



# Immigration and health among non-Hispanic whites: The impact of arrival cohort and region of birth

Jen'nan Ghazal Read<sup>a,b,\*</sup>, Jessica S. West<sup>a</sup>, Christina Kamis<sup>a</sup>

<sup>a</sup> Department of Sociology, Duke University, Durham, NC, USA

<sup>b</sup> Duke Global Health Institute, Duke University, Durham, NC, USA

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## ABSTRACT

Immigration is central to our understanding of U.S. racial and ethnic health disparities, yet relatively little is known about the health of white immigrants – a group whose ethnic origins have become increasingly diverse. To the extent that whites are included in social stratification research, they are typically used as the reference category for gauging health inequities, with little attention to diversity among them. This study addresses this question using nationally representative data from the American Community Survey (2008–2017). We disaggregate non-Hispanic whites by nativity, region of birth, and period of arrival in the U.S. and examine differences in physical disability among adults aged 40 and older ( $n = 12,075,638$ ). The analysis finds that foreign-born whites have a slightly lower prevalence of disability than U.S.-born whites, and this varies by arrival cohort. Immigrants who arrived in the 1981–1990 and 1991–2000 cohorts have a smaller advantage over U.S.-born whites than immigrants in the earlier and later cohorts. Compositional changes in the region of birth of white immigrants, especially the influx of eastern Europeans and Middle Easterners during the 1980s and 1990s, explained this variation. These findings challenge the oft-assumed notion that whites are a monolithic group and highlight growing intra-ethnic heterogeneity that is obscured by the aggregate category. Our findings also suggest that the standard practice of using whites as the reference for benchmarking health inequities may mask health inequities not only among them, but also between whites and other racial and ethnic populations.

## 1. Introduction

The health of immigrants on arrival and over time has garnered considerable attention because immigrants and their offspring make up an increasing component of the U.S. population and are consequential for the healthcare system. The bulk of research has focused on the healthy immigrant effect, whereby immigrants arrive in the U.S. healthier than the native-born population but experience declining health over time (Acevedo-Garcia et al., 2010; Elo et al., 2011; Jasso, 2003). Such a pattern has been found across major U.S. racial and ethnic groups, including Hispanics, Asians, and blacks (Antecol and Bedard, 2006; Fenelon et al., 2017; Mehta et al., 2016).

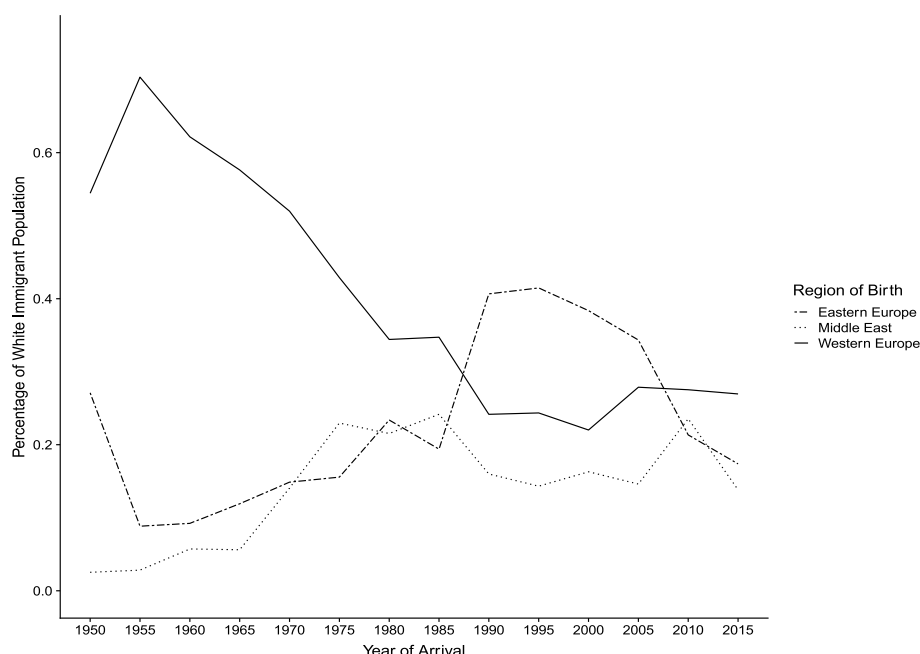
There is also mounting evidence of growing ethnic heterogeneity within broad racial categories being driven by immigration from diverse world regions (Hamilton and Hummer, 2011; Kaushal, 2009; Mehta et al., 2016; Reynolds et al., 2016). The 1965 Immigration and Nationality Act lifted restrictions on migration from non-western European countries and drastically altered the ethnic origins of immigrants entering the U.S. after that time (Iceland, 2014; Ro et al., 2015). In

2016, 13.5 percent of the U.S. population was foreign-born (43.7 million), up from less than 5 percent (9.6 million) in 1970 (Zong et al., n.d.). Over the same period, the proportion of immigrants born in western Europe plummeted, while the proportion born in other world regions grew. These newer immigrants are incorporated within the U.S. racial and ethnic stratification system and contribute to growing diversity and complexity in population health (Iceland, 2014).

While there has been extensive research on the impact of immigration on the health of racial and ethnic minorities, studies that focus on non-Hispanic whites are practically non-existent. A systematic review of existing literature finds that U.S.-born whites are almost always used as the reference category for gauging health inequities, with scarce attention to the health of white immigrants – a group that currently comprises 18 percent of the U.S. foreign-born population (López and Radford, 2017). The practice of using whites as the reference category is problematic because it is based on a definition that equates whiteness with western Europeans and overlooks historical changes in the region of origin of white immigrants arriving in the U.S. in different eras (Malat et al., 2018). As seen in Fig. 1, western Europeans

\* Corresponding author. Department of Sociology, Duke University, 417 Chapel Drive, Durham, NC 27708, USA.

