



Does the immigrant health advantage extend to incarcerated immigrants?

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1. Introduction

Prevailing research on immigrant health tends to focus on explaining immigrants', particularly Latino immigrants', superior health when compared to their U.S.-born counterparts. This immigrant health advantage extends to multiple outcomes such as mortality, chronic conditions, and mental health, and is often greatest for immigrant men and those racialized as Black or Latino (Argeseanu Cunningham et al., 2008; Engelman & Ye, 2019; Read & Reynolds, 2012; Singh & Miller, 2004). Scholars postulate that the immigrant health advantage is produced by overlapping, individual- or community-level mechanisms such as the self-selection of healthier persons into migration (Landale et al., 2006; Riosmena et al., 2013, 2017) and cultural factors such as social support embedded in migrant networks (Eschbach et al., 2004; Jasso et al., 2004; Riosmena et al., 2017). In contrast, many foreign-born groups, such as non-U.S. citizen immigrants, have limited health care access and exhibit worse physical and self-rated health relative to the U.S.-born (Argeseanu Cunningham et al., 2008; Boen & Hummer, 2019; Campbell et al., 2012; Goldman et al., 2005; Jasso et al., 2004). The immigrant health advantage also wanes over time, as immigrants' risk of ill-health increases the longer they reside in the U.S. (Abraído-Lanza et al., 2016; Argeseanu Cunningham et al., 2008). Exposure to forces such as discrimination (Viruell-Fuentes, 2007) and the criminal legal system may be associated with this deterioration in health.

Importantly, extant immigrant health studies rely on datasets that exclude institutionalized populations and thus do not account for incarcerated immigrants, including the 83,573 non-U.S. citizens and unreported number of foreign-born naturalized citizens in federal or state custody in 2016 (U.S. Department of Justice, 2019). The criminal legal system is a crucial site to assess immigrant well-being given established health disparities among incarcerated populations. Imprisoned persons experience higher rates of chronic conditions (Binswanger et al., 2009; Wilper et al., 2009), mental illnesses (Wilper et al., 2009), substance abuse disorders (Bronson et al., 2017), and infectious diseases (Hammett, 2006) compared to the non-incarcerated population.

Moreover, the racial/ethnic health disparities observed in the general population are not always observed in the prison population (Nowotny et al., 2017; Patterson, 2010; Wildeman & Wang, 2017), in part because the incarcerated population is not representative of the non-incarcerated population in terms of racial/ethnic composition, educational attainment, and other social characteristics that are linked to well-being (Pettit, 2012).

In a similar manner, the incarcerated immigrant population may have different health profiles than the non-incarcerated immigrant population. Incarcerated immigrants may be non-representative of the general immigrant population due to differences in racial/ethnic, socioeconomic status, and U.S. citizenship status compositions, as well as varying exposure to stressors related to criminalization and the legal system. Furthermore, the removal of social support networks upon incarceration (Poehlmann, 2005) may be another factor that differs between incarcerated and non-incarcerated immigrants. While strong social support is one proposed contributor to the overall immigrant health advantage (Eschbach et al., 2004), immigrants may avoid those who experience incarceration due to fear surrounding law enforcement systems and their association to deportation. This isolation from social support may potentially worsen the health of immigrants who experience incarceration.

Emerging research demonstrates that incarceration in immigrant detention facilities is associated with poor health (Saadi et al., 2022; Singer et al., 2022; Von Werthern et al., 2018). One recent study has extended this research from immigrant detention facilities to correctional facilities. Kuper and Turanovic (2021) found that although immigrants have better self-rated health overall, prior incarceration in correctional facilities erodes the self-rated health of foreign-born individuals as it does for U.S.-born individuals. Nevertheless, it is not clear if disparities in physical health exist by immigration status and race/ethnicity among incarcerated individuals. The current study builds upon existing research to evaluate chronic physical health conditions by immigration status among incarcerated men by nativity, with attention to race/ethnicity and citizenship, and compare results to the patterns

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observed in the general, non-incarcerated population. The present study is novel because (a) it assesses a population incarcerated in correctional facilities rather than immigrant detention facilities, where the vast majority of present work has been situated, and (b) it examines physical health outcomes rather than self-rated health, which is the outcome that the one study (Kuper & Turanovic, 2021) on immigration and incarceration status differences in health among those in correctional facilities has examined. We address two research questions: Is there evidence of an immigrant health advantage among incarcerated individuals? Are there nativity differences in health among incarcerated individuals by race/ethnicity or citizenship status? For the purposes of this study, “incarcerated immigrants” refer to foreign-born individuals held in correctional facilities, but not in Immigration and Customs Enforcement (ICE) detention centers.

