Prevalence and associated factors for infection in this vulnerable population were comparable with other populations in Western countries. Our findings support the importance of facilitating access to existing screening opportunities in particular to individuals at higher risk.

Keywords Chlamydia trachomatis · Sexually transmitted infection · Undocumented immigrants

Background

Geneva (Switzerland) hosts an estimated 8,000–12,000 undocumented immigrants (immigrants without residency permit), representing 1.8–2.8% of the 434,500 resident population [1]. More generally, undocumented immigrants represent a rapidly growing population in Europe and North America. Most of them left their home country because of poor economic conditions in search of better opportunities in Europe. They usually live in very precarious conditions in Geneva.

Chlamydia trachomatis infection (CTI) is the most frequently diagnosed bacterial agent of sexually transmitted infections in both men and women in the Western world. In the USA, the prevalence in the general population ranges between 1 and 5% [2]. In Switzerland, CTI reporting is mandatory in the general population. Paget et al. [3] found 2.8% prevalence in asymptomatic sexually active women attending private gynaecology and antenatal clinics in 1998 but estimated that the exact burden of this infection remains unknown as an important proportion of CTI is not diagnosed and reported. The number of cases notified countrywide increased from 3,493 in 2003 to 6,178 in 2008 and from 439 to 712 in the canton of Geneva [4].

Most cases of infection remain undiagnosed, thus many individuals remain at risk of developing complications and of infecting others. Risk of infection depends on demography and behaviour. Women under the age of 25,
non-white individuals and people with new or multiple sex partners are considered at increased risk in the US [2]. On the basis of studies showing a significant reduction in poor health outcomes following treatment of positive cases, American and British recommendations favour screening of all asymptomatic sexually active and or pregnant women at increased risk [2-5]. Few studies have assessed the role of socio-economic status or immigration as risk factors for CTI and these factors are not formally recognised as indicators for systematic screening. Undocumented immigrants represent a particularly vulnerable group of population because of financial constraints, poor access to care and more risk for abuse. To the best of our knowledge, only two studies specifically addressed CTI prevalence in undocumented immigrants. Wong et al. [6] found a CTI prevalence of 3.5% in 198 very precarious Latino immigrant day workers in San Francisco. Wolff et al. [7] investigated 175 undocumented pregnant women undergoing early termination of pregnancy in Geneva and found a 13% CTI prevalence. Improving our understanding of disease in vulnerable populations is critical to improving services designed to reduce prevalence.

The aim of this study was to measure the prevalence of CTI and assess factors associated with infection in a sequential sample of undocumented immigrants without health insurance living in Geneva, in order to estimate the need to develop specific CTI screening programs in this population.

Methods

Setting

This cross-sectional study took place in Geneva’s Community Mobile Care Unit. This is a unique health care facility in the region, created in 1996 within the Department of Community Medicine of Geneva University Hospitals. The facility is dedicated to providing easy and affordable access to primary care for uninsured and/or economically deprived adults based on a culturally-sensitive and non-stigmatizing approaches. Around 3,200 immigrants with variable situation regarding residency permit and health insurance attend the facility each year through its walk-in clinic.

Most undocumented immigrants without health insurance attending the clinic are female coming from Latin America and working in the domestic industry. Their average monthly income is less than 800 US dollars, which is around 50% below the poverty threshold in Switzerland [8]. Gynaecological and obstetrical problems are frequent, including an important demand for prenatal care and for voluntary termination of pregnancy [7, 9, 10].

Participants and Procedure

Undocumented immigrants attending the Community Mobile Care Unit from November 2007 to February 2008 were offered the opportunity to participate following informed consent. Participants completed a questionnaire about their socio-demographic profile and sexual behaviour and provided a urine sample. Confidentiality was ensured by asking participants to complete the questionnaire in a separate room. Inclusion criteria were capacity for providing formal consent, age between 18 and 50, no legal residence permit nor health insurance and absence of specific antibiotic treatment for CTI in the last 3 months. Questionnaires were available in French, English, Spanish and Portuguese; a multilingual (French, Spanish, Portuguese) investigator was always available on site to help complete the questionnaire. Questionnaires had been translated by bilingual physicians and pre-tested in all four languages on a total of 20 patients. First-void urine samples were collected at the time the questionnaire was completed, kept refrigerated in the Unit and tested at the Geneva University Hospitals within 15 days. Participants received no incentive for their participation.

Chlamydia Testing

Real-time PCR detection for CTI was performed with the Abbott CT/NG reagents on an m2000 platform (Abbott Molecular Diagnostics, Des Plaines, IL; Marshall and al 2007). This assay is designed to detect the cryptic plasmid of C. trachomatis; the interpretation of the results was made according to the CE (European Conformity) package.

![Flow diagram of study participants (n=453)](image-url)
insert. All specimens that gave positive results were confirmed by a second analysis of the same urine sample. Confirmed positive cases were contacted by phone by the study nurse in order to provide them with treatment by a single dose of azithromycin 1 g orally, after a pregnancy was excluded by a negative urine βHCG test. They were given a similar single-dose treatment for their partner(s), when identifiable.

Statistical Analysis

In order to investigate the relationship between CTI and possible associated factors, we used $2 \times 2$ tables and performed Chi-square and Fisher’s exact tests for categorical variables and unpaired Student’s $t$-tests for continuous variables. Univariate and multivariate logistic regression analysis were used to assess factors associated with CTI. Significant risk factors of univariate analysis ($P > 0.05$) were included in the multivariate model except sex, which was kept in each model. All analyses were performed using SPSS for Windows (version 15.0).

Missing Data

All undocumented immigrants who gave a urine sample were included in the study. CTI prevalence in those who did not reply to the questionnaire was compared to those for whom a complete data set was available.

Ethical Considerations

All undocumented immigrants gave written consent. The study was approved by the ethical research committee of the Geneva University Hospitals.

Results

Of 453 adults assessed for eligibility, 313 (69%) persons were included in the study after providing a urine sample (Fig. 1). The 62 individuals who refused to participate did not differ from participants in terms of age, sex and origin. No significant difference was observed between participants completing the questionnaire or not concerning age in those who completed the questionnaire and in those who didn’t (32.6 (SD 8.0) respectively 31.4 (SD 7.9); $P = 0.24$), and CTI prevalence (6.2% respectively 4.2%; $P = 0.37$).

Socio-Demographic Characteristics

Mean age of the participants was 32.4 years (standard deviation (SD) 8.0, range: 18–50). 68.4% of the subjects were female and 78.3% originated from South and Central America: Bolivia (40.7%), Brazil (21.2%), Ecuador (7.9%), Colombia (7.5%), Chile (2.5%), Paraguay (2.1%), Peru (0.3%), Honduras (0.8%), Nicaragua (0.8%), Argentina and Haiti (0.3% each). 13.1% of participants came from Africa, 4.5% from Asia and 4.1% from Europe. None had a valid health insurance. 52.1% were single, others were married (27.7%), divorced (9.7%), separated (8.8%) or widowed (1.7%). 72% were currently working, mostly in very low-wage jobs and 66.4% had a post obligatory or higher educational level.

Health Related Aspects

Self-rated health status was the following: poor (24.9%), fair (49.2%) and good or very good (25.9%). 32% of the participants had used antibiotics during the last 3 months. At the time of screening, 1.3% of men and 10.9% of women reported urinary tract symptoms, 22.7% of the latter had recently noticed vaginal discharge.

Chlamydia trachomatis Infection (CTI)

CTI was found in 18 of 313 subjects (5.8%, 95% CI 3.2–8.3). Table 1 shows relevant characteristics of study subjects with and without CTI. Significant differences were found concerning age and the number of sexual partner during the year prior to the study. Among those who had CTI, prevalence was higher in women compared to men but this difference was not significant (6.5% vs. 4.0%; $P = 0.27$; Tables 1, 2). Being female, unmarried, of Central and South American origin, low educated and using antibiotics during the last 3 months was not associated with a significantly increased risk of being infected. Multivariate analyses showed that young undocumented immigrants (≤25 versus >25 years) had a 4 times higher risk of CTI (adjusted OR 3.9; 95% CI 1.3–12.2). Individuals who had had 2 or more partners during the last year had a 4–5 times higher risk for CTI (adjusted OR 4.5; 95% CI 1.5–13.7) compared to those with no or one sexual partner.

Clinical Follow-Up

All CTI patients, except one, could be contacted by phone, which frequently necessitated repeated calls. All but one contacted positive cases received treatment for themselves and their partners. No side-effects were reported.

Discussion

This study showed CTI prevalence in undocumented immigrants of 5.8% with higher risk in those younger than
Table 1  Description of study subjects with and without C. trachomatis infection in undocumented immigrants, Geneva, Switzerland

<table>
<thead>
<tr>
<th></th>
<th>Subjects with C. trachomatis Mean (SD) or n (%)</th>
<th>N in analysisa</th>
<th>Subjects without C. trachomatis Mean (SD) or n (%)</th>
<th>N in analysisb</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>25.4 (4.7)</td>
<td>18</td>
<td>32.8 (8.0)</td>
<td>295</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>14 (78%)</td>
<td>18</td>
<td>200 (68%)</td>
<td>295</td>
<td>0.27</td>
</tr>
<tr>
<td>Civil status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmarried</td>
<td>13 (81%)</td>
<td>16</td>
<td>160 (72%)</td>
<td>223</td>
<td>0.31</td>
</tr>
<tr>
<td>Married</td>
<td>3 (19%)</td>
<td>16</td>
<td>63 (28%)</td>
<td>223</td>
<td></td>
</tr>
<tr>
<td>Latin American origin</td>
<td>16 (89%)</td>
<td>18</td>
<td>229 (78%)</td>
<td>295</td>
<td>0.21</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>&lt;Post-obligatory</td>
<td>8 (53%)</td>
<td>15</td>
<td>70 (32%)</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td>Post-obligatory</td>
<td>7 (47%)</td>
<td>15</td>
<td>151 (68%)</td>
<td>221</td>
<td></td>
</tr>
<tr>
<td>Antibiotic ≤3 months</td>
<td>5 (33%)</td>
<td>15</td>
<td>72 (32%)</td>
<td>226</td>
<td>0.96</td>
</tr>
<tr>
<td>Uro-genital complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.11</td>
</tr>
<tr>
<td>Present</td>
<td>8 (73%)</td>
<td>11</td>
<td>87 (49%)</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>3 (27%)</td>
<td>11</td>
<td>92 (51%)</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>Sexual partner(s) in last year (n)</td>
<td>1.1 (0.5)</td>
<td>15</td>
<td>1.5 (0.6)</td>
<td>220</td>
<td>0.017</td>
</tr>
</tbody>
</table>

a  Total number of study subjects with CTI available for subgroup analysis
b  Total number of study subjects without CTI available for subgroup analysis

Table 2  Frequencies of associated factors and unadjusted and adjusted odds ratios (OR) of C. trachomatis infection in undocumented immigrants, Geneva, Switzerland

<table>
<thead>
<tr>
<th></th>
<th>Prevalence of C. trachomatis n (%)</th>
<th>Unadjusted OR for CTI (95% CI)</th>
<th>Adjusted OR for CTI (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25 years (n = 66)</td>
<td>10/66 (15.2%)</td>
<td>5.3 (2.0–14.1)</td>
<td>3.9 (1.3–12.2)</td>
</tr>
<tr>
<td>≥25 years (n = 247)</td>
<td>8/247 (3.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>14/214 (6.5%)</td>
<td>1.7 (0.5–5.2)</td>
<td>2.3 (0.6–9.5)</td>
</tr>
<tr>
<td>Men</td>
<td>4/99 (4.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmarried</td>
<td>13/173 (7.5%)</td>
<td>1.6 (0.4–5.8)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>3/66 (4.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America</td>
<td>16/245 (6.5%)</td>
<td>2.3 (0.5–10.3)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2/68 (2.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-obligatory education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without</td>
<td>8/78 (10.3%)</td>
<td>2.8 (0.9–8.4)</td>
<td></td>
</tr>
<tr>
<td>With</td>
<td>7/158 (4.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic ≤3 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5/77 (6.5%)</td>
<td>1.07 (0.35–3.2)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>10/164 (6.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uro-genital complaints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8/95 (8.4%)</td>
<td>2.8 (0.7–11.0)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3/95 (3.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual partners in last year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2 (n = 53)</td>
<td>8 (15.1%)</td>
<td>4.4 (1.5–12.9)</td>
<td>4.5 (1.5–13.7)</td>
</tr>
<tr>
<td>&lt;2 (n = 182)</td>
<td>7 (3.8%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adjustment for relevant associated factors: age, gender, number of partners the last year
25 years old and/or those who reported having had ≥2 sexual partners the year prior to the study. Prevalence of infection in those presenting one of these risk factors was very high (15%). The prevalence of CTI in our study was slightly higher than previously reported in the general population in Western countries, where prevalences between 1 and 5% were found [2, 3, 5, 11]. In Europe, a report estimated global CTI prevalence of 3.4% in asymptomatic women [12]. Yet, even if populations samples and recruitment locations were not comparable, we believe that our data did not show a clinically significant difference compared to recently published data.

The factors associated with CTI in this study (age <25 years and ≥2 sexual partners in the preceding year) have previously been shown to be associated with CTI prevalence as high as 10% [13, 14]. Studies in different settings have found that having multiple partners increased the risk of infection as compared with having a single partner [13–15]. On the other hand, we found that unmarried subjects did not have an increased risk for CTI, which contradicts previous studies [15]. This difference could be explained by the fact that the majority of undocumented immigrants live separated from their husband/wife, thus potentially narrowing the difference in relation to marital status in terms of CTI risk.

The self-administered questionnaire revealed a rather low perception of self-rated health status and a high frequency of antibiotic use (32%) in the 3 months preceding the study. As antibiotics name and dosage were not defined, it was not possible to assess the exact impact on CTI prevalence. Prevalence in antibiotic users and non users did not, however, differ significantly. This frequent use of antibiotic among immigrants in Geneva has already been described and related to widely practiced self-prescription (usually medicines bought or sent from the country of origin) [16].

Social and demographic factors have been associated with the risk of acquiring CTI. Studies have shown that being non-white and having a lower educational level significantly increased the risk of infection [13, 14, 17, 18]. Still, data on CTI prevalence in economically deprived immigrants are scarce. A study in a mainly Hispanic community in Washington showed prevalence of 5.4%. In Amsterdam, Van den Hoek et al. showed a higher prevalence in female immigrants from Surinam (4.9%) compared to the general population (4.2%) [19, 20]. Several social aspects could explain the increased prevalence found in our cohort of undocumented immigrants. First, this population included mostly young sexually-active females, which were at increased risk for CTI. Secondly, poor access to health care means less CTI detection and screening, thus an increased risk of transmission. Recent studies have shown insufficient knowledge and practice concerning family planning and adequate contraceptive use among undocumented immigrants in Geneva [9, 10].

This study has strength in that it presents original data on CTI prevalence and associated factors in a poorly studied but rapidly growing population in Europe. The high participation rate, despite the sensitive topic, adds value to the reported results. This study showed that research on undocumented immigrants was possible through migrant-friendly health care facilities. Community-based, culturally-sensitive approaches and non-stigmatizing attitudes favoured acceptance and participation in the study. Similar strategies have already been shown to be efficient elsewhere [21].

Limitations of our study included the relatively small sample size and the predominance of Central and South American undocumented immigrants. Our results reflect the situation among a very vulnerable urban population in a Western European country. Considering the social and economical specificities of this population, we cannot generalize our results to the whole resident population. Nevertheless, several aspects led us to believe that this study reached a substantial and representative proportion of undocumented immigrants in Geneva and consequently that our results can be generalized to other urban areas with high number of Latino Americans undocumented immigrants: (1) The Geneva University health care facility for undocumented immigrants is well known and widely used by this hard-to-reach population; (2) The proportion of Central and South American undocumented immigrants (78%) was similar to that found by the Geneva Trade Union that recently found 76% of undocumented workers in Geneva were Latin Americans [22]. Recruitment within a health clinic may have biased our sample towards less healthy individuals, as illustrated by the perceived low level of health reported by participants. Yet, care must be taken when evaluating the overall bad health perception in a mostly Latino American population. This may actually reflect more acculturation and other factors rather than real health conditions as shown in a survey in Los Angeles [23].

Furthermore, we had to deal with a substantial number of missing values which was mainly explained by the 72 unfilled the questionnaire concerning potential risk factors. Still, no significant difference concerning CTI prevalence was observed between responders and non-responders. In addition, comparable CTI prevalences were found in surveys performed in Central and South America [24, 25]. The high number of subjects reporting recent antibiotic use before the study may have represented another limitation because of its potential impact on CTI prevalence. More studies are needed in different settings and with different groups to develop a more global view on CTI prevalence in this particularly vulnerable population.
New Contribution to the Literature

Our findings do not call for the implementation of specific screening program targeting undocumented immigrants in Geneva but rather stress the importance of ensuring CTI screening are accessible to this particularly vulnerable population and in particular to individuals at higher risk.

Acknowledgments

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References

Tuberculosis

An important factor affecting urban health is population density and the facility for transmission of diseases through respiratory routes. In most European countries more than half of all tuberculosis (TB) cases occur among foreign-born individuals. Several studies have shown that most of the reported cases were due to reactivation of infections acquired abroad, but that transmission to other people in the host country were rare. Therefore, screening for TB among immigrants is performed in many developed countries with the aim of detecting and treating active disease or latent tuberculosis infection (LTBI).

Undocumented migrants represent 5%-30% of immigrants and 5%-10% of TB cases in low- or intermediate-incidence countries. Most undocumented migrants in Switzerland come from five Latin-American countries: Brazil, Colombia, Bolivia, Peru and Ecuador, where the prevalence of TB is 5-fold to 50-fold higher than in Switzerland. A survey of this hard-to-reach population concerning all TB notifications between 1994 and 1998 in Geneva showed that the first consultation was often delayed. Only 5% of undocumented migrants with active TB consulted a healthcare professional during the first month of symptoms, compared to 30% of patients with TB and legal status.

In Lausanne, we found LTBI in 19% of undocumented migrants from Latin America. A survey in Geneva found that the main factor increasing the proportion of TB–related fibrotic signs was a 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) of undocumented migrant status and Latin American origin as compared to legal residents of non-Latin America origin.

See: “Undocumented migrants in Switzerland: Geographical origin vs. legal status as risk factor for tuberculosis” and “Latent Tuberculosis Infection and Tuberculosis among Undocumented Migrants in Lausanne, Switzerland”
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].
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 LTBI in undocumented migrants originating mainly from Africa and Asia [10]; in Switzerland, Bodenmann found that 19% of undocumented migrants from Latin America had LTBI [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), Emmanuil, 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)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Legal residents (n = 12,904)</th>
<th>Undocumented migrants (n = 206)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: mean (SD)</td>
<td>36.2 (10.5)</td>
<td>37.8 (11.8)</td>
<td>0.048</td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Latin America</td>
<td>555 (4.3)</td>
<td>170 (82.5)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>12,349 (95.7)</td>
<td>36 (17.5)</td>
<td></td>
</tr>
<tr>
<td>X-ray results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) Normal</td>
<td>12,233 (94.8)</td>
<td>192 (93.2)</td>
<td>0.38</td>
</tr>
<tr>
<td>(B) Pathologic not suggestive of TB</td>
<td>517 (4.0)</td>
<td>4 (1.9)</td>
<td>0.21</td>
</tr>
<tr>
<td>(C1) Fibrotic signs suggestive of TB without signs of activity</td>
<td>151 (1.2)</td>
<td>10 (4.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(C2) Active TB</td>
<td>3 (0.02)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Total number of X-rays suggestive of TB</td>
<td>154 (1.2)</td>
<td>10 (4.9)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

* Fisher’s exact test

\( \text{TB} \) tuberculosis

\( \text{SPRINGER} \)
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)

<table>
<thead>
<tr>
<th></th>
<th>Undocumented migrants</th>
<th>Legal residents</th>
<th>OR crude (95% CI)</th>
<th>OR adjusted for age and sex (95% CI)</th>
<th>OR adjusted for age, sex, and Latin-American origin (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrotic signs suggestive of tuberculosis (TB)</td>
<td>n = 206 (9.5%)</td>
<td>n = 12,904 (1.2%)</td>
<td>4.2 (2.2;8.1)</td>
<td>3.9 (2.0;7.5)</td>
<td>1.7 (0.8;3.7)</td>
</tr>
<tr>
<td>Without fibrotic signs suggestive of tuberculosis (TB)</td>
<td>196 (95.1%)</td>
<td>12,750 (98.8%)</td>
<td>1.0 (ref)</td>
<td>1.0 (ref)</td>
<td>1.0 (ref)</td>
</tr>
</tbody>
</table>

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: 0.94;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.

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)

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

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)

<table>
<thead>
<tr>
<th>Stratum and/or Latin-American origin</th>
<th>Prevalence of fibrotic signs suggestive of TB</th>
<th>OR (95% CI)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undocumented status</td>
<td>Latin-American origin</td>
<td>n (%)</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>10 (5.9)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>15 (2.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>139 (1.1)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>164</td>
</tr>
</tbody>
</table>

* P-value for interaction = 0.99

** Sex- and age-adjusted

* 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 (\( \leq 20/100,000 \) 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 that facilitate participation and access to health services by hard-to-reach migrant groups, such as undocumented migrants.

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Screening for latent tuberculosis infection among undocumented immigrants in Swiss healthcare centres; a descriptive exploratory study

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* Corresponding author

Abstract

Background: Migration is one of the major causes of tuberculosis in developed countries. Undocumented patients are usually not screened at the border and are not covered by a health insurance increasing their risk of developing the disease unnoticed. Urban health centres could help identify this population at risk. The objective of this study is to assess the prevalence of latent tuberculosis infection (LTBI) and adherence to preventive treatment in a population of undocumented immigrant patients.

Methods: All consecutive undocumented patients that visited two urban healthcare centres for vulnerable populations in Lausanne, Switzerland for the first time were offered tuberculosis screening with an interferon-γ assay. Preventive treatment was offered if indicated. Adherence to treatment was evaluated monthly over a nine month period.

Results: Of the 161 participants, 131 (81.4%) agreed to screening and 125 had complete examinations. Twenty-four of the 125 patients (19.2%; CI95% 12.7;27.2) had positive interferon-γ assay results, two of which had active tuberculosis. Only five patients with LTBI completed full preventive treatments. Five others initiated the treatment but did not follow through.

Conclusion: Screening for tuberculosis infection in this hard-to-reach population is feasible in dedicated urban clinics, and the prevalence of LTBI is high in this vulnerable population. However, the low adherence to treatment is an important public health concern, and new strategies are needed to address this problem.

Background

Each year, more than 8 million people develop active tuberculosis (TB) worldwide with regional variability. It is the most common cause of death from communicable diseases [1,2]. Movement of people between countries has a large influence on the incidence of TB in Western-
Europe [3-5]. Several studies have shown that most reported cases are due to reactivation of infections acquired abroad but that transmission to other people in the host country is rare [6-9]. Therefore, screening for tuberculosis among immigrants is performed in many developed countries with the aim of detecting and treating the active disease [10,11] or a latent tuberculosis infection (LTBI) [12-14]. The introduction of interferon-γ assays has improved specificity for detecting LTBI compared with the tuberculin skin test [15,16]. This promises a considerable improvement in the cost-effectiveness of targeted screening programs [17-20]. However, there is no clear consensus regarding the true benefits of screening and it is difficult to assess treatment policies [21].

In practice, screening policies address immigrants that enter into the country via an official channel (asylum claim & working permit). In Switzerland, a screening policy exists for asylum seekers and refugees at the border, but no system exists for undocumented immigrants from countries with a high prevalence of tuberculosis [22,23]. The latter represent a large proportion of the foreign-born population (estimates vary between 150,000 and 300,000 people for a total immigrant population of 7.5 million) [24]. Targeted screening programs may be cost-effective [25], but further studies are needed to evaluate the prevalence of LTBI, the acceptability of screening, and adherence to treatment in this hard-to-reach vulnerable population.

Methods
We conducted a pilot trial to investigate the acceptance, prevalence of positive findings, and adherence to treatment of undocumented immigrant patients offered LTBI screening. We offered a free tuberculosis screening procedure to all consecutive, undocumented immigrants that were over 15 years old, had no major psychiatric disabilities, and were visiting one of two low-threshold healthcare premises for the first time in Lausanne. The recruitment proceeded during a six-month period in 2007 at the Department of Ambulatory Care and Community Medicine of the University Hospital and at the Point d’Eau, Vulnerable population urban healthcare centre. Patients were evaluated by nurse practitioners or primary care physicians trained in community medicine.

Patients were asked to answer a health questionnaire in their preferred language that highlighted symptoms or history that might be associated with tuberculosis (cough, sputum, night sweating, weight loss, prior contact with tuberculosis, prior treatment for tuberculosis, and smoking). From each patient, 8 ml of blood was collected in a Vacutainer-CPT. Within the next 24 h, an enzyme-linked immunospot γ-interferon assay (T-Spot.TB*, Oxford Immunotec) was performed to assess the previous tuberculosis infection status. This test has been shown to have a sensitivity of 90% and a specificity of 93% to detect latent tuberculosis [26]. If results were inconclusive, the assay was repeated. Patients with suspect symptoms, a prior history of tuberculosis, prior contact with tuberculosis, or a positive interferon-γ test result had a chest X-ray and a medical examination by a physician. A bacteriological examination of sputum was performed in all patients that had suspected symptoms or an abnormal X-ray. Patients with active tuberculosis were treated in our Department according to the current Swiss Guidelines [27,28]. Patients that had a positive interferon-γ assay with no signs of tuberculosis were offered preventive treatment. Treated patients were followed for a six-month period. We monitored the acceptance of screening, the number of patients that returned for test results, the number of patients that accepted treatment, and the number of patients that finished treatment.

Sample size was calculated to assure a 0.1 margin of error for the LTBI prevalence rate with a significant level set at 95% and an expected prevalence of 0.5 [worst case scenario]. We estimated that 97 patients were necessary to sufficiently power the analysis. In anticipation of loss to follow-up and missing data, we included 130 participants in the study. Prevalence and acceptance rates are given with a 95% confidence interval. Other results are given in a descriptive form without inference, as we expected small sample sizes.

All patients provided written informed consent for participation, the protocol was approved by the Lausanne University Ethical Committee (protocol 183/06), and the study conformed to the standards defined in the Declaration of Helsinki.

Results
Between January and July 2007, 161 undocumented immigrants that visited one of two medical centres for the first time were asked to participate in this study. Among these, 131 agreed to answer a questionnaire regarding symptoms and history associated with tuberculosis and had a blood sample drawn for an interferon-γ assay. The questionnaire acceptance rate was 81.4% (CI95% 74.5:87.1). However, of these 131 patients, two patients left the waiting room before seeing the practitioner, and one refused to give a blood sample. Thus, 128 laboratory samples were tested, and five of these were inconclusive. Twenty-five patients (19.5%) did not return for their test results, and three of these had an initial inconclusive laboratory result. Confirmation of the inconclusive essay revealed on positive and one negative patient. Laboratory results were therefore available for 125 patients (Figure 1).
Figure 1
Flow-chart of patient inclusion in the study.
The demographic data are given in Table 1. The mean age of the participants was 34.8 years, 47.2% were female, and 64% were single. Most of the patients (83.2%) entered Switzerland without receiving the official tuberculosis screening procedure for asylum seekers. The majority of patients were undocumented immigrants born in Latin America (51.2%), and many were from Sub-Saharan Africa (19.2%). Most of the patients (76.8%) were from countries that had a high incidence rate of active tuberculosis (≥ 50/100,000 per year). The mean length of time spent in Switzerland was under two years for 52.8% of the population. Only five out of the 24 participants that tested positive and 15 of the 101 participants that tested negative for TB reported previous contact with a person that had TB. Thus, the sensitivity of this question was 20.8% and the specificity was 85.1%.

The interferon-γ assay indicated that 24 immigrants were positive for TB (19.2%) [CI 95% 12.7–27.2]. Of these, two had smear-positive tuberculosis (1.6%) [CI95% 0.2–5.7], three had a history of prior treatment for tuberculosis, one had a history of prior treatment for LTBI, and 18 had no active or prior tuberculosis (14.4%, CI95% 8.8–21.8). One patient was suspected to falsely have a negative

<table>
<thead>
<tr>
<th>Population characteristic</th>
<th>Interferon-γ assay</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive n = 24</td>
<td>n = 125</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>0 (0)</td>
<td>3 (2.4)</td>
</tr>
<tr>
<td>20–39</td>
<td>13 (54)</td>
<td>78 (62.8)</td>
</tr>
<tr>
<td>40–59</td>
<td>11 (46)</td>
<td>18 (14.6)</td>
</tr>
<tr>
<td>60 or more</td>
<td>0 (0)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13 (54)</td>
<td>66 (52.8)</td>
</tr>
<tr>
<td>Female</td>
<td>11 (46)</td>
<td>46 (38.0)</td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compulsory or less</td>
<td>16 (64)</td>
<td>79 (63.2)</td>
</tr>
<tr>
<td>Reasons for migrating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economical</td>
<td>14 (58)</td>
<td>79 (63.2)</td>
</tr>
<tr>
<td>Political persecution</td>
<td>12 (48)</td>
<td>63 (50.5)</td>
</tr>
<tr>
<td>Religious persecution</td>
<td>4 (17)</td>
<td>16 (12.8)</td>
</tr>
<tr>
<td>Disease</td>
<td>4 (17)</td>
<td>16 (12.8)</td>
</tr>
<tr>
<td>Family grouping</td>
<td>1 (4)</td>
<td>8 (6.5)</td>
</tr>
<tr>
<td>Studies</td>
<td>0 (0)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (4)</td>
<td>6 (5.0)</td>
</tr>
<tr>
<td>Arrived in Switzerland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2 years</td>
<td>12 (48)</td>
<td>66 (52.8)</td>
</tr>
<tr>
<td>2–7 years</td>
<td>6 (25)</td>
<td>38 (30.2)</td>
</tr>
<tr>
<td>More than 7 years</td>
<td>6 (25)</td>
<td>15 (12.0)</td>
</tr>
<tr>
<td>Tobacco</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>0 (0)</td>
<td>15 (12.0)</td>
</tr>
<tr>
<td>Close contact with TBC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reported</td>
<td>5 (21)</td>
<td>15 (12.0)</td>
</tr>
<tr>
<td>Not reported</td>
<td>19 (79)</td>
<td>86 (68.4)</td>
</tr>
<tr>
<td>Proximity of at least one hour with someone during previous 3 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disco or dancing</td>
<td>8 (33)</td>
<td>51 (40.8)</td>
</tr>
<tr>
<td>Religious meetings</td>
<td>10 (42)</td>
<td>51 (40.8)</td>
</tr>
<tr>
<td>Interior sports</td>
<td>4 (17)</td>
<td>23 (18.4)</td>
</tr>
<tr>
<td>Restaurants or pubs</td>
<td>4 (17)</td>
<td>23 (18.4)</td>
</tr>
<tr>
<td>Welfare hostel</td>
<td>4 (17)</td>
<td>20 (16.0)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (4)</td>
<td>6 (4.8)</td>
</tr>
</tbody>
</table>

(page number not for citation purposes)
interferon-γ assays as he had been treated for a putum confirmed active tuberculosis two years previously.

The two patients with active tuberculosis were isolated and treated according to the current Swiss Guidelines [27]. Both were adherent to treatment and were cured. Among the 14 immigrants with no prior history of TB and a positive interferon-γ assay result, four had counter-indications for preventive treatment (high age, liver disease), four did not show up for further examinations, and 10 accepted preventive treatment for LTBI. Of the 10 that accepted preventive treatment, only five followed the treatment until the scheduled completion. Therefore, full treatment was sustained by 5/18 patients with LTBI (Figure 2).

**Discussion**

In our study, 19.2% (24/125) of the undocumented immigrant patients had positive interferon-γ assay results and 14.4% (18/125) had LTBI that was previously undetected. Carvalho et al [25] found similar results (15% [15/100]) for undocumented immigrant patients attending an Italian health care service. Although the sample sizes were small in both these studies, the observed prevalence of positive interferon-γ results appeared to be substantial compared to other population groups, including German subjects that had been in close contact with an index case (10%) [29], healthcare workers in Denmark (1.4%) [30] or Japan (9.9%) [31], American Navy recruits (0.6%) [32], and the general Japanese population (7.1%) [33]. Prior exposure to an index case with pulmonary TB in the country of origin appeared to be the primary cause of LTBI in low-incidence rate countries [3]. Furthermore, the risk of reactivating a LTBI into active tuberculosis seemed to mainly be related to the initial exposure in high incidence countries of origin and not to other risk behaviours or environmental conditions in the host country [7,34].

More than 3/4 of undocumented immigrants consulting healthcare centres in Western Switzerland are from countries with incidence rates of tuberculosis above 50 cases/100,000 people per year. This is most likely the major reason for the high prevalence of LTBI in this population.

Targeted tuberculosis screening seems to be more cost-effective for preventing outbreaks than systematic screening [17,21]. Clinical trials have shown that preventive treatment reduced infection rates by more than half when strict adherence was achieved [14,35]. Most cost-effectiveness studies [18-20,36,37] are based on estimates that do not take into consideration the number of positive interferon-γ assays that are due to past infections where treatment was interrupted. Nevertheless, our study showed a potential benefit of screening and offering preventive therapy for this specific vulnerable population. Preventing the emergence of new index cases in this hard-to-reach population that often lives in close quarters could substantially reduce expenses related to controlling an outbreak [38]. The high prevalence of LTBI suggests that screening with an interferon-γ assay could be cost-effective under conditions that promoted adherence to the end of therapy for most patients [36]. However, the risk of developing tuberculosis is much higher for individuals with positive interferon-γ results than those with a positive tuberculosis skin test [39].

