



3-7-2017

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Recommended Citation

Khat, Myriam, and Michel Guillot. 2017. "Health and Mortality Patterns Among Migrants in France." *University of Pennsylvania Population Center Working Paper (PSC/PARC)*, 2017-8. https://repository.upenn.edu/psc_publications/8.

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Keywords

France, Migrants, Migration, Emigrants, Immigrants, Emmigration, Mortality, Health, Causes of Death, Aging, Nativity, Immigration Policy, Diseases, Health Transition, Migrant Mortality Paradox

Disciplines

Demography, Population, and Ecology | International and Area Studies | Public Health | Quantitative, Qualitative, Comparative, and Historical Methodologies | Race and Ethnicity | Sociology

Health and mortality patterns among migrants in France

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Acknowledgments: This research for this paper was funded in part by a grant from NICHD (R01 HD079475). This is a longer version of a chapter forthcoming in *Migration, Health and Survival - International Perspectives*, edited by Frank Trovato (editor), Edward Elgar Publisher.

Introduction

Research on migrants' health and mortality has been lagging in France, by comparison with other European countries with shorter immigration histories. This lag has been related to the predominance in France of the *modèle d'intégration républicaine* (republican model of integration), according to which the state disregards criteria such as race, ethnicity or religion when interacting with individuals, in order to guarantee equal treatment for all (Oberti, 2008). Given the strong links between the state and the statistical system, the dividing line has long been limited to the basic distinction between foreigners and French citizens (Safi, 2007).

The first census to include information on nationality at birth dates back to 1962, and in 1992, the *Haut Conseil à l'intégration* (Higher Council for Integration) adopted the following official definition: 'an immigrant is a person residing in France and born abroad with a foreign nationality at birth'. Nationality at birth is not available on death certificates, and rarely available in official statistics and survey data, and therefore country of birth, which is a better indicator of migrant status than nationality, has been widely used. Ignoring nationality at birth is however consequential in a number of countries of Europe, including France, where immigration originated in large part from former colonies. In those countries, the migratory waves resulting from decolonization consisted of two major streams, one of former colonists returning to Europe and the other of formerly colonized low-wage laborers (Alba and Silberman, 2002). This heterogeneity is a complicating factor which has to be addressed in the interpretation of the findings.

In France, the field of migrant health and mortality research has developed very slowly. Throughout the eighties, only two publications on the mortality of foreigners appeared in the literature. They were followed in the nineties by a coordinated series of publications on cancer mortality in migrants, which were all authored by a team of researchers working with the World Health Organization's International Agency for Research on Cancer (IARC).

Indeed, migrant studies have long been popular in the field of cancer epidemiology, as they provide a kind of ‘natural experiment’ offering insight on the relative importance of environmental exposures in disease etiology (Parkin and Khlal, 1996). The above-mentioned studies resulted from a large research program on cancer among Italian migrants throughout the world, within which France was one of the included host countries (Geddes et al., 1993).

No national-level study can be found in the literature between the late nineties and the mid-2000s. The latter date was a turning point, with the publication in close succession of a series of uncoordinated papers on migrants’ health. Most of the studies were based on nationally representative surveys : health surveys (*Enquête Décennale Santé, Enquête santé et Protection Sociale, Enquête Santé Mentale en Population Générale, Etude Longitudinale Française depuis l’Enfance*) ; broader surveys containing pieces of information on health, among which were biographical surveys (*Enquête Histoire de Vie*); European cross-national surveys (*Survey of Ageing, Health and Retirement in Europe, European Union Survey on Income and Living Conditions*), or; surveys specifically targeting migrant populations (*Enquête Passage à la Retraite des Immigrés, Enquête Trajectoires et Origines*). Other studies relied on disease or hospital registers, particularly for the description of infectious diseases or perinatal morbidity. The rationale of this batch of studies was quite different from that prevailing in cancer epidemiology, as the main focus was on social inequalities related to migration. It is worth noting that this phase of research expansion occurred in parallel with extensive debates in the media and policy circles on the integration of the second generation of immigrants following the autumn 2005 urban riots (Oberti, 2008). There was also a growing concern among policy makers with the ageing of first-generation immigrants and a parliamentary mission was convened in 2013 to develop a plan of action in order to address the specific needs of this elderly population.

From the early 2010s, several papers on migrants' mortality in Europe were also published in a comparative perspective, within the framework of the European Union funded project Migrant and Ethnic Minority Health Observatory (MEHO). France was one immigration country among others in this project, which aimed at considering inequalities related to migration for different countries of origin, generating hypotheses about the causes of diseases and ultimately investigating the association between integration policies in different countries and migrants' mortality.

A literature review on health of migrants in France in relation to their dietary practices was published in 2001 (Darmon and Khlata, 2001), and another one on their health and health care use in 2012 (Berchet and Jusot, 2012). In this chapter, we update and complete these reviews, with a particular focus on studies dealing with specific diseases, which bring new light on the situation of migrants with regard to the 'accelerated health transition' framework.

