



Tobacco use and tobacco-related cancer risks in migrants in Europe

Simon Ducarroz

► To cite this version:

Simon Ducarroz. Tobacco use and tobacco-related cancer risks in migrants in Europe. Human health and pathology. Université de Lyon, 2016. English. NNT : 2016LYSE1029 . tel-01861848

HAL Id: tel-01861848

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THESE DE L'UNIVERSITE DE LYON

Délivrée par

L'UNIVERSITE CLAUDE BERNARD – LYON 1

Ecole Doctorale Interdisciplinaire Science et Santé (EDISS)

Pour l'obtention du

DIPLOME DE DOCTORAT

Mention « Epidémiologie, Santé publique, Recherche sur les services de santé »

Soutenue publiquement le 19 février 2016

par

M. Simon DUCARROZ

*Le tabagisme et le risque de cancers liés au tabac
chez les migrants en Europe*

- - -

*Tobacco use and tobacco-related cancer risks
in migrants in Europe*

Thèse dirigée par Anne-Marie SCHOTT PETHELAZ et Joachim SCHÜZ

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Résumé en Français

Les migrations internationales augmentent et l'Europe ne fait pas exception avec plus de 10% de la population de l'Union Européenne en 2014. Une question importante est le tabagisme des immigrés qui pourrait entraîner des risques de maladies liées au tabac différents de ceux des natifs des pays hôtes. Pourtant, on ne connaît que très peu l'usage du tabac, qui est une cause évitable de cancer, et les maladies liées au tabac chez les immigrés en Europe.

L'objectif général de cette thèse était d'étudier l'usage du tabac et le risque de cancers liés au tabac chez les immigrés. Les objectifs spécifiques étaient de:

- enquêter sur le tabagisme et ses déterminants chez les immigrés en France (étude pilote TOBAMIG),
- comparer l'incidence des cancers liés au tabac entre les immigrés et les natifs au Danemark,
- mettre ces résultats en contexte avec les connaissances actuelles, et
- suggérer un design d'étude sur le tabagisme et le risque de cancer lié chez les immigrés en France.

L'étude pilote TOBAMIG a collecté des informations sur l'usage du tabac dans un échantillon d'immigrés, représentatif pour la plupart des caractéristiques démographiques. Avec des modifications, les résultats indiquent la faisabilité d'une étude à grande échelle en France. Au Danemark, le taux d'incidence des cancers liés au tabac chez les immigrés était inférieur à celui des natifs ; cependant, de grandes disparités ont été observées par site cancéreux et pays d'origine, suggérant en outre un rôle du tabagisme dans les pays d'origine des immigrés. Enfin, deux designs d'étude sont proposés, qui varient en fonction de la quantité d'information recherchée, afin de mieux comprendre le tabagisme des immigrés.

Mots clés : Tabac, Cancer, Immigrés, France, Danemark, Etude pilote

English summary

International migration is increasing and Europe is no exception with immigrants accounting for more than 10% of the total European Union population in 2014. One pressing issue is tobacco use in immigrants as they may use tobacco differently from the natives of the host-country and this could result in differing tobacco-related cancers (TRC) risks compared to those in the natives. However very little is known about tobacco use, a major avoidable cancer cause, and TRC in immigrants in Europe.

The overall objective of this thesis was to investigate tobacco use and risk of TRC in immigrants. The aims were to:

- explore tobacco use and its determinants in immigrants in France (TOBAMIG pilot study),
- compare the burden of TRC between immigrants and natives in Denmark,
- put these results into context with current knowledge, and
- give guidance on how to set up a study on tobacco use and cancer risk in immigrants in France using the experience from the TOBAMIG pilot study.

In the TOBAMIG pilot study information on tobacco use and its determinants was collected from a mixed sample of immigrants, suggesting a large-scale study was in principle feasible, but modifications from the TOBAMiG approach were to be made. In Denmark, the overall TRC rate in immigrants was lower than that of the natives; however, large differences were observed by cancer-site and by country of origin, suggesting that among other factors the smoking patterns from the immigrant's country of origin have a primary role in the burden of TRC. Finally, with regard to a large-scale study in France, two study designs are proposed, depending on the quantity of information sought, to better understand tobacco use in immigrants and risk of TRC.

Key words: Tobacco, Smoking, Cancer, Immigrants, France, Denmark, Pilot study

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Acknowledgement

I would like to thank my thesis director Anne-Marie SCHOTT, my thesis co-director Joachim SCHUZ and my supervisor Maria LEON ROUX for giving me the chance to do my PhD at the International Agency for Research on Cancer. In particular, I would like to thanks them for the trust they showed me during these 4 years.

I would also like to acknowledge the financial support I received from the French “Ligue Nationale Contre le Cancer” who granted me a 3-years doctoral grant and the International Agency for Research on Cancer who supported me when the former grant ended, for an additional 15 months.

I wish to thank the people who have given their time to take part in the TOBAMIG survey.

I am also grateful to my colleagues at IARC who have been supportive and have given precious advice at different times during the preparation of this thesis. Furthermore, I want to thank the colleagues who helped proof-read my thesis.

I would like to acknowledge Susanne DALTON, Pierre CHAUVIN and Edouard TURSAN D’ESPAGNET who have kindly accepted to review my thesis and to be part of the thesis jury committee.

Last but not least, I want to warmly thank my family and friends for their patience and constant support without which this thesis would not have been possible. I am very grateful to them.

Résumé substantiel en français

Introduction

Les migrations internationales augmentent et l'Europe ne fait pas exception à ce phénomène. En 2014, Les immigrés représentaient plus de 10% de la population dans l'Union Européenne. Une question importante est la santé des immigrés, étant donné que les immigrés peuvent avoir des comportements différents en matière de santé. Par exemple, ils peuvent consommer le tabac différemment, tant en intensité de consommation que de produits utilisés (cigarette, chicha, tabac sans fumée), ce qui pourrait entraîner des risques différents de maladies attribuables au tabac par rapport aux natifs des pays d'accueil. Pourtant, on ne connaît que très peu l'usage du tabac et le fardeau des maladies liées au tabac chez les immigrés en Europe. C'est une question importante puisque l'usage du tabac est une cause évitable majeure de cancer, et est maintenant un facteur de risque établi pour environ 20 types de cancer. En Europe, on estime qu'environ un cas de cancer sur cinq est causé par la cigarette. Par conséquent, l'étude de l'usage du tabac et des cancers liés au tabac chez les immigrés est d'une importance grandissante.

Nous nous attendons à ce que les normes et les traditions des pays d'origine continuent d'influencer le comportement des migrants après leur installation dans les pays d'accueil Européens. Par conséquent, nous prévoyons que la prévalence du tabagisme – incluant les cigarettes, les cigares et les narguils, ainsi que l'utilisation de tabac sans fumée à priser et à chiquer - chez les migrants montre une tendance similaire à la prévalence dans les pays d'origine. Plus précisément, les migrants originaires d'un pays avec une prévalence du tabagisme particulièrement faible consommeraient moins de tabac que les migrants venant de pays à forte prévalence du tabagisme, ou que les natifs des pays hôte Européens à forte prévalence du tabagisme.

Nous nous attendons également à ce que l'acculturation modifie les comportements spécifiques des populations migrantes. Il a été observé que les migrants de la deuxième génération ou ceux qui ont émigré à un jeune âge ou résidé pendant une longue période dans le pays hôte sont plus semblable à la population d'accueil dans leur usage du tabac que ceux qui ont émigré plus tard dans la vie ou ont résidé une période plus courte dans le pays hôte. Ceci est d'une importance particulière compte tenu de la différence de prévalence du tabagisme entre les hommes et les femmes qui est encore très importante dans les pays en développement, tandis que dans les pays développés, comme les pays européens, cette différence s'est atténuée dans une large mesure.

Objectifs

L'objectif général de cette thèse était d'étudier l'usage du tabac et le risque de cancers liés au tabac chez les immigrés en développant un protocole de collecte et d'analyse des informations pertinentes. Les quatre objectifs spécifiques de la thèse étaient:

- d'enquêter sur l'usage du tabac et les déterminants de son utilisation chez les immigrés en France en testant un protocole d'étude et un questionnaire pour la collecte des données dans une étude pilote (TOBAMIG),
- de comparer l'incidence des cancers liés au tabac entre les immigrés et les natifs au Danemark,
- de mettre ces résultats en contexte avec les connaissances actuelles sur l'usage du tabac et de l'incidence et de la mortalité des cancers liés au tabac dans les populations immigrées en Europe, et
- d'identifier les limites des objectifs 1 et 2 et proposer un design d'étude pour mettre en œuvre une étude à grande échelle sur l'usage du tabac et le risque de cancer chez les immigrés en France.

Le **Chapitre I** comprend deux revues de littérature, la première sur le tabagisme et la seconde sur le fardeau des cancers liés au tabac chez les migrants en Europe. Par la suite, un aperçu global du phénomène de la migration, du tabagisme et des cancers liés au tabac est présenté comme arrière-plan de cette thèse.

L'étude pilote TOBAMIG est présentée au **chapitre II**; un protocole innovant a été développé afin d'enquêter sur l'usage du tabac dans un échantillon français des immigrés non-européens, afin d'informer plus tard, la conception et la mise en œuvre d'une étude à grande échelle sur l'usage du tabac et de ses déterminants dans la population immigrée en France.

Dans le **chapitre III**, l'incidence des principaux cancers liés au tabac est explorée et comparée entre les natifs Danois et les 1^{ères} et 2^{èmes} générations d'immigrés, par région d'origine, à l'aide d'une étude de cohorte basée sur un registre contenant tous les hommes vivant au Danemark entre 1978 et 2010.

La discussion générale (**chapitre IV**) résume les résultats de cette thèse avec ses forces et ses limites. Une réflexion critique et les perspectives de la recherche future - y compris des designs d'étude à grande échelle - sont présentées.

Méthodes

En vue de faire le point sur les connaissances sur l'usage du tabac et le fardeau des cancers liés au tabac chez les immigrés en France, deux revues de la littérature ont été effectuées sur ce qui a été publié dans ce domaine en Europe. Par conséquent, une recherche a été effectuée à l'aide de la base de données PubMed et d'une combinaison de mots-clés et de terme MeSH. Toutes les études originales, soumises à un comité de lecture international, en langue française ou anglaise, publiées après 1990 ont été incluses.

L'étude de faisabilité TOBAMIG s'est concentrée sur les immigrés adultes non-européens de 1^{ère} et 2^{ème} génération, dans les 6 communes ayant la plus grande proportion d'immigrés de la région lyonnaise. Les données ont été recueillies anonymement en entretiens en face à face, pendant 2 mois en 2013. Une combinaison de 8 types de lieux a été choisie pour recruter un échantillon représentatif de la population cible.

Pour l'étude de cohorte au Danemark, nous avons utilisé une cohorte existante de l'ensemble des hommes vivant au Danemark entre 1978 et 2010, établie initialement pour l'étude du cancer du testicule. Nous avons calculé les ratios standardisés d'incidence (SIR) avec des intervalles de confiance à 95%, pour comparer l'incidence par statut migratoire et par pays de naissance pour 9 sites de cancers liés au tabac :

poumon, larynx, vessie, oropharynx, œsophage, cavité buccale, foie, estomac et pancréas. Pour les cancers du poumon, nous avons étudié l'incidence par sous-types histologiques.

Résultats

Le premier enseignement à travers les deux revues de la littérature sur l'usage du tabac et sur le fardeau des cancers lié au tabac chez les immigrés en Europe est que, malgré une augmentation de la population de ce groupe minoritaire dans les pays d'accueil européens, on connaît peu le statut et les évolutions en matière de santé et de mode de vie des immigrés, qui contribuent à leur risque de cancer. L'étude d'un sous-groupe démographique qui représente une faible proportion de la population d'un pays constitue un défi que les chercheurs de plusieurs pays ont abordé différemment, dans une large mesure en fonction des ressources disponibles dans ces pays. Dans la 1^{ère} revue de la littérature, nous avons observé les méthodes d'échantillonnage utilisées pour identifier et recruter des immigrants dans les études épidémiologiques sur l'usage du tabac. Les protocoles d'étude basés sur des registres, où les immigrés et les natifs peuvent être identifiés, offraient une approche directe pour atteindre la population cible et s'assurer de la représentativité, avec des données collectées en routine et une grande taille d'échantillon.

Les résultats ont montré que l'étude pilote TOBAMIG a collecté avec succès des informations sur l'usage du tabac et les déterminants de son utilisation dans un échantillon d'immigrés. Lors de la phase d'enquête de terrain, 84 personnes ont été interrogées, dont 75 participants éligibles (49 immigrés de 1^{ère} génération et 26 de 2^{ème} génération). La prévalence tabagique était supérieure à celle de la population générale française. Notre échantillon était similaire pour la plupart des caractéristiques démographiques à la population immigrée du lieu d'échantillonnage. Les principaux pays d'origine étaient l'Algérie (29%), la Tunisie (21%), le Maroc (9%), et la Turquie (7%). Notre étude a également montré que les sites à forte circulation piétonne ont donné une meilleure participation. Bien que les résultats indiquent la faisabilité d'une étude à grande échelle sur l'usage du tabac et de ses déterminants en France, plusieurs limites sont apparues, qui peuvent conditionner la mise en œuvre d'une étude plus vaste.

Au Danemark, nous avons identifié 131 317 cas de cancers d'intérêt parmi 3 508 204 hommes (dont 280 526 immigrés de 1^{ère} génération et 129 056 de 2^{nde} génération). Le taux global d'incidence des 9 principaux cancers liés au tabac chez les immigrés des 22 générations était inférieur de 15% à celui des natifs. Cependant, de grandes disparités ont été observées par site cancéreux et pays d'origine. Par rapport aux natifs Danois, l'incidence du cancer du poumon chez les immigrés de 1^{ère} et 2^{ème} génération était inférieure de 10% et 27% respectivement. Cependant, l'incidence du cancer du poumon chez les immigrés de 1^{ère} génération a augmenté pour rejoindre le niveau d'incidence des natifs vers la fin des années 2000. Les immigrés de 1^{ère} génération ont montré une incidence du cancer de la vessie d'environ 50% inférieure à celle des natifs. Toutefois, les ratios standardisés d'incidence étaient élevés chez les immigrés pour les cancers du foie et de l'estomac.

Discussion

Dans le contexte français où des registres de population incluant des informations sur le pays de naissance ne sont pas disponibles, nous avons élaboré un protocole de recherche novateur. Notre méthode est similaire par certains aspects à d'autres études existantes, par exemple l'utilisation d'enquêteurs formés appartenant au groupe cible des immigrés à échantillonner, postés dans des lieux publics connus pour être fréquentés par la population immigrée. Mais notre approche d'échantillonnage est unique par son échantillonnage dans un ensemble de sites connus pour être fréquenté par les immigrés, situés dans des communes à forte proportion d'immigrés, et sélectionnés afin de capturer les profils démographiques différents pour assurer un échantillon le plus proche possible de la population immigrée de ces municipalités. Dans l'étude de faisabilité TOBAMIG, la durée des entretiens s'est révélée inadaptée pour les paramètres de ce type d'enquête effectuée lors de visites fortuites dans des lieux publics; en particulier, l'anonymat ne permet pas le suivi des réponses manquantes. Par ailleurs, les lieux les plus fréquentés ont démontrés la possibilité de fournir l'anonymat nécessaire pour administrer le questionnaire.

Les données de l'étude de cohorte au Danemark suggèrent que les habitudes de tabagisme des pays d'origine de l'immigré ont un rôle primordial dans les cancers liés

au tabac, mais cela doit être confirmé en utilisant des données individuelles de statut tabagique.

Enfin, deux designs d'étude pour des études futures à grande échelle sont proposés afin de mieux comprendre la santé des immigrés et de leur usage du tabac. Les deux options varient en fonction de la quantité d'information recherchée : 1) un petit ensemble d'informations (par exemple, la prévalence de consommation des produits du tabac) peut être recueilli rapidement à travers une enquête de terrain en face-à-face dans une combinaison de zones géographiques et de types de lieux ou, 2) un ensemble complet d'informations dans un échantillon représentatif d'immigrant, avec possibilité d'inclure les natifs peuvent être collectées via des enquêtes téléphoniques non anonymes.

Conclusion

Le paysage des populations européennes change en devenant une société de plus en plus multiculturelle et multiethnique. Par conséquence, la santé des immigrés représente un défi de santé publique pour garantir le plus haut niveau possible de santé pour tout individu, l'équité et l'accès aux soins de santé. En outre, d'un point de vue épidémiologique, la recherche sur la santé des immigrés a encore un long chemin à faire pour obtenir des informations complètes, y compris sur leur consommation de tabac et la morbidité et mortalité associées au tabac.

Nos résultats de TOBAMIG démontrent la faisabilité d'une étude à grande échelle sur le tabagisme des populations immigrées en France. Les modifications principales à apporter au protocole seraient l'inclusion des natifs, une concentration du recrutement sur des lieux à forte fréquentation et la réduction de la durée de l'entretien.

Les résultats de l'étude Danoise ont mis en évidence une incidence des cancers liés au tabac inférieure chez les immigrés par rapport aux natifs. L'incidence inférieure des cancers de la vessie chez les immigrés de 1^{ère} génération nécessite davantage de recherche.

À l'issue de cette thèse, une chose apparaît comme évidente: autant il est imprécis d'analyser l'état de santé des individus sans faire la distinction entre les hommes et les femmes ou sans tenir compte de l'environnement social, autant il est inexact d'étudier

la santé des immigrés indépendamment de leur diversité en termes d'origines géographiques, de durée de séjour dans le pays d'accueil ainsi que de leurs conditions de vie. Nos résultats confirment les conclusions précédemment établies dans la littérature, comme l'incidence et la mortalité globalement inférieure des cancers liés au tabac chez les immigrés par rapport aux natifs, mais avec de grandes disparités par cancer lié au tabac selon le pays de naissance et le sexe des immigrés.

Enfin, même si la littérature actuelle est rare par rapport à la taille de plus en plus importante des populations immigrées en Europe, il est déjà établi comme nécessaire d'agir sur la santé des immigrés. De manière à atteindre cet objectif, les politiques et les interventions de santé publique prenant en compte les comportements de santé des immigrés sont cruciales.

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Abbreviations

ASR	Age standardised rate
CNIL	Commission Nationale de l'Informatique et des Libertés (French regulatory authority)
CPR	Unique personal identifier number
EU	European Union
GLOBOCAN	Global estimates of cancer
HCI	French High Council for Integration
IARC	International Agency for Research on Cancer
ICD	International Classification of Diseases
IEC	IARC Ethical Committee
INSEE	Institut National de la Statistique et des Etudes Economiques (French institute for statistics and economic studies)
IOM	International Office for Migration
SHS	Second-Hand smoke
LNCC	Ligue Nationale contre le Cancer
SES	Socioeconomic status
SIR	Standardised Incidence Ratio
SLT	Smokeless Tobacco
TRC(s)	Tobacco-related cancer(s)
UN	United Nations
WHO	World Health Organization

CHAPTER I:

INTRODUCTION

1 OVERVIEW

The overall objective of the thesis was to investigate tobacco use and tobacco-related cancer (TRC) risks in immigrants in France. All the cancers that are caused by tobacco use, in all its forms, are referred to as TRC.

One original specific objective of this thesis was to describe the tobacco use in a representative sample of the French immigrant population, which required the development of a questionnaire and of a specific methodology of sampling and recruiting the target population. The study protocol was submitted to the IARC Ethical committee (IEC) in April 2012. As the IEC was concerned with the potential of the study to provoke stigma or discrimination, the Committee suggested carrying out a pilot study in collaboration with Migrations Santé - a local non-profit organisation providing health promotion to migrants that I had previously identified and approached. In line with the IEC's comments, it was decided not to conduct the originally proposed larger scale study and the IEC's recommendation was to use a pilot study to inform future research. This change implied that the development and completion of the large scale study originally planned would not fit in a timely manner with the PhD program. It was decided to conduct a pilot study in order to test the study protocol, in particular the random selection of recruitment locations, and to develop, test and validate the questionnaire to ensure the acceptability of the survey. In this way the participation rate and the representativeness of the participating sample could also be tested.

To investigate TRC risk in migrants we searched for any existing data sources in France, and then later expanded the search to the rest of Europe. We successfully identified cancer incidence data from a cohort comprising the whole Danish male population. This dataset included information allowing to compare the incidence of selected TRC between native Danes and migrants (1st and 2nd generations). This study allowed us to appropriately address this complementing research question. In summary, designing, collecting and analysing data on tobacco use and TRC in immigrants constitute the central themes of this dissertation.

The terms and definitions used in the field of migration research are numerous as there is no universally accepted definition for "migrant". The different definitions mainly vary depending on the specificity of the term but also on the context in which they are used. A *migrant* is the broader term used for a person who, according to the International

Organization for Migration (IOM, <http://www.iom.int/>), moves to another country or region to better their material or social conditions and improve the prospect for themselves or their family. Therefore, the term “migrants” include many different situations such as economic migrants, refugees, undocumented migrants as well as intra-national migrants (e.g. rural-urban migrants). An *immigrant* is a non-national who moves into a country for the purpose of settlement. In this thesis, the term “migrant” is used in a broad manner to cover all type of migration into a country differing from one’s country of birth. The term “immigrant” is used from the perspective of the host-country, i.e. France or Denmark.

Although the descendants of immigrants – referred to as 2nd generation immigrants as opposed to their parents referred to as 1st generation immigrants - did not actively migrated themselves, they often share similar conditions, i.e. in life-style behaviours, that are related to the migration, cultural and geographical origin of their parents. In this regard, the use of the term “2nd generation immigrant” appears to be inappropriate. However, as this term is widely used in the scientific literature to designate the descendants of one or two 1st generation immigrants, it was decided in this thesis to stick to this conventional terminology. In a country, most of the time, the immigrant population is constituted gradually, and the proportion of immigrants at any point in time reflects past immigration flows. The population of immigrants residing today in the host country results from successive waves of immigration, less losses in number of immigrants incurred due to departures or deaths.

When used as part of a research study, it is often believed that once an analysis is adjusted for social class— often measured by individual socio-economic position - migration or ethnic inequalities in health disappear or are considerably reduced. Nevertheless, conflating migration status and social class fail to disentangle differences by country of birth and socio-economic position, which could highlight health inequalities (Lorant and Bhopal, 2011). In addition to isolating the determinants of migrants’ health of interest to a study, it is important to clarify the scope within which migrant health is to be assessed. The scope refers to consideration of the complete migration process not only from a receiving country perspective but within all stages: pre-departure, migration journeys, destination, and return to sending countries. The “healthy migrant effect”, is one of the concepts that was proposed to explain the migration of healthier people which is associated with positive health outcomes in comparison to their counterparts in the home country but can deteriorate over time as migrants adopt risky health behaviours (e.g. smoking patterns) specific of host

country populations (referred to as acculturation). These changing health patterns in immigrants have been associated with a high prevalence of non-communicable diseases, among some 1st and 2nd generation migrant groups (Kennedy, 2006, McDonald and Kennedy, 2004, Rubalcava et al., 2008). Nevertheless, studies (Jayaweera and Quigley, 2010) have challenged the use of linear acculturation models (Abraido-Lanza et al., 2006) and highlighted the importance of taking into account the complexity of social determinants, health behaviour and disease patterns in countries of origin, and the pre-migration health status, in understanding patterns of migrants' health over time. Acculturation was first defined as "the phenomena which results when groups of individuals having different cultures come into continuous first hand contact with subsequent changes in the original cultural patterns of either or both groups" (Redfield et al., 1936).

2 BACKGROUND: LITERATURE REVIEW

2.1 Tobacco use in immigrants in Europe

Interventions to prevent tobacco use directed at the general population may be less effective in immigrants if their tobacco use differ from those of the general population, but there is currently limited supporting evidence available for most European countries, especially France and, to a lesser extent, Denmark.

In 2004/2005, the Survey of Health, Aging and Retirement in Europe (SHARE) examined health differences between immigrants and the native-born populations aged 50 years and older in 11 European countries (Sole-Auro et al., 2012, Sole-Auro and Crimmins, 2008). In this study, differences in smoking behaviours were observed between immigrants and non-immigrants. Immigrants in Denmark and France exhibited a 13% and 31% higher likelihood of being current smokers compared to non-immigrants respectively, however, when pooled together smoking behaviour across the 11 countries did not differ significantly between immigrants and the native-born (Sole-Auro and Crimmins, 2008).

Although France has a long history of migration, studies on behaviours impacting the health of migrants are few. The scarcity of studies may be related to the complexity of either accessing the target population or developing appropriate study protocols for these population groups (Parkin and Khlal, 1996). Additionally, ideological or political motives may

be a barrier due to concerns that data on health-related behaviours and the corresponding morbidity and mortality could be used to the disadvantage of immigrants. Additionally, as mentioned previously, it is often believed that differences in health outcomes between immigrants and natives are mainly attributable to socioeconomic differences. In France, migrant health emerged as a research field in the 1990s, with pioneer studies on mortality (Khlat, 1995, Courbage and Khlat, 1996) and morbidity (Khlat et al., 1998, Mizrahi et al., 1993). In the 2000s, migrant status was added to the general population health survey, allowing for a better description of migrant health. However, the conclusions that could be drawn from these data were limited as the number of migrants was too low in general population surveys to allow a description of the results by country of origin or length of stay. From 2008, the “Trajectories and Origin” (TeO) survey (Beauchemin et al., 2010) in France focused on the issues of immigration: integration and discrimination - which are major national topics of public debate - aimed to identify the impact of origins on living conditions and social trajectories. Questions on health were included but did not cover tobacco use, despite tobacco use being a major determinant of health and health inequalities.

Literature search strategy on tobacco use in immigrants

In order to inform the original focus of this thesis on tobacco use in immigrants in France, a literature review was conducted to identify the published research addressing tobacco use in migrants in Europe. Although it is an important component of the study and an ongoing review of the literature was conducted from the outset, the completion of the systematic search was delayed to permit analysis of the Danish database and preparation of the first publication contributing to this dissertation. Accordingly, I designed a search in August 2015 using PubMed with a combination of MeSH terms and keywords as displayed in Figure 1.1. The 519 papers retrieved were filtered first on title (210 articles remained) and then by abstract (48 articles remained) following the inclusion and exclusion criteria listed below. Finally, the full-texts of the remaining articles were assessed and 33 articles were retained in the review.

All peer-reviewed original studies in English or French language published after 1990 were included. Studies were included if they met the following conditions: international migration to a European country was covered; and they focussed on tobacco use and related factors (e.g. prevalence of smoking, cessation, health behaviours, etc.). Studies were excluded if

they concentrated on a non-European host country; if they covered biological aspects (cf. “cellular or molecular migration”); if they were not an original research (e.g. review, letter, editorial, news); if they were published before 1990 or in a language other than English or French; if they focused on a disease, tobacco farm workers, national migrants (within a country, e.g. rural to urban), marketing, addiction, policies or methodology issues; and finally if tobacco use or migration was only a side issue in the study (e.g. for adjustment purpose in the analysis).

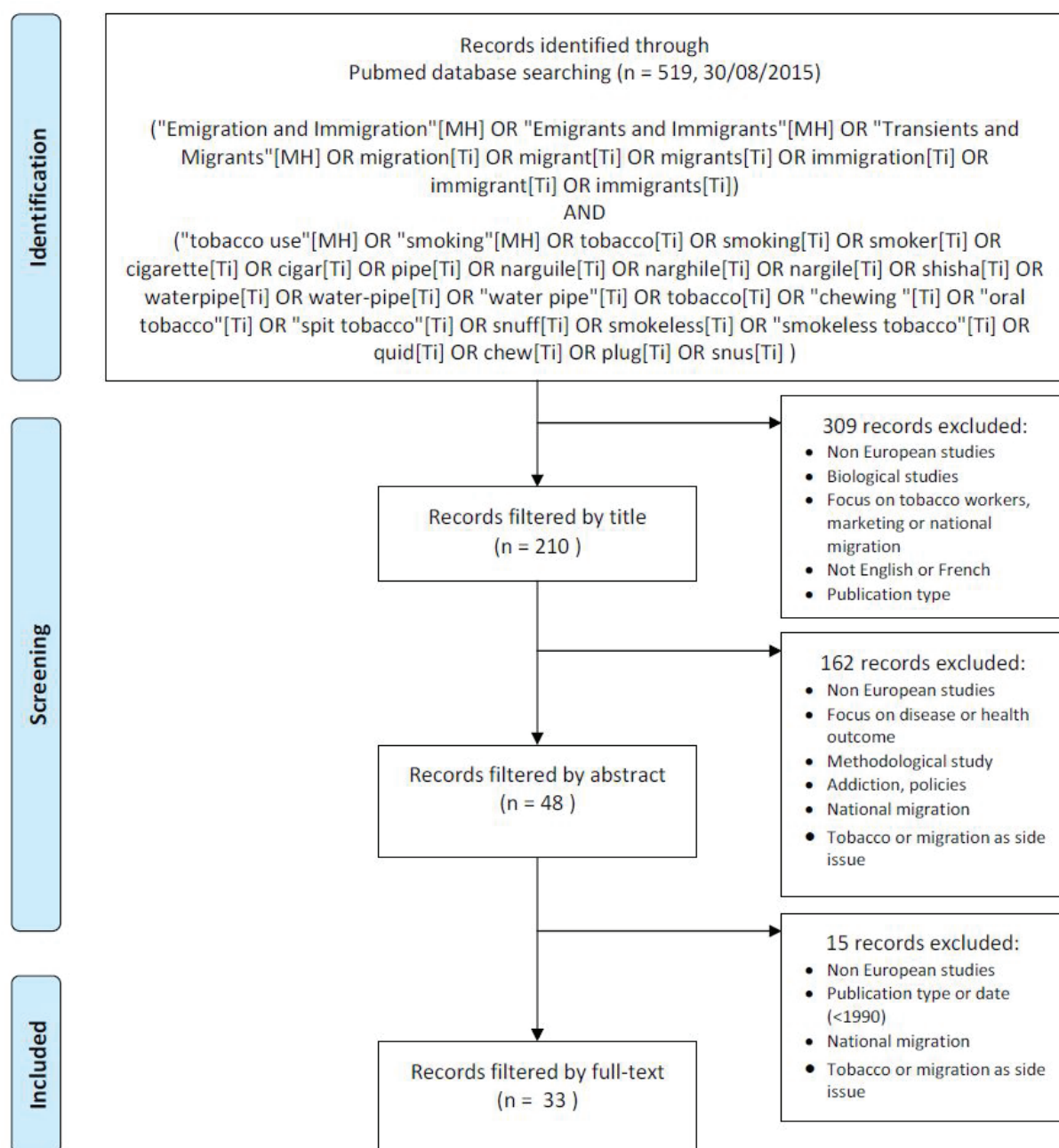


Figure 1.1: Inclusion and exclusion of publications in the systematic review on tobacco use in immigrants in Europe.

Synthesis of results

The results reported in the selected articles (n=33) were included in this review regardless of their statistical significance. I did not perform a meta-analysis as populations of interest, definitions and measurements of variables were not consistent across the studies to combine them in a quantitative way.

The 33 studies included were from Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Sweden, Switzerland and the United Kingdom. However, a majority (n=27) of the studies were conducted in 4 countries: Germany, the Netherlands, Sweden or the United Kingdom. Some of these studies were conducted in 2 or more countries. The 33 studies included were published between 1994 and 2015 and referred to data collected on the period from 1982 to 2012.

Seven studies (Westman et al., 2008, Abbotts et al., 1999, Allamani et al., 2009, Jorgensen et al., 2005, Kabir et al., 2008, Mullen et al., 1996, Reiss et al., 2010) were identified, which included immigrants from Albania, Finland, the Former Soviet Union ("resettlers"), Ireland or Poland. While most of these studies reported a higher smoking prevalence in immigrants, two of them (Mullen et al., 1996, Westman et al., 2008) showed no differences in smoking prevalence by migration status. Mullen et al. showed that the difference in smoking between Scots of Irish descents and other Scots was not due to migration but to their religious affiliation: the smoking rate in Catholics was higher than in Protestants. In these 7 studies, different trends in smoking between immigrants and natives were observed by sex: Jörgensen et al. reported a higher smoking prevalence in Finnish migrant women in Sweden than in non-migrants women while the prevalence in men was not different (Jorgensen et al., 2005). On the other hand, Reiss et al. showed that the smoking rate in women "resettlers" from the Former Soviet Union was lower than in German native women, while the opposite trend was observed in men (Reiss et al., 2010).

The remaining 26 papers included in the review investigated tobacco use in non-western immigrants, half of which investigated tobacco use in immigrants from any geographic origin (Aspinall and Mitton, 2014, Bodenmann et al., 2005, Hansen et al., 2008, Hawkins et al., 2008, Hosper et al., 2007, Melchior et al., 2015, Morgenstern et al., 2013, Moussa et al., 2010, Pudaric et al., 2000, Reijneveld, 1998, Tomson and Aberg, 1994, Urquia et al., 2014, Vedoy, 2013, Wallby and Hjern, 2008). The other studies were looking either at a particular group of immigrants from one origin or from several origins. Immigrants from Turkey were

the most studied with 7 studies in the Netherlands (Hosper et al., 2007, Nierkens et al., 2005, Nierkens et al., 2006, Reeske et al., 2009, Reijneveld, 1998, Reiss et al., 2014b, van Oort et al., 2006), one study in the United Kingdom (Aspinall and Mitton, 2014), one study in Switzerland (Schnoz et al., 2011), one in Norway (Vedoy, 2013), and three studies in Germany (Reiss et al., 2015, Reiss et al., 2014b, Reeske et al., 2009). In most of these studies, Turkish immigrants had a higher smoking prevalence than the natives. In the Netherlands and Germany, two studies reported a higher smoking in the 2nd generation Turkish immigrants than in the 1st generation (Hosper et al., 2007, Reeske et al., 2009). South Asian immigrants' tobacco use was investigated in three studies (Anthony et al., 2012, Vedoy, 2013, Williams et al., 1994) showing a lower prevalence of smoking in South Asians – especially in women - than in natives, either in UK or Norway.

Iranian immigrant smoking patterns in Sweden was investigated in one study (Koochek et al., 2008). A higher smoking rate was observed in Iranian men and women residing in Sweden. In France, Wanner et al. observed a higher likelihood of smoking in North African immigrant men compared to the natives (OR=1.37, $p<0.05$) as well as a higher intensity of smoking (Wanner et al., 1995b). On the contrary, North African immigrant women were less likely to be current smokers than French native women (Wanner et al., 1995b).

Four studies (Ezika, 2014, Nierkens et al., 2011, Nierkens et al., 2005, Schnoz et al., 2011) focused on awareness and motivation to quit, psychosocial determinants of smoking, beliefs on smoking cessation, and evaluation of cessation programs for migrants rather than prevalence of tobacco use.

This review indicated that there are different patterns of smoking prevalence in immigrants in the European countries depending on the immigrants' country of origin, whether smoking is more or less prevalent than in the European host-country. The smoking prevalence in immigrants also depends on the sex, as immigrant women generally smoked less (e.g. in North African countries). Further, but to a smaller extent, differences in smoking prevalence were also observed between host-country, according to their general population smoking prevalence. In the population aged 50 years and older of 11 European countries, the overall smoking behaviour was similar between immigrants and the native-born population in 2004-2005 (Sole-Auro and Crimmins, 2008). Still, diverging trends were observed by country of origin: in most of the studies, Turkish immigrants had a higher smoking than the natives of

their host-country, while South Asian immigrants – and especially South Asian immigrant women – had a lower smoking prevalence than their host-countries' native counterparts.

Sampling methods

In my literature review I paid particular attention to sampling methods of the immigrant study populations, as this would inform the discussion from my own feasibility study of sampling and contacting migrants in Lyon. Hence, the sampling methods are reviewed here and discussed in the context of my own experiences in the Discussion chapter of this thesis. Studies on tobacco use in immigrants in European countries have used various methods to recruit the target population. In Germany, the microcensus – an annual census representing 1% of all German households – was used to estimate the smoking prevalence in migrants (Reeske et al., 2009, Reiss et al., 2010, Reiss et al., 2014b). The microcensus made it possible to differentiate between natives, 1st and 2nd generation migrants. As participation in the microcensus is obligatory, the participation rate is generally high (94% in 2005) and enables to recruit significant numbers of migrants. Some studies used population registries to identify potential responders, e.g. the Swedish population registry (Pudarcic et al., 2000), the population register of Amsterdam, and the municipal registers in Rotterdam and The Hague (van Oort et al., 2006). Large national surveys, for example the Integrated Household Survey in the United Kingdom, have been used to investigate the tobacco use amongst migrants (Aspinall and Mitton, 2014, Hosper et al., 2007, Pudarcic et al., 2000, van Oort et al., 2006). The strength of these studies is their large sample sizes - more than 770,000 in Aspinall et al. study - which enable to differentiate between a wider range of immigrant groups. Another recruitment avenue employed in the studies reviewed is via health centres. In a suburb of Stockholm, Swedes and immigrants were recruited when they attended health centres for a health check, allowing also for biological investigations relating to tobacco use (Tomson and Aberg, 1994). In Sweden, invitation to participate in a study on migration and cardiovascular disease, including exposure to smoking, was conducted via a letter distributed to all Iranian-born persons in the township of Kista, Greater Stockholm (Koochek et al., 2008). This type of approach is only possible where a population registry exists and distinction of residents according to immigration status is not sanctioned by laws or ethical confidentiality concerns. In contrast, in the United Kingdom and Ireland, exploration of smoking in migrants was performed by invitation through the use of flyers, posters, word of mouth and

advertisement in local migrant community magazine, and responders completed an interviewer-administered questionnaire (Ezika, 2014, Kabir et al., 2008). Interviewers were also recruited from the target migrant group. They were trained before being posted at busy intersection of the city area and in the neighbourhoods of numerous target migrant group shops (Kabir et al., 2008). Despite smaller samples, this recruitment method illustrated the potential to collect qualitative information in immigrants in the absence of a population-based register. However, this method has limitations in terms of representativeness of its sample as it consists of a convenient sample with similar age and sex distributions in immigrants and natives. In the absence of active measures preventing potential selection bias in the sampling protocol, this approach may attract health-conscious individuals who self-select themselves.

From the 1st literature review we identified the sampling methodologies used to identify and recruit immigrants in epidemiologic studies investigating tobacco use. Registry-based study protocols where immigrants and natives can be identified offered a straight forward approach to reach the target population and ensure representativeness, as data are collected in routine and the sample sizes are large. Often due to the lack of such registries in the countries where studies on immigrants have been conducted, identification through household or public place surveys was a commonly used sampling method.

2.2 Tobacco-related cancers in migrants in Europe

Studies on cancer in immigrants to the USA have shown that the incidence of some common cancers changed to the level of the new host country within 1 or 2 generations (Parkin and Khlat, 1996). For instance, stomach cancer incidence rates in Japanese immigrants to Hawaii were lower than in Japan, and in Hawaii-born Japanese they were even lower but remained higher than in the white population (Hanai and Fujimoto, 1982). These findings were influential to the understanding of the environmental aetiology of human cancer (Hemminki et al., 2006). The continuation of previously recorded rates across various generations of immigrants illustrated the role of genetic susceptibility in determining cancer risk, while a rapid change in rates following immigration implies that lifestyle or environment are more influential modifiers of cancer outcomes (Parkin and Khlat, 1996).

In Europe, the immigrant population in 2014 was recorded at more than 51 million in all the EU Member States (European Commission, 2014). Literature on cancer risk of immigrants, especially for tobacco exposure, in Europe in general is scarce. However, a body of work focused on cancer in immigrants exists but this is predominant based on work in the Nordic countries and in the United Kingdom. Although in these countries immigrants do not represent a large proportion of the population in comparison to other EU countries, they have pioneered work in this field, largely facilitated by their population and cancer registries. The Swedish immigrant study showed that the overall cancer pattern in immigrants was set before the age of 20 years, as a large proportion of the current immigrant population in Sweden had entered the country in their early 20s. That is, they found that immigrants to Sweden who lived in a low-risk country to the age of 20 remained at low risk, and conversely those who lived to this age in a high-risk country remained at high-risk (Hemminki et al., 2014).

In 2010, the cancer risk in non-western migrants in Europe was assessed (Arnold et al., 2010) and it was found that more favourable all-cancer morbidity and mortality were observed in immigrants in comparison to the natives of their host-countries. Still, large geographically-specific disparities existed: non-western migrants were more likely to suffer from cancers related to exposure to infections in their early life. Additionally, lower incidence and/or mortality of lung cancer were observed for migrant women from most origins, with the exception of Northern African and South Eastern Asian migrant women in France. For men, a different pattern was observed in the different host countries with a higher incidence and/or mortality of lung cancer for Eastern and Southern European (including Turkey) migrants. This study discussed the potential role of diet, physical activity, reproductive factors or socioeconomic status in the observed patterns of cancer in non-western migrants but did not address the possible role tobacco use exposure might have played. However, it is known that smoking patterns can vary greatly in immigrants when compared to the native populations of the European host countries. This led to the further investigation of previous work analysing TRCs in immigrant populations.

Literature search strategy

A literature review conducted to identify the published research addressing TRC in migrants in Europe. I designed a search in September 2015 using PubMed with a combination of

MeSH terms and keywords as displayed in Figure 1.2. The 910 papers retrieved were filtered first on title (150 articles remained) and then by abstract (90 articles remained) following the inclusion and exclusion criteria listed below. Finally, the full-texts of the remaining articles were assessed and 60 articles retained in the review.

All peer-reviewed original studies in English or French language published after 1990 were included. Studies were included if they met the following conditions: international migration to a European country was reported and the focus was on cancer overall or one of the 8 main TRC (Agudo et al., 2012): lung, larynx, oropharynx, oesophagus, oral cavity, liver, stomach and lower urinary tract (bladder) cancers. Studies were excluded if they concentrated on a non-European host country; if they focused on other diseases (including other cancers) or on risk factors; if they were not original research, e.g. review, letter, editorial, news; if they were published before 1990 or in another language than English or French; if the focus was on intra-national migration (rural to urban), perception and communication or methodology issues; and finally, if TRC or migration was only a side issue in the study (e.g. for adjustment purpose). One study was excluded as it was retracted by its authors.

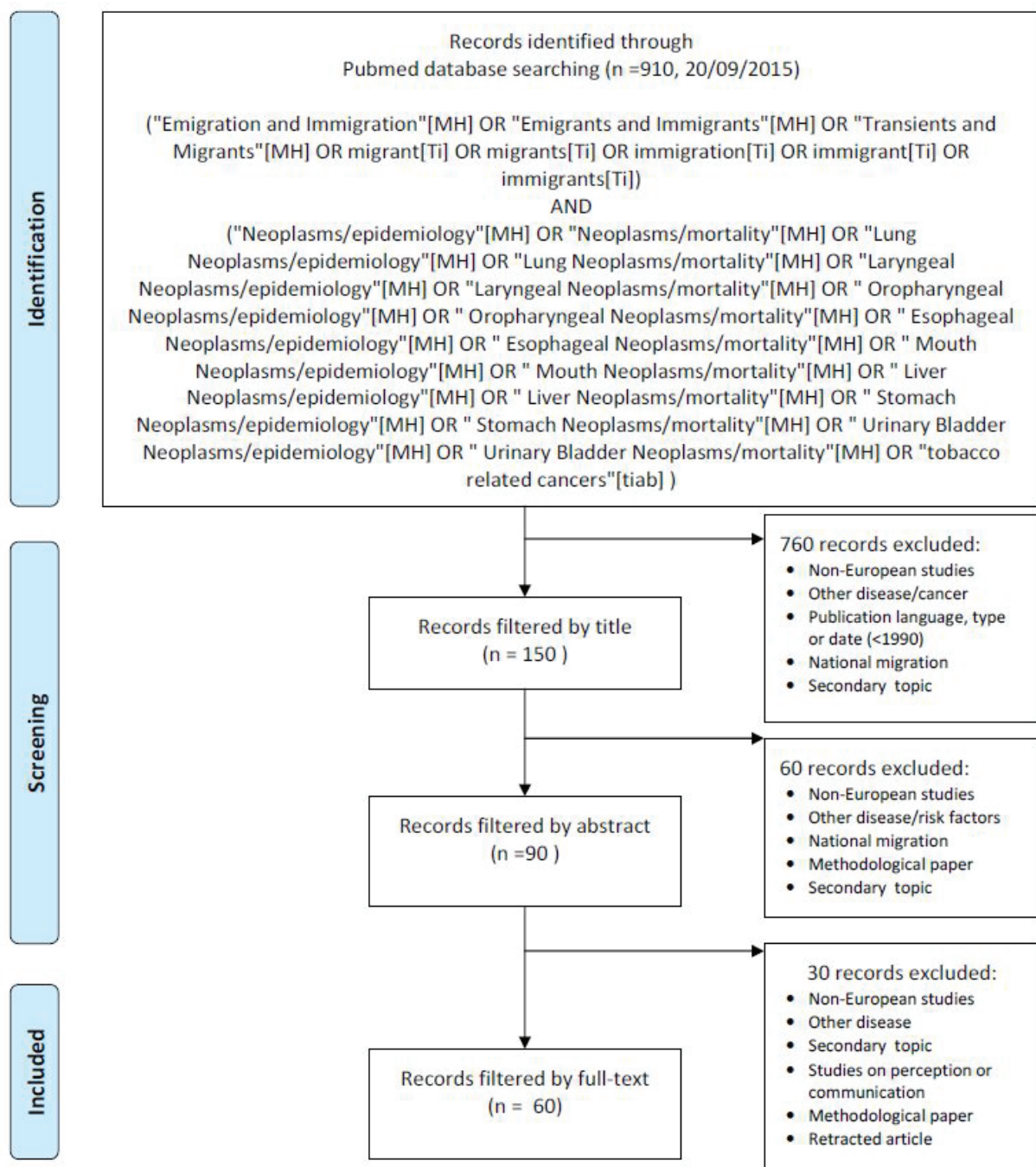


Figure 1.2: Inclusion and exclusion of publications in the systematic review on tobacco related cancers in migrants in Europe.

Synthesis of results

Sixty articles were included in this review. The studies included were conducted in 9 countries: Belgium, Denmark, France, Germany, the Netherlands, Spain, Switzerland, Sweden and the United Kingdom. However, a majority (n=34) of the studies were conducted in the United Kingdom or Sweden. The 60 articles were published between 1993 and 2014 and referred to data collected on the period from 1958 to 2009. None of the studies

investigated individual tobacco use status. The studies investigated either incidence or mortality of TRCs, with only 2 studies looked at TRC survival in immigrants (Nilsson et al., 1997, Siemerink et al., 2011). In these 2 studies, looking at Estonian immigrants in Sweden and first generation immigrants in the Netherlands, it was shown that a better survival for lung or stomach cancers in immigrants than in the natives of the respective host-countries. All results are given in comparison with the respective host-countries' natives. Only the statistically significant trends are presented, unless otherwise specified.

Turkish immigrants

As Turkey is a country with one of the highest number of immigrants to any European country, ten studies investigated the incidence or mortality by cancer in Turkish immigrants. In Belgium, Denmark, France, Germany, the Netherlands and Sweden, Turkish immigrants had an overall lower cancer mortality than corresponding natives (Mortality Risk Ratio (MRR) ranging from 0.65-0.71 in men and 0.49-0.83 in women, $p < 0.05$) (Spallek et al., 2012, Zeeb et al., 2002, Rostila and Fritzell, 2014). In contrast to the lower overall mortality reported, Zeeb et al. also showed an increase in lung cancer mortality in Turkish immigrant men in Germany (Zeeb et al., 2002). However, in France and the Netherlands, the lung cancer mortality rate was lower (MRR 0.81 and 0.83, $p < 0.05$) (Spallek et al., 2012).

Among the 8 studies investigating cancer incidence in Turkish immigrants, 4 focused on specific cancer-sites: breast, cervical, colorectal, gallbladder, liver, lung, oesophageal, prostate and/or stomach cancers (Hemminki et al., 2010b, Mousavi et al., 2012a, Arnold et al., 2013a, Arnold et al., 2013b). All-site cancer incidence in Turkish immigrants was lower compared to their corresponding host-countries natives, for both sexes (Visser and van Leeuwen, 2007, Mousavi et al., 2013). Visser et al. observed a 34% lower all-cancer incidence (SIR 0.66, $p < 0.05$) in Turkish immigrants (Visser and van Leeuwen, 2007). The lung cancer incidence rate was higher in Turkish men than their native counterparts (Spallek et al., 2009, Zeeb et al., 2002, Mousavi et al., 2013). Additionally, while Mousavi et al. observed a higher lung cancer incidence in Turkish immigrants to Sweden than natives but a similar incidence to men in Turkey, they found that Turkish immigrant women had higher lung cancer incidence than women in Turkey but similar to that of native Swedish women, which could indicate the presence of an influencing lifestyle factor (Mousavi et al., 2013). Higher liver cancer incidence was also observed in Turkish immigrants in Sweden (Standardized

Incidence Ratio (SIR) of 2.15) (Hemminki et al., 2010b) and in the Netherlands (SIR 4.6) (Visser and van Leeuwen, 2007).

Nordic and Baltic countries immigrants

Thirteen studies investigated the overall cancer or specific TRC burden in immigrants in Nordic and/or Baltic countries moving to Sweden (Abdoli et al., 2014, Nilsson et al., 1997, Nilsson et al., 1993, Hemminki et al., 2010b, Hemminki et al., 2010a, Hemminki and Li, 2002a, Hemminki and Li, 2002b, Hemminki et al., 2002, Mousavi et al., 2012c, Mousavi et al., 2012a, Mousavi et al., 2011, Mousavi et al., 2010b, Rostila and Fritzell, 2014). A higher mortality from all cancers was observed in women from Denmark (SIR 1.27, $p < 0.05$), as well as in men from Denmark and Finland (Rostila and Fritzell, 2014). Similarly, Abdoli et al. showed higher cancer mortality in women born in Denmark and Iceland compared to that of women born in Sweden (Abdoli et al., 2014). A higher incidence of all cancers was observed in Danish immigrants (SIR 1.07, $p < 0.05$), while it was lower in Finnish immigrants and their descendants (SIR 0.88-0.92, $p < 0.05$), and in Norwegian immigrants (SIR 0.87, $p < 0.05$) (Hemminki and Li, 2002a). Several studies observed lower bladder cancer incidence in Finnish immigrants for both sexes (Hemminki et al., 2010a, Mousavi et al., 2010b, Hemminki and Li, 2002b, Hemminki and Li, 2002a). However, Hemminki et al. observed lower bladder cancer incidence in women only, while in men there was an increased bladder cancer incidence (Hemminki et al., 2002). Higher lung cancer incidence in immigrants from the Nordic countries residing in Sweden was observed in several studies (Mousavi et al., 2011, Hemminki and Li, 2002a, Mousavi et al., 2010b), while a lower incidence of lung cancer was shown in immigrant men from Baltic countries (Mousavi et al., 2011).

North African, Sub-Saharan and other African immigrants

Fifteen studies investigated the risk of cancer in African immigrants living in Europe, 9 of which also documented cancer mortality. Most of the studies found lower cancer mortality overall in African immigrants (Bouchardy et al., 1995, Bouchardy et al., 1996, Grulich et al., 1992, Khlal, 1995, Visser and van Leeuwen, 2007, Norredam et al., 2007) living in Denmark, England and Wales, France and the Netherlands. However, higher overall cancer mortality was observed in Sub-Sahara African immigrants in Denmark (Norredam et al., 2012), in West

African males in England and Wales (Grulich et al., 1992), and in men from Angola in Sweden (Abdoli et al., 2014).

Specifically related to TRCs, lower rates of individual TRC were found in East African and West African immigrants in England and Wales (Standardized Mortality Ratio 17-62, $p < 0.05$) (Wild and McKeigue, 1997). Lower incidence rates for most TRCs were also observed in Moroccan and North African immigrants in the Netherlands (SIR 0.1-0.7, $p < 0.05$) (Visser and van Leeuwen, 2007). Higher incidence or mortality of liver cancer was found in Moroccan immigrants in the Netherlands (Visser and van Leeuwen, 2007), in Sub-Saharan immigrant men and women in Sweden (Hemminki et al., 2010b), in West African immigrant men in England and Wales (Grulich et al., 1992), in West African immigrants in France (Bouchardy et al., 1995), in men born in the African Commonwealth (except East Africa) in England and Wales (Haworth et al., 1999), and in immigrants from Ethiopia, Ghana and Somalia in the Netherlands. For lung cancer the differences were more obvious by sex. In England and Wales lower mortality of lung cancer was observed in West African and East African men than in nationals (Grulich et al., 1992), which was also the case for Southeast African immigrant men in Sweden (Mousavi et al., 2011). However, in Southeast African immigrant women to Sweden there was a higher incidence of lung cancer compared to the natives (Mousavi et al., 2011). Stomach cancer mortality was also lower for immigrant men from East African countries in England (Grulich et al., 1992). On the other hand, the mortality rates of other TRCs were elevated. Notably, higher bladder cancer mortality in Algerian immigrants in France (Bouchardy et al., 1996), higher oral cavity cancer mortality in West and East African immigrant men and women in England (Grulich et al., 1992), higher pharynx cancer in East African immigrant men and higher cancer of the oesophagus in East African women in England (Grulich et al., 1992) were observed.

South, Southeast, other Asian, and Middle East immigrants

Twenty six studies investigated the burden of cancer and TRC in South, Southeast, other Asian, and Middle East immigrants in Europe. Lower mortality and incidence of all cancers was observed consistently in the studies in England and Wales, Sweden, Denmark and Spain for immigrants from Asia, South Asia, Bangladesh, Pakistan, India, Middle East, Iran and Iraq (Norredam et al., 2007, Norredam et al., 2012, Harding and Rosato, 1999, Mousavi et al., 2010a, Maringe et al., 2013, Winter et al., 1999, Rastogi et al., 2008, Mangtani et al., 2010,

Regidor et al., 2008, Rostila and Fritzell, 2014, Harding, 2003). Yet, Abdoli et al. observed a higher mortality for all cancers in immigrants from Laos and Cambodia in Sweden (Abdoli et al., 2014).

Compared to the respective host-country natives, lung cancer incidence and mortality were lower in South East Asian immigrant (Hemminki et al., 2010a, Bouchardy et al., 1994), in Iranian men (Mousavi et al., 2012a, Mousavi et al., 2010b, Mousavi et al., 2010a), in Asian women – in particular in Indian women (SIR 0.16, $p < 0.05$) (Mousavi et al., 2012a), in Asian immigrant women (Abdoli et al., 2014), and in South Asian immigrants (Wild and McKeigue, 1997, Winter et al., 1999, Mangtani et al., 2010), in Bangladeshi, Pakistani and Indian immigrants (Balarajan, 1995, Swerdlow et al., 1995), and in Asian Arab immigrant women (Mousavi et al., 2012c). Higher lung cancer mortality or incidence was observed in South East Asian women in France (Bouchardy et al., 1994) and in Asian Arab immigrant men in Sweden (Mousavi et al., 2012a). Higher liver cancer incidence and mortality was observed in immigrants from Asia and Middle East in most studies (Visser and van Leeuwen, 2007, Bouchardy et al., 1994, Hemminki et al., 2010b, Haworth et al., 1999, Winter et al., 1999, Mangtani et al., 2010). However, lower liver cancer incidence was shown in Iranian immigrant men and women in Sweden (Mousavi et al., 2010a). Other studies described higher oral cancer incidence in Asian immigrants (Warnakulasuriya et al., 1999), higher stomach cancer mortality in Asian immigrants (Bouchardy et al., 1994, Abdoli et al., 2014), lower stomach incidence in Iranian immigrants (Mousavi et al., 2010a), lower bladder cancer incidence in South East Asian immigrants (Hemminki et al., 2010a, Mousavi et al., 2010b, Winter et al., 1999), higher bladder cancer incidence in Arab immigrants (Hemminki et al., 2010a) and Iranian immigrant men (Mousavi et al., 2010a), and higher oral cavity cancer in South Asian immigrants (Mangtani et al., 2010, Swerdlow et al., 1995).