The acceptance rate for screening was high (81.4%). Using nurse practitioners and trained primary physicians in secure environments could help build the trust of this hard-to-reach population. Maintaining confidentiality could be essential to assure trust [40].

On the other hand, there are obstacles in ensuring that patients follow their treatment to the end. Only five patients out of eighteen with LTBI completed the preventive therapy in our study. Ailinger et al [41] observed an adherence prevalence of 72% for Latino patients that were undocumented immigrants in Washington DC. A prior study from our institution observed that the rate of adherence was 76% in a group composed mainly of foreign workers and refugees [42]. Therefore, adherence to treatment may depend on the setting and the confidence the patients have in the system (fear of denunciation and rejection). Supervising [43] or monitoring [44] drug administration, offering free access to care [45], using models of explanation based on the patient’s representation of his own health [46], and relying on trained nurse practitioners for screening [47,48] could improve compliance. Furthermore, compared to tuberculosis skin tests, the introduction of interferon-γ assays has largely improved the specificity of LTBI detection; thus, the number of patients that would receive preventive treatment without needing it can be reduced. This knowledge might raise the motivation of healthcare workers in their efforts to follow patients and help them adhere to the proposed treatment.

Our study has several weaknesses. The small size of the population sample led to a lack of precision in the results. The absence of a non-migrant control group made it difficult to compare the prevalence of LTBI in migrants with that of the local population; however, we considered it safe to assume that the local population living in Switzerland had a much lower prevalence of LTBI than the study population. The setting of our study could limit the generalisability of our results to rural migrants attending a healthcare centre. Patients who do not attend a healthcare centre could be younger and less deprived than those included in the study. Our population could be more at risk to have been in contact with tuberculosis. Our results are therefore limited to quantifying the prevalence of
latent tuberculosis in a setting in which it is possible to consider targeted screening and prevention programs to take place. Finally, interferon-γ positivity may not equate perfectly with latent TB infection. As such additionally data using another interferon-γ or the tuberculosis skin test would have been helpful.

**Conclusion**

Our study shows the benefit of using highly sensitive assays for detecting LTBI on targeted populations at risk that easily accept screening in appropriate health settings by trained nurse practitioners and primary care physicians. Nevertheless, methods for improving adherence to
treatment are lacking. Our results demonstrate the high prevalence of LTBI in migrants and emphasize the need for developed countries to invest in programs that reduce the transmission of tuberculosis worldwide; in particular, the focus should be on undocumented migrants that frequently come from countries with high incidence rates of tuberculosis.

Abbreviations
LTBI: latent tuberculosis infection; TB: active tuberculosis; CI: confidence interval; HIV: human immunodeficiency virus.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
PB has made substantive contribution to conception, acquisition of data, design and interpretation of data. PV has contributed to conception, design, analysis and interpretation of data. PB and PV have drafted the manuscript. HW, BF and EM have contributed to the interpretation of data and critically revised the manuscript. FdF has contributed to acquisition of data and revising the manuscript. JPZ has made contribution to conception and design, interpretation of data and has revised the manuscript with important intellectual content. All authors have given their approval for this version to be published.

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Chagas disease

Chagas disease is a zoonosis caused by *Trypanosoma cruzi* (T. cruzi), a flagellated protozoa transmitted to humans by the feces of blood-sucking triatomine bugs. The parasite can also be acquired by blood transfusion, organ transplant, ingestion of contaminated food, or congenital transmission.67 Chagas disease currently affects eight to ten million people worldwide and kills more people than any other parasitic disease in Latin America.68 Until recently its geographical distribution was mostly determined by the area of endemcity of the vectors.

Non-endemic countries (i.e., countries free of vectors) in North America, Europe and the Pacific Region have seen the recent emergence of Chagas disease following the migration of more than 15 million people at risk from endemic areas.69

We found a high (12.8%) prevalence of Chagas disease among 1,012 Latin American migrants attending Geneva’s mobile health care unit and two Latino churches in Geneva. This figure is much higher than previously reported in Germany (2%), but lower than the very high (41%) prevalence found at a referral center in Spain.70-71 Our finding was mostly explained by the high (48%) proportion of Bolivian migrants in the study cohort, of whom 26.2% were diagnosed with Chagas disease. This figure is consistent with recent epidemiological studies conducted in the most affected provinces of Bolivia (Santa Cruz, Beni, and Cochabamba), from where most of the Bolivian migrants living in Geneva originate.72-73 In our study, Bolivian origin was the main predictive factor for *T. cruzi* infection, in agreement with other reports from non-endemic countries.70-74.

The identification of Chagas disease in urban centers of non-endemic countries illustrates the complexity of international migration because detection is only possible if the migrants have access to medical care, and if well-trained doctors in western countries even think about this relatively uncommon protozoa.

See: "Prevalence, clinical staging and risk for blood-borne transmission of Chagas disease among Latin American migrants in Switzerland: a cross sectional study"75
Prevalence, Clinical Staging and Risk for Blood-Borne Transmission of Chagas Disease among Latin American Migrants in Geneva, Switzerland

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Abstract

Background: Migration of Latin Americans to the USA, Canada and Europe has modified Chagas disease distribution, but data on imported cases and on risks of local transmission remain scarce. We assessed the prevalence and risk factors for Chagas disease, staged the disease and evaluated attitudes towards blood transfusion and organ transplant among Latin American migrants in Geneva, Switzerland.

Methodology/Principal Findings: This cross-sectional study included all consecutive Latin American migrants seeking medical care at a primary care facility or attending two Latino churches. After completing a questionnaire, they were screened for Chagas disease with two serological tests (Biomerieux ELISA cruzi; BioLite Biosellia Chagas). Infected subjects underwent a complete medical work-up. Predictive factors for infection were assessed by univariate and multivariate logistic regression analysis. 1,012 persons (females: 83%; mean age: 37.2 [SD 11.3] years, Bolivians: 48% [n = 485]) were recruited. 96% had no residency permit. Chagas disease was diagnosed with two positive serological tests in 130 patients (12.8%; 95%CI 10.8%–14.9%), including 127 Bolivians (26.2%; 95%CI 22.3%–30.1%). All patients were in the chronic phase, including 11.3% with cardiac and 0.8% with digestive complications. Predictive factors for infection were Bolivian origin (OR 33.2; 95%CI 7.5–147.3), reported maternal infection with T. cruzi (OR 6.9; 95%CI 1.9–24.3), and age older than 35 years (OR 6.7; 95%CI 2.4–18.8). While 22 (16.9%) infected subjects had already donated blood, 24 (18.5%) and 34 (26.2%) considered donating blood and organs outside Latin America, respectively.

Conclusions: Chagas disease is highly prevalent among Bolivian migrants in Switzerland. Chronic cardiac and digestive complications were substantial. Screening of individuals at risk should be implemented in nonendemic countries and may include undocumented migrants.

Introduction

Chagas disease is a zoonosis caused by Trypanosoma cruzi (T. cruzi), a flagellated protozoan transmitted to humans by the faeces of blood-sucking triatomine bugs. The parasite can also be acquired by blood transfusion, organ transplant, ingestion of food contaminated with triatomines or their feces, or congenital transmission [1]. In 2009, we celebrate the 100th anniversary of the first complete description of the disease by Carlos Chagas, a Brazilian physician. Chagas disease affects eight to ten million people worldwide and kills more than any other parasitic disease in Latin America [2]. Until recently, its geographical distribution was mostly determined by the area of endemicity of the infected vectors. Successful vector control in endemic countries, urbanisation, human migration and unpreparedness of newly affected areas have contributed to modify the distribution of Chagas disease [3,4]. Non-endemic countries (i.e. countries free of vectors) in North America, Europe and Western Pacific Region have seen the recent emergence of Chagas disease following the migration of more than 1.5 million people from endemic areas [4]. Estimates of
Author Summary
Chagas disease, a parasitic disease caused by Trypanosoma cruzi, is a leading cause of cardiac and digestive tract disorders in Mexico, Central and South America. An increasing number of cases have recently been reported in North America and Europe due to international human migration, but data outside Latin America remains scarce. This study showed that Chagas disease is an emerging health problem in Switzerland, affecting a substantial proportion of Latin American immigrants (13%). Persons at increased risk of infection were Bolivian, older than 35 years or had a mother infected with T. cruzi. Early signs of cardiac or digestive tract disease were found in one out of six infected patients. The risk of local transmission by blood transfusion or organ transplant was illustrated by the frequent willingness expressed by patients to donate blood or organs in Switzerland. The authors recommend the screening of persons at risk of infection and the diffusion of appropriate information to the medical community to increase awareness of this emerging health problem. Considering that affected persons frequently lack health insurance in Switzerland, a facilitated access to medical care is an important step towards better recognition and management of Chagas disease.

the total number of T. cruzi infected people living in non-endemic countries and reported cases are both on the rise, reaching an estimated 25,000 to 40,000 in Western European countries in 2008, [4-11]. These estimates are usually based on the number of registered Latin American migrants in the recipient country multiplied by the mean prevalence of the disease among blood donors in the home country. This mode of calculation has several limitations, as it does not include migrants without legal registration (undocumented), and does not take into account regional variations of disease prevalence within endemic countries [12].

Acute T. cruzi infection - frequently asymptomatic - is followed by a long period of latency with few or no circulating parasites (indeterminate form of the chronic phase) [1]. After decades, 20-30% of infected persons develop chronic cardiac or digestive tract complications. Chronic chagasic cardiopathy (CCC), which is responsible for the high morbidity, mortality, and socio-economical impact of the disease in affected areas, is frequently underdiagnosed, particularly in non-endemic countries [7]. ECG is the recommended screening test for cardiac damage [13]. Up to 10% of T. cruzi infected persons may develop gastro-intestinal motility disorder leading to progressive dilatation of the oesophagus (megaoesophagus) and/or the colon (megacolon). Suspected digestive tract complications are investigated by barium studies. Specific clinical features of Chagas disease in non-endemic countries are not well characterized and may differ from those found in Latin America for various reasons, including different duration of exposure to infection. Until now, the few published studies describing disease patterns in Europe were conducted in specialized centres, and the findings may not be extrapolated to the global Latin American migrant community [5,14].

Blood-borne transmission of T. cruzi has been reported in several non-endemic countries [11,15]. Prevalence of infected blood donations in Europe and North America varies widely, reaching 0.62% in risk donors in Spain [1]. Recently, USA, Spain and France have implemented measures to reduce transfusion risk through blood donors screening and deferral strategies [11]. However, most European countries that may harbour blood donors at risk have yet to implement screening measures. The attitude and practice of Latin American migrants towards blood donation in non-endemic countries has yet to be investigated. In 2008, Switzerland hosted 43,000 legal residents originating from Central and South America [16]. This figure did not include Swiss nationals from Latin American origin and the estimated 30,000 undocumented Latin American migrants. Undocumented migrants experience difficulties in accessing medical care in Switzerland, as health insurance is mandatory and expensive [17]. The first report of Chagas disease in Switzerland goes back to 1996. Since then, several imported and congenital cases have been reported [18,19].

The objectives of this descriptive transversal study were to (1) determine the prevalence of Chagas disease in a community of Latin American adult migrants living in Geneva, (2) assess the risk factors for T. cruzi infection, (3) clinically stage the disease, and (4) evaluate the transfusional and transplantation risk to local recipients.

Methods
Setting
The study took place in a primary care centre (the Community Care Mobile Unit) of the Geneva University Hospitals which provides affordable care to more than 2000 Latin American migrants yearly, the majority of them living in Geneva with neither residency permit nor health insurance. Privacy is strictly ensured for undocumented persons. This unit cooperates closely with representatives of migrants communities. Information about the study was widely diffused in cultural centres, churches and migrant associations. In addition, two recruitment sessions took place in churches attended by migrants.

Participants and procedures
Between June and December 2008, all consecutive adult Latin American migrants were invited to participate to the study. Other inclusion criteria were age more than 16 years and signature of an informed consent form. Pregnant women were excluded from the study and were referred to the Maternity ward of the Geneva University Hospitals where a specific program for Chagas screening has been ongoing since January 2008 [9]. Written informed consent was requested from participants. Participants completed a questionnaire (available in Spanish, Portuguese and French) that collected socio-demographic and medical data, and assessed their prior and current attitudes towards blood donation and organ transplant. A multilingual volunteer was available to help on-site. Serological tests, clinical investigations and treatment were free of charge. This study was approved by the ethics committee of the Geneva University Hospitals in January 2006 (protocol 07-265).

Diagnosis of T. cruzi infection
Peripheral blood was drawn by a qualified nurse and serum was kept refrigerated at −20°C. Two commercialized ELISA-based serological tests (ELISA cruzi, Biomérieux, Brazil and Bioelisa Chagas, Biokit, Spain), which detect antibodies against crude and recombinant T. cruzi antigens respectively, were performed according to manufacturers’ instructions with Dyneltech-MRW Microplate Washer. Chagas disease was diagnosed when both tests were positive. The two tests were repeated in case of discrepant results (e.g. positive-negative; doubtful-negative). External quality control consisted of testing serum samples from all individuals with positive or discordant ELISA tests and from 10% of individuals with negative tests (Laboratory of Chagas disease, Goias University, Brazil). A combination of four serological tests was performed.
performed (Chagatex ELISA, Biomerieux, Argentina; EIE Chagas Bio-Manguinhos, Brasil; Chagatest HAI, Wiener, Argentina; in-house immunoassay test using Biomerieux conjugate, Biomerieux, Brazil). Results were sent back with an integrated conclusion (positive, negative or non-conclusive).

Staging and management of the disease
All individuals with confirmed *T. cruzi* infection were contacted by phone and underwent a clinical evaluation that included full medical history, physical examination, and a 12-lead electrocardiogram (ECG) with a 30-second DII strip. In case of symptoms or signs suggestive of cardiac failure, history of syncope, or ECG changes consistent with CCG, an echocardiogram and a 24-hour Holter recording were performed. Results of cardiac investigations were independently reviewed by two cardiologists. The classification of CCC was based on the Brazilian Consensus [20]. Patients with dysphagia or solid or liquid food and/or with severe constipation were examined every 2 weeks and/or use of laxatives for more than 3 days per week were more than 6 months underwent gastrointestinal tract barium examination. Oesophageal abnormalities were staged according to the classification of Rezende [21]. The colon was considered abnormal if its diameter exceeded 6 cm. In the absence of abnormal findings by ECG, echocardiography, 24-hour Holter recording, and barium studies, Chagas disease was classified in the indeterminate form of the chronic phase. According to recent recommendations, all eligible cases were treated with nitrofurantoin or benznidazole for 60 days [13].

Statistical analysis
In order to investigate the relationship between Chagas disease and possible predictive factors, we used 2×2 tables and performed Chi-square and Fisher's exact tests for categorical variables and unpaired Student’s t-tests for continuous variables. Univariate and multivariate logistic regression analyses were used to assess factors associated with Chagas disease. All analyses were performed using SPSS for Windows (version 15.0).

Results

Thousand and twelve participants, with a mean age of 37.2 (standard deviation (SD) 11.3) years and a female predominance (83%) were recruited in the study. Ninety-six percent of participants were unidrome. Countries of origin were Bolivia (n = 403; 48%), Brazil (n = 249; 29%), Colombia (n = 61; 6%), Peru (n = 58; 69%), Ecuador (n = 47; 5%), Paraguay (n = 58; 39%), Nicaragua (n = 24; 2.9%), Honduras (n = 24; 2%); and others (n = 36; 4%). The mean duration of stay outside Latin America was 4.9 (SD 1.0) years. Socio-demographic characteristics and medical history data related to *T. cruzi* infection of 1012 participants are shown in Table 1. Previous bite by triqueimine bugs were reported by 11.2% of the participants. 12.7% had received blood transfusion in Latin America and 7.7% were born from a *T. cruzi* infected mother. Previous positive testing for Chagas disease was reported by 2.6% of participants.

Prevalence of Chagas disease and predictive factors

On the basis of concordant positive serological tests, *Trypanosoma cruzi* infection was diagnosed in 130 participants, resulting in an overall prevalence of 12.8% (95% confidence interval (CI) 10.8–14.9). Prevalence among Bolivians was 26.2% (95%CI 22.3–30.1; n = 127). External quality control confirmed all positive cases. Three infected individuals originated from Argentina (n = 2) and Brazil (n = 1); all had lived for several years in Bolivia. All (n = 12) discordant serological results in Geneva were controlled at the reference laboratory and proved to be negative. Socio-demographic characteristics and clinical data of *T. cruzi* infected individuals compared to non-infected ones and analysis of factors associated with infection are shown in Tables 1 and 2, respectively. Multivariate analysis showed that major predictive factors for *T. cruzi* infection were Bolivian origin (adjusted odds ratio (OR) 33.2; 95%CI 17.5–147.5); maternal infection with *T. cruzi* (OR 8.9; 95%CI 1.9–41.5); and age older than 30 years (OR 6.7; 95%CI 2.4–18.0).

Clinical description

Clinical evaluation was performed in 124 patients (95.4%), whereas 6 patients were lost to follow-up due to unexpected departure from Switzerland. Out of 14 patients (11.3%) with ECG abnormalities consistent with CCC, 12 (9.7%) were classified as grade A; one as grade B1 (0.8%) and one could not be fully investigated (Table 3). Twelve (9.7%) other patients with normal ECG had symptoms or signs consistent with heart disease. Seven of them underwent further investigations. Four had echocardiographic signs of low-grade diastolic dysfunction and one showed coronary sinus dilatation. Two others presented rhythmic abnormalities on Holter recording. In the absence of definite criteria defined by the Brazilian consensus, we did not consider these seven patients as cases of CCC. Twenty-one (16.9%) patients reported dysphagia (n = 10) and/or severe constipation (n = 16). Barium studies were performed in 16 patients. One patient (9.8%) had grade 1 oesophageal involvement (Figure 1). 109 (87.9%) patients were classified as chronic infection in the indeterminate form.

Blood and organ donation

Two-hundred forty seven participants (24.1%) and twenty-two patients (16.9%) had already donated blood. Twenty-four (18.3%) and 34 (26.2%) patients expressed willingness to donate blood and organs outside Latin America, respectively (Table 4).

Discussion

We found a high (12.8%) prevalence of Chagas disease among 1012 Latin American migrants attending an urban primary care centre and two Latino churches in Geneva, Switzerland. This figure is much higher than previously reported in Canada (1%) and Germany (2%), but lower than the very high (41%) prevalence found at a referral centre in Spain [22,23]. Our finding is mostly explained by the high proportion (48%) of Bolivian migrants in the study cohort, of whom 26.2% were diagnosed with Chagas disease. This figure is consistent with recent epidemiological studies conducted in affected provinces of Bolivia (Santa Cruz, Cochabamba), where most of the Bolivian migrants living in Geneva originate from [24,25]. Bolivian participants were not over-represented in our study as they constitute 42% of Latin American migrants consulting in our primary care facility. Bolivian origin was the main predictive factor for *T. cruzi* infection, in concordance with other reports from non-endemic countries [5,9]. Only three of the 130 patients originated from other countries (Argentina and Brazil). This is unclear whether these three patients were infected in their country of origin or in Bolivia, where they lived for several years. The absence of cases diagnosed in migrants from other endemic countries is likely to be explained by the insufficient number of persons tested, the possible effect of cluster sampling (as shown in Bolivians) and the lower average national prevalence of *T. cruzi* infection in other Latin American countries [4]. Nevertheless, cases originating from most Central and South American countries have been reported in non-endemic countries [5,14]. Therefore, consideration for *T. cruzi* infection should not be restricted to Bolivians.
### Table 1. Description of Latin American migrants (n = 1012) with and without Chagas disease (CD) in Geneva, Switzerland.

<table>
<thead>
<tr>
<th></th>
<th>Total population N = 1012, Mean (SD) or n (%)</th>
<th>Subjects with CD, N = 130, Mean (SD) or n (%) within CD</th>
<th>Subjects without CD, N = 882, Mean (SD) or n (%) without CD</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (mean)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤35 years</td>
<td>37.4 (SD 11.3)</td>
<td>41.0 (SD 9.4)</td>
<td>36.9 (SD 11.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>&gt;35 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex (female)</strong></td>
<td>355 (25.9%)</td>
<td>108 (83.3%)</td>
<td>727 (82.4%)</td>
<td>0.85</td>
</tr>
<tr>
<td><strong>Origin</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Bolivia</td>
<td>486 (47.5%)</td>
<td>127 (97.7%)</td>
<td>359 (40.7%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>528 (52.5%)</td>
<td>3 (2.3%)</td>
<td>523 (59.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Years outside Latin America</strong></td>
<td>4.9 (SD 4.0)</td>
<td>4.6 (SD 2.1)</td>
<td>4.9 (SD 4.2)</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Mother with T. cruzi infection</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>78 (7.7%)</td>
<td>26 (20.0%)</td>
<td>52 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>604 (59.7%)</td>
<td>47 (36.2%)</td>
<td>557 (63.2%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>330 (32.6%)</td>
<td>57 (43.8%)</td>
<td>273 (31.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Previous testing</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>80 (7.9%)</td>
<td>27 (20.7%)</td>
<td>53 (6.1%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>857 (84.7%)</td>
<td>95 (73.1%)</td>
<td>762 (86.4%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>75 (7.4%)</td>
<td>8 (6.2%)</td>
<td>67 (7.6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Previous triatomine bite</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Yes</td>
<td>113 (11.2%)</td>
<td>35 (26.9%)</td>
<td>78 (8.8%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>336 (33.2%)</td>
<td>20 (15.4%)</td>
<td>316 (35.8%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>563 (55.6%)</td>
<td>75 (57.7%)</td>
<td>488 (55.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Previous transfusion</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>129 (12.7%)</td>
<td>30 (23.1%)</td>
<td>99 (11.2%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>879 (89.9%)</td>
<td>100 (76.9%)</td>
<td>779 (88.3%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>4 (0.4%)</td>
<td>0</td>
<td>4 (0.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Previous treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>Yes</td>
<td>10 (1.0%)</td>
<td>5 (3.8%)</td>
<td>5 (0.6%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1001 (99.9%)</td>
<td>125 (96.2%)</td>
<td>876 (99.3%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>1 (0.1%)</td>
<td>0</td>
<td>1 (0.1%)</td>
<td></td>
</tr>
</tbody>
</table>

*p* concerns difference between subjects with and without Chagas disease.

doi:10.1371/journal.pntd.0000519abor

Older migrants were at increased risk for *T. cruzi* infection, most likely due to a longer and more intense exposure to vectorial transmission in their home country. Vector control campaigns have resulted in a sharp reduction of transmission in endemic countries during the last decades, therefore conferring relative protection to younger generations [3]. History of maternal infection (defined by positive serology in the home country) was also a strong and independent predictive factor for infection. Being borne from an infected mother cumulates the risk of vertical transmission and shared exposure to vectorial transmission.

The risk of unrecognized vertical transmission in non-endemic countries is increased by the low proportion of patients aware of being infected, the lack of clinical signs in most infected newborns and the absence of systematic prenatal screening program [1,9,10]. Screening should be offered to women of childbearing age, pregnant women and their offspring (in case of proven maternal infection) [9].

Only 4% of patients had valid residency permit and health insurance. It is estimated that several millions of migrants at risk for Chagas disease reside undocumented in Europe and in North America [4,26]. In many countries, such as Switzerland, undocumented migrants face difficulties to access preventive and curative care. This socio-economic dimension must be taken into consideration by policy makers at the planning stage of screening programs for Chagas disease in non-endemic countries.

ECG abnormalities consistent with CCC were found in 11.3% of cases, a proportion comparable to previous reports [5,27]. Most patients who could be classified were in grade A CCC according to the Brazilian consensus classification. One patient presented with advanced stage cardiopathy (grade B2) requiring specific therapy. Interestingly, five symptomatic patients with normal ECG had low-grade diastolic dysfunction or coronary sinus dilatation by echocardiography and two others presented rhythmical abnormalities on Holter recording. In the absence of identified alternative etiology, the diagnosis of early stage CCC is possible. However, the Brazilian criteria do not allow these patients to be classified as such. More studies are needed to define the diagnostic and prognostic value of echocardiography and Holter in symptomatic cases with normal ECG. The low rate of advanced CCC in our study can be explained by the overall young patients’ age and, possibly, by the healthy migrant effect. The latter implies that persons who initiate a long distance migration tend to be healthier than persons who do not migrate [28]. Nevertheless, cases of...
Table 2. Predictive factors, unadjusted and adjusted odds ratios (OR) for Chagas disease (CD) among T. cruzi infected Latin American migrants in Geneva, Switzerland (n = 130).

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Prevalence of CD. n (%)</th>
<th>Unadjusted OR for CD (95%CI)</th>
<th>Adjusted OR for CD* (95%CI)</th>
<th>Adjusted OR for CD* (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;35</td>
<td>37/494 (7.5%)</td>
<td>2.7 (1.24.0)</td>
<td>3.6 (2.35.6)</td>
<td>6.1 (2.216.7)</td>
</tr>
<tr>
<td>≥35</td>
<td>95/918 (10.8%)</td>
<td>1.04 (0.61.7)</td>
<td>0.85 (0.51.5)</td>
<td>1.04 (0.33.4)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>108/835 (12.9%)</td>
<td>1.04 (0.61.7)</td>
<td>0.85 (0.51.5)</td>
<td>1.04 (0.33.4)</td>
</tr>
<tr>
<td>Men</td>
<td>22/177 (12.4%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butefa</td>
<td>127/486 (26.1%)</td>
<td>61.7 (19.5193.3)</td>
<td>71.2 (22.4226.4)</td>
<td>31.7 (7.2119.5)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/28 (9.6%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother with T. cruzi infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother with T. cruzi infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26/78 (33.3%)</td>
<td>5.9 (3.410.3)</td>
<td>6.5 (1.922.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No previous triamterine bite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35/113 (31.0%)</td>
<td>7.1 (3.912.0)</td>
<td>1.8 (0.74.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No previous triamterine bite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/336 (6.0%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Adjustment for age, sex and origin (patients included in this model: n = 1012).
*Adjustment for all variables in table 2 (patients included in this model: n = 378).

T. cruzi transmission by blood transfusion has been sporadically reported in North America and in Europe [1,11,15]. Persistent parasitemia in infected blood donors can lead to infected donations over a long period of time [29]. In our cohort, 24.4% participants and 16.9% of T. cruzi infected patients had a prior history of blood donation. Despite a relatively short time (mean: 8.9 years) spent outside Latin America, 6.9% of participants had already donated blood in North America or in Europe. Moreover, a significant proportion of participants and of T. cruzi infected patients expressed the intention to donate blood outside Latin America in the future.

Table 3. Description and staging of patients with Chagas disease and ECG abnormalities in Geneva, Switzerland.

<table>
<thead>
<tr>
<th>Patient (sex age)</th>
<th>Symptoms</th>
<th>Signs</th>
<th>ECG</th>
<th>Holter</th>
<th>Staging</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 28</td>
<td>chest pain</td>
<td>none</td>
<td>inverted T wave and</td>
<td>normal</td>
<td>PVB (576/24h); bradycardia 45'</td>
</tr>
<tr>
<td>F 35</td>
<td>-</td>
<td>partial RBBB</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>F 40</td>
<td>palpitation</td>
<td>none</td>
<td>inverted T wave vs-v</td>
<td>3</td>
<td>normal</td>
</tr>
<tr>
<td>F 43</td>
<td>-</td>
<td>none</td>
<td>AVB grade I</td>
<td>normal</td>
<td>sustained AT</td>
</tr>
<tr>
<td>F 45</td>
<td>-</td>
<td>RBBB</td>
<td>normal</td>
<td>PVB (860/24h); PSVB</td>
<td>A</td>
</tr>
<tr>
<td>F 46</td>
<td>dyseoria, syncope</td>
<td>none</td>
<td>RBBB</td>
<td>normal</td>
<td>PSVB; sustained AT</td>
</tr>
<tr>
<td>F 46</td>
<td>-</td>
<td>bradycardia</td>
<td>normal</td>
<td>PVB (284/24h); PSVB; bradycardia 39'</td>
<td>A</td>
</tr>
<tr>
<td>F 50</td>
<td>dyseoria, chest pain, palpitation</td>
<td>none</td>
<td>LBBB</td>
<td>normal</td>
<td>LVEF 39%; global hypokinesia; PVB (3960/24h); non-sustained VT</td>
</tr>
<tr>
<td>F 51</td>
<td>syncope</td>
<td>none</td>
<td>RBBB; bradycardia</td>
<td>normal</td>
<td>bradycardia 34'</td>
</tr>
<tr>
<td>F 54</td>
<td>chest pain, palpitation</td>
<td>none</td>
<td>PVB</td>
<td>diastolic dysfunction grade 2</td>
<td>PVB (9504/24h)</td>
</tr>
<tr>
<td>M 36</td>
<td>-</td>
<td>none</td>
<td>PVB, LAFB</td>
<td>normal</td>
<td>PVB (284/24h); bi-atrial</td>
</tr>
<tr>
<td>F 39</td>
<td>-</td>
<td>none</td>
<td>inverted T wave vs-v, q wave in D1, m1</td>
<td>diastolic dysfunction grade 1; dilated LA</td>
<td>PVB (432/24h); PSVB; bradycardia 44'</td>
</tr>
<tr>
<td>M 44</td>
<td>chest pain</td>
<td>none</td>
<td>LAFB; inverted T wave avf</td>
<td>normal</td>
<td>normal</td>
</tr>
</tbody>
</table>

RBBB, right bundle branch block; LBBB, left bundle branch block; LAFB, left anterior fascicular block; AVB, anterioventricular block; PSVB, premature supraventricular beat; PVB, premature ventricular beat; LA, left atria; AT, atrial tachycardia; LVEF, left ventricular ejection fraction.

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This positive attitude towards blood donation and the large proportion of patients unaware of being infected highlights the risk of blood-borne transmission and support the implementation of preventive measures in non-endemic countries.

Organ transplant is a rare mode of transmission that has been reported both in endemic and non-endemic countries [30]. Chagas disease can present as a fulminant systemic disease in immunosuppressed patients [1]. In our cohort, none of the participants had donated organs and none of the T. cruzi infected patients had a previous history of organ transplant. However, a high proportion of participants and cases considered organ donation while alive or after passing away. Health professionals involved in organ transplantation should be informed or reminded that organ donors or recipients at risk of being infected require screening for Chagas disease.

The high proportions of migrants with no legal registration and of Bolivian origin, as well as the recruitment limited to one city, represent the main limitations of this study as they partially restrict the extrapolation of our findings to other settings. We believe that these limitations are counter-balanced by the large population screened and by the choice of a primary care setting as a recruitment site. Therefore, our study may offer a valuable insight into the current trends of this emerging health problem in Europe.

According to our and others’ findings, we recommend screening for Chagas disease in priority all Latin American persons at increased chance of (1) infection (e.g. Bolivian origin, diagnosis of Chagas disease in the mother or in other close family members, prior history of blood transfusion in endemic countries, presence of suggestive cardiac or digestive complaints), (2) severe illness (e.g. immunosuppressed individuals), (3) transmitting T. cruzi to others (e.g. pregnant women and women of child bearing age, blood or organ donors), and (4) cure with existing treatments (newborns and children). Cost-effectiveness studies may help to design more rational recommendations. Considering the millions of persons at risk who have recently migrated outside Latin America, medical students and physicians in non-endemic countries must be made aware of the emergence of this neglected tropical disease.

Supporting Information

Alternative Language Abstract S1 Translation of the abstract into French by YJ.

Found at: doi:10.1371/journal.pntd.0000592.s001 (0.02 MB DOC)

Table 4. Frequency of history and intention of blood and organ donation in Latin American migrants living in Geneva, Switzerland.

<table>
<thead>
<tr>
<th></th>
<th>Latin American migrants (n = 1012) N (%)</th>
<th>Bolivian migrants (n = 486) N (%)</th>
<th>Migrants with Chagas disease (n = 130) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of blood donation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in Latin America</td>
<td>247* (24.4)</td>
<td>109 (22.4)</td>
<td>22 (16.9)</td>
</tr>
<tr>
<td>in Europe</td>
<td>208 (84.2)</td>
<td>96 (88.1)</td>
<td>22 (100)</td>
</tr>
<tr>
<td>not stated</td>
<td>27 (10.9)</td>
<td>1 (0.9)</td>
<td>0</td>
</tr>
<tr>
<td>Intention to give blood outside Latin America</td>
<td>206 (26.4)</td>
<td>70 (14.4)</td>
<td>24 (18.5)</td>
</tr>
<tr>
<td>History of organ donation</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intention to give organ</td>
<td>260 (35.4)</td>
<td>149 (30.7)</td>
<td>34 (26.2)</td>
</tr>
</tbody>
</table>

*Five individuals have donated blood in more than one geographical region.

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Acknowledgments

Authors wish to thank Odile Colombel, Tina Mazzocca, Martine Locatelli, Heidi Fowler, Njie, Noulene Tavares and Tatiana Collipal for their valuable help.

References

Health in detention

“The degree of civilization in a society can be judged by entering its prisons”

Fyodor Dostoyevsky, The House of the Dead

Serious crime was found to be strongly related to several indicators of inequality, poverty and/or socioeconomic deprivation, all of which are more frequent in urban settings. An important predictor of high crime rates, particularly concerning property crimes, was the percentage of young males between ages 16 and 29 who were dissatisfied with their income and/or unemployed. It has been postulated that an important challenge for Western European countries in the area of crime prevention is the social and economic integration of young immigrants in urban areas. Detention has a strong influence on the health of urban communities as they 1. Concentrate individuals at high risk of violence and morbidity, 2. Adversely affect employment opportunities for ex-offenders, 3. Disrupt family life and push children into foster care. On the other hand, detention facilities may be an opportunity for promoting healthy behavior, screening, treatment and link vulnerable populations to needed health and social services.