Theoretical background

Several hypotheses and theories have been developed within this area of research on migrants' health and mortality. The 'migrant mortality paradox' concept emphasizes the contradiction between the advantaged mortality level and disadvantaged socioeconomic condition of migrants. The predominant hypothesis for this paradox is that of the 'healthy migrant effect', according to which individuals who migrate are among the healthiest of their population of origin. An alternative explanation is the 'salmon-bias' hypothesis, which assumes that migrants tend to return to their home country whenever they become seriously ill, leaving behind the healthiest members of the community. Recently, a framework has been developed that views migration through the lenses of the theory of health transition. According to this theory, migrants moving from less-developed to more-developed countries experience an 'accelerated health transition' (Spallek, Zeeb, and Razum, 2011). Upon arrival,

they benefit from better environmental conditions and health care, which permits a fast reduction of their mortality from infectious disease. In parallel, they are progressively exposed to the western lifestyle and the related traditional risk factors of chronic diseases, resulting after a lag period in a rise of those diseases. Shortly, the hypothesis of migration as ‘accelerated health transition’ predicts a fast decline of the initially high infectious-disease mortality of migrants and a progressive reduction of their advantage in terms of chronic disease mortality over time. Very few studies have investigated this hypothesis to date (Vandenheede et al., 2015; Wallace and Kulu, 2015).

History of immigration to France

Although France is not considered as a traditional country of immigration such as the USA, Canada or Australia, it stands out in Europe as the oldest country of immigration and the one having received the largest numbers of immigrants over time (Noiriel, 1988; Weil, 2005).

This long history of immigration is in part attributable to the unusual demographic transition of the country. Indeed, fertility started to decline in France as early as the middle of the eighteenth century, leading to slow population growth and labor shortages during the Industrial Revolution. At the same time, other industrialized countries in Western Europe, which were still experiencing high fertility rates, were mostly countries of emigration.

The first wave of immigration to France during the Second Empire (1852 to 1870) arose in this context, with neighboring countries providing the bulk of immigrant workers. A second wave during the 1920s originated mainly from eastern European countries. During the Second World War, France suffered the destruction of much of its infrastructure, and there was again a great need of foreign workers for the reconstruction and modernization of the country. The most important flows of this third immigration wave arrived during the economic boom of the 1950s and 1960s. They originated primarily from former colonies undergoing the process of

decolonization, and particularly from Algeria, which became independent in 1962. In parallel, the country once again recruited workers from neighbouring countries, and especially from Portugal. The 1973 oil crisis altered the labor market and led to a major shift in immigration policies in Western Europe, with the end of labor migration in France (Therborn, 1987). Since that date, family reunification and asylum have represented the principal channels for immigration (Wihtol de Wenden, 2012), and the population of migrants has become increasingly diverse, with larger proportions from Sub-Saharan Africa and Asia. The creation of the borderless Schengen area in 1995 and the 2004 and 2007 enlargements of the European Union also led to increases in immigration from other European Union countries.

Until the mid-1970's, immigration flows consisted predominantly of male workers. From this period, the share of females has risen. In 2012, 51% of all immigrants in France were females, as opposed to only 44% in 1968 (Beauchemin, Borrel, and Régnard, 2013). Females were a majority among immigrants born in Europe (except Portugal) and in sub-Saharan Africa, while males were a majority among immigrants from North Africa. Since 1975, immigrants have represented around 8% of the total population, and the geographical origins of the immigrants have become more diversified, with an expanding share of immigrants from Eastern Europe or the United Kingdom. Overall, migrants with the longest duration of stay are from Southern Europe (with Portuguese more recently arrived than Spaniards and Italians), followed by those from North Africa (Algeria, Tunisia and later Morocco), then by those from sub-Saharan Africa, Turkey and Eastern Europe (Breuil-Genier, Borrel, and Lhommeau, 2011). Migration from South-East Asia (Cambodia, Laos, Vietnam) was very concentrated in time, with half of the arrivals occurring between 1976 and 1982. The size of the migrant communities from the earlier waves is gradually shrinking, due to deaths and returns to the home country. In current political debates, migrants from those earlier waves, primarily of Southern European origin and catholic, have often been opposed to

migrants from more recent waves, coming primarily from former colonies and predominantly Muslim (Safi, 2007).

Methods

Search strategy

We searched PubMed, Cairn and the French bibliographic databases from the health or social sciences field (BDSP, library of the national public health agency Santé Publique France, library of the Institut National d'Etudes Démographiques, library of Migrinter, Proquest...).

Our search algorithms in PubMed were:

(((((France[MeSH Terms]) AND ('transients and migrants')) OR ('emigrants and immigrants')) AND health[MeSH Terms]) OR mortality[MeSH Terms]) OR causes of death[MeSH Terms]) OR aging[MeSH Terms]

For the French databases, we used the terms: (Immigré or Immigration) and France and (Santé or Morbidité or Mortalité or Causes de décès or Vieillessement),

Our review concerned publications reporting country of birth or nationality-based mortality or health differences from empirical quantitative nationally-representative studies. Only book chapters and articles in peer-reviewed journals were included.

Summary of the findings

National-level studies specifically targeting mortality, health or health-related behaviours of migrants are presented in tabular form. Other studies more limited in scale or with a different focus are referred to in the interpretation and discussion. The selected studies differed in their definition of migrant status: some considered country of birth, others current nationality and others a combination of the two. Only a few applied the official definition combining country of birth and nationality at birth.

Mortality studies

Our selection consisted of 17 articles in peer-reviewed journals and 1 book chapter (Table 1). All studies had an un-linked design, relating aggregate deaths collected from the national register of deaths to the corresponding person-years at risk calculated from the census. Altogether a large time period was covered, extending from the mid-seventies to the mid-2000s.