European and other origin immigrants

Twenty eight studies investigated the overall cancer and TRC burden in immigrants born in a European country, who have immigrated to another European country, as intra-European Union migration has been an important phenomenon for decades. In particular, five studies focused solely on Italian immigrant in different countries (Swerdlow, 1993, Head et al., 1993, Black, 1993, Sarti et al., 1993, Bouchardy, 1993). The overall cancer mortality in Italian immigrant men and women was shown to be lower in the United Kingdom, compared to the

natives (Black, 1993, Head et al., 1993). Whereas, in France Italian immigrant women had lower overall cancer mortality but men had higher mortality (Bouchardy, 1993). Four other studies investigated the cancer mortality and incidence in immigrants from the Former Soviet Union in Germany (Winkler et al., 2014, Winkler et al., 2009, Kyobutungi et al., 2006, Ronellenfitsch et al., 2009). These studies found mostly non-significant differences in the cancer mortality or incidence compared to the German natives, with the exception of a lower all-cancer mortality in women from the Former Soviet Union (SIR 0.95, $p < 0.05$) (Winkler et al., 2009). The cancer mortality among Polish immigrants in France was studied by Tyczynski et al. (Tyczynski et al., 1992); no significant trends were observed in men, while lower overall cancer mortality was shown in Polish immigrant women (RR 0.95, $p < 0.05$).

In France, in contrast to other western countries such as the United States of America, the United Kingdom or Sweden, the burden of TRCs in migrants has been little studied. These studies, mainly conducted in the 1990s, found lower cancer mortality in immigrants in France (Bouchardy et al., 1996, Bouchardy et al., 1995, Bouchardy, 1993), despite a higher prevalence of smoking in immigrants than in French nationals (Wanner et al., 1995b). The 1st study on migrant mortality in France showed that the mortality of migrants was unexpectedly lower than in the natives, but also lower than in the corresponding occupational categories in France (Darmon and Khlát, 2001). In a later study the authors observed also a lower morbidity in North African immigrants, although the prevalence of smoking in men was similar to that in the natives (Khlát et al., 1998).

In Denmark, population register-based studies investigated cancer risk in immigrants without a specific focus on TRCs to our knowledge. In 1994 to 2003, a historical prospective cohort study compared cancer mortality among migrant patients with that in Danish-born patients (Norredam et al., 2014). Norredam et al. observed no differences in cancer mortality overall between migrants and natives (Norredam et al., 2014). For lung cancer, which is largely caused by smoking, non-statistically significant findings suggested lower mortality in immigrants compared with native Danes by sex and region of origin (Norredam et al., 2014). However, another study showed a higher incidence of lung cancer in immigrants or descendant men from either a western or a non-western country and in immigrant and descendant women from a western country; in immigrant women from non-

western country, the trend was not significant (Dalton et al., 2008). An earlier study, in Denmark, comparing cancer incidence between migrants and natives showed differences by type of cancer and country of birth of the migrants. Migrants from East Europe had similar overall cancer incidence than the native Danes, while Middle East and North African migrants had lower incidence. Further, the natives of Denmark had a higher incidence of breast and colorectal cancer compared to immigrants overall, whereas East European immigrant men had a higher incidence of lung cancer (Norredam et al., 2007).

This literature review on cancer in immigrants in Europe indicated that the majority of the studies observed lower overall cancer and all TRCs incidence and mortality rates in immigrant populations compared to the natives in European countries. However, the incidence and mortality rates of TRCs in immigrants did differ by specific TRC site, country of origin, sex, and, to a lesser extent, by host-country. Turkish immigrants had a lower incidence of cancer overall and TRCs, but the lung cancer burden was higher in Turkish men than in the natives of the respective host countries. Similarly, the cancer incidence and mortality was lower in African immigrants than in the natives, but increased rates of liver, bladder or oesophagus cancers were observed in several studies. In Asian immigrants, lower overall cancer mortality and incidence rates were observed consistently. Nonetheless, there was still evidence of elevated liver, bladder, stomach and oral cavity cancer rates compared to the European natives. For immigrants from other European countries and the Former Soviet Union, the patterns for cancer and TRCs were less clear with no significant trends observed.

3 RATIONALE

3.1 International migration

International migration is increasing globally with 232 million persons estimated to be living outside their country of birth in 2013 (United Nations, 2013). Figure 1.3 shows the heterogeneous distribution of international migrants worldwide. These international migrants represented around 3% of the global population. Fifty years ago, migrants were 3 times less numerous (75 million in 1965) but constituted already 2.3% of the world

population (United Nations, 2013). In 2013, the most common migration pattern (40%) (International Office for Migration, 2013) was from countries of the South to countries of the North, using the North-South categorization as defined by the United Nations Development Program (UNDP). UNDP's "South" includes countries ranking low, middle and high on the Human Development Index (HDI) developed by the United Nations Development Programme (<http://hdr.undp.org/en/content/human-development-index-hdi>); "North" includes countries ranking very high on the HDI. In 2013, Europe had the largest number of migrants (72 million). The proportion of men and women is nearly equal among migrants globally: in 2013, women accounted for 48% of the international migrants, but were more numerous in the developed regions, the highest percentage being in Europe with 51.9% (United Nations, 2013). Globally, a large majority of migrants (74%) were of working age in 2013, i.e. between the ages of 20 and 64. Furthermore, migrants were on average older than the global population (median age of 38.4 years and 29.2 years in 2013, respectively), and 70% of all of the migrants aged 65 and over were concentrated in the developed regions.

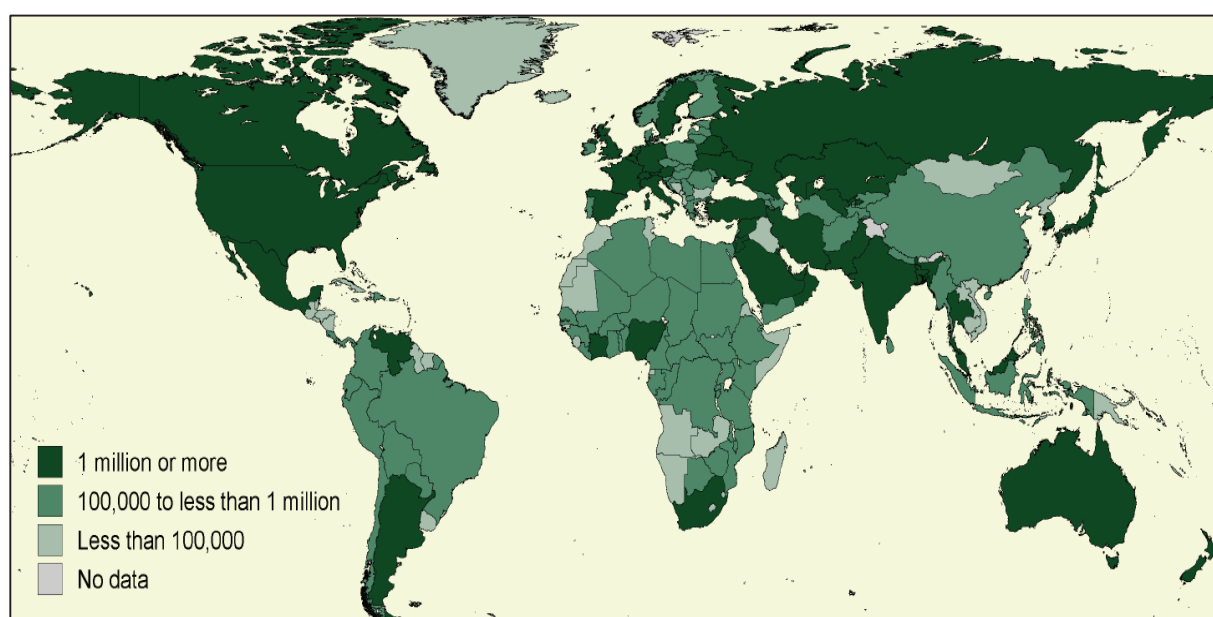


Figure 1.3: Distribution of international migrants in the world in 2013, in number.

Source: From International migration wallchart 2013, by United Nations, Department of Economic and Social Affairs, Population Division, © 2013 United Nations. Reprinted with the permission of the United Nations.

In European countries, international migration has become an increasingly important phenomenon. Until the middle of the 20th century, Europe was characterized by substantial

emigration to the rest of the world. However, after the end of the Second World War, Europe gradually shifted from being a major source of emigration to becoming a major destination for immigrants. In 2014, more than 51 million foreign-born people lived in the EU Member States, 10.1% of the total EU population (see Figure 1.4) (European Commission, 2014). The patterns of migration flows to and within Europe have changed over time and between countries. Within Europe, successive enlargement of the EU has facilitated access to the labour market and residence for citizens of other EU Member States. Therefore, the opportunities and attractiveness of intra-EU migration have increased. Still, in most EU countries, the majority of foreign-born persons were born outside of the EU. Thus the composition and size of migrant populations reflects both current and historical migration flows.

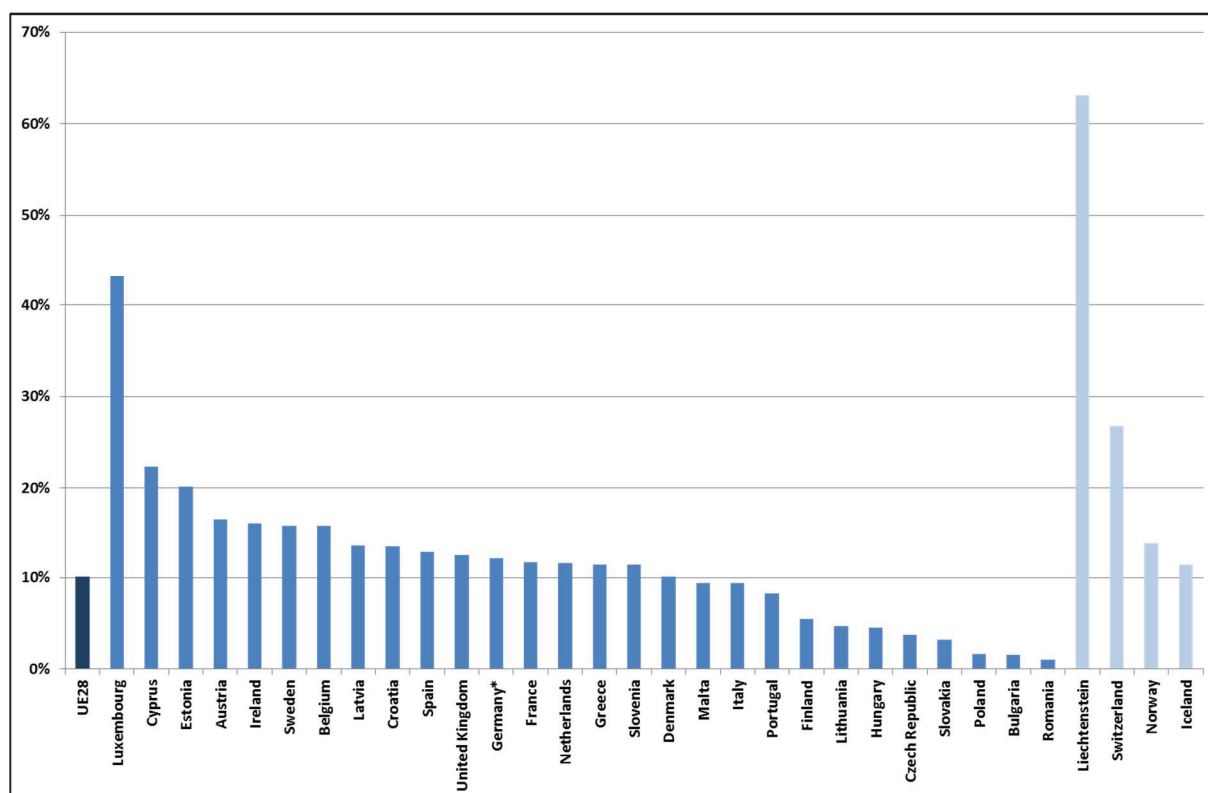


Figure 1.4: Proportion (%) of international migrants in the European countries in 2014.

Source: Eurostat

The integration of migrants can be a long and complex process, and extend to the native-born immediate descendants of migrants. Second generation migrants include native born with both parents being foreign-born and native born with one foreign-born parent and one native-born parent – also called mixed background. In the EU, nearly 10.4 million persons

aged 25-54 were 2nd generation migrants in 2008, 5.0% of the 25-54 aged total population (European Commission, 2008).

France

Migration in France is not a new phenomenon: at the beginning of the 20th century, there were 1 million immigrants, increasing to 2.3 million in 1954, then to 4.2 million in 1990 and finally the latest figures from 2012 showed there were 5.7 million (INSEE, 2012b). In relative terms, the proportion of immigrants in the French population was stable from 1975 to the 2000s at around 7.5% - while a diversification of immigrants' origins has taken place. In 2008 the proportion increased to 8.4%. Even if France is similar to other large European countries in its proportion of immigrants, it is characterized by older migration flows, an increasing immigration in the early 2000s but lowering since 2008 (see Figure 1.5).

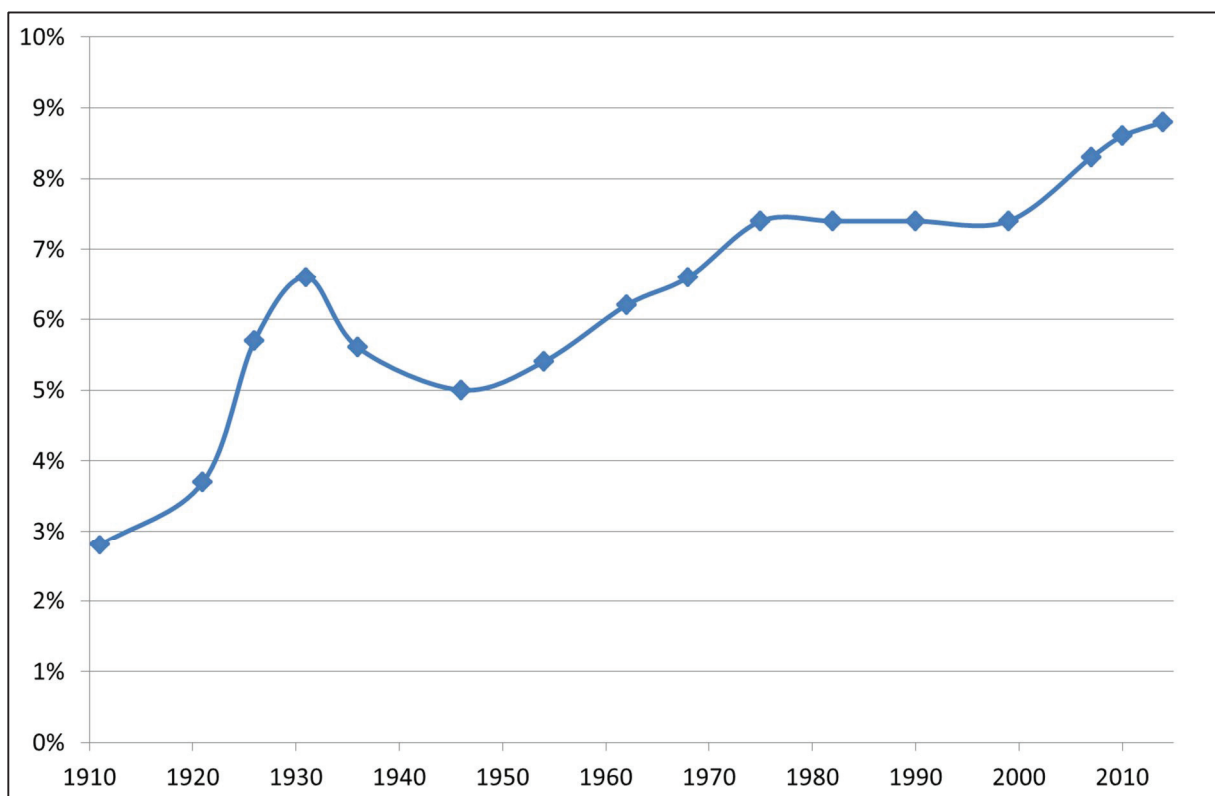


Figure 1.5: Trends of the proportion of immigrants in the French metropolitan population between 1911 and 2012.

Source: INSEE population censuses (www.insee.fr)

The proportion of 2nd generation immigrants in the French population is amongst the highest of any European country. The 2nd generation immigrants are the direct descendants of

immigrants – following the conventional French definition. In 2008, 6.7 million – or 11% of the population - were 2nd generation immigrants, including 2.2 million below 18 year of age. In the 25-54 age group (which is used for comparison with other European countries), France was in 2008 the country with the largest proportion of 2nd generation immigrants (13.5%) (INSEE, 2012b). Similarly, the proportion of 1st and 2nd generation immigrants in France was over one quarter of the total population aged 25-54 (26.2%), the highest in Europe (European Commission, 2011).

Denmark

In Denmark, immigrants are defined - following the most commonly used definition - as those born abroad. The proportion of immigrants and their descendants in Denmark has increased (see Figure 1.6) from around 3.1% in 1980 to 13.1% of the total Danish population in January 2015, corresponding to 657,473 persons (Statistics Denmark, 2015). Nearly 10% are 1st generation immigrants and 3.1% are 2nd generation immigrants.

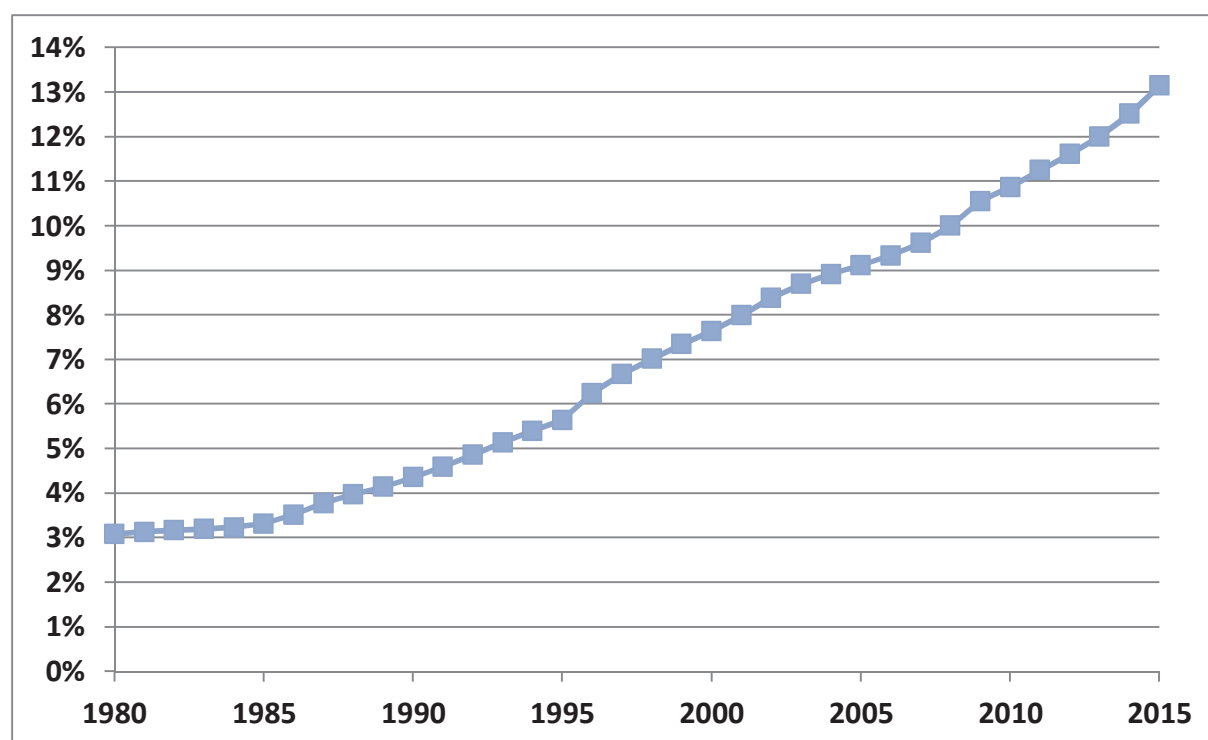


Figure 1.6: Trends of the proportion of 1st and 2nd generation immigrants in the Danish population between 1980 and 2015.

Source: Statistics Denmark (<http://www.statbank.dk/>)

3.2 Tobacco use

Within one and a half century after Columbus's finding of *Nicotina tabacum* in the Americas and its introduction into Europe, tobacco was being used around the globe. Tobacco leaves were first used in the form of pipes, cigars and snuff but its use spread massively from the end of the 19th century with the rise of manufactured cigarettes. At the beginning of the 2000s, about 30% of adults all over the world, including an increasing number of women, used tobacco (American Cancer Society, 2015).

Tobacco is used in either the smoking or the smokeless forms (American Cancer Society, 2015), each including different type of products. Globally, manufactured cigarettes are by far the most commonly used type of tobacco product, followed by roll-your-own cigarettes, cigars and pipes. In the Mediterranean region, as well as North Africa and parts of Asia, waterpipes – also known as shisha or narghile – are traditionally smoked. Over 300 million people around the world, the vast majority of whom live in South Asia, use smokeless tobacco products (American Cancer Society, 2015). Smokeless tobacco consists essentially of chewing tobacco that is place in the mouth, in the inner cheek or inner lip and chewed or sucked, as well as moist snuff and dry snuff – a fine tobacco powder that is inhaled through the nose or taken by the mouth. Snus is a form of snuff that is mainly used in the European Nordic countries; it is taken as a pinch or in sachets placed under the lip for extended periods (American Cancer Society, 2015, World Health Organisation, 2015, International Agency for Research on Cancer, 2012b).

The prevalence of smoking reported by the Eurobarometer from its most recent survey in 2014 in men and women were respectively 31% and 22% in EU-28 and 34% and 29% in France, and 23% in Denmark in each sex (European Commission, 2015a, European Commission, 2015b).

Cigarette smoking

Globally, more than 1.1 billion adults – 950 million men and 177 million women – or 21% of the world population were current cigarette smokers in 2013 (World Health Organisation, 2015). The prevalence of smoking was the highest in high-income countries between 2007 and 2013 (see Figure 1.7). This difference in tobacco smoking prevalence between high- and middle- and low-income countries was mainly driven in 2013 by divergent smoking prevalence in women across countries, with only 3% of women being current smokers in

low-income in contrast to 17% in high-income countries. This gender gap in smoking prevalence was observed, among others, in the main countries of origin of French and Danes non-western migrants: Algeria (28% vs. 2%), Morocco (43.6% vs. 1.6%) and Turkey (41.6% vs. 13.2%) (World Health Organisation, 2013).

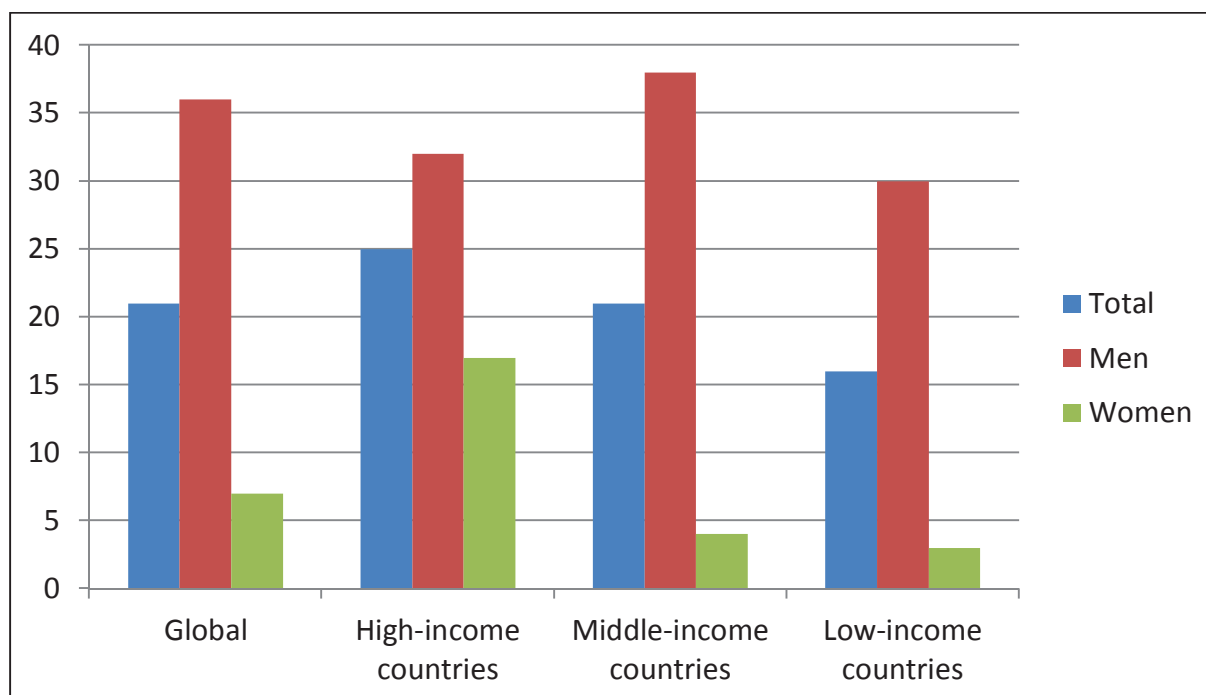


Figure 1.7: Current tobacco smoking prevalence by country income-level and sex, 2007-2013.

Source: WHO report on the global tobacco epidemic, 2015

Waterpipe smoking

Water pipes are most commonly used in India, Africa, and the Middle East (American Cancer Society, 2015). Waterpipe smoking has become a global phenomenon among youth, and particularly in the Middle East, where waterpipe smoking was found to be more common than cigarette smoking in 13-15 years old adolescents (Maziak et al., 2015). For instance, in Lebanon in 2011, the prevalence of waterpipe smoking in 13-15 years old responders in Lebanon was 35%, much higher than the prevalence of cigarette smoking (around 11%) (Maziak et al., 2015). High prevalence of waterpipe smoking in persons aged 15 years and above was also observed in Latvia, Lithuania, Cyprus, Denmark and Czech Republic (Maziak et al., 2015), ranging from approximately 11.8% to 8%.

Smokeless tobacco use

Globally, more than 300 million people in at least 70 countries were using smokeless tobacco products in 2013, most of whom living in South East Asia (89%) and Africa, but also in Sweden and Norway (National Cancer Institute and Centers for Disease Control and Prevention, 2014). Generally, the prevalence of smokeless tobacco use is higher in men than in women but in some low- and middle-income countries a similar or higher prevalence has been observed in women, e.g. in Bangladesh (National Cancer Institute and Centers for Disease Control and Prevention, 2014). The prevalence of smokeless tobacco users in 13 to 15 years adolescents is also high in the South East Asia region – e.g. in Bhutan (9.4%), in India (9.0%), in Sri Lanka (6.8%) and in Myanmar (6.5%) - and is similar to the prevalence of cigarette smoking in the region (National Cancer Institute and Centers for Disease Control and Prevention, 2014).

Tobacco use in Europe

In 2014, the overall proportion of smokers in the EU countries was just over a quarter of the population (26%) (European Commission, 2015a). The highest prevalence of current smokers was observed in Southern Europe, in particular in Greece (38%), Bulgaria (35%), Croatia (33%) and France (32%). Two countries had less than 20% current smokers in their populations: Sweden (11%) and Finland (19%) (European Commission, 2015a). Since 2006, a decrease in smoking prevalence has been observed in most EU-28 countries. For all EU-28 countries, the prevalence of current smokers decreased from 32% in 2006 to 26% in 2014 (European Commission, 2015a). The countries that recorded the most significant decrease during this period were Estonia (from 33% to 22%), United Kingdom (from 33% to 22%), Italy (from 31% to 21%) and Denmark (from 32% to 23%). On the other hand, in Slovenia an increase in smoking prevalence was observed during the same period from 23% to 30%.

The waterpipe smoking prevalence in EU-28 countries remained stable in 2014 with 16% of people reporting having tried a waterpipe, including 11% who tried it only once or twice (European Commission, 2015a). Notably, waterpipe smoking was more common in people ages 15-24 (33%). The highest prevalence of ever trying waterpipe smoking was observed in Latvia (39%), Lithuania (34%), Denmark (34%) and Sweden (33%) (European Commission,

2015a). The largest increase in prevalence of ever trying since 2012 was observed in Sweden which rose by 11%, as well as in Spain and France (both rising by 5%).

In 2014, smokeless tobacco was tried by 5% of the EU-28 countries population, including 4% who tried it only once or twice (European Commission, 2015a). Five EU-28 countries reported 10% of their population or a higher proportion having tried smokeless tobacco: Sweden (50%), Finland (14%), Denmark (13%), Austria (10%) and Estonia (10%). Current or past regular smokeless tobacco use prevalence is significantly higher in Sweden (15%) and in Norway (14%) compared to any other European countries, where it is virtually null (World Health Organisation, 2015). Within the EU, in addition to Sweden, an increase in smokeless tobacco prevalence was only observed in Hungary and Finland, both by 1%.

3.3 Tobacco-related cancers

Tobacco use is responsible for more than 100 million deaths in the 20th century, more than both World Wars combined. Furthermore, tobacco is expected to result in over 1 billion deaths in the 21st century if the current smoking patterns continue (American Cancer Society, 2015).

Tobacco use is a major avoidable cause of cancer, with its carcinogenicity known since the middle of the 20th century in the case of lung cancer and smoking (Doll and Hill, 1950). Since the release of this seminal work, the evidence on the carcinogenicity of tobacco has accumulated and smoking is now an established risk factor for over 20 cancer types (Secretan et al., 2009a, International Agency for Research on Cancer, 2012b). The use of smokeless tobacco is also an established risk factor for 3 cancer types (Secretan et al., 2009a, International Agency for Research on Cancer, 2012b, International Agency for Research on Cancer, 2007). Overall, tobacco smoking is estimated to account for 21% of cancer deaths worldwide: 29% in high-income countries and 18% in low- and middle-income countries (Lee and Hashibe, 2014). In Europe, the proportion of all TRC cases attributable to smoking was 34.9% in 2008 (Agudo et al., 2012). Figure 1.8 shows that the fraction of tobacco related incident cancers attributed to cigarette smoking varies greatly by anatomical site, and ranged from over 80% - in lung and laryngeal cancers - to less than 10% - in kidney cancer (Agudo et al., 2012).

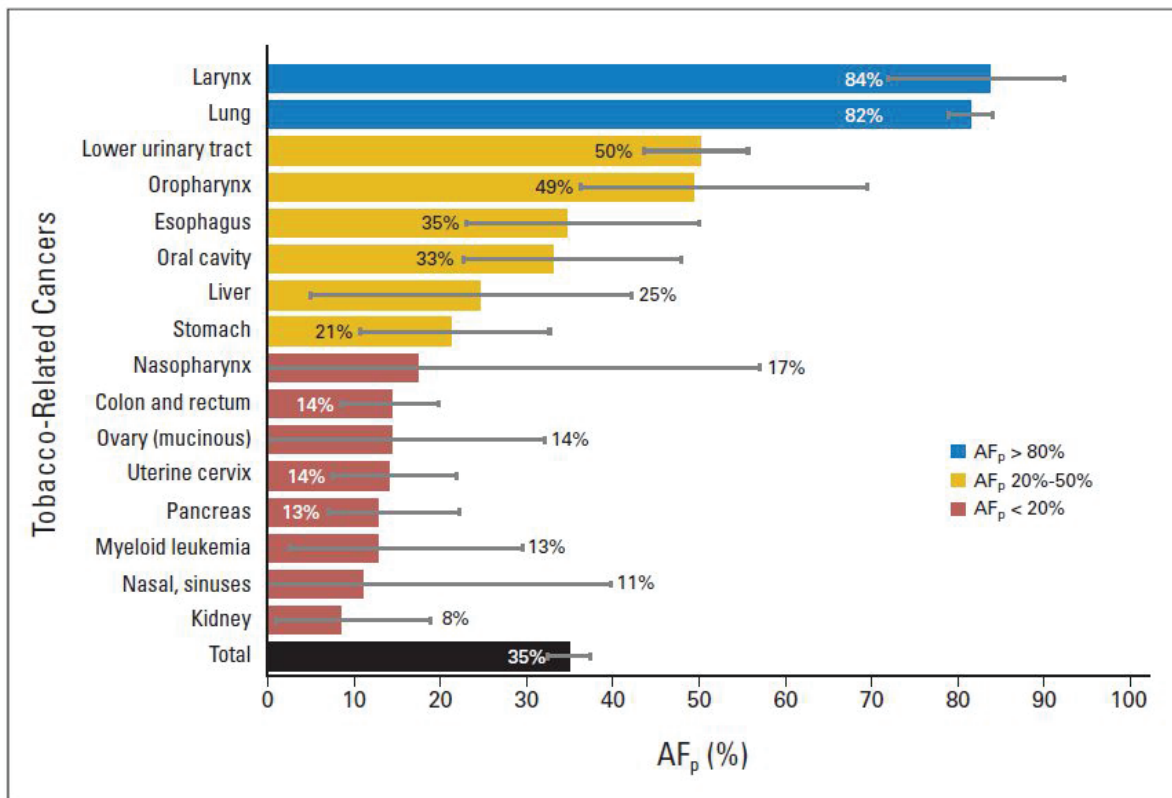


Figure 1.8: Population attributable fraction (AF_p) by tumor site for all tobacco-related cancers (TRC), based on smoking prevalence among cancer cases of the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort.

Source: From Agudo et al., 2012

In 2012, the incidence and mortality of the main eight TRCs associated with smoking, including laryngeal, lung, lower urinary tract (pelvis, ureter, and bladder), oropharynx, oesophagus, oral cavity, liver and stomach cancers, was shown to vary greatly by countries or regions (Ferlay et al., 2013). Globally, the eight main TRCs represented about half of the total number of cancers (47.9%) and 58.9% of the cancer deaths. However, it should be noted that these cancer sites have competing risks which would affect the total number of cases or deaths. Further, mortality can be influenced significantly by treatment and access to treatment after cancer diagnosis which can vary greatly by country. Therefore, the number of TRC cases or deaths caused by tobacco would be lower. This pattern differs between more developed regions (all regions of Europe plus Northern America, Australia/New Zealand and Japan) and less developed regions. On one hand, in more developed regions, the incidence of the eight main TRCs was 36.8%, and their corresponding mortality was 49.4%. While in less developed regions, the burden of the main TRCs was significantly higher in incidence and mortality, at 56.2% and 66.3% respectively. This difference in cancer burden

between countries is showed in the Figures 1.9 and 1.10 (Ferlay et al., 2013), with the example of the lung cancer incidence in men and in women. These figures also illustrate the gender gap that existed in the lung cancer incidence by country in 2012. For most of the countries, the estimated lung cancer incidence was higher in men than in women.

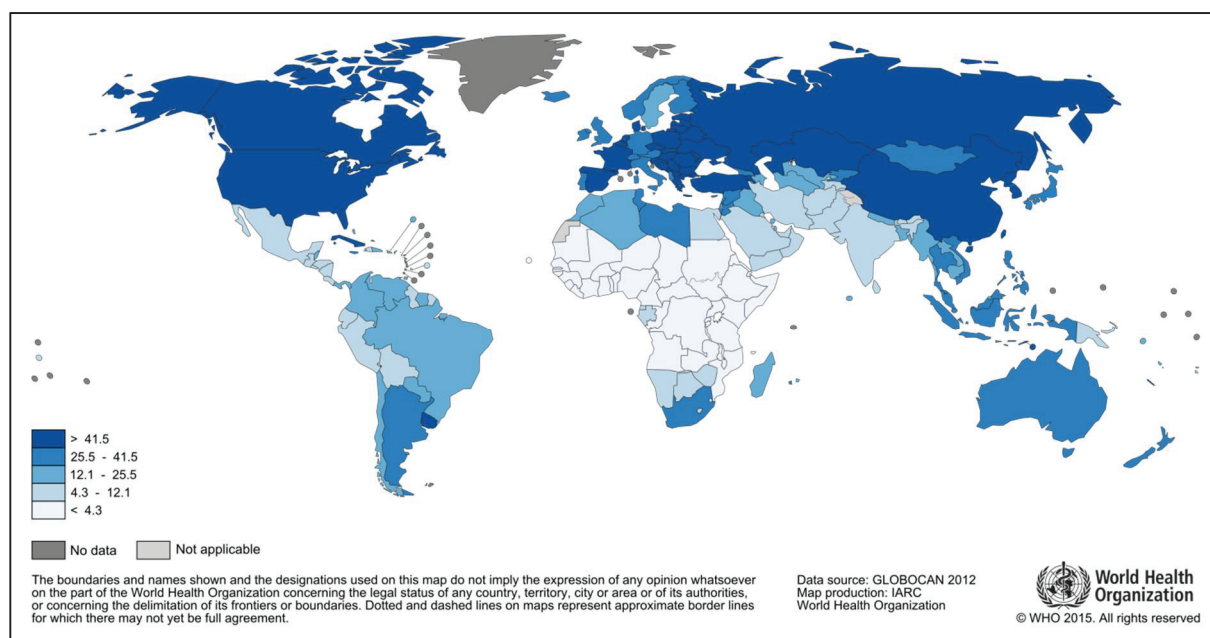


Figure 1.9: Estimated age-standardised lung cancer incidence rates worldwide in 2012 for men.

Source: Globocan 2012 (IARC) (Ferlay et al., 2013)

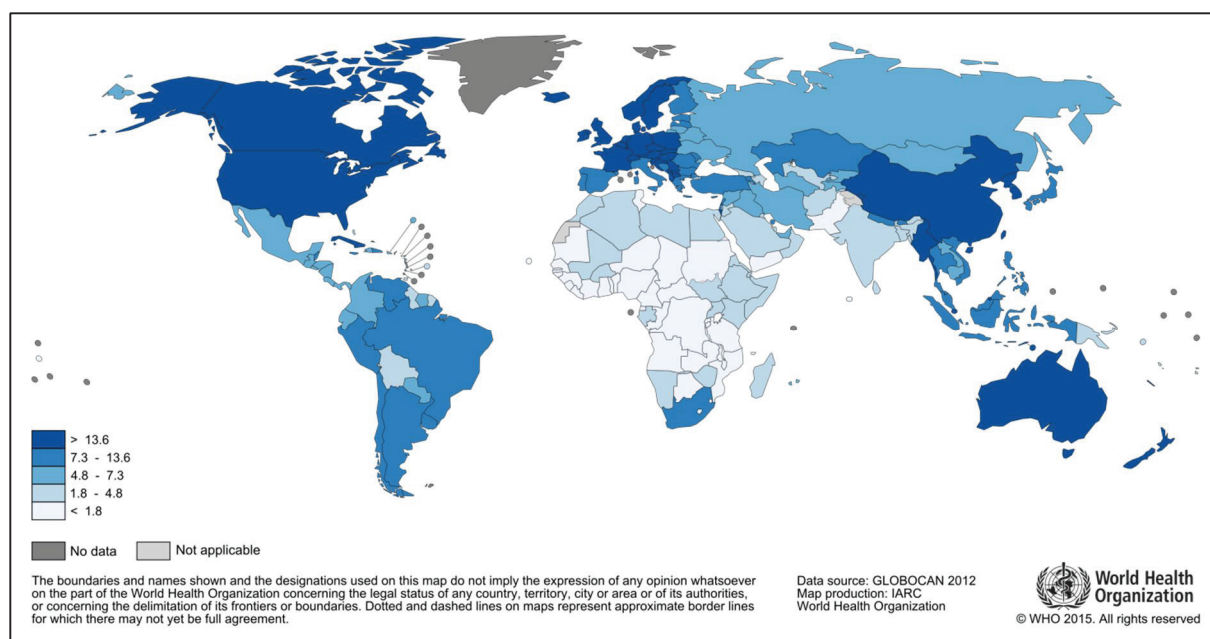


Figure 1.10: Estimated age-standardised lung cancer incidence rates worldwide in 2012 for women.

Source: Globocan 2012 (IARC) (Ferlay et al., 2013)

In the EU-28, the incidence and mortality of the main 8 TRCs in 2012 accounted for 34.9% and 47% of the total burden of cancer respectively (Ferlay et al., 2013). The French estimates were similar to those of EU-28, with the 8 TRCs representing 31.9% and 46.9% of the total incident cases and deaths. The Danish TRC burden was below the European average, with 29.1% and 42.5% of the total cancer incidence and mortality.

4 HYPOTHESES AND OBJECTIVES OF THE THESIS

Evidence has shown that the norms and traditions of the countries of origin have a continuing influence on the behaviour of migrants after settling in their host countries. Therefore we hypothesize that the tobacco use differs in immigrants compared to the natives. Furthermore, we expect that the tobacco use prevalence - including cigarettes, cigars and shisha smoking, as well as use of snuff and chewing tobacco - among migrants shows a pattern similar to the prevalence in the countries of origin. More specifically, migrants from a country with particularly low tobacco use prevalence are expected to use tobacco less than migrant groups coming from countries where tobacco is commonly used or than natives of the host-country with high tobacco use prevalence.

We also expect acculturation to modify home country behaviours imprinted by their original cultures and norms. Among the broad group of migrants, it is often seen that second generation migrants or those who migrated at a young age or resided for a long period in the host-country are more successful in terms of educational and economic development. We hypothesize that migrants who migrated at a younger age or resided longer in the host-country and second generation migrants will be more similar to the host population in their tobacco use prevalence than those who migrated later in life or resided a shorter period in the host-country in Europe where smoking tends to be high or historically has been high.

This is of particular importance in view of the large disparity in the gap in smoking prevalence between men and women which is still very large in developing countries, while in developed countries it has decreased to a large extent. Other research showed that more assimilated men smoke less, while more assimilated women smoke more, thereby decreasing the gender gap (Reiss et al., 2014b). We therefore expect that the 'gender gap' in

smoking prevalence will be smaller among migrants than in their countries of origin, but still larger than among the European-born.

Smoking or smokeless tobacco use contributes to the development of cancer associated with tobacco use. Approximately 80% of lung cancer cases in Europe are attributed to cigarette smoking (Agudo et al., 2012). TRC incidence patterns, most prominent in lung cancer, may therefore reflect the extent to which immigrants use tobacco, which could suggest adoption of the lifestyle of the host population or continuation of behaviours typical of their country of origin, including use of tobacco. There are implications for cancer risk of immigrant women coming from low-prevalence tobacco use countries if they begin to smoke as often as the native European women. Incidence rates of TRC may therefore suggest relevant insight into patterns of smoking among immigrants, especially when there is a significant difference in TRC risk between the country of origin's population from which the migrants came and the host population (Parkin and Khatib, 1996). We expect patterns of TRC incidence in immigrants to be in line with patterns of tobacco use. That is, immigrants may use tobacco differently than the natives and this may result in tobacco-attributable disease risk dissimilar to those of natives in the host-country.

The aims of this thesis were

- Originally, to investigate tobacco use and determinants of use in immigrants in France. This objective was modified and evolved into developing and testing a study protocol and data-collection instrument to investigate tobacco use in immigrants in Lyon, including data collection which could generate preliminary estimates of tobacco use in a small number of immigrants surveyed in a pilot study.
- To compare the burden of TRC between immigrants and natives in Denmark.
- To put these results into context with current knowledge on tobacco use and TRC occurrence and mortality in migrant populations in Europe.
- To describe limitations of the studies and give guidance on how to set up a study on tobacco use and cancer risk in immigrants in France.

Chapter I comprises two literature reviews, the first on the tobacco use and the second on the burden of the TRC in migrants in Europe. Subsequently, a global overview of the

migration phenomenon, the tobacco use and the TRC were presented as a background to the thesis.

The TOBAMIG feasibility study is presented in **Chapter II**; it developed an innovative protocol and explored the tobacco use in a French sample of non-European immigrants, in order to inform later the design and implementation of a large scale study on tobacco use and its determinants in the immigrant population of France. The TOBAMIG pilot study presented in Chapter II had for specific objectives:

- to design and evaluate an approach to identify a sample of the immigrant population in Lyon Metropole,
- to ascertain the feasibility of conducting private interviews of the target population intercepted in public places,
- to assess the participation to the study, and
- to pilot the questionnaire on tobacco use developed for the survey.

In **Chapter III**, major TRCs incidence were explored and compared between native Danes and 1st and 2nd generation immigrants by region of origin using a register-based cohort study involving all Danish men (1978–2010). The specific objective of the Danish cohort study, presented in Chapter III, was to compare the incidence of TRCs among male immigrants of first and second generation in Denmark with the incidence among native Dane males.

The discussion (**Chapter IV**) summarises the results of this thesis with its strengths and limitations. The results from these two studies provided insight into the burden of tobacco in migrants compared to the natives in Europe, and to identify gaps in knowledge to be investigated in further studies. In this concluding chapter, a critical reflection and perspectives of future research - including methodological remedies – are presented.

CHAPTER II:

TOBAMIG

A FEASIBILITY STUDY

1 OBJECTIVE

To address the lack of data on tobacco use and determinants of use in immigrants in France, the TOBAMIG pilot study aimed to develop a protocol and test the feasibility of collecting information on tobacco use in a sample of this population minority group. The pilot study was conceived as a preliminary step to evaluate the feasibility of undertaking a full-scale study of tobacco use in immigrants in the country.

To achieve its main objective, TOBAMIG aimed:

- 1) to develop an approach to identify a representative sample of the immigrant population in Lyon Metropole;
- 2) to ascertain the feasibility of conducting private interviews of the target population in public places;
- 3) to assess the potential study participation;
- 4) to develop and pilot a questionnaire on tobacco use, determinants of use and other domains including knowledge of adverse effects of tobacco on health; and
- 5) to summarize tobacco use in immigrants contacted in the pilot study

This Chapter presents the TOBAMIG feasibility study. The related scientific manuscript (submitted for peer-review on 24th November 2015) is included below. The manuscript is preceded by a short background to the study that includes details on the immigrant populations and their health, as well as tobacco use behaviours in France. Additional information on the study methodology and the results are also presented. Some minor repetitions of the information found in the article are included in this chapter to help the reader understand the additional material in this section. The conclusions of the study can be found in the manuscript.

2 BACKGROUND

2.1 The French immigrant populations

In 2014, France had the 3rd largest share (7.6 million) of the immigrant (foreign-born) population amongst the European countries, after Germany (9.8 million), and the United Kingdom (8.0 million) (European Commission, 2014). The distribution by country of birth

has not only been influenced by recent migration but also by historical migration flows. The age structure of the foreign-born population compared to the native-born shows that the migrant population is younger than the natives, and that young working-age adults represent a greater proportion in immigrants.

Unlike international comparisons including all foreign-born persons, the French statistics use the narrower definition for an immigrant as recommended by the French High Council for Integration (HCI, <http://hci.gouv.fr>), i.e. a person born abroad of a foreign nationality at birth. This therefore includes people born abroad, whether they acquired French nationality later on or remained foreigners. It does not include those born in France of foreign nationality (about 550,000) nor does it include the persons born abroad but of French nationality at birth. In 2011, there were approximately 1.8 million individuals born abroad with French citizenship, mainly in Maghreb (INSEE, 2012b).

The migration phenomenon in France has been regularly described by the French national institute for statistics INSEE (INSEE, 2014, INSEE, 2012b, Tavan et al., 2005). Throughout French history, different waves of immigrants have progressively contributed to the current group of 5.7 million immigrants – using the HCI definition - in 2012 (INSEE, 2015). Migration in France is not a new phenomenon. Figure 2.1 shows the flux of immigrants coming from neighbouring countries in the nineteenth century - Belgium, England, Germany and Switzerland. In the twentieth century, after the First World War, immigrants arrived from Poland, Italy, and Spain. After the Second World War, immigrants came from Portugal and North Africa and more recently, from sub-Saharan Africa and Asia. The proportion of immigrants from European countries decreased from 66% in 1975 to 37% in 2011, as early immigrants from Spain, Italy and Portugal died or returned to their country of birth, and fewer immigrants came to France from these countries (INSEE 2012b). During the same period, the proportion of immigrants coming from African and Asian countries increased significantly. In 2011, 43% of immigrants in France (2.4 million persons) were born in an African country. Immigrants born in the Maghreb represent 30% of all immigrants in 2011; this proportion has remained stable since 1975 (INSEE 2012b). Immigration from sub-Saharan Africa has been recorded more recently, particularly from countries formerly under French administration. Immigrants from Asia represented 14% of the pool in 2011. Apart from Cambodia, Laos and Vietnam,

immigration from Asian countries has increased, especially from Turkey and China (INSEE 2012b).

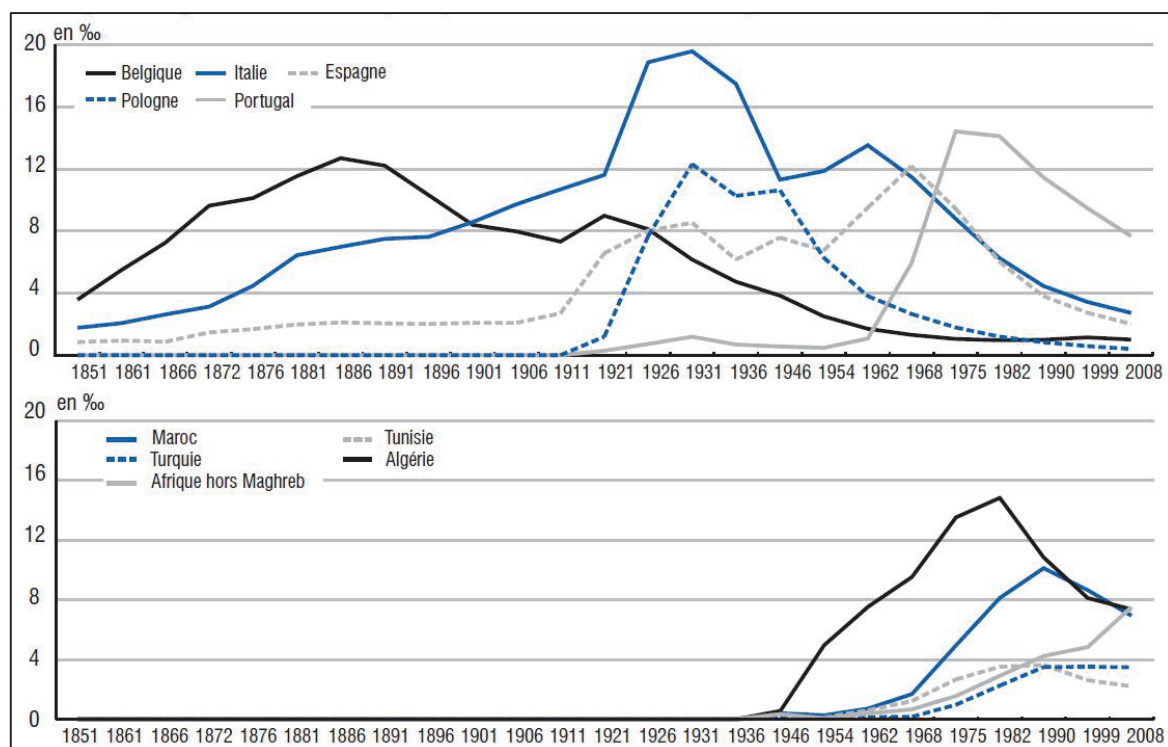


Figure 2.1 Trends of immigration rates by nationality in France from 1851 to 2008.

Source: From *Immigrés et descendants d'immigrés en France*. INSEE, Edition 2012, Paris. (INSEE 2012b)

Although the proportion of 1st generation immigrants in France is close to the average in Europe, the proportion of 2nd generation immigrants is remarkable: they are the most numerous by both proportion and number in comparison to the other European countries (European Commission, 2014). In 2011 there were approximately 6.6 million 2nd generation immigrants in France, accounting for 10.4% of the population (INSEE, 2012a). The countries of origin of the 2nd generation immigrants are related to the time of the different migration waves. In 2011, 3.2 million descendants of immigrants (48.1%) had a parent that emigrated from a European country. New migration flows from Eastern Europe were too recent to have a significant impact on the descendants of immigrants. Also, 4 out of 10 descendants of immigrants had a father or mother born in the African continent. In 2011, the main countries of origin of the 2nd generation immigrants in France were Algeria (15.0%), Italy (13.6%), Morocco (10.9%), Portugal (9.2%), Spain (8.4%), Turkey (4.0%) and Tunisia (3.8%) (INSEE, 2012b).

The geographic distribution of immigrants varies greatly in France; 2010 figures show the 1st generation were mainly resident in metropolitan areas with the largest proportion of nearly 40% living in or near Paris in the Ile-de-France region and with the rest spread across the other regions of France (See Figure 2.2). To a lesser extent this urban distribution is also seen in the 2nd generation immigrants. Despite limitations derived from the actual small number of immigrants for the different origins, data on the distribution of 1st generation immigrants by municipalities are available from yearly censuses, with stratification by country of birth, sex and other required variables (i.e. <http://www.reseau-quetelet.cnrs.fr>). As the 2nd generation immigrant status is not recorded routinely in the census or as part of any other longitudinal studies, the only national estimates available for this population group are derived from one-off, cross-sectional studies (Beauchemin et al., 2010) and only a few include working-age groups (INSEE, 2012a). Therefore, no data were available on the demographic characteristics of the 2nd generation immigrant population residing in the sampling area of Lyon Metropole.