Sociodemographic characteristics

It is important to know the sociodemographic characteristics of correctional facilities because origin is an important determinant of morbidity. In Switzerland’s largest pre-trial prison (Champ-Dollon), 92.8% of the detainees were of foreign origin in 2007 and hundred-fifteen different nationalities were represented. Main regions of origin were Western Europe (28.9%), followed by North Africa and Middle East (27.5%) and Sub-Saharan Africa (20.1%). Mean age was 29.5 years (SD 9.5) and 95% were male. Length of stay was short as 27% stayed less than one week and 78% less than three months in the prison.
General health problems

Detained persons are a vulnerable and underserved population. Prior to imprisonment they frequently have limited access to healthcare due to educational, social and economic disadvantages.\textsuperscript{79,80} Prison has been identified as a substantial opportunity to address the health needs of vulnerable groups. In particular, prison health services aim to reduce inequalities by providing primary care services similar in range and quality to those available in the general community.\textsuperscript{81}

Our study of Swiss detainees in a remand setting was the first to describe the wide range of health problems encountered among detainees in Switzerland.\textsuperscript{78} Illicit drug use (40.2%) and mental health problems (32.6%) were frequent in this mainly migrant population of detainees, but most (57.6%) required treatment for common primary care problems, such as skin (27.0%), infectious disease (23.5%), musculoskeletal (19.2%), injury related (18.3%), digestive (15.0%) or respiratory disorders (14.0%). Until recently Switzerland lacked national comparative data concerning health problems of a primary care nature for the general population. A recent publication provides data from ICPC-2 coded electronic medical records of 24 Swiss GPs concerning 29,398 doctor-patient encounters. The main reasons for the visits were musculoskeletal (21%), circulatory (19%), respiratory (9%) and endocrine, metabolic and nutritional disorders (8%).\textsuperscript{82} Prevalence data in our study were different for most health problems, with the exception of musculoskeletal disorders. This adds value to our findings by highlighting the extent to which primary care services in prison may differ from those provided to the general population. Our findings are consistent with those from Great Britain\textsuperscript{83} and Belgium\textsuperscript{84}, where detainees consulted 3 to 3.8 times more frequently as compared to the age- and sex-adjusted general population. The main ICPC-2 code groups in the Belgium report were the same as we found. Nearly 70% of detainees in our study had consultations with a primary care physician. The increased demand for primary care services in prison can be explained not only by the accumulation of negative social determinants of health which contributes to a high burden of disease, but also by improved access to health care services in prison.\textsuperscript{80,84,85} For many inmates contact with the prison health service is their first opportunity to meet a healthcare professional. Addressing the health needs of detainees through well-coordinated primary care services offers an excellent opportunity to interact with this hard-to-reach vulnerable population.
in the interests of their individual health and of public health overall. Furthermore, these services provide an opportunity for future research to increase epidemiologic knowledge and evaluate preventive actions.

See: “Health problems among detainees in Switzerland: a study using the ICPC-2 classification”\textsuperscript{78}
Health problems among detainees in Switzerland: a study using the ICPC-2 classification

Hans Wolff1*, Paul Sebo2, Dagmar M Haller1, Ariel Eytan3, Gérard Niveau4, Dominique Bertrand1, Laurent Gétaz1 and Bernard Cerutti1

Abstract

**Background:** Little is known about the health status of prisoners in Switzerland. The aim of this study was to provide a detailed description of the health problems presented by detainees in Switzerland’s largest remand prison.

**Methods:** In this retrospective cross-sectional study we reviewed the health records of all detainees leaving Switzerland’s largest remand prison in 2007. The health problems were coded using the International Classification for Primary Care (ICPC-2). Analyses were descriptive, stratified by gender.

**Results:** A total of 2195 health records were reviewed. Mean age was 29.5 years (SD 9.5); 95% were male; 87.8% were migrants. Mean length of stay was 80 days (SD 160). Illicit drug use (40.2%) and mental health problems (32.6%) were frequent, but most of these detainees (57.6%) had more general primary care problems, such as skin (27.0%), infectious diseases (23.5%), musculoskeletal (19.2%), injury related (18.9%), digestive (15.0%) or respiratory problems (14.0%). Furthermore, 7.9% reported exposure to violence during arrest by the police.

**Conclusion:** Morbidity is high in this young, predominantly male population of detainees, in particular in relation to substance abuse. Other health problems more commonly seen in general practice are also frequent. These findings support the further development of coordinated primary care and mental health services within detention centers.

**Keywords:** Primary care prisoners, detainees, jail, ICPC, coding, access to care, prison health care

Background

Prisoners are an underserved and vulnerable population. They frequently have had limited previous access to healthcare due to educational, social and economic disadvantage [1,2]. Prison has been identified as a significant opportunity to address the health needs of vulnerable groups. In particular, prison health services aim to reduce inequalities by providing primary care services that are similar in range and quality to those available in the community [3]. Addiction, psychiatric problems and infectious disease are recognized as important health problems in prison, their extent varies widely from one setting to another [1]. Belgian prisoners have been shown to make substantial use of primary care services during incarceration [4]. In US jails 36.9% of inmates in 2002 reported having a current medical problem but only 42% of them said that they had seen a health care professional about it. The most frequent specific health problems were dental problems (25%), arthritis (13%), followed by hypertension (11%) and asthma (10%). Furthermore, 13% of inmates reported being injured since admission [5].

The frequency and range of health problems encountered in prisons may shape the composition and competence profile of prison health care services. Yet little is known about the primary care needs of detainees in most European countries, and no detailed description is available for Switzerland. The aim of this study was thus to provide a detailed description of the health problems of detainees in Switzerland’s largest remand prison.

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Methods

Setting
In 2007, Switzerland had 115 institutions for 5715 prisoners of whom 29% were in pre-trial detention. This country had an average of 76 prisoners per 100,000 residents, which is one of the lowest rates in the world [6]. Geneva however topped the national statistics with an average of 200 inmates per 100,000 residents [7]. The majority of detainees in Swiss jails were male (93.6%) and of foreign origin (81.4%) [6]. Furthermore, the canton of Geneva has the highest proportion of foreigners (38.3%) among its general resident population [8].

The study took place in Switzerland’s largest remand prison, situated in Geneva and built in 1977. Initially conceived to receive 270 prisoners, this prison is overcrowded with a mean occupation rate of 169% in 2007. At the time the study took place, 10 to 20% of detainees were sentenced prisoners waiting to be transferred to another institution. The medical unit attached to Genova University Hospitals is completely independent of the prison administration. It offers a low-threshold primary care approach to health care and employs 37 health professionals, including general practitioners, nurses, psychiatrists, psychologists and dentists. The facility operates 24 h/day with a nurse present at all times. All detainees admitted to the facility are submitted to a health assessment by primary health care nurses within the first 8 hours of their admission. This evaluation acts as triage to identify any health problems requiring medical attention, such as allergies, injuries, breathing problems, mental health problems including suicidal ideas, addiction, regular medical treatment, suspicion of tuberculosis or allegations of violence during arrest. The nurse evaluation is also an introduction to the facility’s health service. When necessary, nurses refer detainees immediately to a primary care physician. At any time, inmates can ask for a medical consultation and are then addressed to a primary care physician. Referrals to the psychiatric team occur via the primary care physician.

Instrument and design
This retrospective, cross-sectional study assessed the health problems of all detainees leaving the facility between January 1st and December 31st in 2007. All health records (nurse evaluation forms and medical files) were reviewed and coded using the French version of the international classification of primary care, second edition (ICPC-2) [9,10]. This coding is particularly adapted to primary care where complaints do not always lead to a specific diagnosis. The questionnaire (additional file 1) grouped ICPC-2 diagnoses within six categories created to reflect the clinical reality of prison medicine: 1. symptoms without precise diagnosis, 2. substance abuse or self-harm, 3. infections, 4. general internal medicine, 5. psychiatry and 6. injuries.

Daily use of at least one cigarette defined tobacco use. The first three questions of the Alcohol Use Disorders Identification Test (AUDIT) were used to assess alcohol misuse defined as excessive drinking including heavy drinking, binge drinking or both, or alcohol abuse or dependence. The standard 10-item AUDIT [11] has been tested and validated in primary care, but its length precludes its use in jail settings. The derived three-item AUDIT-C has shown good screening performance for alcohol use disorders and risky drinking, and is now considered a reliable alternative to the standard AUDIT score [12,13]. All detainees were asked about illicit substance use during the initial nurse evaluation. Prisoners referred to the primary care physician were systematically screened again for substance use during the first consultation. Active cocaine, respectively heroin use was classified as positive if used during the last 30 days before entering the prison. Previous cocaine, respectively heroin use was recorded if prisoners reported lifetime but no active use. Regular use of cannabis or benzodiazepine (more than once a week, without medical prescription) was recorded if the prisoner reported use during the last 30 days before admission to the prison. Cocaine, heroin and cannabis use were grouped as “illicit drug use”. All detainees were asked about exposure to violence during arrest in the initial nurse evaluation and referred to the primary care physician if such exposure was reported. Socio-demographic data were age, gender, nationality (as a proxy for origin). Length of stay was recorded as it could be correlated with morbidity. Detainees who stay longer in prison have a higher probability of developing health problems and being in contact with health services.

The methodology and the coding instrument were pre-tested over a three-month period (October 2006 to December 2006). Approximately 400 files were analyzed during this pre-test. It allowed improvements to be made to the research procedure. A codebook was established to harmonize the use the ICPC-2 coding system within the research team. All health records were then coded following this procedure. One coder (DB) reviewed all the files and followed strict coding rules established by the research team at the initiation of the study. Coding doubts were discussed and resolved during regular meetings both with another coder in a different detention setting (DMH) and the entire research team. All data were recorded anonymously. Our focus was on somatic health problems and substance abuse. A more detailed description of specific psychiatric health problems are presented in a separate article [14].
Statistical analysis and ethical approval

Descriptive statistics were computed for demographic characteristics. The frequencies of ICPC-2 coded health problems were computed with 95% confidence intervals. Unless specified, we used Chi square tests to explore possible associations between commonly occurring health problems and patient characteristics. Age and sex-adjusted odds ratios for the association between origin and health problems were obtained with logistic regression models. Statistical analyses were done with S-Plus 7.0 Enterprise Developer and SPSS 15.0. The research project was approved by the Ethics Committee of Geneva University Hospitals.

Results

Sociodemographic characteristics

Of 2195 prisoners leaving the prison during 2007, 1510 (68.8%) had a primary care consultation during their stay and 685 (31.2%) only had an initial health assessment by the nurse. Hundred-fifteen different nationalities were represented and 92.8% detainees with at least one medical consultation were of foreign origin. Main regions of origin were Western Europe (28.9%), followed by North Africa and Middle East (27.5%) and Sub-Saharan Africa (20.1%). More details are shown in table 1. Length of stay was short as 27% stayed less than one week and 78% less than three months in the prison.

ICPC coded health problems

Figure 1 describes the ICPC coded health problems identified in 2195 health records. Morbidity was high; both somatic (57.6%) and mental (32.6%) health problems were highly prevalent. There were no gender differences in relation to the percentage of somatic health problems which were observed in female (61.1%; 95%CI 51.9-70.3) and male (57.4%; 95%CI 55.3-59.5) of detainees (p = 0.45). Major somatic health problems were: 1. skin (27.0%), 2. musculoskeletal (19.2%), 3. digestive (15.0%) and 4. respiratory (14.0%) disorders. Somatic disorders were slightly more frequent in those 29 years (median) or older (64% vs. 53%, p < 0.0001). Mean number of identified health problems were 2.4 (SD 1.8). Those who stayed less than 1 month had a mean of 2.0 (SD 1.3), those who stayed 3 to 6 months a mean of 3.2 (SD 2.0) and those who stayed more than 6 months a mean of 4.1 (SD 2.6) identified health problems.

Symptoms or complaints without precise diagnosis

Symptoms or complaints without precise diagnosis, such as insomnia, back pain or feeling anxious, were present in 926 detainees (42.2%). Their prevalence is presented in figure 2 and table 2.

Substance abuse

Substance abuse was frequent and observed in 1562 detainees (71.2%): 61.5% smoked tobacco and 34.8% reported excessive alcohol consumption. Forty percent used at least one illicit drug (heroin, cocaine or cannabis) in the 30 days before admission. Lifetime consumption of cocaine or heroin was 33.8%. All substances were more frequently used by men compared to women (details are presented in figure 3 and table 3).

Infectious diseases

Infectious diseases were found in 23.5%. As shown in figure 4, upper airway infection was the most frequent infection, followed by fungal infections. Hepatitis C infection was found in 5.7% of detainees and among 15.4% (95%CI 12.8-18.0) of those who used either heroin or cocaine on admission. A fifth of Georgians, who also showed high prevalence rates of illicit drug (see below), were infected by HCV (20.8% CI95% 9.3-32.3). Only 0.8% (95%CI 0.4-1.3) of non-users of illicit drugs had hepatitis C infection. Chronic Hepatitis B was identified in 1% and HIV infection in 1% of the inmates.

Health problems grouped as “general internal medicine”

Thirty percent had health problems grouped in this category (figure 5, table 2). Skin problems, such as xerosis with pruritus, acne or eczema were predominant in this group. Asthma was the second most frequent health problem, observed in 3.2% of men and 2.8% of women. Diabetes was identified in 1.3% (CI95% 0.8-18) of male and in no female detainee.

Psychiatric disorders (excluding substance abuse)

Excluding substance abuse, psychiatric problems were found in 15.9% of men and 25% of women (figure 6). Depression was observed more than twice as frequently in women (16.7%) than in men (6.9%). Other frequently observed disorders were personality (5.5%) and adjustment disorders (4.5%).

Exposure to violence and injury

Injuries occurred in 18.3% of detainees and were more than twice as frequent in men (18.8%) compared to women (8.3%) (figure 7). Nearly one in ten detainees alleged being a victim of violence during arrest; 90% of these blaming the police. No significant gender differences were found but alleged exposure to violence by the authorities was more frequently declared by younger inmates (<28 years) compared to older detainees (>28 years) (9.4% vs 6.1%, p = 0.0037).

Self harm (drug overdose, self-mutilation and swallowing of foreign bodies) was observed in 1.9% of women and 4.7% of men. No death occurred in the institution during 2007.
### Table 1 Socio-demographic characteristics of 2195 detainees in a remand prison in Geneva, Switzerland, 2007

<table>
<thead>
<tr>
<th>Variable</th>
<th>Detainees with at least one medical consultation N = 1510</th>
<th>Detainees without medical consultation N = 685</th>
<th>All detainees N = 2195</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years, SD, range)</td>
<td>30.1 (94, 18-82)</td>
<td>28.0 (88, 18-71)*</td>
<td>29.5 (95, 18-82)*</td>
</tr>
<tr>
<td>Sex male (n)</td>
<td>95% (1434)</td>
<td>95% (653)</td>
<td>95% (2087)</td>
</tr>
<tr>
<td>Length of stay in prison (days, SD, range)</td>
<td>98 (179, 1-2635)**</td>
<td>37 (89, 1-1010)*****</td>
<td>80 (160, 1-2635)*****</td>
</tr>
<tr>
<td>Origin (continent and 5 most frequent countries):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Europe§§</td>
<td>27.4% (413)</td>
<td>32.7% (208)</td>
<td>29.9% (621)</td>
</tr>
<tr>
<td>France</td>
<td>8.9% (135)</td>
<td>9.4% (60)</td>
<td>9.1% (195)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>7.7% (116)</td>
<td>8.6% (61)</td>
<td>8.2% (177)</td>
</tr>
<tr>
<td>Italy</td>
<td>2.3% (35)</td>
<td>2.4% (15)</td>
<td>2.3% (50)</td>
</tr>
<tr>
<td>Portugal</td>
<td>2.1% (31)</td>
<td>2.7% (17)</td>
<td>2.2% (46)</td>
</tr>
<tr>
<td>Spain</td>
<td>2.1% (31)</td>
<td>1.1% (7)</td>
<td>1.8% (30)</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>14.6% (221)</td>
<td>22.0% (140)</td>
<td>16.6% (361)</td>
</tr>
<tr>
<td>Albania</td>
<td>5.5% (93)</td>
<td>13.8% (90)</td>
<td>6.0% (171)</td>
</tr>
<tr>
<td>Romania</td>
<td>2.0% (30)</td>
<td>4.6% (29)</td>
<td>2.7% (59)</td>
</tr>
<tr>
<td>Russia</td>
<td>2.7% (40)</td>
<td>0.6% (4)</td>
<td>2.1% (44)</td>
</tr>
<tr>
<td>Kosovo</td>
<td>1.7% (25)</td>
<td>0.9% (6)</td>
<td>1.4% (31)</td>
</tr>
<tr>
<td>ex-Yugoslavia§§</td>
<td>1.6% (22)</td>
<td>1.4% (9)</td>
<td>1.4% (31)</td>
</tr>
<tr>
<td>North Africa and Middle East</td>
<td>30.6% (461)</td>
<td>20.3% (129)</td>
<td>27.5% (590)</td>
</tr>
<tr>
<td>Algeria</td>
<td>15.8% (239)</td>
<td>8.6% (55)</td>
<td>13.7% (294)</td>
</tr>
<tr>
<td>Pales dine</td>
<td>5.8% (88)</td>
<td>3.1% (20)</td>
<td>5.0% (108)</td>
</tr>
<tr>
<td>Iraq</td>
<td>3.6% (55)</td>
<td>2.2% (14)</td>
<td>3.2% (69)</td>
</tr>
<tr>
<td>Morocco</td>
<td>3.6% (54)</td>
<td>1.7% (11)</td>
<td>3.0% (65)</td>
</tr>
<tr>
<td>Turkey</td>
<td>1.7% (26)</td>
<td>2.5% (16)</td>
<td>2.0% (42)</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>20.0% (315)</td>
<td>18.2% (116)</td>
<td>20.1% (442)</td>
</tr>
<tr>
<td>Guinea</td>
<td>5.2% (79)</td>
<td>5.3% (34)</td>
<td>5.2% (112)</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>1.9% (29)</td>
<td>1.6% (10)</td>
<td>1.8% (38)</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>1.5% (23)</td>
<td>1.6% (10)</td>
<td>1.5% (33)</td>
</tr>
<tr>
<td>Congo</td>
<td>1.1% (16)</td>
<td>1.4% (9)</td>
<td>1.2% (25)</td>
</tr>
<tr>
<td>Mali</td>
<td>1.0% (15)</td>
<td>1.3% (8)</td>
<td>1.1% (23)</td>
</tr>
<tr>
<td>Asia</td>
<td>3.8% (57)</td>
<td>2.2% (14)</td>
<td>3.3% (71)</td>
</tr>
<tr>
<td>Georgia</td>
<td>2.7% (41)</td>
<td>1.1% (7)</td>
<td>2.2% (40)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>0.2% (3)</td>
<td>0.5% (1)</td>
<td>0.2% (4)</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.2% (3)</td>
<td>-</td>
<td>0.1% (3)</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>0.1% (2)</td>
<td>-</td>
<td>0.1% (2)</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>0.1% (2)</td>
<td>-</td>
<td>0.1% (2)</td>
</tr>
<tr>
<td>America</td>
<td>2.8% (42)</td>
<td>4.4% (28)</td>
<td>3.3% (70)</td>
</tr>
<tr>
<td>Chile</td>
<td>0.7% (11)</td>
<td>0.6% (4)</td>
<td>0.7% (13)</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.7% (10)</td>
<td>0.8% (5)</td>
<td>0.7% (15)</td>
</tr>
<tr>
<td>Peru</td>
<td>0.2% (4)</td>
<td>0.6% (4)</td>
<td>0.4% (8)</td>
</tr>
<tr>
<td>Colombia</td>
<td>0.1% (2)</td>
<td>0.9% (6)</td>
<td>0.4% (8)</td>
</tr>
<tr>
<td>Jamaica</td>
<td>0.3% (4)</td>
<td>0.2% (1)</td>
<td>0.2% (5)</td>
</tr>
</tbody>
</table>

### Origin-related health problems

Compared to Western Europeans who served as the reference group, sub-Saharan Africans had a higher burden of infectious diseases (OR 1.62, CI95% 1.21-2.17), and detainees from North-Africa/Middle-East more psychiatric problems (OR 1.47, CI95% 1.09-1.98). Other statistical significant differences were observed only for substance abuse related problems: Asians had a higher prevalence of heroin use (OR 2.06, CI95% 1.14-3.73). In particular Georgians had high prevalence rates of illicit drug use (56.2%, CI95% 42.2-70.3). A quarter of them used heroin (27.1%, CI95% 14.5-39.7) and 31.2% cocaine (CI95% 18.1-44.4). Detainees from North-Africa/Middle-East were more likely to use benzodiazepines (OR 1.81; CI95% 1.38-2.37), cocaine (OR 1.5, CI95% 1.13-2.01) and alcohol (OR 1.48; CI95% 1.16-1.87). Lower rates...
Figure 1 ICPC-2 coded health problems in 2195 of detainees in a remand prison in Geneva, Switzerland, 2007.

Figure 2 Symptoms coded without precise diagnosis (42.2%, 95%CI 40.1-44.3)
<table>
<thead>
<tr>
<th>Category (common examples)</th>
<th>Males N = 2087</th>
<th>Females N = 108</th>
<th>All detainees N = 2195</th>
<th>Prevalence data general population</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Symptoms without precise diagnosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insomnia, sleep disturbance</td>
<td>310 (14.9)</td>
<td>16 (19.4)</td>
<td>16 (19.4)</td>
<td>41.6-16.3</td>
</tr>
<tr>
<td>Anxiety, nervousness, irritability, anger</td>
<td>226 (10.8)</td>
<td>21 (6.5)</td>
<td>21 (6.5)</td>
<td>11.3 (9.9-12.6)</td>
</tr>
<tr>
<td>Back pain</td>
<td>154 (7.4)</td>
<td>7 (6.5)</td>
<td>7 (6.5)</td>
<td>5.2-8.8</td>
</tr>
<tr>
<td>Epigastralgia, dyspepsia, pyrosis</td>
<td>96 (4.6)</td>
<td>3 (2.8)</td>
<td>3 (2.8)</td>
<td>3.7-4.4</td>
</tr>
<tr>
<td>Pain (not specified)</td>
<td>89 (4.3)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>4.1-5.3</td>
</tr>
<tr>
<td>B. Infectious diseases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper airways infection</td>
<td>155 (7.4)</td>
<td>13 (12.0)</td>
<td>13 (12.0)</td>
<td>7.7 (6.5-8.8)</td>
</tr>
<tr>
<td>Mycosis (genital excepted)</td>
<td>138 (6.6)</td>
<td>2 (1.8)</td>
<td>2 (1.8)</td>
<td>6.4 (5.7-8.8)</td>
</tr>
<tr>
<td>Folliculitis, Furunculosis</td>
<td>59 (2.8)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>2.7 (2.1-3.4)</td>
</tr>
<tr>
<td>Other prisoner relevant infections:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pediculosis, scabies</td>
<td>19 (0.9)</td>
<td>0 (0.9)</td>
<td>0 (0.9)</td>
<td>0.2 [36]</td>
</tr>
<tr>
<td>Hepatitis B (chronic active)</td>
<td>22 (1.1)</td>
<td>6 (2.5)</td>
<td>6 (2.5)</td>
<td>2.0 (1.1-3.3)</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>118 (5.7)</td>
<td>8 (7.4)</td>
<td>8 (7.4)</td>
<td>1.0 (0.6-1.4)</td>
</tr>
<tr>
<td>HIV, AIDS</td>
<td>19 (0.9)</td>
<td>5 (2.8)</td>
<td>5 (2.8)</td>
<td>0.3 [36]</td>
</tr>
<tr>
<td>Tuberculosis (active)</td>
<td>5 (0.2)</td>
<td>3 (0.2)</td>
<td>3 (0.2)</td>
<td>0.006 [19]</td>
</tr>
<tr>
<td>C. General internal medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xerosis with pruritus</td>
<td>143 (6.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>6.6 (5.7-7.6)</td>
</tr>
<tr>
<td>Asthma</td>
<td>67 (3.2)</td>
<td>3 (2.8)</td>
<td>3 (2.8)</td>
<td>2.5 [25]</td>
</tr>
<tr>
<td>Acne</td>
<td>51 (2.4)</td>
<td>4 (3.7)</td>
<td>4 (3.7)</td>
<td>2.5 (1.9-3.3)</td>
</tr>
<tr>
<td>Eye disease (without conjunctivitis)</td>
<td>54 (2.6)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>2.5 (1.9-3.2)</td>
</tr>
<tr>
<td>Hypertension (arterial)</td>
<td>47 (2.3)</td>
<td>5 (4.6)</td>
<td>5 (4.6)</td>
<td>1.0 (0.7-1.3)</td>
</tr>
<tr>
<td>Allergy</td>
<td>45 (2.2)</td>
<td>5 (2.3)</td>
<td>5 (2.3)</td>
<td>2.5 [7.6]</td>
</tr>
<tr>
<td>Eczema</td>
<td>47 (2.3)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2.2 (1.6-2.9)</td>
</tr>
<tr>
<td>Dyslipidemia, hypercholesterolemia</td>
<td>42 (2.0)</td>
<td>3 (2.8)</td>
<td>3 (2.8)</td>
<td>1.1-6.3 [24]*</td>
</tr>
<tr>
<td>Hemorrhoids</td>
<td>39 (1.9)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>1.0 (1.3-2.4)</td>
</tr>
<tr>
<td>Migraine, tension headache</td>
<td>32 (1.5)</td>
<td>5 (4.6)</td>
<td>5 (4.6)</td>
<td>1.7 (1.1-2.2)</td>
</tr>
<tr>
<td>D. Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alleged victim of violence</td>
<td>166 (8.0)</td>
<td>7 (6.5)</td>
<td>7 (6.5)</td>
<td>7.9 (6.8-9.0)</td>
</tr>
<tr>
<td>Contusion (without skin lesion)</td>
<td>141 (6.8)</td>
<td>7 (6.5)</td>
<td>7 (6.5)</td>
<td>6.7 (5.7-7.8)</td>
</tr>
<tr>
<td>Contusion (with skin lesion)</td>
<td>124 (5.9)</td>
<td>3 (2.8)</td>
<td>3 (2.8)</td>
<td>5.8 (4.8-6.8)</td>
</tr>
<tr>
<td>Sprained ankle</td>
<td>41 (2.0)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>1.9 (1.3-2.5)</td>
</tr>
<tr>
<td>Periarticular lesion</td>
<td>33 (1.6)</td>
<td>0 (0.3)</td>
<td>0 (0.3)</td>
<td>1.5 (1.0-2.0)</td>
</tr>
<tr>
<td>Self harm</td>
<td>98 (4.7)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>1.0 [0.4-4.4]</td>
</tr>
<tr>
<td>During imprisonment</td>
<td>50 (2.4)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>2.3 (1.7-3.0)</td>
</tr>
<tr>
<td>Previous</td>
<td>57 (2.7)</td>
<td>1 (0.9)</td>
<td>1 (0.9)</td>
<td>2.6 (2.0-3.3)</td>
</tr>
</tbody>
</table>

*adults < 49 years
were found for Eastern Europeans for cannabis (OR 0.67; CI95% 0.49-0.92) and alcohol misuse (OR 0.69; CI95% 0.51-0.92).

**Discussion**

This study is the first to detail the wide range of health problems among detainees in a Swiss remand prison. Illicit drug use (40.2%) and mental health problems (32.6%) were frequent in this mainly migrant population, but most of these detainees (57.6%) required care for common primary care problems, such as skin (27.0%), infectious diseases (23.5%), musculoskeletal (19.2%), injury related (18.3%), digestive (15.0%) or respiratory problems (14.0%). Until recently Switzerland lacked national comparative data concerning health problems in primary care. With the advent of electronic medical records this is slowly changing. A recent publication provides data about ICPC-2 coded electronic medical records of 24 Swiss GPs concerning 29'398 doctor-patient encounters. Main reasons for encounter were musculoskeletal (21%), circulatory (19%), respiratory (9%) and endocrine, metabolic and nutritional disorders (8%) [15]. Prevalence data in our study were different for most health problems (with the exception of musculoskeletal disorders). This adds value to our findings in highlighting the extent to which primary care services in prison may differ from those provided to the general population. Our findings are consistent with findings in Britain [16] and Belgium [4], where detainees consulted 3 to 3.8 times more frequently compared to the age- and sex-adjusted general population. Main ICPC-2 code groups in the Belgium study were the same as in ours. Nearly 70% of detainees in our study had consultations with a primary care physician. The high need for primary care services in prison can be explained by the accumulation of negative social determinants of health which contributes to a high burden of disease [2,4,17] but also by improved access to health care services in prison as well as the prison culture. For example, self-medications is usually forbidden in prison. Prisoners therefore have few opportunities to resort to self-care and are more likely to request medical help even for simple complaints [16].

Publications concerning US jail inmates report the following most frequent medical problems: arthritis (13-20%), hypertension (11-21%), asthma (10-24%), heart problems (5.9-11%), hepatitis (2.6-10%) and diabetes (2.7-6.5%) [5,18] Gender differences were observed with higher burden of chronic medical disorders, psychiatric disorders and drug dependence in men compared to women [18]. Our study identified higher burden of psychiatric disorders in women, an equal burden of somatic diseases in men and women.
health problems in both groups and a higher burden of drug dependence in men. Cardiovascular risk factors such as hypertension (3.5%) and diabetes (1.2%) appear to be less frequent in the population involved in our study. As blood pressure was checked among all prisoners during the initial nurse evaluation, measurement bias is unlikely to explain the low proportion of hypertension in our study. In addition, our findings in relation to hypertension and diabetes are well in line with population data in Switzerland, suggesting that, with the exception of tobacco cessation counseling, these detainees may have little need for cardiac or cardiovascular preventive care.

Our study identified prevalence rates ≥10 times those found in the general population for tuberculosis (0.2% vs. 0.006% [19]), HCV infection (5.7% vs. 0.7-1% [20] and heroin use (12.3% vs. 0.7%[21]). Worldwide, TB-notification rates are found to be 14.9 times higher in prisoners compared to civilians, in Western Europe TB-notification rates are 8.1-times higher [22]. The high rates of infectious diseases and particularly of tuberculosis are related to risk factors which aggregate in prison: low socioeconomic status, intravenous drug use, homelessness, lack of access community based health care as well as the origin of high TB-incidence countries [22,23]. Our findings highlight the vulnerability of detainees to TB and other infectious diseases and stress the need for effective screening and containment measures in prison [22]. The frequency of common health problems such as dyslipidemia, back pain, or epigastralgia was well in line with that observed in the general Swiss population [24-26]. Asthma was less frequently reported than in prison settings in the US, UK or Australia [18,23], but in accordance with general population data of Switzerland [27].

Most psychiatric disorders were observed more frequently than in the general population. However, the proportion of detainees with psychiatric disorders was low compared to available data from the literature where prevalence rates of up to 65% for personality disorder (including 47% with antisocial personality) were found [23,28]. Several reasons may explain these findings. First, the health problems were identified by general practitioners and not by specialists. The ICPC-2

<table>
<thead>
<tr>
<th>Category (common examples)</th>
<th>Males N = 2087</th>
<th>Females N = 108</th>
<th>All detainees N = 2195</th>
<th>Prevalence data: General population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>E. Substance abuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance abuse (licit)</td>
<td>1502</td>
<td>72.0 (70.0-73.9)</td>
<td>60</td>
<td>55.6</td>
</tr>
<tr>
<td>Tobacco (active)</td>
<td>1296</td>
<td>62.1 (60.0-64.2)</td>
<td>55</td>
<td>50.9</td>
</tr>
<tr>
<td>Alcohol misuse</td>
<td>750</td>
<td>35.9 (33.9-38.0)</td>
<td>13</td>
<td>12.0</td>
</tr>
<tr>
<td>Benodiazepine</td>
<td>465</td>
<td>22.3 (20.5-24.1)</td>
<td>13</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illicit drug use (active)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannabis</td>
<td>852</td>
<td>40.8 (38.7-42.9)</td>
<td>31</td>
<td>28.7</td>
</tr>
<tr>
<td>Cocaine</td>
<td>605</td>
<td>29.0 (27.0-30.9)</td>
<td>19</td>
<td>17.6</td>
</tr>
<tr>
<td>Cocaine</td>
<td>418</td>
<td>20.0 (18.3-21.7)</td>
<td>10</td>
<td>9.3</td>
</tr>
<tr>
<td>Heroin</td>
<td>255</td>
<td>12.2 (10.8-13.6)</td>
<td>14</td>
<td>13.0</td>
</tr>
<tr>
<td>Illicit drug use (lifetime)</td>
<td>720</td>
<td>34.5 (32.5-36.5)</td>
<td>21</td>
<td>19.4</td>
</tr>
<tr>
<td>Cocaine</td>
<td>673</td>
<td>32.2 (30.2-34.3)</td>
<td>17</td>
<td>15.7</td>
</tr>
<tr>
<td>Heroin</td>
<td>369</td>
<td>17.7 (16.0-19.3)</td>
<td>17</td>
<td>15.7</td>
</tr>
</tbody>
</table>
Figure 4 Health problems coded as infectious diseases (23.5%; 95%CI 21.7-25.3)

Figure 5 Health problems coded as general internal medicine (29.9%; 95%CI 28.0-31.8)
Figure 6 Health problems coded as psychiatry (16.4%; 95%CI 14.8-17.9)

Figure 7 Health problems coded as injuries (18.3%; 95%CI 16.7-19.9)
tool favors the identification of symptoms and complaints where diagnoses are not available and is particularly adapted for ambulatory settings in primary care. Second, we did not systematically use a diagnostic screening interview which explains why certain diagnoses were less prevalent in our study than usually described in the literature. This appears to be particularly true for long lasting problems such as personality disorders compared with acutely symptomatic mental disorders. Third, remand detainees differ from the local Swiss population regarding several socio-demographic characteristics, all of which are relevant for the prevalence, course and outcome of most mental disorders. More specifically, compared with the general Swiss population, detainees included in our study were younger, more often foreign born and with lower socio-economic status. However, in order to allow for a broad comparison, ranges of prevalence mentioned in the DSM-IV [29] for specific disorders are presented in Table 3.