Within this set of mortality studies, two subsets of coordinated papers based each on a common dataset made up in total about two-thirds of the papers. The first subset is related to a large collaborative project on cancer in Italian migrant populations coordinated by the International Agency for Research on Cancer (IARC). This project, which dates back to the end of the 1980s, was sponsored jointly by the IARC and the Italian League against Cancer, and its originality consisted in the follow-up of a single source population (Italians) in ten of its destination countries, including

France. The change in cancer risk after migration and the speed with which it developed was the main outcome of interest, and was interpreted as a clue (or lack thereof) of the relative importance of specific environmental factors in the etiology of different cancers. Seven publications belong to this subset (Bouchardy 1993; Bouchardy, Khlat, and Parkin, 1992; Bouchardy et al., 1998; Bouchardy, Parkin, and Khlat, 1994; Bouchardy et al., 1996; Wanner, Bouchardy, and Parkin, 1995; Wanner, Bouchardy, and Khlat, 1997).

---Table 1 about here---

The second subset of studies relates to the Migrant and Ethnic Health Observatory (MEHO), which aimed at comparing and monitoring the health status of immigrants in Western Europe with a public health perspective (<http://mesu.ku.dk/research/projects/meho/>). This large-scale European cooperation project was funded by the European Union

Commission at the end of the years 2000s, and included a large number of host countries and migrant groups. Six publications belong to this subset (Bhopal et al., 2011; Ikram, Mackenbach, et al., 2015; Ikram, Malmusi, et al., 2015; Rafnsson et al., 2013; Spallek et al., 2012; Vandenheede et al., 2012).

The remaining publications had a national focus, with an interest in either younger age groups (Bouvier-Colle, Magescas, and Hatton, 1985), pregnancy and the perinatal period (Saurel-Cubizolles et al., 2012) or one specific migrant group (Courbage and Khlat, 1996). Two publications were more comprehensive in scope (Boulogne et al., 2012; Brahim, 1980).

The study on Moroccans (Courbage and Khlat, 1996) had the longest observation period (13 years). It is also more elaborate methodologically, as the authors evaluated the completeness of death registration coverage by using an indirect method originally designed for developing countries suffering from incomplete registration of deaths. This approach allowed the authors to uncover that the proportion of missing deaths was negligible for women (2%) and more significant for men (23%), and to confirm that the findings were robust to corrections for under-registration of deaths.

Considering all-cause mortality, the existence, direction and width of the foreign-born vs. native-born difference varied according to age, gender and origin. A mortality advantage was visible from the early adult ages, much more so for men than for women (Boulogne et al., 2012; Courbage and Khlat, 1996), and at the opposite younger migrants suffered from higher mortality (Bouvier-Colle, Magescas, and Hatton, 1985). The latter disadvantage early in life accords with a study of social inequalities in infant mortality, in which social categories were found to converge, while the increased mortality of children born to foreign parents (second generation) remained (Dinh, 1998). Among adult men, the under-mortality was particularly marked for migrants from North Africa and sub-Saharan Africa, while those from Eastern

Europe had higher mortality (Ikram, Mackenbach, et al., 2015). A striking gender contrast was found for migrants from Sub-saharan Africa, as females suffered from higher mortality in comparison with the local-born, unlike males (Ikram, Mackenbach, et al., 2015). It is worth noting that these studies did not adjust for socio-economic confounders (except (Wanner, Bouchardy, and Khlat, 1997). Since migrants tend to have lower socio-economic status than the native-born population, lack of adjustment is unlikely to explain observed mortality advantages, but may have contributed to mortality disadvantages for certain groups.

Overall, migrants had higher mortality from deaths caused by infectious diseases (particularly tuberculosis) and diabetes, and lower mortality from cancers and violent deaths (Boulogne et al., 2012; Courbage and Khlat, 1996). Regarding cancers, very distinctive patterns were found for migrants from North Africa, sub-Saharan Africa and South-East Asia, with lower risks than the host population for most cancer sites together with higher risks for a few cancers (Bouchardy, Khlat, and Parkin, 1992; Bouchardy, Parkin, and Khlat, 1994; Bouchardy, Wanner, and Parkin, 1995; Bouchardy et al., 1996). A review of cancer risks in non-western migrants to Europe including this set of studies (Arnold, Razum, and Coebergh, 2010) confirmed the importance of exposures experienced before, during and after migration, and concluded that migrants were more prone to cancers related to early life infections, such as liver, cervical and stomach cancer, and less prone to cancers related to a western lifestyle, such as colorectal, breast and prostate cancers. A similar conclusion was reached in a review of cancer in Mediterranean migrants (Khlat, 1995).

In terms of circulatory disease mortality, migrants from China, Poland, Turkey or Yugoslavia had in France higher death rates than the local-born, but lower death rates compared to their counterparts in other immigration countries (Bhopal et al., 2011; Rafnsson et al., 2013). This pattern was discussed in the context of the so-called 'French paradox', according to which circulatory diseases are relatively low in France despite high prevalence of

traditional risk factors (e.g. smoking, high-fat diet), with the suggestion that this paradox may also apply to some extent to France's foreign-born population. For diabetes mortality, a general pattern of disadvantage was visible in migrants, and the lower the gross domestic product of the country of origin, the larger the disadvantage, which led to the suggestion of a major role of socio-economic change, and in particular lifestyle changes including diet and exercise (Vandenheede et al., 2012).

Lastly, specific risks were attached to pregnancy and childbirth for foreign women, whose maternal mortality rate over the period 1998-2007 was as high as 12.5 per 100,000 live births, versus 7.9 among French women (Saurel-Cubizolles et al., 2012). In another study, Moroccan women were also shown to be disproportionately affected by maternal deaths (Courbage and Khlat, 1996).