E-mail address: [jennan.read@duke.edu](mailto:jennan.read@duke.edu) (J.G. Read).



**Fig. 1.** Major regions of birth for non-Hispanic white immigrants, 1950–2015. Note: Data taken from the American Community Survey (ACS) Public Use Microdata Sample (2008–2017). Birthplace categories based on Office of Management and Budget's classification schema.

comprised roughly 60 percent of all white immigrants arriving in the U.S. prior to 1965 but dropped to around 20 percent in the 1990s, where it continues to hover today (U. S. Census Bureau, 2015). In contrast, emigration from eastern Europe and the Middle East has steadily climbed, with eastern Europeans accounting for over 40 percent of white immigrants arriving in the U.S. during the 1990s and Middle Eastern immigration peaking at 24 percent in 2010.

Changes in the ethnic origins of whites are likely associated with differing socio-political contexts of exit and reception that are known to be consequential for the health of U.S. immigrants (Hamilton and Hummer, 2011; Reynolds et al., 2016; Son, 2013). Immigration scholars have recently begun including the life course principle of time and place in explanations of immigrant health, highlighting the importance of region of birth and arrival cohort because differing historical context and migration timing can create compositional variation among immigrants that translate to health inequities (Hamilton et al., 2015; Treas and Gubernskaya, 2015). However, the extent to which contemporary explanations for immigrant health apply to white immigrants is unknown. The current study addresses this gap and contributes to a growing body of work that disaggregates racial and ethnic groups in analyses of health inequality (Brown, 2018; Elder et al., 2015; Hamilton et al., 2015; Read et al., 2005). Our primary objectives are to determine whether the nativity health gap among whites resembles that found among minority ethnic groups and to assess whether the health of white immigrants varies by region of birth and period of arrival in the U.S. To achieve these objectives, we use nationally representative data from ten years of the American Community Survey (ACS) (2008–2017) to examine differences in physical disability among whites by nativity, region of birth, and period of arrival in the U.S.

## 2. Background

### 2.1. Contemporary explanations for immigrant health

Immigration research has long proposed that foreign-born individuals have a health advantage over U.S.-born individuals upon arrival, often referred to as the healthy immigrant effect (Acevedo-Garcia et al., 2010; Antecol and Bedard, 2006; Jasso, 2003). Furthermore, studies suggest that the initial health advantage declines with increased

duration in the U.S. and subsequent exposure to U.S. health practices and behaviors (Lee et al., 2013). Explanations for these empirical patterns have centered on the selective nature of migration and changes in lifestyle and cultural factors once in the host country (Riosmena et al., 2017). Selection has typically referred to the healthier migration of individuals relative to those left behind, while lifestyle and cultural arguments have focused on the adoption of less healthy behaviors and a loss of cultural buffers post-migration (Antecol and Bedard, 2006; Bostean, 2013; Waters and Pineau, 2015).

However, more recent work has called for greater attention to the historical conditions that may lead to negative health selection. Specifically, sending countries have unique histories that may increase or decrease the degree of migrant selectivity over time, necessitating a deeper understanding of migration based on region of birth and period of arrival in the U.S. (Bakhtiari, 2018; Hamilton et al., 2015; Ro et al., 2015). For example, periods of political and civil unrest in certain regions of the world may push individuals to seek refuge through involuntary migration, while economic opportunities and familial networks may lead to immigrants leaving voluntarily (Levels et al., 2008; Reynolds et al., 2016; Son, 2013). Immigrants born in different world regions have also been exposed to varying levels of human and economic development and thus arrive in the U.S. with disparate characteristics and resources. Consequently, not all immigrants may showcase a health advantage over their native-born counterparts when arriving in the U.S.

Migration scholars interested in selection have paid particular attention to the salience of arrival cohort because it captures time-varying immigration policies and distinct historical periods that can affect the context of reception and, in turn, the health of immigrants on arrival and over time (Mueller and Bartlett, 2017; Treas and Gubernskaya, 2015). Research on Asian subgroups, for example, finds that Vietnamese immigrants – who primarily came to the U.S. as refugees in the post-Vietnam War era – arrived with low levels of human capital and consistently exhibit worse health outcomes than other national origin Asian immigrants (Gee and Ponce, 2010; Rkasnuam and Batalova, 2014). Mueller and Bartlett (2017) likewise note that exposure to distinct immigration policy regimes corresponded with varying disability trajectories for immigrants from Mexico, with those arriving after the passage of the 1986 Immigration Reform and Control Act (IRCA)

experiencing worse health than non-migrants, partly due to increased border enforcement and threats of deportation. In a similar vein, [Hamilton and Hummer \(2011\)](#) attribute declining health selectivity among black Caribbean immigrants in more recent arrival cohorts to provisions in IRCA that allowed undocumented immigrants to apply for U.S. citizenship and subsequently sponsor visas for family members, which resulted in less health selectivity relative to earlier arrival cohorts. Together, these and similar studies indicate that using broad racial categories can obscure heterogeneity among ethnic groups and underscore the need to consider region of birth and arrival cohort when analyzing the health of immigrants.

## 2.2. Socio-historical origins of diversity among whites

Most research that disaggregates immigrant populations by arrival cohort and region of birth has focused on minorities with little attention paid to potential diversity among whites. However, the ethnic composition of whites is far from homogeneous and includes persons who trace their origins to western Europe, eastern Europe and the Middle East, including parts of north Africa and western Asia ([OMB, 1997](#)). As illustrated in [Fig. 1](#), emigration from western Europe has steadily declined over time, while migration from non-western European world regions has increased ([Read and Reynolds, 2012](#); [Waters and Pineau, 2015](#)). Changes in the ethnic composition of whites are tied to U.S. immigration policies and to global socio-political and economic contexts ([Migration Policy Institute, 2013](#); [Waters and Pineau, 2015](#)). While immigration up until the 1960s was dominated by western Europeans, increased economic stability in western Europe following World War II disincentivized emigration and led to a steady decline of migrants from this region ([Zhao, 2016](#)). Around the same time, the passage of the 1965 Immigration and Nationality Act lifted national origin restrictions and subsequent migration from regions outside of western Europe, including eastern Europe and the Middle East, climbed dramatically ([Waters and Pineau, 2015](#)).