Our findings in relation to the high rates of heroin, cocaine and benzodiazepine use were well in range with those from previous studies, both in the US and in Europe [30-33]. That 40.2% detainees used at least one illicit drug at entry highlights the need for general practitioners (GP) working in detention to be well trained in addiction medicine. Offering adequate care to detainees who suffer from drug addiction is an important priority. It is particularly important to implement harm reduction strategies, such as opioid substitution treatment which has been shown to be a powerful tool to: 1. decrease the level of injecting, 2. prevent the transmission of blood-borne viruses and crime following release as well as recidivism [30,34]. Furthermore, excessive use of alcohol (34.8%) and tobacco (61.5%) requires particular attention. Smoking rates were more than twice as high as in the general population in Switzerland where 32% of men and 23.8% of women smoked in 2007 [35]. Smoking is highly problematic in confined institutions as exposure to passive smoking is almost inevitable for everyone: inmates, prison officers and health professionals.

A challenge for the GP working in prison is continuity of care. Disease management requires good coordination with different health services before and after imprisonment. This is particularly important for medical management of infectious diseases such as hepatitis which is more prevalent in prison compared to the general population [36]. Fifty-six percent of iv drug users in Switzerland are infected with hepatitis C virus (HCV) [37]. Our study identified hepatitis C in 15.4% of those who reported using either heroin or cocaine on admission compared to 0.8% who denied use of illicit drugs. Vescio showed in a meta-analysis that HCV sero-prevalence in prison is closely related to the proportion of iv drug users in prison who are found to have a 24 times higher risk of HCV infection [38]. We identified highest sex- and age-adjusted opiate-consumption rates in Asians. These findings are concordant with international prevalence studies which confirm high rates of opiate and intravenous drug use in Asia. This region represents almost one-quarter of people who inject drugs worldwide [39]. In particular Georgia has one of the highest intravenous drug use rates worldwide (4.2% of 15-64 year olds), compared to Switzerland where 0.65% of 15-64 year olds inject drugs [40]. Georgians in our sample had high prevalence rates of HCV infection which were four times higher than the average (20.8% vs 5.7%). High rates of hepatitis C in this sample, even in the absence of a systematic screening policy, confirm the need to develop such a policy in our setting, and country of origin could serve as a rough decision-making criterion for ordering additional health screening. Impressionism has to be considered as an opportunity to provide medical care and preventive measures to this hard-to-reach population. Furthermore, hepatitis C treatment is proven cost-effective in prison settings [41] but can only be effective if the prison health services and particularly the GP is able to achieve continuity of care.

Following systematic screening upon admission, alleged violence from the authorities was reported by 8% of detainees. Our health service has set-up a system for reporting these alleged violent events to a state ombudsman in order to favor a reduction in unethical behavior in law enforcement state services.

In the absence of systematic screening policies in our institution, the identification of problems such as STI, AIDS, hepatitis and psychiatric illnesses was based on clinical evaluation and/or patient requests for tests. This may have led to underestimations of the frequency of these health problems. Yet, our primary aim was not to provide precise prevalence data but to offer data on frequently encountered health problems in order to inform prison healthcare services development. Even if our findings provide conservative estimates of prevalence rates, they underline the high morbidity in this population in particular in relation to addiction and infectious diseases but also in relation to more common health problems seen in general practice. That all detainees underwent a health evaluation and were systematically referred to the physician when a medical problem was identified adds strength to the notion that, despite its limitations, our study provides a comprehensive picture of the health status of this population.

Another limitation was that data were extracted retrospectively by only one coder, a primary care physician
who had not necessarily been involved in the care of each of the patients. Errors in coding, however, were minimized by setting strict rules for coding at the initiation of the study. Doubts were discussed and resolved in regular meetings with the research team. Finally, we studied a single facility in one country. Thus our findings may not necessarily be generalizable to other detention centers in other countries. Yet we hypothesize that the health profile described here would be comparable in other detention centers where the sociodemographic profile corresponds to that described here. The study population was similar to that of other pre-trial prisons in Switzerland, which are also characterized by high proportions of migrants (81.4%) and males (94%) [6]. Factors contributing to the high rates of incarceration in migrants include high rates of illegal migration throughout Europe, the lower socio-economic status of this group and the fact that they are less likely to be granted a bail sentence. The high proportion of foreigners in Swiss jails underlines the need for culturally-sensitive approaches and non-stigmatizing attitudes towards this vulnerable population.

Strengths of the study include the large sample size including inmates of both genders. Information was gathered on all inmates present in the detention facility over an entire year. The use of the ICPC-2 coding system allowed us to capture the full range of health needs for which these inmates could benefit from primary care services upon admission and during their incarceration.

Conclusions

The wide range of health problems that were identified in this prison population highlights the need for GP working in prison to acquire skills in many domains, including general internal medicine, addiction medicine, psychiatry and language- and culturally-appropriate communication with patients. Prison health services and prison authorities should carefully assess the possibilities for strengthening self-care options in prison in order to reduce the burden of self-limited illnesses on primary care services. For many inmates, contact with the prison health service is their first ever opportunity to meet a health professional. Addressing the health needs of these prisoners through well coordinated psychiatric and primary care services offers an opportunity to reach-out to this hard-to-reach vulnerable population in the interest of their individual health and of public health.

Additional material

Additional file 1: Questionnaire ICPC-2, prison Champ-Dollon, Geneva, Switzerland 2007
Infectious diseases and epidemics

Infectious diseases are frequent in detention settings. Hammet estimated that “during 1997, 20% to 26% of all people living with HIV in the United States, 29% to 43% of all those infected with the hepatitis C virus, and 40% of all those who had tuberculosis disease in that year passed through a correctional facility.”

Our findings highlight the vulnerability of detainees to infectious diseases. These diseases challenge modern social security systems and need to offer access to screening and treatment for all inmates, independent of cost. Effective screening, containment and therapeutic measures in prison provide not only obvious health and safety benefits for inmates, but these measures are also invaluable for prison personnel, facilities, and the community at large.

Tuberculosis, Hepatitis and HIV

In Switzerland, we identified prevalence rates for tuberculosis among detainees at more than ten times those found in the general population (0.2% vs. 0.006%). TB-notification rates are 14.9 times higher worldwide in detainees as compared to the general population, and in Western Europe they are 8.1-times higher. The high rates of infectious diseases, particularly tuberculosis, are related to risk factors which aggregate in prison, including low socioeconomic status, intravenous drug use, homelessness, lack of access to community-based health care, and detainee origin from high TB-incidence countries. High rates among inmates were also found for other infectious diseases such as HCV (5.7%) and HIV (1.0%) compared to the general population in Switzerland (0.7-1% for HCV and 0.3% for HIV).

Chlamydia trachomatis

As previously mentioned, CTI is the most frequently diagnosed STD in both men and women in the Western world. The exact burden of this infection remains unknown as a substantial percentage of CTI is neither diagnosed nor reported. Undiagnosed infections are a real challenge as untreated disease leaves patients at risk of developing complications such as sterility, ectopic pregnancy, inflammatory pelvic disease and orchitis. We found a CTI prevalence of 6.5 % among males and 10% among females in Switzerland’s largest prison, higher than in the general Swiss population (CTI prevalence of 2.8%) but within the range found in corresponding
prison settings in France, the United Kingdom, and the U.S. where the prevalence varied between 3.9% and 21%.94-100

**Chickenpox**

Chickenpox is a highly contagious viral disease with greater complications and higher mortality in adults than in children. Secondary attack rates reach 90% for susceptible household contacts.101 Young adults who grew up in Western Europe have a high protective immunity (97% to 100%).102-104 The high proportion of inmates coming from tropical countries, as well as overcrowding, increases the risk of chickenpox epidemics in prison. High ambient temperatures and humidity in the tropics may inactivate varicella zoster virus (VZV) which might explain a lower incidence in children and a higher susceptibility in adults in these regions.105-107 Outbreaks of chickenpox with deadly complications have been documented in prisons in the U.S., Australia, Scotland and Italy.108-111 Mass media has reported outbreaks of even greater magnitude in prisons in Asia, Africa and Latin America.

The occurrence of an outbreak in Switzerland’s largest prison provided the opportunity to identify susceptibility rates for chickenpox, and found a 6-fold higher susceptibility compared to Swiss or other Western European adults (12.7%).102;112 Furthermore, effective prevention measures were developed including post-exposure vaccination and quarantine of the contacts.

**Measles**

Measles is a highly contagious viral disease with an attack rate in susceptible exposed individuals of 75%.113 Complications are more frequent if the infection occurs during adulthood, leading to serious debilitation and even death.114-117 In 1998 the WHO member states adopted the goal of eradicating measles in Europe by 2010. However measles still persists on this continent despite the intensification of general vaccination campaigns. Switzerland, where the current measles epidemic shows no sign of decline, has one of the poorest immunization coverages and one of the highest annual incidence rates of measles in Europe.118;119

Both environmental and demographic characteristics in confined institutions, particularly prisons, explain the high risk of measles epidemics. Large proportions of inmates are migrants who come from countries where vaccination coverage is low and susceptibility rates are unknown. Moreover, the potential for dissemination is high in overcrowded conditions,120;121 and
outbreaks of measles have been documented in various prisons in Western countries.\textsuperscript{122,123} It is important to identify specific groups at risk for measles and to tailor health information and preventive measures specifically for these individuals.

Our study of measles susceptibility in detention identified a rather low susceptibility level (6\%).\textsuperscript{124} The study suggests that measles vaccination is most efficient if targeted specifically for adult migrants born after 1981 originating from transitional and developing countries outside sub-Saharan Africa.

See: “Chickenpox in a Swiss prison: susceptibility, post-exposure vaccination and control measures”,\textsuperscript{112} “Improvement of measles immunity among migrant populations: lessons learned from a prevalence study in a Swiss prison”\textsuperscript{124} and “Chlamydia trachomatis infection in a Swiss prison: a cross sectional study”\textsuperscript{93}
SHORT COMMUNICATION

Chickenpox in a Swiss prison: Susceptibility, post-exposure vaccination and control measures

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Abstract
After the occurrence of a case of chickenpox in Switzerland’s largest pre-trial prison, protective measures including post-exposure vaccination were implemented, as chickenpox can cause severe complications in adults. Serology for chickenpox was carried out for all contacts of the index case and rapid post-exposure vaccination proposed to all prisoners with a negative history for chickenpox. Susceptibility was found in 14 out of 110 prisoners (12.7%; 95% confidence interval 6.5–18.9). The positive predictive value of a history of chickenpox was 90%. In this predominantly migrant population, susceptibility to chickenpox was approximately 6 times higher than in the general Swiss adult population. Since the attack rate among susceptible household contacts is usually high, preventive measures such as vaccination and quarantine probably allowed containment of the spread of infection.

Introduction
Chickenpox is a highly contagious viral disease with more complications and a higher mortality in adults than in children. Secondary attack rates reach 90% for susceptible household contacts [1]. Young adults who grow up in Western Europe have a high protective immunity (97–100%) [2–4].

The high proportion of inmates coming from tropical countries and overcrowding increase the risk of chickenpox epidemics in prison. High ambient temperatures and humidity in the tropics may inactivate varicella zoster virus (VZV), which could explain the lower incidence in children and higher susceptibility in adults in these regions [5–7]. Outbreaks of chickenpox have been documented in prisons in the USA, Australia, Scotland, and Italy, where the chickenpox-related death of an inmate occurred [8–11]. The mass media have reported outbreaks of even greater magnitude in prisons in Asia, Africa and Latin America.

It is known that vaccination within 3 to 5 days following VZV exposure can decrease both the risk of infection and the occurrence of severe cases, in particular in children [12–15]. We describe here the first control program of rapid post-exposure prophylaxis vaccination in the adult population of a confined institution.

Materials and methods
Setting
This cross-sectional study took place in April 2009 in Geneva, Switzerland’s largest and most overcrowded (184% in 2009) pre-trial prison accommodating 540 prisoners, 243 prison officers and 37 health care workers.

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Exposure definition and contact tracing

Significant exposure was defined as a contact of more than 15 min in the same room or a 5 min face-to-face conversation with a case of chickenpox during the contagious period, beginning 2 days before the onset of the rash until skin lesions are crusted [16]. ‘Close contact’ relates to inmates who have been exposed much longer than the minimum time defining a significant exposure (more than 3 h) and ‘very close contact’ as more than 1 day in the same room.

Serology, vaccination and data collection

Serology testing to detect susceptibility to chickenpox (using the Vidas-BioMérieux Immunoassay) was proposed to all prisoners in contact with the index case. A structured questionnaire was used to collect information concerning socio-demographic characteristics and history of chickenpox. In order to achieve optimum collaboration with the prisoners, we provided culturally-sensitive explanations in 9 different languages. The following vaccination strategy was adopted: without waiting for serological results in order to avoid a lapse of >5 days from exposure, the prisoners with a negative history of chickenpox were all immediately vaccinated. VZV vaccination catch-up was also offered as soon as possible to all other seronegative prisoners (Figure 1). Severe immunosuppression contraindicates VZV vaccination; as the prevalence of HIV in Swiss prisons is generally low, around 1%, we relied on clinical history before proposing vaccination. All inmates were seen at least once 5–10 days after vaccination. Moreover, they had instructions to contact the medical staff if any symptoms appeared. Among prison officers and health professionals, serology and vaccination were performed only in the case of a negative history of chickenpox, since the positive predictive value of a history of chickenpox has been proven excellent in developed countries [17].

Quarantine

All significant contacts without serology-proven protective immunity were quarantined between the 8th day after the first exposure and the 21st day after the last possible contact with the index case, in an individual cell or in the company of prisoners serologically confirmed as immune. Furthermore, seronegative prison officers and health care workers were excluded from the prison during the period of possible incubation.

Ethical considerations and statistical analysis

All inmates gave written consent to study participation. The study was approved by the ethics research committee (CER 09-137). Univariate analyses were used to assess risk factors associated with VZV susceptibility. Chi-square and Fisher’s exact tests were performed to compare proportions for categorical variables (using OpenEpi).

Results

Description of the index case of chickenpox

An inmate sought medical attention 48 h after the beginning of a rash characteristic of chickenpox. He was immediately isolated in a hospital and treated with acyclovir. A positive direct immunofluorescent detection of VZV from vesicle smears confirmed the diagnosis; furthermore, seroconversion (IgM) occurred within 7 days. The index case had been imprisoned 9 days prior to the onset of symptoms. Consequently, since the minimum time of incubation is 10 days, we estimated that he was infected prior to imprisonment. As the infectious period of chickenpox begins 2 days before the rash appears, the index case was considered to have been contagious for 4 days in prison.

Study population

We identified 110 male inmates as contacts of the index case. All were HIV-negative and accepted participation in the study. Mean age was 27 y (standard deviation 7.1 y). African countries and the Balkans were the main regions of origin, whereas a minority of inmates originated in Western Europe, Latin America and Asia (Table 1).

Prevalence of VZV susceptibility

Fourteen out of 110 prisoners (12.7%; 95% confidence interval (CI) 6.5–18.9) had a negative serology and were VZV-susceptible, including 7 susceptible close contacts.

Table 1 shows rates of VZV susceptibility related to different socio-demographic characteristics and self-recall history of chickenpox. The majority of inmates originated from Africa and Eastern Europe; susceptibility rates were 11.5% and 16.2%, respectively. Prisoners of lower socio-economic status (SES) were 3.2 times more susceptible compared to those of higher SES (odds ratio (OR) 3.2, 95% CI 1.2–8.5). Inmates from Eastern Europe with a low level of education were 10.8 times more susceptible
compared to those with a higher level of education (OR 10.8, 95% CI 1.1–101.7).

Among 14 inmates with proven susceptibility by serology, 2 stated during the self-evaluation that they were certain they had already contracted chickenpox. Since 18/20 inmates who gave a past history of chickenpox had positive serological titres for VZV, the positive predictive value (PPV) of a VZV history was 90% (95% CI 70–97%).

Vaccination

Two to 5 days after contact with the index case we offered vaccination (without awaiting serological results) to 78 prisoners with a negative or uncertain history of chickenpox (Figure 1). Four initially refused vaccination, 1 of whom was identified with a negative serology and subsequently accepted vaccination. Twenty other inmates with a positive history of chickenpox were not initially vaccinated, but 2 with a negative serology accepted vaccination. Three inmates asked to be vaccinated despite a positive history of chickenpox and received immunization. Overall, 80 prisoners were vaccinated including all 14 susceptible significant contacts. Nineteen percent of the vaccinated inmates complained of local deltoid pain. Rates of headache, subjective sensation or objective measurement of fever were similar among vaccinated and unvaccinated prisoners. No post-vaccination rash or secondary case of chickenpox was documented.

Among 78 prison officers potentially in contact with the index case, only 8 had a negative history of chickenpox. One of them had a doubtful serology and avoided any contact with prisoners throughout the duration of a potential incubation. Among the 37 members of the medical unit, all had a positive history of chickenpox or a positive serology.

Quarantine

The 14 susceptible inmates agreed to remain in quarantine from day 8 to day 21 after the first and the last contact with the index case, respectively.

Discussion

Overall, 12.7% of the prison population was susceptible to chickenpox, which represents an approximately 6-fold higher susceptibility compared to Swiss or other Western European adults [2]. We found a high susceptibility not only among prisoners native of tropical countries (Africa), but also from Eastern Europe. In tropical countries susceptibility is lower, probably for mainly climatic reasons [5–7]. We found an association between susceptibility and low SES. We also found a statistically significant association between susceptibility and low level of education among Eastern Europeans. In developing and transition countries, susceptibility could be related to living conditions. A lower prevalence of immunity has previously been reported among subjects with lower levels of education and related to SES. This has been attributed mainly to fewer y of exposure to the virus within the educational system [18,19].
Table I. Susceptibility to chickenpox for inmates by socio-demographic characteristics and history of varicella in a pre-trial prison, Geneva, Switzerland, 2009.

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Total n</th>
<th>Susceptible (IgG-negative), n (%)</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>61</td>
<td>7 (11.5%)</td>
<td></td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>37</td>
<td>6 (16.2%)</td>
<td></td>
</tr>
<tr>
<td>Western Europe</td>
<td>8</td>
<td>1 (12.5%)</td>
<td></td>
</tr>
<tr>
<td>South America</td>
<td>3</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td>1</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;28 y</td>
<td>59</td>
<td>8 (13.5%)</td>
<td>1.17 (0.4–3.6)</td>
</tr>
<tr>
<td>≥28 y</td>
<td>51</td>
<td>6 (11.8%)</td>
<td></td>
</tr>
<tr>
<td>History of varicella</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, don’t know</td>
<td>90</td>
<td>12 (13.3%)</td>
<td>1.38 (0.3–9.8)</td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>2 (10%)</td>
<td></td>
</tr>
<tr>
<td>Self-rated socio-economic status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>12</td>
<td>4 (33.3%)</td>
<td>3.2 (1.2–8.5)</td>
</tr>
<tr>
<td>Middle/high</td>
<td>95</td>
<td>10 (10.5%)</td>
<td></td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never attended school/high-school partial</td>
<td>52</td>
<td>10 (19.2%)</td>
<td>3.0 (0.9–10.4)</td>
</tr>
<tr>
<td>High-school completed/university</td>
<td>55</td>
<td>4 (7.3%)</td>
<td></td>
</tr>
<tr>
<td>Level of education among inmates from Eastern Europe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never attended school/high-school partial</td>
<td>13</td>
<td>5 (38.5%)</td>
<td>10.8 (1.1–101.7)</td>
</tr>
<tr>
<td>High-school completed/university</td>
<td>28</td>
<td>1 (3.6%)</td>
<td></td>
</tr>
<tr>
<td>Principal place of living</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>22</td>
<td>5 (22.7%)</td>
<td>2.6 (0.8–8.7)</td>
</tr>
<tr>
<td>Urban</td>
<td>88</td>
<td>9 (10.2%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>110</td>
<td>14 (12.7%)</td>
<td></td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval.

The index case was in prolonged and close contact with several susceptible prisoners. Given the high contagiousness of chickenpox, measures including vaccination and quarantine of the contacts were decided upon. During the 48 h of greatest contagiousness, the index case remained in a small cell with 2 susceptible prisoners and these were considered as household contacts. Consequently, the probability of contracting the disease for each of the 2 inmates was 90%. During an outbreak in an Italian prison, an attack rate of 22% was reported, while preventive measures probably contributed to reducing the spread of infection [11]. This rate fell within the range of secondary attack rates for outbreaks in other institutional settings [20]. Consequently, a transmission risk of at least 22% applies to each of the 12 prisoners exposed to the index case less than 24 h a day. Without preventive measures, the probability of occurrence of at least 1 secondary case was estimated as exceeding 99% (1 − (0.12 × 0.7812)). Therefore it is reasonable to assume that our management was effective, since no secondary case occurred.

Among populations that have grown up in developed countries, the PPV for self-related history of chickenpox is higher than 97.5% and considered as reliable [17]. In our population study, the PPV was lower (90%). In previous studies within populations that have grown up in developing countries, the PPV has been found to be 72–84% [5], and self-related history of chickenpox has also been demonstrated to be unreliable during an outbreak among prisoners in Australia [10]. Therefore, health care workers treating migrants in prisons should consider migrant self-related history of chickenpox as unreliable.

A strength of our study is the ideal acceptance rate of 100% among inmates, which underlines the detainees’ trust in the medical staff who used culturally sensitive tools in order to achieve a high participation rate. Another strength concerns the good collaboration between health workers and the prison management in implementing rapid control measures to prevent a chickenpox outbreak. Limitations of our study relate to the relatively low number of susceptible inmates, which limits the power of the study and did not allow adjusting for possible confounding factors: e.g. the association of seroprevalence with education level and SES may be due to confounding variables such as age and country of origin. Furthermore, the survey was only observational and not randomized; however recruitment bias was probably minor as all the prisoners with significant contact with the index case agreed
to participate. The prisoners included in the study represented a fifth of the prison population; no policy of allocation of cells according to the origin of the prisoner or any other criteria exist. This leads us to believe that the study participants were representative of the prison as a whole.

In conclusion, chickenpox is a major concern in confined institutions characterized by overcrowding and migrant populations. These factors, observed in almost every prison in Europe, increase the spread and severity of infectious diseases such as chickenpox. Since the attack rate among susceptible household contacts is usually high, preventive measures such as vaccination and quarantine must be planned to limit the risk of the spread of chickenpox.

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Declaration of interest: No conflict of interest declared.

References
Improvement of measles immunity among migrant populations: lessons learned from a prevalence study in a Swiss prison

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Summary

BACKGROUND: Measles persists worldwide despite the implementation of general vaccination campaigns. The environmental and demographic characteristics in many prisons increase the risk of measles epidemics. A large proportion of inmates come from countries where immunization coverage is low. We aimed to estimate the susceptibility to measles among prisoners in order to implement preventative measures.

METHODS: Serology screening for measles was carried out among 116 inmates in Switzerland’s largest pre-trial prison. Socio-demographic characteristics were collected through a structured questionnaire. Risk factors for lack of measles immunity were examined.

RESULTS: A total of 7 out of 116 (6%) inmates were not immune to measles. All 17 inmates from sub-Saharan Africa were immune. Considering only people native from regions other than sub-Saharan Africa, 7 of 40 inmates born after 1981 were susceptible (18.5%), whereas none of the 39 inmates born in 1981 or before were susceptible (p = 0.006).

CONCLUSION: Susceptibility to measles was fairly low in this prison population composed mainly of migrants. Living in sub-Saharan Africa during childhood, and birth before 1982 were protective factors associated with the presence of immunity against measles. The heterogeneity of vaccination campaigns in the various regions of the world, particularly in terms of the timing of their introduction and scale of diffusion, explains epidemiological variability. Targeted vaccination in accordance with origin and age would offer excellent herd immunity and would substantially reduce risks of outbreaks as well as costs.

Key words: measles; immunity; vaccination; transients and migrants; prisons

Introduction

Measles is a highly contagious viral disease and the attack rate in susceptible exposed individuals is 75% [1]. Complications are more frequent if infection occurs during adulthood, leading to serious debilitation and even death [2–5]. In 1998, the World Health Organisation’s (WHO) member states adopted the goal of eradicating measles in Europe by 2010. However, measles still persists on this continent despite the intensification of general vaccination campaigns. Switzerland has one of the poorest levels of immunisation coverage and one of the highest annual incidence rates of measles in Europe [6]. The current measles epidemic shows no sign of decline [7]. According to the WHO, target levels of susceptibility have been set for measles elimination in Europe with age group stratification. The target susceptibility for adults is set at 5% [8–10].

In Western Europe, before the beginning of mass vaccination programmes in the late 1960s, large and frequent outbreaks induced a high morbidity during childhood but led to excellent acquired immunity in adult populations. Mass vaccination reduced the amplitude of epidemics, but resulted in non-negligible susceptibility in adulthood since vaccination coverage is incomplete and unvaccinated people mostly remain non-immune. Unvaccinated people also often remain susceptible due to lowered virus circulation after a large-scale vaccination has been introduced [11]. Thus, it is well known that, in Western Europe, people born before 1963 have a high probability of being immune to measles contrary to younger people [7]. According to Cotzias and De Fau, a similar trend exists in developing countries [12, 13]. However, we made the hypothesis that the cut-off date for increased susceptibility to measles is likely to be later than 1963 in developing countries since the implementation of vaccination campaigns started later and was less effective than in Western Europe. The environmental and demographic characteristics in confined institutions, particularly in prisons, explain the high
risk of measles epidemics. Large proportions of inmates are migrants who come from countries where vaccination coverage is low and whose susceptibility rates are unknown. Moreover, the potential for dissemination is high in overcrowded conditions [1, 14] and outbreaks of measles have been documented in various prisons in Western countries [15, 16]. It is important to identify specific groups at risk for measles and to tailor health information and preventative measures specifically for these groups. Catch-up vaccination campaigns among identified groups who are not immunised can dramatically close immunity gaps [17].

We aimed to estimate the susceptibility to measles and its risk factors among inmates in the largest Swiss pre-trial prison in order to estimate the risk of measles outbreaks and develop policies and guidelines for health services in prisons.

Methods

Setting
This cross-sectional study took place in April 2009 in Geneva, where Switzerland’s largest and most overcrowded (184% in 2009) pre-trial prison accommodates 540 prisoners, 243 prison officers and 37 health care workers.

Data collection and statistical analysis
In April 2009, the opportunity to investigate the susceptibility to measles was taken when all prisoners in contact with an index case of chickenpox, regardless of their origin or other criteria, had a blood test [18]. Measles IgG antibody titers were measured by enzyme-linked fluorescent assay (Vidas, BioMèrieux). A structured questionnaire was used to collect self-reported information on socio-demographic characteristics (nationality, place of main schooling, year of arrival on the Western European Continent / in Switzerland) and questions related to history of measles and vaccination (Have you ever been infected by measles? Are you vaccinated against measles?). No vaccination card was available to ascertain immunisation status.

All inmates gave written consent. The study was approved by the ethical research committee (CER 09-137) of the University Hospitals of Geneva. Univariate analyses were used to assess risk factors associated with measles-susceptibility. Risk factors and confounders were established a priori. For age, the cut-off year (1981) corresponded to the start of widespread mass vaccination campaigns in various regions of the world (e.g. Balkans, North Africa). For sub-Saharan Africans, this cut-off was not adopted as large-scale vaccination campaigns were generally ineffective until the turn of the 21st century in their origin country. Categorical variables were statistically compared with chi-square test or Fisher’s exact test, where appropriate (using OpenEpi, version 2.3). In order to investigate the hypothesis postulating that people from sub-Saharan Africa, as well as older people from other regions have higher acquired immunity to measles, one-tailed tests were used. The presented 95% intervals for proportion are the so-called exact (Clopper-Pearson) confidence interval (CI) calculation (Stata release 11, College Station, TX). A multivariate analysis was not feasible given the seroprevalence of 100% among those born before 1981, regardless of origin. We therefore proposed a stratified analysis according to age.

Results

Study population
We identified 116 male inmates who had been in contact with the index case of chickenpox. All consented to participate in the study. As shown in table 1, median age was 27 years (range 20-57) and emigration from their country of origin occurred on average 6 years before incarceration (range 0-23). Africa and the Balkans were the main regions of origin, whereas a minority of inmates originated in Western Europe, Latin America or Asia.

Prevalence of measles susceptibility
This cross-sectional prevalence study identified a negative serology, hence a susceptibility to measles, for 7 out of 116 prisoners (6.1% CI95% 2.5-12.0). All 37 inmates from sub-Saharan Africa were immune (CI95% 0-9.5) (table 2). Considering only people native from regions other than sub-Saharan Africa, 7 out of 40 inmates (18.5%, CI95% 7.3-32.8%) born after 1981 were susceptible, whereas none of the 39 inmates born in 1981 or before (CI95% 0-9.0%) were susceptible, which is a statistically significant difference (p = 0.006) (table 3). Susceptibility by origin was also significant when considering people from all regions (p = 0.034). The proportion of young people (born after 1981) was higher among inmates from sub-Saharan Africa (62%) than from other regions (51%). If age were a confounding factor, we would expect seroprevalence to be lower (not higher as was observed) in the sub-Saharan group (table 2).

All 17 inmates who reported a history of measles vaccination and all 13 with a positive self reported history of measles were immune. Seven responded positively to both questions. The positive predictive value (PPV) of these two questions was 100%.

Figure 1
Flowchart: measles susceptibility according to origin and age in a pre-trial prison, 2009, Geneva, Switzerland.
Cost estimates according to the criteria of vaccination

A total of 46% of the prisoners were born before 1982 and only 3% before 1964. 32% were of sub-Saharan Africa origin. None had proof of vaccination (vaccination card). Swiss recommendations advocate 2 doses of vaccine for every person born after 1963, in the absence of proof of vaccination. Therefore, according to the Swiss immunisation guidelines, 97% of inmates should be vaccinated at entry. If detainees from countries outside Western Europe born before 1982 and all prisoners from sub-Saharan Africa were considered sufficiently immune against measles, only 35% of inmates would need measles immunisation (fig. 1). In our prison, for example, this 62% reduction of vaccinations for 3000 prisoners yearly would imply annual cost savings of 72'000 Euros.

Discussion

This is the first study of measles susceptibility in a prison setting and amongst adult migrants in Switzerland. In this rather young and cosmopolitan prison population, susceptibility to measles was fairly low (6%). In our study, inmates susceptible to measles were only found among people born after 1981 and originating from regions other than sub-Saharan Africa. These results are coherent with the expected impact of vaccination campaigns according to the region of the world [19-24] and with the susceptibility observed among adult migrants in Canada [25].

Measles epidemiology varies greatly throughout the world. The origin of a person is an important factor to consider in institutions such as prisons where the majority of inmates come from countries outside of Western Europe. Depending on the region of the world, we can expect differences among age groups due to heterogeneity in the implementation of vaccination campaigns, particularly in terms of the timing of introduction and the level of vaccine uptake.

In the Balkans, vaccination campaigns against measles were implemented in the early 1970s. Although, vaccination coverage rates were below 90% for the first dose of measles in ex-Yugoslavia until the mid-1980s [19]. In this region, epidemics have virtually disappeared, giving way in recent years to a few resurgence within Rom populations whose vaccination coverage was low [19, 20].

In Northern Africa, large-scale measles vaccination campaigns started in the 1980s. In 1990, the immunisation coverage rate was 84% according to United Nations data [21]. This corroborates our findings: 16% and 21% of young adults from the Balkans and from Northern Africa, respectively, were susceptible whereas all older adults native from these regions were immune.

In our study, all people from sub-Saharan African countries were immune against measles. This reflects the fact that in most of these countries, large-scale vaccination campaigns were generally ineffective until the turn of the 21st century [22]. Poor vaccination coverage throughout the past century resulted in large-scale epidemics. Almost everyone was infected in childhood and thus acquired im-

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Table 1: Sociodemographic characteristics of 116 inmates in a pre-trial prison, 2009. Geneva, Switzerland.

<table>
<thead>
<tr>
<th>Factors</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>116 (100%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>28.4 (7.1)</td>
</tr>
<tr>
<td>Region of origin</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>37 (31.9%)</td>
</tr>
<tr>
<td>Balkans and Eastern Europe</td>
<td>42 (36.2%)</td>
</tr>
<tr>
<td>North Africa</td>
<td>25 (21.6%)</td>
</tr>
<tr>
<td>Western Europe (including 3 Swiss nationals)</td>
<td>8 (6.9%)</td>
</tr>
<tr>
<td>South America</td>
<td>3 (2.6%)</td>
</tr>
<tr>
<td>Asia</td>
<td>1 (0.9%)</td>
</tr>
<tr>
<td>* includes inmates originating outside Western Europe</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Inmates’ susceptibility to measles by origin. Unstratified analysis according to age in a pre-trial prison, 2009. Geneva, Switzerland.

<table>
<thead>
<tr>
<th>Origin</th>
<th>Born in or before 1981</th>
<th>Born after 1981</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>14</td>
<td>0</td>
<td>0.034</td>
</tr>
<tr>
<td>Other regions</td>
<td>50</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Inmates’ susceptibility to measles by age among inmates not native to sub-Saharan Africa in a pre-trial prison, 2009. Geneva, Switzerland.