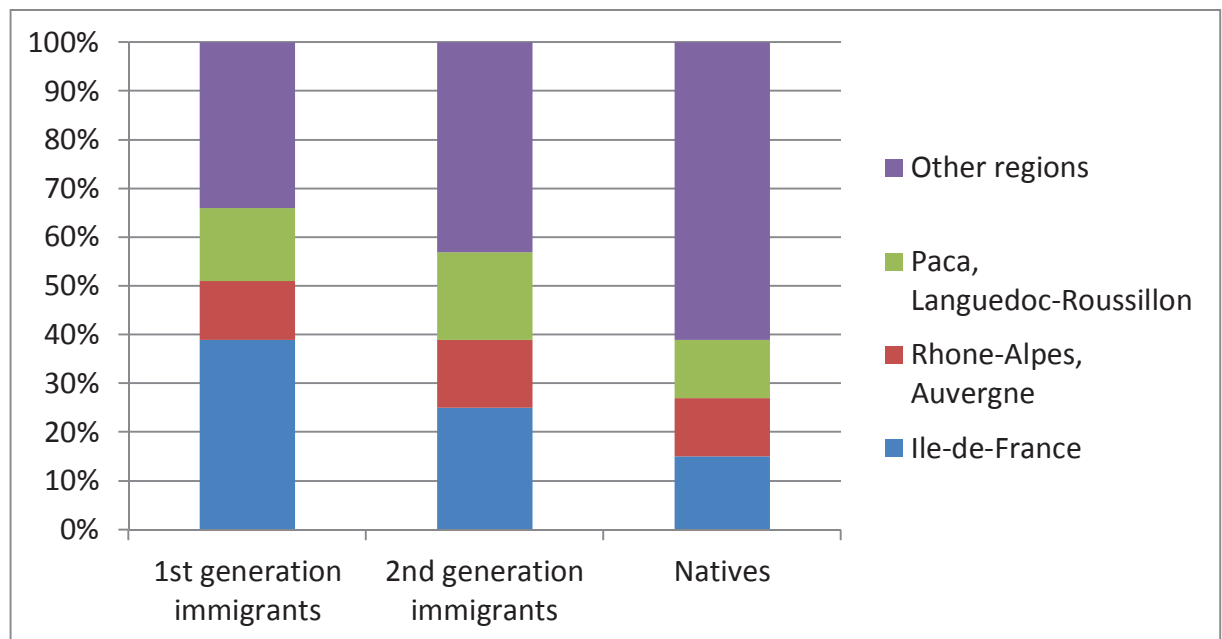


Figure 2.2: Distribution of 1st and 2nd generation immigrants and natives by region in France.

Source: INSEE, enquête emploi 2006-2010 (<http://www.insee.fr>)

The metropolitan region of Lyon, so-called Lyon Metropole, consisting of 59 municipalities representing 1,281,971 inhabitants, was selected to implement the feasibility study because immigrants are more concentrated in larger urban areas (INSEE,

2012b). Overall, in Lyon Metropole, the proportion of 1st generation immigrants was above the national average with 13.9% in 2009, with an approximately equal number of men and women. First generation immigrants originating from African, European and Asian countries represented 50.8%, 30.1% and 15.4% of the total immigrant population of Lyon Metropole respectively. Among non-European countries of origin, Algeria was the most represented with 24.7% of first generation immigrants, followed by Tunisia (8.2%), Morocco (7.2%) and Turkey (3.4%) (INSEE, 2012c).

2.2 French immigrants' health

Few surveys or epidemiologic studies have been conducted to document health and nutritional status, or social or cultural conditions of specific immigrants' sub-groups in France (Conde, 1984, Darmon and Khlat, 2001, Khlat, 1995, Mejean et al., 2007, Beauchemin et al., 2010, Berchet and Jusot, 2010). In the south of France, the Regional Observatory of Health conducted a survey in 2002 on elderly immigrants living alone (Siera Antelo et al., 2003). Vaillant and Wolff investigated self-reported health among older immigrants and found that male immigrants from southern Africa and Asia, and female immigrants from northern Europe, southern Africa and Asia, are more likely to be in good health, while the health status is lower among immigrants from Eastern Europe living in France (Vaillant and Wolff, 2010). Several population-based, anthropological and sociocultural studies were conducted in the Rhône-Alpes region (Dumolard, 1979, Begag, 1988, Békaert et al., 2011). To our knowledge, only very few epidemiologic studies have been conducted documenting cancer experience or determinants of cancer in immigrant populations in France (Wanner et al., 1995a, Bouchardy et al., 1994, Bouchardy et al., 1995, Bouchardy et al., 1996). Bouchardy et al. (1996) investigated cancer mortality in immigrants from China, Italy, North Africa, Southeast Asian countries and Sub-Saharan countries in France between 1979 and 1985. These studies found lower cancer mortality in immigrants in France with respect to French natives. More recent studies have investigated other diseases or health conditions in immigrants, i.e. tuberculosis (Che and Antoine, 2009), HIV infection (Jasseron et al., 2008, Lapostolle et al., 2011), and risk of preterm birth (Zeitlin et al., 2011).

2.3 Tobacco use behaviour in France

For more than 20 years, the French National Institute for Prevention and Health Education (INPES) has run regular “Health Barometer” surveys on health behaviour – including smoking - and risk perception of persons residing in France (Beck et al., 2011, Beck and Gautier, 2012, Guignard et al., 2015, Guignard et al., 2013). The Health Barometer series was last conducted in 2014 (Guignard et al., 2015) but only the main results have been published already, such as prevalence of smoking. The previous data on smoking, behaviours and tobacco risk perception were collected in 2010 (Guignard et al., 2013). This series covers all forms of tobacco smoking, e.g. cigarettes, cigars and waterpipes, but does not include smokeless tobacco. The data on smokeless tobacco use in France are retrieved from the Eurobarometer series, a European Commission edition, whose last survey was conducted at the end of 2014 (European Commission, 2015a).

The Health Barometer 2010 has shown an increase of daily smokers prevalence since 2005, from 27.0% to 29.1% ($p<0,001$), and especially among women, from 22.9% to 26.0% ($p<0,001$) (Guignard et al., 2013). The 2014 edition indicated a decrease in smoking intensity, but a stable prevalence of current smokers with 34% of the French population being smokers (Guignard et al., 2015). These figures remain well above those of other high-income countries with stringent tobacco control initiatives such as the United Kingdom, Canada and Australia (World Health Organisation, 2015). As described in the Health Barometer in France, smoking is higher among men than women, with 32.3% and 24.3% prevalence of daily smokers in 2014 respectively. Daily smoking decreased slightly from 29.1% in 2010 to 28.2% in 2014 ($p=0.01$) (Guignard et al., 2015). A contribution to this meagre change in prevalence is the decrease in the level of daily smoking in women from 26% in 2010 to 24% in 2014 (Guignard et al., 2015). This downward trend in women’s smoking habits was mainly observed in daily smokers aged 20-44 years while daily smoking increased in 55-64 year-olds. The prevalence of smoking in men overall was stable between 2010 and 2014; hence the sex gap in smoking is reducing. The overall decreasing trend in smoking prevalence in the last decades had recently stabilized and even inversed in some subgroups such as 45-64 years-old women and the unemployed; both groups have registered an increase in smoking prevalence (Beck et al., 2011). The social inequalities in smoking, which widened between 2000 and

2010, were maintained in 2014: that is the less educated, the lowest income and the unemployed smoke more (Guignard et al., 2013, Guignard et al., 2015).

In 2014, 29.0% of the 15-75 year-old regular smokers reported at least one attempt to quit smoking in the previous year and a greater proportion, 59.5%, expressed the desire to quit smoking (Guignard et al., 2015). In 2010, 31.8% of the current smokers discussed their tobacco use with their health practitioner (Beck and Gautier, 2012).

Regarding exposure to second-hand smoke, approximately one third (35.8%) of the 15-75 year-old current smokers in France reported that smoking occurred regularly inside their homes in 2014. Almost all respondents acknowledged that smoking can cause cancer: 74.6% replied it “certainly” does and 23.3% “probably” (Beck and Gautier, 2012). The widest difference of opinion between smokers and non-smokers was their support of a tax increase in cigarettes: 61.9% of non-smokers were in favour of a tax increase on tobacco products while only 21.5% of smokers supported it (Beck and Gautier, 2012).

Waterpipe ever smokers represented 2.9% of the French population in 2010, or 9.0% of the total number of current smokers. The prevalence of waterpipe smoking is higher in men than in women, 3.9% and 2.0% respectively. The largest waterpipe smoking prevalence was observed in 15-19 year-olds (13.4%). After adjusting by sex and age, unemployment was positively associated with waterpipe smoking (OR=1.4, $p<0.05$) (Guignard et al., 2013).

The use of smokeless tobacco was rare in France in 2012, with virtually nobody reporting either regular or occasional use; 4% of the French respondents to the Eurobarometer survey reported having tried smokeless tobacco once or twice only (European Commission, 2015a).

Few studies investigated the prevalence of smokers in immigrants in France (Wanner et al., 1995b, Berchet and Jusot, 2010). In the 1990s, Wanner et al. observed a higher tobacco intake among Maghrebian immigrants than in French natives. In 2006, Berchet and Jusot investigated the self-reported health status of 1st and 2nd generation immigrants, compared to that of the natives. The proportion of current smokers in their sample was 24.1% in 1st generation immigrants, 28.1% in 2nd generation immigrants, and 25.7% in natives. The study sample was representative of ordinary households living in metropolitan France; however, the reduced sample size of immigrants did not allow conclusion to be drawn for the national immigrant population. To our knowledge, no

other data were available on other forms of tobacco use or on determinants of use of tobacco in the immigrant population in France that was constituted of 5.7 million 1st generation immigrants in 2012.

3 METHODS OF THE PILOT STUDY

3.1 Population groups

In France, the High Council for Integration (HCI) recommended the use of a specific definition for an immigrant: a person born abroad of foreign nationality at birth, excluding a foreign-born person born abroad of a French nationality. In terms of studying acculturation and health behaviours, the definition of the HCI is relevant as a French person born abroad is not expected to differ from the French natives as much as a foreigner born abroad.

Consequently, the descendants of immigrants, also called 2nd generation immigrants, are the persons born in France from one or two 1st generation immigrant parents.

Furthermore, in our study we focused on adult immigrants, aged 18 years and over, as tobacco use in adolescents may be different from that in adults. Additionally, it would have required ethical approval by the CNIL and signed consent from their parents or responsible adult to include minors in the pilot survey.

The targeted population was limited to immigrants of non-European origins because the use of tobacco in other European countries is generally more similar to that in the French general population and better described in the literature than tobacco use in other principal countries of origin of immigrants in France.

3.2 Sampling approach

To increase the probability of reaching the population of interest in the metropolitan region of Lyon, the 5 municipalities with the largest proportion of African or Asian immigrants were chosen to conduct the survey, as well as a district of Lyon. To obtain a representative sample of the immigrant population residing in the selected municipalities in terms of sex, age, education and country of origin, a combination of different types of location was chosen to reach the target population. The different types of venues were: 1) street markets 2) public and private primary schools (to recruit parents) 3) bars and

restaurants 4) Universities and colleges 5) shop fronts with international phone facilities (“phone parlors”) 6) residences specifically accommodating disadvantaged families or single immigrant workers known as Adoma residences, and 7) community arts centres and youth clubs “MJC”. Large shopping centers were added later. For each type of location we randomly selected 2 venues for the trained interviewers to contact potential responders. We aimed to conduct 100 interviews in total, with the number of administered questionnaires equally distributed across the 16 different venues. Four interviewers were trained to recruit and administer the questionnaire to eligible responders.

Sampling approach

The sampling method used in this pilot study falls under the definition of a “convenience sampling”. A convenience sample is a sample that uses individuals or sample units that are readily available rather than those that are selected to be representative or selected via a probabilistic mechanism (Li, 2009). Although convenience sampling is, like the name suggests – convenient – it runs a risk that the sample will not be representative of the population. Nevertheless, a convenience sample is sometimes the only way to efficiently recruit participants. Convenience sampling is a type of non-probability sampling – i.e. where participants are randomly selected, and each has an equal chance of being chosen. With non-probability techniques, the randomness element is absent. However, convenience sampling does have its uses, especially when it is needed to conduct a study quickly or on a tight budget, and also when representativeness is not necessarily needed. It is also one of the only methods one can use when a list of all the population is not available. In its basic form, convenience sampling method can be applied by stopping random people on the street and asking questionnaire questions. Although the use of this sampling technique is discouraged in epidemiological research due to inability to generalise research findings - because the sample does not truly represent the larger target population - this sampling technique may prove to be effective during exploration stage of the research area, and when conducting pilot data collection in order to identify and address shortcomings associated with questionnaire or sampling design. Furthermore, validity of convenience samples can be increased by approximating

random selection as much as possible, and preventing the introduction of potential bias into the sample selection.

In this regard, the TOBAMIG methodology was designed to interview a large set of respondents' profiles depending on the recruitment type of locations: younger/older, more/less educated, men/women; hence, recruitment of a mixed sample was considered more important than having all groups represented in the sample according to their proportion in the underlying immigrant population (i.e. in a stratified sample). Additionally, exhaustive lists of each type of locations (i.e. street markets, primary schools, bars and restaurants, Universities and colleges, phone parlors, social residences, community arts centres and youth clubs "MJC", and large shopping centers) were built for the target sampling area, in which 2 locations were randomly selected for each type. In the absence of a population register that would allow identification and recruitment of immigrants, the TOBAMIG methodology introduced randomness in the sampling as well as a wide range of type of places to minimize the effects of the convenience sample, and allow making valid inferences about the larger group from which they are drawn.

As opposed to a convenience sample, a random sample to investigate tobacco use in immigrants in France – where no population register exist to facilitate the identification and recruitment of immigrants – could consist in a household survey: a survey that is administered at the household level. As in other household surveys' protocols, interviewers would have to go and ring at the doors, then identify and offer participation to the eligible respondents. In theory almost any population-based subject can be investigated through household surveys. However, in the case of tobacco use in immigrants in the French context, experts from the French Institute for Demographic Studies (INED) recommended not to use a household survey sampling as participation would be too low. Another alternative approach can be using a telephone based survey, but this methodology has not yet been tried and validated to study the health of French immigrants.

3.3 Questionnaire development

Based on validated questionnaires from earlier French or international studies (Beck and Gautier, 2012, Gallus et al., 2014, World Health Organization, 2008, Simon and Clément,

2006, Oh et al., 2010), I developed a comprehensive questionnaire addressing not only tobacco use in all its forms but also other determinants of use. It was mainly based on the Global Adult Tobacco Survey questionnaire (World Health Organization, 2008). The questionnaire consists of 12 sections as shown in the Table 1 of in the manuscript for publication found in page 80, and approximately 820 variables spread over 77 pages. It was designed to be administered by a trained interviewer.

The development of the finalised questionnaire was a particularly time-consuming activity in this thesis work (approximately 10 months), as it involved the gathering and harmonisation of all sections and items, creation of new questions when necessary and establishing a complex skip pattern according to smoking status (current, former, never), frequency of smoking (daily versus non-daily) and type of product. The interviewer was redirected to specific questions depending on the participant's type of tobacco use (smoking tobacco in all forms but shisha (manufactured cigarettes, hand-rolled cigarettes, pipes, cigars, cigarillos and other types), shisha smoking and/or smokeless tobacco) and also on the participant migration status (cf. history of tobacco use in the country of birth). The different combination of products and status of use results in many different profiles as displayed in Table 2.1 for smoked tobacco only. Similarly, different profiles are identified for smokeless tobacco use.

		CURRENT		
		DAILY SMOKER	NON-DAILY SMOKER	NON SMOKER
PAST	DAILY SMOKER	ALWAYS DAILY SMOKER	CURRENT NON-DAILY SMOKER PAST DAILY SMOKER	FORMER DAILY SMOKER
	NON-DAILY SMOKER	CURRENT DAILY SMOKER PAST NON-DAILY SMOKER	ALWAYS NON-DAILY SMOKER	FORMER NON-DAILY SMOKER
	NON SMOKER			NEVER SMOKER

LEGEND :

NEVER SMOKER

EVER SMOKER

Table 2.1: Tobacco smoking profiles according to current and past smoking exposure.

Prior to the implementation of the pilot study, the questionnaire was tested on a convenient sample (n=10) of both target and non-target population that included different tobacco user profiles. This testing allowed for adjustment and corrections of the skip pattern as well as corroboration of the clarity of the questions being asked and estimation of the questionnaire's administration time.

3.4 Evaluation

Attention was paid to different aspects of the completed pilot study. The sex, age, generation and country of origin distributions of responders in the pilot was compared to the distribution of these attributes in the population of immigrants in the selected municipalities of the Lyon Metropolitan area from which the sample was drawn. The number of interviews completed by type of venue and the total number of interviews completed in comparison to the *a priori* set sample size informed the discussion of logistics including determinants of completeness and possible remedial measures. The prevalence of tobacco users obtained by type of venue informed the possible presence or absence of a selection bias or independence of smoking profile from the sampling modality, a consideration impacting the validity of tobacco use estimates that could be derived from the sampling approach used in the pilot study. The time required to administer the study questionnaire and the level of completeness were examined in relation to the number of questions, location of questions in the instrument as well as by interviewer, suggesting changes in the instrument and level of training.

4 OVERALL AND ADDITIONAL RESULTS

In addition to the results presented in the article, we also found that our pilot study represented an innovative method to investigate tobacco use and related determinants in 1st and 2nd generation immigrants in selected municipalities of Lyon Metropole. Our sample was similar in most of its demographic characteristics to that of the immigrant population in the sampling area. The main country of origin of both generations' immigrants in our sample was Algeria (29%). We observed a proportion of current

tobacco smokers (45%) above that of the general population of France (34.1%). A large gender gap was also observed: more men were smokers than women, respectively 35.6% and 27.9% in the general population, and 51% and 38% in our sample. In our sample, the proportion of shisha users was twice higher than in the general population: 15% versus 7%.

Type of venue	No. eligible interviews	Administration time (min)	Recruitment time (min)
Adoma	5	52 $\sigma=43$	39
Bars-Restaurants	0	-	-
Markets	7	32 $\sigma=15$	53
MJC	2	25 $\sigma=14$	20
Phone parlors	3	20 $\sigma=7$	43
Schools	4	13 $\sigma=6$	11
Universities	14	32 $\sigma=7$	22
Shopping centers	23	27 $\sigma=9$	26
Total	58	29 $\sigma=17$	29

Table 2.2: Characteristics of interviews by type of venue for the 2 main interviewers

Out of four interviewers two administered the majority of the questionnaires (77%). Table 2.2 shows the distribution of interviews conducted for each type of venue, with administration and recruitment times, for these 2 main interviewers. The venues most frequented by the general population – markets, universities and large shopping centers – provided most of the interviewees (76%) of the survey conducted by the 2 main interviewers. In these 2 interviewers, the average time of administration of the questionnaires was 12% shorter (29 minutes vs. 33 minutes) than for all interviewers combined (cf. results provided in the submitted manuscript). This can be explained by a progressive mastering of the questionnaire’s complex skip pattern by those interviewers completing a larger number of interviews. Their average time of recruitment, i.e., the time required to enlist a new eligible participant, was similar to that of the 4 interviewers combined (29 minutes vs. 27 minutes). However, these 2 interviewers spent a significant

larger amount of time for recruiting in venues such as markets (53 min vs. 36 min), phone parlors (43 min vs. 32 min) and large shopping centers (26 min vs. 22 min).

ARTICLE 1

Tobacco use in immigrants in Lyon metropolitan area,
France: a pilot study.

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*Submitted to Population
on 24th November 2015*

Title

Tobacco use in immigrants in Lyon metropolitan area, France: a feasibility study.

Le tabagisme des immigrés dans la métropole Lyonnaise : une étude de faisabilité.

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Abstract

Introduction: In 2011, 19.1% of the French population were immigrants, and their descendants. Despite this large proportion, little is known about their lifestyle entailing exposure to health hazards. In particular, tobacco consumption in immigrants may differ from that in the French native population. We conducted a feasibility study to assess a protocol investigating tobacco use among immigrants in the region of Lyon.

Methods: This feasibility study focused on non-European 1st and 2nd generation immigrants aged 18+ years in the 6 municipalities with the largest proportion of immigrants in Lyon area. Information was collected anonymously via face-to-face interviews during 2 months in 2013. A mix of 8 types of venues was chosen in order to recruit a representative sample of the target population.

Results: 84 subjects were interviewed of which 75 were eligible participants (49 1st generation and 26 2nd generation immigrants). The smoking prevalence was above the general population in France – respectively 45% and 34% - with more men smoking (51%) than women (38%). Our sample was similar to the immigrant population in the sampling area for most of its demographic characteristics. Main countries of origin were Algeria (29%), Tunisia (21%), Morocco (9%), and Turkey (7%). The study also showed that high pedestrian traffic venues yielded improved participation.

Conclusions: Our results indicate the feasibility of a large scale study on tobacco use and its determinants in immigrants in France. Inclusion of natives, a focus on high-attendance venues for recruitment and reduction of the length of the interview are modifications to incorporate.

Keywords

Tobacco; smoking; Immigration; France; Feasibility study; Pilot

Résumé

Introduction: En 2011, la population française comptait 19,1% d'immigrés. Malgré leur importance, leur style de vie impliquant des risques sanitaires demeure peu connu. En particulier, leur tabagisme peut être différent de la population native. Nous avons réalisé une étude de faisabilité pour évaluer un protocole d'étude du tabagisme des immigrés dans la région de Lyon.

Méthodes: Cette étude de faisabilité s'est concentrée sur les immigrés adultes non-européens de 1^{ère} et 2^{ème} génération, dans les 6 communes ayant la plus grande proportion d'immigrés de la région lyonnaise. Les données ont été recueillies anonymement en entretiens en face à face, pendant 2 mois en 2013. Une combinaison de 8 types de lieux a été choisie pour recruter un échantillon représentatif de la population cible.

Résultats: 84 personnes ont été interrogées, dont 75 participants éligibles (49 1^{ères} générations et 26 2^{èmes} générations). La prévalence tabagique était supérieure à celle de la population générale française. Notre échantillon était semblable à la population immigrée du lieu d'échantillonnage pour la plupart des caractéristiques démographiques. Les principaux pays d'origine étaient l'Algérie (29%), la Tunisie (21%), le Maroc (9%), et la Turquie (7%). Notre étude a également montré que les sites à forte circulation piétonne ont donné une meilleure participation.

Conclusions: Nos résultats démontrent la faisabilité d'une étude à grande échelle sur le tabagisme des populations immigrées en France. Les modifications principales à apporter au protocole seraient l'inclusion des natifs, une concentration du recrutement sur des lieux à forte fréquentation et la réduction de la durée de l'entretien.

Mots clés

Tabac; Immigration; France; Etude de faisabilité; Etude pilote

Background

Mainland France (henceforth referred to as France) has a long history of immigration. In 2011, 5.5 million 1st generation immigrants (defined by country and citizenship at birth) were living in France, representing 8.7% of the population (INSEE, 2015). While the proportion of 1st generation immigrants from other European countries decreased from two thirds in the 1970s to one third in 2011 (INSEE, 2014), the proportion of those from non-European origin increased, particularly from African and Asian countries. In 2011, the main countries of birth of 1st generation immigrants were, in decreasing order, Algeria (13%), Morocco (12%), Portugal (11%), Italy (5%), Turkey (4%), Tunisia (4%) and Spain (4%), with African countries adding up to 44% (INSEE 2015). In 2009, the municipalities of Lyon Metropole over 5,000 inhabitants – representing 94% of the inhabitants of this area – comprised 13.8% of 1st generation immigrants (INSEE, 2012c). Immigrants born in Algeria (25%) outnumbered any other origin. The proportion of immigrants from African countries was significantly higher than in France (53% vs. 44%), while those originating from European countries were less numerous (28% vs. 38%).

Second generation immigrants were approximately 6.6 million or 10.4% of the population in France, in 2011 (INSEE, 2012a). The main countries of origin of the 2nd generation immigrants were Algeria (15%), Italy (14%), Morocco (11%), Portugal (10%), Spain (8%), Turkey (4%) and Tunisia (4%).

Despite this increasing demographic trend, literature is scarce in France about the lifestyle and behaviours entailing health hazards in immigrants, in particular those leading to an excess cancer risk. Some surveys and epidemiologic studies have been conducted in immigrants to document health and nutritional status, and social or cultural conditions of specific immigration sub-groups in France (Bouchardy, 1993; Bouchardy et al., 1994; Bouchardy et al., 1995; Conde, 1984; Darmon and Khlat, 2001; Khlat, 1995; Mejean et al., 2007a; Mejean et al., 2007b; Mejean et al., 2009). Noteworthy findings were that in comparison to French natives, Maghrebian immigrants had lower risks of death from cancer of the lung and larynx, in a study on cancer mortality between 1979-85 (Bouchardy et al., 1996). Wanner et al. reported a higher smoking prevalence in male immigrants

from the Maghreb than in their national counterparts in France (Wanner et al., 1995). Méjean et al. reported a lower prevalence of smoking among Tunisian immigrants residing in Languedoc-Roussillon compared to peers born in France and their counterparts residing in the country of birth (28.6%, 34.7% and 40.8% respectively) (Mejean et al. 2007b).

Tobacco use is the major cause of cancer and therefore differences in tobacco use behaviour greatly determine cancer risk in the populations (Leon et al., 2015). In 2014, 34.1% of the French adult population (15-75 years of age) were current smokers, including 28.2% regular smokers (Guignard et al., 2015). The prevalence of regular smokers was 32.3% in men and 24.3% in women (Guignard et al., 2015). The use of shisha and smokeless tobacco (SLT) was rare in France in 2012, with virtually nobody reporting regular use while respectively 7% and 1% of the French respondents to the Eurobarometer survey reported occasional use (European Commission, 2012). In France, smoking is regularly described but the immigrant population is under-represented in general population surveys (Beck et al., 2011; Guignard et al., 2013; Guignard et al. 2015). Therefore, we do not know which tobacco products are used by immigrants as well as prevalence, intensity and determinants of use.

Tobacco smoking has been proven carcinogenic in humans in over 15 anatomical sites (International Agency for Research on Cancer, 2012). Tobacco chewing, sucking and sniffing also cause cancer. Further, exposure to second-hand smoke, and parental smoking, are causally associated with lung cancer in non-smokers and with tumors in the offspring, respectively (International Agency for Research on Cancer, 2004; International Agency for Research on Cancer, 2007; International Agency for Research on Cancer 2012). Tobacco use is also a significant contributor to health inequalities as smoking tends to be more prevalent in those from lower socio-economic groups (Guignard et al. 2015; Peretti-Watel et al., 2009).

In 2004 smoking was responsible for 73,000 deaths in France, including 44,000 cancer deaths, of which nearly 60% were due to lung cancer (n=26,000). The remaining 29,000 deaths were caused by cardiovascular, respiratory and infectious diseases (Hill, 2012).

Interventions to prevent tobacco use or to increase tobacco control directed at the general population may be less effective in immigrants if their habits differ significantly from those of the general population, but this remains uninvestigated at present.

We expect to find differences in lifestyle behaviours between immigrants and the general population of France. Tobacco use, including use of snuff, chewing tobacco and shisha smoking, for example, are more prevalent in some of the countries of origin of immigrants than in the general population in France (World Health Organisation, 2015). We also expect acculturation to modify the country-specific lifestyle behaviours imprinted in immigrants by their original cultures and norms. Second generation immigrants or those who migrated at a young age, or who have been in France for a longer period, might be more similar to the French general population in their tobacco habits, than those who have migrated later in life or resided a shorter period in France. This is of great importance in view of the large disparity in tobacco use typically seen between men and women in some of the countries of origins of immigrants and sex-specific tobacco use rates in France (World Health Organisation 2015). There are implications for cancer risk if immigrant women, for example, begin to use tobacco in similar proportions and as often as the native French women. In sum, immigrants may use tobacco differently than the natives and this may confer tobacco-attributable disease risk dissimilar to that of nationals.

Objectives

The aim of the feasibility study was to develop and test a study protocol to investigate tobacco use in immigrants in the French urban area of Lyon, in order to inform the design and implementation of a large scale study on tobacco use and its determinants in the immigrant population of France. The specific objectives were therefore to 1) ascertain the feasibility of conducting private interviews of the target population intercepted in public places, 2) evaluate the best approach to identify the immigrant population in Lyon Metropole, 3) assess the participation to the study and 4) pilot the questionnaire on tobacco use developed for the survey.

Method

Target population

This study focused on non-European immigrants and their descendants – so-called 1st and 2nd generation immigrants respectively - aged 18 years or older, living in France for at least one year and residing in the Lyon metropolitan area (overall 1.3 million inhabitants) at the time of the study. Information was collected anonymously using a questionnaire developed for the purpose of the study, having in mind a full exploration of tobacco use, with the interview being conducted face-to-face by a trained interviewer.

A 1st generation immigrant – sometimes solely designated as immigrant - is a person residing in France and born abroad with a foreign nationality. A 2nd generation immigrant – also called a descendant of immigrant - is a person born and residing in France, having one or two 1st generation immigrant parents. Within this broad group of immigrants, it was decided to concentrate on immigrant populations originating from any non-European country as the use of tobacco in other European countries is generally more similar to that of France and better described in the literature than tobacco use in other principal countries of origin of immigrants in France.

Sampling frame

For convenience, the metropolitan region of Lyon (so-called Lyon Metropole) - consisting of 59 municipalities spread over 538 km², and representing 1,281,971 inhabitants - was selected to implement the feasibility study as immigrants are more concentrated in larger urban areas (INSEE, 2012b). The feasibility pilot aimed at sampling at a single geographical site in France; if working for this site then this approach could be applicable to other sites in different parts of the country in a larger study. The proportion of immigrants by sex and country of birth for the municipalities of Lyon Metropole over 9,999 inhabitants and with a proportion of immigrants overall higher than the national average (8.5%) was obtained from the last available census (2009) through the Réseau Quetelet. This Institute can provide researchers with data derived from censuses and other databases of the French National Institute of Statistics and Economic Studies

(INSEE). To increase the probability of reaching the population of interest, the 5 municipalities with the largest proportion of African or Asian immigrants were chosen to conduct the survey: Décines-Charpieu, Rillieux-la-Pape, St-Fons, Vaulx-en-Velin and Vénissieux. The 8th district of Lyon was also added for hosting the largest proportion of non-European immigrants residing in Lyon, allowing us to include in the study sample immigrants living in down-town Lyon, a distinction with the other municipalities which were outside of the city of Lyon's limits. Overall in these 6 municipalities, the proportion of 1st generation immigrants was 20.6% in 2009, with a nearly equal number of men and women. Among non-European countries of origin, Algeria was the most represented with 39% of non-European immigrants, followed by Tunisia (16%), Morocco (9%) and Turkey (6%). First generation immigrants originating from other African countries represented 14% of the immigrant population in the sampling area.

To obtain a sample as representative as possible of the immigrant population residing in the selected municipalities in terms of sex, age, education and country of origin, a combination of different type of locations was chosen to reach the target population. The type of places, either indoor or outdoor, originally selected with the help of a local non-governmental organisation (NGO) working on immigrants' health in Lyon Metropole, consisted of: 1) street markets (outdoor), 2) public and private primary schools (outdoor, to recruit parents), 3) bars and restaurants (outdoor), 4) Universities and colleges (outdoor), 5) shop fronts with international phone facilities ("phone parlors", outdoor), 6) residences specifically accommodating disadvantaged families or accommodating single immigrant workers known as Adoma residences (indoor), and 7) *Community arts centre and youth club* "MJC" (outdoor). For each type of location, the exhaustive list of all venues in the target 6 municipalities was obtained from appropriate sources, e.g. local council offices, Chamber of Commerce and Industry of Lyon, the Academy of Lyon, and Adoma leaders.

Mosques were originally advised as a possible location of interview for its capacity of gathering a transversal sample of the immigrant population demographically (age, sex and education-wise), and geographically. Nevertheless, the lack of systematic lists, given that there are many informal places for prayers, in addition to the potential misreporting of tobacco use due to the religious prescription, led

us to decide to not include this type of location to conduct the survey. Aralis residences – another type of residences for disadvantaged families and single immigrant workers – were, on the other hand, considered as a type of venue in this study, but despite the initial agreement with its leaders they did not provide us specific sites to carry out the survey.

Large shopping centers (indoor, over 2,500 m²) were added later during the implementation of the study.

Sampling approach

We planned to contact potential respondents at a two different venues per type of location, originally adding up to a total of 14 venues plus 2 shopping centers. For each type of location we randomly selected 5 venues to conduct the survey allowing for additional venues in case the first two selected did not allow contact with the target population. For Adoma residences, we selected at random one site within each type of residences, i.e., residences for disadvantaged families and for single immigrant workers. For each of the randomly selected 16 venues, we informed by letter the person in charge about the planned feasibility survey (e.g. mayors of the municipalities for the markets, school directors, leaders of Adoma centres, managers of the bars-restaurants, the phone parlors and the large shopping centers) at least one month before the place was visited by the interviewers. The letter mentioned the objectives of the study, the full anonymity of the survey, the disclosure of ethical approvals, and the dates during which the interviewers would potentially come. It was also disclosed that the interviews would take place outside these venues as this would facilitate greater privacy, therefore permission was not requested but this information was meant to facilitate the planned work of the interviewers.

Each venue was to be visited 2 times, at a different time of the day, or on a different day of the week to enrol potentially different subgroups of immigrants, therefore totalling 32 site visits. Interviewers were asked to attempt to contact as many of the individuals present at the time of their visit of enclosed spaces with low attendance (telephone parlors, bars and restaurants and MJC) when the subjects were leaving the venue in order to assess eligibility and interest in participating in the survey. In open-space venues with high attendance, markets

for example, the interviewers were asked to be at a fixed location and to attempt to contact every person passing nearby, or depending on the level of attendance, every 10th (or higher number) person passing nearby.

Target sample size

We aimed to conduct in total 100 interviews, with the same number of questionnaires, equally distributed across the 16 different venues, which is 6-7 interviews per venue. The time required to recruit respondents was estimated to be 15 minutes. If the recruitment time were to change, the total sample size would need to be modified to align with the study's budgetary constraints.

Questionnaire development

The questionnaire was developed with the help of validated questionnaires from previous studies (Beck and Gautier, 2012; Gallus et al., 2014; Giovino et al., 2012; Oh et al., 2010; Simon and Clément, 2006). It consisted of 12 sections as indicated in Table 1. We were interested in exploring not only tobacco use in all its forms but motivation to quit, cessation attempts, exposure to second-hand smoke, knowledge, perceptions and attitudes about the harmfulness of tobacco and the benefits of quitting tobacco use. Prior to the start of the study, the questionnaire was tested among few individuals from the target and non-target population.

Table 1. Sections of the questionnaire

	Section	Description
A	ELIGIBILITY CRITERIA	Age, place of residence, country and citizenship at birth of interviewee, father and mother, immigration year
B	INTERVIEW INFORMATION	Interviewer, type of venue, language, date and time
C	PARTICIPANT CHARACTERISTICS	Sex, education, occupation, French fluency, ethnicity
D	TOBACCO SMOKING	Smoking status (any smoking but shisha): current/former/never and regular/occasional, age of initiation, intensity by product, dependence level
E	SHISHA USE	Shisha smoking status: current/former/never and regular/occasional, age of initiation, intensity by product, dependence level
F	SMOKELESS TOBACCO USE	SLT use status: current/former/never and regular/occasional, age of initiation, intensity by product, dependence level
G	SECONDHAND SMOKE (SHS)	Exposure to SHS in different places (home, work, etc.)
H	TOBACCO CESSATION	Quit attempts and cessation method, motivation to quit
I	ECONOMICS	Amount spend for tobacco, packaging, reaction to tax increase
J	KNOWLEDGE, PERCEPTIONS, ATTITUDES & BEHAVIOURS	Perceptions on tobacco use, associated health effects, benefits of quitting support towards tobacco control strategies
K	MEDIA	Exposure to tobacco advertisement
L	SMOKING HISTORY IN COUNTRY OF BIRTH	Change in tobacco use since immigration

Test of the questionnaire

In addition to informing the implementation and logistics of a future large-scale study, the feasibility was meant to allow testing the understanding of the questionnaire by responders, the duration of the interview, the time required to recruit eligible participants, the need of additional language skills on the part of the interviewers and the reliability of the questionnaire. By consequence, a second interview in a sub-sample of up to 40 responders was planned to allow assessment of reproducibility of responses as well as testing improvements introduced in the questionnaire since first round of administration (later on referred to as second phase of the feasibility). Each individual responding anonymously to the questionnaire in the first round was asked if interested in completing a second interview two months later. If agreed, participants were given an appointment card - without any personal identification - but including the number of the questionnaire completed at the first interview. The appointment card - specifying date, time and place, arranged at the participants' convenience - was the sole link between the first and the second rounds. As an incentive to participate to the 2nd phase, a monetary expense allowance of 12€ was advertised to the participants.

Ethics

This feasibility study was approved by the IARC Ethical Committee on 18th April 2012. Ethical approval was also granted on 3^d April 2013 by the French “Commission on Information Technology and Liberties” (CNIL), requesting that full anonymity of participants is guaranteed. The consent of the participants to participate in the feasibility survey was asked verbally at the beginning of each interview after disclosure of the objectives and the topics covered in the questionnaire. The participants were also assured of their full anonymity, and right not to answer any question or to stop their participation in the survey at any time.

Training of interviewers

For the purposes of the study, two interviewers were necessary; but in order to overcome a possible lack of manpower, two additional interviewers were recruited through the local NGO. The four bilingual interviewers (French-Arabic, French-English, French-Spanish and French-Turkish) received a one-day training session at IARC including information on the structure of the questionnaire and on how to conduct the survey following the sampling approach.

Analysis and reporting of results

At first we describe the implementation of the survey and the number of questionnaires administered by type of venue, as well as the challenges encountered during the realisation of the feasibility survey. We also describe the degree of completion of the questionnaire by sections as an indicator of the feasibility of conducting interviews and administration of the questionnaire in public places. Secondly, we present the demographic characteristics of the interviewees and the representativeness of this sample (with the help of Fisher’s exact test) compared to the census population. We thereafter present the tobacco use in the sample reached by the survey (proportions with 95% confidence intervals). A comparison of the prevalence of tobacco use by type of venue was performed in order to explore if the type of location sampled conditioned the tobacco use profile of responders, an indication of possible selection bias which would compromise the validity of the sampling approach. Thirdly, we compare the average recruitment time – chosen as a proxy for participation. Finally, we provide

information on the 2nd phase of the study designed to validate few aspects of the questionnaire.

Results

Eighty-four interviews were conducted between May and July 2013. Nine interviews were excluded from the analysis as the respondents were not eligible as a result of their place of birth (Europe), nationality at birth (French born abroad) or age (less than 18 years). The 75 eligible participants included 49 1st generation immigrants and 26 2nd generation immigrants, with an equal number of men and women overall. All interviews were conducted fully in French.

Table 2 shows the distribution of interviews conducted as well as the average interview and recruitment time by type of venue. The most frequented venues – markets, universities and large shopping centers - accounted for 76% of the eligible interviews completed. Nevertheless, the non-eligible interviews were also completed in these highly frequented venues. Overall, the average interview time was 33 minutes (SD=18) and the average time of recruitment, i.e. the time required to enlist a new eligible participant, was 27 minutes.

Table 2: Number and average duration of interviews' administration and recruitment time by type of venue

Type of venue	No. interviews	No. eligible interviews n (%)	Administration time min	Recruitment time min
Adoma	5	5 (7%)	52 SD=43	39
Bars-Restaurants	1	1 (1%)	44	30
Markets	19	15 (20%)	40 SD=17	36
MJC	2	2 (3%)	25 SD=14	20
Phone parlors	4	4 (5%)	25 SD=11	32
Schools	6	6 (8%)	27 SD=31	12
Universities	16	15 (20%)	32 SD=7	26
Shopping centers	31	27 (36%)	30 SD=13	22
Total	84	75 (100%)	33 SD=18	27

SD: standard deviation

Due to difficulties contacting the target population and conducting the interviews outside of bars, restaurants, telephone parlors and the MJC, these venues were abandoned after the completion of 7 interviews. In particular, the interviewers reported their concern of a potential risk of stigmatization of the non-European immigrant population when recruiting them in low attendance areas. This is why we further selected large shopping centers (sale surface over 2,500 m²), with high volume of pedestrian transit, as an additional type of location to reach the target population (see Methods). Thirty one interviews were conducted at the shopping centers representing 36% of the total sample.

The completion of the questionnaire was overall 76.2% (data not shown in Table 3); it was above 80% for the introductory sections on eligibility (A), interview information (B) and demographic characteristics (C), as well as the core epidemiologic sections on all forms of tobacco use and exposure profile (D-G). For other sections the completion proportion was lower.

Table 3: Completeness of sections of the questionnaire employed in the study.

Section	Topic	Completion (%) n=75
A	ELIGIBILITY CRITERIA	100
B	INTERVIEW INFORMATION	97
C	PARTICIPANT CHARACTERISTICS	94
D	TOBACCO SMOKING	90
E	SHISHA / NARGILE	86
F	SMOKELESS TOBACCO	84
G	SECONDHAND SMOKE	89
H	TOBACCO CESSATION	56
I	ECONOMICS	54
J	KNOWLEDGE, PERCEPTIONS, ATTITUDES & BEHAVIOURS	74
K	MEDIA	63
L	SMOKING HISTORY IN COUNTRY OF BIRTH	39

The demographic characteristics and the tobacco use prevalence by immigration generation in our sample are presented in Table 4. While the overall sex ratio was close to one, there were more men (59%) in the 1st generation than in the 2nd generation (33%) immigrants. As in the corresponding estimates for France overall, the 2nd generation immigrant was on average younger, with more than 9 out of 10 participants below 39 years of age. Using the completion of secondary

school as a threshold, 2nd generation immigrants had more educated interviewees (85%) than the 1st generation (69%). The occupation proportions differed also between the generations, with more 2nd generation participants working or studying. Algeria and Tunisia were the first countries of origin in both generations, with these 2 countries of origin representing 50% of the sample. Turkey and Morocco were the 3rd and 4th most frequent countries of origin in the 1st generation responders, and the same countries but in reverse order for the 2nd generation. The other African countries of origin in our sample were Angola (n=1), Benin (n=1), Central African Republic (n=2), Congo (n=2), Democratic Republic of the Congo (n=2), Gabon (n=1), Ivory Coast (n=1), Madagascar (n=1), Mali (n=1) and Senegal (n=3). Apart from Turkey, the other Asian countries of origin were Afghanistan (n=1), Iran (n=1), Laos (n=2), Lebanon (n=3), Pakistan (n=1) and Vietnam (n=2). From the year 2000 onwards, approximately 50% of 1st generation immigrants in our sample migrated to France. The average length of stay of 1st generation immigrants was 20 years (SD=14). Immigrants between 20 and 29 years old represented the largest age group (39%). About tobacco use, 41% of the 1st generation immigrant men consumed tobacco currently while 35% of the same generation women reported similar use. The gender gap in prevalence of current tobacco user is larger in 2nd generation immigrants with 88% of men and 41% of women being current users. More 1st generation immigrants reported having never used tobacco (47%) than 2nd generation immigrants (35%).

Table 4: Participants' characteristics in the sample reached by the feasibility survey

Variable	1 st generation n = 49		2 nd generation n = 26*		Total n = 75	
	n	% [95% CI]	n	% [95% CI]	n	% [95% CI]
Sex						
Men	29	59 [44 - 73]	8	31 [15 - 52]	37	50 [38 - 61]
Women	20	41 [27 - 56]	17	65 [44 - 82]	37	49 [38 - 61]
Age						
<20	-		1	4 [1 - 27]	1	1 [1 - 8]
20-29	12	26 [14 - 39]	17	65 [44 - 82]	29	39 [28 - 51]
30-39	11	22 [12 - 37]	6	23 [10 - 44]	17	23 [14 - 34]
40-49	11	22 [12 - 37]	2	8 [1 - 27]	13	17 [10 - 28]
50-59	6	12 [5 - 25]	-	-	6	8 [3 - 17]
60+	9	18 [9 - 33]	-	-	9	12 [6 - 22]
Education level						
Low	15	31 [19 - 46]	3	12 [3 - 31]	18	24 [15 - 35]
High	34	69 [54 - 81]	22	85 [64 - 95]	56	75 [63 - 84]
Occupation						
Currently working or studying	27	55 [40 - 69]	17	65 [44 - 82]	44	59 [47 - 70]
Not currently working or studying	22	45 [31 - 60]	8	31 [15 - 52]	30	40 [29 - 52]
Country of origin						
Algeria	12	25 [14 - 39]	10	39 [21 - 59]	22	29 [20 - 41]
Morocco	3	6 [2 - 18]	4	15 [5 - 36]	7	9 [4 - 19]
Tunisia	10	20 [11 - 35]	6	23 [10 - 44]	16	21 [13 - 33]
Other African countries	15	31 [19 - 46]	-	-	15	20 [12 - 31]
Turkey	4	8 [3 - 20]	1	4 [1 - 27]	5	7 [2 - 16]
Other Asian countries	5	10 [4 - 23]	5	19 [7 - 40]	10	13 [7 - 24]
Immigration year						
<1979	8	16 [8 - 30]			8	11 [5 - 20]
1980-1989	9	18 [9 - 33]			9	12 [6 - 22]
1990-1999	5	10 [4 - 23]			5	7 [2 - 16]
2000-2009	20	41 [27 - 56]			20	27 [17 - 38]
2010+	4	8 [3 - 20]			4	5 [2 - 14]
Unknown	3	6			3	4

		[2 - 18]			[1 - 12]	
Age at immigration (years)						
0-9	5	10		5	7	
		[4 - 23]			[2 - 16]	
10-19	9	18		9	12	
		[9 - 33]			[6 - 22]	
20-29	18	37		18	24	
		[24 - 52]			[15 - 35]	
30+	14	29		14	19	
		[17 - 43]			[11 - 30]	
Unknown	3	6		3	4	
		[2 - 18]			[1 - 12]	
Tobacco use prevalence						
Current user	19	39	15*	58	34*	45
		[26 - 54]		[37 - 76]		[34 - 57]
Men	12	41	7	88	19	51
		[24 - 61]		[47 - 99]		[35 - 68]
Women	7	35	7	41	14	38
		[16 - 59]		[19 - 67]		[23 - 55]
Former user	7	14	2	8	9	13
		[6 - 28]		[1 - 27]		[6 - 22]
Men	7	24	-	-	7	19
		[11 - 44]				[9 - 36]
Women	-	-	2	12	2	5
				[2 - 38]		[1 - 20]
Never user	23	47	9	35	32	43
		[33 - 62]		[18 - 56]		[31 - 55]
Men	10	36	1	13	11	30
		[19 - 54]		[1 - 53]		[16 - 47]
Women	13	65	8	47	21	57
		[41 - 84]		[24 - 71]		[40 - 72]

* Totals do not add as one 2nd generation immigrant did not report sex, education and occupation statuses;

SD: standard deviation;

1st generation immigrant: men or women born outside of France with a foreign citizenship; 2nd generation immigrant: men or women born in France with at least one 1st generation immigrant parent.

The representativeness of our sample was checked separately for several criteria, i.e. ratio of generations, sex and distribution by countries of origin. Depending on the test, different populations were chosen as a reference, due to limited data available (e.g. no estimates of the distribution of 2nd generation immigrants were available for Lyon Metropole). The ratio of 1st vs 2nd generation of immigrants in our sample (2) was not representative ($p=0.01$) of the immigrant population of all ages combined in mainland France, where it was about one in 2009. The sex ratio in 1st generation immigrants in the feasibility sample was similar ($p=0.25$) to the sex ratio in the 1st generation immigrant population in the selected municipalities, where men represented 51% of the 1st generation non-European immigrant population in 2009. In the sampled 1st generation immigrants, the distribution by country of origin was not representative ($p=0.04$) of the target population in the 6

municipalities of Lyon Metropole. The biggest difference is for immigrants born in *Other African countries* that represented 30% in our sample while it was 14% in the 1st generation immigrants of the selected municipalities. When re-running the test without this last subgroup, our sample would have been representative of the distribution by country of origin ($p=0.48$). The distribution of countries of origin of the sampled 2nd generation immigrants was similar ($p=0.11$) to the distribution reported for the 2nd generation immigrant population, over 18 years old, of mainland France.

The tobacco use by generation, by sex, and by type of tobacco products in our sample is shown in Table 5. Overall in our sample, 45% of responders were current tobacco users. Tobacco use was more prevalent in both 2nd generation men (58%) and women (41%) than in 1st generation counterparts (41% and 35%, respectively). Cigarette smoking was by far the most commonly used tobacco product (39% of our sample). About half of the current cigarette smokers were consuming exclusively cigarettes. The current shisha smokers accounted overall for 15% of the interviewees, with a higher proportion in the 2nd generation immigrants compared to the 1st generation immigrants, with respectively 27% and 8%. Only one 1st generation immigrant reported using smokeless tobacco currently.

Table 5: Prevalence of current tobacco use by type of tobacco product, by sex and by immigration generation.

	1st generation immigrant						2nd generation immigrant						Total					
	Men (n=29)		Women (n=20)		Total (n=49)		Men (n=8)		Women (n=17)		Total* (n=26)		Men (n=37)		Women (n=37)		Total (n=75)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Current users	12	41%	7	35%	19	39%	7	88%	7	41%	15	58%	19	51%	14	38%	34	45%
Cigarette ¹ smokers	11	38%	7	35%	18	37%	4	50%	6	35%	11	42%	15	41%	13	35%	29	39%
Cigarette ² only	6	21%	5	25%	11	22%	1	13%	5	29%	6	23%	7	19%	10	27%	17	23%
Shisha smokers	4	14%	-	0%	4	8%	5	63%	2	12%	7	27%	9	24%	2	5%	11	15%
Shisha only	1	3%	-	0%	1	2%	3	38%	1	6%	4	15%	4	11%	1	3%	5	7%
Smokeless tobacco	1	3%	-	0%	1	2%	-	0%	-	0%	-	0%	1	3%	-	0%	1	1%

¹ Manufactured cigarettes, roll-your-own cigarettes and cigars;

² Manufactured cigarettes and roll-your-own cigarettes;

* One 2nd generation immigrant did not report sex, therefore totals do not add;

1st generation immigrant: men or women born outside of France with a foreign citizenship; 2nd generation immigrant: men or women born in France with at least one 1st generation immigrant parent.

Table 6 shows the prevalence of cigarettes and cigars smokers in our sample depending on the type of venue where they were enrolled. In the 3 main types of venues, i.e. markets, Universities and large shopping centres, the prevalence of ever smokers was particularly high and ranged from 48 to 80% of the eligible interviews conducted in these venues. On the contrary, the prevalence of ever smokers was particularly low outside of the schools (17%).

Table 6: Number and prevalence of cigarette* smokers per type of venue

Type of venue	Ever smoker	Current smoker	No. interviews
Adoma	4 (80%)	2 (40%)	5
Bars-Restaurants / MJC / Phone parlors	3 (43%)	0	7
Markets	8 (53%)	6 (47%)	15
Schools	1 (17%)	1 (17%)	6
Universities	9 (60%)	8 (53%)	15
Shopping centres	13 (48%)	12 (44%)	27
Total	38 (51%)	29 (39%)	75

* *Manufactured cigarettes, roll-your-own cigarettes and cigars;*

Based on the current tobacco use in our sample, the mean intensity of cigarette smoking, shisha smoking and smokeless tobacco consumed were, respectively, 12 (SD=6.4) cigarettes per day, 3 (SD=2.8) shisha sessions per week and 14 smokeless tobacco units per week (data not shown). In these current users, the mean age of initiation by type of products were 19 (SD=10.2) years old for smokers of products other than shisha (manufactured cigarettes, roll-your-own cigarettes and cigars) and 18 (SD=4.1) years old for current shisha smokers.

Half of the current smokers tried to quit in the past 12 months, and 82% reported they wanted to quit, of which 39% in the current year and 43% wanted to quit but not before another year. On second-hand smoke, 62% of all of the respondents reported smoking took place daily inside their home. Virtually all of the interviewees, smokers and never smokers alike, considered that smoking can cause severe diseases (93%, data not shown). In particular, 87% of the respondents with available data reported that smoking can cause cancer. Overall, 40% of the respondents with available data expressed their support toward tax increases on tobacco products; there were more supporters of this tobacco

control policy in never users (67%) than in ever users (19%). Among current tobacco users, 75% reported having discussed about their smoking with a health professional in the last 12 months; 67% of those individuals were actually advised to quit.

Due to the strict anonymity in the protocol, interviewers had no means of contacting participants of the 1st phase to join the 2nd phase. Only 2 participants called back the interviewers to participate in the 2nd phase and despite appointments were made at their convenience (time and location) to complete the second questionnaire, none of them showed up.

Discussion

Our feasibility study was intended to develop an effective approach to investigate tobacco use in non-European immigrants in Lyon Metropole, France. To our knowledge, this is the first study in the field of health research and epidemiology that developed a population based recruitment method of this particular minority group. The constitution of a mixed sample in terms of distribution by sex, age, countries of origin and generation of immigrants suggested the approach was successful in identifying the target population.

The number of interviews differed by type of sampling locations despite the original objective of achieving an equal distribution across all types. The low-attendance type of places (bars and restaurants, phone parlors and MJC) revealed not to be ideal in the feasibility study setting to conduct anonymous interviews at fortuitous visits in public places. Even though Adoma residences were early on envisaged as a convenient sampling place, the fortuitous visits of the interviewers did not match with the availability of the residents. In our study setting, the venues that allowed for the largest participation proved to be those with high attendance, i.e. the highest pedestrian traffic.

The average time of recruitment of eligible participants was 26 minutes and therefore well above the foreseen time of 15 minutes. This possibly indicated the difficulty of reaching a minority population in the type of venues selected for this feasibility study and/or the ability of the interviewers. As recruitment time was shorter in interviewers that administered the greatest number of questionnaires, a

prolonged recruitment time may indicate the need of longer training to increase the effectiveness of interviewers and consequently an increased participation rate to the study, or of a selection of more experienced interviewers.

This feasibility study revealed disparities depending on the recruitment settings. Regarding the implementation of the survey in different type of places, the interviewers reported the perceived risk of stigmatisation of the target population outside of places with low attendance, e.g. bars and restaurants, phone parlors and MJC. Interviewing a minority population in low-attendance public places on their tobacco use behaviours could raise the stigma from the surrounding bystanders and defiance in the interviewees; and therefore affect the quality of their answers. It is noticeable that at Adoma residences, despite being low attendance with discrete transit of people, contacting and interviewing target population did not constitute a perceived risk of stigmatisation. Adoma leaders enabled to recruit people and administering the questionnaire inside the residences and thus constituted an asset. In spite of this, only 5 interviews were conducted in the residences. An explanation of this apparent under-achievement resides in the tenants not being on site all the time, combined with the spontaneous visits of the interviewers. Taking into account these practical constraints, we were not able to attain an equal number of interviews per type of venue.

The aim was to strike a balance between the range of information relevant to tobacco use and questionnaire length to get as many complete interviews as possible. However, the questionnaire completion differed by section of the questionnaire. We obtained an overall completion proportion of 76.2%, but this varied greatly by section: from 100% in the first sections to under 40% in the final section. Unfortunately, there was no option to re-contact interviewees to follow up on missing responses as participation was anonymous. Notably, the section on perception and behaviours was well answered (74.2%) despite being near the end of the questionnaire. This may highlight a special interest of the interviewees.

Such a feasibility study with reduced number of participants provides limited insight into its representativeness. Nevertheless, our analyses suggested that our approach had the potential of building a representative sample. The larger proportion of 1st generation immigrants, in a sample of 75 immigrants, compared

to the figures for mainland France could be due to chance. It is noticeable that 3 out of 4 interviewers recruited together 40 of the 49 1st generation immigrants and only 12 of the 26 2nd generation immigrants. Further, the selection of bilingual interviewers might have induced an over-selection of 1st generation immigrants with specific language needs, e.g. Turkish immigrants, as interviewers might have tried to make advantage of their skills, even if all interviews were actually conducted in French. Similarly, the test on distribution of countries of origin in 1st generation immigrants showed an “oversampling” of individuals with *Other African* origin that could be due to chance in this small sample, or to the types of locations chosen that may condition the distribution of participants by country of origin. Apart from the reference population for the distribution of countries of origin of the 2nd generation immigrants which included only ≥ 18 years old immigrants, the other reference populations used to assess representativeness included all ages while our sample was restricted to subjects aged 18 years and above.