The arrival of immigrants from eastern Europe and the Middle East is noteworthy because the contexts of exit in the sending regions were often characterized by economic instability, political conflict, and civil unrest. These contexts coincided with several changes in U.S. immigration policy that impacted the degree of migrant selectivity and resulted in compositional differences among arrival cohorts. During the 1970s, immigrants arriving from eastern Europe, particularly from the Former Soviet Union (FSU), had to overcome significant barriers to obtain exit visas, which resulted in a more highly selective group arriving in the U.S. ([Mehta and Elo, 2012](#)). The passage of the Refugee Act of 1980 increased the number of refugees admitted each year and subsequent migration from communist regimes increased. Middle Easterners immigrating during the 1970s and 1980s were likewise fleeing regional conflicts caused by the Iranian Revolution, Palestinian-Israeli War, and Lebanese Civil War ([Foad, 2013](#); [Samhan, 1999](#)).

Beginning in the early 1990s, several circumstances altered the composition and subsequent selectivity of white immigrants arriving from eastern Europe and the Middle East. The Immigration Act of 1990 increased the number of legal immigrants allowed to enter the U.S. each year and introduced a lottery system that assigned visas to immigrants randomly, thereby reducing immigrant selectivity ([Migration Policy Institute, 2013](#)). The passage of this Act coincided with the breakdown of the FSU, the removal of formal barriers to leave the Soviet Union, and the first Gulf War in Iraq, all of which contributed to a growing number of immigrants arriving from these regions, many of whom were refugees ([Abdelhady, 2014](#); [Mehta and Elo, 2012](#)). Moreover, the formal establishment of the European Union in the early 1990s provided western Europeans with economic incentives to remain in their home countries, further decreasing migrant flows from this region ([Zhao, 2016](#)).

The turn of the twenty-first century ushered in a new era of immigration reform that continued to alter the composition of white

immigrants entering the U.S. In the aftermath of the September 11, 2001 terrorist attacks, the passage of the USA Patriot Act (2001) and Homeland Security Act (2002) led to a tightening of U.S. borders and a stricter vetting procedure for immigrants ([Migration Policy Institute, 2013](#)). While legislation during this decade initially led to declines in immigration as a whole, individuals continued to migrate from eastern Europe as a result of economic instability in the wake of the dissolution of the Soviet Union. Growing U.S. involvement in political conflicts in the Middle East, the war in Iraq, and uprisings associated with the Arab Spring likewise led to an uptick of refugees from this area in subsequent years ([Migration Policy Institute, 2015](#)).

## 2.3. Theorizing the health of white immigrants

To date, systematic evidence on the potential health consequences of ethnic diversity among whites is largely missing. Research that includes whites typically does so as the reference group and restricts the sample to U.S.-born whites, excluding immigrants. In a notable exception to this approach, [Antecol and Bedard \(2006, p. 344\)](#) stratified their analyses by race and compared the health of white immigrants to U.S.-born whites to “avoid confounding racial differences in assimilation.” Unlike the results for Hispanics, they found that white immigrants did not show a consistent health advantage over their native-born counterparts. [Dupre et al. \(2012\)](#) also included foreign- and native-born whites in their study on mortality and life expectancy and found that the nativity gap in survival was much smaller for whites than for blacks. More recently, [Brown \(2018\)](#) argued that the healthy immigrant effect depends on race and ethnicity. Specifically, he found that black and Mexican American immigrants experienced a growing health advantage over their native-born counterparts with age, a pattern that did not exist for whites.

Studies that isolate specific white ethnic subpopulations provide additional evidence of variability in the healthy immigrant effect based on region of birth and arrival cohort. For instance, research on eastern European immigrants finds higher rates of physical disability and self-care disability when compared to U.S.-born whites ([Mehta and Elo, 2012](#)). When further differentiated by arrival cohort, immigrants arriving in the pre-1987 cohort reported better health than those arriving in the post-1987 cohort, which the authors attribute to changes in Soviet emigration policies that relaxed restrictions and led to a subsequent decline in health selectivity ([Mehta and Elo, 2012](#)). Research on Middle Easterners, who are also classified as white, likewise finds smaller health advantages for immigrants and more varied profiles among arrival cohorts across a host of health outcomes, including physical disability, self-care disability ([Dallo et al., 2015](#); [Read et al., 2019](#)) and self-rated health ([Read et al., 2005](#); [Read and Reynolds, 2012](#)).

Potential explanations for varied outcomes among whites can be found in the historical literature on the social location of white immigrants within the U.S. ethno-racial stratification system ([Bonilla-Silva, 2009](#)). Although all white ethnic groups have benefitted from their color status as white, western Europeans have long occupied the highest rung on the ethno-racial hierarchy and enjoyed easier paths to assimilation than other immigrant groups, including non-western European whites ([Bakhtiari, 2018](#)). During the first half of the twentieth century, white immigrants from central, southern, and eastern Europe were seen as racially different from western Europeans and experienced widespread discrimination based on mainstream beliefs about their genetic and cultural inferiority ([Foner, 2005](#)). Although many of these intra-racial boundaries have blurred over time, ethnic stratification likely continues to play a pivotal role in shaping the well-being of white immigrants from varied backgrounds ([Waters and Pineau, 2015](#)).