Health studies

Studies were of two types. First, 18 articles were based on nationally-representative large scale interview surveys, with relevant information on global indicators of health and on reported morbidity and health behaviours (Table 2). Second, 4 articles were based on data from registries for diseases subject to compulsory reporting, such as HIV, tuberculosis or Hepatitis B, or hospital registries for perinatal conditions (Table 3). The chronology of the publications in Tables 2 and 3 reflects the expansion of research on migrants' health in France starting from the mid-2000s.

Global indicators of health

In the unique study based on data from the early nineties (Khlat, Sermet, and Laurier, 1998), respondents of North African origin enjoyed a health advantage. Later findings were mixed. In the *Enquête Passage à la Retraite des Immigrés* (2002-2003), migrants on the whole turned out to have worse health outcomes than the local-born, but their disadvantage was largely

explained by their work conditions (Attias-Donfut and Tessier, 2005). Also, not all migrant groups experienced a disadvantage. Males originating from Asia and southern Africa, and females originating from northern Europe, were advantaged in comparison with the local population (Vaillant and Wolff, 2010). In the *Enquête Histoire de Vie*, male migrants from non-European countries, and particularly those from North Africa, reported functional limitations less frequently than the native-born, while no significant difference was found for female migrants, regardless of their region of origin (Lert, Melchior, and Ville, 2007). On the contrary, analysis of the *Enquête Trajectoires et Origines* did lead to the conclusion of a definite health disadvantage, with however better health among the newly arrived male migrants (Cognet, Hamel, and Moisy, 2012; Hamel and Moisy, 2012; Hamel and Moisy, 2015). In-depth analyses by health economists of the *Enquête Décennale Santé* and of the *Enquête Santé et Protection Sociale* either provided no salient difference after adjustment for socio-economic confounders (Mizrahi and Mizrahi, 2008), or provided heterogeneous findings, with no significant difference remaining after adjustment for socio-economic conditions, dietary habits and tobacco and alcohol consumption (Berchet and Jusot, 2009, Jusot et al., 2009, Berchet and Jusot, 2010). In a cross-national study of populations aged 50 years in 11 European countries, migrants in France generally had worse health than the local-born (Solé-Auro and Crimmins, 2008). Another study of the same type showed an interesting North-South gradient in Europe, with better health status among migrants in Italy and Spain than in France and Belgium (Moullan and Jusot, 2014). Moreover, a relation between migrants' health and integration policies in European countries was suggested: in 'exclusionist' and in 'assimilationist' countries (among which France), migrants reported worse health outcomes than in 'multicultural' countries¹ (Malmusi, 2014).

¹ The 'differential exclusionist' model assumes a temporary presence of labour migrants, bases citizenship on ancestry and has low social and political tolerance; the 'assimilation model' is restrictive on residence and labour market access but open on nationality, and confines cultural manifestations to the private sphere; the

---Table 2 about here---

Specific diseases or conditions

A few studies documented specific diseases or conditions which disproportionately affected migrants. For instance, the prevalence of diabetes was more elevated among migrants from North Africa than among the French-born population. Women were particularly affected, and their vulnerability was not entirely explained by a higher prevalence of obesity, which lead to the suggestion of a genetic predisposition to diabetes (Fosse and Fagot-Campagna, 2012). In addition, diabetic persons from North Africa were not as closely monitored as the native-born population, and more frequently suffered from ophthalmologic complications. The pattern of disadvantage found for women is consistent with the higher mortality from diabetes in female migrants from Morocco compared to the French population (Courbage and Khlat, 1996).

Migration and particularly forced migration are associated with painful life events and the stress of adaptation to a new environment, and in the most extreme cases with psycho-traumatism. In a general health survey, there was no indication of a higher prevalence of reported mental morbidity among migrants from North Africa (Khlat, Sermet, and Laurier, 1998). However, migrants were found to have an elevated prevalence of psychotic disorders in a more targeted mental health survey (Amad et al., 2013).

Migrant mortality is higher overall for deaths caused by infectious diseases (Boulogne et al., 2012). Conditions such as HIV infection, tuberculosis and hepatitis B indeed have high prevalence in some regions of the world, in particular in sub-Saharan Africa, which puts migrants from these regions at greater risk for these diseases. Information on the situation of migrants was based on the analysis of data collected through compulsory registration systems

‘multicultural model’ is characterized by tolerance of cultural differences and by citizenship acquired through residence or birth (Malmusi, 2014).

(for HIV and tuberculosis) or disease reference centers based in hospitals (for hepatitis B). During the first 10 years of the AIDS epidemic, the cumulative incidence rate was twice as high among foreigners as among the French population, with highest risks among sub-Saharan Africans and Haïtians (Savignoni et al., 1999). In 2009, nearly half of the reported cases of HIV infection and of tuberculosis were migrants, and so were three-quarters of the patients newly referred for Hepatitis B treatment (Lot et al., 2012). From those figures, the authors estimated that rates of new HIV diagnoses and tuberculosis cases were respectively 10 and 8 times higher among migrants than among persons born in France, with late diagnosis compounding the problem.

