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Frailty and migration in middle-aged and older Europeans

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ABSTRACT

We evaluated life course influences on health by investigating potential differences in levels of frailty between middle-aged and older European immigrants born in low- and middle-income countries (LMICs), immigrants born in high income countries (HICs), and their native-born European peers. Using data from the Survey of Health, Ageing, and Retirement in Europe (SHARE), we constructed a frailty index from 70 age-related health measures for 33,745 participants aged 50+ (mean = 64.9 ± 10.2 years; 54% women) in 14 European countries. Participants were grouped as native-born or as immigrants born in LMICs or in HICs, and further by current residence in Northern/Western or Southern/Eastern Europe. Seven percent of participants (n = 2369) were immigrants (mean = 64.4 ± 10.2 years; 56% women; LMIC-born = 3.4%, HIC-born = 3.6%). In Northern/Western Europe, after adjustment for age, gender, and education, LMIC-born immigrants demonstrated higher frailty index scores (mean = 0.18, 95% confidence interval = 0.17–0.19) than both HIC-born immigrants (0.16, 0.16–0.17) and native-born participants (0.15, 0.14–0.15 both $p < 0.001$). In Southern/Eastern Europe, frailty index scores did not differ between groups ($p = 0.2$). Time since migration explained significant variance in frailty index scores only in HIC-born immigrants to Southern/Eastern Europe (4.3%, $p = 0.03$). Despite differences in frailty, survival did not differ between groups ($p = 0.2$). LMIC-born immigrants demonstrated higher levels of frailty in Northern/Western Europe, but not Southern/Eastern Europe. Country of birth and current country of residence were each associated with frailty. Life course influences are demonstrable, but complex.

1. Introduction

As the global population ages, better understanding the determinants of frailty – and ultimately, how they might be ameliorated – is vital (Clegg, Young, Iliffe, Olde Rikkert, & Rockwood, 2013). Frailty is a multiply determined state of vulnerability to poor health outcomes, due to a diminished ability to respond to stress (Malaguarnera, Vacante, Frazzetto, & Motta, 2013; Rodríguez-Mañas et al., 2012). It is related to multiple social factors, including social vulnerability (Andrew, Mitnitski, & Rockwood, 2008; Casale-Martinez, Navarrete-Reyes, & Avila-Funes, 2012), income, and education (Etman, Burdorf, Van der Cammen, Mackenbach, & Van Lenthe, 2012; Lang et al., 2009; Lucchetti et al., 2009; Yang & Lee, 2010).

Recent cross-sectional data from SHARE have identified ecological associations with frailty: people who have lived and aged in the relatively resource-poor countries of Southern and Eastern Europe are more likely to be frail than people in the relatively resource-rich countries of Northern and Western Europe (Santos-Eggimann, Cuenoud, Spagnoli, & Junod, 2009; Theou, Brothers, Rockwood, Mitnitski, & Rockwood, 2013). Environmental contributions to frailty across the life course are of particular interest, as experiences in childhood might have determining effects that become more evident with age (Birnie et al., 2011; Gavrilov & Gavrilova, 2012). One way to further clarify environmental contributions to frailty over the life course is by examining international migration: people who move from poorer environments to wealthier environments might demonstrate levels of frailty more similar to their country of birth, more similar to their new country of residence, or somewhere in between.

Existing data from SHARE support this notion, as immigrants age 50 and older report worse general health and more functional problems than native-born participants in some countries (Solé-Auró & Crimmins, 2008). Differences in health between migrants and native-born participants also vary by region: migrants in SHARE report higher rates of depression than native-born participants in Northern and Western Europe, but not in Southern Europe. Further, risk for depression is not associated with the length of time immigrants have spent in their current country (Aichberger et al., 2010). Neither of these studies delineated immigrants by their country of origin – that is, to see whether they

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were born in a relatively poorer or wealthier country. It is not known how such changes in environment contribute to frailty.

Here, our primary objective was to determine whether there are differences in levels of frailty between middle-aged and older European immigrants born in LMICs, immigrants born in HICs, and their native-born European peers. Our secondary objectives were to determine if frailty in immigrants is associated with time since migration, and to determine if the association between frailty and risk of death differs among migrant groups.

2. Materials and methods

2.1. Participants and study design

This is an analysis of baseline data from the first two waves of the SHARE (release 2.5.0 of May 24th 2011). SHARE is a representative survey of community-dwelling people aged 50 years and older, and their spouses/partners regardless of age, in 15 countries (wave 1, 2004/2005: Austria, Belgium, Denmark, France, Germany, Greece, Israel, Italy, The Netherlands, Spain, Sweden, and Switzerland; wave 2, 2006/2007: Czech Republic, Poland, and Ireland). 37,546 individuals participated in baseline interviews during the first two waves of SHARE (mean age = 64.2 ± standard deviation 10.5 years; 56% female). We excluded participants under 50 years of age (n = 1228), and further excluded participants living in Israel (n = 2598); Israel's migrant population differs greatly from the included European countries (i.e. 57% of Israeli participants age 50 and older report being born outside of Israel), and country-of-origin information was unavailable for Israeli immigrants. The final sample included 33,745 participants (mean age 64.9 ± 10.2 years; 54% female).