## 2.4. Current study

The current study aims to contribute to existing research by assessing variation in health among whites by nativity, region of birth, and

arrival cohort. We include these characteristics within the same analytic framework to provide a better understanding of how immigration is shaping the well-being of a population often treated in the aggregate and as the reference category. Our primary objectives are to determine whether the nativity gap in health among whites resembles that found among minority ethnic groups and to assess whether the health of white immigrants varies by period of arrival and region of birth. To that end, we use nationally representative data to address two related questions: 1) to what extent does the nativity health gap among whites vary by immigrant arrival cohort? and 2) to what extent are differences among arrival cohorts driven by changes in the region of birth of white immigrants over time?

### 3. Methods

#### 3.1. Data

Data for this study come from the 2008 to 2017 one-year files of the American Community Survey (ACS) Public Use Microdata Sample (PUMS) (Ruggles et al., 2018). The ACS is particularly useful because it represents one of the only large, nationally-representative datasets that contains detailed ethnic origin data on whites and has relatively large sample sizes. Each microdata file is a stratified subsample of the full Census that contains one percent of U.S. housing units. Census microdata includes information on both persons and households, with the individual as the unit of observation. Inconsistent wording for the disability questions prior to 2008 preclude the inclusion of prior survey years in the current analysis. Our analysis includes individuals who self-identified as non-Hispanic white (hereafter white) and captures those who immigrated before the age of 40 but assesses disability at age 40 and older because health problems tend to manifest during midlife (Martin and Schoeni, 2014). We conducted a sensitivity analysis using older age cutoffs (50 + and 65 +) and found that the pattern of results did not differ. Our final unweighted analytic sample across nine years is comprised of 12, 075, 638 whites (4.4 percent foreign-born, 95.6 percent native-born).

#### 3.2. Measures

The main dependent variable is physical disability, which is a valid and reliable indicator of functional limitation (Elo et al., 2011; Katz et al., 1963; Nagi, 1991). Moreover, it is an important indicator of morbidity and is detectable regardless of clinical diagnosis, which is a nontrivial distinction in research on immigrants who have less access to clinical care and thus may underreport health conditions that require diagnosis (Brown, 2018; Read and Smith, 2017). Physical disability is measured by asking, “Does this person have any of the following long-lasting conditions—a condition that substantially limits one or more basic physical activities, such as walking, climbing stairs, reaching, lifting, or carrying?” Responses to this question are dichotomous (0 = no, 1 = yes). In ancillary analyses not shown, we also tested self-care disability (difficulty bathing or dressing) and independent living and found that the substantive patterns were similar to those for physical disability. Due to space constraints, we focus on one outcome.

We examine differences in physical disability among whites by nativity, immigrant arrival cohort, and region of birth. Nativity is a dichotomous variable indicating whether individuals are foreign-born or U.S.-born (reference). Immigrant arrival cohort was created using a continuous variable in the ACS that reports the year in which a foreign-born individual entered the U.S. (“When did this person come to live in the United States?”). We identify five historical periods based on global events and U.S. immigration policy that changed the composition and flow of immigrants over time: 1) prior to 1965; 2) 1965–1980 (1965 Immigration and Nationality Act); 3) 1981–1990 (Refugee Act of 1980); 4) 1991–2000 (1990 Immigration Act and first Gulf War); and 5) 2001 + (9/11 terrorist attacks and USA Patriot Act).

Region of birth is based on the ACS question that asks, “Where was this person born?” White immigrants are classified into six regions based on the Office of Management and Budget’s classification schema: western Europe (reference); eastern Europe; Middle East; Asia; Central and South America; and other North America (i.e., primarily Canada) (Office of Management and Budget, 1997). A small percentage of respondents had birthplaces that were not classified in any of the major categories (2.6 percent); we labeled these as “other” and include them in the analyses but do not attempt to interpret the findings.

Recent work has established the necessity of including both arrival cohort and duration in the U.S. when estimating immigrant health (Hamilton et al., 2015). We control for duration of U.S. residence using a continuous variable in the ACS that measures how long a foreign-born individual has been living in the U.S. We collapsed this variable into five categories: 0–5 years, 6–10 years, 11–15 years, 16–20 years, and 21 or more years living in the U.S. We also control for survey year and several sociodemographic characteristics associated with health. We include education as a measure of socioeconomic status (SES) because it is acquired relatively early in life and is less subject to reverse causality than income or poverty status, which are more likely to be affected by health status in adulthood (Elo et al., 2011; Smith, 2005). Educational attainment is measured with dummy variables for less than high school (reference), high school degree, some college, and a college degree or more. Demographic characteristics include age (in years); gender (male = reference, female); marital status (married = reference, separated/divorced, widowed, never married/single); and U.S. region of residence (Northeast = reference, Midwest, South, and West).

#### 3.3. Statistical methods

In order to estimate health differences between arrival cohorts and native-born individuals while controlling for duration, we leverage multiple cross-sections of data and employ the widely used method developed by Borjas (1985). The estimation equation is:

$$Y_i = X_i\beta + A_i\gamma + C_i\delta + R_i\varphi + T_i\pi + \epsilon_i$$

where  $Y$  is a binary indicator of having a physical disability.  $C$  is a vector of dummy variables identifying the three arrival cohorts,  $A$  is a vector of dummy variables for the duration categories, and  $R$  is a vector of dummy variables for region of birth.  $T$  represents a vector of dummy variables for survey wave.  $X$  is a vector of control variables including sex, education, marital status, current region of residence, age, and age squared. For the native-born sample, arrival cohort, duration, and birthplace are all set to “0.” The estimation equation is:

$$Y_i = X_i\beta + T_i\pi + \epsilon_i$$

It should be noted that all estimations were conducted pooling observations of immigrants and native-born individuals in each survey wave. This establishes the restriction that the effect of period, as well as the other covariates in the model, on disability are estimated as being the same for both immigrants and the native-born. Restraining period as such is a necessary assumption to allow for the separate analysis of cohort and duration amongst immigrants (Antecol and Bedard, 2006; Hamilton et al., 2015).

