Annals of Epidemiology xxx (2016) 1–7

Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Original article

Immigrant status and cardiovascular risk over time: results from the Multi-Ethnic Study of Atherosclerosis

Félice Lê-Scherban PhD [a,*], Sandra S. Albrecht PhD [b], Alain Bertoni MD [c], Namratha Kandula MD [d], Neil Mehta PhD [e], Ana V. Diez Roux MD, PhD [a]

[a] Department of Epidemiology and Biostatistics, Dornsife School of Public Health, Drexel University, Philadelphia, PA
[b] Department of Nutrition, Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill
[c] Division of Public Health Sciences, Department of Epidemiology & Prevention, Wake Forest University, Winston–Salem, NC
[d] Department of Medicine, Northwestern University, Chicago, IL
[e] Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA

ARTICLE INFO

Article history:
Received 30 December 2015
Accepted 11 April 2016
Available online xxx

Keywords:
Cardiovascular events
Immigrants
Cohort studies
Cardiovascular risk factors

ABSTRACT

Purpose: Despite cross-sectional evidence that foreign-born United States (US) residents often have better health than US-born residents of similar race and/or ethnicity, we know little about overall cardiovascular risk progression over time among immigrants as they age in the US.
Methods: Using longitudinal data from the Multiethnic Study of Atherosclerosis on 6446 adults aged 45–84 years at baseline, we examined how nativity and length of US residence related to change in cardiovascular health (CVH) and cardiovascular event incidence over 11-year follow-up. CVH was measured using the American Heart Association's CVH measure (range, 0–14; higher is better).
Results: Immigrants, particularly those with shorter US residence, had better baseline CVH and lower cardiovascular event incidence than the US born. Baseline CVH scores ranged from 8.67 (8.42–8.92) among immigrants living in the US less than 10 years to 7.86 (7.76–7.97) among the US born. However, recent immigrants experienced the largest CVH declines over time: 10-year declines ranged from −1.04 (−1.27 to −0.80) among immigrants living in the US less than 10 years at baseline to −0.47 (−0.52 to −0.42) among the US born.
Conclusions: Public health prevention efforts targeting new immigrants may help slow the deterioration of CVH and reduce future cardiovascular risk.

Introduction

Immigrants to the United States (US) often display better health and lower mortality relative to US-born groups of similar race and/or ethnicity, net of socioeconomic differences [1–4]. Hypothesized mechanisms driving this "immigrant advantage" include positive health selection of immigrants from originating populations; negative health selection of ailing immigrants back to their countries of origin; cultural differences in health-related behavioral norms; and supportive familial and social networks among immigrant groups [2,5,6]. However, longer length of US residence among immigrants is related to narrower health differentials by nativity [4,7–9]. One explanation is that acculturation—adoption of US behavioral and social norms—leads to poorer health behaviors and the erosion of social and familial ties that are critical to good health [4,8]. The vast majority of research examining the immigrant advantage and length of US residence has been cross-sectional. This is problematic in part because observed associations between length of US residence and health can be confounded by differences across immigrant arrival cohorts. Emerging longitudinal research has begun to document progression of cardiovascular (CV) risk in immigrants over time, but these studies have focused almost exclusively on single risk factors [10–12]. Therefore, we know relatively little about how nativity and length of US residence relate to the progression of overall CV risk over time.

Research on the immigrant advantage with respect to specific behavioral and clinical CV risk factors is mixed. Poorer diet and a higher prevalence of obesity have been consistently associated with being US born or with longer length of US residence among the foreign born [7,13]. Longer US residence has been related to higher

No potential conflicts of interest relevant to this article were reported.

* Corresponding author. Department of Epidemiology and Biostatistics, Dornsife School of Public Health, Drexel University, 3215 Market Street, 5th Floor, Philadelphia, PA 19104. Tel.: +1-267-359-6178; fax: +1-267-359-6201.
E-mail address: f.lescherban@drexel.edu (F. Lê-Scherban).

http://dx.doi.org/10.1016/j.annepidem.2016.04.008
1047-2797/

smoking prevalence among Asian and Hispanic immigrant women while results among men are less consistent [14,15]. The foreign born are less likely to meet overall physical activity recommendations than the US born, but also to have less sedentary behavior [8,16–18]. US birth and longer US residence have also been associated with higher prevalence of diabetes, hypercholesterolemia, and hypertension, but the presence and strength of these associations varies across studies [19–22]. If residence in the US contributes to accelerated progression of overall CV risk, interventions targeted to recent immigrants may be an effective way to reduce future CV disease burden in immigrant populations.