Preliminary findings on tobacco use from this feasibility study should be interpreted with caution, nevertheless the data suggested disparities between our sample and the French general population. The prevalence of smoking was higher in our sample (45.3%) than for the general population in France (34.1%) in 2014 (Guignard et al. 2015) but the gender gap was preserved: more men were current users than women, respectively 32.3% and 24.3% in the general population (Guignard et al. 2013), and 51.4% and 37.8% in all immigrants combined. Another important difference was observed in the prevalence of current shisha smokers: 7% in the general population (European Commission, 2015), and 8% and 27% in 1st and 2nd generation immigrants interviewed. Smoking prevalence in several of the countries of origin of 1st and 2nd generation immigrants in our sample is considerably higher than in France and the popularity of tobacco may be carried on by men migrating from those countries into France. For example, according to the World Health Organisation, in 2006 43.6% of men between 15 and 74 years old in Morocco were current smokers (World Health Organisation 2015) and in Turkey (2012) 41.4% of men were current tobacco smokers (World Health Organisation 2015). Another consideration is to question if to interview in indoor or outdoor venues could have conditioned the type of tobacco use profile of the responders intercepted by the interviewers. However in

our sample interview of responders in indoor venues also generated high smoking prevalence estimates, e.g. 80% of ever smokers in the Adoma residences.

Among current tobacco users, 29.0% tried to quit in the last year in France (Guignard et al. 2013) while 50% of the respondents in our sample (n=30) tried in the same period. Similarly, 73% of the immigrant current tobacco users in our sample who responded (n=26) declared they were motivated to quit while 31.8% declared so in the general population users (Guignard et al. 2013). These higher figures in quitting attempts and motivation to quit could be seen in line with the higher prevalence of tobacco use in immigrants registered in our feasibility study. In the general population current smokers, 31.8% reported a discussion of their tobacco use with a health professional in the last 12 months (Beck & Gautier 2012); in our sample the proportion of tobacco users who reported having a discussion in the last year was of 80% (n=20). However, not all of them were actually advised to quit by this health professional (63%, n=16). Exposure to tobacco smoke at home – with at least one person smoking regularly at home - was reported in 35.8% of the current smokers in France (Guignard et al. 2013) while this type of exposure was reported in 42% of participants in our sample (n=64). Knowledge of the harmful effects of tobacco use to health and in particular that tobacco can cause cancer was similar in both populations, i.e. 97.9% in the general population and 97% (n=66) in our sample. The support to tax increase was similar in the never and ever users of both the general population and the immigrants contacted in our sample, with respectively 61.9% and 21.5%, and 59% (n=22) and 24% (n=29) supporting this tobacco control intervention.

Testing the reliability of responses obtained with the pilot's questionnaire was not achieved as no participants could be reached for the 2nd interview. The important lesson to learn from this pilot is however that anonymous recruitment would not work in any main study, if repeated contact with participants is needed, i.e. for follow-up of missing answers or testing the consistency of responses at two different points in time.

Although our feasibility study represents an innovative method to investigate tobacco use in a minority group that would be under-represented in surveys of the general population, it is not without limitations. Firstly, not including French natives in our study precluded direct comparisons of demographics and tobacco use

between the two populations to contrast using the same sampling approach. Further, inclusion of French nationals in our sampling scheme would have possibly mitigated the potential of stigmatization when interviewing responders of minority groups in low attendance venues. A major limitation of the study was the inability to calculate the participation rate – the proportion of eligible people who accepted to participate among all those who were approached – as the total number and eligibility of individuals approached was not recorded by the interviewers. Any future study should ensure adequate collection of the number of people approached overall and by type of place to overcome this limitation and inform large scale study design.

Other studies on tobacco use in immigrants in European countries have used alternative methods to recruit the target population. In Germany, the microcensus – an annual census representing 1% of all German households – was used to estimate the smoking prevalence (Reeske et al., 2009; Reiss et al., 2010; Reiss et al., 2014). The microcensus made it possible to differentiate between natives, 1st and 2nd generation migrants. As the participation to the microcensus is obligatory, the participation rate is generally high (94% in 2005) and enables to recruit significant numbers of migrants. Some studies used population registries, e.g. the Swedish population registry, the population register of Amsterdam, and the municipal registers in Rotterdam and The Hague, or large national surveys, e.g. the integrated household Survey in the United Kingdom, to investigate the tobacco use amongst migrants (Aspinall and Mitton, 2014; Hosper et al., 2007; Pudaric et al., 2000; van Oort et al., 2006). The strength of these studies is their large sample sizes - more than 770,000 in Aspinall et al. study - which enable to differentiate between wider ranges of migrant groups. Another recruitment technic is through health centres, i.e. in a suburb of Stockholm, Swedes and immigrants were recruited when they attended for a health check, allowing also for physiological investigations (Tomson and Aberg, 1994). In Sweden, invitation to participate to a study on migration and cardiovascular disease, including exposure to smoking, was realised via a letter written to all Iranian-born persons in the sampling area (Koochek et al., 2008). This type of approach is only possible where a population registry exists and distinction of residents according to immigration status is not sanctioned by laws or ethical confidentiality concerns. Similarly in the United Kingdom and Ireland, exploration of smoking in migrants

was performed with invitation through the use of flyers, posters, word of mouth and advertisement in local migrant community magazine, and responders underwent an interviewer-administered questionnaire (Ezika, 2014; Kabir et al., 2008). Interviewers were also recruited and trained from the target migrant group, and posted at busy intersection of the city area, in the neighbourhoods of numerous target migrant group shops (Kabir et al. 2008). Despite smaller samples, this recruitment method has the potential to collect qualitative information, and is an alternative in the absence of quality register. Nevertheless, this method had limitations in terms of representativeness of its sample as it consists of a convenient sample, although age and sex distribution in the migrants were similar to that in the natives.

The lessons learnt from our feasibility study have implications for a future study. In the presence of similar anonymity demands, the length of the questionnaire – conditioning the length of the interviews – should be reduced to allow higher completion of the questionnaire, as follow-up on missing responses cannot be done. Along the same line, it is important to evaluate the length of the questionnaire, in this setting of private interviews conducted in public places, as a balance between more exhaustive information on the one hand and higher participation on the other. Despite the use of incentives, this feasibility study did not succeed in completing a re-interviewing of a sub-sample of responders one month after the first interview. The selection of the type of venues should focus on highly frequented places. The last main implication for a future study is the need of extensive training of interviewers, including greater familiarity with the questionnaire, the rigor of collecting all data in the questionnaire as well as keeping track of all subjects contacted and concomitant refusal rate. Also important is the selection of interviewers with greater experience. Interviewers' representations on immigration should also be investigated before the study to ensure that they will not interfere with the conduct of the survey, particularly regarding their perception of a potential stigma while administering questionnaire in public areas.

This feasibility study protocol indicated the approach used was effective to investigate tobacco use in a sample of immigrants that is representative of the municipalities where the study was conducted. But the immigrant population in our

sampling area is not fully representative of the national immigrant population. This raises the question on how to obtain a representative sample of immigrants in France in areas that are not representative of the national mainland.

Conclusion

This feasibility study developed and tested a new method to investigate tobacco use and the determinants of use in 1st and 2nd generation immigrants residing in Lyon Metropole. Most of the demographic characteristics of our sample were similar to that of the immigrant population in the sampling area. For the characteristics that were not similar, e.g. distribution by generation or distribution by country of origin, the limited statistical power of this feasibility does not indicate major differences either. Immigrants of Algerian origin were most common in our sample. The questionnaire data revealed a smoking prevalence above the general population in France – respectively 45% and 34% - with a large gender gap: more men were smoking than women, respectively 32% and 24% in the general population, and 51% and 38% in our sample. Additionally, the prevalence of shisha current users was twice as high as in the general population: 15% versus 7%. Despite having been successful in reaching the target population, improvements are necessary to plan a future large scale study. In particular, the length of the interviews should be reduced and the inclusion of natives envisaged allowing for direct comparisons in their tobacco use. Additionally, priority should be given to high attendance venues to administer the questionnaire. After incorporating modifications as indicated by our findings, this feasibility study protocol could be used to recruit a sample of immigrants which is representative of this minority group in the population in France. It is of major importance to develop and refine a methodology to study life-style behaviours of immigrants with important health repercussions as is the case of tobacco use, particularly when 1st and 2nd generation immigrants represent more than 20% of the French population and very little is known on their health risks. Developing research addressing immigrants' healthy habits will become more and more necessary in this increasing subgroup of the population – and France is not an exception - to direct effective interventions on these minority groups.

Funding

Ligue Nationale Contre le Cancer 3-years (2011-2014) doctoral program funding for Simon Ducarroz is gratefully acknowledged.

Acknowledgement

French population census 2009: customized tabulation, INSEE (producer), ADISP-CMH (distributor).

Conflict of interest

None

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CHAPTER III:

TOBACCO-RELATED CANCERS IN AN IMMIGRATION PERSPECTIVE

1 OBJECTIVE

In this chapter, the aim was to compare the incidence of TRC in men living in Denmark, depending on their migration status (natives and immigrants). A secondary objective was to investigate whether the TRC patterns observed in 1st and 2nd generation immigrants corresponded to the patterns of tobacco use in the respective countries of birth.

The related scientific manuscript (published online in *Acta Oncologica* on 27th March 2015) is included below. Prior to the manuscript, an overall presentation is given, including complementary information about the background, method and results of this study. Limited repetitions of information that can be found in the article are presented for the understanding of the additional details in this section. The conclusions of the study are given in the manuscript.

2 BACKGROUND

In Denmark, 53% of all 1st and 2nd generation immigrants originated from a European country in 2014 (Statistics Denmark, 2015). Previously, foreign-born people who migrated to Denmark originated mainly from neighbouring Nordic countries or other European countries, and to a lesser degree from Turkey and the former Yugoslavia. During the 1980s and 1990s, an increasing number of immigrants came from Asia and the Middle East (e.g. Iraq, Iran, Afghanistan and Pakistan) or Africa (e.g. Somalia and Ethiopia). As shown in Figure 3.1, the main country of origin in 2015 was Turkey; 9.4% of all immigrants and their descendants, or a total of 61,634 persons. Poland and Germany are the 2nd and 3rd most common countries origins for immigrants and descendants, with respectively 6.0% and 4.9%.

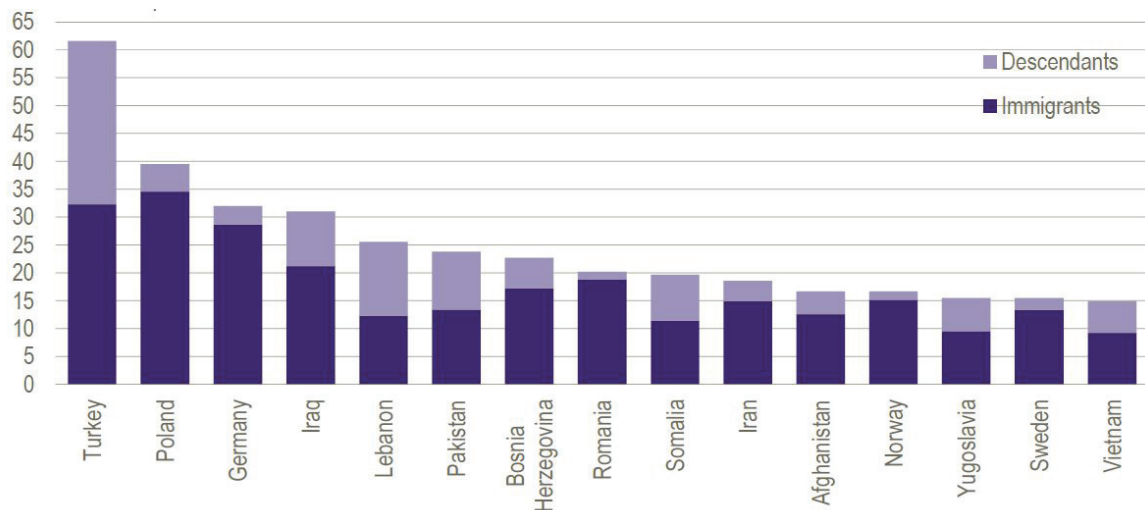


Figure 3.1: Numbers of immigrants and their descendants (in thousands) by country of origin in Denmark, on 1st January 2015.

Source: From Statistical Yearbook 2015, Statistics Denmark (www.statbank.dk/folk1)

In January 2015, immigrants and their descendants from non-western countries represented two third (64.6%) of first and second generation immigrants combined, and 7.5% of the total Danish population (Statistics Denmark, 2015).

Tobacco use in Denmark

In Denmark, the smoking prevalence in men has decreased from more than 70% in the 1950s and 1960s to less than 30% in 2010 (Clemmensen et al., 2012). In women, the prevalence of tobacco smoking peaked in the 1970s around 45%, and decreased to about 24% in 2010. In 2014, 21% of Danes were current smokers. The proportion of those who smoke daily was constant at 17%, and there was no difference in the proportion of daily smokers between men and women (Danish Health and Medicines Authority, 2014).

One in three (34%) Danish people had tried waterpipe smoking at least once or twice in 2014; amongst which 8% were current regular (1%) or occasional (7%) waterpipe smokers (European Commission, 2015a).

The prevalence of smokeless tobacco use in Denmark was 2% in 2010; 3% in men and 1% in women (Danish Health and Medicines Authority, 2010).

3 METHODS OF THE COHORT STUDY

This study is a register-based cohort study, using data from the Danish Civil Registration System and from the Danish Cancer Registry, collected initially for a testicular cancer cohort study (Schmiedel et al., 2010). For all men living in Denmark between 1978 and 2010, information on date and place of birth, migration and death, were retrieved from the Danish Civil Registration System. With the help of a unique personal identification number (CPR), this information were linked to the cancer data, including cancer code following the International Classification of Diseases, version 10 (ICD-10).

3.1 Population groups

In Denmark, '1st generation immigrant' commonly refers to a person born outside of Denmark. Persons born in Denmark can either be 'natives' if both of their parents were also born in Denmark or '2nd generation immigrant' if one or both of the parents were born abroad.

For 15% of the 1st generation immigrants, the date of immigration was missing and therefore 49,895 1st generation immigrants were excluded from the main analysis. We provide here additional details on this group of 1st generation immigrants.

3.2 Cancer codes

All primary cancers – excluding non-melanoma skin cancers – were retrieved from the national cancer registry. We selected 9 major TRC types according to their smoking attributable fraction as estimated by Agudo et al. (Agudo et al., 2012): laryngeal (C32), lung (C34), lower urinary tract (C65-68: pelvis, ureter, and bladder), oropharynx (C09-10; C12-14), esophagus (C15), oral cavity (C00-08), liver (C22), stomach (C16) and pancreatic cancers (C25). All of these cancers had a smoking attributable fraction above 20%, with the exception of pancreatic cancer. Pancreatic cancer was included because, together with oral and esophageal cancer, it is an established cancer site associated with smokeless tobacco (International Agency for Research on Cancer, 2012b, International Agency for Research on Cancer, 2007, Secretan et al., 2009b).

3.3 Statistical methods

In order to compare TRC incidence among 1st and 2nd generation immigrants to that in the native Danes, we calculated Standardized Incidence Ratios (SIR) and 95% confidence intervals (CI), using five-year age group and one-year time intervals. For each migration status, the SIRs were stratified by region or country of birth and by TRC.

Incidence rates of the nine selected TRC combined and of lung separately were standardised according to the World Standard Population (R et al., 1966). The rates were smoothened by three-year intervals to mitigate the fluctuations due to small number of cases in 1st generation immigrants. The numbers were too small in 2nd generation immigrants, and therefore not reported. Lung cancers age-standardised rates were compared graphically between 1st generation immigrants and natives, over the cohort time period (from 1978 to 2010). The overall TRC age-standardised rates in the same 2 groups were compared by age-group.

4 OVERALL AND ADDITIONAL RESULTS

In our cohort study, during up to 32 years of follow-up, we identified 131,317 TRCs among 3,508,204 men, including 280,526 1st generation and 129,056 2nd generation immigrants. Overall, immigrants of both generations experienced an approximately 15% lower incidence of TRC than natives, although there were large variations by type of TRC and country of birth.

Compared to natives, 1st and 2nd generation immigrants had 10% and 27% lower incidence, respectively, of lung cancer, with Asian males experiencing the lowest incidence. First generation immigrants had an about 50% lower incidence of lower urinary tract cancer than natives. Only liver and stomach cancer were observed in excess among immigrants. Incidence of lung cancer along the study period increased in 1st generation immigrants reaching the level of that of native Danes in the mid-2000s.

Subgroup of 1st generation immigrants without immigration date

In the main analysis used for our manuscript below, 1st generation immigrants without immigration date were excluded (n=49 891). Given the large size of this group, we investigated how the results would change if they were included in the analyses.

Table 3.1 shows the distribution of this subgroup of 1st generation immigrants by country or region of birth. In this subgroup, 2 323 cases of the nine selected TRC were diagnosed, as shown in Table 3.2.

Table 3.1: Distribution of country or region of birth in 1st generation immigrants with or without date of immigration in Denmark in 1978 to 2010

Region of birth	1 st generation immigrants w/o date of immigration		1 st generation immigrants w/ date of immigration	
	n	%	n	%
Europe (excl. Denmark)	39 172	78,5%	152 164	54,3%
Nordic countries ¹	10 987	22,0%	37 005	13,2%
Sweden	5 500	11,0%	10 985	3,9%
Norway	3 789	7,6%	12 666	4,5%
Iceland	728	1,5%	9 943	3,5%
Finland	970	1,9%	3 411	1,2%
Turkey	3 132	6,3%	16 274	5,8%
Former Yugoslavia ²	4 089	8,2%	15 155	5,4%
Germany	9 261	18,6%	15 865	5,7%
United Kingdom	3 094	6,2%	18 127	6,5%
Poland	1 441	2,9%	6 346	2,3%
Africa	2 168	4,3%	24 026	8,6%
Somalia	117	0,2%	7 533	2,7%
Asia	4 476	9,0%	73 031	26,0%
Southern Asia ³	2 479	5,0%	29 830	10,6%
Iran	294	0,6%	8 840	3,2%
Pakistan	1 517	3,0%	7 572	2,7%
South-Eastern Asia ⁴	519	1,0%	9 273	3,3%
Vietnam	41	0,1%	4 872	1,7%
Iraq	168	0,3%	11 823	4,2%
Lebanon	190	0,4%	7 475	2,7%
America	3 701	7,4%	27 205	9,7%
Oceania	338	0,7%	3 556	1,3%
Unknown	36	0,1%	416	0,1%
Total all origins	49 891	100,0%	280 398*	100,0%

¹ Iceland, Finland, Norway and Sweden

² Croatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia

³ Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka

⁴ Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam

* the total number of 1st generation immigrants indicated here differs by 128 individuals from that of the manuscript for publication due to minor errors in the main analysis.

Table 4.2: Distribution of tobacco-related cancers in 1st generation immigrants with or without date of immigration in Denmark in 1978 to 2010

Cancer type	1 st generation immigrants w/o date of immigration		1 st generation immigrants w/ date of immigration	
	n	%	n	%
Larynx	101	4,3%	78	5,6%
Lung	1 018	43,8%	635	45,4%
Adenocarcinoma	255	11,0%	185	13,2%
Squamous cell	287	12,4%	168	12,0%
Large cell carcinoma	73	3,1%	27	1,9%
Small cell carcinoma	152	6,5%	95	6,8%
Other	251	10,8%	160	11,4%
Lower urinary tract	320	13,8%	97	6,9%
Oropharynx	68	2,9%	60	4,3%
Esophagus	94	4,0%	51	3,6%
Oral cavity	138	5,9%	87	6,2%
Liver	122	5,3%	99	7,1%
Stomach	256	11,0%	187	13,4%
Pancreas	206	8,9%	104	7,4%
All TRC	2 323	100,0%	1398	100,0%

As the mean year of birth in this subgroup was substantially earlier than in the rest of the 1st generation immigrants (1943 vs. 1967), we included this subsample in the cohort with imputation of their date of entry as 1st January 1978, or their date of birth if occurred after. They were followed up, similarly to the rest of the cohort, until 31 December 2010, date of diagnosis of a selected TRC or date of death, whichever came first. Table 3.3 presents SIRs by region of birth for the nine TRC overall and for lung cancer, for the whole cohort, including the subgroup of 1st generation immigrants with missing immigration date.

The addition of the 1st generation immigrants with no immigration date to the analysis does not induce major changes in the results, compared to the rest of the 1st generation (as presented in the article below). However, there are exceptions, for instance the statistically significant excess of lung cancer incidence in European immigrants that disappears (SIR=1.11 to SIR=0.98). Overall, the incidence of all selected TRC combined is approximately 10% lower in 1st generation immigrants than in the natives (SIR=0.89, $p<0.05$) (cf. Table 3.3). Noticeably, immigrants born in Turkey have a similar incidence of lung cancer compared to the natives (SIR=1.07 vs. SIR=1.5 without the 1st generation immigrant with no immigration date).

Table 3.4 shows that the incidence of all other TRC, but pancreas cancer, in all immigrants (with or without immigration date) is significantly different: lower in the 1st

generation immigrants than in the natives for larynx, bladder, oropharynx, esophagus and oral cavity cancers; higher for liver and stomach cancers. These figures differ from that of the article's analysis in larynx cancer incidence being significantly lower ($SIR=0.84$, $p<0.05$). Furthermore, the addition of the subgroup of immigrants reduced the SIRs' values: the incidence of the 1st generation immigrants' TRCs is actually closer to that of the natives when including the group of 1st generation immigrants with no immigration date. Similarly, the inclusion of the 1st generation immigrants with no immigration date in the cohort has not changed the direction of the results, but the magnitude of the differences with the natives is affected. For instance, the high incidence of laryngeal cancer observed in immigrants born in the Former Yugoslavian countries is less high than in the main analysis ($SIR=1.8$ vs. $SIR=2.6$).

	Population	Person-yrs	Tobacco related cancers		Lung	Other Tobacco related cancers	
			No.	SIR (95% CI)		No.	SIR (95% CI)
Immigration status							
Native	3 098 622	77 420 046	129 760	Referent	61 298	Referent	68 462
1st generation immigrant	330 289	4 340 497	3 721	0.89 (0.86-0.91)*	1 653	0.86 (0.82-0.90)*	2 068
2nd generation immigrant	129 056	2 513 834	159	0.85 (0.73-0.99)*	51	0.73 (0.54-0.94)*	108
Region of birth							
Denmark	3 227 678	79 933 880	129 919	Referent	61 349	Referent	68 570
Europe (excl. Denmark)	191 336	2 507 859	2 909	0.98 (0.94-1.02)	1 324	0.96 (0.91-1.02)	1 585
Nordic countries ¹	47 992	555 902	690	0.97 (0.90-1.04)	295	0.89 (0.79-1.00)	395
Sweden	16 485	248 175	269	0.88 (0.78-0.99)*	109	0.77 (0.64-0.93)*	160
Norway	16 455	189 028	302	1.03 (0.92-1.15)	133	0.97 (0.81-1.14)	169
Iceland	10 671	77 276	41	0.92 (0.66-1.23)	23	1.15 (0.73-1.67)	18
Finland	4 381	41 423	78	1.13 (0.89-1.39)	30	0.93 (0.62-1.29)	48
Turkey	19 406	409 146	259	0.94 (0.83-1.06)	132	1.07 (0.89-1.26)	127
Former Yugoslavia ²	19 244	340 876	368	1.21 (1.09-1.34)*	194	1.40 (1.21-1.60)*	174
Germany	25 126	387 619	745	0.99 (0.92-1.06)	350	0.99 (0.89-1.10)	395
United Kingdom	21 221	238 088	197	0.91 (0.78-1.04)	84	0.85 (0.68-1.04)	113
Poland	7 787	102 512	158	0.90 (0.77-1.05)	66	0.81 (0.63-1.02)	92
Africa	26 194	334 818	154	0.79 (0.67-0.92)*	60	0.70 (0.54-0.89)*	94
Somalia	7 650	85 332	22	0.76 (0.48-1.11)	7	0.56 (0.22-1.05)	15
Asia	77 507	1 190 164	433	0.58 (0.53-0.64)*	175	0.53 (0.45-0.61)*	258
Southern Asia ³	32 309	509 845	135	0.39 (0.33-0.46)*	46	0.30 (0.22-0.39)*	89
Iran	9 134	159 999	37	0.38 (0.27-0.51)*	14	0.33 (0.18-0.53)*	23
Pakistan	9 089	152 703	57	0.43 (0.32-0.54)*	24	0.40 (0.25-0.57)*	33
South-Eastern Asia ⁴	9 792	172 580	112	0.86 (0.71-1.03)	51	0.86 (0.64-1.11)	61
Vietnam	4 913	103 745	80	0.96 (0.77-1.19)	36	0.95 (0.66-1.28)	44
Iraq	11 991	156 165	53	0.65 (0.49-0.83)*	23	0.65 (0.41-0.95)*	30
Lebanon	7 665	146 973	45	0.74 (0.54-0.97)*	26	0.99 (0.64-1.40)	19
America	30 906	270 939	211	0.78 (0.68-0.89)*	88	0.70 (0.56-0.86)*	123
Oceania	3 894	30 242	8	0.69 (0.29-1.25)	4	0.79 (0.21-1.75)	4
Unknown	452	6 475	6	0.73 (0.26-1.44)	2	0.52 (0.05-1.48)	4

¹ Iceland, Finland, Norway and Sweden

² Croatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia

³ Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka

⁴ Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam

* Significant difference, $\alpha=5\%$, with at least 5 cases

^{1st} generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; ^{2nd} generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and ^{2nd} generation immigrants.

Table 5.3: Tobacco-related cancers overall and lung cancers SIR by immigration status and region of birth in Danish men in 1978 to 2010

Immigration status																
	Larynx		Lower urinary tract		Oropharynx		Esophagus		Oral cavity		Liver		Stomach		Pancreas	
	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Native	5884	Referent	17979	Referent	3933	Referent	6099	Referent	7815	Referent	4624	Referent	11832	Referent	10296	Referent
1st generation immigrant	179	0.84 (0.72-0.97)*	417	0.78 (0.71-0.86)*	128	0.78 (0.65-0.92)*	145	0.71 (0.60-0.83)*	225	0.75 (0.66-0.85)*	221	1.49 (1.30-1.69)*	443	1.16 (1.06-1.27)*	310	0.94 (0.84-1.05)
2nd generation immigrant	9	0.78 (0.35-1.38)	19	1.10 (0.66-1.66)	6	0.46 (0.16-0.90)*	8	0.84 (0.36-1.53)	22	1.00 (0.63-1.46)	14	1.46 (0.80-2.33)	21	1.14 (0.71-1.68)	9	0.62 (0.28-1.09)
Region of birth																
Denmark	5893	Referent	17998	Referent	3939	Referent	6107	Referent	7837	Referent	4638	Referent	11853	Referent	10305	Referent
Europe (excl. Denmark)	148	1.01 (0.85-1.18)	333	0.86 (0.77-0.96)*	106	0.97 (0.80-1.17)	114	0.79 (0.65-0.95)*	181	0.89 (0.77-1.03)	136	1.30 (1.09-1.52)*	325	1.21 (1.08-1.34)*	242	1.04 (0.91-1.17)
Nordic countries ¹	29	0.85 (0.57-1.19)	92	0.97 (0.78-1.18)	39	1.59 (1.13-2.13)*	36	1.06 (0.74-1.43)	52	1.11 (0.83-1.44)	31	1.23 (0.83-1.70)	62	0.95 (0.73-1.20)	54	0.96 (0.72-1.23)
Sweden	10	0.70 (0.33-1.21)	38	0.92 (0.65-1.23)	16	1.54 (0.88-2.39)	17	1.16 (0.68-1.78)	20	1.00 (0.61-1.48)	15	1.38 (0.77-2.17)	26	0.91 (0.60-1.30)	18	0.74 (0.44-1.12)
Norway	13	0.94 (0.50-1.52)	45	1.14 (0.83-1.50)	17	1.76 (1.02-2.70)*	13	0.93 (0.49-1.51)	18	0.97 (0.57-1.47)	12	1.15 (0.59-1.90)	25	0.94 (0.61-1.35)	26	1.13 (0.73-1.60)
Iceland	2	0.87 (0.08-2.49)	3	0.55 (0.10-1.35)	2	1.07 (0.10-3.06)	-	-	4	1.18 (0.31-2.61)	1	0.63 (0.00-2.45)	3	0.73 (0.14-1.79)	3	0.86 (0.16-2.11)
Finland	4	1.13 (0.29-2.50)	6	0.69 (0.25-1.35)	4	1.52 (0.40-3.38)	6	1.78 (0.64-3.48)	10	2.12 (1.01-3.63)*	3	1.24 (0.23-3.04)	8	1.32 (0.56-2.46)	7	1.31 (0.52-2.46)
Turkey	21	1.36 (0.84-2.00)	19	0.60 (0.36-0.91)*	6	0.46 (0.17-0.91)	3	0.22 (0.04-0.53)	20	0.89 (0.54-1.33)	10	1.03 (0.49-1.77)	42	1.71 (1.23-2.26)*	6	0.28 (0.10-0.56)
Former Yugoslavia ²	29	1.78 (1.19-2.48)*	27	0.74 (0.49-1.05)	8	0.61 (0.26-1.11)	4	0.27 (0.07-0.59)	20	0.87 (0.53-1.30)	14	1.31 (0.72-2.09)	52	1.93 (1.44-2.49)*	20	0.85 (0.52-1.27)
Germany	20	0.58 (0.35-0.86)*	97	0.94 (0.76-1.13)	24	1.01 (0.65-1.46)	33	0.93 (0.64-1.27)	49	1.05 (0.78-1.37)	22	0.83 (0.52-1.21)	77	1.12 (0.88-1.38)	73	1.22 (0.96-1.52)
United Kingdom	10	0.87 (0.41-1.49)	19	0.72 (0.43-1.08)	7	0.75 (0.30-1.41)	13	1.20 (0.64-1.95)	15	0.91 (0.51-1.43)	11	1.44 (0.71-2.42)	17	0.87 (0.50-1.33)	21	1.24 (0.77-1.83)
Poland	10	1.24 (0.59-2.14)	18	0.75 (0.44-1.13)	6	1.07 (0.39-2.10)	8	0.96 (0.41-1.75)	3	0.27 (0.05-0.67)	9	1.45 (0.66-2.56)	19	1.18 (0.71-1.77)	19	1.37 (0.82-2.05)
Netherlands	4	1.17 (0.31-2.60)	9	1.11 (0.50-1.95)	2	0.75 (0.07-2.14)	1	0.31 (0.00-1.22)	1	0.21 (0.00-0.82)	-	-	3	0.51 (0.10-1.24)	5	0.98 (0.31-2.02)
Italy	4	1.15 (0.30-2.56)	7	0.95 (0.38-1.78)	4	1.42 (0.37-3.15)	1	0.32 (0.00-1.24)	2	0.41 (0.04-1.18)	4	1.82 (0.47-4.04)	6	1.08 (0.39-2.12)	7	1.45 (0.57-2.72)
France	2	0.85 (0.08-2.43)	7	1.22 (0.48-2.28)	2	1.08 (0.10-3.09)	-	-	1	0.30 (0.00-1.16)	4	2.44 (0.63-5.41)	4	0.95 (0.25-2.11)	5	1.39 (0.44-2.87)
Africa	6	0.53 (0.19-1.04)	13	0.60 (0.32-0.98)*	3	0.30 (0.06-0.74)	5	0.50 (0.16-1.04)	8	0.47 (0.20-0.86)*	32	4.70 (3.21-6.46)*	17	0.97 (0.56-1.48)	10	0.67 (0.32-1.14)
Asia	14	0.35 (0.19-0.55)*	41	0.46 (0.33-0.62)*	11	0.32 (0.16-0.55)*	15	0.40 (0.23-0.63)*	20	0.34 (0.20-0.50)*	39	1.48 (1.05-1.98)*	75	1.10 (0.87-1.36)	43	0.74 (0.54-0.98)*
America	9	0.69 (0.31-1.21)	30	0.84 (0.57-1.17)	8	0.83 (0.36-1.51)	8	0.62 (0.26-1.12)	15	0.82 (0.46-1.29)	14	1.45 (0.79-2.31)	25	1.01 (0.65-1.44)	14	0.66 (0.36-1.04)
Oceania	1	1.57 (0.00-6.16)	-	-	-	-	3	5.18 (0.98-12.69)	-	-	-	-	-	-	-	-
Unknown	1	2.51 (0.00-9.84)	-	-	-	-	-	-	1	1.90 (0.00-7.43)	-	-	1	1.38 (0.00-5.40)	1	1.57 (0.00-6.14)

¹ Iceland, Finland, Norway and Sweden

² Croatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia

* Significant difference, $\alpha=5\%$, with at least 5 cases

^{1st} generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; ^{2nd} generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and ^{2nd} generation immigrants.

Table 6.4: Other tobacco-related cancers SIR by immigration status and region of birth in Danish men in 1978 to 2010

ARTICLE 2

Are male immigrants in Denmark at lower
or higher risk of tobacco-related cancers?

A Danish nationwide cohort study

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Acta Oncologica, 2015; Early Online: 1–8

ORIGINAL ARTICLE

Are male immigrants in Denmark at lower or higher risk of tobacco-related cancers? A Danish nationwide cohort study

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ABSTRACT

Background. Tobacco-related cancers (TRC) represent approximately a third of the cancer incidence in Denmark. However, tobacco consumption levels in immigrants may differ to the native population. We compared incidence rates of nine TRCs among male immigrants of first and second generation in Denmark with those among males of the native population.

Material and methods. We used an established cohort of all Danish men (1978–2010) and calculated standardized incidence ratios (SIR) with 95% confidence intervals (CI) to compare incidence by immigration status and region of birth for nine TRCs.

Results. We identified 131 317 incident cases of TRCs among 3 508 204 men (280 526 first generation and 129 056 second generation immigrants). Overall, immigrants of both generations experienced approximately 15% lower incidence of TRC than natives, however, with large variations by country of birth and type of TRC. Compared to natives, lung cancer incidence in first and second generation immigrants was 10% and 27% lower, respectively. However, lung cancer incidence increased in first generation immigrants reaching the level of native Danes in the late 2000s. First generation immigrants experienced approximately 50% lower incidence of lower urinary tract cancer than natives. However, only liver and stomach cancer had higher SIRs in immigrants.

Conclusion. Overall TRC incidence was lower among immigrants than in native Danes. Lower urinary tract cancer among first generation immigrants warrants further investigation.

Tobacco use has been known cause cancer in humans since the middle of the 20th century. Since then, the evidence of carcinogenicity of tobacco has increased and smoking is now an established risk factor for about 20 cancer types in humans [1], referred to as tobacco-related cancers (TRC). In Europe, the attributable fraction (AF) for tobacco use in relation to cancer differs by TRC type, and ranges from above 80% (lung cancer) to less than 20% (pancreatic cancer) [2]. In Denmark, the nine major TRC have been estimated to represent 32% of newly occurring cancer cases [3].

International migration is increasing globally with estimated 232 million persons living outside their

country of birth, including estimated 72.4 million individuals in Europe alone [4]. Consequently, it becomes increasingly important to identify special requirements of immigrants in national public health strategies. The proportion of immigrants and their descendants in Denmark has increased from 3.0% in 1980 to 11.1% in 2014, corresponding to more than 600 000 individuals [5]. Previously, immigrants in Denmark originated mainly from neighboring Nordic countries or other European countries, and to a lesser degree from Turkey and the former Yugoslavia. In Denmark, an increasing number of immigrants came from Asian (e.g. Iraq, Iran, and Pakistan) or African countries (e.g. Somalia). Today (2014),

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(Received 24 November 2014; accepted 3 February 2015)

ISSN 0284-186X print/ISSN 1651-226X online © 2015 Informa Healthcare
DOI: 10.3109/0284186X.2015.1016626

immigrants and their descendants from non-western countries represent 7.2% of the Danish population and 65% of immigrants, respectively [5].

Cancer incidence patterns may reflect the extent to which immigrants adopt the lifestyle of the host population – also called native population – or continuing behaviors typical of their country of origin, including use of smoked or smokeless tobacco. Incidence rates of TRC may therefore provide relevant insight into tobacco use patterns among immigrants and its consequences. The objective of our study was to compare the incidence of TRCs among male immigrants of first and second generation in Denmark with incidence among males in the native population.

Material and methods

Cohort

The study population comprised a cohort of all men residing in Denmark for at least three months between 1978 and 2010, established using the Danish Civil Registration System. This cohort was used previously to investigate testicular cancer risk in Danish immigrants [6]. Inclusion of all cancer-free men began on 1 January 1978, on their date of birth or on the date of immigration into Denmark, whichever came last. Subjects were followed up until the date of diagnosis of a selected TRC, date of emigration or death, or 31 December 2010, whichever came first. Since 1968, the Danish Civil Registration System has assigned a unique personal identification number, encoding date of birth and gender, to all residents in Denmark. The Civil Registration System also holds information on date and place of birth, addresses, immigration or emigration, and death. Information on cancer was obtained from the Danish Cancer Registry, which contains virtually complete records of incident cases of cancer in Denmark since 1943. Cancers are coded according to the International Classification of Diseases, version 10 (ICD-10); morphological and topographic classifications are coded according to the ICD of oncology (ICD-O-3). All primary cancers – excluding non-melanoma skin cancers – were retrieved from the registry. We selected the main nine TRCs associated with smoking [2]: lung (ICD-10, C34) and laryngeal (C32) cancer, having AFs above 80%, and cancers of lower urinary tract (pelvis, ureter, and bladder) (C65-68), oropharynx (C09-10; C12-14), esophagus (C15), oral cavity (C00-08), liver (C22) and stomach (C16) with AFs between 20% and 50%. In addition, we included pancreatic cancer (C25) for which, together with oral and esophageal cancer, smokeless tobacco is an established risk factor [1,7]. Further, we classified

lung cancer cases into histological subtypes according to ICD-O morphology codes, i.e. squamous cell carcinoma (SCC), adenocarcinoma (AC), large cell carcinoma (LC), small cell carcinoma (SC), and “other”, including remaining ICD-O codes or unknown histology. Smoking increases the risk of all types of lung cancer, however, the attributable proportions of smoking for the histological subtypes are different, e.g. SC and SCC are more common in smokers [8].

A first generation male immigrant was defined as a man born outside Denmark. Men born in Denmark were defined as native males if their two parents were also born in Denmark or as second generation immigrants when at least one parent was not born in Denmark. Consequently, men born in Denmark included both natives and second generation immigrants, and the term “native population” thus only referred to men with two parents born in Denmark.

We excluded 13 711 men born in Greenland, as well as 32 men who were diagnosed with TRC prior to immigration to Denmark. In addition, we excluded 49 891 first generation immigrants due to missing dates of immigration.

Statistical analysis

We calculated standardized incidence ratios (SIR) and 95% confidence intervals (CI) for TRC among first or second immigrants compared to the native population during the period 1978–2010, using five-year age-group and one-year time intervals. We quantified the higher or lower incidence of each cancer type, by immigration status and by region of birth, compared to the native population. We stratified SIR by type of TRC and by region of birth for main countries/regions (> 50 000 person-years). The cancer types were categorized from high to moderate AFs related to smoking, and region of birth was categorized according to number of person-years.

To directly compare incidence rates of the nine TRCs in natives and first generation immigrants – numbers were too small among second generation immigrants – incidence rates were standardized according to the World Standard Population [9]. In first generation immigrants we used smoothened rates over three-year intervals to mitigate the annual fluctuations due to small number of cases. No ethical approval was required for the record linkage study.

Results

The cohort comprised 3 508 204 men, including 280 526 first generation and 129 056 second generation immigrants, who contributed with a total of 86 074 964 person-years. During up to 32 years of follow-up,

131 317 cases of the nine selected TRC were diagnosed among cohort members.

Table I presents SIRs by immigration status and region of birth for the nine TRC overall and for lung cancer, the most common TRC, separately. Overall, first and second generation immigrants experienced approximately 15% significantly lower incidence of the nine selected TRC than natives. Apart from men born in former Yugoslavia or in Finland, all men born outside of Denmark had lower or similar overall TRC incidence compared to men born in Denmark. In particular, immigrants from Asia as well as from most individual countries within Asia, experienced a significantly lower incidence of TRC than natives (Asia overall: SIR = 0.62, CI 0.55–0.69; Southern Asia: SIR = 0.39, CI 0.31–0.47). The former Yugoslavia (i.e. Croatia, Slovenia, Serbia and Montenegro,

Bosnia-Herzegovina and Macedonia) was the only region of birth associated with a statistically significant higher incidence for overall TRC among immigrants (SIR = 1.37, CI 1.19–1.55).

First and second generation immigrants experienced significantly lower SIRs for lung cancer compared to natives (10% and 27% lower, respectively). Men from Turkey and former Yugoslavia were the only immigrant groups who exhibited a higher incidence of lung cancer than natives, by 50–60%. Southern Asian immigrants experienced a three times lower incidence of lung cancer overall compared to natives.

The SIRs by immigration status and region of birth for the histologic subtypes of lung cancer are presented in Table II. First generation immigrants experienced an incidence of AC similar to that among

Table I. Tobacco-related cancers overall and lung cancers SIR by immigration status and region of birth in Danish men in 1978–2010.

	Population	Person-years	Tobacco-related cancers ^a		Lung		Other tobacco-related cancers ^f	
			No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status								
Native	3 098 622	77 420 046	129 760	Referent	61 298	Referent	68 462	Referent
1 st generation immigrant	280 526	3 144 726	1398	0.87 (0.83–0.92)*	635	0.90 (0.84–0.98)*	763	0.85 (0.79–0.91)*
2 nd generation immigrant	129 056	2 513 834	159	0.85 (0.73–0.99)*	51	0.73 (0.54–0.94)*	108	0.93 (0.77–1.12)
Region of birth								
Denmark	3 227 678	79 933 880	129 919	Referent	61 349	Referent	68 570	Referent
Europe (excl. Denmark)	152 234	1 576 260	920	1.04 (0.97–1.10)	436	1.11 (1.01–1.22)*	484	0.97 (0.89–1.06)
Nordic countries ^a	37 015	302 712	161	0.93 (0.79–1.08)	65	0.84 (0.65–1.06)	96	1.00 (0.81–1.21)
Sweden	10 989	117 373	58	0.86 (0.65–1.09)	27	0.89 (0.59–1.26)	31	0.83 (0.57–1.15)
Norway	12 670	104 577	69	0.97 (0.76–1.21)	25	0.78 (0.50–1.11)	44	1.13 (0.82–1.49)
Iceland	9944	61 404	12	0.69 (0.36–1.14)	8	1.11 (0.47–2.01)	4	0.40 (0.10–0.88)
Finland	3412	19 358	22	1.27 (0.79–1.86)	5	0.64 (0.20–1.32)	17	1.79 (1.04–2.75)*
Turkey	16 279	329 740	90	1.04 (0.84–1.27)	52	1.50 (1.12–1.93)*	38	0.74 (0.52–0.99)*
Former Yugoslavia ^b	15 182	225 744	224	1.37 (1.19–1.55)*	120	1.61 (1.34–1.92)*	104	1.16 (0.95–1.39)
Germany	15 876	179 955	140	1.00 (0.84–1.18)	67	1.07 (0.83–1.34)	73	0.95 (0.74–1.18)
United Kingdom	18 132	162 711	89	0.91 (0.73–1.11)	40	0.94 (0.67–1.25)	49	0.89 (0.66–1.15)
Poland	6347	72 248	69	0.96 (0.74–1.19)	30	0.91 (0.62–1.27)	39	0.99 (0.70–1.33)
Africa	24 033	277 668	95	0.94 (0.76–1.13)	32	0.76 (0.52–1.04)	63	1.07 (0.82–1.35)
Somalia	7535	82 400	22	0.86 (0.54–1.26)	7	0.64 (0.25–1.21)	15	1.03 (0.57–1.61)
Asia	73 073	1 078 837	321	0.62 (0.55–0.69)*	138	0.61 (0.51–0.71)*	183	0.62 (0.54–0.72)*
Southern Asia ^c	29 849	446 513	88	0.39 (0.31–0.47)*	33	0.34 (0.23–0.46)*	55	0.43 (0.32–0.55)*
Iran	8847	153 230	36	0.40 (0.28–0.54)*	14	0.36 (0.19–0.57)*	22	0.43 (0.27–0.63)*
Pakistan	7578	112 692	26	0.45 (0.30–0.64)*	14	0.56 (0.30–0.89)*	12	0.37 (0.19–0.61)*
South-Eastern Asia ^d	9276	160 428	95	0.95 (0.77–1.15)	42	0.93 (0.67–1.23)	53	0.97 (0.73–1.25)
Vietnam	4874	103 255	80	1.00 (0.79–1.23)	36	0.98 (0.69–1.33)	44	1.01 (0.74–1.34)
Iraq	11 834	152 408	53	0.70 (0.52–0.90)*	23	0.71 (0.45–1.02)	30	0.69 (0.46–0.96)*
Lebanon	7480	142 425	42	0.76 (0.55–1.00)	24	1.01 (0.65–1.46)	18	0.57 (0.34–0.86)*
America	27 211	184 283	54	0.69 (0.51–0.88)*	25	0.72 (0.47–1.03)	29	0.66 (0.44–0.92)*
Oceania	3557	21 880	2	0.42 (0.04–1.20)	2	1.03 (0.10–2.96)	–	–
Unknown	418	5798	6	0.95 (0.34–1.86)	2	0.67 (0.06–1.92)	4	1.19 (0.31–2.65)

First generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia; ^cAfghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka; ^dBrunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam; ^eAll selected tobacco related cancers: lung, larynx, lower urinary tract, esophagus, oral cavity, liver, stomach and pancreas cancers; ^fAll selected tobacco related cancers but lung: larynx, lower urinary tract, esophagus, oral cavity, liver, stomach and pancreas cancers.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

Table II. Lung cancers histological subtypes SIR by immigration status and region of birth in Danish men in 1978–2010.

	Squamous cell carcinoma		Adenocarcinoma		Large cell carcinoma		Small cell carcinoma		Other	
	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status										
Native	18 022	Referent	13 410	Referent	3597	Referent	10 524	Referent	15 745	Referent
1 st generation immigrant	168	0.85 (0.73–0.99)*	185	1.03 (0.89–1.18)	27	0.61 (0.40–0.85)*	95	0.75 (0.61–0.91)*	160	1.04 (0.88–1.20)
2 nd generation immigrant	15	0.85 (0.47–1.33)	11	0.54 (0.27–0.90)*	1	0.21 (0.00–0.81)*	10	0.82 (0.39–1.40)	14	0.93 (0.51–1.49)
Region of birth										
Denmark	18 037	Referent	13 421	Referent	3598	Referent	10 534	Referent	15 759	Referent
Europe (excl. Denmark)	125	1.13 (0.94–1.34)	115	1.15 (0.95–1.37)	20	1.00 (0.97–1.03)	73	1.03 (0.81–1.28)	103	1.21 (0.98–1.45)
Nordic countries ^a	15	0.68 (0.38–1.07)	14	0.72 (0.39–1.15)	4	0.81 (0.49–1.20)	12	0.86 (0.44–1.42)	20	1.16 (0.70–1.72)
Turkey	18	1.98 (1.17–3.00)*	12	1.21 (0.62–1.98)	5	0.83 (0.21–1.83)	4	0.64 (0.17–1.42)	13	1.85 (0.98–2.99)
Former Yugoslavia ^b	43	2.00 (1.45–2.65)*	22	1.21 (0.76–1.76)	4	2.11 (0.67–4.37)	19	1.43 (0.86–2.14)	32	1.92 (1.31–2.64)*
Germany	19	1.06 (0.64–1.59)	20	1.25 (0.76–1.86)	1	0.86 (0.22–1.92)	10	0.87 (0.41–1.49)	17	1.29 (0.75–1.97)
United Kingdom	9	0.76 (0.34–1.33)	19	1.68 (1.01–2.52)*	–	–	7	0.90 (0.35–1.68)	5	0.57 (0.18–1.18)
Poland	8	0.85 (0.36–1.54)	8	1.04 (0.44–1.88)	–	–	8	1.39 (0.59–2.52)	6	0.75 (0.27–1.47)
Africa	7	0.61 (0.24–1.15)	11	0.94 (0.47–1.58)	1	0.00 (0.48–0.48)	3	0.39 (0.07–0.96)	10	1.15 (0.55–1.97)
Asia	33	0.52 (0.35–0.71)*	49	0.85 (0.63–1.11)	2	0.36 (0.00–1.40)	15	0.37 (0.21–0.58)*	39	0.75 (0.54–1.01)
America	2	0.20 (0.02–0.59)	8	0.89 (0.38–1.61)	3	1.36 (0.26–3.33)	4	0.63 (0.16–1.41)	8	1.09 (0.47–1.98)
Oceania	1	1.96 (0.00–7.68)	1	1.81 (0.00–7.09)	–	–	–	–	–	–
Unknown	–	–	1	1.47 (0.00–5.77)	1	5.56 (0.00–21.78)	–	–	–	–

First generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

natives, whereas second generation immigrants had only half the incidence of natives. Both first and second generation immigrants had lower incidences of SC and SCC. Compared to natives, Southern Asian immigrants revealed substantially lower incidence rates of AC (SIR = 0.24), SC (SIR = 0.23), and SCC (SIR = 0.40) (not otherwise shown). In contrast, men born in Lebanon had a 2.4-fold higher incidence (SIR = 2.44, CI 1.36–3.84) of AC compared to men born in Denmark (not shown in Table II).

Table III shows SIRs by immigration status and region of birth for the remaining eight TRC. For six of the nine TRCs [including lung cancer (cf. Table I)], there was a tendency towards a lower incidence in second generation immigrants compared to first generation immigrants, albeit numbers were small among second generation immigrants. When stratified by immigrant status, only liver and stomach cancers had substantially higher incidence rates compared to natives, ranging from 14% to 75% higher.

Substantial differences in SIRs according to country of origin were found for liver, oral, and lower urinary tract cancer. The incidence of liver cancer was markedly higher among first generation immigrants from Somalia (SIR = 11.84, CI 5.88–19.87) and Vietnam (SIR = 5.96, CI 3.44–9.07) compared to natives (not shown in Table III). For oral cancer,

a high SIR (4.37, CI 1.57–8.57) was seen exclusively among men born in Finland (not shown in Table III). Finally, the incidence of lower urinary tract cancer, i.e. primarily bladder cancer, was almost two times lower in first generation immigrants compared to natives.

The incidence of lung cancer declined among native Danish men during the study period (Figure 1), whereas the lung cancer incidence among first generation immigrants – which was about 50% lower in the early 1980s – increased slightly during the same period to reach the level of natives in the late 2000s.

The age-specific incidence of the selected nine TRC combined increased from the age of 30 years in natives to reach two pikes around the ages of 60 and 70 years (Figure 2). The trend of age-specific incidences followed a similar pattern in first generation immigrants at a lower incidence level, with the exception of the older immigrants. Indeed, the decreasing rate of TRC incidence in the older immigrants reached a plateau at the age of 75 years and exceeded the curve for the native males.

Discussion

In this large nationwide cohort study in Denmark we found that the overall incidence of nine selected

Table III. Other tobacco-related cancers SIR by immigration status and region of birth in Danish men in 1978–2010.

	Larynx		Lower urinary tract		Oropharynx		Esophagus		Oral cavity		Liver		Stomach		Pancreas	
	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status																
Native	5884	Referent	17 979	Referent	3933	Referent	6099	Referent	7815	Referent	4624	Referent	11 852	Referent	10 296	Referent
1 st generation immigrant	78	0.87 (0.69–1.07)	97	0.53 (0.43–0.64)*	60	0.76 (0.58–0.96)*	51	0.63 (0.47–0.81)*	87	0.64 (0.51–0.78)*	99	1.75 (1.42–2.11)*	187	1.27 (1.09–1.46)*	104	0.83 (0.68–1.00)
2 nd generation immigrant	9	0.78 (0.35–1.38)	19	1.10 (0.66–1.66)	6	0.46 (0.16–0.90)*	8	0.84 (0.35–1.53)	22	1.00 (0.63–1.46)	14	1.46 (0.80–2.33)	21	1.14 (0.71–1.68)	9	0.62 (0.28–1.09)
Region of birth																
Denmark	5893	Referent	17 998	Referent	3939	Referent	6107	Referent	7837	Referent	4638	Referent	11 853	Referent	10 305	Referent
Europe (excl. Denmark)	63	1.26 (0.97–1.59)	61	0.60 (0.46–0.76)*	47	1.08 (0.79–1.41)	40	0.89 (0.63–1.18)	66	0.88 (0.68–1.11)	36	1.15 (0.80–1.55)	104	1.28 (1.05–1.54)*	67	0.97 (0.75–1.22)
Nordic countries ^a	10	1.06 (0.50–1.82)	10	0.49 (0.23–0.84)*	15	1.89 (1.06–2.97)*	11	1.27 (0.63–2.13)	18	1.30 (0.77–1.97)	9	1.46 (0.66–2.96)	14	0.89 (0.48–1.42)	9	0.67 (0.30–1.18)
Turkey	4	0.73 (0.19–1.63)	6	0.72 (0.26–1.40)	3	0.54 (0.10–1.33)	3	0.37 (0.07–0.91)	9	0.96 (0.43–1.69)	1	0.32 (0.00–1.26)	15	1.77 (0.96–2.78)	8	0.63 (0.27–1.14)
Former Yugoslavia ^b	23	2.63 (1.66–3.81)*	15	0.76 (0.42–1.19)	4	0.56 (0.15–1.25)	8	1.12 (0.48–2.04)	13	1.03 (0.55–1.66)	5	0.86 (0.27–1.79)	33	2.23 (1.53–3.05)*	14	1.30 (0.71–2.08)
Germany	7	0.89 (0.35–1.66)	10	0.63 (0.30–1.07)	11	1.64 (0.81–2.75)	7	1.37 (0.54–2.58)	11	0.97 (0.48–1.62)	3	0.62 (0.12–1.51)	9	0.73 (0.33–1.28)	12	1.39 (0.82–2.62)
United Kingdom	3	0.52 (0.10–1.27)	3	0.28 (0.05–0.69)	5	0.95 (0.30–1.97)	5	1.41 (0.44–2.91)	6	0.69 (0.25–1.35)	4	1.17 (0.30–2.60)	9	1.02 (0.46–1.79)	8	1.41 (0.60–2.55)
Poland	6	1.65 (0.59–3.23)	5	0.54 (0.17–1.12)	2	0.70 (0.07–2.01)	3	0.56 (0.11–1.38)	4	0.40 (0.10–0.88)	25	6.96 (4.50–9.95)*	14	1.46 (0.78–2.32)	5	0.63 (0.20–1.31)
Africa	3	0.48 (0.09–1.19)	7	0.67 (0.27–1.26)	2	0.34 (0.03–0.96)	7	0.27 (0.11–0.50)*	11	0.25 (0.12–0.42)*	34	1.83 (1.27–2.49)*	57	1.17 (0.80–1.49)	28	0.69 (0.46–0.96)*
Asia	9	0.31 (0.14–0.55)*	28	0.46 (0.31–0.65)*	2	0.36 (0.16–0.63)*	1	0.25 (0.09–0.98)	5	0.74 (0.23–1.52)	4	1.41 (0.37–3.12)	11	1.54 (0.76–2.58)	3	0.49 (0.09–1.21)
America	2	0.44 (0.04–0.55)*	1	0.11 (0.00–0.44)	2	0.50 (0.05–1.45)	1	0.25 (0.09–0.98)	1	0.25 (0.12–0.42)*	1	1.76 (0.00–6.91)	1	2.02 (0.00–7.92)	1	2.02 (0.00–7.92)
Oceania	1	3.28 (0.00–12.86)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unknown	1	3.28 (0.00–12.86)	—	—	—	—	—	—	—	—	—	—	—	—	—	—

First generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

TRCs was about 15% lower in first and second generation male immigrants compared to native males. However, large variations by specific types of TRC and regions of birth were observed. Immigrants experienced a 14–75% higher incidence of liver and stomach cancer than the natives. Among immigrants from Africa, liver cancer incidence was up to 12 times more compared to natives. For most of the selected TRCs, incidence rates were similar among first and second generation immigrants; however, numbers of second generation immigrant cases were small. Depending on the region of birth, lung cancer incidence in immigrants was as low as one third (South Asians) of the rate of natives. Even larger differences in lung cancer incidence were observed for subtypes of lung cancer for which the lowest incidence rates were seen among Asian immigrants. Overall, lung cancer incidence rates for first generation immigrants and natives reached a similar level in the late 2000s.