We first estimate differences in descriptive characteristics using Pearson  $\chi^2$  and Wald tests (Table 1). The large sample size produces uniformly significant results, thus we report on descriptive patterns. We then address our research questions by employing multivariable logistic regression to predict physical disability by nativity, immigrant arrival cohort, and region of birth. Model 1 in Table 2 explores the impact of arrival cohort on immigrant health controlling for duration. Model 2 includes region of birth to determine if differences among immigrant arrival cohorts are driven by immigration flows. To further assess how arrival cohort patterns differ across these regions, we estimate models stratified by the three major regions of birth (Table 3). Tables 2 and 3 present results from logistic regressions in odds ratios. Fig. 2 showcases



**Table 1**  
Sample characteristics for non-Hispanic whites by nativity and arrival cohort, aged 40 + (n = 12,075,638).

	Native-born (%)	Foreign-born (%)	Foreign-born by arrival cohort				
			Pre-1965 (%)	1965–1980 (%)	1981–1990 (%)	1991–2000 (%)	2001 + (%)
<b>Health status</b>							
Physical disability	13.4	11.7	20.5	10.7	8.1	8.5	6.9
<b>Immigration characteristics</b>							
Arrival cohort							
< 1965	–	24.9	–	–	–	–	–
1965–1980	–	24.0	–	–	–	–	–
1981–1990	–	15.4	–	–	–	–	–
1991–2000	–	21.3	–	–	–	–	–
2001 +	–	14.4	–	–	–	–	–
Region of birth							
Western Europe	–	38.5	61.0	46.1	29.5	20.2	23.5
Eastern Europe	–	26.0	14.7	16.5	28.0	45.6	30.5
Middle East	–	15.1	4.1	18.4	22.1	15.0	21.4
Asia	–	2.5	1.8	2.8	3.5	2.1	2.5
North America	–	10.5	14.7	9.5	7.4	8.3	11.5
Central/South America	–	5.0	2.7	4.4	6.5	5.8	7.3
Other	–	2.4	1.1	2.4	3.0	2.9	3.5
Duration in U.S.							
0–5 years	–	6.4	–	–	–	–	–
6–10 years	–	6.1	–	–	–	–	–
11–15 years	–	9.1	–	–	–	–	–
16–20 years	–	11.0	–	–	–	–	–
21 + years	–	67.5	–	–	–	–	–
<b>Sociodemographic characteristics</b>							
Age, mean (sd)	59.7 (13.0)	60.8 (13.0)	73.3 (11.2)	61.5 (11.5)	56.1 (10.8)	53.7 (11.5)	53.5 (11.6)
Female	52.2	54.2	60.5	52.4	50.8	52.4	52.4
Marital status							
Married	63.2	67.8	55.4	68.1	71.7	74.0	75.6
Separated/divorced	17.4	13.6	12.7	14.8	15.7	13.6	10.8
Widowed	10.5	12.6	26.7	10.5	6.5	6.6	7.3
Never married/single	8.9	6.0	5.2	6.6	6.0	5.8	6.3
Education							
Less than high school	9.0	15.5	20.6	18.8	12.2	10.3	12.5
High school graduate	30.9	24.4	28.7	23.9	22.2	22.1	23.6
Some college	29.6	23.0	25.4	23.3	24.1	21.4	19.8
College degree +	30.5	37.1	25.3	34.0	41.6	46.2	44.2
Region of residence							
Northeast	19.0	31.0	32.3	34.4	30.6	30.7	24.2
Midwest	26.2	16.0	17.4	14.5	14.0	17.7	15.5
South	35.8	24.3	22.9	22.8	23.8	24.0	30.5
West	19.0	28.7	27.5	28.3	31.6	27.7	29.8
Observations	11,540,108	535,530	150,292	131,456	79,692	105,615	68,475

Data: ACS 2008–2017.

Note: Sample sizes are unweighted. Estimates are weighted. sd = standard deviation. Due to large sample sizes, comparisons between the native-born and foreign-born whites and between the < 1965 cohort and all other cohorts are significant at  $p \leq 0.001$  and are not reported in the table for visual clarity.

the results from Table 2 in the form of predicted probabilities. All descriptive statistics and subsequent analyses are estimated using Stata 15.1 (StataCorp, 2017). The regression analyses include sample weights provided by the ACS to make our estimates representative of the U.S. population. Predicted probabilities are estimated using the margins command in Stata holding all other covariates at their means (Fig. 2) (Long and Mustillo, 2018).

## 4. Results

### 4.1. Descriptive results

Table 1 shows weighted descriptive statistics stratified by nativity and immigrant arrival cohort. The results show that the nativity gap in physical disability is relatively narrow (13.4 percent and 11.7 percent for U.S.- and foreign-born whites, respectively). White immigrants are dispersed across arrival cohorts with the largest percentages arriving in the pre-1965 and 1965–1980 cohorts (24.9 percent and 24.0 percent, respectively) and a majority (67.5 percent) having 21 years or more of U.S. residency. Over one-third (38.5 percent) of white immigrants were born in western Europe, with persons born in eastern Europe (26.0

percent) and the Middle East (15.1 percent) making up the next two largest groups. In terms of sociodemographic factors, white immigrants are approximately the same age as native-born whites and a little over half of both groups are female. White immigrants are significantly more likely than their U.S.-born peers to have a college degree or more (37.1 versus 30.5 percent, respectively), but are also more likely than the native-born to have less than a high school degree (15.5 versus 9.0 percent, respectively).