We used 11 years of longitudinal data from the Multi-Ethnic Study of Atherosclerosis (MESA), a multisite, multiethnic cohort study of older adults to examine how nativity and baseline length of US residence related to change over time in overall CV health (CVH) and to incidence of CV events. Our measure of overall CVH was the ideal CVH measure developed by the American Heart Association in 2010, which incorporates the "Life's Simple 7" metrics: smoking, diet, physical activity, obesity, total cholesterol, blood pressure, and fasting glucose [23]. We hypothesized that foreign-born participants would have better CVH and experience fewer CV events during follow-up than US-born participants of the same racial and/or ethnic background, and that these advantages would be largest for recent immigrants. We also hypothesized that foreign-born participants, particularly more recent immigrants, would experience faster declines in CVH over time than the US born. Faster progression in CV risk factors over time among recent immigrants may stem from the abrupt behavioral and social changes that occur in the period soon after migration, as well as stress associated with the migration process itself [4,10,21,24]. Finally, we examined whether these associations varied by baseline age [13,25,26]. As older immigrants may be less likely to assimilate to unhealthy behavior patterns in the US [13], we hypothesized that CV risk among younger immigrants would converge to that of the US born more quickly than among older participants.

Materials and methods

Study population

Data came from the MESA, a cohort study of 6814 adults aged 45–84 years and free of clinical CV disease at baseline, recruited from six sites (Forsyth County, NC; New York City, NY; Baltimore, MD; St. Paul, MN; Chicago, IL; and Los Angeles, CA). Population-based methods were used to recruit participants from four racial and/or ethnic groups: non-Hispanic white, non-Hispanic black, Hispanic, and Chinese [27]. Baseline exams were conducted in 2000–2002, with four additional follow-up waves in 2002–2003, 2004–2005, 2006–2007, and 2010–2012. Study design details are available elsewhere [27]. The study was approved by the Institutional Review Boards at each site and all participants gave written informed consent. After exclusion of participants with incomplete information, our analysis sample included $n = 6446$ (95% of the original sample) for CVH score analyses and $n = 6515$ (96%) for CV event analyses.

Measures

As defined by the American Heart Association, CVH score was calculated incorporating three behavioral (smoking, diet, and physical activity) and four clinical metrics (obesity, total cholesterol, blood pressure, and fasting glucose; [23]). In keeping with previous research, each participant was assigned a value of 0, 1, or 2 corresponding to poor, intermediate, or ideal status, respectively, for each metric (Table 1; [23]). The values were then summed across the seven metrics to create a total CVH score ranging 0–14 for each examination wave [28,29]. Higher values correspond to better CVH.

Smoking status was self-reported and included information about timing, duration, and quantity of current and past smoking. Physical activity was measured using a 28-item survey asking participants about the frequency, duration, and intensity of their participation in a variety of activity categories (e.g., work, walking, sports) during a typical week in the past month [30]. Categories were sample tertiles of total minutes of moderate activity per week, with minutes of vigorous activity double counted. Results were similar using the absolute cutoffs described in the original CVH measure [23], but the MESA questionnaire likely resulted in overestimates of physical activity time; tertiles also yielded a distribution more closely approximating that of other US samples [23,31,32].

Diet was measured using a food frequency questionnaire based on the Insulin Resistance Atherosclerosis Study instrument, which had comparable validity among non-Hispanic white, non-Hispanic black, and Hispanic persons, and modified to include foods typically eaten in Chinese populations [27]. Categories were based on the number of the following healthy diet components that were met: 4.5 or more servings of fruit or vegetables per day, two or more servings of fish per week, three or more servings of whole grains per day, less than 1500 mg sodium per day, and less than three servings of sugar-sweetened beverages per week. Because diet information was not collected in study waves 2–4 and physical

Table 1
Definitions of ideal, intermediate, and poor status for ideal cardiovascular health score

Metric	Status		
	Ideal	Intermediate	Poor
Smoking	Never smoker; or former smoker, quit ≥12 months ago	Former smoker, quit <12 months ago	Current smoker
Body mass index	<25 kg/m^2	25–29.9 kg/m^2	≥30 kg/m^2
Healthy diet*	0–1 component	2–3 components	4–5 components
Physical activity†	Highest tertile	Middle tertile	Lowest tertile
Total cholesterol	<200 mg/dL and untreated	Untreated with 200–239 mg/dL; or treated with <200 mg/dL	Untreated with ≥240 mg/dL; or treated with ≥200 mg/dL
Blood pressure	Untreated with SBP <120 mm Hg and DBP <80 mm Hg	Untreated with SBP 120–139 mm Hg or DBP 80–90 mm Hg; or treated with SBP <120 mm Hg and DBP <80 mm Hg	Untreated with SBP ≥140 mm Hg or DBP ≥90 mm Hg; or treated with SBP ≥120 mm Hg or DBP ≥80 mm Hg
Fasting blood glucose	Untreated with <100 mg/dL	Untreated with 100–125 mg/dL; or treated with <100 mg/dL	Untreated with ≥126 mg/dL; or treated with ≥100 mg/dL

DBP = diastolic blood pressure; MESA = Multi-Ethnic Study of Atherosclerosis; SBP = systolic blood pressure.

* Healthy diet components are (1) 4.5 or more servings of fruit or vegetables per day, (2) two or more servings of fish per week, (3) three or more servings of whole grains per day, (4) less than 1500 mg sodium per day, and (5) less than three servings of sugar-sweetened beverages per week.

† Tertiles are based on minutes/week of moderate physical activity + (2 × minutes/week of vigorous physical activity). Tertile 1 = 0–655; tertile 2 = 660–1585; tertile 3 = 1590–32,475. There is known overreporting of physical activity in MESA.