Participants who reported being born outside their current country of residence were identified as immigrants. Immigrants were grouped according to the 2007 World Bank Development Report classification of their country of birth as LMICs or HICs (World Bank, 2006). Identification of country of birth was missing for 106 participants, whom we excluded from immigrant subsample analysis. Time since migration was calculated using self-reported year of arrival. As an earlier study identified a gradient in levels of frailty between different regions of Europe (Theou et al., 2013), participants were further categorized according to their current country of residence by United Nations (2011) definitions into Northern/Western Europe (Austria, Belgium, Denmark, France, Germany, Ireland, Netherlands, Sweden, Switzerland) and Southern/Eastern Europe (Czech Republic, Greece, Italy, Poland, and Spain), to assess whether any associations between frailty and migration group differed by current region of residence. Education level was standardized across countries by International Standard Classification of Education (ISCED) 1997 codes and categorized dichotomously as lower education (ISCED code < 2, no education or basic education) and higher education (ISCED code ≥ 2, some secondary education and higher). Forty-month survival data were obtained from the second (2006/2007) and third (2008/2009) waves of SHARE for all countries except Ireland (follow-up data unavailable). Secondary analyses were approved by the Research Ethics Committee of the Capital District Health Authority, Halifax, Nova Scotia, Canada.

2.2. Frailty index

We defined frailty in relation to the accumulation of health deficits, using a frailty index. A frailty index is a simple means of summarizing health status and its variability with age. It has been widely validated for characterizing risk of death and other adverse health outcomes (de Vries et al., 2011; Drubbel et al., 2013; Rockwood & Mitnitski, 2011). A frailty index counts the number of age-related health deficits an individual has accumulated – including signs, symptoms, diseases, disabilities, and laboratory abnormalities – and infers frailty on that basis, irrespective of the specific nature or combinations of deficits. Health deficits are eligible for inclusion in a frailty index if they meet established criteria: (a) they are related to adverse health outcomes, (b) they accumulate with age, and (c) they do not saturate too early (i.e. reach full prevalence at a premature age) (Searle, Mitnitski, Gahbauer, Gill, & Rockwood, 2008). We selected 70 items from the physical, behavioral, cognitive, and mental health domains of the SHARE survey (see Appendix). We mapped the items to a 0–1 interval, with value 0 when a deficit was absent and value 1 when it was present. We calculated frailty index scores for each participant by dividing the number of deficits an individual has accumulated out of the total number of deficits considered. For example, if an individual had 7 of the 70 deficits, his or her frailty index score was 7/70 = 0.1. One hundred fifty nine participants were missing information for greater than 20% of the deficits (14 variables) and were excluded from frailty analyses. For regression analyses, frailty index scores were log-transformed for normality and entered as a continuous variable.

2.3. Statistical analysis

Analyses of variance (ANOVA) and Kruskall–Wallis tests were used to compare descriptive characteristics between LMIC-born immigrants, HIC-born immigrants, and native-born participants. A 3×2 analysis of covariance (ANCOVA) was applied for frailty index scores, with migration group (LMIC-born vs. HIC-born vs. native-born) and current region of residence (Northern/Western Europe vs. Southern/Eastern Europe) as the between-subjects variables, and controlling for age, gender, and education. Multiple linear regressions were performed on the two immigrant groups (LMIC-born immigrants and HIC-born immigrants) to determine the proportion of variance in frailty index scores attributable to time spent in current country of residence. Multiple Cox regression models were applied to see if differences in survival existed between migration groups while controlling for age, gender, and education, and if these were explained by differences in frailty. Significance level was set at $p < 0.05$. Analyses were performed using PASW Statistics (18.0.0) and Matlab version 7.1 (Matsoft, Inc.).

3. Results

Seven percent of participants (n = 2369) were immigrants, about half of whom were born in LMICs (3.4%), and half of whom were born in HICs (3.6%). Native-born participants less often had higher education and less often lived in Southern/Eastern Europe than both LMIC-born and HIC-born immigrants (Table 1). Native-born participants were significantly older than

Table 1
Descriptive characteristics of participants at baseline, by migration status.

	Native-born Europeans	European immigrants	
		HIC-born	LMIC-born
No. of participants	31,376	1212	1157
Age, years	64.8 (10.1)[b]	64.8 (10.1)	64.0 (10.2)
% women	54.6	56.8	54.7
% w/higher education (ISCED ≥ 2)	47.5[a,b]	56.3	52.5
% residing in Southern/Eastern Europe	39.5[a,b]	6.4[b]	22.0
Death rate at 40 months, %	6.1	4.7[b]	6.1
Years since migration	–	43.3 (17.4)[b]	38.0 (19.5)

[a] $p < 0.05$ compared with HIC-born immigrants.
[b] $p < 0.05$ compared with LMIC-born immigrants.