Table 1 also includes descriptive statistics of white immigrants across the five arrival cohorts, which reveal a noticeable shift in region of birth over time. Western Europeans comprised nearly two-thirds (61.0 percent) of white immigrants in the pre-1965 cohort but less than one-third in the three most recent cohorts. Persons born in eastern Europe increased steadily from 14.7 percent in the earliest cohort to 45.6 percent and 30.5 percent in the two most recent cohorts, as did the proportion born in the Middle East (4.1 percent in pre-1965 and 21.4 percent in 2001 +). In calculations not shown, the relative rise in eastern Europeans in the 1991–2000 cohort is driven by those from Russia and Ukraine, while the rise in Middle Easterners in the most recent cohort is the result of increased immigration from Iran and Iraq.

**Table 2**

Odds ratios of physical disability by nativity, immigrant arrival cohort, and region of birth among non-Hispanic whites, aged 40+ (n = 12,075,638).

Variable	Model 1	Model 2
	OR (95% CI)	OR (95% CI)
<i>Arrival cohort</i>		
Native-born (ref)		
Pre-1965	0.66 (0.59–0.74) ***	0.62 (0.55–0.69) ***
1965–1980	0.66 (0.59–0.75) ***	0.56 (0.50–0.63) ***
1981–1990	0.72 (0.64–0.81) ***	0.54 (0.48–0.61) ***
1991–2000	0.83 (0.75–0.92) ***	0.59 (0.53–0.65) ***
2001 +	0.66 (0.62–0.70) ***	0.48 (0.45–0.51) ***
<i>Years since arrival</i>		
0–5 years (ref)		
6–10 years	1.15 (1.05–1.25) **	1.08 (0.991–1.18)
11–15 years	1.14 (1.04–1.25) **	1.08 (0.983–1.19)
16–20 years	1.22 (1.10–1.36) ***	1.15 (1.034–1.28) **
21 + years	1.08 (0.96–1.21)	1.04 (0.927–1.16)
<i>Region of birth</i>		
Western Europe (ref)		
Eastern Europe		1.80 (1.75–1.85) ***
Middle East		1.80 (1.73–1.87) ***
Other North America		0.91 (0.87–0.94) ***
Central/South America		0.89 (0.83–0.95) ***
Asia		1.53 (1.42–1.66) ***
Other		0.73 (0.66–0.81) ***

Data: ACS 2008–2017.

Note: Sample sizes are unweighted. Estimates are weighted. \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. All models also include sex, age, age squared, education, marital status, current region of residence, and survey year.

#### 4.2. Comparison of disability by arrival cohort and region of birth

Table 2 provides results assessing the impact of arrival cohort and region of birth on physical disability. Model 1 addresses our first research question by estimating baseline differences for the arrival cohorts without the inclusion of region of birth. Since this model includes both duration and arrival cohort, odds ratios for arrival cohort must be interpreted in relation to the reference category for duration (0–5 years); in other words, the odds ratios represent differences between immigrants and the native-born associated with being part of a specific entry cohort. In the first five years, white immigrants in each arrival cohort have lower odds of disability compared to native-born whites. White immigrants who were part of the pre-1965 cohort, the 1965–1980 cohort, and the most recent cohort have the largest health advantage over native-born whites. In comparison, the 1981–1990 (OR = 0.72, 95% CI = 0.64, 0.81) and the 1991–2000 cohort (OR = 0.83, 95% CI = 0.75, 0.92) have a much smaller health

advantage over their native-born counterparts. White immigrants begin to lose their health advantage immediately after their first five years in the U.S.

We examine our second research question in Model 2 which estimates the impact of arrival cohort with the inclusion of region of birth. Among whites, those born in eastern Europe (OR = 1.80, 95% CI = 1.75, 1.85) and the Middle East (OR = 1.80, 95% CI = 1.73, 1.87) – the second and third most represented regions of birth in our sample – have greater odds of disability compared to those born in western Europe, as do those born in Asia (OR = 1.53, CI = 1.42, 1.66). The arrival cohort coefficients in Model 2 capture the differences between arrival cohorts of western Europeans in their first 0–5 years compared to native-born whites. Since these arrival cohort coefficients are difficult to interpret and cannot be compared across models, Fig. 2 presents predicted probabilities of disability from Models 1 and 2 with and without the inclusion of region of birth (see Appendix Table 1 for margins and confidence intervals).

As evident in Fig. 2, the inclusion of region of birth changes predicted probabilities of disability among white immigrant arrival cohorts. The predicted probability of disability for the 1981–1990 cohort is reduced from 8.1 percent to 7.3 percent in Model 2 and is significantly lower than the predicted probability of the pre-1965 cohort (7.4 percent in Model 1 and 8.2 percent in Model 2). Similarly, the predicted probability of disability for the 1991–2000 cohort is reduced from 9.2 percent to 7.9 percent and is no longer significantly different from the pre-1965 cohort once we account for region of birth. Recall that the 1981–1990 and the 1991–2000 cohorts witnessed the greatest compositional change in the region of birth of white immigrants, with sharp declines in western European arrivals and large increases in eastern European ones (Table 2). The predicted probability for the 2001 + cohort is also reduced from 7.4 percent to 6.6 percent and becomes significantly lower than the pre-1965 cohort. These results suggest that region of birth is an important factor driving health differences across white immigrant arrival cohorts.