Sexual and reproductive health is considered an area of concern for migrant women. Analysis of data from perinatal surveys led to the conclusion that foreign women, and particularly those originating from sub-Saharan countries, had a higher rate of stillbirths, preterm births and low birthweight babies (Saurel-Cubizolles et al., 2012). A higher prevalence of perinatal conditions among women from North Africa was also reported from a population-based survey (Khlat, Sermet, and Laurier, 1998). This is consistent with the finding of an excess mortality from maternal causes among foreign women in France (Saurel-Cubizolles et al., 2012), and especially among women of Moroccan origin (Courbage and Khlat, 1996).

Health-related behaviours

Migrants from North Africa and Southern Europe (Italy, Portugal, Spain) reported lower consumption of meat and dairy products and higher consumption of starchy food and dried vegetables (Wanner, Khlat, and Bouchardy, 1995). According to a review of the dietary practices of migrants in France (Darmon and Khlat, 2001), adult migrants originating from

those two regions had a Mediterranean pattern of eating, renowned for its positive effects on health.

The relative advantage or disadvantage of migrants for overweight, tobacco and alcohol consumption was strongly patterned by gender. Considering migrants aged 50 years and older, no excess prevalence of overweight was found, based on age and sex-adjusted estimates (Solé-Auro and Crimmins, 2008). There seems to be a specific pattern among female migrants, as a higher prevalence was found for foreign women (Lert, Melchior, and Ville, 2007). This concerns particularly women of North African origin (Khlat, Sermet, and Laurier, 1998), which is consistent with their higher mortality from diabetes and circulatory diseases. On the contrary, female migrants from North Africa had a lower level of tobacco consumption than French nationals, while males had a higher consumption (Khlat, Sermet, and Laurier, 1998; Saurel-Cubizolles et al., 2012; Wanner, Khlat, and Bouchardy, 1995). Both genders had a lower consumption of alcohol (Wanner, Khlat, and Bouchardy, 1995). Paradoxically, Moroccan men have a much lower mortality from lung cancer than nationals, in spite of their higher level of smoking (Courbage and Khlat, 1996), but this may be due to a more recent diffusion of smoking in this population. In the ELFE cohort study of children born in France in 2011, migrant women as a whole had lower consumption of alcohol and tobacco than native-born during pregnancy (Melchior et al., 2015).

Findings on health care utilization are sparse. One study suggested similar utilization of general practitioner care and lower utilization of specialist care among migrants than among native-born (Attias-Donfut and Tessier, 2005), while another one provided evidence for lower utilization of general practitioner care and higher utilization of specialist and hospital care (Mizrahi and Mizrahi, 2008). For equivalent health needs, a more recent study demonstrated that migrants had lower demand for both general practitioner and specialist care (Berchet, 2013). Lastly, migrants from southern Europe and northern Africa were found to be

less likely to report preventive health care utilization (for vaccines, blood pressure tests, health check-ups) than their French peers (Wanner, Khlata, and Bouchardey, 1995), and foreign women as a whole to be much less likely to have undergone breast or cervical cancer screening (Grillo, Soler, and Chauvin, 2012; Rondet et al., 2014). Overall, those findings were interpreted as an illustration of unequal access to health care, in relation with language barriers and insufficient knowledge of the health system.

---Table 3 about here---

Discussion

As research on migrants' health only started to expand in France in the years 2000s, there is to date a limited number of studies in comparison to other large immigration countries. And yet, an overview of this set of national population-based studies yields a coherent picture and raises important questions and avenues for future research.

Healthy migrant effect or vulnerable populations?

The so-called 'healthy migrant effect' universally reported in the international literature is only visible in a subset of studies: (1) mortality studies, in which differences are predominantly in favour of male migrants starting from the early adult ages (and irregularly in favour of female migrants), and; (2) an earlier health study based on data from the early 1990s. Most the studies based on health surveys from the 2000s provide mixed findings, of which quite a few are more in line with the traditional representation of migrants as 'vulnerable populations'.

Regarding the health findings, one limitation is that the information was mostly based on self-reports. Another aspect worth noting is that findings based on self-rated health provided more evidence of a disadvantage than those based on the declaration of chronic

diseases or functional limitations. It has been suggested that a subjective notion such as poor self-rated health may be enhanced by social isolation and hardship, while the notions of chronic diseases or functional limitations may more difficult to understand by some or be underreported due to less demanding expectations or norms in terms of health (Berchet and Jusot, 2012).

Studies based on medical diagnoses or on factual information recorded in medical institutions are not subjected to self-reporting biases and therefore more likely to reflect the health of the entire population of migrants, including migrants living in collective dwellings (*foyers*) and illegal migrants. Findings provide strong evidence of a specific vulnerability of migrants to infectious diseases and perinatal conditions. Regarding HIV, a recent study challenged the common-held belief that HIV-positive migrants contracted HIV prior to migration. Using cross-sectional survey data, the authors showed that a third to a half of sub-Saharan migrants receiving HIV care in France have been infected post-migration (Desgrées-du-Loû et al., 2015), particularly during periods of social hardship (Desgrées-du-Loû et al., 2016), and called for more targeted efforts in terms of prevention and early care. The epidemiological profile of tuberculosis cases in migrants in France is also more in favour of recent infections than of post-migration reactivations (Che and Antoine, 2009), in opposition with what has been hypothesized in Canada (De Maio, 2010).