<table>
<thead>
<tr>
<th>Age</th>
<th>IgG+ n</th>
<th>IgG- n (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in or before 1981</td>
<td>39</td>
<td>0</td>
<td>0.006</td>
</tr>
<tr>
<td>Born after 1981</td>
<td>33</td>
<td>7 (18.5%)</td>
<td></td>
</tr>
</tbody>
</table>

---

*Includes inmates originating outside Western Europe
munity. However, changes might be coming: in 2001, the countries of the WHO African Region took part in a global initiative aimed at reducing the number of measles deaths. Between 2001 and 2008, the estimated coverage for the first dose of measles vaccine increased from 57% to 73%. Concomitantly, the number of reported measles cases decreased by 93% [22]. Currently, all adult sub-Saharan African populations generally have excellent immunity regardless of age. However, even if the vaccination campaigns currently ongoing in sub-Saharan Africa continue to be effective, susceptibility to measles will probably paradoxically increase from 2020 onwards among unvaccinated, less exposed young adults.

Only few inmates in our prison were from Latin America or Asian countries. According to the analysis of the implementation of vaccination campaigns in these regions [23, 24], susceptibility among South American adult migrants is expected to be comparable to Northern African or Eastern European populations, and among Asians there is quite a similar situation to sub-Saharan Africans migrants. Studies estimating the susceptibility to measles amongst adults in developing and transitional countries are scarce and incomplete. Only one study has investigated this parameter among immigrants. In a study on migrants and refugees in Canada. Greenwood reported heterogeneity depending on the regions of origin. For example, a significant difference of susceptibility was noticed between adults from the Balkans and Eastern Europe compared to adults from sub-Saharan Africa (9% versus 1%) [23].

We identified that all individuals who stated they had been vaccinated and/or had bad measles were seropositive (PPV 100%). Nevertheless, recall bias has to be considered. The literature reports conflicting results: some studies suggest a positive correlation between history and seroprotection [26], while other studies report a lack of reliability for this information [27–29]. To our knowledge, no previous studies have evaluated this topic in prison settings. Confirmation of our observations would possibly further improve the targeting of susceptible populations. A strength of this study is the ideal participation rate of 100% and the fact that an important health issue was investigated in an underserved population. Limitations relate to the sample size, which limits the power of the study, in particular the data concerning self-reported history of disease and vaccination. In addition, a multivariate analysis was not feasible because of seroprevalence of 100% in some subgroups. Nevertheless, our results were reinforced by a stratified analysis and are consistent with relevant data documented in the literature, particularly amongst migrants and refugees in Canada. This study consisted entirely of male participants. Results can therefore not be readily applied to females. Additionally, we studied a single facility in one country. Thus our findings may not necessarily be generalisable to other detention centres in other countries.

Yet we hypothesise that the immunity profile described here would be comparable to other detention centres where the sociodemographic profile corresponds to that described here. The study population was similar to that of other pre-trial prisons in Switzerland, which are also characterised by high proportions of migrants (81.4%) and males (94%) [30]. Another limitation relates to the study design, as this was a convenience sample and not a random sample. Country of origin or age would not be possible to randomise, so the observational versus randomised statement is less relevant than the sampling method. Recruitment bias was probably minor as the prisoners included in the study concerned an entire section of the prison and represented one fifth of the prison population. Furthermore, all agreed to participate and no policy of attribution of cells according to the origin of the inmates or any other criterion exists. Although the representativeness is not guaranteed for all Swiss prisons, the discussed reasons lead us to believe that this convenience sample was representative for the largest pre-trial prison in Switzerland.

Conclusion

Epidemiologic heterogeneity enables targeted measles vaccinations of people according to their region of origin and their age, particularly amongst migrant adults in confined institutions whose characteristics differ from the general population. This allows vaccination efforts to be focused on individuals with the highest risk in order to achieve optimal herd immunity, to reduce the risk of measles outbreaks and lower vaccination costs. Our case study of a Swiss prison suggests that measles vaccinations must be targeted specifically on adult migrants born after 1981 originating from transitional and developing countries outside sub-Saharan Africa. This is the current reality and will evolve in the future: for example from 2020, a catch-up vaccination should be proposed to young unvaccinated sub-Saharan African adults. Large-scale immunisation campaigns were initiated in 2001 in their home country and unvaccinated people often remain susceptible due to a lowered virus circulation after vaccination is introduced. This is the only data available in Switzerland concerning measles immunity among inmates. Data collection should be repeated and confirmed in larger studies with broader prison populations, including post-trial prisons. Standard guidelines continue to apply to all Western Europeans born after 1963. Strategies to update vaccination programmes for foreign-born adults must be developed. Efforts to improve immunity rates within the migrant populations not only limit the risk of outbreaks within closed institutions, but also help in protecting the community outside the prison.

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Chlamydia trachomatis infection in a Swiss prison: a cross sectional study

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Summary

BACKGROUND: Chlamydia trachomatis infection (CTI) is the most frequent sexually transmitted infection in Switzerland and its prevalence in correctional settings is currently unknown. The aim of this study was to determine the prevalence of CTI and associated risk factors in a population of inmates aged 18–35 years.

METHODS: Inmates attending the health care unit of the largest Swiss remand prison from June 2008 to May 2009 were invited to participate in this cross-sectional study. All participants completed a questionnaire and provided a void-urine specimen for CTI testing based on a PCR assay. Univariate and multivariate logistic regression analyses were used to assess risk factors associated with CTI.

RESULTS: 214 male and 20 female inmates agreed to participate. Overall CTI prevalence was 6.5% in men (95% CI 3.2; 9.9) and 10% (95%CI 0; 23.1) in women. None of the following possible risk factors analysed were significantly correlated to CTI: age, origin, education, religion, number of sexual partners, iv drug use, subjective health status and uro-genital symptoms.

CONCLUSION: CTI prevalence in the largest Swiss prison was two to six times higher than in the general population but similar to other European prison settings. This result should raise our awareness that this population is at particularly high risk for sexually transmitted infections and motivate a widespread surveillance of prison CT prevalence. We hesitate to consider systematic screening because evidence is still lacking in relation to the benefits of screening in males. Local cost effectiveness studies would highly contribute to a correct decision concerning implementation of screening.

Key words: Chlamydia trachomatis infection; jail; prison; risk factors; prevalence; STI

Introduction

Chlamydia trachomatis infection (CTI) is the most frequently diagnosed bacterial agent of sexually transmitted infections (STI) in both men and women in the Western world. The exact burden of this infection remains unknown as an important proportion of CTI is not diagnosed and reported [1]. Undiagnosed infections are a real challenge as untreated disease leaves patients at risk of developing complications such as sterility, ectopic pregnancy, inflammatory pelvic disease and orchitis.

In the USA, CTI prevalence in the general population ranges between 1 and 10.3% [2–4]. Similar results are found in the UK [5]. In Switzerland, there are no population studies on CTI prevalence. CTI reporting is mandatory and recent data show an increasing incidence [6]. Abraha reported that CTI notification in Geneva had increased by 46% between 1999 and 2004 [7]. Studies in specific populations found a 2.8% prevalence in sexually active women in 1998 and of 1.3% among Swiss army recruits (18–26 years old) [8].

In correctional settings in the USA, CTI prevalence rates were shown to be as high as 21% among females under 25 years of age and 18% in African-American males [9, 10]. Nevertheless, prevalence varies widely (as in the general population), with rates below 4% in a study including inmates 18–35 years [11]. To the best of our knowledge, no data exists to describe the situation in Swiss prisons.

The risk of acquiring CTI is associated with socio-demographic and behavioural factors. Studies have shown that being non-white and having a lower educational level significantly increased the risk of CTI [12–15]. Women under the age of 25, non-white individuals and people with new or multiple sex partners are considered at increased risk in the USA [2]. Risk of infection is more likely in individuals who have had their last medical visit more than

Chlamydia trachomatis infection in a Swiss prison: a cross sectional study

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6 months ago [16]. Inmates are considered as a population with increased risk for many infectious diseases in relation to health compromising behaviours (no condom use, multiple sex partners, iv drug use, unstable partnership due to incarceration) and proximity related to incarceration [17, 18].

On the basis of studies showing a significant reduction in poor health outcomes following treatment of Chlamydia trachomatis (CT) positive cases, American and British recommendations favour screening of all asymptomatic sexually active or pregnant women at increased risk [19, 20]. Data are lacking to provide evidence based recommendations for males [2]. Though, specific data examining impact of screening for CT in jail found a decline in infection incidence in the female community surrounding jails where screening was organised [21].

The aim of this study was to measure the prevalence of CTI and to assess associated risk factors in a representative sample of inmates from Switzerland’s largest prison in Geneva in order to inform the need for screening programmes in correctional settings in the future.

Methods

Setting
This cross-sectional study took place in Switzerland’s largest remand prison in Geneva. Approximately 2400 men and 200 women are admitted to this facility each year (occupancy rate 169% in 2008). At the time the study took place, between 10 to 20% of inmates were sentenced prisoners waiting to be transferred to another institution. The medical unit is affiliated with the Geneva University Hospitals and independent from the prison administration. It offers a low threshold primary care approach to health care and is composed of general practitioners, nurses, psychiatrists, psychologists and dentists. All detainees admitted to the facility are submitted to a health care assessment by primary health care nurses within 12 hours of their admission. This evaluation acts as triage. Any identified health problem will be referred as soon as needed to the attending physicians. The medical team is available 24h a day, 7 days a week for emergencies. Prisoners can obtain a medical consultation at any time during their incarceration via letters, social service or prison administration within the regular opening hours of the medical consultation (8h-17h).

Participants and procedure
Prisoners attending the Medical Care Unit between June 2008 and May 2009 were invited to participate. To ensure that clinical priorities could maintain precedence over the study, recruitment times varied according to the availability of medical staff. All study subjects were recruited during the regular consultation times (8h to 17h).

Following informed consent, participants completed a questionnaire and provided a first-void urine sample. Inclusion criteria were capacity for providing formal consent and age between 18 and 35 years. This age range permitted the inclusion of approximately 85% of inmates as the average age in this facility is 29 years. Exclusion criteria were absence of legal competency or inability to understand French, English, Spanish, Arabic, Russian or Albanian. Questionnaires were available in the above mentioned languages and translated by professional translators. A general practitioner was present to help inmates to complete the questionnaire in case of illiteracy. The questions covered the following themes: sociodemographic factors, subjective health status, previous STI, antibiotic use during last three months, urogenital symptoms during preceding week, iv drug use.

Chlamydia testing and treatment
Real-time PCR detection for CTI was performed with the Abbott CT-NG reagents on a m2000 platform (Abbott Molecular Diagnostics, Des Plaines, IL). This assay is designed to detect the cryptic plasmid of C. trachomatis; the interpretation of the results was made according to the CE (European Conformity) package insert. Positive cases were offered antibiotic treatment within the medical unit (single dose of azithromycin 1 gram orally).

Sample size calculation
From previous publications, we estimated a likely prevalence of CTI no higher than 10% in men and 15% in women [9–11]. To measure such prevalence rates with a standard error no larger than 3%, we calculated that a sample size of 142 men and 100 women would be necessary.

A reorganisation of the prison drastically reduced the number of female detainees admitted since September 2008. Thus, our target population of women could not be reached within the time frame of the study. In compensation, we decided to increase the sample size of men to be included in the study in order to provide more precise prevalence estimates for males.

Statistical analysis
In order to investigate the relationship between CTI and possible predictive factors, we first used 2x2 tables and performed Chi-square and Fisher’s exact tests to compare proportions for categorical variables and unpaired Student’s t-tests to compare means for continuous variables. Multivariate logistic regression analyses were then used to explore the association of risk factors associated with CTI, adjusting for age, sex. The level of statistical significance was set at p <0.05. All analyses were performed using SPSS for Windows (version 15.0). Missing data for each variable are mentioned in the tables.

Ethical considerations
All inmates gave written informed consent. The study was approved by the ethical research committee of the Geneva University Hospitals (no 08-063).

Results
Of 292 detainees invited to participate in the study, 37 (54 men) declined (12.7%) and 255 agreed (87.3%), among whom 21 (18 men) did not complete the questionnaire or did not provide a urine sample despite giving consent. Finally, 234 (80.1% of invited participants) inmates were included in the study. Those who declined participation or
did not complete the data were similar to participants in terms of age, sex and origin.

**Socio-demographic characteristics**

214 men (91.5%) and 20 women (8.5%) participated in the study. Mean age was 26.4 years (SD 4.6, range 18–35). The majority (94.9%) was non-Swiss (31.5% Europeans, 49.5% Africans and 15.3% Asians, mainly from Cameroun and 3.0% Americans). 35.7% had a primary school or lower educational level, 31.9% had been living less than one year in Switzerland and 63.3% 3 years or less in Switzerland or another European country.

No socio-demographic differences were found between CTI positive and CTI negative individuals.

**Health related aspects**

Self-rated health status was declared poor or very poor by 19.7% of study subjects, good by 51.1% and very good or excellent by 29.2%. 6.4% had had an antibiotic treatment during the previous three months. At time of screening, 32.5% had any type of low abdominal or uro-genital complaints. 14.6% were active or former iv drug-users. We found no differences between infected and non infected participants.

**Chlamydia trachomatis infection (CTI)**

CTI was found in 14 of 214 males (prevalence 6.5%, 95% CI 3.2–9.9) and in 2 of 20 females (10%, 95% CI 0–23.1). Table 1 shows the relationship between participant characteristics and risk of CTI. None of these factors were significantly associated with an increased CTI risk. When selecting male inmates, no significant statistical difference in CTI prevalence was observed among those 18–26 years compared those older than 26 (7.4% vs. 5.7%, p = 0.60).

**Clinical follow-up**

All patients with CTI received antibiotic treatment. No treatment side-effects were reported.

**Discussion**

This study shows a CTI prevalence of 6.5% among males and 10% among females in Switzerland’s largest prison. This result is within the range of those found in corresponding prison settings in France, UK and USA where the prevalence measured varied between 3.9% and 21% [9–11, 22–28].

The prevalence of CTI was comparable with those previously reported in the general population of persons under age 35 in Western countries, where prevalences between 1 and 10% were found [1, 2, 4, 5, 8, 19]. A recent study among male Swiss army recruits aged 18–26 years found a prevalence of 1.2%. Among this group, those living in urban settings had a higher prevalence of CTI (2.9%) [6]. Comparing our results to the latter study, inmates has a six fold risk of being infected.

Our study did not find significant socio-demographic, behavioural and symptomatic differences between subjects with and without CTI confirming previous observations made in a similar settings in France but contrasts with studies in the general population [22, 29–31]. The size of the sample might have been too small to identify significant risk factors. However, we believe that it is more probably that this highly selected population shares different and more powerful risk factors. Being imprisoned and being a recently immigrated migrant (most probably associated with a new partnership) might be a decisive element. This hypothesis is also suggested by Buffardi, who points out that socio-economic conditions such as housing insecurity and being arrested are most consistently associated with exposure to a high risk environment [32]. Little access to care may be another common denominator in this popu-

<table>
<thead>
<tr>
<th>Table 1: Frequencies of potential risk factors and unadjusted and adjusted odds ratios (OR) of Chlamydia trachomatis infection (CTI) in a prison setting, Geneva, Switzerland, 2008.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of Chlamydia trachomatis infection (CTI) n (%)</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>≤25 years</td>
</tr>
<tr>
<td>&gt;25 years</td>
</tr>
<tr>
<td>9/133 (6.7)</td>
</tr>
<tr>
<td>7/131 (5.3)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1.7 (0.6–4.8)</td>
</tr>
</tbody>
</table>

* Adjustment for age and sex; adjusted results were similar to unadjusted (not shown)
lation, which includes a high proportion of undocumented migrants without insurance coverage [16].

Unilateral or abdominal complaints were reported by 32.5% of the subjects. On the other hand, 46.2% of infected subjects did not have any symptoms. Screening symptomatic individuals only would have missed 6 out of 13. Therefore, and in contradiction with previous reports, symptom-based screening would not be efficient in this custodial setting [3, 24, 33].

Our study is important because it presents the first CTI prevalence data in a sample of inmates of a Swiss prison. The high participation rate, despite the fact that the topic is sensitive, shows that research in a prison setting is possible, even if it remains difficult. Culturally sensitive approaches and non-stigmatising attitudes favoured acceptance and participation in the study. Similar strategies have already been shown to be efficient elsewhere and should be promoted [31].

In light of the small sample of CTI positive prisoners our study had limited power in regard to the identification of risk factors. Estimates for women were imprecise due to the small sample size. Another limitation concerns the validity of the answers in relation to sensitive topics such as sexual behaviour. As patients with low literacy levels could not complete the questionnaire confidentially (the questions were read out to them) this may have biased their responses to sensitive questions. Nevertheless, when comparing inmates who accepted with those who declined no difference could be detected concerning age, sex and origin. When comparing our sample with the total population of our custodial setting, we can consider our sample as representative in terms of age, sex and origin [35].

We can consider our group at risk and as a reservoir for CTI. Should we screen them? We would expect an individual benefit as prison offers access to health care in an otherwise deprived population. An ecological study examining impact of screening men for CT in jail found a decline of incidence in the female community surrounding jails where screening was organised [21]. Therefore we support a large access to high quality curative and preventive care during the incarceration. Although it would be difficult to manage community benefit of systematic screening in such mobile community (mainly undocumented migrants) where follow up of cases would be very difficult. Cost effectiveness is another important point to be examined before implementing a screening. Some studies in US jails found screening of males <30 years old to be cost effective if partners could be notified, but this result was not reproduced elsewhere [36, 37]. Precise data should be determined regarding the local cost and prevalence in order to make a correct decision.

Conclusions

In our setting, we found a prevalence of 6.5% of CTI among male inmates, which is two- to six-fold higher than in the general Swiss population but similar to other European prison settings. This result should raise our awareness that this population is at particular risk for sexually transmitted infections and motivate a widespread surveillance of prison CT prevalence. We hesitate to consider systematic screening because evidence is still lacking in relation to the benefits of screening in males. Local cost effectiveness studies would highly contribute to correct decision making concerning the implementation of screening.

The authors would like to thank the medical and nurses’ teams from Chalm-Dellon’s medical unit for their active collaboration in collecting data as well as Carmen Ruffinno and Michiel Kossovsky for help with the database.

Funding / potential competing interests

No funding, no competing interests.

References


Adolescent health

Adolescents in detention often had limited prior access to healthcare due to social and economic disadvantages, family dysfunction, educational dropout, and lack of appropriate support in the early years of life. Adolescents suffer greater morbidity and mortality than their peers. Approximately 60% of adolescent males and 75% of adolescent females in detention suffer from one or several mental disorders, as compared to an average of 20% of adolescents in the general population. Tobacco, alcohol, cannabis and other substance abuse are common, with 35% to 50% of detained adolescents presenting a substance related disorder. Approximately 10% of girls entering detention facilities are pregnant and the prevalence of CTI in detained adolescents has been reported as high as 10% in males and 22% in females (compared to 1%-3% in the general community). The latter finding is in contrast with reports from the Geneva adolescent detention facility where CTI was found in only 2% of adolescent detainees. A large survey from that same facility detailed the wide range of health problems for which adolescents received primary care services. In addition to the frequent health issues found among young offenders such as mental illness, substance abuse and STD, most of these adolescent detainees required care for more generic primary care problems, including respiratory, digestive and skin disorders. Indeed these adolescents needed as much care for somatic health problems as they did for mental health disorders. These findings highlight the importance of providing comprehensive primary care health services to adolescents in detention.

See: “Chlamydia trachomatis infection in males in a juvenile detention facility in Switzerland” and “Health problems for which Primary care services are provided to adolescents in juvenile detention centres: A study using ICPC-2 in Switzerland”
Chlamydia trachomatis infection in males in a juvenile detention facility in Switzerland

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Summary

QUESTIONs UNDER STUDY: Young offenders represent a group for which Chlamydia trachomatis infection screening is recommended in the US. In the absence of local epidemiological data it is difficult to assess whether such recommendations apply to the Swiss context. Our aim was to obtain local prevalence data for Chlamydia trachomatis infection among young male offenders as a basis for screening strategies in Swiss juvenile detention centres.

METHODS: This cross-sectional study was conducted in a juvenile detention facility in Geneva, Switzerland. Adolescent males aged 15–18 years admitted to the detention facility were invited to participate during a consultation with a nurse conducted within 48 hours of admission. Participants were asked to provide a first void urine sample for PCR detection of Chlamydia trachomatis infection and to complete a questionnaire on reproductive health behaviours.

RESULTS: 72 males were considered for participation in the study. 13 were excluded (mainly due to the language barrier or a shorter than 3 days’ stay in the facility) and 9 (15%) declined participation. Not being sexually active was the most common reason for declining participation. Most participants originated from Switzerland or the European Union and 68% reported having ≥2 sexual partners in the past year. Only one participant (18 years, asymptomatic) had Chlamydia trachomatis infection (2%; 95% CI: 0.4–6%).

CONCLUSIONS: This study does not support screening for Chlamydia trachomatis among young offenders admitted to detention centres in Switzerland. Studies in other European detention centres should document the extent to which our findings are generalisable to the European context.

Key words: Chlamydia trachomatis; screening; prison; adolescent; young offenders

Introduction

With an estimated 92 million new cases a year, Chlamydia trachomatis infections (CTI) are the most common sexually transmitted bacterial infections in the world [1]. These infections can be the cause of severe reproductive health morbidity including pelvic inflammatory disease, chronic pelvic pain and tubal factor infertility [2]. They may also be a cause of male infertility [3]. They can easily be treated with a single dose of antibiotics, but often go undetected as they are frequently asymptomatic [2]. As a consequence, systematic screening has been recommended in high-risk groups. These include sexually active adolescents, in particular females, in whom the prevalence of CTI has been shown to be particularly high (8–29%) [4].

Epidemiological studies in the US indicate that with a prevalence ranging between 5.9 and 14.4% young male offenders are also particularly at risk [5–7]. Screening adolescent males on admission to detention has been shown to be cost-effective in the US and has therefore been recommended [8]. Data suggest that CTI are also common in high-risk populations and young offenders in Australia and the UK [9, 10]. In contrast, a study conducted 10 years ago in juvenile educational centres in Quebec showed a much lower prevalence of CTI among males (3%), suggesting that systematic screening of male delinquents may not always be warranted [11]. We found no report on the prevalence of CTI among male adolescent offenders in any other country. Conscript population data suggest a very low prevalence of CTI among young males in Switzerland (1.2%). The prevalence of CTI in males detained in the largest remand prison in Switzerland was also lower than described in US prisons [12]. We hypothesised that CTI rates in Switzerland may be too low to justify systematic screening of adolescent males entering detention centres, as recommended in the US [13]. The aim of this study was therefore to provide the first account of the point prevalence of CTI among male adolescent offenders in Switzerland to document the need for systematic screening in this population.
Methods

This cross-sectional study was conducted between July 2008 and February 2009 within the primary care health service of a juvenile detention facility in Geneva, Switzerland. This is a 30-bed facility in which 300–400 adolescents (11–19 years) are admitted each year. All adolescents admitted to the detention facility are offered an initial health assessment by a nurse within 48 hours of admission. During this assessment consecutive boys aged 15 years or older were invited to participate in the study. Exclusion criteria were: projected stay in the facility too short to allow time for the study (<2 days), illiteracy and inability to understand the study languages (i.e., inability to read the information, consent and questionnaire documents which were available in French, English, Spanish, Arabic, Russian and Albanian), acute illness requiring immediate medical attention, mental disability (resulting in inability to provide informed consent), antibiotic use (tetracycline for acne, for example) within the past 3 months. Following informed consent, participants were asked to provide a first void urine sample for PCR detection of CTI using Abbott CT/NG reagents on an m2000 platform (Abbott Molecular Diagnostics, Des Plaines, IL). All participants also completed a questionnaire on sociodemographic characteristics and reproductive health behaviors. From clinical experience we anticipated a low prevalence of CTI. Using the formula proposed by Bland, we estimated that a sample size of 50 would be sufficient to measure such prevalence rates with a standard error no larger than 3% [14]. Descriptive statistics (proportions with 95% CI for dichotomous variables and mean and SD for continuous variables) were computed using Stata version 9.1. The study was approved by the Ethics Committee of Geneva University Hospital (protocol 08-063).

Results

During the study period 72 males (15–18 years) were considered for participation in the study and 13 were excluded on the basis of criteria (mainly language barrier, 5 individuals, and short stay in the facility, 4 individuals). Of the remaining 59 males, 9 (15%) declined participation. Not being sexually active was the most common reason for declining participation (5 individuals). There were no differences between the mean ages of those who were included in the study and those who were excluded or declined participation.

Table 1 presents participants’ sociodemographic and health characteristics. The majority were from Switzerland or the European Union and reported having multiple sexual partners in the past year. Nine participants reported urogenital symptoms (lower abdominal pain 4; frequency 3; dysuria 2). Only one participant had CT (2%; 95% CI: 0–6%). This individual was 18 years old and asymptomatic. He was incarcerated for less than a week and therefore had left the facility by the time the results of screening were available. The results were forwarded to him but we cannot be certain that he followed our advice on treatment.

Discussion

Despite being sexually active at a young age and reporting having multiple sexual partners in the past year, these adolescent males detained in a Swiss juvenile detention centre had a low prevalence of CTI, a prevalence much lower than that reported for adolescents in the US, where prevalence in detention settings is reported to be as high as 14% [5]. They are nevertheless in line with recent data for Swiss conscripts [13], and are also similar to those found ten years ago in a study of adolescents in educational centres in Quebec [11]. That sexual risk behaviour was not necessarily correlated with risk of CTI is also consistent with previous reports [6]. Low prevalence in the general population associated with moderately high rates of con-

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Table 1: Sociodemographic and health characteristics of 50 male detainees participating in the study

<table>
<thead>
<tr>
<th>Characteristic or behaviour</th>
<th>Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean, SD)</td>
<td>16.2 (1.6)</td>
</tr>
<tr>
<td>Origin</td>
<td></td>
</tr>
<tr>
<td>Switzerland &amp; European Union</td>
<td>30 (60)</td>
</tr>
<tr>
<td>Other European country</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Africa</td>
<td>7 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14 (28)</td>
</tr>
<tr>
<td>Christian (catholic, protestant, orthodox)</td>
<td>19 (38)</td>
</tr>
<tr>
<td>Muslim</td>
<td>16 (32)</td>
</tr>
<tr>
<td>Number of years in school (mean, SD)</td>
<td>8.7 (3.0)</td>
</tr>
<tr>
<td>Number of sexual partners, past 12 months</td>
<td>3 (1.0)</td>
</tr>
</tbody>
</table>

| None | 4 (8) |
| One  | 11 (22) |
| Two to five | 22 (44) |
| Six or more | 12 (24) |
| Urogenital complaints | 0 (10) |
| IV drug use (lifetime) | 0 |

1 self-reported
2 missing data for one participant
3 dysuria: frequency, discharge, lower abdominal pain in the past week
dom use in Switzerland (75% males aged 16–20 years report using a condom at first intercourse) may in part explain our results [15]. None of the 9 participants who reported urogenital symptoms in the questionnaire had CTI, which underlines the unspecific nature of such symptoms particularly in the stress-related context of recent incarceration. Short detention durations and the mobile nature of this population mean a positive screen does not necessarily lead to treatment [7]. This was the case of the individual in whom CTI was identified in the context of our study and for whom confirmation of treatment could not be obtained. This highlights the fact that in addition to prevalence findings, follow-up and treatment opportunities should be factored into decisions on CTI screening strategies. Limitations to our study include the potential selection bias related to moderate rates of exclusion. Since the language barrier resulted in the exclusion of 5 potential participants we cannot be certain that the rate of CTI would not have been higher had these migrants been included. Yet CTI prevalence was low despite the fact that 40% of participants came from countries beyond Switzerland and the European Union. In addition, from a clinical perspective, screening and treating young people who do not understand what is being undertaken due to a language barrier is ethically questionable. Many of those who declined participation indicated they were not sexually active. This reduces the likelihood that CTI were missed in males who were not included in the study. Though a larger sample size would have provided a more precise estimate, it is unlikely that with such a low prevalence this would have altered our conclusions in a significant way.

Conclusions

In contrast to US recommendations our results do not support systematic screening of male adolescents on admission to Swiss juvenile detention centres [8]. That the only infected participant was asymptomatic also argues against targeted screening in this population. These findings further support the need to collect regional data before implementing recommendations based on epidemiological findings from other countries. Future studies including other detention centres in Switzerland and in Europe should provide information as to the extent to which our findings can be replicated in a larger sample and apply to the entire country and, more broadly, to the European setting. Further studies should also provide data on the prevalence of CTI in female adolescent detainees in Europe, as women detainees have repeatedly been shown to be at much higher risk of CTI than males [6, 7].

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References

Primary care services provided to adolescents in detention: a cross-sectional study using ICPC-2

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Adolescent, Health services, Primary health care, Prisons

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Abstract

Aim: The aim of this study was to provide a detailed description of the health problems for which primary care services are provided to adolescents in a juvenile detention facility in Europe.

Methods: We reviewed the medical files of all detainees in a juvenile detention centre in Switzerland in 2007. The health problems for which primary care services were provided were coded using the International Classification for Primary Care, version 2. Analysis was descriptive, stratified by gender.

Results: A total of 514 adolescents (18% female) aged 11–19 years were included. Most (95%) had a health assessment and 19% (62%) had consultations with a primary care physician; 80% of the latter had a physical health problem, and 60% had a mental health problem. The most commonly managed problems were skin (49.7%), respiratory (23.6%), behavioural (22.6%) and gynaecological problems (females: 23.9%); 13% of males (no males) had sexually transmitted infections (STI), and 8.7% were pregnant. Substance abuse was common (tobacco: 64.6%, alcohol: 26.2%, cannabis: 31.3%).

Conclusion: In addition to health problems known to be more prevalent among young offenders, such as mental health problems and STI, these adolescent detainees required care for a range of common primary care problems. These data should inform the development of comprehensive primary care services in all juvenile detention facilities in Europe.

INTRODUCTION

Adolescents in detention represent an underserved population with often limited previous access to healthcare as a result of social and economic disadvantage, family dysfunction, educational dropout and lack of appropriate support in the early years of life (1,2). Research (mostly from the US) has highlighted the differential health needs of this group, emphasizing the high levels of mental health and substance abuse problems, sexually transmitted infections and pregnancies among incarcerated adolescents compared with adolescents in the community (2,3). Indeed, about 60% of male and 75% of female adolescents in detention suffer from mental disorders, compared with an average of 20% of adolescents in the general population (3). Tobacco, alcohol and cannabis abuse are common with 35–50% of detained adolescents presenting a substance related disorder (4–6). Studies have reported a prevalence of Chlamydia infection as high as 10% in men and 22% in women (compared with 1–3% in the community) (2). Approximately 10% of girls entering detention facilities are pregnant (2).

A decade ago several American associations issued recommendations for the health care of incarcerated adolescents (7,8). In more recent years, European experts collaborating with WHO, joined to issue a consensus statement on ‘promoting the health of young people in custody’ (9). Underlying this statement is the UN Convention on the Rights of the Child which recognizes children’s rights to access the highest attainable standard of care, particularly primary and preventative care. It underlines that young people in custody should have access to health services that are equivalent to those offered in the community and that respond to their specific health needs and health compromising behaviours.

Despite these recommendations, the development of comprehensive and developmentally appropriate health services in juvenile detention centres remains slow, both in Europe and in many other countries in the world (10,11). Whereas the mental health needs of this population have been described in various European countries, their other primary care needs have attracted less attention (6,12–15). Studies undertaken in the US more than 20 years ago describe high rates of reproductive health, respiratory and skin problems as well as high levels of trauma and dental problems in this population (2). The extent to which these epidemiological data are still valid today and apply to the European context is unknown. We found only one previous
study assessing the general health status of adolescents
detained in a European juvenile detention centre (16).
Another study provided data on long standing physical
complaints of young offenders aged 16–20 years (17).
Although they provided some insight into the physical and
mental health needs of young detainees, these studies did
not use standardized methods suitable to assessing the
entire extent of primary care services provided to adoles-
cents in detention. However, epidemiological data on the
specific healthcare needs of these youth are essential to
develop services that are responsive to these needs and meet
the recommendations for appropriate healthcare for young
people in custody (9).

In this article, we present a detailed description of the
health problems for which primary care services were pro-
vided to adolescents admitted to a juvenile detention centre
in Switzerland over a year to inform the further develop-
ment of health services in European juvenile detention
centres.

METHODS
This cross-sectional study was undertaken in a pre-adju-
dication and educational detention centre in Geneva,
Switzerland. This is a 30 bed facility for adolescents
(11–19 years) awaiting trial or sentenced to an educational
placement in detention. The facility’s primary care service
delivers approximately 2000 consultations to 300–400 ado-
lescents detained in the facility each year. The primary
care team works in close collaboration with a psychiatric
team. The health service is attached to Geneva University Hospi-
tals and is independent from the prison authorities. In an
effort to provide unbiased care to detainees, the medical
team does not receive information on their reason for
detention. According to Geneva official statistics 2004–
2006, approximately 70% of adolescents are condemned in
Geneva for offences against Swiss common law, 12% for
offences against traffic laws, and 4–6% for illegal entry into Switzerland.

As recommended by the United Nations and the Council
of Europe, all the adolescents admitted to the detention
facility are offered an initial health evaluation by a nurse
within 48 h of admission (18,19). This evaluation acts as tri-
age to identify any health problem requiring medical atten-
tion. It is also an opportunity for the adolescents to discover
what medical help is available to them. Adolescents for
whom the nurse identifies a need, those who request it or
those who stay beyond a week are offered a medical assess-
mend with a primary care practitioner.