To further investigate how region of birth shapes the health status of white immigrants, Table 3 estimates separate models stratified by the three major regions of birth (western Europe, eastern Europe, and the Middle East). The results show that western Europeans in each arrival cohort have significantly lower odds of disability in their first five years compared to native-born whites. In contrast, the results for immigrants from eastern Europe are more variable across cohorts. Particularly noteworthy is the poorer health of eastern European immigrants arriving in the 1981–1990 and 1991–2000 cohorts, a time in which political unrest in this region was high and health selection low. In their first five years in the U.S., immigrants in the 1981–1990 cohort (OR = 0.96, 95% CI = 0.80, 1.15) and the 1991–2000 cohort (OR = 1.10, 95% CI = 0.93, 1.28) did not statistically differ from native-born whites. Furthermore, immigrants from the Middle East in

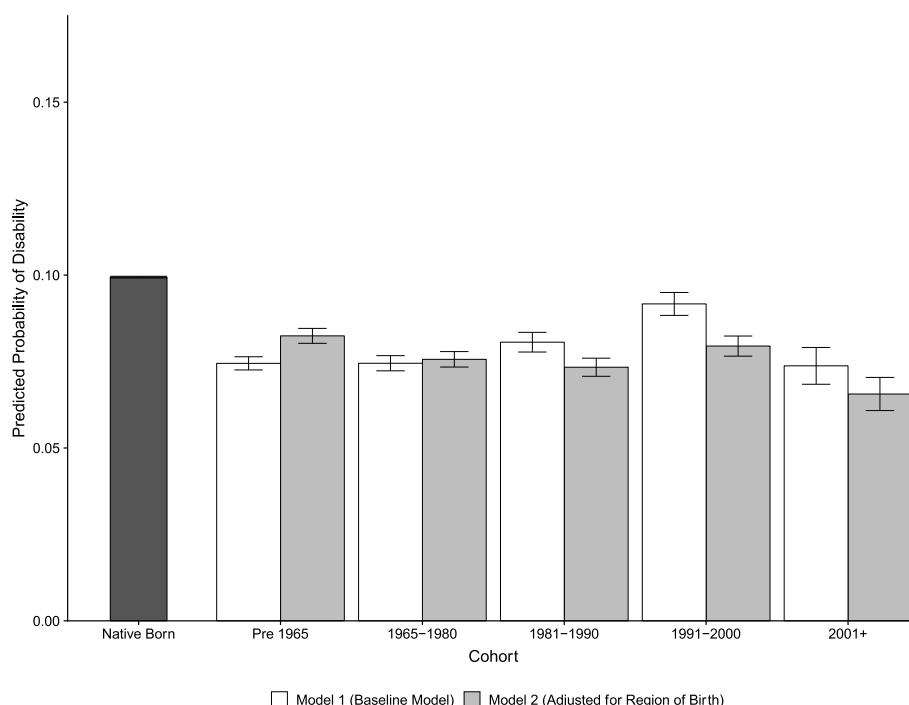
**Table 3**

Odds ratios of physical disability among foreign-born non-Hispanic whites aged 40 + by region of birth.

Variable	Western Europe	Eastern Europe	Middle East
	OR (95% CI)	OR (95% CI)	OR (95% CI)
<i>Arrival cohort</i>			
Native-born (ref)			
Pre-1965	0.48 (0.36–0.65) ***	0.75 (0.623–0.89) ***	1.40 (1.07–1.83) *
1965–1980	0.43 (0.32–0.59) ***	0.82 (0.686–0.99) *	1.39 (1.07–1.79) *
1981–1990	0.36 (0.27–0.49) ***	0.96 (0.801–1.15)	1.45 (1.12–1.87) **
1991–2000	0.36 (0.27–0.47) ***	1.10 (0.934–1.28)	1.33 (1.09–1.63) **
2001 +	0.39 (0.34–0.44) ***	0.81 (0.717–0.90) ***	1.30 (1.17–1.44) ***
Observations	11,764,040	11,668,102	11,612,387

Data: ACS 2008–2017.

Note: Sample sizes are unweighted. Estimates are weighted. \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. All models also include sex, age, age squared, education, marital status, current region of residence, and survey year.



**Fig. 2.** Predicted probability of physical disability by nativity and immigrant arrival cohort. Note: Predicted probabilities derived from odds ratios in Table 2 holding all covariates at their means. All models adjusted for sex, age, age squared, education, marital status, current region of residence, and survey year.

every arrival cohort have significantly higher probabilities of disability in their first five years compared to native-born whites. These findings suggest that the initial health advantage of immigrants in the pre-1965 cohort (Table 2) may be driven by the relatively larger proportion of western Europeans who were healthier than native-born whites. The declining proportion of western Europeans and increasing proportion of people from eastern Europe and the Middle East in the 1980–1990 and 1991–2000 cohorts also contributed to a smaller health advantage for immigrants in these arrival cohorts.

## 5. Discussion

Immigration and growing population diversity have become central to our understanding of U.S. racial and ethnic health disparities. Despite a large body of work on this topic, less is known about the health of white immigrants, a group that comprises a sizable portion of the foreign-born population and whose origins have become increasingly heterogeneous in recent decades. Our findings suggest that this is an important oversight that obscures distinct health patterns among whites. The oft-noted immigrant health advantage found among other racial and ethnic groups is less evident among whites, at least in terms of self-reported physical disability. For example, in contrast to previous studies on blacks which report better health among foreign-compared to native-born blacks, disability prevalence for foreign- and U.S.-born whites was nearly identical (Hamilton and Hummer, 2011; Read and Emerson, 2005).

Apart from establishing if there was a nativity gap in health among whites, we sought to examine more closely the role of arrival cohort and region of birth in shaping outcomes among foreign-born whites. The results indicate that white immigrants arriving in the 1981–1990 and 1991–2000 cohorts had a smaller health advantage over U.S.-born whites compared to those arriving in both the earlier (pre-1965, 1965–1980) and later (2001+) cohorts. The poorer health evident for immigrants arriving in the two middle cohorts could reflect decreased selectivity following the Refugee Act of 1980 and the 1990 Immigration Act, as well as the increased number of refugees from eastern Europe after the breakdown of the Former Soviet Union and from the Middle

East after the Gulf War. In calculations not shown, we find that over a third of eastern European immigrants in the 1991–2000 and 2001+ cohorts were from Russia and Ukraine, and nearly one-half of Middle Eastern immigrants in the most recent cohort were from Iran and Iraq. Important for functional health is that when a country experiences prolonged instability, it influences whether and what type of work is available, access to nutrition and medical care, and elevated exposure to toxins and environmental hazards (Levy and Sidel, 2013). These situations can increase the likelihood of physical injuries that would compromise mobility and functional health.