Former prevalence of smoking or smokeless tobacco use is an indicator of the current risk of TRC, whereas current prevalence predicts the future burden. The risk of cancer associated with tobacco use also relies on other factors, including the age of start, the duration of use, the intensity of use, as well as other etiologic agents – including genetic factors – contributing to the development of TRC. In particular, immigrants might have been exposed to different other causes of cancer, e.g. air pollution, prior to their immigration in Denmark. Therefore, trends in TRC incidence during the study period in relation to current tobacco use prevalence need to be interpreted cautiously. That being said, we found that overall trends of TRC incidence in immigrants from different regions appeared to be in line with recent trends of tobacco use prevalence of their respective region of birth.

Tobacco is used in either smoked or smokeless form, but the most common form is cigarettes. Whereas smoking prevalence has increased in low and middle income countries during recent decades, especially among men [10,11], the prevalence has gradually decreased in many high income countries [12]. For some of the countries from which most immigrants into Denmark originated, WHO reported in 2011 the following age-standardized smoking prevalence: Lebanon (46%), Vietnam (46%), Bosnia and Herzegovina (44%), Turkey (42%), Serbia (38%) and Poland (38%) [13]. In addition, smokeless forms of tobacco are widely used in some regions, e.g. Africa and South Asia where more than 17% of the total population [14] are current users – as well as in some Nordic countries. Indeed, Sweden and Norway had by far the highest prevalence of smokeless tobacco use in Europe, with about 20% users in

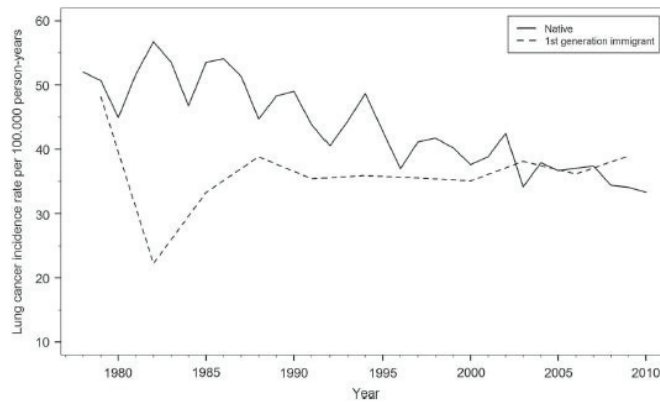


Figure 1. Lung cancers age-standardised rates per 100 000 person-years in Denmark from 1978 to 2010, in natives from Denmark (solid line) and in first generation immigrant (dashed line).

the adult population [13]. In Denmark, the smoking prevalence in men has decreased from about 70% in the early-1970s [15] to 23.8% in 2013. The prevalence of smokeless tobacco is low in Denmark; only 3% in 2010 [16].

Immigrants from Former Yugoslavia showed a high overall incidence of the selected TRC, and in particular of lung (especially SC and SCC), larynx and stomach cancers, which is in line with the high smoking prevalence.

Even though the smoking prevalence among Danish men (23.8%) [13] is among the lowest in Europe (average, 32%) [13], Danish natives experienced a slightly higher TRC incidence than most European immigrants to Denmark. This unexpected finding may be explained by the *healthy immigrant*

effect or the *salmon bias* hypotheses [17]. A healthy immigrant effect would suggest a high representation of healthy individuals among immigrants to Denmark who adapt to the habits among natives over time. This would explain the lower incidence of TRC at immigration increasing during the study period and the second generation to reach that of the natives. This effect could be counterbalanced by the genetic background of immigrants; second generation immigrants and natives who were all born in Denmark had different incidence patterns of some TRCs. The *salmon bias* describe the phenomenon that immigrants may return to their country of birth after retirement, or when they have first symptoms of illness, thus leaving Denmark before being diagnosed with a TRC. However, considering the Danish

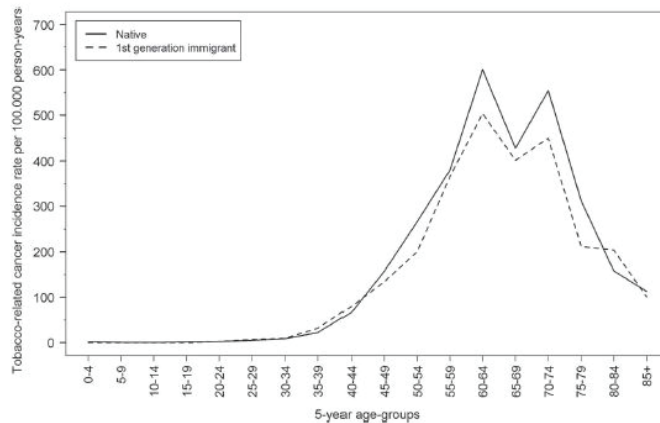


Figure 2. Tobacco-related cancers age-specific incidence rates per 100 000 person-years in Denmark from 1978 to 2010, in native men of Denmark (solid line) and in first generation immigrant (dashed line).

immigrants and their descendants from non-western countries represent 7.2% of the Danish population and 65% of immigrants, respectively [5].

Cancer incidence patterns may reflect the extent to which immigrants adopt the lifestyle of the host population – also called native population – or continuing behaviors typical of their country of origin, including use of smoked or smokeless tobacco. Incidence rates of TRC may therefore provide relevant insight into tobacco use patterns among immigrants and its consequences. The objective of our study was to compare the incidence of TRCs among male immigrants of first and second generation in Denmark with incidence among males in the native population.

Material and methods

Cohort

The study population comprised a cohort of all men residing in Denmark for at least three months between 1978 and 2010, established using the Danish Civil Registration System. This cohort was used previously to investigate testicular cancer risk in Danish immigrants [6]. Inclusion of all cancer-free men began on 1 January 1978, on their date of birth or on the date of immigration into Denmark, whichever came last. Subjects were followed up until the date of diagnosis of a selected TRC, date of emigration or death, or 31 December 2010, whichever came first. Since 1968, the Danish Civil Registration System has assigned a unique personal identification number, encoding date of birth and gender, to all residents in Denmark. The Civil Registration System also holds information on date and place of birth, addresses, immigration or emigration, and death. Information on cancer was obtained from the Danish Cancer Registry, which contains virtually complete records of incident cases of cancer in Denmark since 1943. Cancers are coded according to the International Classification of Diseases, version 10 (ICD-10); morphological and topographic classifications are coded according to the ICD of oncology (ICD-O-3). All primary cancers – excluding non-melanoma skin cancers – were retrieved from the registry. We selected the main nine TRCs associated with smoking [2]: lung (ICD-10, C34) and laryngeal (C32) cancer, having AFs above 80%, and cancers of lower urinary tract (pelvis, ureter, and bladder) (C65-68), oropharynx (C09-10; C12-14), esophagus (C15), oral cavity (C00-08), liver (C22) and stomach (C16) with AFs between 20% and 50%. In addition, we included pancreatic cancer (C25) for which, together with oral and esophageal cancer, smokeless tobacco is an established risk factor [1,7]. Further, we classified

lung cancer cases into histological subtypes according to ICD-O morphology codes, i.e. squamous cell carcinoma (SCC), adenocarcinoma (AC), large cell carcinoma (LC), small cell carcinoma (SC), and “other”, including remaining ICD-O codes or unknown histology. Smoking increases the risk of all types of lung cancer, however, the attributable proportions of smoking for the histological subtypes are different, e.g. SC and SCC are more common in smokers [8].

A first generation male immigrant was defined as a man born outside Denmark. Men born in Denmark were defined as native males if their two parents were also born in Denmark or as second generation immigrants when at least one parent was not born in Denmark. Consequently, men born in Denmark included both natives and second generation immigrants, and the term “native population” thus only referred to men with two parents born in Denmark.

We excluded 13 711 men born in Greenland, as well as 32 men who were diagnosed with TRC prior to immigration to Denmark. In addition, we excluded 49 891 first generation immigrants due to missing dates of immigration.

Statistical analysis

We calculated standardized incidence ratios (SIR) and 95% confidence intervals (CI) for TRC among first or second immigrants compared to the native population during the period 1978–2010, using five-year age-group and one-year time intervals. We quantified the higher or lower incidence of each cancer type, by immigration status and by region of birth, compared to the native population. We stratified SIR by type of TRC and by region of birth for main countries/regions (> 50 000 person-years). The cancer types were categorized from high to moderate AFs related to smoking, and region of birth was categorized according to number of person-years.

To directly compare incidence rates of the nine TRCs in natives and first generation immigrants – numbers were too small among second generation immigrants – incidence rates were standardized according to the World Standard Population [9]. In first generation immigrants we used smoothed rates over three-year intervals to mitigate the annual fluctuations due to small number of cases. No ethical approval was required for the record linkage study.

Results

The cohort comprised 3 508 204 men, including 280 526 first generation and 129 056 second generation immigrants, who contributed with a total of 86 074 964 person-years. During up to 32 years of follow-up,

131 317 cases of the nine selected TRC were diagnosed among cohort members.

Table I presents SIRs by immigration status and region of birth for the nine TRC overall and for lung cancer, the most common TRC, separately. Overall, first and second generation immigrants experienced approximately 15% significantly lower incidence of the nine selected TRC than natives. Apart from men born in former Yugoslavia or in Finland, all men born outside of Denmark had lower or similar overall TRC incidence compared to men born in Denmark. In particular, immigrants from Asia as well as from most individual countries within Asia, experienced a significantly lower incidence of TRC than natives (Asia overall: SIR = 0.62, CI 0.55–0.69; Southern Asia: SIR = 0.39, CI 0.31–0.47). The former Yugoslavia (i.e. Croatia, Slovenia, Serbia and Montenegro,

Bosnia-Herzegovina and Macedonia) was the only region of birth associated with a statistically significant higher incidence for overall TRC among immigrants (SIR = 1.37, CI 1.19–1.55).

First and second generation immigrants experienced significantly lower SIRs for lung cancer compared to natives (10% and 27% lower, respectively). Men from Turkey and former Yugoslavia were the only immigrant groups who exhibited a higher incidence of lung cancer than natives, by 50–60%. Southern Asian immigrants experienced a three times lower incidence of lung cancer overall compared to natives.

The SIRs by immigration status and region of birth for the histologic subtypes of lung cancer are presented in Table II. First generation immigrants experienced an incidence of AC similar to that among

Table I. Tobacco-related cancers overall and lung cancers SIR by immigration status and region of birth in Danish men in 1978–2010.

	Population	Person-years	Tobacco-related cancers ^e		Lung		Other tobacco-related cancers ^f	
			No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status								
Native	3 098 622	77 420 046	129 760	Referent	61 298	Referent	68 462	Referent
1 st generation immigrant	280 526	3 144 726	1398	0.87 (0.83–0.92)*	635	0.90 (0.84–0.98)*	763	0.85 (0.79–0.91)*
2 nd generation immigrant	129 056	2 513 834	159	0.85 (0.73–0.99)*	51	0.73 (0.54–0.94)*	108	0.93 (0.77–1.12)
Region of birth								
Denmark	3 227 678	79 933 880	129 919	Referent	61 349	Referent	68 570	Referent
Europe (excl. Denmark)	152 234	1 576 260	920	1.04 (0.97–1.10)	436	1.11 (1.01–1.22)*	484	0.97 (0.89–1.06)
Nordic countries ^a	37 015	302 712	161	0.93 (0.79–1.08)	65	0.84 (0.65–1.06)	96	1.00 (0.81–1.21)
Sweden	10 989	117 373	58	0.86 (0.65–1.09)	27	0.89 (0.59–1.26)	31	0.83 (0.57–1.15)
Norway	12 670	104 577	69	0.97 (0.76–1.21)	25	0.78 (0.50–1.11)	44	1.13 (0.82–1.49)
Iceland	9944	61 404	12	0.69 (0.36–1.14)	8	1.11 (0.47–2.01)	4	0.40 (0.10–0.88)
Finland	3412	19 358	22	1.27 (0.79–1.86)	5	0.64 (0.20–1.32)	17	1.79 (1.04–2.75)*
Turkey	16 279	329 740	90	1.04 (0.84–1.27)	52	1.50 (1.12–1.93)*	38	0.74 (0.52–0.99)*
Former Yugoslavia ^b	15 182	225 744	224	1.37 (1.19–1.55)*	120	1.61 (1.34–1.92)*	104	1.16 (0.95–1.39)
Germany	15 876	179 955	140	1.00 (0.84–1.18)	67	1.07 (0.83–1.34)	73	0.95 (0.74–1.18)
United Kingdom	18 132	162 711	89	0.91 (0.73–1.11)	40	0.94 (0.67–1.25)	49	0.89 (0.66–1.15)
Poland	6347	72 248	69	0.96 (0.74–1.19)	30	0.91 (0.62–1.27)	39	0.99 (0.70–1.33)
Africa	24 033	277 668	95	0.94 (0.76–1.13)	32	0.76 (0.52–1.04)	63	1.07 (0.82–1.35)
Somalia	7535	82 400	22	0.86 (0.54–1.26)	7	0.64 (0.25–1.21)	15	1.03 (0.57–1.61)
Asia	73 073	1 078 837	321	0.62 (0.55–0.69)*	138	0.61 (0.51–0.71)*	183	0.62 (0.54–0.72)*
Southern Asia ^c	29 849	446 513	88	0.39 (0.31–0.47)*	33	0.34 (0.23–0.46)*	55	0.43 (0.32–0.55)*
Iran	8847	153 230	36	0.40 (0.28–0.54)*	14	0.36 (0.19–0.57)*	22	0.43 (0.27–0.63)*
Pakistan	7578	112 692	26	0.45 (0.30–0.64)*	14	0.56 (0.30–0.89)*	12	0.37 (0.19–0.61)*
South-Eastern Asia ^d	9276	160 428	95	0.95 (0.77–1.15)	42	0.93 (0.67–1.23)	53	0.97 (0.73–1.25)
Vietnam	4874	103 255	80	1.00 (0.79–1.23)	36	0.98 (0.69–1.33)	44	1.01 (0.74–1.34)
Iraq	11 834	152 408	53	0.70 (0.52–0.90)*	23	0.71 (0.45–1.02)	30	0.69 (0.46–0.96)*
Lebanon	7480	142 425	42	0.76 (0.55–1.00)	24	1.01 (0.65–1.46)	18	0.57 (0.34–0.86)*
America	27 211	184 283	54	0.69 (0.51–0.88)*	25	0.72 (0.47–1.03)	29	0.66 (0.44–0.92)*
Oceania	3557	21 880	2	0.42 (0.04–1.20)	2	1.03 (0.10–2.96)	–	–
Unknown	418	5798	6	0.95 (0.34–1.86)	2	0.67 (0.06–1.92)	4	1.19 (0.31–2.65)

First generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia; ^cAfghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka; ^dBrunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam; ^eAll selected tobacco related cancers: lung, larynx, lower urinary tract, esophagus, oral cavity, liver, stomach and pancreas cancers; ^fAll selected tobacco related cancers but lung: larynx, lower urinary tract, esophagus, oral cavity, liver, stomach and pancreas cancers.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

Table II. Lung cancers histological subtypes SIR by immigration status and region of birth in Danish men in 1978–2010.

	Squamous cell carcinoma		Adenocarcinoma		Large cell carcinoma		Small cell carcinoma		Other	
	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status										
Native	18 022	Referent	13 410	Referent	3597	Referent	10 524	Referent	15 745	Referent
1 st generation immigrant	168	0.85 (0.73–0.99)*	185	1.03 (0.89–1.18)	27	0.61 (0.40–0.85)*	95	0.75 (0.61–0.91)*	160	1.04 (0.88–1.20)
2 nd generation immigrant	15	0.85 (0.47–1.33)	11	0.54 (0.27–0.90)*	1	0.21 (0.00–0.81)*	10	0.82 (0.39–1.40)	14	0.93 (0.51–1.49)
Region of birth										
Denmark	18 037	Referent	13 421	Referent	3598	Referent	10 534	Referent	15 759	Referent
Europe (excl. Denmark)	125	1.13 (0.94–1.34)	115	1.15 (0.95–1.37)	20	1.00 (0.97–1.03)	73	1.03 (0.81–1.28)	103	1.21 (0.98–1.45)
Nordic countries ^a	15	0.68 (0.38–1.07)	14	0.72 (0.39–1.15)	4	0.81 (0.49–1.20)	12	0.86 (0.44–1.42)	20	1.16 (0.70–1.72)
Turkey	18	1.98 (1.17–3.00)*	12	1.21 (0.62–1.98)	5	0.83 (0.21–1.83)	4	0.64 (0.17–1.42)	13	1.85 (0.98–2.99)
Former Yugoslavia ^b	43	2.00 (1.45–2.65)*	22	1.21 (0.76–1.76)	4	2.11 (0.67–4.37)	19	1.43 (0.86–2.14)	32	1.92 (1.31–2.64)*
Germany	19	1.06 (0.64–1.59)	20	1.25 (0.76–1.86)	1	0.86 (0.22–1.92)	10	0.87 (0.41–1.49)	17	1.29 (0.75–1.97)
United Kingdom	9	0.76 (0.34–1.33)	19	1.68 (1.01–2.52)*	–	–	7	0.90 (0.35–1.68)	5	0.57 (0.18–1.18)
Poland	8	0.85 (0.36–1.54)	8	1.04 (0.44–1.88)	–	–	8	1.39 (0.59–2.52)	6	0.75 (0.27–1.47)
Africa	7	0.61 (0.24–1.15)	11	0.94 (0.47–1.58)	1	0.00 (0.48–0.48)	3	0.39 (0.07–0.96)	10	1.15 (0.55–1.97)
Asia	33	0.52 (0.35–0.71)*	49	0.85 (0.63–1.11)	2	0.36 (0.00–1.40)	15	0.37 (0.21–0.58)*	39	0.75 (0.54–1.01)
America	2	0.20 (0.02–0.59)	8	0.89 (0.38–1.61)	3	1.36 (0.26–3.33)	4	0.63 (0.16–1.41)	8	1.09 (0.47–1.98)
Oceania	1	1.96 (0.00–7.68)	1	1.81 (0.00–7.09)	–	–	–	–	–	–
Unknown	–	–	1	1.47 (0.00–5.77)	1	5.56 (0.00–21.78)	–	–	–	–

First generation immigrants: men not born in Denmark; Natives: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

natives, whereas second generation immigrants had only half the incidence of natives. Both first and second generation immigrants had lower incidences of SC and SCC. Compared to natives, Southern Asian immigrants revealed substantially lower incidence rates of AC (SIR = 0.24), SC (SIR = 0.23), and SCC (SIR = 0.40) (not otherwise shown). In contrast, men born in Lebanon had a 2.4-fold higher incidence (SIR = 2.44, CI 1.36–3.84) of AC compared to men born in Denmark (not shown in Table II).

Table III shows SIRs by immigration status and region of birth for the remaining eight TRC. For six of the nine TRCs [including lung cancer (cf. Table I)], there was a tendency towards a lower incidence in second generation immigrants compared to first generation immigrants, albeit numbers were small among second generation immigrants. When stratified by immigrant status, only liver and stomach cancers had substantially higher incidence rates compared to natives, ranging from 14% to 75% higher.

Substantial differences in SIRs according to country of origin were found for liver, oral, and lower urinary tract cancer. The incidence of liver cancer was markedly higher among first generation immigrants from Somalia (SIR = 11.84, CI 5.88–19.87) and Vietnam (SIR = 5.96, CI 3.44–9.07) compared to natives (not shown in Table III). For oral cancer,

a high SIR (4.37, CI 1.57–8.57) was seen exclusively among men born in Finland (not shown in Table III). Finally, the incidence of lower urinary tract cancer, i.e. primarily bladder cancer, was almost two times lower in first generation immigrants compared to natives.

The incidence of lung cancer declined among native Danish men during the study period (Figure 1), whereas the lung cancer incidence among first generation immigrants – which was about 50% lower in the early 1980s – increased slightly during the same period to reach the level of natives in the late 2000s.

The age-specific incidence of the selected nine TRC combined increased from the age of 30 years in natives to reach two pikes around the ages of 60 and 70 years (Figure 2). The trend of age-specific incidences followed a similar pattern in first generation immigrants at a lower incidence level, with the exception of the older immigrants. Indeed, the decreasing rate of TRC incidence in the older immigrants reached a plateau at the age of 75 years and exceeded the curve for the native males.

Discussion

In this large nationwide cohort study in Denmark we found that the overall incidence of nine selected

Table III. Other tobacco-related cancers SIR by immigration status and region of birth in Danish men in 1978–2010.

Immigration status	Larynx		Lower urinary tract		Oropharynx		Esophagus		Oral cavity		Liver		Stomach		Pancreas	
	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)	No.	SIR (95% CI)
Immigration status																
Native	5884	Referent	17 979	Referent	3933	Referent	6099	Referent	7815	Referent	4634	Referent	11 832	Referent	10 296	Referent
1 st generation immigrant	78	0.87 (0.69–1.07)	97	0.53 (0.43–0.64)*	60	0.76 (0.58–0.96)*	51	0.63 (0.47–0.81)*	87	0.64 (0.51–0.78)*	99	1.75 (1.42–2.11)*	187	1.27 (1.09–1.46)*	104	0.83 (0.68–1.00)
2 nd generation immigrant	9	0.78 (0.35–1.38)	19	1.10 (0.66–1.66)	6	0.46 (0.16–0.90)*	8	0.84 (0.36–1.53)	22	1.00 (0.63–1.40)	14	1.46 (0.80–2.33)	21	1.14 (0.71–1.68)	9	0.62 (0.28–1.09)
Region of birth																
Denmark	5893	Referent	17 998	Referent	3939	Referent	6107	Referent	7837	Referent	4638	Referent	11 853	Referent	10 305	Referent
Europe (excl. Denmark)	63	1.26 (0.97–1.59)	61	0.60 (0.46–0.76)*	47	1.08 (0.79–1.41)	40	0.89 (0.61–1.18)	66	0.88 (0.68–1.11)	36	1.15 (0.80–1.55)	104	1.28 (1.05–1.54)*	67	0.97 (0.75–1.22)
Nordic countries ^a	10	1.06 (0.50–1.82)	10	0.49 (0.25–0.84)*	15	1.89 (1.06–2.97)*	11	1.27 (0.63–2.13)	18	1.30 (0.77–1.97)	9	1.46 (0.66–2.86)	14	0.89 (0.48–1.42)	9	0.67 (0.30–1.18)
Turkey	4	0.73 (0.19–1.43)	6	0.72 (0.26–1.40)	3	0.54 (0.10–1.33)	3	0.37 (0.07–0.91)	9	0.96 (0.43–1.69)	1	0.32 (0.00–1.26)	15	1.77 (0.99–2.78)	8	0.63 (0.27–1.14)
Former Yugoslavia ^b	23	2.63 (1.66–3.81)*	15	0.76 (0.42–1.10)	4	0.56 (0.15–1.25)	8	1.12 (0.54–2.03)	13	1.03 (0.55–1.66)	5	0.86 (0.27–1.79)	33	2.23 (1.53–3.05)*	14	1.30 (0.71–2.08)
Germany	7	0.89 (0.35–1.66)	10	0.63 (0.30–1.07)	11	1.64 (0.81–2.75)	7	1.37 (0.54–2.58)	11	0.97 (0.48–1.62)	4	1.17 (0.30–2.60)	9	1.02 (0.33–1.28)	12	1.39 (0.82–2.62)
United Kingdom	3	0.52 (0.10–1.27)	3	0.28 (0.05–0.69)	5	0.95 (0.30–1.97)	5	1.41 (0.44–2.31)	6	0.69 (0.23–1.53)	1	1.57 (0.41–3.49)*	9	1.38 (0.62–2.39)	8	1.41 (0.60–2.53)
Poland	3	0.63 (0.14–1.47)	7	0.58 (0.17–1.12)	2	0.70 (0.07–2.01)	3	0.36 (0.11–1.38)	4	0.40 (0.10–0.88)	25	6.96 (4.50–9.95)*	14	1.46 (0.79–2.52)	5	0.63 (0.20–1.31)
Africa	3	0.48 (0.09–1.19)	7	0.67 (0.27–1.26)	2	0.34 (0.03–0.96)	7	0.27 (0.11–0.50)*	11	0.25 (0.12–0.42)*	34	1.83 (1.27–2.49)*	57	1.17 (0.89–1.49)	28	0.69 (0.46–0.96)*
Asia	9	0.31 (0.14–0.55)*	28	0.46 (0.31–0.65)*	2	0.36 (0.16–0.63)	1	0.25 (0.03–0.98)	5	0.74 (0.23–1.52)	4	1.41 (0.37–3.12)	11	1.54 (0.76–2.58)	3	0.49 (0.09–1.21)
America	2	0.44 (0.04–1.27)	1	0.11 (0.00–0.44)	2	0.50 (0.05–1.45)	1	0.25 (0.03–0.98)	1	0.25 (0.03–0.98)	1	1.76 (0.00–6.91)	1	2.02 (0.00–7.92)	1	2.02 (0.00–7.92)
Oceania	1	3.28 (0.00–12.86)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

First generation immigrants: men not born in Denmark; Native: men born in Denmark whose two parents also born in Denmark; 2nd generation immigrant: men born in Denmark with at least one parent not born in Denmark; Men born in Denmark include both natives and 2nd generation immigrants.

^aIceland, Finland, Norway and Sweden; ^bCroatia, Slovenia, Serbia and Montenegro, Bosnia-Herzegovina and Macedonia.

*Significant difference, $\alpha = 5\%$, with at least 5 cases.

TRCs was about 15% lower in first and second generation male immigrants compared to native males. However, large variations by specific types of TRC and regions of birth were observed. Immigrants experienced a 14–75% higher incidence of liver and stomach cancer than the natives. Among immigrants from Africa, liver cancer incidence was up to 12 times more compared to natives. For most of the selected TRCs, incidence rates were similar among first and second generation immigrants; however, numbers of second generation immigrant cases were small. Depending on the region of birth, lung cancer incidence in immigrants was as low as one third (South Asians) of the rate of natives. Even larger differences in lung cancer incidence were observed for subtypes of lung cancer for which the lowest incidence rates were seen among Asian immigrants. Overall, lung cancer incidence rates for first generation immigrants and natives reached a similar level in the late 2000s.

Former prevalence of smoking or smokeless tobacco use is an indicator of the current risk of TRC, whereas current prevalence predicts the future burden. The risk of cancer associated with tobacco use also relies on other factors, including the age of start, the duration of use, the intensity of use, as well as other etiologic agents – including genetic factors – contributing to the development of TRC. In particular, immigrants might have been exposed to different other causes of cancer, e.g. air pollution, prior to their immigration in Denmark. Therefore, trends in TRC incidence during the study period in relation to current tobacco use prevalence need to be interpreted cautiously. That being said, we found that overall trends of TRC incidence in immigrants from different regions appeared to be in line with recent trends of tobacco use prevalence of their respective region of birth.

Tobacco is used in either smoked or smokeless form, but the most common form is cigarettes. Whereas smoking prevalence has increased in low and middle income countries during recent decades, especially among men [10,11], the prevalence has gradually decreased in many high income countries [12]. For some of the countries from which most immigrants into Denmark originated, WHO reported in 2011 the following age-standardized smoking prevalence: Lebanon (46%), Vietnam (46%), Bosnia and Herzegovina (44%), Turkey (42%), Serbia (38%) and Poland (38%) [13]. In addition, smokeless forms of tobacco are widely used in some regions, e.g. Africa and South Asia where more than 17% of the total population [14] are current users – as well as in some Nordic countries. Indeed, Sweden and Norway had by far the highest prevalence of smokeless tobacco use in Europe, with about 20% users in

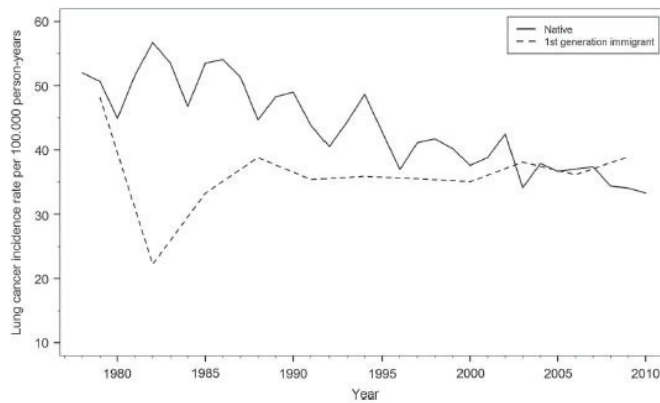


Figure 1. Lung cancers age-standardised rates per 100 000 person-years in Denmark from 1978 to 2010, in natives from Denmark (solid line) and in first generation immigrant (dashed line).

the adult population [13]. In Denmark, the smoking prevalence in men has decreased from about 70% in the early-1970s [15] to 23.8% in 2013. The prevalence of smokeless tobacco is low in Denmark; only 3% in 2010 [16].

Immigrants from Former Yugoslavia showed a high overall incidence of the selected TRC, and in particular of lung (especially SC and SCC), larynx and stomach cancers, which is in line with the high smoking prevalence.

Even though the smoking prevalence among Danish men (23.8%) [13] is among the lowest in Europe (average, 32%) [13], Danish natives experienced a slightly higher TRC incidence than most European immigrants to Denmark. This unexpected finding may be explained by the *healthy immigrant*

effect or the *salmon bias* hypotheses [17]. A healthy immigrant effect would suggest a high representation of healthy individuals among immigrants to Denmark who adapt to the habits among natives over time. This would explain the lower incidence of TRC at immigration increasing during the study period and the second generation to reach that of the natives. This effect could be counterbalanced by the genetic background of immigrants; second generation immigrants and natives who were all born in Denmark had different incidence patterns of some TRCs. The *salmon bias* describe the phenomenon that immigrants may return to their country of birth after retirement, or when they have first symptoms of illness, thus leaving Denmark before being diagnosed with a TRC. However, considering the Danish

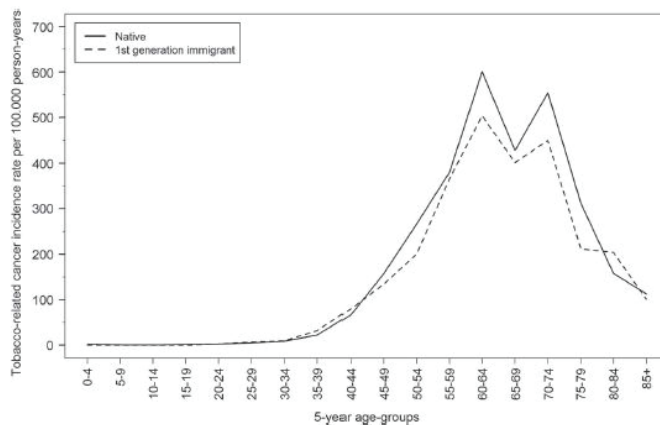


Figure 2. Tobacco-related cancers age-specific incidence rates per 100 000 person-years in Denmark from 1978 to 2010, in native men of Denmark (solid line) and in first generation immigrant (dashed line).

healthcare system with free and equal access to all citizens, any immigrants returning to their home country for treatment is most likely to originate from countries providing a level of health care equivalent to that in Denmark, which are basically few.

Interestingly, the incidence of ACs of the lung was high in Lebanese immigrants compared to Danish natives. Although we did not have information on smoking status of men included in the cohort, hookah use is known to be a popular smoking habit in Lebanon and current hookah or water-pipe smoking prevalence among adults was 15% in 2011 [18]. Deep breathing is experienced in hookah smoking and deep inhalation has been associated with increased risk of AC of the lung – as similarly deep inhalation in cigarettes is associated with this subtype of cancer [19].

Also, in Polish immigrants, the high incidence of cancers of larynx, esophagus, liver [1] and possibly of pancreas [20] could be due to the combined high prevalence of smoking and alcohol use in Poland [13,21]. A similar high prevalence – but to a smaller extent – of these two risk factors might explain the findings in Finnish immigrants who exhibited high incidences of laryngeal, oropharyngeal, esophageal and oral cancer compared to natives.

Denmark has the seventh highest bladder cancer incidence in the world [3] [ASR (W) = 22.9/100 000] and apart from Iraqi immigrants, all first generation immigrants had a lower incidence of bladder cancer than Danish native males. Overall, first generation immigrants had half the incidence of bladder cancer of the natives, while second generation immigrants had about the same incidence as natives. This result is compatible with the *healthy immigrant effect* [17], suggesting a selection of healthy immigrants to Denmark, and with time and generations, an adoption of Danish habits by the immigrant population, e.g. for smoking, leading to an increase in TRC incidence. Increased occupational exposures to carcinogens may also contribute to this increase of bladder cancer incidence in second generation immigrants. In particular, the industrial use of aromatic amines and occupational exposure as a painter have been identified as the main carcinogens – with sufficient evidence in humans [22] – resulting in increased bladder cancer incidence [23].

Liver and stomach cancers occur predominantly in low-resource countries [3]. The high incidence of liver cancers among first and second generations of immigrants might be due to hepatitis B or C virus (HBV or HCV) infections, heavy alcohol drinking, as well as other factors [24,25]. Similarly, the high incidence of stomach cancer in immigrants was likely due to a greater prevalence of *Helicobacter pylori* infections [25].

The overall incidence of lung cancer has been declining among men in Denmark, but only in natives, whereas immigrants have experienced an increasing lung cancer incidence. The incidence gap has therefore become smaller in recent decades. This reflects changes in risk factors in the various regions but also changes in migration patterns.

Although our nationwide cohort represents a unique data source for research, especially as it includes immigrants followed for more than 30-years, it is not without its limitations. Firstly, the SIRs are indicators of a 32-year period, thus they may mask any possible yearly trends. Additionally, 15% of first generation immigrants had missing dates of immigration and their exclusion may have influenced our findings. In addition, the statistical precision of the study was limited; only 159 second generation immigrants were diagnosed with one of the selected TRC during the study period. Lastly, the lack of information on tobacco use at individual level is a major limitation of this study.

In view of the gap in smoking prevalence between men and women – especially in the non-western regions [13] – and the increasing incidence of TRC in women in Europe [26], further research is warranted to examine TRC incidence in female immigrants in Denmark.

Conclusion

Male immigrants in Denmark showed an overall 15% decreased incidence of nine selected TRC compared to Danish male natives. Generally, the SIR for each selected TRC varied according to the prevalence of smoked and smokeless tobacco use in regions and countries of origin of the immigrants. A high incidence of liver and stomach cancer was seen among non-European immigrants. Some immigrant groups had unexpectedly a lower incidence of TRC compared to the native Danes, notably for lower urinary tract cancer. Additional research is needed to investigate the individual factors contributing to these findings; in particular studies assessing tobacco use at individual level.

Our data suggest a main role of different smoking patterns between natives and immigrants, and if confirmed by studies having individual smoking data, targeted tobacco cessation and prevention programs need to be intensified to control and reduce harms of cancer associated with tobacco, especially in natives and in immigrants who originate from high-smoking prevalence regions.

Acknowledgments

We thank Gilles Ferro (IARC) for the help with calculation of person-years and Marianne Steding-Jessen

(Danish Cancer Society Research Center) for the information on coding in the Danish Cancer Registry. Ligue Nationale Contre le Cancer 3-year doctoral program funding for Simon Ducarroz is gratefully acknowledged. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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CHAPTER IV:

DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

1 RECALL OF THESIS OBJECTIVES

The aim of this thesis was to provide insight into the tobacco use and related cancer burden in immigrants compared to the natives in the European host-countries. This objective was addressed with two literature reviews and two distinct studies, in order:

- to explore tobacco use and determinants of use in immigrants in France by testing a study protocol and data-collection instrument (TOBAMIG feasibility study, Chapter II).
- to compare the burden of tobacco-related cancers between immigrants and natives in Denmark (Danish nationwide cohort study, Chapter III).
- to put these results into context with current knowledge on tobacco use and tobacco-related cancer occurrence and mortality in immigrant populations in Europe (Chapter IV).
- to describe limitations of the studies and give guidance of how to set up a study on tobacco use and cancer risk in immigrants in France (Chapter IV).

The TOBAMIG pilot study aimed specifically 1.1) to ascertain the feasibility of conducting private interviews of the target population recruited in public places, 1.2) to evaluate an approach to identify the immigrant population in Lyon Metropole, 1.3) to assess the participation to the study and 1.4) to pilot a questionnaire on tobacco use developed for the study.

The specific objective relating to the Danish cohort study was to compare the incidence of TRCs among male immigrants of first and second generation in Denmark with incidence among males in the native Danish population.

2 RESULTS

Several conclusions may be drawn from the results of each individual element of this thesis, as well as the work in its entirety. These learnings are presented below.

Literature review on tobacco use in immigrants in Europe

The first learning garnered from both literature reviews on tobacco use and on tobacco-related-cancer burden in immigrants in Europe is that despite increasing immigrant populations, little is known about immigrants' health and lifestyle trends as they relate to cancer risk in European countries. Furthermore, studying a demographic sub-group, which comprises a small proportion of a nation's population, comes with challenges that have been approached differently, depending to a large extent on the population-based resources available in the country of interest. From the 1st literature review we identified various sampling methodologies used to identify and recruit immigrants in epidemiologic studies investigating tobacco use. Registry-based study protocols (Pudaric et al., 2000, van Oort et al., 2006) where immigrants and natives could be singled out, offered a straight forward approach to reach the target population and ensure representativeness, as data are routinely collected and the sample size is generally large, if not nationwide. The representativeness of such studies is a clear asset. Due to the lack of such registries in the countries where studies on immigrants have been conducted, identification through household or public places surveys was a commonly used sampling method (Aspinall and Mitton, 2014, Hosper et al., 2007, Ezika, 2014, Kabir et al., 2008). This approach, however, requires building study specific sampling frames and sampling strategies, as well as adapted instruments to collect the tobacco use information. In the latter approach to immigrant studies, the representativeness of the sample was not always reported. This gap in reported information limits the generalizability of stated findings.

No studies were identified with a sampling approach similar to that employed as part of the TOBAMIG pilot study. Our methodology required the construction of a sampling frame and setting priority rules for sampling municipalities where non-European immigrants resided. Indeed, our sample was representative in terms of sex, country of birth and distribution by migration generation of the total population of immigrants living in the sampled municipalities. In the future, this method could be adjusted to sample immigrants in different parts of France. This would enable the construction of a sampling frame which would be representative of the broader immigrant population of France, especially useful where no access to census information is available. On the other hand, our approach identified large and frequently transited public venues as the most efficient locations for identifying and enrolling responders. Nevertheless, with greater

coordination alternative places for sampling such as the Adoma residences and similar venues could be included in a larger study. The likelihood of stigmatizing potential participants could be minimized if sampling of French natives is also incorporated into the recruitment process. Incorporating sampling of French natives would comprise additional benefits including the possibility of obtaining tobacco use estimates in national counterparts for direct comparison to immigrants in the study and to nationals in the country of origin in other studies (Koochek et al., 2008).

In 2004-2005, the overall smoking prevalence estimates in 11 European countries in the population aged 50 years and older were similar between immigrants and the native-born population (Sole-Auro and Crimmins, 2008). However, this review also indicated evidence of major differences in smoking in immigrants by country of origin and sex in Europe. In few studies the level of smoking was found to be higher in immigrants than in natives, namely in immigrants from Albania, the Former Soviet Union, Poland, or Turkey, in several host countries including Germany, Ireland, Italy, Sweden, the United Kingdom (Abbotts et al., 1999, Allamani et al., 2009, Jorgensen et al., 2005, Kabir et al., 2008, Reiss et al., 2010, Reiss et al., 2015). Few studies reported higher tobacco use in native women than in immigrant women in host countries including in France, Norway or UK (Anthony et al., 2012, Vedoy, 2013, Williams et al., 1994, Wanner et al., 1995b). However, inconsistent results on tobacco use in immigrants between different host countries make it difficult to delineate trends and are often due to the small sample sizes or differing operational definitions of immigrant used. The smoking prevalence in immigrants in the European countries examined suggest different patterns according both the country of origin of the immigrant and its smoking prevalence and sex, as women in the major countries of origin of immigrants generally smoke less than native European women (e.g. in North African countries). To a lesser extent, the host-country has also a role in the difference in smoking behavior between immigrants and natives, depending on the level of the general population's smoking prevalence. However, the relationship is increasingly complex as evidenced by diverging trends which were observed. For instance, in most studies, Turkish immigrants exhibited a higher smoking than the natives of their host-country, while South Asian immigrants – and especially women – had a lower smoking prevalence than the natives.

Literature review on cancer and TRC in immigrants in Europe

Although many studies on TRCs in immigrants were identified as part of the 2nd literature review, it was clear that there is still much to be explored. Again the sample sizes – from few hundreds (Mousavi et al., 2012b) to approximately 1.8 million immigrants (Hemminki et al., 2010a) - and varying definitions limit our understanding of the variations in TRC burden in immigrants. The majority of the studies observed a lower incidence and mortality of overall cancer rates and of TRCs overall in immigrant populations compared to the natives in the European countries. As for the smoking prevalence, the burden of TRC in immigrants depended on the country of origin, sex, and to a lesser extent on the host-country. Differences were also seen according to cancer site. For instance, Turkish immigrants had a lower incidence of cancer overall and TRC, but the lung cancer burden was higher in Turkish men than in the natives of the respective host countries. Similarly, the cancer incidence and mortality in general and TRC, in particular, was lower in African immigrants than in the natives, but increased rates of liver, bladder or oesophagus cancers were observed in several studies. In Asian immigrants, lower mortality and incidence of all-site cancer was observed consistently across all studies, however, elevated rates of liver, bladder, stomach and oral cavity cancers were shown compared to the European natives. Patterns of cancer and TRC were less clear and no significant trend was observed in western immigrants, mostly from other European countries and the Former Soviet Union.

TOBAMIG feasibility study

Ideally, exploring tobacco use in immigrants requires a study using a validated protocol. The TOBAMIG pilot study tested the feasibility of investigating tobacco use and its determinants in 1st and 2nd generation immigrants in the French metropolitan area around Lyon. In the sampling area, the study sample was shown to be similar to that of the immigrant population in terms of demographic characteristics. Nevertheless, some minor differences were observed in the distribution by generation or by country of origin. Our pilot sample included a higher number of immigrants of other African origin than the population in France. Based on 75 subjects, the questionnaire data revealed a smoking prevalence above that of the general population in France – 45% and 34% respectively - with a gender gap: more men were smoking than women, 36% and 28% in

the general population respectively, and 51% and 38% in our sample. Additionally, the prevalence of current shisha users was twice as high as in our sample compared to the general population, respectively 15% and 7%.

The length of administration of the interviews revealed to be inadequate as not all sections of the questionnaire were fully completed, due to the settings of anonymous interviews conducted at fortuitous visits in public places. In particular, the anonymity of the questionnaire did not allow for follow up of missing responses. This indicated that the questionnaire should be shorter to improve response to a study using a recruitment strategy of intercepting people in public places. Additionally, high-frequented venues provided the required anonymity to administer the questionnaire. With modifications, this pilot study protocol can be used to recruit a sample of immigrants which can be representative of the population in France. Finally, in this limited sample, the preliminary findings on tobacco use suggested disparities, that are generally higher rates, in tobacco use between our sample and the French general population.

Danish cohort study on TRC in immigrants

The Danish cohort study showed an overall 15% decreased incidence of the nine selected major TRC in male immigrants compared to Danish male natives. Generally, the SIR for each selected TRC varied according to the prevalence of smoking and smokeless tobacco use in regions and countries of origin, suggesting that the smoking patterns from an immigrant's country of origin may have a primary role in the burden of TRC in Denmark. Nevertheless, our analysis did not have access to data on tobacco use at the individual level and thus we can only suggest, at best, possible explanations for the observed trends. A high incidence was observed among non-European immigrants for liver and stomach cancers in line with several previous studies. Unexpectedly, a lower incidence of TRC was seen in some immigrant groups compared to the native Danes, notably for lower urinary tract cancer. The increase in bladder cancer in native Danes could be due to differences in the occupational exposures. Workers with aromatic amine exposure have been shown to have the highest incidence of bladder cancer, while those exposed to polycyclic aromatic hydrocarbons and heavy metals had the greatest mortality (Cumberbatch et al., 2015).

Overall results

This thesis contributes new knowledge on immigrant health in one European country, Denmark, specifically on cancers associated with tobacco use and on a potential sampling approach to identify and interview immigrants to document tobacco use, particularly in Lyon, to inform the design of a study to investigate this knowledge gap in France. We have shown in Denmark that immigrants overall had a lower incidence of the main TRC compared to the natives. This finding is in line with the literature in other European countries. But we also showed that this lower rate of TRC overall implies diverging cancer incidence trends in relation to immigrant sub-groups according to the country of origin and the cancer site. Consistently with the literature that is summarized in the 2nd review on cancer in immigrants, we observed that non-western immigrants had higher incidence of liver and stomach cancer which are also caused by infections (International Agency for Research on Cancer, 2012a). The prevalence of diseases caused by infections is especially high in low and middle income countries and immigrants from these countries. Another important finding in our study is the decreasing difference in incidence of lung cancer over time between immigrants and natives in Denmark. The size of the Danish cohort (n=3,508,204) was a unique asset to show the trends in cancer incidence in the different immigrant sub-groups including country of origin, generation and histologic sub-types. Further, this study highlighted the probable role that tobacco exposure plays in the morbidity of the immigrant populations in the host-country. To our knowledge, no previous studies have focused on investigating the link between the tobacco use and TRC burden in immigrants in Europe, in spite of the increasing proportion of immigrants and the potential of tobacco control to reduce the cancer burden worldwide and in Europe. We have proposed that TRC incidence in Danish immigrants corresponds to the level of the smoking and smokeless tobacco use in their countries of origin. Although it was not the objective of our study to assess this association, this finding deserves further investigation. Additionally, cancer development is a complex and long process and former prevalence of smoking or smokeless tobacco use is an indicator of the current risk of TRC, whereas current prevalence predicts the future burden. TRC cancer risk is also dependent on other factors, including the age of starting smoking, the duration of tobacco use, the intensity of its use, as well as other etiologic agents contributing to development of TRCs, e.g. infectious diseases or genetic factors. Therefore, the trends in

TRC incidence that we observed in the Danish immigrants in relation to the level of the current tobacco use prevalence in the countries of origin should be interpreted with caution. This study also underlines the unique possibilities for research in immigrants' health presented through the use of population registry-based data (Norredam et al., 2011), even without information on individual tobacco use.

To address the lack of information on tobacco use in immigrants in the European countries, researchers have been challenged to design epidemiologic studies inclusive of these minority groups. Developing and assessing a protocol to investigate a behaviour which impacts health – tobacco use in our case – in a minority group presents several challenges. Firstly, the identification and effective recruitment of immigrants give rise to consideration of the representativeness of the sample; further, it may also imply certain ethical or legal considerations to avoid stigmatizing a population's lifestyle. Our review showed that the literature on the tobacco use in immigrants in Europe was scarce (n=33 original studies). Approximately half of these few studies used established population registers, such a municipality register entailing immigration status and/or country of birth recording, to identify immigrants. Identification through household or public places surveys is difficult, consequently, the number of studies is limited.

In the French context, where registries including information on country of birth are not available, we opted to develop an innovative research protocol. Our method incorporated some elements of existing studies, e.g. use of trained interviewers from the target immigrant group to be sampled posted at public places known to be frequented by the immigrant population (Kabir et al., 2008). However, our sampling approach is unique in using a variety of locations known to be attended by immigrants, located in municipalities with high proportion of immigrants, and selected in order to capture different demographic profiles to ensure an overall sample representative of the immigrant population from such municipalities. Unfortunately, the use of incentives for re-contact with participants of the first round of interviews was unsuccessful in our study, while it showed to be effective in Germany in a community-based sampling strategy (Reiss et al., 2014a).

Although the TOBAMIG feasibility study had a limited sample size, our preliminary estimates of tobacco use were in line with the literature from the 1st review. Indeed, a higher prevalence of smoking was observed in our sample, constituted mainly of North

African and Turkish immigrants, than national values for the French population reported in recent surveys (Guignard et al., 2015). Further, the smoking prevalence was higher in men than in women as observed in other studies (Reiss et al., 2010, Jorgensen et al., 2005). Our data on tobacco use in the 1st generation immigrants therefore confirm results from older studies using different sampling methodologies (Wanner et al., 1995b, Berchet and Jusot, 2010). Although our feasibility study contributed new knowledge on tobacco use in showing a higher smoking prevalence in the 2nd generation immigrants, and a high prevalence of shisha users in this 2nd generation, these estimates are derived from a limited number of subjects and thus these last findings require confirmation in studies with larger sample sizes.

Finally, both existing studies identified in the literature and our results showed that inequalities in health related to tobacco exposure are pronounced between the immigrant group and the natives of the host-countries, that is, with higher incidence in natives, overall. Further, these inequalities exist within the immigrant group, depending on country of origin, sex, site-specific, between the 1st and the 2nd generation immigrants, and to a lesser extent on the host-country.

3 STRENGTHS AND LIMITATIONS

This thesis addresses the lack of knowledge of immigrants' use of tobacco, a major determinant of health, and on the burden of tobacco use as illustrated by overall cancer incidence and tobacco-related cancer when compared to natives in the host country. Chapter I confirmed the scarcity of current literature on tobacco use in immigrants in Europe, which is concerning considering the increasing phenomenon of international migration. In Europe, few countries, such as Denmark, Germany, the Netherlands, Sweden and the United Kingdom, have studied this issue. However in other countries, including France, very little is known, although the 1st and 2nd generation immigrants can represent nowadays one person in five in the whole population. This is surprising considering that France is the European country with the largest proportion of 1st and 2nd generation immigrants overall (INSEE, 2012b, European Commission, 2008).

The TOBAMIG pilot study – described in Chapter II - is one of the rare studies in France that has attempted to address tobacco use in the immigrant population. Our study

developed a methodology to explore the tobacco use in both generations of immigrants, including all forms of tobacco use, determinants of use as well as other related domains. Further, it is also the only study on tobacco use in immigrants in France conducted with face-to-face interviews in public places; previous French studies were household national surveys (Wanner et al., 1995b, Berchet and Jusot, 2010). One of TOBAMIG's major strengths was to develop an extensive sampling methodology along with a comprehensive questionnaire. It has shown that, with certain modifications, this protocol has the potential to be implemented in a large-size study on a nationwide scale with high prospects of obtaining a representative sample of immigrants in France.

The length of administration of the questionnaire is considered a reason of a low participation as the approximate time of compilation was announced by interviewers to prospective responders when inviting to participate. Also, reduced completeness of the questionnaire was seen when responders, in several occasions, left questions unanswered towards the end of the questionnaire.

Not including French natives in the sample precluded a direct comparison of their patterns of tobacco use with that of immigrants. Including natives would also have mitigated any possible potential stigmatisation when interviewing participants in low-frequented venues, as interviewing non-European immigrants on their tobacco behaviours in a public places could be perceived as discriminating. Another limitation of this pilot study is the lack of participation data, overall and by type of venues, i.e. the number of persons willing to respond the questionnaire among all those who were approached was not recorded by the interviewers. This information would be important to assess the effectiveness of identifying and recruiting the target population at specific types of venues, as well as the rate and type of refusals which could hypothetically be a function of smoking prevalence of potential respondents in a given area. Nevertheless, the sampling at different types of venues indicated, based on the recruitment time, and other feedback provided by the interviewers, which venues were not ideal and which ones were better, such as markets, universities and large shopping centers.

In Chapter III, the study on comparing TRC incidence between natives and immigrants in Denmark showed the potential of high-quality register-based cohort studies. Large

registry-based cohorts have sufficient sample size to show differences of TRC incidence by country of origin. Even if an overall lower incidence of the selected TRCs was observed in immigrants in Denmark, I demonstrated that immigrants are not an homogeneous population and that differences in TRC incidence existed by country of origin. Again exploring these differences was only made possible by the large data set of a national cohort for a 30 years-period. However, national registers are not without their limitations. The estimated SIR on a period of more than 30 years may mask possible yearly fluctuations. Further, the exclusion of 15% of the sample for which the date of immigration was unknown might have introduced bias. However, the exploration of TRC incidence in this subgroup did not reveal major differences with the rest of the 1st generation immigrants that was included in the main analysis. The added value for research using register data does not need to be confirmed further but the missing date for 15% of our large sample highlights the need of quality assurance in such databases. Immigrants' health inequalities are in part attributable to socioeconomic circumstances, making the two concepts closely interrelated but still distinct (Stronks and Kunst, 2009). As presented earlier, conflating migration status and social class, fails to fully unravel the relationship between differences by country of birth, socio-economic and health inequalities (Lorant and Bhopal, 2011). However, immigrants often share lower socioeconomic conditions in the host-country (INSEE, 2014, INSEE, 2012b). Therefore, it is important to include the socio-economic information in relevant studies to determine the specific impact of the immigration status on population health and to assess the health inequalities attributable to the migration process. In this regard, in the registry-based Danish cohort study information on the socioeconomic status was not available. This information was also partially lacking in the TOBAMIG questionnaire, as only proxies of socioeconomic status, such as education level and employment status, were included. Collecting the income level would contribute to describing socioeconomic status, but it was decided not to include it in the TOBAMIG questionnaire as it could be perceived as intrusive, in addition to the other topics covered in the questionnaire.

To address these limitations and take full advantage of these thesis strengths, the next section outlines suggested potential remedies to these limitations for a future larger scale study on tobacco use and determinants of use in immigrants in France.

4 RECOMMENDATIONS

Few studies in Europe have investigated the tobacco use in immigrants, while differences in the prevalence and intensity are known to be significant by country of origin compared to natives of a host-country (World Health Organisation, 2015). The first step is therefore to develop standardised methodology. The TOBAMIG study originally aimed to investigate tobacco use and the determinants of use in immigrants in France. To inform this aim, and following IEC recommendations, we developed a feasibility study protocol to identify and recruit a sample of the non-European immigrant population in selected municipalities of Lyon Metropole, and to conduct private interviews of the target population intercepted in public places.