A range of factors may be involved in explaining the health disadvantage, and those are consistent with the traditional determinants of social inequalities in health, aggravated by the specific difficulties of the migrants. Regarding access to health care, health economists have demonstrated that, for the same level of need, migrants present lower access to general practitioners and to specialists, partly due to lower health care coverage (Berchet, 2013; Mizrahi and Mizrahi, 2008). Migrants were also found to more frequently give up health care seeking for financial reasons (Boisguerin and Haury, 2008), and their disadvantage was

compounded by less frequent recourse to preventive medicine, including vaccination and screening (Grillo, Soler, and Chauvin, 2012; Rondet et al., 2014, Wanner, Khlal, and Bouchardy, 1995). Quality of health care provided to migrants has also been questioned (Bhopal, 2007), and a call has recently been issued to support more inclusive and migrant-sensitive approaches in routine health care and prevention campaigns, as opposed to migrant-specific more exclusive approaches (Razum and Spallek, 2014).

In the light of those findings, the mortality advantage of migrants appears as doubly paradoxical: first, in relation to their socio-economic profile; second, in relation to their health profile. Some authors have pinpointed that the health-mortality paradox had been identified from separate studies and could therefore be attributed to differences in the selection of study populations. And yet, it is worth noting that the immigrants living in workers hostels and illegal immigrants, likely to be in poorer health, are under-represented, if represented at all, in population-based health surveys, while they contribute to mortality statistics. Other explanations have been suggested by the same authors, namely that migrants would be suffering more from disabling illnesses than from life-threatening illnesses, or die from causes not related to perceived health (Stirbu et al., 2006).

In fact, the mortality data may be questioned in the same way as the health data, as it may be subject to artifact from inadequate recording of deaths. Indeed, deaths occurring abroad are not part of the numerator count, which inevitably leads to an under-estimation of mortality for the foreign-born, as they constitute an internationally mobile population. Further to that, the preferential return of unhealthy migrants to their home country ('salmon bias') is likely to compound the positive health selection at entry (Khlal and Darmon, 2003). It is worth noting also that the 'salmon bias' is more likely to be a factor in Western Europe, given the geographical proximity of most migrants to their host countries, than in Canada, Australia or the USA.

In spite of this limitation attached to mortality figures, it is worth noting that there is a very specific and coherent pattern of cancer mortality, in that there is an under-mortality for cancers related to the western lifestyles and an over-mortality for cancers related to predispositions or known early exposures in countries of origin. Differential mortality by broad groups of causes of death also provided a coherent set of findings, with migrants enjoying under-mortality from cancers and circulatory diseases. External consistency with the body of knowledge on the risk factors for individual cancers and with the health transition framework strengthens the mortality findings.

Temporal factors: duration of stay effects

Several specific findings emphasize duration of stay as a determinant of migrant health. Longer duration of stay was associated with worse self-rated health, after adjustment for confounders (Attias-Donfut and Tessier, 2005), and women who had immigrated during adolescence had more activity of daily living (ADL) limitations (Lert et al., 2007). Also, male migrants who had arrived within the past 5 years had significantly better health than the local-born, regardless of their age at arrival and educational level, but this was not found among females (Hamel and Moisy 2012, Hamel and Moisy, 2015). Lastly, the disadvantage in terms of chronic diseases and disabilities only pertained to naturalized immigrants, whereas non-naturalized immigrants had a better health profile than the native-born population (Jusot et al., 2009). The latter finding was interpreted as reflecting the wear of the health-selection effects over time, as naturalized migrants have been living in France for longer, on average, than non-naturalized migrants. The absence of evidence of a health advantage among migrants aged 50 years in France accords with this pattern (Solé-Auro and Crimmins, 2008).

The faster deterioration of health has to be related to the disproportionate exposure of migrants to hardship in terms of their work and employment conditions in comparison with

the local-born, notwithstanding unemployment and discrimination on the labour and housing market (Berchet and Jusot, 2010; Jusot et al., 2009; Mizrahi and Mizrahi, 2008). There may also be an unfavorable effect of social isolation and loss of family and social support networks after migration, which adds up to the difficulties related to the language barriers (Berchet and Jusot, 2012). As an outcome of isolation, higher risk of suicide for migrants would be expected, and yet, mortality from this cause was consistently found to be lower among migrants in Europe (Ikram, Mackenbach, et al., 2015). In the survey *Trajectoires et origins*, the discriminations the migrants were particularly subjected to were found to have a negative influence on their health self-report (Cognet, Hamel, and Moisy, 2012; Hamel and Moisy, 2012). On the other hand, it has been suggested that ‘immigrants who experience discrimination may be more likely to report worsening health’ (De Maio, 2010).

The study of the second generation of migrants is particularly interesting, as it extends and enriches the analysis of acculturation by questioning changes across generations. Within most surveys in France, the identification of the second generation is difficult due to insufficient information on the respondents’ parents. In the only study providing information on both the first and second generation of migrants, the second generation of migrants from North Africa unexpectedly exhibited better health than the local-born after adjustment for confounders (Berchet and Jusot, 2010).

Temporal factors: time period effects

In addition to the worsening of health with increasing duration of stay, there may be a deterioration of migrants’ health over historical time. Indeed, the advantage found in the early 1990s study contrasts with the more mitigated situation found in the 2000s. This trend was investigated by Mizrahi and Mizrahi (2008) who compared results from the *Enquête Décennale Santé* 2002-2003 to results from the preceding rounds of the same survey (*Enquête*

Décennale Santé 1991-1992 and 1980). The authors found that in the latest survey (2002-03), there was little difference between migrants and non-migrants in terms of health outcomes, while there was a health advantage in the 1991-1992 survey, and an even greater one in the 1980 survey. This trend relies on self-reported data and should thus be interpreted with caution. Nevertheless, it provides some support for the hypothesis of a less favorable evolution over time of migrants' health than that of the general population.