The study assessed the health services provided to all
the adolescents detained in the facility between 1st January
and 31st December 2007. We recorded age, gender,
nationality (as a proxy for origin) and length of stay as well
as the proportion seen for the initial nurse evaluation and/or the complete medical assessment. All the primary
care medical files were reviewed and the health problems
for which services were provided were documented using the French version of the International Classification for
Primary Care (ICPC), version 2 (20). This coding was cho-

se all results as it is recommended by WHO to describe reasons for
encounter in primary care. In this setting, it has benefits
over the International Classification of Diseases coding
system as it allows coding of symptoms and complaints (as
often presented in primary care) rather than only diagno-
ses. The coding methodology was refined in a pilot study
in which approximately 90 files were analysed. This pilot
study informed the study’s procedure and helped define
ICPC-2 coding rules within the research team. These rules
were summarized in a document which was referred to
throughout the study. As adult criteria could not appropri-
ately be applied to this adolescent population, we used data collected with a structured questionnaire (Dep-Ado)
within the consultation to define substance abuse (21). The
Dep-Ado allows assessment of both the frequency of use
and the related psycho-social consequences. Scores on the
Dep-Ado are summarized as green (infrequent use, few or
no psychosocial consequences) orange (intermediate) or
red (frequent use with a range of psychosocial conse-
quences) light, a visual method which makes it easier for
adolescents in the consultations to understand the severity
of the potential health implications of their current sub-
stance use. A combination of regular use of alcohol and/or
cannabis and an orange or red light on the Dep-Ado were
coded under the ICPC code for alcohol/cannabis abuse.
Report of any other substance use (mostly heroin, ecstasy
or cocaine) on the Dep-Ado was coded as ‘other drug use’.

The files were coded anonymously by the facility’s pri-
mary care practitioner (DMH). All the health problems for
which primary care services had been provided during an
adolescent’s stay had been summarized upon closing the file
using the ICPC codes. Therefore, even though the retrieval
of codes was retrospective, the actual coding could be said
to have been undertaken in a prospective manner. Coding
doubts were discussed and resolved with the research team
during regular meetings.

Descriptive statistics were computed for demographic
characteristics. The frequencies and proportions of ICPC
coded health problems were computed with 95% confi-
dence intervals. We estimated the need for a sample size of
at least 170 to present these proportions with confidence
intervals no wider than ±7.5%. Unless specified, we used
Chi square tests, respectively Fisher exact tests when low
frequencies were observed, to explore possible associations
between commonly occurring health problems and patient
characteristics. Analyses were performed with S-Plus 7.0
Enterprise Developer, Insightful Corp.

The study was approved by the Ethics Committee of Gen-
eva University Hospitals.

RESULTS
Overall, 314 adolescents (18% female) aged 11–19 years
(mean age 16) were detained in the facility during the study
period. In addition, four young people who were originally
admitted to the facility as minors but later found to be older
were not included in the study. Most (88% of males; 95% of
females) benefited from a health assessment during their detention. A quarter of these (26.8%) saw only the nurse whereas 195 adolescents (62.1%) had consultations with the primary care physician. ICPC coded data were available for all 195. The median length of stay of those who did not benefit from this assessment (11% of all adolescents) was very short [2 days (range 1–7)] and the median length of stay of those who only saw a nurse was also shorter than for those who saw the primary care physician [7 days (range 3–30) versus 16 days (range 2–308)].

Table S1 describes the ICPC coded somatic health problems identified in the medical files of the 195 adolescents who were assessed by the primary care physician. Most adolescents (78% of boys and 89% of girls) had at least one somatic health problem. Half the adolescents presented a skin problem such as skin injury, acne or pytiriasis versicolor. The prevalence of respiratory (for example asthma or upper respiratory tract infections) and musculoskeletal health problems (i.e. limb trauma or backache) was also high in both sexes. In girls, gynaecological problems such as dysmenorrhoea were frequent (24%). There were three cases of bacterial vaginitis in girls who denied possible exposure to STI but admitted to having recently hidden objects in their vagina; 13% females (no males) were treated for STI (all were Chlamydia infections), and nearly one in ten needed care for pregnancy during incarceration. Nearly 10% required treatment for an acute dental problem. Alleged exposure to violence from the authorities was rare yet not negligible.

Table S2 presents the ICPC coded mental health and substance abuse problems of the adolescents assessed by the primary care physician. Mental health problems affected more than 50% of boys and 73% of girls. ‘Adolescent behaviour symptom or complaint’ was the most frequent mental health problem followed by acute stress reactions, general feelings of anxiety and depressive disorder or symptoms. Self-harm (mostly through self-cutting) was frequent in girls (24%). Most adolescents abused substances with two-thirds smoking tobacco daily and more than one in four reaching the criteria for alcohol and/or cannabis abuse. More than half of those who abused alcohol also abused cannabis. Other drug use (heroin, cocaine and benzodiazepines) was rare.

Many adolescents presented both somatic and mental health problems (55% of boys and 76% of girls). Table S3 presents the associations between the most commonly noted health problems and demographic characteristics. Gender differences were prominent for mental health and digestive problems which were more frequent in girls. With the exception of alcohol abuse, there was no significant difference in the prevalence of health problems among younger adolescents compared with older ones. There were variations in the extent of substance abuse according to regional origins. Tobacco and cannabis abuse was particularly predominant in adolescents from Switzerland and the European Union. Alcohol most prevalent among Africans and cannabis use strikingly rare among those originating from European countries outside the European Union. Those who stayed longer were more likely to receive care for a larger range of mental and somatic health problems.

**DISCUSSION**

This study is the first to detail the wide range of health problems for which adolescents receive primary care services in a juvenile detention centre in Europe. In addition to health problems known to be frequent among young offenders, such as mental health problems, substance abuse and STIs, most of these adolescent detainees required care for more generic primary care problems, such as respiratory, digestive and skin problems. Indeed these adolescents needed as much care for somatic health problems as they did for mental health problems. These findings highlight the importance of providing comprehensive primary care health services to adolescents in detention.

The study had limitations. Not all adolescents admitted to the facility benefited from a medical assessment. Thus in accordance with our aims our findings provide information on the health problems for which services were provided and not on the true prevalence of these problems in the studied population. Those who were not seen for an assessment, and some of those who were seen only by the nurse, may have had health problems that did not come to our attention as a result of a short stay in the detention facility. Moreover, in the absence of systematic screening policies in our institution, the identification of problems such as STI or pregnancy was based solely on symptoms and patient requests for tests. Similarly, we did not specifically screen for eating disorders. However, whereas subclinical disorders may have been missed, restriction or purging behaviour could not have gone unnoticed in such a strong surveillance environment. Institutional barriers (and in particular the limited time available to the medical team within the very structured routine of the prison) precluded submitting all adolescents to a structured medical and/or psychiatric assessment. A clinical tool (Dep-Ado), rather than a standardized psychiatric assessment instrument was used to identify substance abuse. The validity of this tool has, however, previously been demonstrated (21). There were also limitations related to using the ICPC-2 coding system in this adolescent population. For example, the ICPC-2 coding did not allow differentiation between self-harm with and without suicidal intentions, a common distinction made in adolescent health. Common adolescent psychiatric disorders such as conduct disorder or attention-deficit hyperactivity disorder had no corresponding codes and were thus coded under the generic ‘adolescent behaviour symptoms/complaints’. Yet as our aim was not to provide prevalence data but to describe service provision to inform the development of primary care services in detention, our method (and the choice of the ICPC-2 coding) had the advantage of providing a more accurate picture of the reality of such a service. In many cases psychiatric diagnoses could be confirmed following referral to the mental health team. Another limitation was that to maintain confidentiality only one coder
(the primary care physician) reviewed the medical files but coding errors were limited by setting strict rules for coding at the initiation of the study. Doubts were discussed and resolved regularly with the research team. Finally, we studied a single facility in one European country. In that the profile of adolescent offenders may vary from one country to another, we cannot be certain that our findings apply at large to European youth detention centres. Nevertheless, European epidemiological studies of adolescent health point to more similarities than differences between youth from Switzerland and many other European countries (22). It is thus likely that the health profile described here resembles rather than diverges from that of young detainees in other European contexts.

The study also had several strengths. The sample was large and included adolescents of both sexes. Information was gathered on all adolescents present in the detention facility over an entire year. Despite the retrospective nature of the study, coding by one primary care physician upon departure of the patient from the detention centre favoured data completeness and accuracy. The ICPC coding system helped capture the full range of primary care health needs upon admission and during incarceration.

An important finding in this study was that the primary care needs of this population were similar in range and frequency to those for which adolescents seek care from family doctors in the community (23,24). In addition, these adolescents had a range of problems typical of underserved populations. The high rate of skin disorders is likely to be related to lack of appropriate skin care in many of these youths. Among girls Chlamydia infection and pregnancies were frequent. These findings speak in favour of introducing systematic screening programmes to offer appropriate care to all female adolescents entering custody (25). In this particular group of patients, primary care practitioners should also be aware of the potential for trauma or infection in girls as a result of the violation of objects in the vagina. Chlamydia infections may have been missed in males as only targeted testing occurred. We are currently conducting a study to assess the prevalence of Chlamydia infections in consecutive adolescent detainees to inform the need for and cost-effectiveness of systematic screening programmes in this setting. Self-harm through cutting was also frequent in girls and is by no means limited to the high rates of mental disorder in this group. In addition to mental health support, offering adequate wound care is important to limit the additional distress related to infection and ugly scarcing. Acne care also has value in helping these young people regain an often affected self-esteem. Although the full extent of dental health needs was not assessed, the high rates of acute dental health problems highlight the need to provide dental care in detention (26).

A truly worrying finding was the high rates of tobacco smoking. It was approximately three times more frequent in this population than among adolescents aged 16–20 years in the general Swiss population (27). This habit is likely to be one of the factors most unfavourably affecting these adolescents’ health in the future. Too often neglected to date, smoking should become a key target for preventive actions in youth detention centres in the future.

Our findings in relation to the high proportion of mental health problems were well in range with those from the previous studies, both in the US and in Europe (3,4,6,12,15). In our country, as in many others, the institutional burden of mental health care thus appears to have shifted to some extent towards the juvenile justice system (2). Offering adequate mental health care to youth in custody is an important priority. In our facility, this was favoured by an easy referral pathway to the mental health team. Identifying those whose mental health condition is not compatible with detention is another important task for health professionals in contact with these adolescents.

As previously described most of those who abused alcohol also abused cannabis (4). Although elevated, the extent of substance abuse in adolescents included in our study was not as high as previously described in studies from the US and Denmark in which a standardized diagnostic interview was used (3,4,6). Similar heterogeneity in results has previously been described for adult populations and is in part related to whether the assessment of substance use is being made by psychiatrists or primary care physicians (28).

More in line with the previous studies, other substance use was rare (4,29). This is in striking contrast to high rates of heroin, cocaine and benzodiazepine use in adult prisoners (28). These findings are encouraging as they point to a window of targeted prevention which could be developed in youth detention centres to limit progression towards more severe substance use in the future (29).

In conclusion, our detailed description of the health problems for which primary care services were provided in a European juvenile detention centre highlights the importance of developing services that can respond both to the specific needs of young offenders and to the often previously neglected primary care needs of this population. For these adolescents, the prison health service is often the first opportunity for an autonomous contact with health professionals. Offering primary care services that respond to health needs in a youth friendly manner can act as a positive experience on which the adolescent can build further relationships with the health system in the future (30). Offering health promotion programmes and promoting links with health services after their release can also do much to improve the health of these adolescents not only during their detention but also as they step back into the community (9).

ACKNOWLEDGEMENTS
This study was supported by institutional funds from the University of Geneva.

References


SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1 ICPC-2 coded somatic health problems for which primary care was provided to 195 detained adolescents

Table S2 ICPC-2 coded mental health and substance abuse problems for which primary care was provided to 195 detained adolescents

Table S3 Univariate associations between the most common health problems and patient socio-demographic characteristics in 195 adolescent detainees seen by the primary care physician

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**Psychiatric problems**

Detainees have high, and rising prevalences of mental health disorders as compared with rates observed in the general population.\textsuperscript{137,138} A systematic review and meta-analysis published in 2002 concluded that approximately one in seven detainees in Western countries have psychotic illnesses or major depression. Prisoners are about ten times more likely to have antisocial personality disorders than the general population.\textsuperscript{139} Substance abuse and dependence are frequent in prisoners. Estimates of prevalence range from 10% to 30% for alcohol related disorders and from 10% to 60% for illegal drug related problems, with differences between male and female prisoners.\textsuperscript{140} Suicide is an omnipresent preoccupation in detention. Several studies have shown that age-standardized rates of suicide among male prisoners are between five to eight times higher than in the general population.\textsuperscript{141}

The prevalence of psychiatric morbidity in prison may mirror general trends in society as regards services to mentally ill individuals.\textsuperscript{142} Barriers to community care for offenders,\textsuperscript{143} repeated incarceration of mentally ill individuals, and the observation that prisons are treating mentally ill people who were off treatment at the time of arrest represent additional relevant factors.\textsuperscript{144,145}

One must realize that most studies were conducted in North America, England and Scandinavia. Thus, it is problematic to extrapolate these figures because criminal justice systems vary across countries, prisoners are of different types (sentenced or on remand), and the possibility of specialized psychiatric care differs from one institutional system to another. Structured information on psychiatric disorders in jails and prisons, and prison mental health care is lacking in most European countries.\textsuperscript{138}

Our study confirmed the high prevalence (46%) of mental health problems in detainees who were seen by a physician during their incarceration, and highlights their frequent association with somatic health problems, thus strongly emphasizing the need for coordinated health care services in these settings.\textsuperscript{146}

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See: “Psychiatric symptoms, psychological distress and somatic co-morbidity among remand prisoners in Switzerland”\textsuperscript{146}
Psychiatric symptoms, psychological distress and somatic comorbidity among remand prisoners in Switzerland

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ABSTRACT

Objective: The aims of this study were to determine the prevalence of psychiatric symptoms and complaints among remand prisoners in Switzerland and to analyze the relationships between psychiatric symptoms, physical health and substance abuse problems in this population.

Method: The medical files of all detainees attending the prison health service in 2007 were reviewed. Identified health problems were coded using the International Classification of Primary Care (ICPC-2). Descriptive statistics and measures of association were computed.

Results: A total of 1510 files were analyzed. Several associations between psychological symptoms (anxiety and insomnia) and physical health problems (skin, respiratory and circulatory) were observed. Substance abuse was also frequently associated with somatic health problems.

Conclusions: These data provide the first comprehensive description of the mental health of detainees in Switzerland’s largest remand prison. Our findings emphasize the need for coordinated health care services in detention settings.

A review of the literature addressing substance abuse and dependence in prisoners showed a marked heterogeneity among studies, but, globally, prisoners are at an increased risk for drug and alcohol problems compared with the general population. The estimates of prevalence for alcohol abuse and dependence in male prisoners ranged from 18% to 30% and 10% to 24% in female prisoners. The prevalence estimates of drug abuse and dependence varied from 10% to 48% in male prisoners and 30% to 60% in female prisoners. (Fazel, Bains & Doll, 2006). More specifically, several studies have noted strong associations between offending behaviour and heroin and cocaine use (Stewart, 2009).

Suicide is an omnipresent preoccupation in detention and numerous studies describe the increased rates of suicide that exist in jails and prisons in several countries (Wortzel, Binowanger, Anderson, & Adler, 2009). Several studies have shown that age-standardized rates of suicide among male prisoners are between five to eight times higher than in the general population (Blauw, Kerkhof & Hayes, 2005), and sometimes as high as fourteen times higher (Shaw, Baker, Hunt, Moloney & Appleby, 2004). In a systematic review, risk factors associated with suicide in prisoners included white ethnicity, being male, being married, occupation of a single cell, suicidal ideation, history of attempted suicide, having a current psychiatric diagnosis, receiving psychotropic medication and having a history of alcohol use problems (Fazel, Cartwright, Norman–Nott & Hawton, 2008).

Data indicate that the number of inmates with mental disorders is rising (Dressing, Kief & Salize, 2009). Several reasons account for this...
increasing prevalence of mental disorders among prisoners. Harsh incarceration conditions causing acute stress is probably one of them, but most authors underline the current trend to criminalize severely mentally ill persons (Okasha, 2004). In other words, there seems to be a shift of psychiatric inpatient care from hospitals to jails and prisons (Lamb & Weinberger, 2005). In most European countries, general psychiatric beds decrease while forensic psychiatric beds and places in forensic institutions tend to increase (Priebe et al., 2005). This trend, alternatively called "trans-institutionalisation" or "re-institutionalisation", is probably related more to changes in global social attitudes than to true modifications in psychopathology and morbidity. The reality of this phenomenon is, however, contested by several authors. Further understanding of this evolution would require a detailed analysis of the interaction among general psychiatry, forensic psychiatry and the prison sector (Salize, Schanda & Dressing, 2008). Prison prevalence of psychiatric morbidity may mirror general trends in the society regarding services for mentally ill subjects (Andersen, 2004). Barriers to community care for offenders' (Lambert, 2004), repeated incarcerations among mentally ill individuals (Ballargue, Binswanger, Penn, Williams, & Murray, 2008) and the observation that prisons are treating mentally ill people who were off treatment at the time of arrest (Wilper et al., 2009) represent additional relevant factors.

Importantly, most prevalence studies were conducted in North America and Scandinavia. Epidemiologic data are also available for England (Birmingham, Mason & Grobin, 1996), Australia (Butler, Andrews, Albutt, Salasita, Smith & Basson, 2006) and New Zealand (Brindin, Simpson, Laidlaw, Fairley & Malcolm, 2001). It is problematic to generalize these figures because criminal justice systems vary across countries and because types of prisons (sentenced or on remand) and possibilities of specialized psychiatric care differ from one institutional system to another. Structured information on prison mental health care and psychiatric disorders in jails and prisons is lacking in most European countries (Dressing et al., 2009). In France, a study was conducted among a random sample of 800 incarcerated males. Each subject was assessed for psychiatric diagnosis by two clinicians, one using a semi-structured interview, the other clinician completing the procedure with an opened clinical interview (Falisier et al., 2006). Prevalence rates for a diagnosis given independently by both clinicians and for a consensus diagnosis were respectively: 3.8% (6.2%) for schizophrenia, 17.9% (24%) for major depressive disorder, 12.0% (17.7%) for generalized anxiety and 10.8% (14.6%) for drug dependence. The authors concluded that psychiatric diagnosis can be difficult to interpret in prison, especially using traditional standardized interviews. In a sample of 80 male prisoners in Greece, the prevalence of mental disorders was more than 78% (Potiaidou, Livaditis, Manou, Kaniotou, & Xenitidis, 2006). The main diagnoses were: anxiety disorder (37.5%); major depression (27.3%); antisocial personality disorder (27.5%); alcohol dependence (29.3%); opiate dependence (27.5%) and schizophrenic or bipolar disorder (11.2%). Twelve prisoners (15%) had an IQ below 75. In Italy, prevalence of either substance use or another psychiatric disorder was 54.3%, while the comorbidity rate was 20.9% among a sample of 302 male detainees (Piselli, Elisie, Murgia, Quartesan, & Abram, 2009). In the Netherlands, 57% of 191 randomly selected prisoners suffered from one or more mental disorders (Buijen, Nijman & van der Staa, 2009). For non-Western countries, reliable data are almost non existent but there are indications suggesting that the prevalence of mental disorders in jails and prisons is similar to what is observed in Europe and North America (Assadi et al., 2006; Fatoey, Fatoey, Oyebanji & Ogungb, 2006; Banerjee, Sengupta, & Ray, 2009).

Another important issue is that prisoners are prone to suffer from multiple pathologies, associating mental disorders (psychotic, depressive or personality disorder), substance abuse disorders and general medical conditions such as transmissible diseases. This concurs to an increased morbidity and mortality, both in incarcerated people and released prisoners (Binswanger et al., 2007; Karimnia et al., 2007). The association between somatic and mental disorders in this population has not, however, been extensively studied before.

There are virtually no available recent epidemiologic data for Swiss jails and prisons, despite well-staffed prison medical services in several centres. A study conducted in 1989 reported high levels of psychiatric symptoms in 57% of a sample of 208 male prisoners, using the General Health Questionnaire (GHQ) (Harding & Zimmermann, 1989). More recently, two independent retrospective studies addressed self-injurious behaviours in the same centre in Geneva. In the first study, suicidal gestures were associated with age less than 25 years, previous suicide attempts, a past history of psychiatric treatment and opiate drug dependence (Scheller, Zimmermann & Raymond, 1996). In the second study, 161 self-aggressive behaviours were recorded over a 15-month period. All the detainees involved were male, with a mean age of 25 years. The most frequent self-aggressive behaviours were cutting, strangulation and fire setting (Ammar, Borras & Eytan, 2008).

The aim of the present study was to document the epidemiology of mental disorders and comorbidities in the largest remand prison of this country. It was also to offer a detailed description of the association between mental health problems, substance abuse and somatic disorders. A secondary objective of the study was to evaluate the feasibility of a systematic medical screening using the IPCIC-2 in prison.

1. Methods

1.1. Setting

The study took place in the remand prison of the Geneva district, situated in the French speaking part of Switzerland. This centre was built 30 years ago. Initially conceived for 270 places, the average number of inmates is currently between 450 and 500, with a mean occupation rate of 165% in 2008. According to the prison census, detainees presented the following characteristics at the time the study took place: Between 10% and 20% of detainees were sentenced prisoners waiting to be transferred to another institution. The population was in majority young (60% of detainees were under 30 years of age) and male (95%). Almost 90% of detainees were of foreign origin. The main regions of origin were North Africa (20%), Eastern Europe and the Balkans (20%), Sub-Saharan Africa (20%) and the European Union (20%). More than 100 different nationalities were represented. Most detainees were foreigners officially living abroad, who did not have permission to be in Switzerland at the time of the offence (66%). Incarcerations were shorter than 4 months in 55% of cases, due to release or transfer to another prison after sentencing. The medical service of the prison is composed of general practitioners, nurses, psychiatrists and psychologists. Seventy to 80% of the mean 2300 detainees admitted annually receive medical care. All detainees admitted to the facility are submitted to a health care assessment by primary health care nurses within 24 hours of their admission. This assessment includes screening questions for the most frequent general medical conditions, infectious diseases, exposure to violence and suicidal ideation. When necessary, nurses refer detainees immediately to a physician. At any time, inmates can ask for medical consultation and are then addressed to a primary care physician or directly to a psychiatrist in case of obvious severe symptoms. The independence of caregivers is guaranteed by the attachment of the service to the Geneva University Hospitals rather than to the prison administration.

1.2. Instruments and design

The medical files of all detainees attending the prison health service in 2007 were reviewed and coded using the French version of the international classification of primary care, second edition (ICPC-2)
In primary care settings, IPC-C2 has benefits over the International Classification of Diseases (ICD) for classifying problems that do not have a precise diagnosis. Indeed, both symptoms and diagnoses are taken into account with the IPC-C2. The instrument allows ordering of clinical data in an episode of care structure. In several studies, IPC-C2 has been found to be adequate, reliable, and feasible for use in primary health care settings. It is widely used in Australia, through the "Breathe" (Bettering the Evaluation and Care of Health) program, a continuous national study of general practice that had gone on for several years (Britt, Miller & Bayram, 2007). IPC-C2 has a bi-axial structure with 17 chapters on one axis and seven components, which are part of each chapter, on the other axis. IPC-C2 chapters are all based on body systems following the principle that localisation has precedence over aetiology. The classification contains two additional chapters, one for psychological problems and one for social problems. Components deal with issues such as preventive or administrative procedures, referrals and other reasons for encounter. For the present study, only two components (symptoms and complaints, and diagnoses) of the second axis were recorded. Rarely reported disorders, for example bipolar disorder, were excluded from the analysis.

The three first questions of the Alcohol Use Disorders Identification Test (AUDIT) (Bradley et al., 2003) were used for assessing alcohol use. The cut-off score (5 points) for a diagnosis of alcohol dependence was chosen according to the criteria proposed by Rumpf (Rumpf, Hapke, Meyer, & John, 2002) and Dawson (Dawson et al., 2005). Regarding other substances of abuse, the screening items of the questionnaire from the Council of Europe Pompidou Group multi-city study were used (Nagler, 1987). Authors of the present study had previous experience with this questionnaire in prison settings (Niveau & Ritter, 2008). For cocaine, heroin and methadone, either past or current abuse was sufficient for the diagnosis of abuse. The screening questions were: "Did you take the substance during the last month?" and "Have you ever taken the substance during your lifetime?" For tobacco, cannabis and benzodiazepines, only current abuse was considered. The questions were: "Do you smoke one cigarette a day or more?", "Do you take cannabis twice a week or more?" and "Do you take benzodiazepines twice a week or more?" We did not distinguish between prescribed and illicitly obtained benzodiazepines, since dependant detainees usually use both. Purely somatic chapters will be presented in another publication.

The methodology and the instrument were pretested over a 3-month period (October 2006 to December 2006). Approximately 400 files were analyzed during the pretest. It informed improvements to be made to the technical procedure and helped harmonize the use of the IPC-C2 within the research team. All IPC-C2 sheets correctly completed by a physician over a 1-year period (January 2007 to December 2007) were analyzed. We excluded files exclusively limited to the nurse health care assessment upon admission to the prison. Socio-demographic data (age, sex, nationality) were also recorded. The study sample did not significantly differ from the whole prison population regarding socio-demographic data. All detainees with psychological complaints or severe psychiatric symptoms were seen by either the psychiatrist or the psychologist of the medical service during the period of the study, but no additional diagnostic instrument was used. One coder (D.B.) reviewed all the files and followed strict coding rules established by the research team at the initiation of the study. All the health problems for which medical or psychological care had been provided during a detainee's stay had been summarized upon closing the files using the IPC-C2 codes. Therefore, even though the retrieval of codes was retrospective, the actual coding could be said to have been undertaken in a prospective manner. Coding doubts were discussed and resolved during regular meetings both with another coder in a different detention setting (DMH) and the entire research team. All data were recorded anonymously. During the period of the survey, the IPC-C2 was used systematically for all detainees seen at the medical facility of the prison and coding did not involve any additional medical consultations for the subjects.

The AUDIT and drug related questions were administered by the usual care giver during a consultation. This was in fact a formalization of routinely asked questions. Allegations of violence and self-aggressive behaviours are routinely investigated during the admission health care assessment and during the subsequent consultations when pertinent. The research project was approved by the Ethics Committee of the University Hospitals of Geneva. Statistical analyses were done with S-Plus 7.0 Enterprise Developer (Insightful Corp. Seattle, WA, USA). Chi square tests were used to measure the association between two variables. Default type one error rates for the tests were set at 5%.

2. Results

2.1. Prevalence of psychological symptoms

A total of 2195 subjects were in contact with the medical unit during the period of the study. Six-hundred eighty five detainees (31.2%), seen only by nurses, had no medical file and were thus excluded from the analysis. Five percent of the remaining files were excluded from the analysis because of incomplete information. Ten percent of people were incarcerated twice or more during the period of the study. In these cases, a synthesis of the information contained in successive files was done and subjects were included only once in the study. This led to a total of 1510 files being analyzed. Prevalence of psychological symptoms and drug abuse is presented in Table 1. Subjects were in majority male (95%), young (mean 30 years of age, median 28 years, ranging from 18 to 82 years) and from very diverse nationalities and ethno-cultural backgrounds. Almost half (45.8%) presented psychological symptoms or complaints, women slightly

<table>
<thead>
<tr>
<th>Table 1</th>
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<tr>
<td>Prevalence of psychological symptoms and drug abuse, N = 1510</td>
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<table>
<thead>
<tr>
<th></th>
<th>Male n = 1434</th>
<th>Female n = 76</th>
<th>Total N = 1510</th>
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<tr>
<td></td>
<td>N (%) (95% CI)</td>
<td>N (%) (95% CI)</td>
<td>N (%) (95% CI)</td>
</tr>
<tr>
<td>Psychological symptoms, independently of substance abuse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance abuse</td>
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<tr>
<td>Tobacco</td>
<td>996 (67.1-71.8)</td>
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<td>1041 (66.6-71.3)</td>
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<tr>
<td>Alcohol</td>
<td>662 (40.4-45.2)</td>
<td>10 (2.0-47.8)</td>
<td>672 (42.8-45.7)</td>
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<tr>
<td>Cannabis</td>
<td>577 (34.4-49.2)</td>
<td>15 (2.0-47.8)</td>
<td>592 (34.3-38.3)</td>
</tr>
<tr>
<td>Cocaine</td>
<td>354 (23.5-28.8)</td>
<td>8 (1.8-47.8)</td>
<td>362 (24.4-28.9)</td>
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<tr>
<td>Heroin</td>
<td>250 (15.5-19.4)</td>
<td>12 (2.5-47.8)</td>
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<tr>
<td>Benzodiazepine</td>
<td>457 (29.5-34.3)</td>
<td>13 (2.5-47.8)</td>
<td>470 (28.8-33.5)</td>
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<td>Alleged victim of violence by the police</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>116 (7.9-13.2)</td>
<td>9 (2.5-17.7)</td>
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127
Table 2

<table>
<thead>
<tr>
<th>Psychological symptoms</th>
<th>Anxiety</th>
<th>Insomnia</th>
<th>Alcohol</th>
<th>Tobacco</th>
<th>Cocaine</th>
<th>Heroin</th>
<th>Cannabis</th>
<th>IZD</th>
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<td>p</td>
<td>p</td>
<td>p</td>
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<td>p</td>
<td>p</td>
<td>p</td>
</tr>
<tr>
<td>Men</td>
<td>45</td>
<td>.054</td>
<td>.011</td>
<td>.030</td>
<td>.42</td>
<td>.001</td>
<td>.089</td>
<td>.060</td>
<td>.27</td>
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<tr>
<td>Women</td>
<td>57</td>
<td>26</td>
<td>21</td>
<td>13</td>
<td>59</td>
<td>11</td>
<td>16</td>
<td>20</td>
<td>17</td>
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<tr>
<td>Age</td>
<td>18 to 22</td>
<td>43</td>
<td>.001</td>
<td>.001</td>
<td>.004</td>
<td>.51</td>
<td>.001</td>
<td>.110</td>
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<td>23 to 28</td>
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<td>20</td>
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<td>26</td>
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<td>35 +</td>
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<td>64</td>
<td>16</td>
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<td>.24</td>
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<td>.041</td>
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<td>12</td>
<td>5</td>
<td>11</td>
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<td>Skin problems</td>
<td>Yes</td>
<td>.558</td>
<td>.047</td>
<td>.26</td>
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<td>.37</td>
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<tr>
<td>Respiratory problems</td>
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<td>.052</td>
<td>.004</td>
<td>.29</td>
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<td>Circulatory problems</td>
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<td>.454</td>
<td>.001</td>
<td>.22</td>
<td>.820</td>
<td>.304</td>
<td>.58</td>
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<td>21</td>
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<td>70</td>
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<td>18</td>
<td>37</td>
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<tr>
<td>Alleged violence</td>
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<td>.308</td>
<td>.13</td>
<td>.320</td>
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</table>

NA: Chi square test not applicable.

more frequently than men (56.6% vs. 45.3% respectively). Smoking was highly prevalent in this sample (68.3%). Alcohol, cannabis, benzodiazepine and cocaine abuse were also frequent (41.2%, 35.9%, 31.1% and 26.6% respectively). Apart from heroine, all substance abuse problems were more frequent among men than among women. Prevalence of allegations of violence by the police or guards was 11.5% and only slightly higher among men than among women (11.6% vs.

2.2. Psychological symptoms and medical conditions

Associations between psychological symptoms, substance use, age, sex and the most common general medical conditions are presented in Table 2. Several statistically significant associations should be noted. Compared with men, women more frequently required care for anxiety and less often for alcohol, cocaine, cannabis and benzodiazepines abuse. Younger prisoners were more prone than older ones to abuse alcohol, cannabis and benzodiazepines and to adopt self-aggressive behaviour (for example scarification), while inmates aged 35 years or more complained more often of diverse psychological symptoms, including anxiety. Heroin and cocaine abuse was also more common in older prisoners than in young ones. Comorbidity between tobacco, alcohol and other substance abuse was very common. Past alcohol abuse was associated with a cohort of problems and behaviours, including insomnia, smoking and self-aggression. We observed several significant associations between anxiety, insomnia, various abused substances and general medical health conditions including skin, respiratory and circulatory problems.

2.3. Mental disorders and medical conditions

Associations between mental disorders, age, sex and the most common general medical conditions are presented in Table 3. Depressive disorders were overrepresented among female prisoners. Personality disorders were more prevalent among younger prisoners. A history of alcohol abuse was associated with posttraumatic stress disorder (PTSD), adjustment disorders and personality disorders. Smoking was associated with adjustment and personality disorders. Respiratory problems were associated with adjustment disorders.

There were generally no significant associations between nationality and any of the examined complaints or diagnoses, even when nationalities were grouped by regions of origin (European Union and Switzerland, Africa, Americas, Asia and miscellaneous), except for slightly higher prevalence of alcohol, cocaine, or benzodiazepine use among African and Asian inmates.

3. Discussion

3.1. Context of the study

This study provides the first detailed description of the mental health problems for which detainees received care in the largest Swiss remand prison. It is also the first description of the association of the mental health problems with somatic health problems in a large sample of detainees. Our findings confirm the high prevalence of mental health problems in this population and highlight frequent associations with somatic health problems thus emphasizing the need for coordinated health care services in these settings.