The lessons learnt from our feasibility study have implications for a future study on many different aspects of the study, i.e. anonymity, ethics, type of venues, length of questionnaire, inclusion of immigrants from any country of origin, etc. Below I address each of these aspects separately and present then two alternative study designs for future studies, with adoption varying depending on the breadth and the depth of the information sought, to better understand tobacco use and related determinants of use in immigrants in France.

Anonymity, legal approval and implications

Conducting health research in immigrants is considered a “sensitive” topic by the French National Ethical and Legal Committee (CNIL) and therefore individuals’ rights are protected by the law and any research protocol has to be submitted for their authorization. The health research authorization is a long process to which there is an alternative: if the whole protocol is “strictly” anonymous, then researchers do not require the special authorization. Strict anonymity means that the researchers should not record any information on the responders that would allow their identification, either directly (names, addresses, phone numbers) or indirectly, which means that crossing of variables cannot allow identification of the respondent. The last has implications especially on immigrants with the recording of date of arrival in France and country of birth of the responders and his parents which could indirectly lead to their identification, especially in the case of small municipality or immigrant from a rare country of birth.

Consequently, we chose an anonymous protocol to speed up the implementation of TOBAMIG feasibility study but this did not come without its limitations. Despite the use of incentives, the feasibility study did not succeed in completing a re-interviewing of a sub-sample of responders one month after the first interview. This full anonymity condition by the CNIL also implied not having the possibility to recontact the participant neither to check responses to the questionnaire (if missing or for quality control), nor to administer additional questions (e.g. on complementary topics).

For a large scale study, one could reconsider this choice of anonymity as our method can be seen as a way for rapidly and independently gathering information on tobacco use – or other health behaviors - in immigrants. Despite its benefits, the most significant downside was our inability to recontact original responders. Trajectories and Origins study (TeO), in France (Beauchemin et al., 2010), has shown to be very effective in building a representative sample of 1st and 2nd generation immigrants: identification of the target population was done with the help of census information – in collaboration with the census bureau (INSEE) - and administration of the questionnaire completed during several interviews. The quality of such a study has to be considered in balance with the time and complexity required for reaching collaboration with the census bureau, approval by the CNIL in the lengthy revision/approval process, its preparation and implementation. But the TeO study was conducted in response to a public mandate, and therefore not necessarily reproducible in ordinary research conditions for non-politically driven agendas conducted by researchers not mandated by the government.

Another alternative is the household survey, often conducted via telephone (e.g. Health Barometer). This would allow re-contacting the responder for additional information or quality check of former responses. In addition, the form of a telephone-based study has another advantage in terms of study efficiency as a larger target population is reachable at limited costs, and use of interpreters, when necessary, can more easily be organized. Nevertheless, nowadays more and more individuals rely less on telephone landlines and more on mobile services for which sampling frames typically used in random digit dialing are being used routinely in general population surveys, but would need to be assessed for completeness in the immigrant population and number of attempts or effort required to identify an eligible responder from a minority group (first generation immigrants) representing about 9% of the population.

Ethical approval

The IARC Ethical committee (IEC) was concerned with the potential of the original larger scale study to provoke stigma or discrimination, and therefore suggested carrying out first a pilot study. Although not done at the time, it would have been possible to discuss and appeal to the decision of the ethics committee by presenting tobacco use from another angle. A major confusion in their arguments was to consider tobacco use as a behavioural problem singled out in a minority group rather than as a morbid condition of dependence that entails substantially higher risk of several major chronic diseases. An addiction involves a treatment like any other serious illness, while behaviour implies a personal choice. Ethics committees must understand that the tobacco industry works to persuade people that the use of tobacco products is only a matter of adults informed choice. Since most adults begin using tobacco and become addicted in adolescence, the idea of choice is often wrong.

Length of the questionnaire

If any future study were to maintain participant anonymity, the length of the questionnaire should be reduced to allow increased completion of the questionnaire, as follow-up on missing responses cannot be done and responders' time availability when intercepted in public places would be limited. Along the same line, it is important to evaluate the length of the questionnaire in this setting of private interviews conducted in public places, as a balance between more detailed information on the one hand and higher completeness on the other. In our case we clearly observed that the completion rates of the questionnaire got reduced after each additional section. In this regard, I would recommend shortening the questionnaire by withdrawing the sections H to K, which are the sections on tobacco cessation, the economics of tobacco use, the knowledge, perceptions, attitudes and behaviours of the respondents about many aspects of the tobacco product and tobacco use, and the section on exposure to tobacco advertisement in different media. The remaining set of questions would then focus on the epidemiologic aspects of the tobacco use: how respondents are exposed to tobacco use, including the different forms of use, the intensity of use, and the different profile of users (current/past/never). Such shorter questionnaire would help in describing the actual tobacco epidemic in immigrants, allowing further specific research at a later time

in another survey on complementing aspects (e.g. cessation, economics, perceptions, etc.) when tobacco exposure is better known. These complementary topics could be explored in especially designed subsamples of a same study through administration of extra modules covering these themes.

Alternatively, opting for a non-anonymous study would allow maintaining the questionnaire in its long form, as re-contacting the responder would be then possible or an appointment for an interview of adequate duration could be accorded.

Target population

It was decided for TOBAMIG to concentrate on non-European immigrants only and consequently not to include the European immigrants in the investigation of tobacco use, as their tobacco use and health behaviours might not differ as much from the French natives than that of the non-European immigrants. As explained in Chapter 2, non-European immigrants are expected to diverge more from the natives than the European immigrants. This is based on the type of tobacco use prevailing in the different countries of origin, while the majority of Europeans smokers principally consume cigarettes at similar levels as French counterparts, North-Africans or South-East Asians populations, in the countries of origin, not only smoke at different level – which is especially true in women – but also use other products, e.g. shisha and smokeless tobacco (World Health Organisation, 2015). However, limitations are still inherent in their study. As differences in tobacco use still exists between European countries, such as elevated snus use in Nordic countries, it would also be of scientific interest to investigate how European immigrants' tobacco behaviours change with migration in France. In the case of Swedish immigrant users of Swedish snus moving into France, it would be relevant to register changes in tobacco use as snus is banned for sale in France. Further, as some European immigrant groups have resided in France for a longer time, including them would also allow further investigation into the phenomenon of acculturation relating to tobacco use in France. Nevertheless, including all immigrants may help preventing any selection of participants based on appearance, as interviewers would offer participation to everybody regardless of ethnic prototypes.

The inclusion of French natives would be another asset to a large scale study as it would enable comparison between natives and immigrant subgroups in their tobacco uses. But this has to be considered also in terms of additional costs to the study.

Selection of venues

The type of venues to implement the survey was found to be a crucial issue. Greater participation was observed at venues offering greater anonymity and required confidentiality, also minimizing potential stigmatisation. According to our results, the selection of the type of venues should focus on highly frequented places. TOBAMIG implementation does not allow us to disentangle the reasons behind limited participation in low-frequented venues. We cannot determine if participation in the study was proportionate to the number of people passing by the venue or if there was an interaction of this low frequentation with a perception of lower confidentiality. Indeed, potential participants may have hesitated responding in a public venue if they had the impression that due to the relative silence and visibility in a low-frequented venue, their interview would not meet satisfactory confidentiality requirements. Inversely, the noise and agitation of a crowd can be reassuring at the time of deciding to engage into a private interview. However, in the case of the Adoma residences, the setting offered more confidentiality, although it is a low-frequented venue, and yet not many interviews were completed at this type of venue for which a greater coordination could render in the future a better rate of enrolment.

As a result, when conducting a larger scale study in a similar anonymous setting, I recommend concentrating on high-frequentation type of venues, such as markets, universities, large shopping centers and potential other similar places.

Interviewers

The next main consideration for a future study is the need of extensive training of interviewers, including greater familiarity with the questionnaire, the rigor of collecting all data in the questionnaire as well as keeping track of all subjects contacted and concomitant refusal rate. Also important is the selection of interviewers with sufficient experience. Interviewers' views on immigration should also be investigated before the study to ensure that they will not interfere with the conduct of the survey, particularly

regarding their perception of a potential stigma while administering questionnaires in public areas.

Individual interviews and focus group

A qualitative study of both the target population and the interviewers could be developed to assess why immigrants may not answer certain parts of the questionnaire and on the investigation of tobacco use in this population group from both perspectives: the interviewer and the respondent. The objectives of this qualitative investigation would be to document separately the respondents' and interviewers' experiences, knowledge and beliefs about investigating tobacco use in the immigrant populations.

Two complementary methods could be used: individual interviews and focus group. This crossed approach enables to collect information to enrich the data collected by the questionnaire, to aid in the interpretation or in the understanding of certain patterns or issues, and the sampling and interviewing protocol. Individual interviews would involve participants from each demographic group based on the immigration status, country of origin and the participant's age and sex. Focus groups would be done to confirm what have been found in the individual interview. The community centers and local associations in the neighbourhood of the sampling area could be solicited in order to obtain a diverse sample of respondents.

Interviews would be conducted in the tradition of the phenomenological interview (Thompson et al., 1990). The interviews would be semi-structured and entail two parts: 1) collect data on general knowledge and experience on tobacco use in immigrants; and 2) use photo-elicitation - which uses images as a basis for open-ended interviewing (Heisley and Levy, 1991) - to gather responses and gain insight into interviewers' and respondents' understanding of the tobacco and immigration imageries.

The focus groups allow discussion during which the participants justify their choices and attitudes and so allow them to specify their representations and beliefs. A semi-structured interview could be used to facilitate an interview situation but the questions should not be restrictive and the anthropological interview aims to discover the individual's pathway, the representative associations (Kitzinger, 1994). The interview leader will facilitate this exploration with the group. These interviews would result in rich insights into interviewers' and respondents' beliefs and perceptions of the tobacco and

the immigration phenomenon and can reveal the social and cultural dynamics that affect these perceptions.

The individual and group interviews would be recorded and transcribed for qualitative analysis. The outcomes of the analysis would be: 1) a series of items to serve in the development or adaptation of the questionnaire; and 2) the identification of elements to be covered by the training of the interviewers and potentially an adaptation of the sampling protocol.

Representativeness

This anonymous feasibility study protocol indicated the approach used was effective to investigate tobacco use in a mixed sample of immigrants that is representative of the municipalities where the study was conducted. However, both was the immigrant population in our sampling area not fully representative of the national immigrant population and with the choice of venues for most efficient recruitment it became a convenience sample of immigrants, still informative for the purpose of our study . In the absence of national register including the immigrant status, it would be critical to combine different areas in France to obtain a sample representative of all types immigrants in the national mainland. The most promising approach is to obtain a stratified sample so that all immigrant groups are well represented in numbers to accurately estimate their tobacco use patterns, but for different groups different recruitment methodology could be used as only internal representativity within each group would be required and respective weighting according to national proportions of immigrant groups could be done using census and other survey information.

Perspectives

In summary, the results of this thesis suggest several perspectives for future research on immigrant health as such and specifically in relation to exposure to tobacco and its related morbidity and mortality. Two alternative study designs for future studies are proposed, which would vary depending on the breadth and the depth of the information sought, to better understand immigrant health and tobacco.

Our innovative protocol has been effective in conducting rapid and independent studies aimed at gathering information on tobacco use or other health behaviors in immigrants

in the French context. The mix of high-frequentation venues offers the potential for constituting a mixed sample with all immigrant groups being represented, in compliance with the strict anonymity demands of the CNIL. Nevertheless, this protocol is not optimal for studies aiming to gather a larger pool of information. In this regard, and in the same French environment, developing and evaluating a household telephone-based study would be a good option to investigate tobacco use and related determinants in the French immigrant populations. However, the effort required to identify the target population through random digit telephone sampling would need to be pilot tested to assess feasibility (cost) and efficiency in the immigrant population.

The lessons learned from this thesis work, and in particular the methodological efforts accomplished within the TOBAMIG feasibility study, suggest two perspectives for future field research on immigrants' health as such, and specifically in relation to their tobacco use and determinants of use. Unlike the objective of the TOBAMIG to set the foundations of a single larger scale study, the thesis gives rise to exciting future research questions. Based on the strengths and limitations of the different aspects of the study described above, I propose here two different study methodologies that could be set to address the original research question, depending on the extent of information sought, which has implication on the anonymity conditions.

Option 1 – Field anonymous face-to-face survey

On one side, in the TOBAMIG setting, the unplanned visits of the interviewers in public places to recruit the target populations did not allow consistent administration of the 30-45 minutes questionnaires in its entirety. Consequently, the completion rates decreased along the questionnaire sections, raising also the question of data quality.

A possible study derived from the TOBAMIG methodology would therefore be to use the same sampling methods. This would mean focusing on geographical areas with a high proportion of the immigrants' populations, within which venues that have high pedestrian frequentation would be listed and a given number randomly selected for conducting the interviews. Then, trained interviewers would be placed in these locations to identify eligible responders. When a participant is assessed as eligible, a modified questionnaire able to be administered in 10-15 minutes could be used. In a similar

anonymity setting, the study could focus on a particular set of questions, e.g. actual tobacco use: the products used, the profile of the user (current daily, current occasional, former, never) and the intensity of use.

In this regard, the questionnaire could be modified based on the selected topic of interest, and assessed in a pilot study prior to a full implementation of the study.

The main asset of this type of methodology rests in its effectiveness for conducting rapid and independent field study gathering information on tobacco use in a target group of the population. As discussed earlier, such a study could include non-immigrants in its target group in order to allow for comparisons and to prevent potential bias. However, the inclusion of natives would require a drastic increase in sample size, in order to recruit the appropriate number of immigrants for comparison by country of origin and sex, unless immigrants are oversampled. Although resulting in a convenience sample it would still be informative for various migrant groups, which would be represented in the sample.

Option 2 – Household non-anonymous survey

Alternatively, a household national telephone-based study could be developed to take advantage of the comprehensive questionnaire, which was developed based on previous validated questionnaires (Giovino et al., 2012, Beck and Gautier, 2012, Gallus et al., 2014, Oh et al., 2010, Simon and Clément, 2006), and covers a large set of information on tobacco use in all its forms, motivation to quit, cessation attempts, exposure to second-hand smoke, knowledge, perceptions and attitudes about the harmfulness of tobacco and the benefits of quitting tobacco use. A telephone-base survey would require an authorization from the CNIL, as it implies dialling individual numbers that could be used to identify the participant. This method has been extensively described (Potthoff, 1994) and is used routinely in France for the Health Barometer surveys series (Beck et al., 2011, Beck and Gautier, 2012, Guignard et al., 2015). Even though this method implies longer preparation for authorization and ethical handling of individual data, it would permit repeated contact with the responder, and therefore allow completion of the full questionnaire in several times, depending also on the responder's availability. Specialized survey companies have developed techniques to automatically dial telephone numbers – either landline or mobile phone – which in combination with the telephone owning

coverage in France (more than one telephone number by resident) it would theoretically give a chance to each person in France to be contacted. This method has a clear advantage on the potential to obtain a representative sample. Its second advantage is a lower cost of implementation, as interviewers' time is optimized with no travelling or long recruitment time in the venues. Even if trying to reach only first and second generation immigrants, as they represent about 20% of the French population, only five calling attempts should theoretically be needed to reach an immigrant. Additionally, the use of interpreters can be organized more easily, as only one by required language is needed at a time on the call centre, which is the technical platform where the interviewers connect to potential participants. This method could be planned to obtain stratified representative samples.

In summary, I recommend two options for future larger scale studies on tobacco use in immigrants in France depending on the quantity of information required: a small focused resource of information (e.g. tobacco products prevalence) could be rapidly gathered through a field face-to-face survey in a combination of geographical areas and type of venues; a comprehensive resource of information in a representative sample of immigrants and/or natives could be collected via non-anonymous telephone surveys. Both methods give the potential for comparisons with the natives. These two methods can be an alternative to register-based studies in other European studies with adaptation to each country's specific legal and ethical conditions, allowing potentially for a European multi-centric study.

5 CONCLUSIONS

The landscape of European populations is increasingly changing; thus Europe has become a multicultural and multi-ethnic society. Alongside the positive effects of migration on European countries seen through the economic contribution of immigrants of working age, this change raises questions relating to the sustainability of European society's social models. In this vein, immigrant health represents a public health challenge to guarantee achievement of an individual's highest attainable health, equity and access to health care. Further, from an epidemiological point of view, research on immigrant health still

requires further investigation before comprehensive information is available, including tobacco use and associated tobacco-related morbidity and mortality.

Understanding the determinants of immigrant health outcomes is of major importance for several reasons. First, the right to the highest attainable health is a fundamental right stated in 1946, in the preamble of the constitution of the World Health Organization (Grad, 2002), and this come along with the principle of equity in health for the entire population. In addition, as immigrants are an increasingly important proportion of the EU population, more than 10% in 2014, they contribute significantly to the health status of the European populations. Finally, promoting and documenting the health of immigrants can also benefit to the natives, with lessons learned about the health protective factors associated with being an immigrant.

To further understand the association between health and the immigrant status, and to facilitate comparisons between countries, more research is required which should cover two aspects of data collection. On one hand, studies specially designed are needed that are culture-specific and when necessary using data collection instruments translated in the mother tongue of the target immigrant populations. On the other hand, in order to include immigrants in general surveys involving the whole population, as well as in registry-based studies, more validated instruments are needed, and larger sample size studies required.

As is common place in most epidemiologic surveys the sex and socio-economic conditions of respondents are included, this thesis has shown that all future studies focusing on immigrant populations should elicit information on the respondent's country of origin, length of stay in the host-country and, ideally, living conditions.

Our results support the findings previously established in the literature, e.g. lower incidence and mortality of TRC overall in the immigrants compared to the natives, large disparities in immigrants' TRC burden depending on country of birth and sex.

The two literature reviews outlined in Chapter 1 showed the lack of qualitative studies within the field of immigrant's health, and in particular of the tobacco burden in this population groups. This was also shown by Nielsen and Krasnik in a systematic review on self-perceived health in immigrants in Europe, in 2010, which identified only 17

publications from 5 EU countries (Nielsen and Krasnik, 2010). Nevertheless, the disadvantaged patterns for immigrants were clear. The TOBAMIG study presented in Chapter 2 has shown the feasibility to conduct a study on tobacco use in immigrants in France, provided modifications are done; the methodological remedies to address these points were discussed in the previous section (see above Recommendations). Despite its small sample size, the TOBAMIG study also observed a higher prevalence of smoking in immigrant men, as well as indication of a higher prevalence of waterpipe smoking. The use of smokeless tobacco was only observed in one respondent, but the reduced size of the pilot study do not allow for conclusions relating to this area.

In regard to cancer burden – whether morbidity or mortality – literature is less scarce on immigrants in European countries but very few have focused on outcomes relating to TRCs.

Our study on tobacco-related cancers incidence in Danish immigrants, presented in Chapter III, contributes to the gap in knowledge. We have shown that Danish immigrant men presented an overall lower risk of tobacco-related cancer incidence ($SIR=0.85$). Nevertheless, we observed that this reduction of incidence varied greatly by country of origin of immigrants and to a lesser extent between the 1st and 2nd generations. Thus in any future study, it is important to remember that immigrants constitute heterogeneous groups with respect to their ethnic features, cultural roots, and health behaviours, and therefore separate analyses for different immigrant groups is indicated.

Other studies have demonstrated that most immigrants in Europe are disadvantaged in regard to health as compared to the majority population even after controlling for age, sex and socio-economic factors (Nielsen and Krasnik, 2010). Though, immigrants seem to bear a double burden with the negative impact on health of immigrant status and socio-economic position.

Noticeably, a majority of studies on cancer in immigrants have been conducted in the Nordic countries, with the help of their registers – either population-based or cancer-specific registries. This observation indicates two research paths: on one hand, developing the cancer registries in the European countries will allow investigating the immigrants' cancer in other European countries; on the other hand, in established high-quality registers, improving the immigrant status variables to cover the regions of birth,

length of stay and other determinants to be assessed, would contribute to a better understanding of the immigrants' health issues.

We know that smoking contributes to health inequalities within the national populations. This thesis therefore provides elements to be considered to address the issue of immigrants' health and tobacco, both in a research perspective but also to elaborate public policies aiming at tackling health inequalities; and this last need to target the most affected groups of immigrants, according to their countries of origin.

The ultimate aim of the information collected through our investigation would be its usefulness in gauging if tobacco control measures in place in France are inclusive of the needs of minority groups that may differ from the general population.

Even if the current literature is scarce compared to the increasingly important size of the immigrant populations in Europe, many countries have actively integrated immigrant health into their health agendas. This is evidenced through the policies and public health interventions being implemented which are crucial addressing the immigrants' health behaviours as well as their access to healthcare. In particular, health professionals and stakeholders should be aware of the patterns of tobacco use in the immigrant populations as well as the tobacco-related cancer burden, as shown in this thesis, to adapt and improve existing prevention programs and develop new programs. Studies have observed that the smoking in immigrants evolved differently in men and women with acculturation: more acculturated women were more likely to smoke than less acculturated women; the contrary was observed in men (Reiss et al., 2014b). In this regard, prevention programs in immigrants should use different strategies in men and women, targeting respectively to reduce the smoking prevalence and to prevent initiation. In order to assess the effect of acculturation on the tobacco use patterns in immigrants, it is important to consider acculturation as a process starting in the country of origin. Therefore, studies addressing the smoking in immigrants need to consider the complexity of this process that only longitudinal studies can properly reveal the mechanisms and determinants in action.

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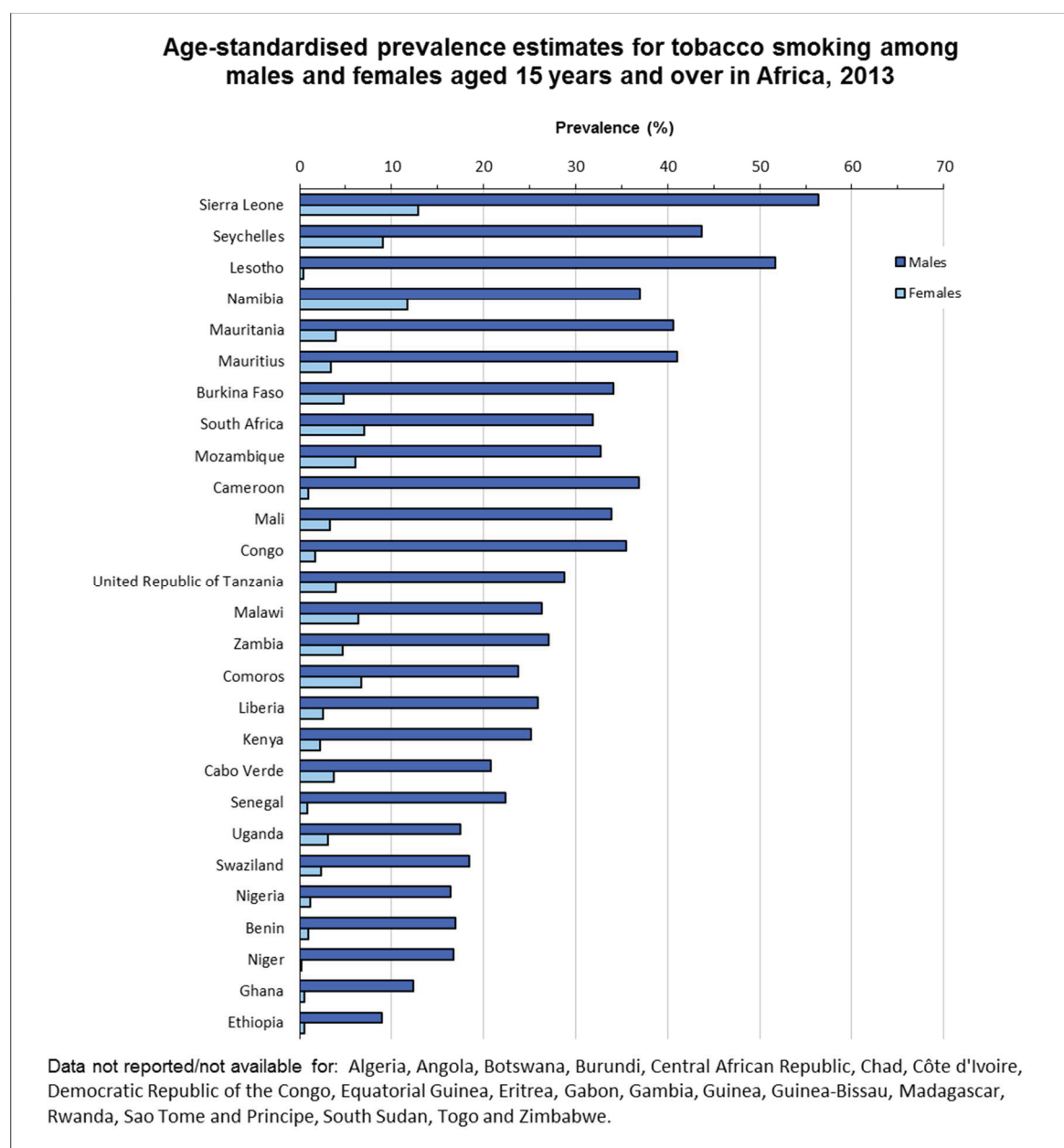
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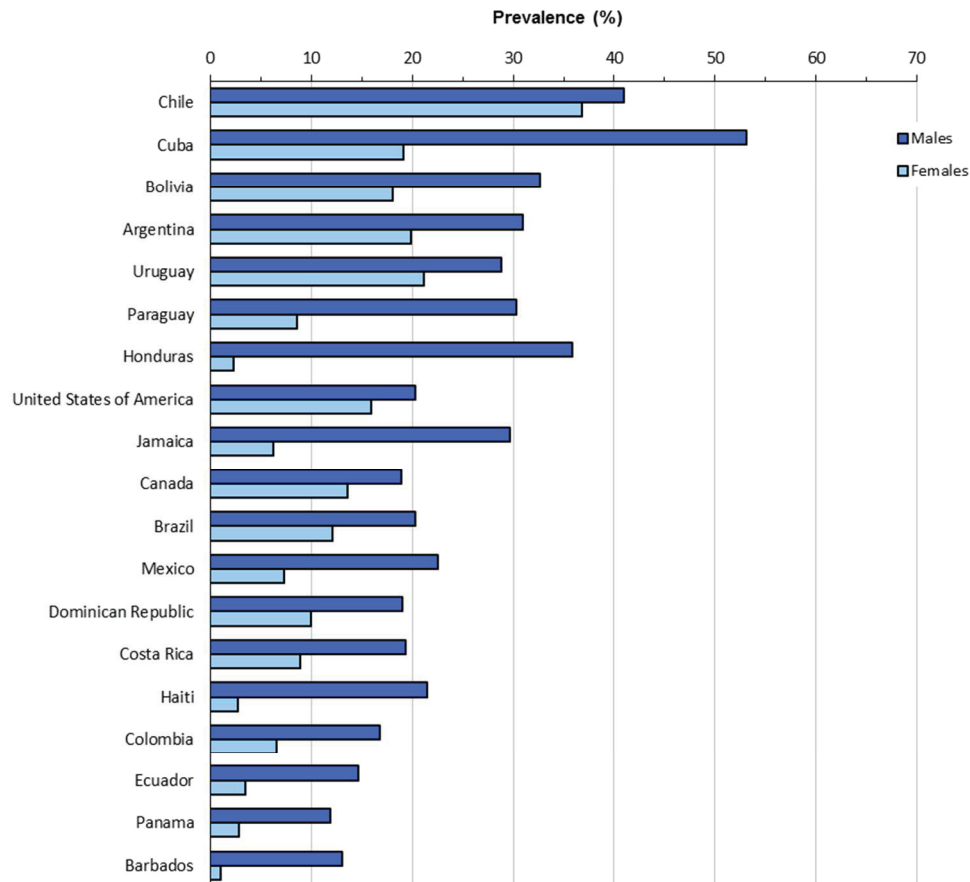
Appendices

Appendix 1: Comparable prevalence estimates for tobacco smoking 2013

Reprinted from WHO report on the global tobacco epidemic, 2015: raising taxes on tobacco, WHO, Appendix X Comparable prevalence estimates for tobacco smoking 2013, Copyright 2015.

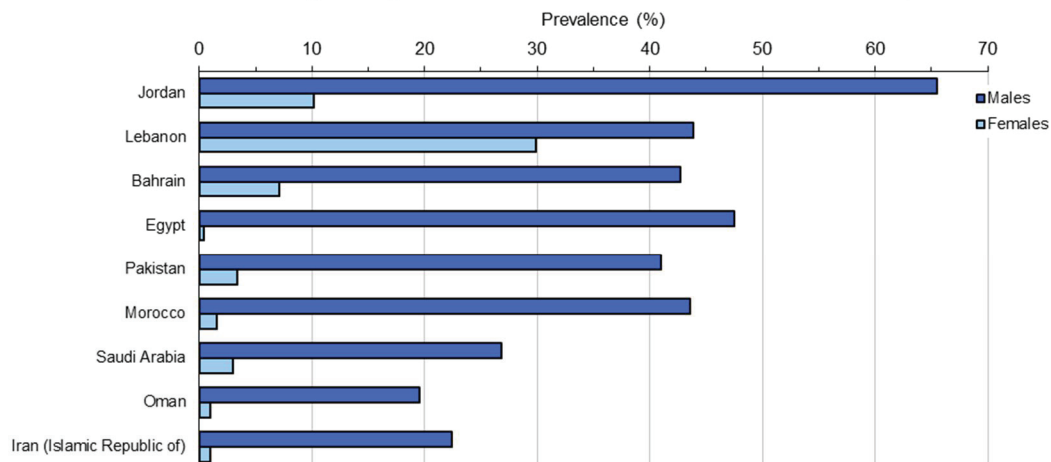


Age-standardised prevalence estimates for tobacco smoking among males and females aged 15 years and over in the Americas, 2013



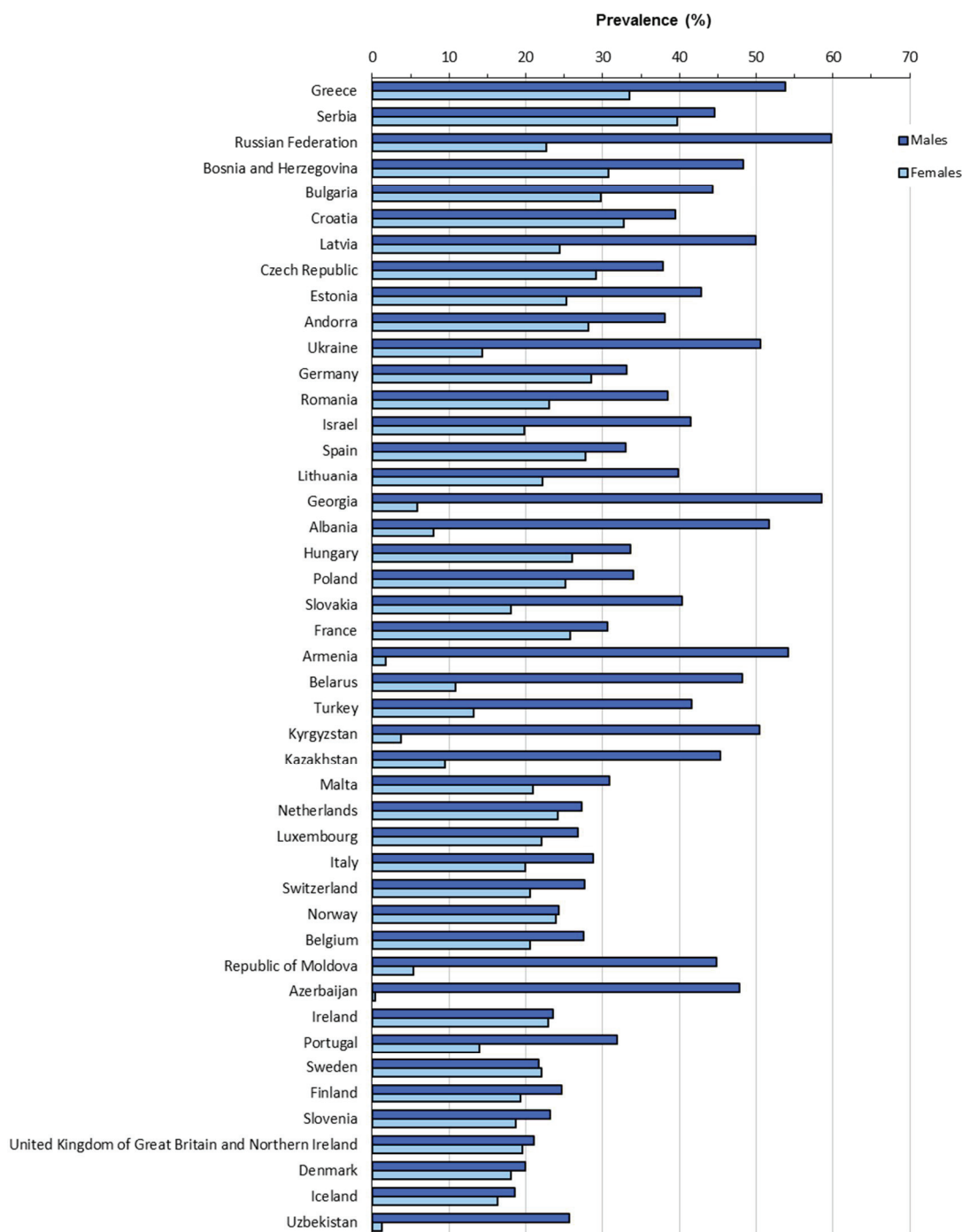
Data not reported/not available for: Antigua and Barbuda, Bahamas, Belize, Dominica, El Salvador, Grenada, Guatemala, Guyana, Nicaragua, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago and Venezuela (Bolivarian Republic of).

Age-standardised prevalence estimates for tobacco smoking among males and females aged 15 years and over in the Eastern Mediterranean, 2013



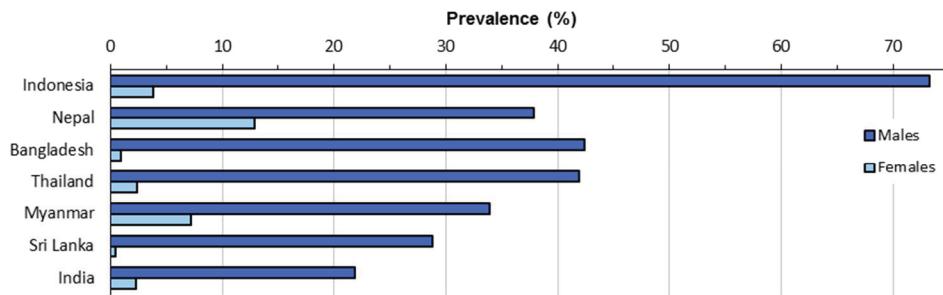
Data not reported/not available for: Afghanistan, Djibouti, Iraq, Kuwait, Libya, Qatar, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, West Bank and Gaza Strip and Yemen.

Age-standardised prevalence estimates for tobacco smoking among males and females aged 15 years and over in Europe, 2013



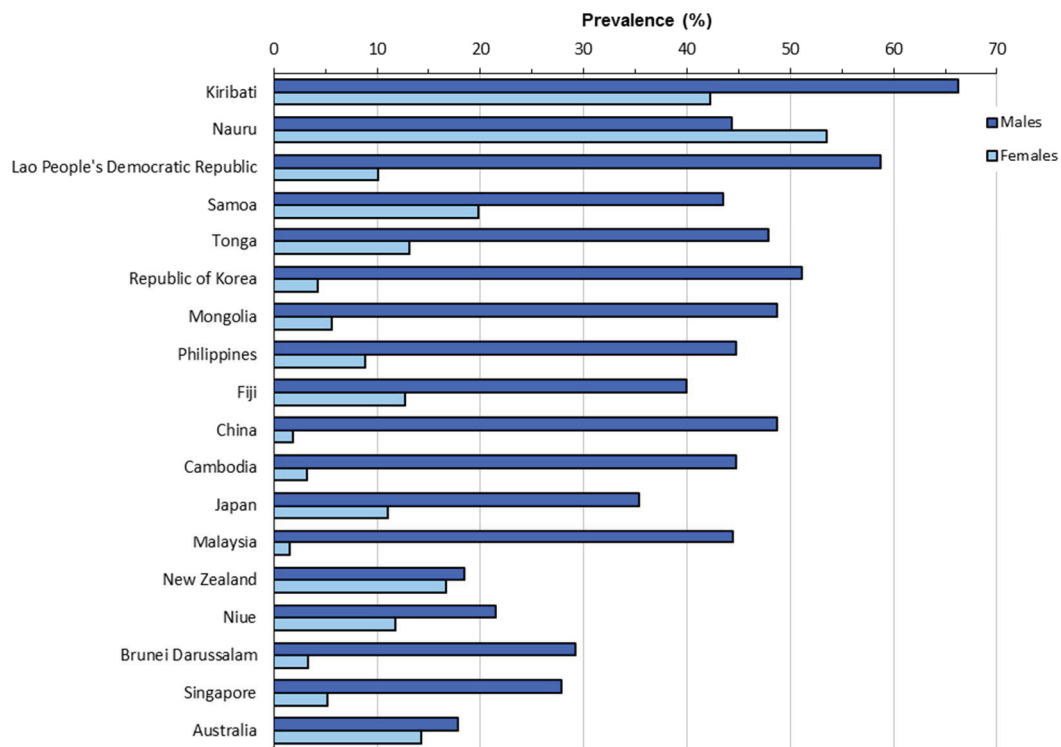
Data not reported/not available for: Cyprus, Monaco, Montenegro, San Marino, Tajikistan, The former Yugoslav Republic of Macedonia and Turkmenistan.

Age-standardised prevalence estimates for tobacco smoking among males and females aged 15 years and over in South-East Asia, 2013



Data not reported/not available for: Bhutan, Democratic People's Republic of Korea, Maldives and Timor-Leste.

Age-standardised prevalence estimates for tobacco smoking among males and females aged 15 years and over in the Western Pacific, 2013



Data not reported/not available for: Cook Islands, Marshall Islands, Micronesia (Federated States of), Palau, Papua New Guinea, Solomon Islands, Tuvalu and Vanuatu.

Appendix 2: TOBAMIG questionnaire



SURVEY ON TOBACCO USE IN THE LYON AREA

ANONYMOUS QUESTIONNAIRE

Thank you for agreeing to participate in this survey. This is an anonymous survey conducted by the International Agency for Research on Cancer in Lyon, a specialized agency of the World Health Organization. This survey will contribute to the development of health research by describing tobacco use in minority groups in France for which no information is currently available; it may also make possible better health services and prevention.

The quality of our study depends on the accuracy of your answers, so if you do not understand a question or if you do not want to answer, please tell me.

This questionnaire was built within the Environment and Radiation section of the International Agency for Research on Cancer, for the study on *Tobacco and migrant: a survey in the Lyon area*, Lyon 2013. This document was developed with the help of the questionnaires of the following studies:

- Beck F., Gautier A., dir. Baromètre cancer 2010. Saint-Denis : Inpes, coll. Baromètres santé, 2012 : 272 p.
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- Patrick SIMON, Martin CLÉMENT, Rapport de l'enquête « Mesure de la diversité ». Une enquête expérimentale pour caractériser l'origine, INED, 2006, 86 p. Documents de travail N° 139.

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Special thanks are due to Emmanuelle Béguinot from the Comité Nationale Contre le Tabagisme (CNCT, Paris) and Lubna Bhatti from the Tobacco Free Initiative, World Health Organization (TFI-WHO, Geneva) who kindly reviewed this questionnaire. Its final version, however, commits only its author.
The help of IARC staff in the Communication and Environment Groups who provided technical assistance is acknowledged.

The realization of this manual is financially supported by the Ligue Nationale Contre le Cancer (doctoral program of Mr. Ducarroz).

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A) ADMISSIBILITY CRITERIA

A1. Have you been contacted and participated in a similar survey in recent weeks?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 7

INT: [IF YES OR DON'T KNOW, **EXCLUSION → SKIP TO INCLUSION BOX**]

A2. What is the month and year of your date of birth?

MONTH:

--	--

 [IF DON'T KNOW, ENTER 77]
 YEAR:

--	--	--	--

 [IF DON'T KNOW, ENTER 7777]

INT: [IF MONTH=77 OR YEAR=7777 IN A2, ASK A3. OTHERWISE SKIP TO A4.
 IF MORE RECENT THAN MAY 1995 (UNDER 18 YO), **EXCLUSION → SKIP TO INCLUSION BOX**]

A3. How old are you?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD AN ANSWER]

--	--

 YEARS OLD

INT: [IF UNDER 18 YEARS, **EXCLUSION → SKIP TO INCLUSION BOX**]

A4. In which municipality do you currently live?

INT: [READ THE LIST BELOW ONLY IF RESPONDENT DOES NOT KNOW THE MUNICIPALITY]

Décines-Charpieu <input type="checkbox"/> 1	Saint-Fons <input type="checkbox"/> 4	Other <input type="checkbox"/> 99
Lyon 8 ^{ème} arrondissement <input type="checkbox"/> 2	Vaulx-en-Velin <input type="checkbox"/> 5	
Rillieux-la-Pape <input type="checkbox"/> 3	Vénissieux <input type="checkbox"/> 6	

INT: [IF A4 = 99, **EXCLUSION → SKIP TO INCLUSION BOX**]

A5. Respondent:

A5.1. In which country were you born?

Algeria	<input type="checkbox"/> 1	
Morocco	<input type="checkbox"/> 2	
Tunisia	<input type="checkbox"/> 3	
Other African countries	<input type="checkbox"/> 4	SPECIFY _____
Turkey	<input type="checkbox"/> 5	
Other Asian countries	<input type="checkbox"/> 6	SPECIFY _____
Other (The Americas, Australia)	<input type="checkbox"/> 7	SPECIFY _____
France	<input type="checkbox"/> 8	
Other European countries	<input type="checkbox"/> 9	SPECIFY _____
Don't know	<input type="checkbox"/> 77	

A5.2. What was your nationality at birth?

- | | | | |
|------------------------------|--------------------------|----|---------------|
| Algerian | <input type="checkbox"/> | 1 | |
| Moroccan | <input type="checkbox"/> | 2 | |
| Tunisian | <input type="checkbox"/> | 3 | |
| Other African | <input type="checkbox"/> | 4 | SPECIFY _____ |
| Turkish | <input type="checkbox"/> | 5 | |
| Other Asian | <input type="checkbox"/> | 6 | SPECIFY _____ |
| Other (American, Australian) | <input type="checkbox"/> | 7 | SPECIFY _____ |
| French | <input type="checkbox"/> | 8 | |
| Other European | <input type="checkbox"/> | 9 | SPECIFY _____ |
| Don't know | <input type="checkbox"/> | 77 | |

A5.3. Did you have another nationality at birth?

- YES ☐ 1
NO ☐ 2 → SKIP TO QUESTION A5.5

A5.4. What was/were your other nationality/nationalities at birth?

INT: [MULTIPLE ANSWERS POSSIBLE]

- | | | | |
|------------------------------|--------------------------|----|---------------|
| Algerian | <input type="checkbox"/> | 1 | |
| Moroccan | <input type="checkbox"/> | 2 | |
| Tunisian | <input type="checkbox"/> | 3 | |
| Other African | <input type="checkbox"/> | 4 | SPECIFY _____ |
| Turkish | <input type="checkbox"/> | 5 | |
| Other Asian | <input type="checkbox"/> | 6 | SPECIFY _____ |
| Other (American, Australian) | <input type="checkbox"/> | 7 | SPECIFY _____ |
| French | <input type="checkbox"/> | 8 | |
| Other European | <input type="checkbox"/> | 9 | SPECIFY _____ |
| Don't know | <input type="checkbox"/> | 77 | |

INT: [IF RESPONDENT IS AN ELIGIBLE IMMIGRANT (A5.1=1-7 AND (A5.2=1-7 OR A5.4=1-7)) ASK QUESTIONS A5.5-A5.7; OTHERWISE SKIP TO QUESTION A6]

A5.5. When did you arrive in France?

- MONTH:

--	--

 [IF DON'T KNOW, ENTER 77]
YEAR:

--	--	--	--

 [IF DON'T KNOW, ENTER [7777]

INT: [IF MONTH=77 OR YEAR=7777, ASK A5.6. OTHERWISE SKIP TO A6
IF RESIDING IN FRANCE FOR AT LEAST 1 YEAR, **INCLUSION → SKIP TO INCLUSION BOX**]

A5.6. How old were you when you arrived?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD AN ANSWER]

--	--	--

 YEARS OLD

INT: [CALCULATE THE TIME OF RESIDENCY WITH A2-A3, IF RESIDING IN FRANCE FOR AT LEAST 1 YEAR, **INCLUSION → SKIP TO INCLUSION BOX**]

A5.7. INT: [WAS RESPONSE ESTIMATED?]

YES ☐ 1
NO ☐ 2

INT: [IF RESPONDENT WAS BORN IN FRANCE (A5.1 = 8) PROCEED WITH A6; OTHERWISE
EXCLUSION → SKIP TO INCLUSION BOX]

A6. Respondent's father:

A6.1. In which country was your father born?

Algeria	<input type="checkbox"/>	1	
Morocco	<input type="checkbox"/>	2	
Tunisia	<input type="checkbox"/>	3	
Other African countries	<input type="checkbox"/>	4	SPECIFY _____
Turkey	<input type="checkbox"/>	5	
Other Asian countries	<input type="checkbox"/>	6	SPECIFY _____
Other (The Americas, Australia)	<input type="checkbox"/>	7	SPECIFY _____
France	<input type="checkbox"/>	8	
Other European countries	<input type="checkbox"/>	9	SPECIFY _____
Don't know	<input type="checkbox"/>	77	

A6.2. What was his nationality at birth?

Algerian	<input type="checkbox"/>	1	
Moroccan	<input type="checkbox"/>	2	
Tunisian	<input type="checkbox"/>	3	
Other African	<input type="checkbox"/>	4	SPECIFY _____
Turkish	<input type="checkbox"/>	5	
Other Asian	<input type="checkbox"/>	6	SPECIFY _____
Other (American, Australian)	<input type="checkbox"/>	7	SPECIFY _____
French	<input type="checkbox"/>	8	
Other European	<input type="checkbox"/>	9	SPECIFY _____
Don't know	<input type="checkbox"/>	77	

A6.3. Did he have another nationality at birth?

YES ☐ 1
NO ☐ 2 → SKIP TO A6.5

A6.4. What was/were his other nationality/nationalities at birth?

INT: [MULTIPLE ANSWERS POSSIBLE]

Algerian	<input type="checkbox"/>	1	
Moroccan	<input type="checkbox"/>	2	
Tunisian	<input type="checkbox"/>	3	
Other African	<input type="checkbox"/>	4	SPECIFY _____
Turkish	<input type="checkbox"/>	5	
Other Asian	<input type="checkbox"/>	6	SPECIFY _____
Other (American, Australian)	<input type="checkbox"/>	7	SPECIFY _____
French	<input type="checkbox"/>	8	
Other European	<input type="checkbox"/>	9	SPECIFY _____

Don't know

☐ 77

INT: [IF RESPONDENT'S FATHER IS AN ELIGIBLE IMMIGRANT (A6.1=1-7 AND (A6.2=1-7 OR A6.4=1-7))
ASK QUESTIONS A6.5-A6.9; OTHERWISE SKIP TO QUESTION A7]

A6.5. What is his year of birth?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A6.6. OTHERWISE SKIP TO A6.7]

A6.6. How old is he?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD AN ANSWER]

YEARS OLD

A6.7. When did he arrive in France?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A6.8 AND A6.9 OTHERWISE SKIP TO A7]

A6.8. How old was he when he arrived?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD THE ANSWER]

YEARS OLD

A6.9. INT: [WAS RESPONSE ESTIMATED?]

YES ☐ 1
NO ☐ 2

A7. Respondent's mother:

A7.1. In which country was your mother born?

Algeria	<input type="checkbox"/>	1	
Morocco	<input type="checkbox"/>	2	
Tunisia	<input type="checkbox"/>	3	
Other African countries	<input type="checkbox"/>	4	SPECIFY _____
Turkey	<input type="checkbox"/>	5	
Other Asian countries	<input type="checkbox"/>	6	SPECIFY _____
Other (The Americas, Australia)	<input type="checkbox"/>	7	SPECIFY _____
France	<input type="checkbox"/>	8	
Other European countries	<input type="checkbox"/>	9	SPECIFY _____
Don't know	<input type="checkbox"/>	77	

Don't know

☐ 77

INT: [IF RESPONDENT'S FATHER IS AN ELIGIBLE IMMIGRANT (A6.1=1-7 AND (A6.2=1-7 OR A6.4=1-7))
ASK QUESTIONS A6.5-A6.9; OTHERWISE SKIP TO QUESTION A7]

A6.5. What is his year of birth?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A6.6. OTHERWISE SKIP TO A6.7]

A6.6. How old is he?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD AN ANSWER]

YEARS OLD

A6.7. When did he arrive in France?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A6.8 AND A6.9 OTHERWISE SKIP TO A7]

A6.8. How old was he when he arrived?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD THE ANSWER]

YEARS OLD

A6.9. INT: [WAS RESPONSE ESTIMATED?]

YES ☐ 1
NO ☐ 2

A7. Respondent's mother:

A7.1. In which country was your mother born?

Algeria	<input type="checkbox"/>	1	
Morocco	<input type="checkbox"/>	2	
Tunisia	<input type="checkbox"/>	3	
Other African countries	<input type="checkbox"/>	4	SPECIFY _____
Turkey	<input type="checkbox"/>	5	
Other Asian countries	<input type="checkbox"/>	6	SPECIFY _____
Other (The Americas, Australia)	<input type="checkbox"/>	7	SPECIFY _____
France	<input type="checkbox"/>	8	
Other European countries	<input type="checkbox"/>	9	SPECIFY _____
Don't know	<input type="checkbox"/>	77	

A7.2. What was her nationality at birth?

- | | | | |
|------------------------------|--------------------------|----|---------------|
| Algerian | <input type="checkbox"/> | 1 | |
| Moroccan | <input type="checkbox"/> | 2 | |
| Tunisian | <input type="checkbox"/> | 3 | |
| Other African | <input type="checkbox"/> | 4 | SPECIFY _____ |
| Turkish | <input type="checkbox"/> | 5 | |
| Other Asian | <input type="checkbox"/> | 6 | SPECIFY _____ |
| Other (American, Australian) | <input type="checkbox"/> | 7 | SPECIFY _____ |
| French | <input type="checkbox"/> | 8 | |
| Other European | <input type="checkbox"/> | 9 | SPECIFY _____ |
| Don't know | <input type="checkbox"/> | 77 | |

A7.3. Did she have another nationality at birth?

- YES ☐ 1
- NO ☐ 2 → **SKIP TO A7.5**

A7.4. What was/were her other nationality/nationalities at birth?

INT: [MULTIPLE ANSWERS POSSIBLE]

- | | | | |
|------------------------------|--------------------------|----|---------------|
| Algerian | <input type="checkbox"/> | 1 | |
| Moroccan | <input type="checkbox"/> | 2 | |
| Tunisian | <input type="checkbox"/> | 3 | |
| Other African | <input type="checkbox"/> | 4 | SPECIFY _____ |
| Turkish | <input type="checkbox"/> | 5 | |
| Other Asian | <input type="checkbox"/> | 6 | SPECIFY _____ |
| Other (American, Australian) | <input type="checkbox"/> | 7 | SPECIFY _____ |
| French | <input type="checkbox"/> | 8 | |
| Other European | <input type="checkbox"/> | 9 | SPECIFY _____ |
| Don't know | <input type="checkbox"/> | 77 | |

INT: [IF RESPONDENT'S MOTHER IS AN ELIGIBLE IMMIGRANT (A7.1=1-6 AND (A7.2=1-5 OR A7.4=1-7))
ASK QUESTIONS A7.5-A7.9; OTHERWISE CONTINUE WITH INCLUSION BOX]

A7.5. What is her year of birth?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A7.6. OTHERWISE SKIP TO A7.7]

A7.6. How old is she?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD AN ANSWER]

YEARS OLD

A7.7. When did she arrive in France?

YEAR: [IF DON'T KNOW, ENTER 7777]

INT: [IF YEAR=7777, ASK A7.8 AND A7.9. OTHERWISE SKIP TO INCLUSION BOX]

A7.8. How old was she when she arrived?

INT: [IF RESPONDENT IS UNSURE, PROBE FOR AN ESTIMATE AND RECORD THE ANSWER]

YEARS OLD

A7.9. INT: [WAS RESPONSE ESTIMATED?]

YES ☐ 1
NO ☐ 2

INCLUSION OF ELIGIBLE RESPONDENT

INT: [TICK THE BOX CORRESPONDING TO THE ELIGIBLE RESPONDENT'S PROFIL]

RESPONDENT	IF A5.1=1-7 AND (A5.2=1-7 OR A5.4=1-7) (RESPONDENT IMMIGRANT), AND A5.5 ≤ Sept. 2011 OR [(A2 OR A3) – A5.6] ≥ 1 YEAR (RESIDING IN FRANCE FOR AT LEAST 1 YEAR)	<input type="checkbox"/> 1
-------------------	---	----------------------------

OR

FATHER	IF A5.1=8 (RESPONDENT BORN IN FRANCE) AND A6.1=1-7 AND (A6.2=1-7 OR A6.4=1-7) (FATHER IMMIGRANT),	<input type="checkbox"/> 2
---------------	--	----------------------------

OR

MOTHER	IF A5.1=8 (RESPONDENT BORN IN FRANCE) AND A7.1=1-7 AND (A7.2=1-7 OR A7.4=1-7) (MOTHER IMMIGRANT),	<input type="checkbox"/> 3
---------------	--	----------------------------

NON-ELIGIBLE ☐ 4

→ [THANK RESPONDENT AND INFORM THEM THAT THE INTERVIEW HAS ENDED;
FILL IN LAST PAGE OF THE QUESTIONNAIRE]

B) IDENTIFICATION AND CONSENT

B1. Questionnaire ID number _____

B2. Date of interview (dd-mm-yyyy) [] [] - [] [] - [] [] [] []

B3. Interviewer name _____

B4. Type of venue

- | | | |
|------------------------|--------------------------|---|
| ADOMA RESIDENCE | <input type="checkbox"/> | 1 |
| ARALIS RESIDENCE | <input type="checkbox"/> | 2 |
| BAR/RESTAURANT | <input type="checkbox"/> | 3 |
| MARKET | <input type="checkbox"/> | 4 |
| MJC | <input type="checkbox"/> | 5 |
| PHONE PARLOUR | <input type="checkbox"/> | 6 |
| SCHOOL | <input type="checkbox"/> | 7 |
| HIGHER EDUCATION | <input type="checkbox"/> | 8 |

CONSENT [READ TO THE SELECTED RESPONDENT]

I am working with the International Agency for Research on Cancer in Lyon, an agency of the World Health Organization. This institution is collecting information about tobacco use in migrants residing in France. This information will be used to determine how rare or common tobacco use is in this group of the French population, what products are used and what people know about tobacco as this information is very valuable for future health promotion and research.

At this site we are trying to contact people willing to participate in the survey. Your responses are very important to us and the community, as these answers will represent those of many other people. Your participation in this survey is entirely voluntary. This is an anonymous survey so your identity is not revealed and can't be matched to your responses. You can withdraw from the survey at any time, and may refuse to answer any question, without any consequence.