The historical evolution of the immigration policy in France may partly explain the deterioration of migrants' health from the early 1990s to the 2000s. The French government indeed put a halt to economic immigration to France in 1974 (Wihtol de Wenden, 2012), which had a significant influence on the composition of subsequent flows and stocks of migrants. First, starting from this period, flows were theoretically limited to reunified family members and asylum seekers, and therefore there was a substantial decline of the number of entries. Second, the average duration of stay in the stock of migrants rose as well as the relative proportion of migrants presumably less subjected to positive health selection, i.e., reunified family members and refugees, the latter possibly suffering from significant health problems (Wihtol de Wenden, 2012). Third, there was recently a diversification of the geographical origins of the migrants, with more migrants from eastern Europe, known to suffer from a health disadvantage, and from sub-Saharan Africa (INSEE, 2015).

Another important factor may be the labour market crisis prevailing in France since several decades, which is likely to have aggravated the situation of migrants. The changing profiles of migrants to the European Union and of their health situation has been pinpointed, and it has been suggested that economic crises may disproportionately exacerbate the risk of infectious diseases in migrants (Villalonga-Olives and Kawachi, 2014), and perhaps even lead to the loss of the healthy migrant effect (Gotsens et al., 2015).

Age and gender patterns

Clearly, younger migrants are disadvantaged healthwise, and this may be related to the circumstances of their migration as children or adolescents accompanying their parents, and therefore not subjected to health selection. Another striking feature emerging from this collection of studies is the contrast between the relative advantage enjoyed by male migrants and the disadvantage observed for female migrants. Traditionally, females arrive for family reunification rather than for work, and are, like their children, less subjected to health selection of the 'healthy worker effect' type. Females form an increasing part of the migrant population in France (more than half according to the latest statistics (Beauchemin, Borrel, and Régnard, 2013)), and those originating from North Africa seem to carry a specific pattern of disadvantage characterized by insufficient recourse to prevention and screening, associated with diabetes, metabolic diseases, overweight and perinatal problems. This is in contrast with the sizeable advantage conferred to men by their comparatively lower level of alcohol consumption, given that in France the prevalence of alcohol-related diseases is quite high. However, male migrants have a comparatively high level of smoking, which is not the case of female migrants. Recently, the added value of integrating a gender perspective to understand migrants' health in epidemiological studies has been emphasized (Llacer et al., 2007).

Health transition

After the 'migration as a natural experiment' framework of cancer epidemiologists, and the public health perspective of migrants as 'vulnerable populations', the health transition framework views migration as an 'accelerated health transition' (Spallek, Zeeb, and Razum, 2011). Studies on infectious diseases are particularly significant within this particular framework, and they represent an interesting addition to traditional studies focused on health inequalities. Within the health transition framework, migrants are expected to arrive in the

host countries with a higher prevalence of infectious diseases, and they were indeed shown in France to disproportionately suffer from such diseases (Che and Antoine, 2009; Alba and Silberman, 2002; Lot et al., 2012). However, the study on HIV infection demonstrates their vulnerability to contracting those diseases after arrival (Desgrées-du-Loû et al., 2015). It is worth noting also that the most recent waves of migrants originate from countries well advanced in the health transition process, and in which chronic diseases are on the rise.

Conclusion

Although evidence on migrants' health and mortality in France is relatively limited, this review brings up several important issues, many of which overlap with what has been found in other receiving countries. A double paradox surrounding migrants' mortality advantage emerges: first in the face of socio-economic disadvantage; and second, in the face of deteriorating health and unmet health needs. Other questions relate to the factors underlying the initial health capital of migrants and the eventual reversal of their advantage. In order to better understand the health needs and processes at play in different migrant groups and generations, more detailed questions should be included in survey questionnaires, relating to date of arrival, nationality at birth, parental country of birth and reason for migration. Temporal trends should be carefully explored, and the influence on the 'healthy migrant effect' of the economic crises and the hardship to which migrants are disproportionately exposed needs to be investigated. Health trajectories of migrants should be explored with special attention to specific conditions or diseases, to differences according to reason for migration and country of origin and to compositional factors over time. More attention should also be given to mental health, to lifestyle factors underlying chronic diseases and to the designing of preventive interventions and campaigns for the benefits of all. An ideal study design would be the cohort type, whereby both health and mortality would be observed over time within and across different immigration cohorts. Although issues relating to migrants'

health and health transitions in their host country are methodologically challenging, they are of great relevance to theoretical debates on the social determinants of health, particularly in the context of the political upheavals in many parts of the world and the ensuing refugees' crises.

