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Article

All-cause mortality, age at arrival, and duration of residence among adult migrants in Sweden: A population-based longitudinal study

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ABSTRACT

Background: A mortality advantage has been observed among recently arrived immigrants in multiple national contexts, even though many immigrants experience more social disadvantage compared to natives. This is the first study to investigate the combined influence of duration of residence and age at arrival on the association between region of origin and all-cause mortality among the adult immigrant population in Sweden.
Methods: Using population-based registers, we conducted a follow-up study of 1,363,429 individuals aged 25–64 years from 1990 to 2008. Gompertz parametric survival models were fitted to derive hazard ratios (HR) for all-cause mortality.
Results: Compared to native Swedes, we observed a health advantage in all group of immigrants, with the exception of individuals from Finland. However, when information on age at arrival and duration of residence was combined, an excess mortality risk was found among immigrants who arrived before age 18, which largely disappeared after 15 years of residence in Sweden. Non-European immigrants over age 18 showed similar or lower mortality risks than natives in all categories of age at arrival, regardless of duration of residence.
Conclusions: The findings suggest that the mortality advantage commonly observed among immigrants is not universal. Combined information on age at arrival and duration of residence can be used to identify sensitive periods and to identify possible selection bias. The study also suggests that young immigrants are a vulnerable subpopulation. Given the increased number of unaccompanied minors arriving in Europe, targeted health or integration policies should be developed or reviewed.

Introduction

Health is a fundamental component of social and economic integration and a precondition for the successful development of many dimensions of life (Indicators of Immigrant Integration, 2015). In several national contexts, recent immigrants have been shown to be relatively healthy, despite often experiencing more social disadvantages, than natives ('healthy migrant paradox') (Markides & Coreil, 1986). This health advantage, which has been shown to be both origin- and outcome-specific (Urquia, O'Campo, & Heaman, 2012), has disappeared in some contexts with greater duration of residence, leading to similar health outcomes (*convergence hypothesis*) (Harding, 2003; McCredie, Williams, & Coates, 1999; Kliewer & Smith, 1995) or worse health outcomes (*unhealthy assimilation*) (Antecol & Bedard, 2006) compared to natives. Variation in the relationship between duration of residence and all-cause mortality, a general measure of overall health, is of particular societal interest because changes with duration of residence can be seen as an indicator of how well host country conditions enable immigrants to obtain good living standards or to buffer potentially adverse early-life circumstances (Juárez & Hjern, 2017).

The relationship between duration of residence and mortality has been assessed in different national contexts, with mixed results (Harding, 2003; Ott et al., 2010; Bos et al., 2007; Gray, Harding, & Reid, 2007). A recent U.S. study (Holmes, Driscoll, & Heron, 2015) suggested that mortality risk among Hispanics varies by age at arrival rather than by duration of residence. The authors postulated that young immigrants might be more likely to adopt risky health behaviors in the new social environment than older immigrants. However, U.S. born Hispanics who had immigrant parents were used as the reference category, rather than the larger U.S. native-origin population, which limits the evaluation of the convergence hypothesis with respect to the host population. Furthermore, age at arrival might be important to

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consider for health prevention efforts, revealing potential sensitive periods in immigrants' health. The lack of studies that assess duration of residence and age at arrival simultaneously in relation to mortality risk limits the generalization of such findings to other receiving contexts.

In this study we aim to assess the extent to which duration of residence and age at arrival modify associations between country or region of birth and the risk of mortality in the Swedish context. Sweden represents an interesting case study to discuss the universality of the healthy migrant and assimilation paradoxes from an international perspective. Unlike the U.S., where these phenomena have primarily been examined, Sweden has an inclusive healthcare system in which access is granted to all legal migrants on equal terms with the native-born population (Hjern, 2012). Furthermore, Sweden is well known for its humanitarian approach to migration (Huddleston et al., 2007), being the European country which hosts the most refugees *per capita* (Integration Migration Outlook, 2015). This characteristic permits assessment of the healthy migrant paradox in a large and heterogeneous group of refugees while testing the most common hypotheses proposed to explain the health advantage: unlike labor migrants, forced migrants are less likely to be positively selected in origin (healthy migrant effect) and to return (salmon bias). While previous studies have found a mortality advantage among forced migrants in Sweden (Honkaniemi et al., 2017), to the authors' knowledge, this is the first Swedish study that investigates the effect of duration of residence and age at arrival simultaneously. Additionally, unlike most previous studies using survey data, Sweden offers the possibility of studying these issues using highly reliable population-based register data that allows us to overcome problems of selection, non-response and attrition which might lead to bias.