3.2. Comparisons with other studies

A wide range of prevalence rates of mental disorders among detainees are found in published studies. This appears to be due to differences in penitentiary laws and practices across countries, but also to a variety of methodological approaches used in these studies. Regarding screening and diagnosis, the Structured Clinical Interview for DSM-IV (SCID) (Assadi et al., 2006; Piselli et al., 2009; Steadman, Other, Robbins, Case & Samuels, 2009), the Composite International Diagnostic Interview for mental illness (CIDI) (Simper, Brinded, Fairley, Lidlaw, & Malcolm, 2003), the Medical Outcome Survey Short Form 36 (SF-36) (Black et al., 2007), the Mini International Neuropsychiatric Interview (MINI) (Falksard et al., 2006; Gunter et al., 2008; Bulen et al., 2009), the General Health Questionnaire (GHQ-30) (Fatyoe et al., 2006) and retrospective data from medical information systems (Ballargeon et al., 2005) were used. To our knowledge, our study is the first to use the IPCD. Our choice of this classification was justified by the fact that our prison health service is primarily a primary care service and not predominantly a specialized psychiatric service in which all subjects are submitted to a detailed psychiatric diagnostic examination. Therefore, comparisons between our cohort and figures reported from other centres should be interpreted with caution. We noticed that both methodologies and results of published studies are highly heterogeneous. This observation should encourage researchers conducting prevalence surveys in places of detention to harmonize their choices.
of psychometric and diagnostic instruments, in order to under-
line clinically significant differences between sites.

As 45.8% of detainees presented psychological symptoms or
complaints, our results fall inside the range found in the medical literature. For
European countries, prevalence estimations for mental disorders among
prisoners are between 27% and 78% (Fotiadou et al., 2006; Dressing et al.,
2009). Our results are also congruent with available data regarding
substance abuse and comorbidity figures. Since alcohol is not readily
available in prison, problems with this substance were either related to
withdrawal symptoms or abuse prior to incarceration. Smoking is usually
documented in prison settings but, as Butler et al. pointed out, tobacco
smoking is part of prison life and culture. This explains smoking rates of up to
90% as described in Australian prisoners (Butler, Richmond, Belcher, Wilhelmin &
Wodak, 2007). With a prevalence of tobacco smoking of almost 70%, which is more than twice the rate of smoking in the Swiss
community, our study confirms the need for targeted interventions in
prison such as proposed in other countries. After exploring the issue
through focus groups, Richmond et al. in Australia concluded that inmate
smoking cessation programs need to address the encouragement of tobacco
in prison life, improve availability of pharmacotherapies (for example
nicotine patches) and a free telephone helpline providing information on
stopping smoking, provide non-smoking cells and areas within prisons,
encourage physical activity for inmates and maintain monitoring of
smoking cessation status after release (Richmond, Butler, Wilhelmin,
Wodak, Cunningham & Anderson, 2009). It appears that prison inmates
are able to quit or reduce tobacco consumption while in prison but any
smoking cessation intervention in this setting needs to address prison-
specific issues such as boredom, stress, transfers to other prisons, court
appearances, and isolation from family and friends (Richmond, Butler,

Since women represent only a small fraction of those incarcerated,
early studies compared rates of mental disorders between sexes in the
same places of detention (Lewis, 2006). However, vast disparities exist in
the distribution of imprisoned women between countries. It is
estimated that, worldwide, correctional facilities house in excess of half
a million females (Moloney, van den Bergh & Moller, 2009). There is,
however, evidence that female offenders have a higher prevalence of
substance abuse and major depression than male offenders (Jordan,
Schlenger, Fairbank, & Caddell, 1990; Teplin, Abram, & McClelland,
1996). Our study confirms these results and speaks in favour of mental
health interventions designed for women in prison. Data from the
literature indicate that past traumatisation plays a significant role in the
development of psychopathology among incarcerated women (Moloney
& Moller, 2008). In a comprehensive behavioural survey of female
prisoners, 70% of respondents reported experiencing severe physical
violence from child or adolescent caregivers, 59% disclosed any form of
child sexual abuse, and 41% described perpetration of sexual violence in
childhood (Browne, Miller & Maguin, 1999). Additionally, 73% and 35%, respec-
tively, recounted any physical violence by or forced intercourse with an
intimate partner, while 77% revealed physical or sexual violence by non-
intimates in adulthood. In a study conducted more than 10 years ago in
the US. 68% of imprisoned women met the criteria for current or lifetime
posttraumatic stress disorder (PTSD), exceeding the prevalence of PTSD
among women in the general community by a factor of 7 (Zlotnick, 1997).
It is therefore surprising that no case of PTSD was diagnosed among
the 76 women included in our study. Insufficient exploration of
psychological symptoms reported by women by predominantly male
practitioners is a possible explanation. Cultural barriers and stigma
associated with sexual abuse among migrant women could also contribute
to nondisclosure of traumatic events by female patients.

A major finding of our study is the strong association between
physical health problems (skin, circulatory and respiratory), sub-
stance abuse and psychological complaints (anxiety and insomnia).
While it seems reasonable to accept that physical health problems are
consequences of substance abuse problems among detainees (for
example skin problems among intravenous heroine users), we
hypothesize that poor physical health is also a contributing factor
for anxiety and insomnia during detention. In another study involving
163 remand prisoners, physical health worries and complaints were
more frequent among insomniaic and anxious detainees. In the same
study, insomnia was related to daily activities. A significantly high-
percentage of non insomniaic prisoners than of prisoners complaining
of insomnia practiced sports in prison, watched television, and spent
their day discussing and meeting other detainees (Elger, 2009).
Insomnia in places of detention should not be reduced to a secondary
problem related to substance abuse and mental illness, as it appears to
be an independent situational problem (Elger, 2007).

More broadly, it is accepted that, in comparison with people in
the community, prisoners are far more likely to suffer multiple complex
health care needs which combine at different levels of severity
(Rutherford & Duggan, 2009). As already shown in Australia, even
young offenders are characterized by both extreme social disadvan-
tage and poor physical health (Butler, Belcher, Champion, Kenny,
Allerton, & Fashler, 2008). Literature data and our findings highlight the

<table>
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<th>Sex</th>
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<th>Psychosis</th>
<th>Posttraumatic stress disorder</th>
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NA: Chi square test not applicable.
need for further studies of psychosomatic complaints among detainees. A more comprehensive knowledge of these multiple comorbidities should facilitate the implementation of appropriate integrated health care programs in prison settings. According to Watson et al., essential components of such programs should be health promotion, health screening on arrival in prison with an emphasis on mental health, partnership between health care staff and prison services, education of prison staff, development of a model of prison health care which looks beyond the prison environment to the community and, possibly, telemedicine as a mode of delivering health care (Watson, Stimpson & Hostick, 2004).

3.3. Potential limitations

This study has several limitations. Firstly, we used an observational approach and analysis was performed on a retrospective basis. Secondly, the instrument chosen, IPCC-2, is not sufficient to ensure accurate diagnoses of mental disorders according to the widely used classification systems, ICD-10 (OMS, 1993) or DSM-IV (APA, 1994). Symptoms were recorded with the IPCC-2, but we did not use a diagnostic screening interview. This explains why prevalence of diagnoses, as opposed to symptoms, is lower than usually found in the literature. Despite this limitation, it is noteworthy that the IPCC categories are compatible with the ICD-10 categories (Dikkes, Jamouille, Lambert & Bentzen, 2000). IPCC was not validated in prison settings, but very few psychometric or diagnostic tools were. On the other hand, the methodology has several strengths. It allowed for inclusion of a large number of detainees in the country’s largest remand prisons. It also allowed for analyses of comorbidities between mental disorders, substance abuse disorders and general medical conditions in a single survey. The quality of coding was enhanced by thorough pretesting in the pilot study and by using strict coding rules including discussion and resolution of doubts in team meetings.

4. Conclusion

The World Health Organization (WHO) Health in Prisons Project (WHO, 2009) indicates clearly that something must be done to improve healthcare in prisons (Fraser, Catheter & Hayton, 2009). In their strategic objectives, the WHO raises issues that point towards the need for coordinated care planning in places of detention: according to the WHO, it is important to encourage cooperation and establish integrated work between public health systems, international nongovernmental organizations and prison health systems to promote public health. Other objectives are to assist the reduction of reoffending by encouraging prison health services to contribute fully to each prisoner’s rehabilitation, especially, but not exclusively, in relation to drug addiction and mental health problems and to reduce the exposure of prisoners to communicable diseases, thereby preventing prisoners becoming focal points of infection. Our study shows a high level of entanglement between substance abuse related disorders, and somatic and mental health problems among detainees. This result supports these WHO recommendations and underlines the need for coordinated care planning in places of detention. In order to allocate appropriate resources and to target interventions it is essential to document health problems in a variety of settings and institutions, using reproducible methodologies.

References


Dual loyalty and fundamental human rights

Prison administrations and health authorities, although serving the same government, have completely different and often conflicting interests. The prison administration’s main task is safety and security; the health authority’s is health care. These partners must collaborate intensely with clear roles and responsibilities. If healthcare professionals are employed by prison authorities there is a high risk of a conflict related to dual loyalty. Dual loyalty may be defined as a clinical role conflict between professional duties to a patient and obligations, (expressed or implied), and the interests of a third party such as an employer, insurer, or the state.147 Prison healthcare professionals face dual loyalty most commonly between their patients and the prison administration or state authority.147

Fundamental human rights need to be respected everywhere, particularly in contact with vulnerable populations such as prisoners. Despite the dissemination of quality standards for the treatment of prisoners, formulated and advocated by numerous international organizations,81-148-150 healthcare professionals in prisons all over the world continue to infringe upon these principles because of perceived or actual dual loyalty to patients and prison authorities.151

Healthcare professionals and non-medical prison staff need greater awareness and training regarding medical ethics and prisoner human rights. All parties should accept integration of prison health services with public health services. Healthcare workers in prison should act exclusively as caregivers, and medical tasks required by the prosecution, court, or security system should be performed by medical professionals not involved in the care of prisoners.151

A recent article proposes a roadmap to end the problem of dual loyalty.151 As long as healthcare professionals working in prisons are employed by the prison administration they are vulnerable to pressures to serve medical purposes other than patient care. Therefore, responsibility for the provision of health care should be transferred from the prison administration to the public health authorities to avoid dual loyalty.

See: “Dual loyalty in prison health care”151
Resolving Ethical Conflicts in Practice and Research

Dual Loyalty in Prison Health Care

Jörg Pont, MD, Heino Stöver, PhD, and Hans Wolff, MD, MPH

Despite the dissemination of principles of medical ethics in prisons, formulated and advocated by numerous international organizations, health care professionals in prisons all over the world continue to infringe these principles because of perceived or real dual loyalty to patients and prison authorities.

Health care professionals and nonmedical prison staff need greater awareness of and training in medical ethics and prisoner human rights. All parties should accept integration of prison health services with public health services.

Health care workers in prison should act exclusively as caregivers, and medical tasks required by the prosecution, court, or security system should be carried out by medical professionals not involved in the care of prisoners. (Am J Public Health. 2012;102:475–480. doi:10.2105/AJPH.2011.300374)

DUAL LOYALTY IS AN ETHICAL dilemma commonly encountered by health care professionals caring for persons in custody.5,6 Dual loyalty may be defined as clinical role conflict between professional duties to a patient and obligations, express or implied, to the interests of a third party such as an employer, an insurer, or the state. The dual loyalty practitioners most commonly face in prison is between their patients and the prison administration or the state authority. We aim to shed light on the problem of dual loyalty in prison health care and to identify measures to reduce and solve the problem.

DOCUMENTS ON MEDICAL ETHICS IN PRISONS

Ethical rules for health care professionals in prisons are amply and clearly defined in rules, resolutions, declarations, and recommendations by the United Nations (UN),5,6 the Council of Europe,7,9 the World Medical Association,10–14 the International Council of Nurses,15 Physicians for Human Rights,1 and Penal Reform International.16 A few national codes also relate to health care matters in prison.17–21

According to these documents, the sole task of health care professionals working in prisons is the care of physical and mental health of the prisoners by:

• acting as the private caregiver to the prisoners and observing the 7 essential principles of medical care in prison as quoted in the standards of the European Committee for Prevention of Torture (free access to medical care, equivalence of prison health care and community health care, confidentiality, patients’ consent, preventive health care, humanitarian assistance, complete professional independence and competence);17
• advising the prison director on health affairs in prison, strictly obeying the 7 principles; and
• acting as a health and hygiene officer by inspecting and reporting on food, hygiene, sanitation, heating, lighting, ventilation, clothing, bedding, and physical exercise.

All of these tasks must be performed with complete loyalty to the prisoners; medical activities not in the interest of prisoners should not be undertaken by professionals who provide health care to prisoners, as stated clearly in principle 3 of the UN resolution on principles of medical ethics relevant to the role of health personnel in prison:

It is a contradiction of medical ethics for health personnel particularly physicians, to be involved in any professional relationship with prisoners or detainees the purpose of which is not solely to evaluate, protect or improve their physical and mental health.

Such activities include forensic assessments, disclosure of patient-related medical data to others without consent of the patient, assisting in body searches or obtaining blood or urine for analyses for safety and security reasons, providing medical expertise for the application of disciplinary measures, and assisting or being complicit in physical or capital punishment, force-feeding, or torture.

The claim of exclusive concern with patients’ welfare may strike some as excessive in light of the obligations health professionals have to third parties in other health care settings. However, health care professionals in prisons face extraordinary ethical challenges: prisoners, who cannot choose their care provider and who are fully dependent on the health care provided to them, are a vulnerable population, as demonstrated by the many exploitations, abuses, and violations of their human rights in the past.
Health care professionals working in prisons are also in a vulnerable position and may face pressures to serve medical purposes other than patient care.

They often try to accommodate their medical skills to the limitations imposed on them. They often need to adopt standards of practice to institutional constraints. Moreover, many health professionals working in this environment are subject to employment arrangements that formally subordinate them to officials responsible for institutional operations, thus compromising their ability to exercise independent judgment. In other cases, they become part of an institutional culture that subordinates patient interests to the financial, political, or administrative agendas of the institution.

**VIOLATIONS OF MEDICAL ETHICS IN PRISONS**

Despite this international body of ethical documents, health care professionals working in prisons continue to be at risk for violating principles of medical ethics, and prison authorities, representatives of states, and even scholars of criminal law ignore or override them time and again.

The most spectacular violations in recent history that were brought before the public and widely discussed involved force-feeding of hunger strikers by prison authorities to obtain and analyze blood, urine (e.g., for drug detection), or other body samples; carry out intimate body searches; or disclose confidential medical data to the prison administration for forensic or security purposes.

- The medical examination on admission of prisoners is of indisputable importance for the detection and treatment of health disorders, particularly those incompatible with imprisonment. However, the health care professional who is to care for the health of the prisoner as a private caregiver should not issue certifications that prisoners are fit for imprisonment—a professional act that clearly is outside the principles of medical ethics and hardly ever fosters a trusting relationship with the patient.
- Penal systems with laws or decrees requiring the involvement of health care professionals in the approval of punishments and in the medical supervision of certain punitive or security measures (e.g., the penitentiary laws or regulations of Austria, Azerbaijan, and Germany), activities that are clearly outside the scope of health care to prisoners, likewise conflict with principles of medical ethics and are therefore rejected by international documents.
- Health care professionals in prisons may be requested by health care professionals participating in carrying out the death penalty and complicity in torture.

However, many subtle, much less spectacular situations in daily prison life cause health care professionals to forsake loyalty to their patients, often unwittingly or by failing to scrutinize routine procedures, decrees, or laws against the standards of medical ethics and human rights:

- The medical examination on admission of prisoners is of indisputable importance for the detection and treatment of health disorders, particularly those incompatible with imprisonment. However, the health care professional who is to care for the health of the prisoner as a private caregiver should not issue certifications that prisoners are fit for imprisonment—a professional act that clearly is outside the principles of medical ethics and hardly ever fosters a trusting relationship with the patient.
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- Health care professionals in prisons may be requested by prison authorities to obtain and analyze blood, urine (e.g., for drug detection), or other body samples; carry out intimate body searches; or disclose confidential medical data to the prison administration for forensic or security purposes.

For instances in which health care professionals must depart from undivided loyalty to prisoner patients, some documents offer an ethical loophole: if the health care professional makes a prisoner clearly understand that the role of the professional has changed in a particular instance and the reason for the change, such a departure can become morally and legally acceptable.

However, the switch from a professional's position of personal confidential caregiver with undivided commitment to the prisoner patient to acting as a forensic or public health officer accountable to the authorities—whose report might harm the patient—certainly is detrimental to the patient's trust, even if thoroughly explained.

The only way to avoid these dual-loyalties conflicts is a clear assignment of different medical roles to separate persons by (1) conferring to health care professionals who care for prisoners complete and undivided loyalty to their prisoner patients and (2) calling in forensic or public health officers who do not have a clinical relationship to patients for all tasks in which the prison administration or the state needs medical expertise that does not accord with the interests of prisoners.

The professional caring for a patient is solely accountable to the patient, and a forensic expert or a public health officer is primarily accountable to the state and to the community.
health officers and forensic experts can follow the principles of public health ethics rather than those of individual health ethics because their relationship to patients is transient; patients know the nontherapeutic purpose of their task, and therefore fidelity concerns are typically small enough to be outweighed by the accompanying social benefits.28

CONTINUING PREVALENCE OF DUAL LOYALTY IN PRISON HEALTH CARE

International documents on medical ethics in prison health care were formulated and published decades ago, but most prison health care professionals and prison systems still struggle with dual loyalty. Several reasons explain the delay in adopting these ethical standards:

- Health care professionals working under the hierarchies of justice or prison authorities receive little if any training in medical ethics regarding health care in prison. Professional ethics was one of the highest-priority training needs in a survey of doctors in English and Welsh prisons.29 Untrained prison health care professionals may not identify potential role conflicts.

- Despite the declarations regarding ethics of health care in prison by international organizations and by some countries,17,28 national professional organizations have largely failed to advocate on this issue. The relevant documents belong to what is called soft law: no legal sanctions apply to violators. If not covered by national law, deviation from principles of medical ethics can only be sanctioned by national professional boards and licensing bodies, which generally have no strongly developed interest in health care in prison.

- Prison directors, representatives of prison administrations, and criminal justice experts need greater knowledge and understanding of the principles of medical law and ethics, the role of health care professionals in prisons, and relevant international documents. One proof of this is the publicly expressed opinion of a professor of criminal law that “medical ethics apply to private doctors but not to prison doctors.”23

- Political influence and calculation may play a role. For instance, as a result of 2 recent workshops, on military medical ethics regarding dual loyalty28 and on interrogations, force-feedings, and the role of health professionals,30 the ethicist G.J. Annas noted that the summaries dramatically demonstrate that, for the first time in the history of the US military, the Department of Defense has a medical policy that goes directly against a well recognized international medical ethics standard.31 or 32

- In times of scarcity of public resources, prison health care may not be given priority. However, according to the revised European Prison Rules,7 neglect of the human right of prisoners to appropriate health care is not justified by lack of resources.

CURRENT STRUCTURES FOR HEALTH CARE IN PRISONS

Health care in prisons is organized in various ways according to the authority responsible for administration of prison health care and the employment status of professionals providing health care for prisoners. Listed in decreasing order for risks of dual loyalty for health care professionals, these consist of (1) the agency in command of the prisons (e.g., Ministry of Justice, Ministry of Interior, Ministry of Defense, police) in order from those who are integrated in military or military-like hierarchies to those who are full-time employed civil servants to those who are privately employed full or part time, and (2) community health services (e.g., Ministry of Health, Health Department, other public health authorities) in order from those who are full-time employed civil servants to those who are privately employed full or part time.

Health care professionals working in prisons who are integrated into uniformed executive bodies face the greatest challenges in defending professional independence and undivided loyalty to their patients because they are subjected to military-like chains of command. Health care professionals employed as civil servants of the prison authority and subject to civil service rules also may encounter demands for dual loyalty and limitations of medical independence and confidentiality. This is particularly the case whenever nonmedical superiors in the administrative prison hierarchy abuse their responsibility of supervision by interfering in medical issues.

Private health care professionals, subject to no other command than their professional code, are less likely to defer to prison authorities who pressure them to compromise exclusive loyalty to their patients. Full-time prison health care professionals are more likely to succumb to institutional cultures that subordinate patient interest to agendas of the prison than are part-time professionals who also work outside of prison walls and maintain continuous contact with health care in the community. Nevertheless, private health care professionals employed by the prison administration also can experience pressure from the threat of dismissal. Furthermore, economic constraints or budgetary problems communicated to doctors may influence their decisions.

Dual loyalty is least likely to arise where health care services are organized independently of the prison authorities. Prison authorities then take responsibility only for medical tasks deemed necessary for safety and security or for forensic purposes.

PRISON SYSTEMS WITH INDEPENDENT HEALTH CARE ADMINISTRATION

The canton of Geneva, Switzerland, in 1963 pioneered prison health care completely independent of prison authorities. Prison
health care was transferred to the Geneva University Hospitals in 1999 and integrated within the community health care system. The cantons Waadt and Vaud followed this lead, but prison health services in the remaining 23 Swiss cantons still lack independence.

In accordance with the principle that prisoners retain all human rights not lawfully taken away from them, the Norwegian Association for Penal Reform implemented its import model regarding health services in 1988. Responsibility for health services in prisons was transferred from the Ministry of Justice to the Ministry of Health. By 1994 municipalities became responsible for primary health care services in prisons and by 2002 the regional health authorities became responsible for specialized health care.33,34

In France, prison health care became the responsibility of the General Health Directorate for public health issues in the Ministry of Health in 1994 and is organized in cooperation with the nearest public hospitals, which set up consultation and health care units in each prison. They are responsible for all health services to prisoners and also organize continuity of medical care on release from prison.34

In New South Wales, Australia, prison health care was already the responsibility of the Minister of Health when in 1997 arrangements were consolidated under the Health Services Act. The health care service also provides basic health services to periodic detention centers (where convicted persons live when performing mandated community service) and works in police cells and courts, operating by means of a statutory memorandum of understanding with the Department of Corrective Services.34

After publication of a highly critical report on prison health care in 1996, the National Health Service and Her Majesty’s Prison Service established a formal partnership that aimed to bring health care standards in prisons up to the level of community standards. In 2003 the budget moved from the Prison Service to the Department of Health, and in 2004 primary health care trusts took over responsibility for delivering health care to some prisons, the handover was completed by 2006. Each prison has a health steering group that is responsible for enacting the local partnership between the prison and the health care provider.34

The Public Health Model of Correctional Health Care in Ludlow, Massachusetts, provides for seamless integration of professional medical information systems, and disease treatment and prevention between a large jail facility and a network of community centers.33 Several countries are considering similar moves, including Georgia, Scotland, and Spain.36,37

A ROADMAP TO ENDING DUAL LOYALTY

As a first step we should strive to meet the guidelines and proposed institutional mechanisms of the 2002 Physicians for Human Rights document Dual Loyalty and Human Rights in Health Professional Practice,1 including

- Raise awareness of principles of medical ethics as well as human rights among health care professionals and nonmedical prison communities and prison administrations.
- Train health care professionals working in prisons in human rights, medical laws and ethics, and skills to identify dual loyalty.
- Increase involvement of international and national professional bodies and boards of health care professionals in both active support and oversight of health care professionals working in prisons. (Active support comprises support of individual health care professionals as well as collective professional actions to uphold undivided loyalty of health care professionals in prison to their patients. National professional organizations and their licensing bodies should hold professionals accountable for violations of medical ethics and human rights and should advocate for developing, implementing, and monitoring national policies that comply with the principles of medical ethics and human rights in prison health care.)

The next step is the unconditionally separation of medical roles in prison. Professionals caring for prisoners should strictly and exclusively adhere to their role as caregivers to their inmate patients, acting in complete and undivided loyalty to them, and should firmly refuse to take over any professional obligation that is outside the interest of their prisoner patients. Professionally, they should be supervised by an authority other than the prison authorities, for example, the public health service or their professional association. In addition, inspections should be performed by an agency or organization that is independent of the prison authority or ministry of justice.

For all prison medical functions that are carried out in the interest of the state, the prosecution, the court, or the security system of the prison, public health officers, forensic experts, or other medical professionals not involved in the care of prisoners should be called in by the prison authorities.

Prison administrations and health authorities, although serving the same government, have completely different and often conflicting interests. The prison administration’s main task is safety and security; the health authority’s is health care. As long as health care professionals working in prisons are employed by the prison administration, they are vulnerable to pressures to serve medical purposes other than patient care. Therefore, responsibility for the provision of health care should be transferred from the prison administration to the public health authorities to avoid dual loyalty.

Better integration of prison health care and the public health service and equivalence of health care for prisoner and nonprisoner patients should be supported by common use of resources, infrastructure, personnel, expertise, training facilities, administration, management, documentation, and planning. This will lead to

- improved quality of health care in prison,
• inclusion of prisoners in public health initiatives,
• uninterrupted continuity of care when prisoners are transferred or released,
• completion of epidemiological surveillance, and
• better recruitment and qualification and less isolation of prison health care staff.

These benefits have been shown in countries that pioneered integration of prison health care with the public health services.34,36–38 However, it also has been shown that the process of transition requires careful preparatory advocacy, establishment of interministerial steering committees, and a stepwise process that takes several years until full implementation. It is high time to start this process.  

References


Access to health care in the general population

“Poverty is not a certain small amount of goods, nor is it just a relation between means and ends; above all it is a relation between people. Poverty is a social status... It has grown... as an invidious distinction between classes...”

Marshall Sahlins, *Stone Age Economics*

Health care insurance in Switzerland

Most societies carefully develop ways to contain increasing health care expenditures. Switzerland, which ranks second in the world's most expensive health care systems (see fig. 2), has universal health insurance coverage permitting access to a broad range of services. Patients are largely satisfied with the health care they receive.¹⁵²

Figure 2: Health expenditure per capita (U.S. dollar in purchasing power parity (PPP)) in 8 developed countries 1995-2007. PPP is a condition between countries where an amount of money has the same purchasing power in different countries.¹⁵³

Health insurance is compulsory for all Swiss citizens (7.9 million) and insurance premiums are paid independent of income.¹⁵⁴ Subsidies are paid for citizens of low income. For example, in
Geneva in 2009 subsidies were paid for 30.7% of the citizens, which is similar to the national mean of 31.4%. Health insurance covers the costs of medical treatment and hospitalization; however the insured person pays part of the cost of treatment. There is an annual flat deductible chosen by the insured which ranges from CHF 300 to a maximum of CHF 2,500 (1 CHF equals approximately 1 U.S. dollar or 0.9 euro) and premiums are adjusted accordingly. In addition there is a 10% deductible of the costs up to a stop-loss amount of CHF 700. Dental care is not included in the basic health insurance. In 2010, the average monthly compulsory basic insurance premiums were: CHF 351 for adults >25 years of age, CHF 294 for those aged 19-25, and CHF 84 for those <18 years of age. About 40% of the Swiss population chose to top-up their insurance coverage by private health insurance, which offers a wider choice of treatments and health professionals or more comfortable accommodation during a hospital stay. In contrast to basic insurance, insurers may refuse applicants for private insurance or only accept them subject to certain conditions. Between 1999 and 2009, health insurance premiums increased by 54%, with increasing out-of-pocket payments (see figure 2). Cuts in the catalogue of reimbursed health care services were agreed upon as cost-containment measures.

Health care renunciation for economic reasons

Health and socioeconomic status are strongly related. Ensuring socioeconomic equity and responsiveness of the health care system is often considered a high priority in health policy, as lack of access and responsiveness may cause or at least reinforce any socioeconomic gradient in health. Health care renunciation for economic reasons may worsen chronic diseases and increase the risk of complications and hospitalization.

Our study was the first to evaluate health care renunciation in a representative sample of the general population of a particular Swiss region, Geneva. We found that a substantial proportion (14.5%) of individuals renounced health care for economic reasons during the previous year. Seventy-five percent renounced dental care, 36% physician consultation, and 26% health devices such as eyeglasses or hearing aids. Because dental care is not covered by basic health insurance it might be the first renounced health care among people with scarce economic resources. Nevertheless, the association between income and health care renunciation remained after removing dental care renunciation, highlighting that dental care was not the only
relevant factor associated with health care renunciation. Another expected finding was the inverse correlation of income with health care renunciation. The poorest were 13 times more likely to renounce health care than the richest, even after adjustment for cardiovascular comorbidities, smoking, education, and occupation.

Reasons for health care renouncement are complex and go beyond purely economic arguments. Studies in the area of Paris noted that “the occurrence of reported forgone healthcare is higher among people who have had financial worries in adulthood, who have had a life course experience of physical, sexual or psychological abuse, who have experienced childhood difficulties, and who express a low degree of sickness orientation, a low self-esteem and/or a high worry/concern about health.”

The revision of the Swiss health insurance law (article 64A) in 2006 provided insurers with the possibility of denying payment of health care expenditures for insured persons who do not pay their health insurance premium. As we found 4.7% of participants who declared that at least one time they were unable to pay their premium, we can estimate that at a minimum 300,000 persons of the 7.9 million Swiss population are at risk to lose health insurance coverage.

These findings stress the importance of public health systems insuring equity in access to health care which means that it should be available to all, including those with a socioeconomic disadvantage.

See: “Health care renunciation for economic reasons in Switzerland” and “Social inequalities and access to health care: consequences of the revision of the Swiss insurance law (art 64A)”
Health care renunciation for economic reasons in Switzerland

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Summary

BACKGROUND: Most societies elaborate ways to contain increasing health care expenditures. In Switzerland out of pocket payments and cuts in the catalogue of reimbursed services are used as cost-containment measures. The aim of the study was to estimate the extent of health care renunciation for economic reasons and to identify associated factors.


RESULTS: 765 men and 814 women aged 35–74 years participated. 14.5% (229/1579) (95%CI 12.7–16.2) renounced health care for economic reasons. Among those who renounced (N = 229), 74% renounced dental care, 57% physician consultation (22% specialist, 15% general practitioner), 26% health devices, 13% medication, and 5% surgery. Income was negatively correlated with renunciation (r = −0.18, p < 0.001). Each decrease in income level category provided a 48% increased risk of renouncing health care for economic reasons (OR 1.48, 1.31–1.65). This association remained when dental care was excluded from the definition of health care renunciation.

CONCLUSIONS: In a region of Switzerland with a high cost of living, such as Geneva, socioeconomic status may influence the use of the health care system, and renunciation for economic reasons was not uncommon. More than 30% of the lowest income group renounced health care for economic reasons in the previous year. Health care underuse and renunciation may worsen the health status of a substantial part of society.

Key words: renunciation; underuse; health care; socioeconomic status; health insurance

Introduction

Most societies elaborate ways to contain increasing health care expenditure. Switzerland, which ranks second in the list of the world’s most expensive health care systems, has universal health-insurance coverage, permitting access to a broad range of services. Patients are largely satisfied with the health care they receive [1].

Health insurance is compulsory for all citizens of Switzerland (7 million) and insurance premiums are paid independently of earnings [2]. Subsidies are paid for citizens with low income (e.g., in Geneva, subsidies were paid for 30.7% of citizens in 2009, a figure similar to the national mean [31.4%]) [3]. Health insurance covers the costs of medical treatment and hospitalisation of the insured. However, the insured person pays part of the cost of treatment: 1, an annual flat deductible, called the franchise, which ranges from CHF 300 to a maximum of CHF 2,500 (1CHF = 15 = 1.35€); at the insured person’s choice (premiums are adjusted accordingly); and 2, a 10% deductible of the costs up to a stop-loss amount of CHF 700. Dental care is not included in the basic health insurance. In 2010, the average monthly compulsory basic insurance premiums were: CHF 351 for adults >25, CHF 294 for
insurance premiums were: CHF 351 for adults >25, CHF 294 for those aged 19–25 and CHF 84 for those <18 years [4]. Some 40% of the Swiss population choose to top up their insurance coverage with private health insurance, which offers a wider choice of treatments and health professionals, or more comfortable accommodation during a hospital stay. In contrast to basic insurance, insurers may refuse applicants for private insurance or only accept them subject to conditions. Between 1999 and 2009, health insurance premiums increased by 54%, with increasing out-of-pocket payments; cuts in the catalogue of reimbursed health care services were decided as cost-containment measures [2].

Health and socioeconomic status are closely related; in general, lower socioeconomic status is related to worse health outcomes [6, 7]. Ensuring socioeconomic equity and responsiveness of the health care system is often considered a high priority in health policymaking, as lack of access and responsiveness may cause or at least reinforce any socioeconomic gradient in health [8, 9]. Health care renunciation for economic reasons may worsen chronic diseases and increase the risk of complications and hospitalisation [10].

The aims of the study were to estimate the extent of of health care renunciation for economic reasons and to identify associated factors.

**Methods**

Our study used a population-based cross-sectional survey (2008–2009) of a representative sample in the Canton of Geneva, Switzerland. The “Bus Santé”-survey is an ongoing population-based cross-sectional study which collects information on cardiovascular (CV) risk factors. Details about the population and sampling methods are described elsewhere [11]. Briefly, every year the Unit of Population Epidemiology contacts and studies a representative stratified sample of men and women from the population of Geneva Canton (inhabitants in 2009). This ongoing, community-based surveillance has been designed to monitor chronic disease risk factors continuously since 1993 [12]. Subjects are selected independently throughout each year to represent the canton’s approximately 100,000 male and 100,000 female non-institutionalised residents aged 35–74 years. Eligible subjects are identified by means of a standardised procedure using an annual residential list established by local government. This list includes all potential eligible participants except persons living illegally in the country. Stratified random sampling is performed on the basis of the list, by gender, within 10-year age strata, proportional to the corresponding population distributions. Selected subjects are mailed an invitation to participate, and, if they do not respond, up to 7 telephone attempts are made at different times on various days of the week. If telephone contact is unsuccessful, 2 letters are mailed. Subjects not reached are replaced using the same selection protocol. Subjects who refuse to participate are not replaced. The participation rates reached 51% in 2008 and 54% in 2009. Each participant receives several self-administered, standardised questionnaires covering lifestyle and the risk factors for major chronic diseases.

**Renouncing health care for economic reasons:**

Renouncing health care for economic reasons was assessed by questionnaire. Participants were asked whether, during the previous 12 months, they had renounced any health care service for economic reasons. Participants specified the type of renounced health care (e.g. surgery), if any. Participants were also asked whether, during the previous 12 months, they had been unable to pay their premiums for economic reasons. For the present analyses, renounced health care was classified using the following six categories: devices (e.g. glasses or hearing device), healthcare provider consultation (generalist or specialist physician), surgery, dental health, medication, and others.