If you have questions about this survey, you can contact the responsible person at our institution at the following telephone number: Dr M. LEON-ROUX, 04 72 73 81 71.

This pilot study has been reviewed and approved by the International Agency for Research on Cancer Ethical Committee, and the protocol and questionnaire have been submitted to the Commission Nationale de l'Informatique et des Libertés (CNIL) review committee, which is a committee whose task is to make sure that research participants are protected from harm as a result of participation in research studies.

If you agree to participate and this time is convenient for you, we will conduct a private interview with you lasting about 35 minutes.

B5. QUESTIONNAIRE LANGUAGE

- | | | |
|---------------|--------------------------|---|
| ENGLISH | <input type="checkbox"/> | 1 |
| FRENCH | <input type="checkbox"/> | 2 |

B6. TIME INTERVIEW BEGINS

____ : ____ [24-HOUR CLOCK, HRS: MINS]

C) BACKGROUND CHARACTERISTICS

INTRO: I am going to first ask you a few questions about your background.

C1. INT: [RECORD GENDER FROM OBSERVATION. ASK IF NECESSARY]

MALE ☐ 1
FEMALE ☐ 2

C2. CURRENTLY, WHAT IS YOUR MARITAL STATUS?

Married ☐ 1
Divorced ☐ 2
Widowed ☐ 3
Separated ☐ 4
Single/Never married ☐ 5
Cohabitant (including PACS) ☐ 6
Refuse to answer ☐ 99

C3. CURRENTLY, HOW MANY ADULTS AND CHILDREN ARE LIVING IN YOUR HOUSE?

<input type="text"/>	<input type="text"/>	ADULTS
<input type="text"/>	<input type="text"/>	CHILDREN (UNDER 18 YEARS)

C4. WHAT IS THE HIGHEST LEVEL OF EDUCATION YOU HAVE COMPLETED?

INT: [SELECT ONLY ONE CATEGORY]

NO FORMAL SCHOOLING ☐ 1
PRIMARY SCHOOL PARTIALLY COMPLETED ☐ 2
PRIMARY SCHOOL FULLY COMPLETED ☐ 3
SECONDARY SCHOOL PARTIALLY COMPLETED ☐ 4
SECONDARY SCHOOL FULLY COMPLETED ☐ 5
HIGH SCHOOL COMPLETED ☐ 6
COLLEGE/UNIVERSITY COMPLETED ☐ 7
POSTGRADUATE DEGREE COMPLETED ☐ 8
DON'T KNOW ☐ 77
REFUSE TO ANSWER ☐ 99

C5. WHICH OF THE FOLLOWING BEST DESCRIBES YOUR MAIN WORK STATUS OVER THE PAST 12 MONTHS? GOVERNMENT EMPLOYEE, NON-GOVERNMENT EMPLOYEE, SELF-EMPLOYED, STUDENT, HOMEMAKER, RETIRED, UNEMPLOYED-ABLE TO WORK, OR UNEMPLOYED-UNABLE TO WORK?

INT: [INCLUDE SUBSISTENCE FARMING AS SELF-EMPLOYED]

GOVERNMENT EMPLOYEE ☐ 1
NON-GOVERNMENT EMPLOYEE ☐ 2
SELF-EMPLOYED ☐ 3
STUDENT ☐ 4
HOMEMAKER ☐ 5
RETIRED ☐ 6

UNEMPLOYED, ABLE TO WORK..... ☐ 7
 UNEMPLOYED, UNABLE TO WORK..... ☐ 8
 DON'T KNOW ☐ 77
 REFUSE TO ANSWER ☐ 99

C6. WHAT IS YOUR MOTHER TONGUE?

INT: [DO NOT READ ITEMS]

FRENCH..... ☐ 1
 ARABIC..... ☐ 2
 TURKISH..... ☐ 3
 OTHER..... ☐ 4 → SPECIFY: _____

INT: [IF C6 = 2-4, ASK C7. OTHERWISE SKIP TO C8]

C7. WHICH OF THE FOLLOWING STATEMENTS BEST DESCRIBES YOUR SITUATION?

I do not speak French well; it bothers me to have to speak in French..... ☐ 1
 I do not speak French well; it does not bother me to have to speak in French..... ☐ 2
 I speak French fairly well; it bothers me to have to speak in French..... ☐ 3
 I speak French fairly well; it does not bother me to have to speak in French..... ☐ 4

C8. HOW WELL DO YOU READ FRENCH?

GOOD..... ☐ 1
 FAIR..... ☐ 2
 POOR..... ☐ 3
 CANNOT READ..... ☐ 3

C9. WITH WHICH (ETHNIC) GROUP(S) DO YOU MOST IDENTIFY?

FRENCH..... ☐ 1
 EUROPEAN..... ☐ 2
 NORTH AFRICAN..... ☐ 3
 OTHER AFRICAN..... ☐ 4
 ASIAN..... ☐ 5
 ANY OTHER..... ☐ 6 → SPECIFY: _____

C10. CURRENTLY, WOULD YOU SAY THAT WITH RESPECT TO RELIGION, YOU HAVE:

A regular religious practice..... ☐ 1
 An occasional religious practice..... ☐ 2
 No practice, but a sense of belonging to a religion..... ☐ 3
 Neither a practice nor a sense of belonging to a religion..... ☐ 4
 DON'T KNOW..... ☐ 77
 REFUSE TO ANSWER..... ☐ 99

D) TOBACCO SMOKING

INTRO: I would now like to ask you some questions about manufactured and hand-rolled cigarettes, cigars, pipes, cheroots, and cigarillos. You will be asked later about shisha (nargile) and smokeless tobacco.

D1. *Currently* do you smoke any tobacco on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → [SKIP TO D3]
LESS THAN DAILY ☐ 2
NOT AT ALL ☐ 3 → [SKIP TO D4]
DON'T KNOW ☐ 7 → [SKIP TO NEXT SECTION]

D2. *In the past*, have you smoked tobacco on a daily basis?

- YES ☐ 1 → [SKIP TO D13]
NO ☐ 2 → [SKIP TO D15]
DON'T KNOW ☐ 7 → [SKIP TO D15]

D3. *In the past*, have you smoked tobacco less than daily?

- YES ☐ 1 → [SKIP TO D5]
NO ☐ 2 → [SKIP TO D7]
DON'T KNOW ☐ 7 → [SKIP TO D7]

D4. *In the past*, have you smoked tobacco on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → [SKIP TO D22]
LESS THAN DAILY ☐ 2 → [SKIP TO D24]
BOTH ☐ 3 → [SKIP TO D20]
NOT AT ALL ☐ 4 → [SKIP TO NEXT SECTION]
DON'T KNOW ☐ 7 → [SKIP TO NEXT SECTION]

CURRENT DAILY TOBACCO SMOKERS

D5. How old were you when you first started smoking tobacco *less than daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF D5 = 99, ASK D6 OTHERWISE SKIP TO D7]

D6. How many years ago did you first start smoking tobacco *less than daily*?

D7. How old were you when you first started smoking tobacco *daily*?

[IF DON'T KNOW ENTER 99]

INT: [IF D7 = 99, ASK D8 OTHERWISE SKIP TO D9]

D8. How many years ago did you first start smoking tobacco *daily*?

D9. *Currently*, how much of the following products do you smoke on average per day? Also, let me know if you smoke the product, but not every day.

INT: [IF RESPONDENT REPORTS SMOKING THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.

IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFETIME, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFE.

IF RESPONDENT REPORTS IN PACKS OR CARTONS, PROBE TO FIND OUT HOW MANY UNITS ARE IN EACH AND CALCULATE THE CORRESPONDING TOTAL NUMBER.

IF RESPONDENT DOES NOT SMOKE A GIVEN PRODUCT, MARK IT OUT]

a. Manufactured cigarettes?				PER DAY
a1. [IF D9a=888] On average, how many manufactured cigarettes do you currently smoke each week?				PER WEEK
a2. [IF D9a1=888] If only a few manufactured cigarettes smoked in lifetime, indicate how many				TIMES
b. Hand-rolled cigarettes?				PER DAY
b1. [IF D9b=888] On average, how many hand-rolled cigarettes do you currently smoke each week?				PER WEEK
b2. [IF D9b1=888] If only a few hand-rolled cigarettes smoked in lifetime, indicate how many				TIMES
c. Cigars?				PER DAY
c1. [IF D9c=888] On average, how many cigars do you currently smoke each week?				PER WEEK
c2. [IF D9c1=888] If only a few cigars smoked in lifetime, indicate how many				TIMES
d. Pipes full of tobacco?				PER DAY

d1. [IF D9d=888] On average, how many pipes full of tobacco do you currently smoke each week?				PER WEEK
d2. [IF D9d1=888] If only a few pipes full of tobacco smoked in lifetime, indicate how many				TIMES
e. Cheroots or cigarillos?				PER DAY
e1. [IF D9e=888] On average, how many cheroots or cigarillos do you currently smoke each week?				PER WEEK
e2. [IF D9e1=888] If only a few cheroots or cigarillos smoked in lifetime, indicate how many				TIMES
f. Any others? → f1. Specify type: _____				PER DAY
f2. [IF D9f=888] On average, how many [FILL IN PRODUCT] do you currently smoke each week?				PER WEEK
f3. [IF D9f2=888] If only a few [FILL IN PRODUCT] smoked in lifetime, indicate how many				TIMES

D10. *Throughout your tobacco smoking history* (including non-daily smoking period, if any), how much of the following products did you smoke on average per day? Also, let me know if you smoked the product less than daily, on average.

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME.

IF RESPONDENT REPORTS IN PACKS OR CARTONS, PROBE TO FIND OUT HOW MANY UNITS ARE IN EACH AND CALCULATE THE CORRESPONDING TOTAL NUMBER.

IF RESPONDENT HAS NOT SMOKED A GIVEN PRODUCT, MARK IT OUT]

a. Manufactured cigarettes?				PER DAY
a1. [IF D10a=888] On average, how many manufactured cigarettes did you smoke each week?				PER WEEK
a2. [IF D10a1=888] If only a few manufactured cigarettes smoked in lifetime, indicate how many				TIMES
b. Hand-rolled cigarettes?				PER DAY
b1. [IF D10b=888] On average, how many hand-rolled cigarettes did you smoke each week?				PER WEEK
b2. [IF D10b1=888] If only a few hand-rolled cigarettes smoked in lifetime, indicate how many				TIMES
c. Cigars?				PER DAY
c1. [IF D10c=888] On average, how many cigars did you smoke each week?				PER WEEK
c2. [IF D10c1=888] If only a few cigars smoked in lifetime, indicate how many				TIMES
d. Pipes full of tobacco?				PER DAY
d1. [IF D10d=888] On average, how many pipes full of tobacco did you smoke each week?				PER WEEK
d2. [IF D10d1=888] If only a few pipes full of tobacco smoked in lifetime, indicate how many				TIMES
e. Cheroots or cigarillos?				PER DAY
e1. [IF D10e=888] On average, how many cheroots or cigarillos did you smoke each week?				PER WEEK
e2. [IF D10e1=888] If only a few cheroots or cigarillos smoked in lifetime, indicate how many				TIMES

f. Any others? → f1. Specify type: _____				PER DAY
f2. [IF D10f=888] On average, how many [FILL IN PRODUCT] did you smoke each week?				PER WEEK
f3. [IF D10f2=888] If only a few [FILL IN PRODUCT] smoked in lifetime, indicate how many				TIMES

D11. How soon after you wake up do you usually have your first smoke? Would you say within 5 minutes, 6 to 30 minutes, 31 to 60 minutes, or more than 60 minutes?

- WITHIN 5 MINUTES..... ☐ 1
 6 TO 30 MINUTES ☐ 2
 31 TO 60 MINUTES ☐ 3
 MORE THAN 60 MINUTES ☐ 4
 REFUSE TO ANSWER ☐ 99

D12. Do you inhale the smoke?

- YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

INT: [SKIP TO NEXT SECTION]

CURRENT LESS-THAN-DAILY TOBACCO SMOKERS

D13. How old were you when you first started smoking tobacco *daily*?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF D13 = 99, ASK D14. OTHERWISE SKIP TO D15]

D14. How many years ago did you first start smoking tobacco *daily*?

--	--

D15. How old were you when you first started smoking tobacco *less than daily*?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF D15 = 99, ASK D16. OTHERWISE SKIP TO D17]

D16. How many years ago did you first start smoking tobacco *less than daily*?

--	--

D17. *Currently*, how much of the following products do you smoke during a usual week?

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT *WITHIN THE PAST 30 DAYS*, BUT LESS THAN ONCE PER WEEK, ENTER 888
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME.

IF RESPONDENT REPORTS IN PACKS OR CARTONS, PROBE TO FIND OUT HOW MANY UNITS ARE IN EACH AND CALCULATE THE CORRESPONDING TOTAL NUMBER.

IF RESPONDENT DOES NOT SMOKE A GIVEN PRODUCT, MARK IT OUT]

a. Manufactured cigarettes?				PER WEEK
a1. [IF D17a=888] If only a few manufactured cigarettes smoked in lifetime, indicate how many				TIMES
b. Hand-rolled cigarettes?				PER WEEK
b1. [IF D17b=888] If only a few hand-rolled cigarettes smoked in lifetime, indicate how many				TIMES
c. Cigars?				PER WEEK
c1. [IF D17c=888] If only a few cigars smoked in lifetime, indicate how many				TIMES
d. Pipes full of tobacco?				PER WEEK
d1. [IF D17d=888] If only a few pipes full of tobacco smoked in lifetime, indicate how many				TIMES
e. Cheroots or cigarillos?				PER WEEK
e1. [IF D17e=888] If only a few cheroots or cigarillos smoked in lifetime, indicate how many				TIMES

f. Any others? → f1. Specify type: _____				PER WEEK
f2. [IF D17f=888] If only a few [FILL IN PRODUCT] smoked in lifetime, indicate how many				TIMES

D18. *Throughout your tobacco smoking history* (including daily smoking period, if any), how much of the following products did you smoke on average per week?

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT *AT LEAST ONCE PER MONTH*, BUT LESS THAN ONCE PER WEEK, ENTER 888
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME.

IF RESPONDENT REPORTS IN PACKS OR CARTONS, PROBE TO FIND OUT HOW MANY UNITS ARE IN EACH AND CALCULATE THE CORRESPONDING TOTAL NUMBER.

IF RESPONDENT DOES NOT SMOKE A GIVEN PRODUCT, MARK IT OUT]

a. Manufactured cigarettes?				PER WEEK
a1. [IF D18a=888] If only a few manufactured cigarettes smoked in lifetime, indicate how many				TIMES
b. Hand-rolled cigarettes?				PER WEEK
b1. [IF D18b=888] If only a few hand-rolled cigarettes smoked in lifetime, indicate how many				TIMES
c. Cigars?				PER WEEK
c1. [IF D18c=888] If only a few cigars smoked in lifetime, indicate how many				TIMES
d. Pipes full of tobacco?				PER WEEK
d1. [IF D18d=888] If only a few pipes full of tobacco smoked in lifetime, indicate how many				TIMES
e. Cheroots or cigarillos?				PER WEEK
e1. [IF D18e=888] If only a few cheroots or cigarillos smoked in lifetime, indicate how many				TIMES
f. Any others? → f1. Specify type: _____				PER WEEK
f2. [IF D18f=888] If only a few [FILL IN PRODUCT] smoked in lifetime, indicate how many				TIMES

D19. Do you inhale the smoke?

YES ☐ 1
NO ☐ 2
DONT KNOW ☐ 77

INT: [SKIP TO NEXT SECTION]

FORMER TOBACCO SMOKERS

D20. How old were you when you first started smoking tobacco *less than daily*?

--	--

 [IF DON'T KNOW, ENTER 99]

INT: [IF D20 = 99, ASK D21 OTHERWISE SKIP TO D22]

D21. How many years ago did you first start smoking tobacco *less than daily*?

--	--

D22. How old were you when you first started smoking tobacco *daily*?

--	--

 [IF DON'T KNOW, ENTER 99]

INT: [IF D22 = 99, ASK D23 OTHERWISE SKIP TO D26]

D23. How many years ago did you first start smoking tobacco *daily*?

--	--

INT: [SKIP TO D26]

D24. How old were you when you first started smoking tobacco *less than daily*?

--	--

 [IF DON'T KNOW, ENTER 99]

INT: [IF D24 = 99, ASK D25 OTHERWISE SKIP TO D26]

D25. How many years ago did you first start smoking tobacco *less than daily*?

--	--

D26. *When you were smoking*, how much of the following products did you smoke each day on average? Also, let me know if you smoked the product, but not every day.

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME.

IF RESPONDENT REPORTS IN PACKS OR CARTONS, PROBE TO FIND OUT HOW MANY UNITS ARE IN EACH AND CALCULATE THE CORRESPONDING TOTAL NUMBER.

IF RESPONDENT HAS NOT SMOKED A GIVEN PRODUCT, MARK IT OUT]

a. Manufactured cigarettes?				PER DAY
a1. [IF D26a=888] On average, how many manufactured cigarettes did you smoke each week?				PER WEEK

a2. [IF D26a1=888] If only a few manufactured cigarettes smoked in lifetime, indicate how many				<i>TIMES</i>
b. Hand-rolled cigarettes?				<i>PER DAY</i>
b1. [IF D26b=888] On average, how many hand-rolled cigarettes did you smoke each week?				<i>PER WEEK</i>
b2. [IF D26b1=888] If only a few hand-rolled cigarettes smoked in lifetime, indicate how many				<i>TIMES</i>
c. Cigars?				<i>PER DAY</i>
c1. [IF D26c=888] On average, how many cigars did you smoke each week?				<i>PER WEEK</i>
c2. [IF D26c1=888] If only a few cigars smoked in lifetime, indicate how many				<i>TIMES</i>
d. Pipes full of tobacco?				<i>PER DAY</i>
d1. [IF D26d=888] On average, how many pipes full of tobacco did you smoke each week?				<i>PER WEEK</i>
d2. [IF D26d1=888] If only a few pipes full of tobacco smoked in lifetime, indicate how many				<i>TIMES</i>
e. Cheroots or cigarillos?				<i>PER DAY</i>
e1. [IF D26e=888] On average, how many cheroots or cigarillos did you smoke each week?				<i>PER WEEK</i>
e2. [IF D26e1=888] If only a few cheroots or cigarillos smoked in lifetime, indicate how many				<i>TIMES</i>
f. Any others? → f1. Specify type: _____				<i>PER DAY</i>
f2. [IF D26f=888] On average, how many [FILL IN PRODUCT] did you smoke each week?				<i>PER WEEK</i>
f3. [IF D26f2=888] If only a few [FILL IN PRODUCT] smoked in lifetime, indicate how many				<i>TIMES</i>

D27. Did you inhale the smoke?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 7

INT: [GO TO NEXT SECTION]

E) SHISHA / NARGILE

INTRO: I would now like to ask you some questions about smoking shisha / nargile.

E1. *Currently* do you smoke shisha on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → SKIP TO E3
LESS THAN DAILY ☐ 2
NOT AT ALL ☐ 3 → SKIP TO E4
DON'T KNOW ☐ 77 → SKIP TO NEXT SECTION

E2. *In the past*, have you smoked shisha on a daily basis?

- YES ☐ 1 → SKIP TO E18
NO ☐ 2 → SKIP TO E20
DON'T KNOW ☐ 77 → SKIP TO E20

E3. *In the past*, have you smoked shisha less than daily?

- YES ☐ 1 → SKIP TO E5
NO ☐ 2 → SKIP TO E7
DON'T KNOW ☐ 77 → SKIP TO E7

E4. *In the past*, have you smoked shisha on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → SKIP TO E33
LESS THAN DAILY ☐ 2 → SKIP TO E35
BOTH ☐ 3 → SKIP TO E31
NOT AT ALL ☐ 4 → SKIP TO NEXT SECTION
DON'T KNOW ☐ 77 → SKIP TO NEXT SECTION

CURRENT DAILY SHISHA SMOKERS

E5. How old were you when you first started smoking shisha *less than daily*?

--	--

 [IF DON'T KNOW, ENTER 99]

INT: [IF E5 = 99, ASK E6 OTHERWISE SKIP TO E7]

E6. How many years ago did you first start smoking shisha *less than daily*?

--	--

E7. How old were you when you first started smoking shisha *daily*?

--	--

 [IF DON'T KNOW, ENTER 99]

INT: [IF E7 = 99, ASK E8 OTHERWISE SKIP TO E9]

E8. How many years ago did you first start smoking shisha *daily*?

--	--

E9. *Currently*, how many shisha sessions do you smoke each day on average?

a. Number of shisha sessions per day?				PER DAY
---------------------------------------	--	--	--	---------

E10. *Throughout your shisha smoking history* (including non-daily smoking period, if any), how many pipes did you smoke on average each day? Also, let me know if on average you smoked shisha less than daily.

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK]

a. Number of shisha sessions per day?				PER DAY
a1. [IF E10a=888] On average, how many shisha sessions did you participate in each week?				PER WEEK

E11. The last time you smoked shisha, how long did you participate in the shisha smoking session?

INT: [ENTER UNIT AND NUMBER]

HOURS.....	<input type="checkbox"/> 1		
MINUTES...	<input type="checkbox"/> 2		

E12. The last time you smoked shisha, how many other people did you share the same pipe with during the session?

PEOPLE

E13. The last time you smoked shisha, about how many rocks were smoked while you were participating in the session?

- LESS THAN 1 ☐ 1
 1 ☐ 2
 2 ☐ 3
 3 ☐ 4
 4 ☐ 5
 5 OR MORE ☐ 6

E14. The last time you smoked shisha, did you smoke it with flavoured tobacco, unflavoured tobacco, or both?

- FLAVOURED ☐ 1 → SPECIFY: _____
 UNFLAVOURED ☐ 2
 BOTH ☐ 3 → SPECIFY: _____

E15. The last time you smoked shisha, did you mix the water in the shisha tank with other substances?

- YES ☐ 1 → SPECIFY: _____
 NO ☐ 2

E16. The last time you smoked shisha, where did you smoke it?

- HOME ☐ 1
 BAR/CAFE ☐ 2
 CLUB ☐ 3
 RESTAURANT ☐ 4
 OTHER ☐ 5 → SPECIFY: _____

E17. Do you inhale the smoke?

- YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

INT : [SKIP TO NEXT SECTION]

CURRENT LESS THAN DAILY SHISHA SMOKERS

E18. How old were you when you first started smoking shisha daily?

[IF DON'T KNOW, ENTER 99]

INT: [IF E18 = 99, ASK E19. OTHERWISE SKIP TO E20]

E19. How many years ago did you first start smoking shisha daily?

E20. How old were you when you first started smoking shisha less than daily?

[IF DON'T KNOW, ENTER 99]

INT: [IF E20 = 99, ASK E21. OTHERWISE SKIP TO E22]

E21. How many years ago did you first start smoking shisha less than daily?

E22. *Currently*, how many shisha sessions do you smoke during a usual week?

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT *AT LEAST ONCE PER MONTH*, BUT LESS THAN ONCE PER WEEK, ENTER 888
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME]

a. Number of shisha sessions per week?	<input type="text"/>	<input type="text"/>	<input type="text"/>	PER WEEK
a1. [IF E22a=888] If only a few shisha sessions smoked in lifetime, indicate how many	<input type="text"/>	<input type="text"/>	<input type="text"/>	TIMES

E23. *Throughout your shisha smoking history* (including daily smoking period, if any), how many pipes did you smoke on average each week?

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT *AT LEAST ONCE PER MONTH*, BUT LESS THAN ONCE PER WEEK, ENTER 888
IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME]

a. Number of shisha sessions per week?	<input type="text"/>	<input type="text"/>	<input type="text"/>	PER WEEK
a1. [IF E23a=888] If only a few shisha sessions smoked in lifetime, indicate how many	<input type="text"/>	<input type="text"/>	<input type="text"/>	TIMES

E24. The last time you smoked shisha, how long did you participate in the shisha smoking session?

INT: [ENTER UNIT AND NUMBER]

HOURS..... ☐

MINUTES ... ☐ 2

E25. The last time you smoked shisha, how many other people did you share the same pipe with during the session?

E26. The last time you smoked shisha, about how many rocks were smoked while you were participating in the session?

- LESS THAN 1 ☐ 1
1 ☐ 2
2 ☐ 3
3 ☐ 4
4 ☐ 5
5 OR MORE ☐ 6

E27. The last time you smoked shisha, did you smoke it with flavoured tobacco, unflavoured tobacco, or both?

- FLAVOURED ☐ 1 → SPECIFY: _____
UNFLAVOURED ☐ 2
BOTH ☐ 3 → SPECIFY: _____

E28. The last time you smoked shisha, did you mix the water in the shisha tank with other substances?

- YES ☐ 1 → SPECIFY: _____
NO ☐ 2

E29. The last time you smoked shisha, where did you smoke it?

- HOME ☐ 1
BAR/CAFE ☐ 2
CLUB ☐ 3
RESTAURANT ☐ 4
OTHER ☐ 5 → SPECIFY: _____

E30. Do you inhale the smoke?

- YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

INT: [SKIP TO NEXT SECTION]

FORMER SHISHA SMOKERS

E31. How old were you when you first started smoking shisha *less than daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF E31 = 99, ASK E32 OTHERWISE SKIP TO E33]

E32. How many years ago did you first start smoking shisha *less than daily*?

E33. How old were you when you first started smoking shisha *daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF E33 = 99, ASK E34 OTHERWISE SKIP TO E37]

E34. How many years ago did you first start smoking shisha *daily*?

INT: [SKIP TO E37]

E35. How old were you when you first started smoking shisha *less than daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF E35 = 99, ASK E36. OTHERWISE SKIP TO E37]

E36. How many years ago did you first start smoking shisha *less than daily*?

E37. *When you were smoking shisha*, how many shisha sessions did you have each day on average? Also, let me know if you used to smoke the product, but not every day.

INT: [IF RESPONDENT REPORTS HAVING SMOKED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK. IF HE/SHE SMOKED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME]

a. Number of shisha sessions per day?	<input type="text"/>	<input type="text"/>	<input type="text"/>	PER DAY
a1. [IF E37a=888] Number of shisha sessions per week?	<input type="text"/>	<input type="text"/>	<input type="text"/>	PER WEEK
a2. [IF E37a1=888] If only a few shisha sessions smoked in lifetime, indicate how many	<input type="text"/>	<input type="text"/>	<input type="text"/>	TIMES

E38. In the past, on average, how long did you participate in a shisha smoking session?

INT: [ENTER UNIT AND NUMBER]

HOURS..... ☐ 1

MINUTES... ☐ 2

E39. In the past, on average, how many other people did you share the same pipe with during a session?

--	--

E40. In the past, on average, about how many rocks were smoked while you were participating in a session?

LESS THAN 1 ☐ 1

1 ☐ 2

2 ☐ 3

3 ☐ 4

4 ☐ 5

5 OR MORE..... ☐ 6

E41. In the past, did you usually smoke shisha with flavoured tobacco, unflavoured tobacco, or both?

FLAVOURED ☐ 1 → SPECIFY: _____

UNFLAVOURED ☐ 2

BOTH..... ☐ 3 → SPECIFY: _____

E42. In the past, did you usually mix the water in the shisha tank with other substances?

YES ☐ 1 → SPECIFY: _____

NO ☐ 2

E43. In the past, where did you usually smoke shisha?

HOME ☐ 1

BAR/CAFE ☐ 2

CLUB ☐ 3

RESTAURANT ☐ 4

OTHER ☐ 5 → SPECIFY: _____

E44. Did you inhale the smoke?

YES ☐ 1

NO ☐ 2

DON'T KNOW ☐ 77

INT: [SKIP TO NEXT SECTION]

F) SMOKELESS TOBACCO

INTRO: The next questions are about using smokeless tobacco, such as snuff and chewing tobacco.

F1. *Currently* do you use smokeless tobacco on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → SKIP TO F3
LESS THAN DAILY ☐ 2
NOT AT ALL ☐ 3 → SKIP TO F4
DON'T KNOW ☐ 7 → SKIP TO NEXT SECTION

F2. *In the past*, have you used smokeless tobacco daily?

- YES ☐ 1 → SKIP TO F13
NO ☐ 2 → SKIP TO F15
DON'T KNOW ☐ 7 → SKIP TO F15

F3. *In the past*, have you used smokeless tobacco less than daily?

- YES ☐ 1 → SKIP TO F5
NO ☐ 2 → SKIP TO F7
DON'T KNOW ☐ 7 → SKIP TO F7

F4. *In the past*, have you used smokeless tobacco on a daily basis, less than daily, or not at all?

- DAILY ☐ 1 → SKIP TO F22
LESS THAN DAILY ☐ 2 → SKIP TO F24
BOTH ☐ 3 → SKIP TO F20
NOT AT ALL ☐ 3 → SKIP TO NEXT SECTION
DON'T KNOW ☐ 7 → SKIP TO NEXT SECTION

CURRENT DAILY SMOKELESS TOBACCO USERS

F5. How old were you when you first started using smokeless tobacco *less than daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF F5 = 99, ASK F6 OTHERWISE SKIP TO F7]

F6. How many years ago did you first start using smokeless tobacco *less than daily*?

F7. How old were you when you first started using smokeless tobacco *daily*?

[IF DON'T KNOW, ENTER 99]

INT: [IF F7 = 99, ASK F8 OTHERWISE SKIP TO F9]

F8. How many years ago did you first start using smokeless tobacco *daily*?

F9. *Currently*, how many times a day on average do you use the following products? Also, let me know if you use the product, but not every day.

INT: [IF RESPONDENT REPORTS USING THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.

IF HE/SHE USED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFETIME, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFE.

IF REPORTED IN CANS OR CONTAINERS, PROBE TO FIND OUT HOW MANY USES THE RESPONDENT GETS FROM EACH AND CALCULATE TOTAL NUMBER

IF RESPONDENT DOES NOT USE A GIVEN PRODUCT, MARK IT OUT]

a. Snuff, by mouth?				PER DAY
a1. [IF F9a=888] On average, how many times a week do you currently use snuff, by mouth?				PER WEEK
a2. [IF F9a1=888] If only a few use of snuff, by mouth, in lifetime, indicate how many				TIMES
b. Snuff, by nose?				PER DAY
b1. [IF F9b=888] On average, how many times a week do you currently use snuff, by nose?				PER WEEK
b2. [IF F9b1=888] If only a few use of snuff, by nose, in lifetime, indicate how many				TIMES
c. Chewing tobacco?				PER DAY
c1. [IF F9c=888] On average, how many times a week do you currently use chewing tobacco?				PER WEEK
c2. [IF F9c1=888] If only a few use of chewing tobacco in lifetime, indicate how many				TIMES
d. Any others? (Specify type:_____)				PER DAY

d1. [IF F9d=888] On average, how many times a week do you currently use [FILL IN PRODUCT]?
d2. [IF F9d1=888] If only a few use of [FILL IN PRODUCT] in lifetime, indicate how many

			PER WEEK
			TIMES

F10. *Throughout your smokeless tobacco use history* (including non-daily use period, if any), how many times a day on average did you use the following products? Also, let me know if you used the product less than daily, on average.

INT: [IF RESPONDENT REPORTS HAVING USED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.
IF HE/SHE USED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFE, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFETIME.

IF REPORTED IN CANS OR CONTAINERS, PROBE TO FIND OUT HOW MANY USES THE RESPONDENT GETS FROM EACH AND CALCULATE TOTAL NUMBER

IF RESPONDENT HAS NOT SMOKED A GIVEN PRODUCT, MARK IT OUT]

a. Snuff, by mouth?				PER DAY
a1. [IF F10a=888] On average, how many times a week did you use snuff, by mouth?				PER WEEK
a2. [IF F10a1=888] If only a few use of snuff, by mouth, in lifetime, indicate how many				TIMES
b. Snuff, by nose?				PER DAY
b1. [IF F10b=888] On average, how many times a week did you use snuff, by nose?				PER WEEK
b2. [IF F10b1=888] If only a few use of snuff, by nose, in lifetime, indicate how many				TIMES
c. Chewing tobacco?				PER DAY
c1. [IF F10c=888] On average, how many times a week did you use chewing tobacco?				PER WEEK
c2. [IF F10c1=888] If only a few use of chewing tobacco in lifetime, indicate how many				TIMES
d. Any others? (Specify type: _____)				PER DAY
d1. [IF F10d=888] On average, how many times a week did you use [FILL IN PRODUCT]?				PER WEEK
d2. [IF F10d1=888] If only a few use of [FILL IN PRODUCT] in lifetime, indicate how many				TIMES

F11. How soon after you wake up do you usually place your first dip? Would you say within 5 minutes, 6 to 30 minutes, 31 to 60 minutes, or more than 60 minutes?

WITHIN 5 MINUTES..... ☐ 1
6 TO 30 MINUTES ☐ 2
31 TO 60 MINUTES ☐ 3
MORE THAN 60 MINUTES ☐ 4
REFUSE TO ANSWER ☐ 99

F12. How often do you swallow tobacco juice?

ALWAYS..... ☐ 1
SOMETIMES..... ☐ 2
NEVER ☐ 3

INT: [SKIP TO NEXT SECTION]

CURRENT LESS-THAN-DAILY SMOKELESS TOBACCO USERS

F13. How old were you when you first started using smokeless tobacco *daily*?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF F13 = 99, ASK F14 OTHERWISE SKIP TO F15]

F14. How many years ago did you first start using smokeless tobacco *daily*?

--	--

F15. How old were you when you first started using smokeless tobacco *less than daily*?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF F15 = 99, ASK F16 OTHERWISE SKIP TO F17]

F16. How many years ago did you first start using smokeless tobacco *less than daily*?

--	--

F17. *Currently*, how many times a week do you usually use the following?

INT: [IF RESPONDENT REPORTS USING THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.

IF HE/SHE USED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFETIME, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFE.

IF REPORTED IN CANS OR CONTAINERS, PROBE TO FIND OUT HOW MANY USES THE RESPONDENT GETS FROM EACH AND CALCULATE TOTAL NUMBER

IF RESPONDENT DOES NOT USE A GIVEN PRODUCT, MARK IT OUT]

a. Snuff, by mouth?				PER WEEK
a1. [IF F17a=888] If only a few use of snuff, by mouth, in lifetime, indicate how many				TIMES
b. Snuff, by nose?				PER WEEK
b1. [IF F17b=888] If only a few use of snuff, by nose, in lifetime, indicate how many				TIMES
c. Chewing tobacco?				PER WEEK
c1. [IF F17c=888] If only a few use of chewing tobacco in lifetime, indicate how many				TIMES
d. Any others? (Specify type:_____)				PER WEEK
d1. [IF F17d=888] If only a few use of [FILL IN PRODUCT]in lifetime, indicate how many				TIMES

F18. *Throughout your smokeless tobacco use history* (including daily use period, if any), how many times a week on average did you use the following products?

INT: [IF RESPONDENT REPORTS HAVING USED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.
IF HE/SHE USED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFETIME, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFE.

IF REPORTED IN CANS OR CONTAINERS, PROBE TO FIND OUT HOW MANY USES THE RESPONDENT GETS FROM EACH AND CALCULATE TOTAL NUMBER

IF RESPONDENT DOES NOT USE A GIVEN PRODUCT, MARK IT OUT]

a. Snuff, by mouth?				PER WEEK
a1. [IF F18a=888] If only a few use of snuff, by mouth, in lifetime, indicate how many				TIMES
b. Snuff, by nose?				PER WEEK
b1. [IF F18b=888] If only a few use of snuff, by nose, in lifetime, indicate how many				TIMES
c. Chewing tobacco?				PER WEEK
c1. [IF F18c=888] If only a few use of chewing tobacco in lifetime, indicate how many				TIMES
d. Any others? (Specify type: _____)				PER WEEK
d1. [IF F18d=888] If only a few use of [FILL IN PRODUCT] in lifetime, indicate how many				TIMES

F19. How often do you swallow tobacco juice?

ALWAYS ☐ 1
SOMETIMES ☐ 2
NEVER ☐ 3

INT: [SKIP TO NEXT SECTION]

FORMER SMOKELESS TOBACCO USERS

F20. How old were you when you first started using smokeless tobacco less than daily?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF F18 = 99, ASK F20 OTHERWISE SKIP TO F21]

F21. How many years ago did you first start using smokeless tobacco less than daily?

--	--

F22. How old were you when you first started using smokeless tobacco daily?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF F20 = 99, ASK F22 OTHERWISE SKIP TO F25]

F23. How many years ago did you first start using smokeless tobacco daily?

--	--

INT: [SKIP TO F25]

F24. How old were you when you first started using smokeless tobacco less than daily?

--	--

[IF DON'T KNOW, ENTER 99]

INT: [IF F22 = 99, ASK F24. OTHERWISE SKIP TO F25]

F25. How many years ago did you first start using smokeless tobacco less than daily?

--	--

F26. On average, how many times a day did you usually use the following products? Also, let me know if you used the product, but not every day.

INT: [IF RESPONDENT REPORTS HAVING USED THE PRODUCT BUT NOT EVERY DAY, ENTER 888 IN THE "PER DAY" ROW AND ASK PER WEEK.

IF HE/SHE USED THE PRODUCT ONLY FEW TIMES IN HIS/HER LIFETIME, ENTER 888 IN THE "PER WEEK" ROW AND ASK THE TOTAL NUMBER OF TIMES IN HIS/HER LIFE.

IF REPORTED IN CANS OR CONTAINERS, PROBE TO FIND OUT HOW MANY USES THE RESPONDENT GETS FROM EACH AND CALCULATE TOTAL NUMBER

IF RESPONDENT DOES NOT USE A GIVEN PRODUCT, MARK IT OUT]

a. Snuff, by mouth?

			PER DAY
--	--	--	---------

a1. [IF F26a=888] On average, how many times a week did you use snuff, by mouth?				PER WEEK
a2. [IF F26a1=888] If only a few use of snuff, by mouth, in lifetime, indicate how many				TIMES
b. Snuff, by nose?				PER DAY
b1. [IF F26b=888] On average, how many times a week did you use snuff, by nose?				PER WEEK
b2. [IF F26b1=888] If only a few use of snuff, by nose, in lifetime, indicate how many				TIMES
c. Chewing tobacco?				PER DAY
c1. [IF F26c=888] On average, how many times a week did you use chewing tobacco?				PER WEEK
c2. [IF F26c1=888] If only a few use of chewing tobacco in lifetime, indicate how many				TIMES
d. Any others? (Specify type: _____)				PER DAY
d1. [IF F26d=888] On average, how many times a week did you use [FILL IN PRODUCT]?				PER WEEK
d2. [IF F26d1=888] If only a few use of [FILL IN PRODUCT] in lifetime, indicate how many				TIMES

F27. How often did you swallow tobacco juice?

- ALWAYS ☐ 1
SOMETIMES ☐ 2
NEVER ☐ 3

G) SECONDHAND SMOKE

INTRO: I would now like to ask you a few questions about smoking in various places.

G1. In your household, is there anyone who currently consumes tobacco (smoking or smokeless) either inside of your home or outside?

- YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G2. Which of the following best describes the rules about smoking inside of your home (excluding outdoor areas such as balconies): Smoking is allowed inside of your home, smoking is generally not allowed inside of your home but there are exceptions, or smoking is never allowed inside of your home?

- ALLOWED ☐ 1
NOT ALLOWED, BUT EXCEPTIONS ☐ 2
NEVER ALLOWED ☐ 3 → SKIP TO G5
DON'T KNOW ☐ 77 → SKIP TO G4

G3. Inside your home, is smoking allowed in every room?

- YES ☐ 1
NO ☐ 2 → SPECIFY: _____
DON'T KNOW ☐ 77

G4. How often does anyone smoke inside your home? Would you say daily, weekly, monthly, less than monthly, or never?

- DAILY ☐ 1
WEEKLY ☐ 2
MONTHLY ☐ 3
LESS THAN MONTHLY ☐ 4
NEVER ☐ 5
DON'T KNOW ☐ 77

G5. Do you currently work outside of your home?

- YES ☐ 1
NO/DON'T WORK ☐ 2 → SKIP TO G10

G6. Do you usually work indoors or outdoors?

- INDOORS ☐ 1 → SKIP TO G8
OUTDOORS ☐ 2
BOTH ☐ 3 → SKIP TO G8

G7. Are there any indoor areas at your workplace?

- YES ☐ 1
NO ☐ 2 → SKIP TO G10

DON'T KNOW ☐ 77 → SKIP TO G10

G8. Which of the following best describes the indoor smoking policy where you work: Smoking is allowed anywhere, smoking is allowed only in some indoor areas, smoking is not allowed in any indoor areas, or there is no policy?

ALLOWED ANYWHERE ☐ 1
ALLOWED ONLY IN SOME INDOOR AREAS... ☐ 2
NOT ALLOWED IN ANY INDOOR AREAS ☐ 3
THERE IS NO POLICY ☐ 4
DON'T KNOW ☐ 77

G9. During the past 30 days, did anyone smoke in indoor areas where you work?

YES ☐ 1
NO ☐ 2 → SKIP TO G11
DON'T KNOW ☐ 77 → SKIP TO G11

G10. How often does anyone smoke in indoor areas where you work? Would you say daily, weekly, monthly, or less than monthly?

DAILY ☐ 1
WEEKLY ☐ 2
MONTHLY ☐ 3
LESS THAN MONTHLY ☐ 4

G11. During the past 30 days, did you visit any government buildings or government offices?

YES ☐ 1
NO ☐ 2 → SKIP TO G12
DON'T KNOW ☐ 77 → SKIP TO G12

G12. Did anyone smoke inside of any government buildings or government offices that you visited in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G13. During the past 30 days, did you visit any health care facilities?

YES ☐ 1
NO ☐ 2 → SKIP TO G14
DON'T KNOW ☐ 77 → SKIP TO G14

G14. Did anyone smoke inside of any health care facilities that you visited in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G15. During the past 30 days, did you visit any restaurants?

YES ☐ 1
NO ☐ 2 → SKIP TO G16
DON'T KNOW ☐ 77 → SKIP TO G16

G16. Did anyone smoke inside of any restaurants that you visited in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G17. During the past 30 days, did you use any public transportation?

YES ☐ 1
NO ☐ 2 → SKIP TO G18
DON'T KNOW ☐ 77 → SKIP TO G18

G18. Did anyone smoke inside of any public transportation that you used in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G19. During the past 30 days, did you visit any schools?

YES ☐ 1
NO ☐ 2 → SKIP TO K20
DON'T KNOW ☐ 77 → SKIP TO K20

G20. Did anyone smoke inside of any schools that you visited in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G21. During the past 30 days, did you visit any universities?

YES ☐ 1
NO ☐ 2 → SKIP TO K22
DON'T KNOW ☐ 77 → SKIP TO K22

G22. Did anyone smoke inside of any universities that you visited in the past 30 days?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

G23. During the past 30 days, did you visit any private workplaces other than your own?

YES ☐ 1
NO ☐ 2 → SKIP TO K24

DON'T KNOW ☐ 77 → SKIP TO K24

G24. Did anyone smoke inside of any of these private workplaces that you visited in the past 30 days?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

G25. During the past 30 days, did you visit any bars or nightclubs?

YES ☐ 1
 NO ☐ 2 → SKIP TO K26
 DON'T KNOW ☐ 77 → SKIP TO K26

G26. Did anyone smoke inside of any bars or nightclubs that you visited in the past 30 days?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

G27. During the past 30 days, did you visit any cafes, coffee shops, or tea houses?

YES ☐ 1
 NO ☐ 2 → SKIP TO K28
 DON'T KNOW ☐ 77 → SKIP TO K28

G28. Did anyone smoke inside of any cafes, coffee shops, or tea houses that you visited in the past 30 days?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

G29. Do you support the law that prohibits smoking inside of the following venues?

[READ EACH ITEM]	YES	NO	DON'T KNOW
a. Hospitals?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
b. Workplaces?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
c. Restaurants?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
d. Bars?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
e. Public transportation vehicles?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
f. Schools?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
g. Universities?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
h. Places of worship?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77

H) TOBACCO CESSATION

INT: [RECORD BELOW ANSWERS TO D1, D4, E1, E4, F1 AND F4 THEN TICK THE CORRESPONDING SUB-SECTION(S) TO ADMINISTER AND FOLLOW SKIP PATTERN.

ATTENTION: IT IS POSSIBLE TO HAVE TO ADMINISTER SEVERAL SUB-SECTIONS

- D1 = ☐ 1 → CURRENT SMOKER
☐ 2 → CURRENT SMOKER
☐ 3 → DO NOT SMOKE
☐ 77 → DO NOT KNOW

- D4 = ☐ 1 → FORMER SMOKER
☐ 2 → FORMER SMOKER
☐ 3 → FORMER SMOKER
☐ 4 → NEVER SMOKED
☐ 77 → DO NOT KNOW

- E1 = ☐ 1 → CURRENT SMOKER
☐ 2 → CURRENT SMOKER
☐ 3 → DO NOT SMOKE
☐ 77 → DO NOT KNOW

- E4 = ☐ 1 → FORMER SMOKER
☐ 2 → FORMER SMOKER
☐ 3 → FORMER SMOKER
☐ 4 → NEVER SMOKED
☐ 77 → DO NOT KNOW

- F1 = ☐ 1 → CURRENT SMOKELESS TOBACCO USER
☐ 2 → CURRENT SMOKELESS TOBACCO USER
☐ 3 → DO NOT USE TOBACCO
☐ 77 → DO NOT KNOW

- F4 = ☐ 1 → FORMER SMOKELESS TOBACCO USER
☐ 2 → FORMER SMOKELESS TOBACCO USER
☐ 3 → FORMER SMOKELESS TOBACCO USER
☐ 4 → NEVER USED TOBACCO
☐ 77 → DO NOT KNOW

CURRENT SMOKER..... ☐ → [GO TO H1]
 CURRENT SMOKELESS TOBACCO USER..... ☐ → [GO TO H10]
 FORMER SMOKER..... ☐ → [GO TO H19]
 FORMER SMOKELESS TOBACCO USER..... ☐ → [GO TO H24]
 DO NOT SMOKE/USE TOBACCO..... ☐ → [GO TO NEXT SECTION]
 NEVER SMOKED/USED TOBACCO ☐ → [GO TO NEXT SECTION]
 DO NOT KNOW ☐ → [GO TO NEXT SECTION]

TOTAL NUMBER OF SUB-SECTION(S) TO ADMINISTER:

CURRENT TOBACCO SMOKERS (ALL TYPES OF SMOKED TOBACCO)

INTRO: The next questions ask about any attempts to stop smoking that you might have made during the past 12 months. Please think about tobacco smoking, including shisha.

H1. Think back to when you started smoking. What do you think were the main reasons why you started smoking?

INT: [MULTIPLE ANSWERS POSSIBLE]

- | | | |
|---|--------------------------|---------------------|
| My friends smoke | <input type="checkbox"/> | 1 |
| My friends approved of my smoking..... | <input type="checkbox"/> | 2 |
| Smoking made me look more 'cool' | <input type="checkbox"/> | 3 |
| Tobacco advertising was attractive to me..... | <input type="checkbox"/> | 4 |
| My parents did not mind that I smoked..... | <input type="checkbox"/> | 5 |
| I wanted to keep my weight low | <input type="checkbox"/> | 6 |
| I wanted to lose weight | <input type="checkbox"/> | 7 |
| It helped me manage my stress | <input type="checkbox"/> | 8 |
| I was less depressed when I smoked..... | <input type="checkbox"/> | 9 |
| I was not worried about health effects | <input type="checkbox"/> | 10 |
| I believed that I could quit whenever I wanted to | <input type="checkbox"/> | 11 |
| Other reason | <input type="checkbox"/> | 12 → SPECIFY: _____ |
| (He/she does not know/ He/she does not answer) | <input type="checkbox"/> | 77 |

H2. What are the main reasons that might discourage you from quitting smoking?

INT: [MULTIPLE ANSWERS POSSIBLE]

- | | | |
|--|--------------------------|---------------------|
| Poor access to medicines or products to help you quit | <input type="checkbox"/> | 1 |
| Poor access to classes or other programs to help you quit .. | <input type="checkbox"/> | 2 |
| I do not want to quit | <input type="checkbox"/> | 3 |
| I enjoy smoking..... | <input type="checkbox"/> | 4 |
| The risk of gaining weight | <input type="checkbox"/> | 5 |
| The loss of a way to handle stress | <input type="checkbox"/> | 6 |
| Many of my close friends or partner smoke | <input type="checkbox"/> | 7 |
| Many of the people that I work with smoke | <input type="checkbox"/> | 8 |
| I am addicted to cigarettes | <input type="checkbox"/> | 9 |
| Other reason | <input type="checkbox"/> | 12 → SPECIFY: _____ |
| (He/she does not know/ He/she does not answer)..... | <input type="checkbox"/> | 77 |

H3. During the past 12 months, have you tried to stop smoking?

- YES ☐ 1
- NO ☐ 2 → SKIP TO H9

H4. Thinking about the last time you tried to quit, for how long did you stop smoking?

INT: [ENTER UNIT AND NUMBER]

- | | | | | | | | | | | | | |
|----------------------------------|--------------------------|---|--|--|--|--|--|--|--|--|--|--|
| MONTHS..... | <input type="checkbox"/> | 1 | <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table> | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| WEEKS | <input type="checkbox"/> | 2 | | | | | | | | | | |
| DAYS | <input type="checkbox"/> | 3 | | | | | | | | | | |
| LESS THAN 1 DAY (24 HOURS) | <input type="checkbox"/> | 4 | | | | | | | | | | |

DON'T KNOW ☐ 7

H5. What was the most important reason that made you decide to quit smoking tobacco?

INT: [DO NOT READ THE ANSWERS – ONLY ONE ANSWER]

- Illness (any medical condition) ☐ 1
- Worry about effects on health ☐ 2
- Physician's advice ☐ 3
- Increased knowledge of the harmful effects of smoking ☐ 4
- Smoke-free legislation ☐ 5
- Pregnancy/birth of a child ☐ 6
- Economic reasons (tobacco too expensive) ☐ 7
- Pressure to quit by partner/relatives ☐ 8
- Employer precluding hiring smokers ☐ 9
- Social pressure (social and societal norms) ☐ 10
- Health warnings on packs ☐ 11
- Staining of teeth ☐ 12
- Other reason → Specify: ☐ 13
- (He/she does not know/ He/she does not answer) ☐ 77

H6. During the past 12 months, did you use any of the following to try to stop smoking tobacco?

[READ EACH ITEM, MULTIPLE ANSWERS POSSIBLE]

YES	NO
▼	▼

- a) Counselling, including at a smoking cessation clinic? ☐ 1 ☐ 2
- b) Nicotine replacement therapy, such as the patch or gum? ☐ 1 ☐ 2
- c) Other prescription medications, for example
Zyban® (bupropion) or Champix® (varenicline)? ☐ 1 ☐ 2
- d) Traditional medicines? Specify: ☐ 1 ☐ 2
- e) A quit line or a stop-smoking telephone support line? ☐ 1 ☐ 2
- f) Switching to smokeless tobacco? Specify: ☐ 1 ☐ 2
- g) Quit without assistance ☐ 1 ☐ 2
- h) Another means? Specify: ☐ 1 ☐ 2

H7. During the past 12 months, how many times did you try to stop smoking tobacco?

--	--

H8. After your attempt to quit, did you smoke more, less, or the same quantity?

- MORE ☐ 1
- LESS ☐ 2
- SAME ☐ 3

H9. Which of the following best describes your thinking about quitting smoking? I am planning to quit within the next month, I am thinking about quitting within the next 12 months, I will quit someday but not within the next 12 months, or I am not interested in quitting?

- QUIT WITHIN THE NEXT MONTH ☐ 1
- THINKING WITHIN THE NEXT 12 MONTHS ☐ 2

QUIT SOMEDAY, BUT NOT NEXT 12 MONTHS.....	<input type="checkbox"/>	3
NOT INTERESTED IN QUITTING	<input type="checkbox"/>	4
DON'T KNOW	<input type="checkbox"/>	77

CURRENT SMOKELESS TOBACCO USERS

INTRO: The next questions ask about any attempts to stop using smokeless tobacco that you might have made during the past 12 months. Please think about your use of smokeless tobacco.

H10. Think back to when you started using smokeless tobacco. What do you think were the main reasons why you started using smokeless tobacco?

INT: [MULTIPLE ANSWERS POSSIBLE]

- My friends used smokeless tobacco ☐ 1
- My friends approved of my use ☐ 2
- Using smokeless tobacco made me look more 'cool' ☐ 3
- Tobacco advertising was attractive to me ☐ 4
- My parents did not mind that I used smokeless tobacco ☐ 5
- I wanted to keep my weight low ☐ 6
- I wanted to lose weight ☐ 7
- It helped me manage my stress ☐ 8
- I was less depressed when I used smokeless tobacco ☐ 9
- I was not worried about health effects ☐ 10
- I believed that I could quit whenever I wanted to ☐ 11
- Other reason, Specify: ☐ 12
- (He/she does not know/ He/she does not answer) ☐ 77

H11. What are the main reasons that might discourage you from quitting using smokeless tobacco?

INT: [MULTIPLE ANSWERS POSSIBLE]

- Poor access to medicines or products to help you quit ☐ 1
- Poor access to classes or other programs to help you quit ☐ 2
- I do not want to quit ☐ 3
- I enjoy using smokeless tobacco ☐ 4
- The risk of gaining weight ☐ 5
- The loss of a way to handle stress ☐ 6
- Many of my close friends or partner use smokeless tobacco ☐ 7
- Many of the people that I work with use smokeless tobacco ☐ 8
- I am addicted to smokeless tobacco ☐ 9
- Other reason, Specify: ☐ 12
- (He/she does not know/ He/she does not answer) ☐ 77

H12. During the past 12 months, have you tried to stop using smokeless tobacco?

- YES ☐ 1
- NO ☐ 2 → SKIP TO H18

H13. Thinking about the last time you tried to quit, for how long did you stop using smokeless tobacco?

INT: [ENTER UNIT AND NUMBER]

- MONTHS ☐ 1

--	--	--
- WEEKS ☐ 2

--	--	--

DAYS ☐ 3

LESS THAN 1 DAY (24 HOURS) ☐ 4

DON'T KNOW ☐ 7

H14. What was the most important reason that made you decide to quit using smokeless tobacco?

INT: [DO NOT READ THE ANSWERS – ONLY ONE ANSWER]

Illness (any medical condition) ☐ 1

Worry about effects on health ☐ 2

Physician's advice ☐ 3

Increased knowledge of the harmful effects of tobacco use ☐ 4

Pregnancy/birth of a child ☐ 5

Economic reasons (tobacco too expensive) ☐ 6

Pressure to quit by partner/relatives ☐ 7

Employer precluding hiring tobacco users ☐ 8

Social pressure (social and societal norms) ☐ 9

Health warnings on packs ☐ 10

Staining of teeth ☐ 11

Spitting is frowned upon ☐ 12

Other reason, Specify: ☐ 13

(He/she does not know/ He/she does not answer) ☐ 77

H15. During the past 12 months, have you used any of the following to try to stop using smokeless tobacco?