Methods

Study population

The study uses the Swedish Work and Mortality Data (HSIA), which contains information on the total population of Sweden born before 1986 who were alive on December 31st, 1980 or 1990, as well as all foreign-born individuals who arrived in Sweden through 2002. The data contains information from different population registers linked via a pseudonymized personal identification number. This study was approved by the Regional Ethical Review Board of Stockholm (decision no. 2012/1260-31).

Fig. 1 shows the selection criteria that defined our study population. From the total population comprised in HSIA (n = 8,604,611 individuals), 7,030,327 observations were excluded according to the following criteria: 1) 'second generation' individuals, who were born in Sweden with at least one foreign-born parent (n = 509,162); 2) persons with multiple in- and out- migrations (n = 180, 192); 3) individuals with missing education and income information in all years of the follow-up period (n = 213,637); 4) foreign-born individuals with missing or unreliable information on date of arrival in Sweden (n = 59,612); and 5) native-born Swedes with recorded out migration and duration of residence (n = 3282). A random sample of 10% of the Swedish-born population was selected for comparison (n = 6,122,184 exclusions). An additional 152,386 observations were excluded by design (see the conditions for inclusion below). The total study population consisted of 1,363,429 individuals.

Follow-up commenced on January 1, 1990 until death, censoring, or end of follow-up (Dec 31, 2008), whichever was earliest. Individuals included in the study were those aged between 25 and 64 years. We considered as left-truncated those immigrants who entered the country during the follow-up until 2002 and as right-censored those who emigrated during the follow-up period.

Outcome and covariates

Our main outcome variable was all-cause mortality. Migrants were identified according to their country of birth and classified by country/region of origin, as follows: Finland, Other Nordic countries, Eastern Europe, Other European countries, Former Yugoslavia, Middle East and Other Non-European (including Africa and Latin America). These categories were based on a classification scheme developed by the

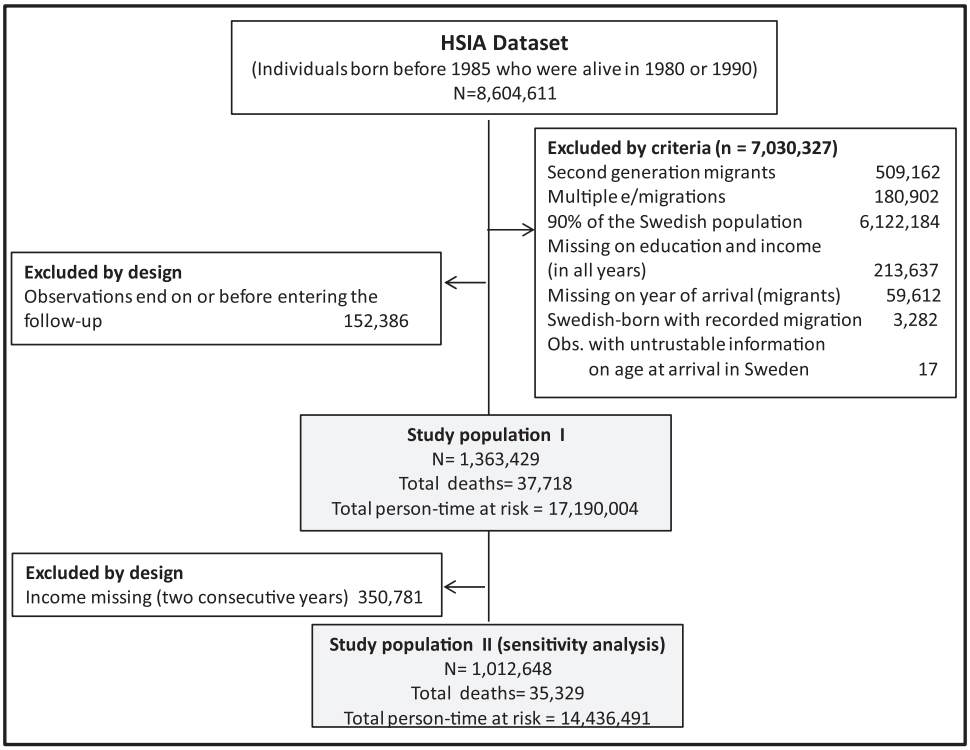

Fig. 1. .