**Cardiovascular disease and risk factors:**

Information on CV comorbidities and risk factors (smoking, diabetes, hypertension, hypercholesterolaemia, myocardial infarction, angina, arterial thrombosis) were collected using questionnaires and defined as follows: yes to both questions: “Have you ever been told that you had diabetes/high blood pressure/high cholesterol/myocardial infarction? If so, are you taking a drug for it?” (if appropriate). Smoking was defined as current smoker.

**Socio-economic status and deductible:**

Occupation, education, and income were used to characterise socioeconomic status. Occupation was grouped into independent/non-manual and non-independent/manual. Education was grouped as high (≥13 years), medium (9–12 years), and low (≤8 years). Income was grouped into 6 categories (<CHF 300/month, 300–4999, 5000–6999, 7000–9499,
9500–13000, >13000). Deducible was grouped into 3 categories (CHF <500, 1000–1500 and ≥2000). All information was self-reported. There were no language restrictions as long as the participants were able to understand and answer the questionnaires. In 2008–9, 0.8% of the subjects were ineligible because of language problems. All participants gave written informed consent. The “Bus Sante”-survey was approved by the ethical research committee of the Geneva University Hospitals.

**Statistical analyses**

Means and frequencies (with 95% confidence intervals) of study variables were calculated. Cochran-Armitage test was used to test trends. Logistic regression models were used to test associations between renunciation of health care for economic reasons and study variables. In Switzerland most subjects do not have insurance for dental care, so we conducted a subanalysis among subjects who renounced care but not dental care. All p values were 2-tailed and significance set at <0.05. All analyses were performed using SAS software (SAS Institute, Inc., Cary, North Carolina).

**Results**

Information on renunciation of care was missing for only 2 subjects who were excluded from the analyses. 765 men and 814 women aged 35–74 years participated (participation rate = 51.5%). Mean age was 51.9 (standard deviation [SD] 10.9) for men and 51.5 (SD 10.8) for women. 229 out of 1579 (14.5%) (95%CI 12.7–16.2) renounced health care for economic reasons. Among those who renounced health care, 74% (95%CI 12.7–16.2) renounced dental care and 36% (92/225), (95%CI 30.1–42.7) physician consultation (21% specialist, 15% general practitioner), 26% (59/225) (95%CI 20.4–31.9) health devices, 12% medication (28/225) (95%CI 8.1–16.7) and 4% (11/225) (95%CI 2.0–7.7) surgery (fig 1).

Income level was negatively correlated with renunciation of care (r = −0.18, p-value = 0.02, fig 2, table 1). 58 subjects renounced care but not dental care. When the analysis was restricted to this subgroup, the association between health care renunciation and income remained. Thus, dental care was not the only relevant factor for the association. Persons with the lowest income (<3000 CHF/month) renounced health care 9 times more frequently than those with the highest income (≥13 000 CHF) (27.3% vs. 3.8%). Further, those with the lowest income presented with the highest burden in terms of CV disease or risk factors (r = −0.12, p <0.001) (fig 2). Compared to non-renouncing subjects, renouncers were 54% more likely to have at least one CV comorbidity or risk factor (OR 1.54 95%CI 1.10–2.17, adjusted for age, gender, Swiss citizenship, education, occupation, income and deductible level). We found no interaction between income and renunciation of health care on the prevalence of CV co-morbidity or risk factors.

After adjustment for smoking, age, sex, education, occupation, CV co-morbidities, deductible level, and Swiss citizenship, each decrease in the income level provided a 48% increased risk of renouncing health care for economic reasons (OR 1.48, 1.31–1.65).

During 2008 and 2009, 4.7% of participants declared they were unable to pay their health insurance premium at least once.

| Table 1: Adjusted odds ratios (OR) and 95% confidence intervals (CI) for risk of health care renunciation for economic reasons by income during the previous 12 months among a representative sample of 35–74-year-old citizens of the Canton of Geneva, Switzerland (2008–9). |
| Adjusted* OR (95%CI) |
| Income | OR | (95% CI) |
| < CHF 3000 vs ≥13 000 | 13.46 (5.85–30.93) |
| 3000–4999 vs ≥13 000 | 6.17 (2.98–12.76) |
| 5000–6999 vs ≥13 000 | 4.98 (2.44–10.14) |
| 7000–9999 vs ≥13 000 | 4.84 (2.43–9.94) |
| 9500–13 000 vs ≥13 000 | 2.59 (1.20–5.11) |

* Odds ratios are adjusted for smoking, age, gender, CV comorbidities, Swiss citizenship, education, occupation, and deductible level.

**Discussion**

A substantial proportion (14.5%) of a representative sample of the general population of Geneva renounced health care for economic reasons during the previous year. 75% renounced dental care, 36% physician consultation and 26% health devices such as eyeglasses or hearing devices. Because dental care is not covered by the basic health insurance in Switzerland, dental care may be the first health care to be renounced among people with scarce economic resources. Nevertheless, the association between income and health care renunciation remained after removing dental care renunciation. Thus, dental care was not the only relevant factor associated with health care renunciation.

Another expected finding was the inverse correlation of income with health care renunciation. The poorest were 13 times more likely to renounce health care than the richest, even after adjustment for CV comorbidities, smoking, education and occupation.

Strengths of the study are the representativeness of the participants, as well as the large sample size which allowed conclusions for an entire Swiss Canton. However, our results may not be representative of Switzerland as a whole.

Another limitation is the self-reported nature of part of the data. Also, since no former data exist, it is difficult to relate health care renunciation to cost containment instruments. It could also be related to other factors connected with health.
care underserved not assessed in our survey, such as culture, patient-doctor communication, or patient motivation [13–15]. Finally, a complete physical morbidity assessment would have improved the strength of the study but was not available. Delay in access to health care and prevention may worsen health problems and, in the end, increase costs, as diseases are not detected in their early stages [10, 16–19]. Also, the accumulation of negative social determinants of health, such as lower educational level or lower income, determines a higher burden of disease [6, 7]. Our findings highlight the fact that persons with lower income have the highest burden of disease and renounce care more frequently. The highest proportion of dental care renunciation is worrying and must be interpreted in the light not only of the association between dental health with socioeconomic status, but also with cardiovascular outcomes [20–21]. A meta-analysis found a 20% higher risk of future cardiovascular events in individuals with periodontal disease compared with those without. This increase in relative risk is more pronounced (44%) in persons aged ≥65 years. Although the increase in CV risk between subjects with or without periodontal disease in the general population is modest, it may have a profound public health impact since nearly 40% of the population has periodontal disease [22].

Income is a strong determinant of health and relates to various social determinants of health, such as housing, healthy food or access to health care [6]. In our study each decrease in income level provided a 48% higher risk of renouncing health care for economic reasons. This finding stresses how important it is that the organisation of public health systems should ensure equity in access to health care, which means that it should be available to all, including the socioeconomically disadvantaged. Our results suggest that this goal is not realised in one of the wealthiest countries of the world.

**Conclusions**

In a region of Switzerland with a high cost of living, such as Geneva, socioeconomic status may influence the use of the health care system and health care renunciation for economic reasons was not uncommon. In the previous year more than 30% of the lowest income group renounced health care for economic reasons. This effect is most pronounced in dental care, which is not included in the basic health insurance. Health care underuse and renunciation may worsen the health status of a substantial part of society.

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**Study funding / potential competing interests**

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Inégalités sociales et accès aux soins : conséquences de la révision LAMal (article 64A)

La révision LAMal article 64A entraîne l'impossibilité pour les personnes touchées d'obtenir certaines prestations médicales, notamment la remise de médicaments en pharmacie. Entre les mois de mai et août 2006, 84 personnes ont consulté à la Polyclinique de médecine des HUG pour y obtenir des médicaments. Ces personnes souffrent en général de maladies chroniques (88%) avec une forte prévalence d'atteintes psychiatriques (59%) et sont de faible niveau socio-économique. Cette révision rend donc aléatoire l'accès aux soins des plus faibles et ouvre une brèche dans le caractère universel de l'assurance maladie.

INTRODUCTION

Depuis le premier janvier 2006, l'article 64A de la loi sur l'assurance maladie (LAMal) autorise les assureurs à suspendre le remboursement des prestations en cas de paiement incomplet des quote-parts ou des primes d'assurance maladie. En avril dernier, le Conseil d'État genevois mandatait la Polyclinique de médecine et la Consultation des maladies infectieuses des Hôpitaux universitaires de Genève (HUG) afin d'assurer la continuité des soins pour les personnes touchées par ces mesures. Nous livrons ici un premier bilan de l'introduction de cet article et un descriptif de la population concernée. Nous tentons par ailleurs de rester à ce problème dans celui, plus global, des inégalités sociales en matière de santé.

INÉGALITÉS SOCIALES ET SANTÉ

Une corrélation directe entre statut social, morbidité et mortalité a été rapportée dans de nombreux pays occidentaux. Au cours des dernières décennies, ce phénomène s'est même accentué dans certains pays tels que l'Angleterre et les États-Unis. Ainsi, entre 1930 et 1990, la différence de mortalité observée entre professionnels qualifiés et main-d'œuvre non qualifiée en Angleterre a plus que doublé pour atteindre une différence d'espérance de vie de dix ans. Si cette tendance semble s'être infléchie à partir de 1990, la différence en termes d'années de vie en bonne santé a continué de s'accroître (66,2 vs 49,4 ans).

L'influence pronostique du statut socio-économique a par ailleurs pu être démontrée concernant différentes pathologies telles que cancers ou infarctus du myocarde. Une corrélation avec des marqueurs biologiques comme la protéine C réactive, le HDL-cholestérol ou le fibrinogène a également été observée. La Suisse n'est pas épargnée par ces phénomènes avec une différence d'espérance de vie de 4,4 ans entre professions libérales ou scientifiques et ouvriers peu ou pas qualifiés.

INÉGALITÉS SOCIALES ET SOINS

Si l'inégalité existe face à la maladie, elle est également présente face au système de santé ; selon des données du CDC, 15% des Américains adultes n'étaient pas au bénéfice d'une assurance maladie en 2004.
Parmi eux, 41% avaient dû renoncer à consulter un médecin lorsque indiqué pour des raisons financières au cours de l’année écoulée et 56% n’avaient pas de médecin traitant (vs 9 et 15% chez les patients assurés). Par ailleurs, les patients non assurés s’estimaient en moins bonne santé que les patients assurés et étaient moins susceptibles d’avoir bénéficié de stratégies de dépistage telles que mammographies, frottis cervical, recherche de sang occulte ou colonoscopie.

Des inégalités sont également observées dans l’accès à certaines technologies ou consultations spécialisées. Une étude récente menée dans plusieurs pays de l’OCDE révèle que les patients avec revenus élevés ont plus facilement accès à des médecins spécialistes que les patients à faibles revenus. Parmi les explications évoquées, les auteurs avancent des possibles facteurs géographiques liés à la distribution de l’offre ainsi qu’une capacité différente à faire valoir sa demande de consultation spécialisée selon le statut social.

De façon intéressante, le système de financement des soins semble également jouer un rôle déterminant dans l’importance de ces différences. Les pays dépourvus de système d’assurance universelle (États-Unis, Mexique) présentent les plus fortes différences en termes d’accès à des consultations médicales en général et les pays bénéficiant de systèmes importants d’assurances privées parallèles (Irlande, Espagne, Portugal) ont des différences significatives en termes de recours à des médecins spécialistes malgré un accès équitable aux médecins de premier recours.

Néanmoins, des différences dans l’accès à des soins spécialisés sont observées même dans des pays pourvus d’une couverture assurancielle universelle. Une relation linéaire entre revenu et accès à une coronarographie ainsi qu’une relation inverse avec le temps d’attente ont ainsi pu être observées dans une étude canadienne portant sur plus de 50 000 patients admis pour un infarctus du myocarde. Par ailleurs, chaque différence de salaire annuel de 10 000 USD était corrélée à une diminution de 10% de la mortalité à un an. Ces résultats ont été obtenus après correction pour l’âge, le sexe, la sévérité de la maladie, la spécialité du médecin urgentiste et les caractéristiques de l’hôpital.

**SITUATION EN SUISSE**

En Suisse, le caractère obligatoire de l’assurance maladie instauré en 1996 garantit en théorie une couverture universelle et solidaire face au risque de maladie.

Néanmoins, à l’instar des autres pays développés, la Suisse a connu une hausse régulière des coûts de la santé au cours de la dernière décennie atteignant en moyenne 5%. Par année et se traduisant par une augmentation parallèle des cotisations d’assurance maladie. La prime annuelle moyenne par assuré adulte est ainsi passée de 2969 francs en 1997 à 4196 francs en 2004, auxquels il convient d’ajouter l’augmentation de la participation aux frais résultant de l’augmentation des quote-parts et des franchises minimales.

Le système suisse d’assurance maladie se caractérise en outre par l’établissement des primes *per capita* et indépendamment de la richesse et du revenu. De fait, une proportion grandissante de personnes rencontre des difficultés à faire face à ces dépenses. Pour le seul canton de Genève, 175 000 personnes, soit 38% de la population, étaient, en 2002, au bénéfice d’un subsidie de la part de l’Etat pour un montant annuel total de 245 mio de francs. Parallèlement, la pauvreté augmente et touche, la même année, une personne sur huit (13%) âgée de 20 à 59 ans et une sur quatorze parmi les personnes vivant dans un ménage dans lequel on trouve au moins l’équivalent d’un emploi à plein temps.

Cette dernière catégorie, désignée par le terme de *working poor* est essentiellement constituée de familles monoparentales, de familles nombreuses (> 3 enfants), de personnes à faible niveau de formation ou de personnes d’origine étrangère.

**L’ARTICLE LAMAL 64A ET LA PROCÉDURE MISE EN PLACE À GENEVE**

La modification de l’article 64A de la LAMal, entrée en vigueur en janvier 2006, autorise les assureurs à suspendre le remboursement des prestations dès la notification à l’assuré d’une procédure de poursuite en cas de non-paiement d’une prime ou d’une participation.

Considérée être un moyen de pression pour les caisses sur les « mauvais payeurs », cette suspension entraîne l’impossibilité d’obtenir certaines prestations telles que remise de médicaments en pharmacie, analyses médicales ou consultations dont le paiement n’est plus garanti.

En mars dernier, le Groupe Sida Genève alertait l’opinion publique sur les premières conséquences de cette mesure, à savoir l’interruption forcée de thérapies chez des patients séropositifs ne pouvant pas obtenir leurs médicaments en pharmacie.

Le Conseil d’Etat genevois a rapidement réagi en mettant en place une procédure en collaboration avec les hôpitaux universitaires de Genève (HUG) et le Service du pharmacien cantonal.

Depuis le 7 avril dernier, les personnes touchées par une suspension des prestations de la part de leur assureur maladie et nécessitant un traitement médicamenteux se voient remettre par leur pharmacien une attestation de non-remise de médicaments. Munis de celle-ci, les patients sont adressés à la Policlinique de médecine des HUG ou au Service des maladies infectieuses concernant les problèmes de thérapies antirétrovirales. Ils s’y font remettre directement les médicaments nécessaires, si ceux-ci sont disponibles, ou sont orientés vers deux pharmacies partenaires.

**CONSEQUENCES DE L’ARTICLE 64A OBSERVÉES À LA POLICLINIQUE DE MÉDECINE**

Sur la base des dossiers de notre service social et du recueil systématique des ordonnances médicales dès le mois de juin 2006, nous avons pu établir certaines caractéristiques sociodémographiques et médicales de ce collectif de patients. De plus, un échantillon aléatoire, représentant le quart de cette population a été contacté téléphoniquement afin d’obtenir, par des questions standardisées, un
apercu de leur état de santé subjectif et des conséquences médicales de la suspension des prestations par leur assureur maladie (renoncement aux soins, refus de soins, interruptions forcées de traitement et conséquences éventuelles de cette interruption).

Entre les mois de mai et d’août 2006, 84 patients, soit environ un nouveau cas par jour, se sont présentés à la polyclinique munis d’une attestation de non-remise de médicaments (figure 1) et quatre à la consultation des maladies infectieuses.

![Figure 1. Patients avec suspension des prestations LAMal se présentant à la Polyclinique de médecine à Genève. Leur nombre a fortement augmenté depuis le mois d'avril 2006.](image)

Le nombre total de consultations pendant ces quatre mois a été de 137 pour les 84 patients de la polyclinique.

L’âge des patients est compris entre 21 et 76 ans avec un âge moyen de 47 ans et une répartition hommes-femmes équilibrée (51% des personnes de sexe masculin).

Une importante majorité (75%) de ces personnes est sans emploi et bénéficiaire d’aides sociales telles que l’assurance invalidité (AI), l’OCPCA, l’AVS ou l’Hospice général.

Dans la plupart des cas, le paiement des primes maladie est assumé régulièrement par les services d’aide sociale et la suspension des prestations est motivée par des contentieux anciens et portant en général sur des sommes de faible importance (non-paiement des quote-parts, non-paiement de la différence entre le montant de la prime cantonale moyenne et la prime réelle de l’assuré, retard de paiement des primes pendant la période précédant l’obtention des aides sociales ou interruption des aides sociales pour des motifs divers).

Sur le plan médical, ces patients souffrent en général de maladies chroniques (68%) et ont consulté pour obtenir des traitements dont l’interruption peut avoir des conséquences graves, voire potentiellement fatales dans près de 40% des cas.

Plus de la moitié des patients (59%) sont atteints dans leur santé psychique et les psychotropes sont la classe de médicaments la plus représentée. Suivent les pathologies cardiovasculaires (25%), le diabète (17%), les dyslipidémies (14%) et les problèmes pulmonaires (14%).

Les médecins prescripteurs se répartissent équitablement entre médecins hospitaliers (51%) et praticiens.

Concernant l’état de santé ressenti, évalué sur la base d’entretiens téléphoniques portant sur un échantillon limité de patients (n = 22), une majorité (63%) se considère en assez mauvaise ou mauvaise santé, se situant entre 1 et 2 sur une échelle de 5 points et plus de la moitié a dû renoncer à consulter, soit pour des raisons financières, soit en raison d’un refus de la part des structures de soins. La plupart des personnes disent par ailleurs avoir dû interrompre leur traitement médicamenteux avant de l’obtenir à la Polyclinique de médecine et pensent que cette interruption a eu un impact défavorable sur leur santé physique ou mentale.

**DISCUSSION**

Nous livrons ici un premier aperçu des effets observables de l’entrée en vigueur de l’article 6ÂA à la Polyclinique de médecine de Genève.

Ce service ayant centralisé la remise de médicaments aux personnes touchées par cette mesure, notre descriptif peut être considéré comme représentatif des patients ayant eu recours à la procédure mise en place par le Conseil d’État dans le canton de Genève. Cette observation apporte des données quantitatives concernant le nombre de personnes concernées et des éléments qualitatifs sur le type de population atteinte.

Elle ne représente toutefois que la partie émergente d’une problématique touchant probablement un nombre beaucoup plus élevé de personnes. En effet, selon des chiffres publiés dans les médias et provenant de certains assureurs, près de 5% de la population pourrait être concerné par la révision de l’article 6ÂA.

Le constat principal est que cet article touche principalement des personnes souffrant de maladies chroniques et de faible niveau socio-économique, puisqu’une majorité d’entre elles est dépendante d’aides sociales. Ce lien entre niveau socio-économique et maladie est corroboré par les chiffres de l’Hospice général. En 2002, 56% des dossiers d’assistance faisaient état d’atteintes à la santé dont 26% d’atteintes psychiques, 17% d’atteintes psychiatriques et 13% d’atteintes psychiques et physiques cumulées.

La forte prévalence de maladies chroniques dans notre collectif suggère plusieurs hypothèses : d’une part, en raison du caractère récent de l’introduction de l’article 6ÂA, il est probable que seules les personnes nécessitant régulièrement des médicaments aient eu recours à la procédure mise en place. D’autre part, il se peut que les patients les plus malades, les « mauvais risques » pour les assureurs, aient été visés prioritairement par ces mesures.

Notre description n’inclut en effet pas les éventuelles personnes en bonne santé touchées par l’article 6ÂA.

Par ailleurs, il est à craindre que certaines personnes très sévèrement atteintes sur le plan psychique ou dans leur mobilité n’aient renoncé à l’obtention de leurs médicaments face à la méconnaissance ou à la complexité de la procédure mise en place et au sentiment de stigmatisation lié au refus de remise de médicaments par leur pharmacien.
D’un point de vue médical, il est intéressant de relever que les maladies cardiovasculaires, le diabète et les problèmes pulmonaires sont fortement représentés. En effet, selon certaines données américaines, ces pathologies figurent parmi les principaux responsables de la surmortalité liée au statut socio-économique et s’expliqueraient en partie par une plus grande prévalence de comportements à risque tels que tabac, alcool et séduction chez les personnes de faible niveau socio-économique.

Il est par ailleurs préoccupant de constater qu’en dépit de la procédure mise en place, une proportion importante de ces patients rapporte avoir dû interrompre son traitement, s’exposant parfois à un risque de complications sévères, voire fatales.

Le deuxième fait marquant de notre observation est la forte prévalence de troubles psychiatriques, notamment de dépressions. L’atteinte à la santé mentale est certainement un facteur majeur de désinsertion socioprofessionnelle de la vie sociale des patients concernés. Comme pour le tabagisme, une intervention doit être envisagée à cette échelle. Les prestations les plus efficaces sont celles qui concernent la victime dans sa globalité, et non seulement les personnes de la plante et du médecin. Il est donc indispensable de réfléchir à des approches plusholistiques et à des politiques de santé plus larges.

Ces patients semblent donc particulièrement susceptibles d’être touchés par l’article 64A en raison de leurs difficultés financières et de leur incapacité à effectuer dans les délais requis les démarches nécessaires auprès des services sociaux compétents.

Sur le plan social, on note que trois patients sur quatre (75%) bénéficient d’aides sociales assumant le paiement de leurs primes d’assurance et que la suspension des prestations par les assureurs intervient parfois en raison des délais induits par la surcharge de certains services établis tels que le service de l’assurance maladie (SAM) ou l’hôpital général (HG). En effet, les prestations étant suspendues dès la notification à l’assuré de l’acte de poursuite, il peut parfois s’écouler plusieurs mois avant l’obtention d’un acte de délai de biens préalable, nécessaire à la prise en charge des primes par le service compétent. Ces particularités cantonales pourraient expliquer l’impact variable de l’introduction de l’article 64A selon les cantons. Nous ne disposons actuellement que de peu de données sur les autres cantons touchés.

Cette observation ne nous permet certes pas d’évaluer les effets bénéfiques de l’article 64A, notamment sur les comptes des assureurs maladie et de l’efficacité de leur effet incitatif sur le paiement des retards de cotisation chez des personnes en situation moins précaire. Il est à craindre, cependant, que le bénéfice financier attendu ne repose prioritairement sur un effet dissuasif quant à l’accès aux soins des plus faibles, remettant en cause le principe de solidarité censé être à la base de notre système d’assurance maladie. En effet, la plupart des patients observés dans notre institution se trouvent dans une incapacité réelle à faire face à leurs frais d’assurance maladie souvent en raison de la coexistence de difficultés socio-économiques, de troubles psychiatriques et de la surcharge de certains services sociaux cantonaux. L’application de l’article 64A risque donc d’entraîner, pour ces personnes, une exclusion parfois durable du système de santé.

On peut par ailleurs s’interroger sur l’intérêt pour la collectivité de continuer à payer des sommes importantes pour des primes d’assurances, alors que les prestations sont suspendues et que la collectivité finit par fournir elle-même des soins dont une partie ne sera probablement jamais remboursée.

Dans l’attente d’une décision du pouvoir politique permettant de résoudre de façon satisfaisante les difficultés induites par l’entrée en vigueur de l’article 64A, il nous apparaît important, pour tout acteur dans le système de santé, et en particulier pour le médecin de premier recours, de connaître cette problématique et de pouvoir informer les patients concernés de la procédure en vigueur dans leur canton. Plus généralement, la connaissance de la situation socio-économique du patient devrait être identifiée de façon systématique, d’autant plus que cette information peut aider à identifier le patient d’obtenir le traitement ou le médicament prescrit. Cela peut engendrer des problèmes plus importants pour une part non négligeable de la population, en particulier pour des personnes à faible revenu et avec des franchises élevées.

Enfin, il nous paraît important de rappeler que les facteurs comportementaux, matériels, environnementaux, psychosociaux ou liés au système de soins expliquent les inégalités sociales en matière de santé et de mortalité. Dans la mesure du possible, il est possible de réduire les inégalités sociales en matière de santé et de mortalité. Dans la mesure du possible, il est possible de réduire les inégalités sociales en matière de santé et de mortalité.

**Remerciements**

Nous remercions Éliana Induni et Grégoire Humbert pour leurs commentaires précieux.

**Implications pratiques**

- L’article LAMal 64A entraîne des difficultés d’accès aux soins pour certains patients.
- Chaque médecin devrait connaître le lien entre statut social et santé et identifier l’éventuelle barrière d’accès aux soins pour ses patients.
- Il incombe au pouvoir politique de surveiller et d’analyser systématiquement les conséquences de l’article 64A afin de ne pas mettre en péril l’objectif principal de la LAMal qui est l’accès aux soins pour l’ensemble de la population.

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Necessary actions for urban health

Health services within cities need to be tailored to the social and physical environment in which people live. In particular they have to take into account the following specificities:

- **Complexity**: Cities are complex. Political, social, and economic factors influence health on an individual, familial, communal, regional, national and global level.
- **Diversity**: Compared to non-urban areas, cities have higher proportions of immigrants and disadvantaged populations. They have a higher variety of sociocultural characteristics, with different lifestyle forms and greater sociodemographic inequalities.
- **Organization**: The organization of cities induces certain benefits (e.g., better use of energy, improved health and social services, and greater tolerance of different behaviors and values) and disadvantages (e.g., concentration of social inequality, loneliness, noise) in a very complex ecosystem.

Access to health care for vulnerable populations

Health care for disadvantaged urban populations such as undocumented migrants, working poor, or detainees has several benefits. **First**, it solves a concrete problem by helping the ill person to have access to preventive services and treatment. **Second**, it increases equity, social justice and the respect of fundamental human rights. Other vulnerable groups (e.g., the elderly, persons with psychiatric disease, etc.) may feel secure when they recognize that the most disadvantaged are treated with respect. In contrary, societies which deny fundamental human rights to certain groups may also neglect these rights for others. **Third**, good access to healthcare for vulnerable populations increases the health of the society as a whole. Healthy societies are advantaged in international economic competition. **Fourth**, healthcare for vulnerable populations helps to identify weaknesses and problems related to social security systems. Careful examination of the situation of disadvantaged urban populations can help to identify weaknesses in the social security system as a whole. For example, the idea to look carefully at barriers to health care in the general population was motivated by the work with undocumented migrants who face multiple barriers in access to health care. The finding that 14.5% of the Swiss residential population renounced health care for economic reasons was
surprising in its extent, and highlighted the fact that even in a healthcare system considered as one of the best in the world substantial inequalities exist, and this even among legal residents.\textsuperscript{162} \textbf{Fifth}, access to hard-to-reach populations is important for the community as a whole. It allows \textit{identification and treatment of health problems} which are of particular concern for public health overall, including infectious diseases which are related to migration and travel without borders.\textsuperscript{39} \textbf{Sixth}, access to health care for vulnerable populations also means access to the individuals themselves, which provides the basis for \textit{epidemiologic research}. Medical research helps to draw public attention to important problems in society and promote actions for change. A recent publication of the British Medical Association states that “Doctors can use their position and their expertise to \textit{advocate for change} to areas outside traditional medical areas, and to promote the generation of research”.\textsuperscript{171}

Healthcare professionals and particularly primary care physicians are well placed to understand the social realities, its health consequences, and the health needs of the population. Most often, they are the individual’s initial contact with the health care system. It was reported that among a group of 1,000 people in a one-month period, 800 will present with any type of health problem, 217 will see a doctor, and 113 a primary care physician.\textsuperscript{172} In Switzerland, 88% of the resident population has a family doctor and 73.5 % will visit at least once per year.\textsuperscript{173} A wide range of specific skills\textsuperscript{174} (person-centered care, specific problem-solving skills, comprehensive and holistic approaches, community orientation) allows for management of a variety of problems in the community and to find solutions if barriers to health care access are identified.

\textbf{Building Healthy Cities}

Urban health needs to be addressed by the interdisciplinary collaboration of many fields of study which focus on health.\textsuperscript{21,167} The WHO European Healthy Cities Network aims to put health high on the social, economic and political agenda of city governments.\textsuperscript{175} The WHO “Healthy Cities” movement promotes comprehensive and systematic policy and planning for health, and its aims are as follows :\textsuperscript{175}

- Improve the quality of its environment
- Promote the development of a supportive community and participatory governance
- Understand the needs of vulnerable groups
• Act in favor of health for all and reduce inequalities
• Develop diversified and innovative economy
• Give everyone the means of access to culture and to realize his or her creative potential

The Healthy Cities movement is not only about the health sector. It includes social, economic and environmental determinants of health because it is the business of all sectors. Local governments are in a unique leadership position with power to protect and promote their citizens’ health and well-being.

Health in all policies

An important aspect of Healthy Cities was the development in 1986 of “healthy in all policies” (HiAP) on the occasion of the Ottawa Charter. HiAP implies that every urban project must take into account the health of the people living in the community. “Health in All Policies is a horizontal, complementary policy-related strategy with a high potential to contributing to population health. The core of HiAP is to examine determinants of health, which can be influenced to improve health but are mainly controlled by policies of sectors other than health.”

This means that public health goes beyond the health field and aims to integrate all stakeholders, such as the following: Ministries (e.g., trade, agriculture, finance, foreign affairs, education), parliamentarians, non-governmental organizations (NGOs), private companies, research institutions and, in developing countries, foreign aid donors, regional and multilateral development banks, United Nations organizations, consultancy firms, and philanthropy.

Kickbusch illustrates these changes in public health and states “...for a significant period in the 19th century the focus of public health was national and political, ...and is now being challenged to strengthen the political strand together with the global dimension of managing interdependence. This political action also has a new dimension: while, in the 19th century, the role of NGOs was an important feature of public health action, a new aspect today is the role of the global industry of health related products and services, which has catapulted the health agenda into discussion”

Health and population well-being needs to be in the center of future development, particularly in urban settings. One of the best examples of successful implementation of HiAP worldwide is New York, where Mayor Michael R. Bloomberg and Health Commissioner Dr. Thomas A. Farley
launched important public health initiatives and improvements in the quality of the health care delivery system. These measures contributed to the record high life expectancy of 80.6 years, an increase of nearly three years since 2000 and nearly two and a half years more than the most recently reported U.S. national rate of 78.2 years.178

Significance and perspectives

The objective of this scientific work was to create and improve epidemiologic knowledge with respect to two vulnerable populations in an urban setting, undocumented migrants and detainees. Several studies were the first in Switzerland and/or Europe to determine specific health problems among these populations.15;20;21;75;78;162 The findings strengthened the sustainability of innovative projects promoted by the clinical units. Above all, the research was a critical support to help primary care physicians advocate for change and decrease health inequality by improving access to quality health care.

Future development needs can be proposed as follows:

1. Epidemiological research: Descriptive epidemiological research needs to be continued and also include qualitative studies which help to understand high risk behavior of certain subgroups. The sociodemographic composition of migrants and detainees (who are mainly migrants) are constantly changing in relation to complex combinations of social, ethnic, economic, and politically related factors which drive migration.179 Therefore, continuous description of the migrant population is essential to optimally adapt health care and prevention to changing needs.

2. Interventions on specific health-related topics and sound evaluations: Urban health professionals should address specific themes (e.g., contraception in undocumented migrants, efficient screening strategies for infectious diseases or harm reduction measures in prison) on the basis of research findings. These projects should use a participatory approach by implementation of the target population and should be thoroughly evaluated. An important field of future research is related to efficacy of prevention measures.171
3. Education: Healthcare professionals and other players in the field of urban health need to improve their understanding of the high degree of complexity and diversity of cities and the health-related consequences of urban organization. Universities have to address these needs as well and should stimulate interdisciplinary approaches. Furthermore, primary care physicians should be in contact with disadvantaged populations during training. And finally, Universities and affiliated hospitals need to support healthcare workers, particularly those who work with disadvantaged populations, and offer them training in epidemiology and biostatistics which is critical for the realization and publication of research projects.

Conclusions

Since 2007, the majority of human beings have come to live in urban settings with growing influence on all spheres of human life. Public health had to adapt to the consequences of the rapid demographic shift towards cities where social and health inequalities are substantial.\textsuperscript{10,167,168} A major aspect in urban health refers to social cohesion and equity in access to health care, particularly for vulnerable populations.\textsuperscript{2,8}

The presented epidemiologic research related to undocumented migrants and detainees helped not only to identify the health status of vulnerable populations and their difficulties in access to health care, but also to identify barriers in access to health care for the general population. This research helped to implement effective and sustainable projects which significantly improved access to health care for disadvantaged populations in Geneva. Further developments concern research on the efficacy of prevention measures among these populations and strengthen the training of healthcare professionals for specific aspects of urban health by stimulating interdisciplinary approaches and permitting contact with disadvantaged populations.

Healthcare professionals and particularly primary care physicians are well placed to understand the social realities, its health consequences and the health needs of the population. In consequence they should use their position and their expertise to advocate for change, also outside traditional medical areas. The increasing importance of urban centers on population health motivated WHO Europe to launch the WHO Healthy Cities movement to promote “health
in all policies”. Health, social justice and population well-being demands its place in the center of attention of future urban development.

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