[READ EACH ITEM, MULTIPLE ANSWERS POSSIBLE]

	YES	NO
a) Counselling, including at a tobacco cessation clinic?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
b) Nicotine replacement therapy, such as the patch or gum?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
c) Other prescription medications, for example Zyban® (bupropion) or Champix® (varenicline)?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
d) Traditional medicines? Specify:	<input type="checkbox"/> 1	<input type="checkbox"/> 2
e) A quit line or a telephone support line?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
f) Switching to another type of tobacco? Specify:	<input type="checkbox"/> 1	<input type="checkbox"/> 2
g) Quit without assistance	<input type="checkbox"/> 1	<input type="checkbox"/> 2
h) Another means? Specify:	<input type="checkbox"/> 1	<input type="checkbox"/> 2

H16. During the past 12 months, how many times did you try to stop using smokeless tobacco?

H17. After your attempt to quit, did you use smokeless tobacco more, less, or the same?

MORE ☐ 1

LESS ☐ 2

SAME ☐ 3

H18. Which of the following best describes your thinking about quitting smokeless tobacco? I am planning to quit within the next month, I am thinking about quitting within the next 12 months, I will quit someday but not within the next 12 months, or I am not interested in quitting?

QUIT WITHIN THE NEXT MONTH	<input type="checkbox"/>	1
THINKING WITHIN THE NEXT 12 MONTHS	<input type="checkbox"/>	2
QUIT SOMEDAY, BUT NOT NEXT 12 MONTHS.....	<input type="checkbox"/>	3
NOT INTERESTED IN QUITTING	<input type="checkbox"/>	4
DON'T KNOW	<input type="checkbox"/>	77

FORMER TOBACCO SMOKERS

INTRO: The next questions ask about your tobacco cessation. Please think about tobacco smoking, including shisha.

H19. Think back to when you started smoking. What do you think were the main reasons why you started smoking?

INT: [MULTIPLE ANSWERS POSSIBLE]

- My friends smoked ☐ 1
 My friends approved of my smoking..... ☐ 2
 Smoking made me look more 'cool' ☐ 3
 Tobacco advertising was attractive to me..... ☐ 4
 My parents did not mind that I smoked..... ☐ 5
 I wanted to keep my weight low ☐ 6
 I wanted to lose weight ☐ 7
 It helped me manage my stress ☐ 8
 I was less depressed when I smoked..... ☐ 9
 I was not worried about health effects ☐ 10
 I believed that I could quit whenever I wanted to ☐ 11
 Other reason, Specify: ☐ 12
 (He/she does not know/ He/she does not answer) ☐ 77

H20. How long has it been since you stopped smoking?

INT: [ONLY INTERESTED IN WHEN RESPONDENT STOPPED SMOKING REGULARLY – DO NOT INCLUDE RARE INSTANCES OF SMOKING]

[ENTER UNIT AND NUMBER]

YEARS

☐ 1

MONTHS

☐ 2

WEEKS

☐ 3

DAYS

☐ 4

LESS THAN 1 DAY (24 HOURS)

☐ 5

DON'T KNOW

☐ 77

INT: [IF H20 = 7, ASK H21. OTHERWISE SKIP TO H22]

H21. How old were you when you quit smoking tobacco?

(IF QUIT SMOKING LESS THAN 1 YEAR AGO, WRITE 98; IF DOES NOT ANSWER, WRITE 99)

H22. What was the most important reason that made you decide to quit smoking tobacco?

INT: [DO NOT READ ANSWERS – ONLY ONE ANSWER]

- Illness (any medical condition)..... ☐ 1
 Worry about effects on health..... ☐ 2
 Physician's advice ☐ 3

Increased knowledge of the harmful effects of smoking	<input type="checkbox"/>	4
Smoke-free legislation	<input type="checkbox"/>	5
Pregnancy/birth of a child	<input type="checkbox"/>	6
Economic reasons (tobacco too expensive)	<input type="checkbox"/>	7
Pressure to quit by partner/relatives	<input type="checkbox"/>	8
Employer precluding hiring smokers	<input type="checkbox"/>	9
Social pressure (social and societal norms)	<input type="checkbox"/>	10
Health warnings on packs	<input type="checkbox"/>	11
Staining of teeth	<input type="checkbox"/>	12
Other reason, Specify:	<input type="checkbox"/>	13
(He/she does not know/ He/she does not answer)	<input type="checkbox"/>	77

H23. When you stopped smoking tobacco, did you use any of the following?

[READ EACH ITEM, MULTIPLE ANSWERS POSSIBLE]

	YES ▼	NO ▼
a) Counselling, including at a smoking cessation clinic?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
b) Nicotine replacement therapy, such as the patch or gum?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
c) Other prescription medications, for example Zyban® (bupropion) or Champix® (varenicline)?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
d) Traditional medicines? Specify:	<input type="checkbox"/> 1	<input type="checkbox"/> 2
e) A quit line or a stop-smoking telephone support line?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
f) Switching to smokeless tobacco?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
g) Quit without assistance	<input type="checkbox"/> 1	<input type="checkbox"/> 2
h) Another means? Specify:	<input type="checkbox"/> 1	<input type="checkbox"/> 2

FORMER SMOKELESS TOBACCO USERS

INTRO: The next questions ask about your tobacco cessation. Please think about smokeless tobacco use.

H24. Think back to when you started using smokeless tobacco. What do you think were the main reasons why you started using smokeless tobacco?

INT: [MULTIPLE ANSWERS POSSIBLE]

- My friends used smokeless tobacco ☐ 1
- My friends approved of my use ☐ 2
- Using smokeless tobacco made me look more 'cool'..... ☐ 3
- Tobacco advertising was attractive to me..... ☐ 4
- My parents did not mind that I used smokeless tobacco..... ☐ 5
- I wanted to keep my weight low ☐ 6
- I wanted to lose weight ☐ 7
- It helped me manage my stress ☐ 8
- I was less depressed when I used smokeless tobacco ☐ 9
- I was not worried about health effects ☐ 10
- I believed that I could quit whenever I wanted to ☐ 11
- Other reason Specify: ☐ 12
- (He/she does not know/ He/she does not answer) ☐ 77

H25. How long has it been since you stopped using smokeless tobacco?

INT: [ONLY INTERESTED IN WHEN RESPONDENT STOPPED USING SMOKELESS TOBACCO REGULARLY -- DO NOT INCLUDE RARE INSTANCES OF USING SMOKELESS TOBACCO]

[ENTER UNIT AND NUMBER]

- | | | | | |
|----------------------------|-----------------------------|----------------------|----------------------|----------------------|
| YEARS | <input type="checkbox"/> 1 | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| MONTHS | <input type="checkbox"/> 2 | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| WEEKS | <input type="checkbox"/> 3 | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| DAYS | <input type="checkbox"/> 4 | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| LESS THAN 1 DAY (24 HOURS) | <input type="checkbox"/> 5 | | | |
| DON'T KNOW | <input type="checkbox"/> 77 | | | |

INT: [IF H25 = 7, ASK H26 OTHERWISE SKIP TO H27]

H26. How old were you when you quit using smokeless tobacco?

[IF QUIT USING SMOKELESS TOBACCO LESS THAN 1 YEAR AGO, WRITE 98; IF DOES NOT ANSWER, WRITE 99]

H27. What was the most important reason that made you decide to quit using smokeless tobacco?

INT: [DO NOT READ THE ANSWERS -- ONLY ONE ANSWER]

- Illness (any medical condition)..... ☐ 1
- Worry about effects on health ☐ 2
- Physician's advice ☐ 3

Increased knowledge of the harmful effects of tobacco use.....	<input type="checkbox"/>	4
Pregnancy/birth of a child	<input type="checkbox"/>	5
Economic reasons (tobacco too expensive).....	<input type="checkbox"/>	6
Pressure to quit by partner/relatives	<input type="checkbox"/>	7
Employer precluding hiring tobacco users.....	<input type="checkbox"/>	8
Social pressure (social and societal norms)	<input type="checkbox"/>	9
Health warnings on packs	<input type="checkbox"/>	10
Staining of teeth	<input type="checkbox"/>	11
Spitting is frowned upon	<input type="checkbox"/>	12
Other reason, Specify:	<input type="checkbox"/>	13
(He/she does not know/ He/she does not answer)	<input type="checkbox"/>	77

H28. When you stopped using smokeless tobacco, did you use any of the following?

[READ EACH ITEM, MULTIPLE ANSWERS POSSIBLE]		<div style="display: flex; justify-content: space-around;"> YES NO </div> <div style="display: flex; justify-content: space-around;"> ▼ ▼ </div>	
a)	Counselling, including at a smoking cessation clinic?	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
b)	Nicotine replacement therapy, such as the patch or gum?.....	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
c)	Other prescription medications, for example Zyban® (bupropion) or Champix® (varenicline)?.....	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
d)	Traditional medicines? Specify:	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
e)	A quit line or a telephone support line?	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
f)	Switching to another type of tobacco? Specify:	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
g)	Quit without assistance.....	<input type="checkbox"/>	1..... <input type="checkbox"/> 2
h)	Another means? Specify:	<input type="checkbox"/>	1..... <input type="checkbox"/> 2

I) ECONOMICS

INT: [RECORD BELOW ANSWERS TO D1, D9a, D17a, D9b, D17b, E1 AND F1 THEN TICK THE CORRESPONDING SUB-SECTION(S) TO ADMINISTER AND FOLLOW INSTRUCTIONS CONCERNING SKIP PATTERN.

ATTENTION: IT IS POSSIBLE TO HAVE TO ADMINISTER SEVERAL SUB-SECTIONS

- D1 = ☐ 1 → [CHECK ANSWERS TO D9 AND D17]
☐ 2 → [CHECK ANSWERS TO D9 AND D17]
☐ 3 → DO NOT SMOKE
☐ 77 → DO NOT KNOW

D9a = ☐ ☐ ☐ ☐ IF > 0 OR = 888 → MANUFACTURED CIGARETTES SMOKER

D9b = ☐ ☐ ☐ ☐ IF > 0 OR = 888 → HAND-ROLLED CIGARETTES SMOKER

D17a = ☐ ☐ ☐ ☐ IF > 0 OR = 888 → MANUFACTURED CIGARETTES SMOKER

D17b = ☐ ☐ ☐ ☐ IF > 0 OR = 888 → HAND-ROLLED CIGARETTES SMOKER

- E1 = ☐ 1 → SHISHA SMOKER
☐ 2 → SHISHA SMOKER
☐ 3 → DO NOT SMOKE
☐ 77 → DO NOT KNOW

- F1 = ☐ 1 → SMOKELESS TOBACCO USER
☐ 2 → SMOKELESS TOBACCO USER
☐ 3 → DO NOT USE TOBACCO
☐ 77 → DO NOT KNOW

MANUFACTURED CIGARETTES SMOKER..... ☐ → [GO TO I1]

HAND-ROLLED CIGARETTES SMOKER..... ☐ → [GO TO I16]

SHISHA SMOKER..... ☐ → [GO TO I31]

SMOKELESS TOBACCO USER..... ☐ → [GO TO I45]

DO NOT SMOKE/USE TOBACCO..... ☐ → [GO TO NEXT SECTION]

DO NOT KNOW..... ☐ → [GO TO NEXT SECTION]

TOTAL NUMBER OF SUB-SECTION(S) TO ADMINISTER: ☐

MANUFACTURED CIGARETTES

INTRO: The next few questions are about the last time you purchased cigarettes for yourself.

11. How much do you spend weekly on *manufactured cigarettes*, for your personal use? If you bought it in another currency, make an estimated conversion into Euros.

INT: [IF INTERVIEWEE DOES NOT KNOW THE EXACT AMOUNT, ENTER AN ESTIMATE]

_____._____ € [IF HE/SHE DOES NOT ANSWER, WRITE 999.99]

12. The last time you bought cigarettes for yourself, how many cigarettes did you buy?

INT: [ENTER UNIT AND NUMBER]

CIGARETTES	<input type="checkbox"/> 1	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>							
PACKS	<input type="checkbox"/> 2	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>							→ How many cigarettes in each pack? _____
CARTONS	<input type="checkbox"/> 3	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>							→ How many cigarettes in each carton? _____
OTHER. SPECIFY: _____	<input type="checkbox"/> 4	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>							→ How many cigarettes in each [FILL IN]? _____
NEVER BOUGHT CIGARETTES	<input type="checkbox"/> 5	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>							→ [SKIP TO NEXT SECTION]

13. In total, how much did you pay for this purchase?

INT: [IF DO NOT KNOW, ENTER 999]

--	--	--

 euros

14. The last time you purchased cigarettes for yourself, where did you buy them?

STORE	<input type="checkbox"/> 1	
STREET VENDOR.....	<input type="checkbox"/> 2	
DUTY-FREE SHOP.....	<input type="checkbox"/> 3	
OUTSIDE THE COUNTRY	<input type="checkbox"/> 4	→ SPECIFY: _____
FROM COUNTRY OF BIRTH.....	<input type="checkbox"/> 5	
INTERNET	<input type="checkbox"/> 6	
FROM ANOTHER PERSON.....	<input type="checkbox"/> 7	
OTHER	<input type="checkbox"/> 8	→ SPECIFY: _____
DON'T REMEMBER.....	<input type="checkbox"/> 77	

15. What brand did you buy the last time you purchased cigarettes for yourself?

INT: [ENTER BRAND ALSO IF BOUGHT ABROAD]

16. What motivated you to choose this brand?

ITS PRICE ☐ 1

- ITS TASTE ☐ 2
 THE PLEASURE IT GIVES ME ☐ 3
 MY FRIENDS SMOKE THIS BRAND ☐ 4
 MY FAMILY SMOKE THIS BRAND ☐ 5
 I LIKE THE PACKAGE ☐ 6
 OTHER ☐ 7 → SPECIFY: _____

INT: COLLECT ALL THE FOLLOWING INFORMATION FROM THE PACK. IF IT IS NOT POSSIBLE TO SEE THE LATEST PACK BOUGHT, THEN ASK THE INTERVIEWEE TO PROVIDE THE INFORMATION REQUIRED

17. Please, could you show me the latest pack of cigarettes that you bought?

- YES ☐ 1
 NO ☐ 2 → If you do not have it with you, could you remember the following information about the last pack of cigarettes that you bought?

18. How much cigarettes are in this pack?

- 10 cigarettes pack ☐ 1
 20 cigarettes pack ☐ 2
 25 cigarettes pack ☐ 3
 30 cigarettes pack ☐ 4
 Other → Specify: ☐ 9

19. Were these cigarettes filtered or non-filtered?

- FILTERED ☐ 1
 NON-FILTERED ☐ 2

110. Were these cigarettes labelled as light, mild, low tar, mentholated or other flavours?

INT: [MULTIPLE ANSWERS POSSIBLE]

- LIGHT ☐ 1
 MILD ☐ 2
 LOW TAR ☐ 3
 MENTHOLATED ☐ 4
 OTHER FLAVOURS ☐ 5 → SPECIFY: _____
 NONE OF THE ABOVE.. ☐ 6
 DON'T KNOW ☐ 77

111. How were the health warnings on the pack?

INT: [MULTIPLE ANSWERS POSSIBLE]

- Health warnings in French ☐ 1
 Health warnings in foreign language ☐ 2
 Health warnings in the form of pictures or pictograms ☐ 3
 Lack of health warnings ☐ 4
 Don't know ☐ 77

I12. How was the tax stamp (banderole) on the pack?

- "01 Vente en France" indication on the side of the pack or French stamp ☐ 1
 Foreign stamp ☐ 2
 Stamp removed or destroyed ☐ 3
 Lack of stamp/Duty-free pack ☐ 4
 Don't know ☐ 77

I13. In the past 30 days, did you read the health warnings on cigarette packages?

- YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

I14. Considering the price of your latest pack of cigarettes, let's assume that it will increase by 20%, i.e. to approximately 7.92 € (Marlboro red – currently 6.60 €). How would you respond to that increase?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- You would quit smoking ☐ 1
 You would consume fewer cigarettes ☐ 2
 You would switch to/also use smokeless tobacco (including snuff or chewing tobacco) ☐ 3
 You would switch to/also use illegal or smuggled cigarettes ☐ 4
 You would switch to hand-rolled cigarettes ☐ 5
 You would switch to cheaper brands ☐ 6
 You would not change your smoking habits ☐ 7
 Don't know ☐ 77

I15. By how much would the current cigarette price have to increase to make you quit smoking completely?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- 20% (7.92€) or less ☐ 1
 21% - 40% (9.24€) ☐ 2
 41% - 60% (10.56€) ☐ 3
 61% - 80% (11.88€) ☐ 4
 81% - 100% (2 times the current price 13.20€) ☐ 5
 3 - 4 times the current price (19.80 – 26.40€) ☐ 6
 5 or more times the current price (33€) ☐ 7
 Don't know ☐ 77

LOOSE TOBACCO (SHAG)

INTRO: The next few questions are about the last time you purchased loose tobacco for yourself.

I16. How much do you spend weekly on 'loose tobacco', for your personal use? If you bought it in another currency, make an estimated conversion into Euros.

INT: [IF INTERVIEWEE DOES NOT KNOW THE EXACT AMOUNT, ENTER AN ESTIMATE]

_____._____._____ € [IF HE/SHE DOES NOT ANSWER, WRITE 999.99]

I17. The last time you bought loose tobacco for yourself, how many packs did you buy?

INT: [ENTER UNIT AND NUMBER]

PACKS ☐ 1

 → How much in each pack? ____ grams

NEVER BOUGHT ☐ 5

 → [SKIP TO NEXT SECTION]

I18. In total, how much did you pay for this purchase?

INT: [IF DON'T KNOW, ENTER 999]

--	--	--

 Euros

I19. The last time you purchased loose tobacco for yourself, where did you buy it?

STORE ☐ 1
 STREET VENDOR ☐ 2
 DUTY-FREE SHOP ☐ 3
 OUTSIDE THE COUNTRY ☐ 4 → SPECIFY: _____
 FROM COUNTRY OF BIRTH ☐ 5
 INTERNET ☐ 6
 FROM ANOTHER PERSON ☐ 7
 OTHER ☐ 8 → SPECIFY: _____
 DON'T REMEMBER ☐ 77

I20. What brand did you buy the last time you purchased loose tobacco for yourself?

INT: [ENTER BRAND ALSO IF BOUGHT ABROAD]

I21. What motivated you to choose this brand?

ITS PRICE ☐ 1
 ITS TASTE ☐ 2
 THE PLEASURE IT GIVES ME ☐ 3
 MY FRIENDS SMOKE THIS BRAND ☐ 4
 MY FAMILY SMOKE THIS BRAND ☐ 5
 I LIKE THE PACKAGE ☐ 6
 OTHER ☐ 7 → SPECIFY: _____

INT: COLLECT ALL THE FOLLOWING INFORMATION FROM THE PACK. IF IT IS NOT POSSIBLE TO SEE THE LATEST PACK BOUGHT, THEN ASK THE INTERVIEWEE TO PROVIDE THE INFORMATION REQUIRED

I22. Please, could you show me the latest pack of loose tobacco that you bought?

YES ☐ 1

NO ☐ 2 → If you do not have it with you, could you remember the following information about the last pack of cigarettes that you bought?

I23. How much tobacco is in this pack?

grams

I24. Do you use these packs with rolling paper, filter tubes, or both?

ROLLING PAPER ☐ 1

FILTER TUBES ☐ 2

BOTH ☐ 3

I25. Were these loose tobacco packs labelled as light, mild, low tar, mentholated or other flavours?

LIGHT ☐ 1

MILD ☐ 2

LOW TAR ☐ 3

MENTHOLATED ☐ 4

OTHER FLAVOURS ☐ 5 → SPECIFY: _____

NONE OF THE ABOVE ☐ 6

DON'T KNOW ☐ 77

I26. How were the health warnings on the pack?

INT: [MULTIPLE ANSWERS POSSIBLE]

Health warnings in French ☐ 1

Health warnings in foreign language ☐ 2

Health warnings in the form of pictures or pictograms ☐ 3

Lack of health warnings ☐ 4

Don't know ☐ 77

I27. How was the tax stamp (banderole) on the pack?

"01 Vente en France" indication on the side of the pack or French stamp ☐ 1

Foreign stamp ☐ 2

Stamp removed or destroyed ☐ 3

Lack of stamp/Duty-free pack ☐ 4

Don't know ☐ 77

I28. In the past 30 days, did you read the health warnings on loose tobacco packages?

YES ☐ 1

NO ☐ 2
 DON'T KNOW ☐ 7

I29. Considering the price of your latest pack of loose tobacco, let's assume that it will increase by 20%, i.e. to approximately 7.80€ (Interval 100% blond 30g – currently 6.50€). How would you respond to that increase?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

You would quit smoking ☐ 1
 You would consume less ☐ 2
 You would switch to/also use smokeless tobacco (including snuff or chewing tobacco) ☐ 3
 You would switch to/also use illegal or smuggled cigarettes ☐ 4
 You would switch to cheaper brands ☐ 5
 You would not change your smoking habits ☐ 6
 Don't know ☐ 77

I30. By how much would the current loose tobacco price have to increase to make you quit smoking completely?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

20% (7.80€) or less ☐ 1
 21% - 40% (9.10€) ☐ 2
 41% - 60% (10.40€) ☐ 3
 61% - 80% (11.70€) ☐ 4
 81% - 100% (2 times the current price 13€) ☐ 5
 3 - 4 times the current price (19.50 – 26€) ☐ 6
 5 or more times the current price (32.50€) ☐ 7
 Don't know ☐ 77

INTRO: The next few questions are about the last time you purchased tobacco for shisha for yourself.

INT: [IF INTERVIEWEE DOES NOT KNOW THE EXACT AMOUNT, ENTER AN ESTIMATE]

132. The last time you bought tobacco for shisha for yourself, how many packs did you buy?

133. In total, how much did you pay for this purchase?

134. The last time you purchased tobacco for shisha for yourself, where did you buy it?

135. What brand did you buy the last time you purchased tobacco for shisha for yourself?

ITS PRICE ☐ 1
 ITS TASTE ☐ 2
 THE PLEASURE IT GIVES ME ☐ 3
 MY FRIENDS SMOKE THIS BRAND ☐ 4
 MY FAMILY SMOKE THIS BRAND ☐ 5
 I LIKE THE PACKAGE ☐ 6
 OTHER ☐ 7 → SPECIFY:

INT: COLLECT ALL THE FOLLOWING INFORMATION FROM THE PACK. IF IT IS NOT POSSIBLE TO SEE THE LATEST PACK BOUGHT, THEN ASK THE INTERVIEWEE TO PROVIDE THE INFORMATION REQUIRED

I37. Please, could you show me the latest pack of tobacco for shisha that you bought?

YES ☐ 1
 NO ☐ 2 → If you do not have it with you, could you remember the following information about the last pack of cigarettes that you bought?

I38. How much tobacco is in this pack?

grams

I39. Was this pack of tobacco for shisha labelled as light, mild, low tar, mentholated or other flavours?

LIGHT ☐ 1
 MILD ☐ 2
 LOW TAR ☐ 3
 MENTHOLATED ☐ 4
 OTHER FLAVOURS ☐ 5 → SPECIFY: _____
 NONE OF THE ABOVE.. ☐ 6
 DON'T KNOW ☐ 77

I40. How were the health warnings on the pack?

INT: [MULTIPLE ANSWERS POSSIBLE]

Health warnings in French ☐ 1
 Health warnings in foreign language ☐ 2
 Health warnings in the form of pictures or pictograms ☐ 3
 Lack of health warnings ☐ 4
 Don't know ☐ 77

I41. How was the tax stamp (banderole) on the pack?

"01 Vente en France" indication on the side of the pack or French stamp ☐ 1
 Foreign stamp ☐ 2
 Stamp removed or destroyed ☐ 3
 Lack of stamp/Duty-free pack ☐ 4
 Don't know ☐ 77

I42. In the past 30 days, did you read the health warnings on the packs?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 7

I43. Considering the price of your latest pack of loose tobacco, let's assume that it will increase by 20%, i.e. to approximately 8.28€ (Al Fakher double pomme 50g – currently 6.90€). How would you respond to that increase?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- | | |
|--|-----------------------------|
| You would quit smoking..... | <input type="checkbox"/> 1 |
| You would consume less..... | <input type="checkbox"/> 2 |
| You would switch to/also use smokeless tobacco (including snuff or chewing tobacco)..... | <input type="checkbox"/> 3 |
| You would switch to/also use illegal or smuggled tobacco..... | <input type="checkbox"/> 4 |
| You would switch to cheaper brands..... | <input type="checkbox"/> 5 |
| You would not change your smoking habits..... | <input type="checkbox"/> 6 |
| Don't know..... | <input type="checkbox"/> 77 |

I44. By how much would the current loose tobacco price have to increase to make you quit smoking completely?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- | | |
|---|-----------------------------|
| 20% (8.28€) or less..... | <input type="checkbox"/> 1 |
| 21% - 40% (9.66€)..... | <input type="checkbox"/> 2 |
| 41% - 60% (11.04€)..... | <input type="checkbox"/> 3 |
| 61% - 80% (12.42€)..... | <input type="checkbox"/> 4 |
| 81% - 100% (2 times the current price 13.80€)..... | <input type="checkbox"/> 5 |
| 3 - 4 times the current price (20.70 - 27.60€)..... | <input type="checkbox"/> 6 |
| 5 or more times the current price (34.50€)..... | <input type="checkbox"/> 7 |
| Don't know..... | <input type="checkbox"/> 77 |

SMOKELESS TOBACCO

INTRO: The next few questions are about the last time you purchased smokeless tobacco for yourself.

I45. How much do you spend weekly on *smokeless tobacco*, for your personal use? If you bought it in another currency, make an estimated conversion into Euros.

INT: [IF INTERVIEWEE DOES NOT KNOW THE EXACT AMOUNT, ENTER AN ESTIMATE]

_____._____ € [IF HE/SHE DOES NOT ANSWER, WRITE 999.99]

I46. The last time you bought smokeless tobacco for yourself, how many units of it did you buy?

INT: [ENTER NUMBER AND CONDITIONING]

SNUFF BY MOUTH	<input type="checkbox"/> 1	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ How much in each pack? ____ grams
SNUFF BY NOSE	<input type="checkbox"/> 2	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ How much in each pack? ____ grams
CHEWING TOBACCO	<input type="checkbox"/> 3	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ How much in each pack? ____ grams
BETEL QUID WITH TOBACCO	<input type="checkbox"/> 4	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ How much in each pack? ____ grams
OTHER SPECIFY: _____	<input type="checkbox"/> 5	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ How much in each pack? ____ grams
NEVER BOUGHT	<input type="checkbox"/> 9	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr></table>				→ [SKIP TO NEXT SECTION]

I47. In total, how much did you pay for this purchase?

INT: [IF DON'T KNOW, ENTER 999]

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 Euros

I48. The last time you purchased smokeless tobacco for yourself, where did you buy it?

STORE	<input type="checkbox"/> 1	
STREET VENDOR	<input type="checkbox"/> 2	
DUTY-FREE SHOP	<input type="checkbox"/> 3	
OUTSIDE THE COUNTRY	<input type="checkbox"/> 4	→ SPECIFY: _____
FROM COUNTRY OF BIRTH	<input type="checkbox"/> 5	
INTERNET	<input type="checkbox"/> 6	
FROM ANOTHER PERSON	<input type="checkbox"/> 7	
OTHER	<input type="checkbox"/> 8	→ SPECIFY: _____
DON'T REMEMBER	<input type="checkbox"/> 77	

I49. What brand did you buy the last time you purchased smokeless tobacco for yourself?

INT: [ENTER BRAND ALSO IF BOUGHT ABROAD]

I50. What motivated you to choose this brand?

- ITS PRICE ☐ 1
 ITS TASTE ☐ 2
 THE PLEASURE IT GIVES ME ☐ 3
 MY FRIENDS USE THIS BRAND ☐ 4
 MY FAMILY USE THIS BRAND ☐ 5
 I LIKE THE PACKAGE ☐ 6
 OTHER ☐ 7 → SPECIFY: _____

INT: [COLLECT ALL THE FOLLOWING INFORMATION FROM THE PACK. IF IT IS NOT POSSIBLE TO SEE THE LATEST PACK BOUGHT, THEN ASK THE INTERVIEWEE TO PROVIDE THE INFORMATION REQUIRED]

I51. Please, could you show me the latest pack of smokeless tobacco that you bought?

- YES ☐ 1
 NO ☐ 2 → If you do not have it with you, could you remember the following information about the last pack of cigarettes that you bought?

I52. How much tobacco is in this pack?

			grams
--	--	--	-------

I53. Was this pack of smokeless tobacco labelled as light, mild, low tar, mentholated or other flavours?

- LIGHT ☐ 1
 MILD ☐ 2
 LOW TAR ☐ 3
 MENTHOLATED ☐ 4
 OTHER FLAVOURS ☐ 5 → SPECIFY: _____
 NONE OF THE ABOVE ☐ 6
 DON'T KNOW ☐ 77

I54. How were the health warnings on the pack?

INT: [MULTIPLE ANSWERS POSSIBLE]

- Health warnings in French ☐ 1
 Health warnings in foreign language ☐ 2
 Health warnings in the form of pictures or pictograms ☐ 3
 Lack of health warnings ☐ 4
 Don't know ☐ 77

I55. How was the tax stamp (banderole) on the pack?

- "01 Vente en France" indication on the side of the pack or French stamp ☐ 1
 Foreign stamp ☐ 2
 Stamp removed or destroyed ☐ 3
 Lack of stamp/Duty-free pack ☐ 4
 Don't know ☐ 77

I56. In the past 30 days, did you read the health warnings on the packs?

- YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 7

I57. Considering the price of your latest pack of smokeless tobacco, let's assume that it will increase by 20%, i.e. to approximately 2.88€ (Makla Ifrikia 20g - currently 2.40€). How would you respond to that increase?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- You would quit using smokeless tobacco ☐ 1
 You would consume less ☐ 2
 You would switch to/also use smoked tobacco ☐ 3
 You would switch to/also use illegal or smuggled smokeless tobacco ☐ 4
 You would switch to cheaper brands ☐ 5
 You would not change your tobacco use habits ☐ 6
 Don't know ☐ 77

I58. By how much would the current smokeless tobacco price have to increase to make you quit using smokeless tobacco completely?

INT: [READ THE ANSWERS – ONLY ONE ANSWER]

- 20% (2.88€) or less ☐ 1
 21% - 40% (3.36€) ☐ 2
 41% - 60% (3.84€) ☐ 3
 61% - 80% (4.32€) ☐ 4
 81% - 100% (2 times the current price 4.80€) ☐ 5
 3 - 4 times the current price (7.20 – 9.60€) ☐ 6
 5 or more times the current price (12€) ☐ 7
 Don't know ☐ 77

J) KNOWLEDGE, PERCEPTIONS, ATTITUDES & BEHAVIOURS

INTRO: The next few questions are about what you know or think about tobacco.

J1. For you, smoking or using tobacco means:

INT: [MULTIPLE ANSWERS POSSIBLE]

- A time of relaxation or pleasure ☐ 1
 A nice time with friends or colleagues ☐ 2
 A feeling of guilt or distress ☐ 3
 Feelings of stress, nervousness ☐ 4
 "Getting away from it all" ☐ 5
 A habit, just like eating or sleeping ☐ 6
 OTHER ☐ 9 → SPECIFY: _____

J2. Around you, smoking or using tobacco is or means:

- Normal ☐ 1
 Being excluded from the group ☐ 2
 Being included in the group ☐ 3
 Regulated (places, etc.) ☐ 4
 Unpopular or frowned upon ☐ 5
 OTHER ☐ 9 → SPECIFY: _____

J3. In your environment, not smoking or using tobacco is or means:

- Normal ☐ 1
 Being excluded from the group ☐ 2
 Being included in the group ☐ 3
 Unpopular or frowned upon ☐ 4
 OTHER ☐ 9 → SPECIFY: _____

J4. Here are some opinions that we hear about tobacco. For each, tell me if you strongly agree, agree, disagree or strongly disagree.

[READ RANDOMLY]

	strongly agree	agree	disagree	strongly disagree	Do not know
Breathing the air of cities is as bad for health as smoking cigarettes	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Smoking can cause cancer only if you smoke a lot and for a long time	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Some people smoke all their lives and never have cancer	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
A smoker can avoid getting cancer due to cigarette if he knows when to stop	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Even if you do not smoke yourself, be exposed to second-hand smoke can cause cancer	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Playing sports helps to cleanse the lungs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77

A former smoker can get cancer due to his smoking long after quitting

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 77

J5. According to you, from how many cigarettes a day smoker may he have cancer due to smoking?

INT: [IF RESPONDANT ANSWERED NEVER OR DO NOT KNOW, ENTER 999 ;
IF LESS THAN 1 CIGARETTE PER DAY, ENTER 000]

cigarettes

INT: [ASK QUESTION J6 ONLY IF J5 ≠ 000 ou 999]

J6. And, according to you, after how many years a person smoking [NUMBER GIVEN AT J5] cigarettes per day is at high risk of getting cancer ?

INT: [IF LESS THAN A YEAR, ENTER 999]

Years

J7. The next question is about smoking tobacco. Based on what you know or believe, does smoking tobacco cause serious illness?

YES ☐ 1
NO ☐ 2 → SKIP TO J10
DON'T KNOW ☐ 77

J8. Based on what you know or believe, what (diseases) can smoking tobacco cause?

INT: [DO NOT READ ITEMS]

Stroke (blood clots in the brain
that may cause paralysis) ☐ 1
Heart attack ☐ 2
Lung cancer ☐ 3
Cancer in other site(s) ☐ 4
Exacerbation of asthma in children ☐ 5
Impotence ☐ 6
Peripheral vascular disease ☐ 7
Other → SPECIFY: ☐ 9
Do not know ☐ 77

J9. Based on what you know or believe, does smoking tobacco cause the following?

INT: [READ EACH ITEM UNLESS
ALREADY CITED ABOVE]

	YES ▼	NO ▼	DON'T KNOW ▼
a. Stroke (blood clots in the brain that may cause paralysis)?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
b. Heart attack?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
c. Lung cancer?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
d. Cancer in other site(s)?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
e. Exacerbation of asthma in children?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
f. Impotence?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77

g. Peripheral vascular disease? ☐ 1 ☐ 2 ☐ 77

J10. Based on what you know or believe, does smoking tobacco during pregnancy cause low birth weight in the newborn?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

J11. Based on what you know or believe, does using smokeless tobacco cause cancer?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

J12. Based on what you know or believe, can breathing smoke from other people's cigarettes cause serious illness in non-smokers?

YES ☐ 1
NO ☐ 2 → SKIP TO J14
DON'T KNOW ☐ 77 → SKIP TO J14

J13. Based on what you know or believe, can breathing smoke from other people's cigarettes increase the risk of developing any of the following?

READ EACH ITEM:	YES	NO	DON'T KNOW
a. Heart disease in adults?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
b. Respiratory illnesses in children?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
c. Lung cancer in adults?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77

INT: [J14 SHOULD ONLY BE ASKED OF CURRENT TOBACCO SMOKERS (D1 = 1 OR 2) WHO BELIEVE THAT SMOKING CAUSES SERIOUS DISEASE (J7 = 1) OR WHO DON'T KNOW WHETHER SMOKING CAUSES SERIOUS DISEASE (J7 = 77)]

J14. Based on your experience of smoking, do you think that your current brand might be less harmful, is no different, or might be more harmful, compared with other brands of cigarettes?

INT: [ANSWERS SHOULD BE CONCISE]

LESS HARMFUL ☐ 1 → SPECIFY WHY, THEN SKIP TO J16: → _____
NO DIFFERENT ☐ 2
MORE HARMFUL ☐ 3 → SPECIFY WHY, THEN SKIP TO J16: → _____

INT: [J15 SHOULD BE ASKED OF EVERYONE EXCEPT FOR THOSE WHO BELIEVE THAT SMOKING DOES NOT CAUSE SERIOUS DISEASE (J7 = 2) AND THOSE WHO BELIEVE THAT BREATHING SMOKE FROM OTHER PEOPLE'S CIGARETTES CAUSES SERIOUS DISEASE (J12 = 1) OR WHO DON'T KNOW WHETHER BREATHING SMOKE FROM OTHER PEOPLE'S CIGARETTES CAUSES SERIOUS DISEASE (J12 = 77)]

J15. Do you think that some types of cigarettes *could* be less harmful than other types, or are all cigarettes equally harmful?

COULD BE LESS HARMFUL ☐ 1
 ALL EQUALLY HARMFUL ☐ 2
 DON'T KNOW ☐ 77

J16. Do you think that compared with shisha, cigarettes are more harmful, less harmful or equally harmful?

CIGARETTES ARE MORE HARMFUL ... ☐ 1
 CIGARETTES ARE LESS HARMFUL ☐ 2
 EQUALLY HARMFUL ☐ 3

J17. Do you believe that manufactured cigarettes are addictive?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J18. Do you believe that hand-rolled cigarettes are addictive?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J19. Do you believe that smokeless tobacco is addictive?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J20. Is the risk of developing lung cancer lower in smokers who quit than in those who continue to smoke?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J21. Does the risk of lung cancer decrease with time since quitting smoking?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J22. Is the risk of disease of the heart and arteries (cardiovascular disease) lower in former than in current smokers?

YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

J23. Does the risk of disease of the heart and arteries (cardiovascular disease) decrease with time since quitting smoking?

YES ☐ 1
NO ☐ 2
DON'T KNOW ☐ 77

J24. Have you visited a doctor, a dentist, or another health care provider in the past 12 months?

YES ☐ 1
NO ☐ 2 → SKIP TO J31

J25. How many times did you visit a doctor, a dentist, or another health care provider in the past 12 months? Would you say 1 or 2 times, 3 to 5 times, or 6 or more times?

1 OR 2 ☐ 1
3 TO 5 ☐ 2
6 OR MORE ☐ 3

J26. During any visit to a doctor, a dentist, or another health care provider in the past 12 months, were you asked whether you use tobacco?

YES ☐ 1
NO ☐ 2

INT: [ASK QUESTIONS J27 TO J30 ONLY IF RESPONDENT IS CURRENT SMOKER (D1=1-2 OR E1=1-2) OR CURRENT SMOKELESS TOBACCO USER (F1=1-2) OTHERWISE SKIP TO J31]

J27. During any visit to a doctor, a dentist, or another health care provider in the past 12 months, were you advised to quit tobacco use?

YES ☐ 1
NO ☐ 2

J28. Were you referred to particular assistance to help you quit tobacco use?

YES ☐ 1 → SPECIFY: _____
NO ☐ 2

J29. Were you informed about the harmful effects to your health of using tobacco?

YES ☐ 1
NO ☐ 2

J30. Were you informed about the benefits to your health of quitting tobacco?

YES ☐ 1
NO ☐ 2

J31. Would you be in favour of or oppose increasing taxes on tobacco products so that their cost increases?

FAVOUR.....☐ 1
 OPPOSE.....☐ 2
 DON'T KNOW..☐ 77

J32. Would you be in favour of increasing taxes on tobacco products if you knew that a cost increase of 10% would reduce the tobacco consumption of young people?

YES.....☐ 1
 NO.....☐ 2
 DON'T KNOW..☐ 77

J33. Would you be in favour of increasing taxes on tobacco products if you knew that part of the taxes would be used to prevent young people from starting to use tobacco and to support tobacco users in quitting?

YES.....☐ 1
 NO.....☐ 2
 DON'T KNOW..☐ 77

J34. Would you be in favour of or oppose the government assigning part of the money collected from tobacco taxes to:

	FAVOUR	OPPOSE	DON'T KNOW
a. assist people to quit tobacco use?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
b. pay hospital bills for tobacco-attributable illnesses?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
c. prevent young people from ever starting to use tobacco? ..	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77

J35. To control and limit tobacco use, the government or the national political decision-makers could adopt several strategies. How useful do you assess each one to be?

	Very useful	Quite useful	Rather useless	Completely useless	Does not know/ answer
Free psychological support for smoking cessation, e.g. group or individual counselling	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Free pharmacological support for smoking cessation, including nicotine replacement therapy (patches, gums) and/or medication	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Making smoking or cigarette sales illegal	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Raising the price of tobacco	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Extending smoking bans to include open spaces such as parks where children play, terraces in restaurants	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Plain packaging and labelling on tobacco	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77

products

Total ban on pro-tobacco advertising	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Ban of sale of tobacco to minors	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77
Ban of use of the term "light"	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 77

INT: [ASK QUESTION J36 ONLY IF RESPONDANT HAS A REGULAR/OCCASIONAL RELIGIOUS PRACTICE, OR NO PRACTICE BUT A SENSE OF BELONGING TO A RELIGION (C10 = 1-3), OTHERWISE SKIP TO NEXT SECTION]

J36. As far as you know, does your religion discourage smoking?

YES ☐ 1
NO ☐ 2
DON'T KNOW.. ☐ 77

K) MEDIA

INTRO: The next few questions ask about your exposure to the media and advertisements in the last 30 days.

K1. In the past 30 days, have you noticed any advertisements or signs promoting *cigarettes* in the following places?

	YES ▼	NO ▼
a. In stores where cigarettes are sold?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
b. On television?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
c. On the radio?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
d. On billboards?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
e. On posters?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
f. In newspapers or magazines?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
g. In cinemas?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
h. On the Internet?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
i. On public transportation vehicles or stations?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
j. On public walls?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
k. Anywhere else?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2

→ Specify: _____

K2. In the past 30 days, have you noticed any of the following types of *cigarette* promotions?

	YES ▼	NO ▼	DON'T KNOW ▼
a. Free samples of cigarettes?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77
b. Cigarettes at sale prices?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77
c. Coupons for cigarettes?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77
d. Free gifts or special discount offers on other products when buying cigarettes?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77
e. Clothing or other items with a cigarette brand name or logo?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77
f. Cigarette promotions in the mail?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2.....	<input type="checkbox"/> 77

K3. In the past 30 days, have you noticed the release of new packaging?

YES ☐ 1 → SPECIFY WHICH BRAND(S): _____

NO ☐ 2

DON'T KNOW .. ☐ 77

K4. In the past 30 days, have you noticed any advertisements or signs promoting *smokeless tobacco* in the following places?

	YES ▼	NO ▼
a. In stores where smokeless tobacco is sold?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2
b. On television?	<input type="checkbox"/> 1.....	<input type="checkbox"/> 2

- c. On the radio? ☐ 1 ☐ 2
- d. On billboards? ☐ 1 ☐ 2
- e. On posters? ☐ 1 ☐ 2
- f. In newspapers or magazines? ☐ 1 ☐ 2
- g. In cinemas? ☐ 1 ☐ 2
- h. On the Internet? ☐ 1 ☐ 2
- i. On public transportation vehicles or stations? ☐ 1 ☐ 2
- j. On public walls? ☐ 1 ☐ 2
- k. Anywhere else? ☐ 1 ☐ 2
- Specify: _____

K5. In the past 30 days, have you noticed any of the following types of *smokeless tobacco* promotions?

READ EACH ITEM:	YES ▼	NO ▼	DON'T KNOW ▼
a. Free samples of smokeless tobacco?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
b. Smokeless tobacco at sale prices?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
c. Coupons for smokeless tobacco?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
d. Free gifts or special discount offers on other products when buying smokeless tobacco?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
e. Clothing or other items with a tobacco brand name or logo?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77
f. Smokeless tobacco promotions in the mail?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 77

L) SMOKING HISTORY IN COUNTRY OF BIRTH

INT: [IF RESPONDENT IS IMMIGRANT (A5.1=1-7 AND (A5.2=1-7 OR A5.4=1-7)) ASK QUESTIONS IN THIS SECTION OTHERWISE SKIP TO NEXT SECTION]

L1. While in your country of birth, did you ever participate in a survey about tobacco use?

- YES ☐ 1
 NO ☐ 2 → SKIP TO L3
 DON'T KNOW ☐ 77

L2. On that occasion, have you freely reported on your tobacco use habits whether you were a user or not?

- YES ☐ 1
 NO ☐ 2
 DON'T KNOW ☐ 77

INT: [ASK QUESTIONS L3 ONLY IF RESPONDENT IS AN EVER TOBACCO USER (D1=1-2 ; D4=1-3) OR (E1=1-2 ; E4=1-3) OR (F1=1-2 ; F4=1-3), OTHERWISE SKIP TO NEXT SECTION]

L3. Since you arrived in France, compared with when you were in your country of origin are you using tobacco:

- AS OFTEN? ☐ 1 → SKIP TO L5
 LESS OFTEN? ☐ 2
 MORE OFTEN? ☐ 3
 DON'T KNOW ☐ 77 → SKIP TO L5

INT: [ASK QUESTIONS L4 ONLY IF RESPONDENT USES TOBACCO MORE OR LESS OFTEN (L3=2-3), OTHERWISE GO TO QUESTION L5]

L4. If less often or more often, by how much?

INT: [DO NOT READ ITEMS, RECORD ANSWER (IN %) THEN TICK CORRESPONDING BOX BELOW; IF NECESSARY PROPOSE X TIMES MORE/LESS THAN BEFORE]

%

- 20% or less ☐ 1
 21%-40% ☐ 2
 41%-60% ☐ 3
 61%-80% ☐ 4
 81%-100% (2 times more/less than before) ☐ 5
 3/4 times more/less than before ☐ 6
 5 or more times more/less than before ☐ 7
 Do not know ☐ 77

L5. What would be the single most important change in your tobacco use habits that you have adopted since you arrived in France?

M) END OF INDIVIDUAL QUESTIONNAIRE

These are all of the questions I have. Thank you very much for participating in this important survey.

TIME INTERVIEW ENDS
[24-HOUR CLOCK]

____:____
HRS MINS

M1.[WAS THE RESPONDENT ALONE DURING THE INTERVIEW?]

YES ☐ 1

NO ☐ 2

M2.[DID YOU HAVE TO INTERRUPT THE INTERVIEW BECAUSE OF LANGUAGE DIFFICULTIES?]

YES ☐ 1

NO ☐ 2

M3.[IF YES, WHAT WOULD HAVE BEEN THE LANGUAGE NECESSARY TO CONTINUE THE INTERVIEW?]

SPECIFY _____

M4.[WAS THE INTERVIEW CONDUCTED PARTIALLY OR TOTALLY IN A LANGUAGE OTHER THAN THAT OF THE QUESTIONNAIRE?]

YES ☐ 1 → SPECIFY _____

NO ☐ 2

M5.[DID THE RESPONDENT HAVE DIFFICULTIES IN RECALLING SOME ANSWERS?]

YES ☐ 1 → SPECIFY _____

NO ☐ 2

RECORD ANY NOTES ABOUT THE INTERVIEW, INCLUDING LEVEL OF PARTICIPATION, QUESTIONS ASKED TO YOU, AND ANY OTHER IMPRESSIONS THAT YOU THINK ARE IMPORTANT TO FEEDBACK AND SHARE WITH US.

CAUTION : KEEP PARTICIPANT CONFIDENTIALITY ALSO IN YOUR COMMENTS

Appendix 3: Demographics of the first generation immigrants in the sampling area of the TOBAMIG study

Source: INSEE population censuses

EFFECTIFS	Métropole		Décines-Charpieu		Lyon 8ème		Rillieux-la-Pape		Saint-Fons		Vaulx-en-Velin		Vénissieux		TOTAL									
	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total									
Population totale	62,465,708	30,246,708	32,219,000	25,414	12,064	13,350	76,782	35,703	41,079	29,990	14,174	15,816	16,690	8,160	8,530	40,339	19,703	20,636	58,643	28,300	30,343	247,858	118,104	129,754
Immigrés	5,325,419	2,619,899	2,705,520	3,961	1,902	2,059	11,964	5,885	6,079	5,152	2,556	2,596	4,609	2,425	2,184	11,577	5,766	5,811	13,930	7,022	6,908	51,192	25,556	25,636
Europe	2,045,642	953,383	1,092,259	1,562	751	811	2,457	1,120	1,337	1,172	606	566	934	471	464	2,305	1,104	1,201	2,633	1,207	1,426	11,063	5,259	5,804
Europe des 27	1,813,978	851,532	962,445	1,380	656	724	1,986	891	1,095	909	472	437	792	387	406	1,592	754	838	2,180	983	1,197	8,840	4,143	4,697
Espagne	251,870	110,617	141,253	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Italie	310,709	152,064	158,645	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Portugal	584,334	299,202	285,131	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Autres pays de l'UE27	667,065	289,649	377,416	1,380	656	724	1,986	891	1,095	909	472	437	792	387	406	1,592	754	838	2,180	983	1,197	8,840	4,143	4,697
Autres pays d'Europe (hors UE27)	231,664	101,851	129,814	182	96	87	470	229	242	263	134	129	142	84	58	713	350	363	453	223	229	2,223	1,116	1,107
Afrique	2,302,910	1,201,938	1,100,972	1,330	690	639	7,684	3,916	3,768	2,584	1,256	1,328	2,967	1,612	1,355	7,139	3,606	3,532	9,342	4,877	4,465	31,045	15,957	15,088
Algérie	721,274	379,969	341,305	871	460	411	3,403	1,675	1,728	1,266	595	671	1,437	693	744	3,566	1,769	1,797	4,997	2,598	2,399	15,539	7,788	7,751
Maroc	663,502	347,165	316,337	113	57	55	950	471	480	270	125	145	286	144	142	1,058	556	502	1,492	458	490	3,626	1,811	1,814
Tunisie	236,242	138,379	97,863	211	107	104	1,301	789	512	630	358	272	845	560	285	1,177	625	552	2,111	1,202	909	6,275	3,640	2,635
Autres pays d'Afrique	681,892	336,425	345,467	135	67	68	2,029	981	1,049	418	179	239	399	215	184	1,338	657	681	1,286	619	666	5,605	2,717	2,888
Asie	1,035	443	592	1,035	443	592	1,470	714	756	1,300	661	639	682	328	355	2,104	1,041	1,063	1,873	906	967	8,464	4,094	4,370
Turquie	242,229	129,418	112,810	274	130	145	275	165	111	138	77	61	469	225	243	726	373	354	689	353	337	2,572	1,322	1,250
Autres pays d'Asie	761	313	447	761	313	447	1,194	550	645	1,162	584	578	214	102	111	1,378	669	709	1,184	553	630	5,892	2,772	3,121
Autres pays	734,637	335,159	399,478	34	17	17	354	135	219	96	33	64	25	15	10	29	14	15	82	32	50	620	246	374

Champ : Communes du Grand-Lyon ou limitrophe de plus de 9999 habitants, dont la proportion d'immigrés est sup érieure a la moyenne nationale (8,5%)
Source : Insee, recensement 2 009, exploitation principale.

PROPORTIONS	Métropole		Décines-Charpieu		Lyon 8ème		Rillieux-la-Pape		Saint-Fons		Vaulx-en-Velin		Vénissieux		TOTAL										
	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Total	Femmes	Hommes	Femmes									
Population totale	62,465,708	30,246,708	32,219,000	15,59%	25,414	12,064	13,350	76,782	35,703	41,079	29,990	14,174	15,816	16,690	8,160	8,530	40,339	19,703	20,636	58,643	28,300	30,343	247,858	118,104	129,754
Immigrés	8,53%	8,66%	8,40%	15,77%	15,59%	15,77%	15,58%	16,48%	14,80%	17,18%	17,18%	18,03%	16,41%	27,61%	29,72%	25,60%	28,70%	29,26%	28,16%	23,75%	24,81%	22,77%	20,65%	21,64%	19,76%
Europe	3,27%	3,15%	3,39%	6,15%	6,23%	6,07%	3,20%	3,14%	3,25%	3,91%	4,28%	3,58%	5,60%	5,77%	5,44%	5,71%	5,71%	5,60%	5,82%	4,49%	4,26%	4,70%	4,46%	4,45%	4,47%
Europe des 27	2,90%	2,82%	2,99%	5,43%	5,43%	5,42%	2,59%	2,50%	2,67%	3,03%	3,33%	2,76%	4,75%	4,74%	4,75%	3,95%	3,95%	3,83%	4,06%	3,72%	3,47%	3,94%	3,57%	3,51%	3,62%
Espagne	0,40%	0,37%	0,44%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Italie	0,50%	0,50%	0,49%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Portugal	0,94%	0,99%	0,88%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Autres pays de l'UE27	1,07%	0,96%	1,17%	5,43%	5,43%	5,42%	2,59%	2,50%	2,67%	3,03%	3,33%	2,76%	4,75%	4,74%	4,75%	3,95%	3,95%	3,83%	4,06%	3,72%	3,47%	3,94%	3,57%	3,51%	3,62%
Autres pays d'Europe (hors UE27)	0,37%	0,34%	0,40%	0,72%	0,79%	0,65%	0,61%	0,64%	0,59%	0,88%	0,95%	0,81%	0,85%	1,03%	0,68%	1,77%	1,77%	1,78%	1,76%	0,77%	0,79%	0,76%	0,90%	0,94%	0,85%
Afrique	3,69%	3,97%	3,42%	5,23%	5,72%	4,79%	10,01%	10,97%	9,17%	8,62%	8,86%	8,40%	17,78%	19,75%	15,89%	17,70%	18,30%	17,12%	15,93%	17,23%	14,72%	12,55%	13,51%	11,63%	
Algérie	1,15%	1,26%	1,06%	3,43%	3,81%	3,08%	4,43%	4,69%	4,21%	4,22%	4,19%	4,25%	8,61%	8,49%	8,73%	8,84%	8,98%	8,71%	8,52%	9,18%	7,91%	6,27%	6,59%	5,97%	
Maroc	1,06%	1,15%	0,98%	0,44%	0,48%	0,42%	1,24%	1,32%	1,17%	0,90%	0,88%	0,92%	1,71%	1,77%	1,66%	2,62%	2,82%	2,43%	1,62%	1,62%	1,46%	1,46%	1,53%	1,40%	
Tunisie	0,38%	0,46%	0,30%	0,83%	0,88%	0,78%	1,69%	2,21%	1,25%	2,10%	2,53%	1,72%	5,06%	6,86%	3,34%	2,92%	3,17%	2,68%	3,60%	4,25%	3,00%	2,53%	3,08%	2,03%	
Autres pays d'Afrique	1,09%	1,11%	1,07%	0,53%	0,55%	0,51%	2,64%	2,75%	2,55%	1,39%	1,26%	1,51%	2,39%	2,64%	2,16%	3,32%	3,33%	3,30%	2,19%	2,19%	2,26%	2,30%	2,38%	2,23%	
Asie	0,39%	0,43%	0,35%	1,08%	1,07%	1,08%	0,36%	0,46%	0,27%	0,46%	0,54%	0,40%	4,09%	4,02%	4,16%	5,22%	5,29%	5,15%	3,19%	3,20%	3,19%	3,41%	3,47%	3,37%	
Turquie	0,39%	0,43%	0,35%	1,08%	1,07%	1,08%	0,36%	0,46%	0,27%	0,46%	0,54%	0,40%	2,81%	2,76%	2,85%	1,80%	1,89%	1,72%	1,18%	1,25%	1,11%	1,04%	1,12%	0,96%	
Autres pays d'Asie	1,18%	1,11%	1,24%	0,14%	0,14%	0,13%	0,46%	0,38%	0,53%	0,32%	0,23%	0,40%	1,28%	1,25%	1,31%	3,42%	3,40%	3,43%	2,02%	1,96%	2,08%	2,38%	2,35%	2,40%	
Autres pays	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	0,29%	

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