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Table 1. Studies of mortality among migrants in France

Study period	Mortality outcome	Study group(s)	First author, Year
1974-1975	Total and cause-specific	Algerians, Moroccans, Portuguese, Spaniards, Italians, Poles	Brahimi, 1980
1980-1982	Total and cause-specific	Foreigners	Bouvier-Colle, 1985
1979-1985	Cancer	Born in Algeria, Morocco, Tunisia, Western Sub-Saharan Africa, Eastern Sub-Saharan Africa, Vietnam/Cambodia/Laos, China/Taiwan	Bouchardy, 1992 ^(a)
		Born in Italy	Bouchardy, 1993 ^(a)
		Born in Vietnam/Cambodia/Laos, China/Taiwan/Hong Kong	Bouchardy, 1994 ^(a)
		Born in West/East/Central/Other Africa	Bouchardy, 1995 ^(a)
		Born in Switzerland	Wanner, 1995 ^(a)
		Born in Algeria, Morocco, Tunisia, Egypt	Bouchardy, 1996 ^(a)
1979-1985	Total and cause-specific	Country of birth or groups of countries	Wanner, 1997 ^(a)
1979-1991	Total and cause-specific	Moroccans born abroad	Courbage, 1996
2005-2007	Cancer	Born in Turkey	Spallek, 2012 ^(b)
	Diabetes mellitus	Born in North Africa, Other Africa, Turkey, Other	Vandenneede, 2012 ^(b)
	Circulatory diseases	Born in China, Poland, Turkey, Yugoslavia	Bhopal, 2011 ^(b)
	Circulatory diseases	Born in Asia, Caribbean, Europe, Latin America, Middle East, North Africa, Sub-Saharan Africa	Rafnsson, 2013 ^(b)

	Total and cause-specific	North Africa, Sub-Saharan Africa, Caribbean, Other Latin America, South Asia, east Asia, eastern Europe, Turkey	Ikram, 2015 ^(b)
		Born in Turkey, Morocco	Ikram, 2015 ^(b)
2004-2007	Total and cause-specific	Born in Algeria, Morocco, Tunisia, Turkey + groups of countries	Boulogne, 2012 ^(b)
1998-2007	Maternal Deaths	Citizenship by continent or sub-continent	Saurel-Cubizolles, 2012

^(a) From IARC project on Cancer in Italian migrant populations

^(b) From MEHO (Migrant and Ethnic Health Observatory) project

Table 2. Studies of health, health behaviours and health care use of migrants in France based on national health interview surveys

Survey	Outcome variable	Study groups	First author, Year
<i>Enquête Conditions de Vie des Ménages</i> , 1987	Preventive health care utilisation, nutritional habits, tobacco, alcohol	Migrants from Italy, Spain/Portugal, North Africa	Wanner, 1995
<i>Enquête Décennale de Santé (EDS)</i> , 1991-1992	Reported health and morbidity, tobacco, body mass index	Household head of Moroccan, Algerian or Tunisian nationality	Khlat, 1998
<i>Enquête Passage à la Retraite des Immigrés (PRI)</i> , 2002-2003	Self-rated health, work-related injuries, occupational diseases, disabilities, health care utilisation	Migrants from Southern Europe, Northern Europe, Eastern Europe, Northern Africa, Sub-Saharan Africa, America, Middle East, Asia	Attias-Donfut, 2005
	Self-rated health	Same as above	Vaillant, 2010
<i>Enquête Histoire de Vie</i> , 2003	Functional limitations, overweight	Migrants	Lert, 2007
<i>EDS</i> , 2002-2003 <i>Enquête Santé et Protection Sociale (ESPS)</i> , 2000-2002 <i>Enquête sur les Hospitalisés</i> , 1991	Self-rated health, health care expenditures	Foreigners	Mizrahi, 2008
<i>EDS</i> , 2002-2003	Self-rated health	Foreign-born by sub-continent	Jusot, 2009
<i>EDS</i> , 2002-2003, <i>Enquête Entred</i> , 2007	Diabetes	Migrants from North Africa	Fosse, 2012
<i>Enquête Santé Mentale en Population Générale (SMPG)</i> , 1999-2003	Psychotic disorders	First, second and third generation migrants	Amad, 2013
Survey of Health, Aging and	Self-rated health, chronic diseases,	Migrants	Solé-Auro, 2008

Retirement in Europe (SHARE), 2004-2005	disabilities, smoking, overweight		
<i>ESPS</i> , 2006, 2008	Self-rated health	First and second generation migrants	Berchet, 2009
<i>ESPS</i> , 2006	Self-rated health, nutritional habits, tobacco, alcohol	Foreign-born by sub-continent	Berchet, 2010
<i>Enquête Trajectoires et Origines (TEO)</i> , 2008	Self-rated health	Migrants from Turkey, South-East Asia, Portugal, Morocco/Tunisia/Algeria, Sub-Saharan Africa, Spain/Italy	Cognet, 2012 Hamel, 2012 Hamel, 2015
<i>ESPS</i> , 2006, 2008	Health care utilisation	Migrants	Berchet, 2013
<i>ESPS</i> , 2004, 2006, 2010	Self-rated health	Migrants	Moullan, 2014
European Union Survey on Income and Living Conditions (SILC), 2011	Self-rated health	Foreign-born	Malmusi, 2014
<i>Etude Longitudinale depuis l'Enfance (ELFE)</i> , 2011	Alcohol, tobacco use in pregnancy	Foreign-born	Melchior, 2015

Table 3. Studies of specific disease or conditions in migrants based on national disease or hospital registers

Data source	Outcome variable	Study groups	First Author, Year
National AIDS register, 1978-1998	New AIDS cases	Foreigners by country	Savignoni, 1999
National tuberculosis register, 2006	New tuberculosis cases	Migrants	Che, 2009
National registers for: HIV infection, 2009 Tuberculosis, 2008, 2009 Hepatitis B, 2008, 2009	New HIV diagnoses, tuberculosis cases and chronic HBV infection cases	Foreign-born by continent or sub-continent	Lot, 2012
<i>Enquête Nationale Périnatale</i> , 1998, 2003, 2010	Premature births, low birthweight	Foreigners by continent or sub-continent	Saurel-Cubizolles, 2012