The inclusion of region of birth in the analyses provided substantial evidence that changes in the ethnic origins of white immigrants over time contributed to differences in health across arrival cohorts. After controlling for region of birth, the gap in physical disability between the middle (1991–2000) and earliest (pre-1965) cohort was no longer statistically significant, a change that reflected the relatively large proportion of healthy western Europeans in the pre-1965 cohort and larger representation of eastern European and Middle Eastern immigrants in the 1990–2000 cohort. Our comparisons of disability by region of birth confirmed this possibility: eastern European and Middle Eastern immigrants both had significantly higher odds of physical disability relative to western Europeans.

Stratified analyses that examined variation within these three regions further underscored the advantaged profile of immigrants from western Europe and highlighted distinctive patterns for immigrants arriving from eastern Europe and the Middle East during the 1980s and 1990s. Western Europeans in each of the arrival cohorts had much lower odds of physical disability compared to U.S.-born whites. In contrast, eastern European immigrants arriving in the 1980–1990 and 1991–2000 cohorts did not have any health advantage over native-born whites, and Middle Eastern immigrants in each arrival cohort had greater odds of disability compared to U.S.-born whites. Taken together, these results indicate important compositional differences among white immigrants arriving in the U.S. from different regions at different points in time that are consequential for health.

Although this study contributes to our understanding of the health of white immigrants, it is not without limitations. The use of U.S. census

data limits analyses of health outcomes to measures of disability; the present study focuses on physical disability because it is a reliable and valid predictor of functional limitation that is less susceptible to cultural or linguistic differences (Elo et al., 2011). While ancillary analysis using self-care and independent living disability as the dependent variables yielded comparable results, it would be informative to see if other outcomes commonly studied in immigration literature, such as self-rated health (Hamilton et al., 2015; Hamilton and Hummer, 2011) or body mass index (Antecol and Bedard, 2006; Frank and Akresh, 2013), operate similarly to physical disability. Additionally, this study relies on region of birth to examine health outcomes among white immigrants. Though these regions of birth are drawn from the Office of Management and Budget definitions, they do encapsulate large geographic areas that are comprised of several countries. Our goal in using these regions was to replicate studies on region of birth diversity among blacks as a first step in identifying heterogeneity among whites. Future work on white immigrants should examine health outcomes by country of birth as well as specific characteristics of these countries that may be driving selectivity.

## 6. Conclusion

Research on health inequality has increasingly highlighted the importance of disaggregating broad racial and ethnic groups by nativity, region of birth, and arrival cohort. However, few studies have applied this approach to the whites, despite some evidence of ethnic heterogeneity among this group. To the extent that whites are included in social stratification research, they are typically used as the reference category. This practice was borne in an era when western Europeans comprised the overwhelming majority of whites, and their status at the top of the racial and ethnic hierarchy justified the approach. Immigration, however, has changed the ethnic composition of whites

and resulted in increased representation from eastern Europe and the Middle East. Such diversity has corresponded to important compositional differences among white immigrants over time, shaped not only by the economic and political context in the sending regions but also by the context of reception under different U.S. policy regimes. Large immigration flows during times of political unrest, changes in immigration policy that reduced selectivity, and assimilation into a racial and ethnic hierarchy beneath western Europeans has resulted in more varied health outcomes among whites than in previous eras.

Economic sanctions against Iran, the travel ban from several Muslim majority countries, and allegations of Russian interference in U.S. elections are among the recent events shaping the context of migration and reception for immigrants from these regions. If U.S. foreign relations with several of the sending regions remain hostile, the health and well-being of immigrants and their offspring could suffer further. As the health of these groups continues to diversify, researchers should think critically about the appropriateness of using the aggregate white category for benchmarking U.S. racial and ethnic health inequalities. Our findings suggest that the standard practice of using whites as the reference group may mask health inequities not only among them, but also between whites and other racial and ethnic populations. Future research will need to continue to monitor the potential health consequences of growing heterogeneity among whites.

## Author contributions section

**Jen'nan Ghazal Read:** Conceptualization, Supervision, Writing-original draft preparation, Writing-Review & editing. **Jessica S. West:** Methodology, Software, Formal analysis, Writing-original draft preparation, Writing-Review & editing. **Christina Kamis:** Methodology, Software, Formal analysis, Writing-original draft preparation, Writing-Review & editing.

## Appendix

Appendix Table 1  
Predicted probability of physical disability by immigrant arrival cohort.

	Model 1	Model 2
	PP (95% CI)	PP (95% CI)
Arrival cohort		
Pre-1965	0.07 (0.07–0.08)	0.08 (0.08–0.09)
1965–1980	0.08 (0.07–0.08)	0.08 (0.07–0.08) <sup>a</sup>
1981–1990	0.08 (0.08–0.08) <sup>a</sup>	0.07 (0.07–0.08) <sup>a</sup>
1991–2000	0.09 (0.09–0.10) <sup>a</sup>	0.08 (0.08–0.08)
2001 +	0.07 (0.07–0.08)	0.07 (0.06–0.07) <sup>a</sup>

Note: PP = Predicted Probability. Predicted probabilities derived from Table 2, Models 1 and 2, holding all covariates at their mean values. All models also include sex, age, age squared, education, marital status, current region of residence, and survey year.

<sup>a</sup> Statistically significant difference compared to pre-1965 cohort at  $p < 0.05$ .

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