2. Material and methods

2.1. Data

To examine the health of the non-incarcerated and incarcerated populations, respectively, we use data from the 2016 National Health Interview Survey (NHIS) (National Center for Health Statistics, 2017a) and 2016 Survey of Prison Inmates (SPI) (U.S. Department of Justice, 2020). The NHIS, collected by the Centers for Disease Control and Prevention’s (CDC) National Center for Health Statistics, is a publicly available survey that obtains comprehensive individual-level information regarding sociodemographic and socioeconomic characteristics, illness, disability, and chronic impairments. Although the NHIS has been conducted on a yearly basis since 1997, and most recently in 2023, we use the 2016 Sample Adult survey in order to maintain consistency with the most recent SPI dataset. Sampling was carried out using a multistage area probability design, which partitions the target population into several nested levels of strata and clusters that are representative of the civilian non-institutionalized population of the U.S (National Center for Health Statistics, 2017b). The NHIS Sample Adult survey consists of one randomly selected member aged 18 years or older from each household in the sampling frame. In 2016, 40,220 households were sampled with a household response rate of 67.9%. A total of 33,028 adults completed interviews, for a Sample Adult survey response rate of 54.3%. Interviews were conducted continuously throughout the year using computer-assisted personal interviewing (CAPI). We merged the Sample Adult data with the Person Level data to acquire education, nativity, and citizenship information.

The Survey of Prison Inmates (SPI) is a nationally representative survey of individuals held in state and federal prisons, most recently conducted by the Bureau of Justice Statistics (BJS) from January to October 2016. The SPI uses computer-assisted personal interviewing (CAPI) to gather information regarding incarcerated individuals’ current offense and sentence, criminal history, prior drug and alcohol use and treatment programs, and personal characteristics, including a battery of health outcomes. Participants were able to complete the interview in English or Spanish. The SPI utilized a two-stage sample design which included a random sample of prisons followed by a random sample of prisoners held in the selected prisons. All male and female prisoners aged 18 years or older who were currently held in a state prison or serving a sentence in a federal prison during 2016 were eligible for participation. Over 98 percent (364 of the 370) of eligible facilities participated in the survey, and 24,848 of the 35,509 eligible individuals participated. The response rate was 69.3% among the state prison population and 72.8% among the federal population (U.S. Department of Justice, 2020). The vast majority of respondents in the 2016 SPI were imprisoned in state, rather than federal, facilities (87.9%). Access to the restricted SPI data was approved by the IRB at the authors’ previous home institution, where the data analysis was conducted.

2.2. Measures

The first dependent variable is an overall indicator of *number of chronic conditions*, measuring if respondents reported any of the seven physical health outcomes contained in both surveys: diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke. In both the NHIS and SPI surveys, respondents were asked if a doctor or other health professional had ever diagnosed them with a specific condition; those who responded affirmatively were coded as 1 to indicate presence of the condition. We truncated the number of chronic conditions at four given that only 4.82% of respondents in the NHIS survey and 3.19% in the SPI survey reported four or more conditions.

We also assessed several binary measures of health. We created a dichotomous measure of having a *chronic condition*, with 1 indicating the presence of any of the seven physical health outcomes included in both surveys. In order to gauge if disparities exist for specific conditions, we evaluated three common health outcomes: *diabetes mellitus*, *hypertension*, and *heart condition*. *Heart condition* includes heart disease, congestive heart failure, or arrhythmia. Small sample sizes at the intersection of immigration status and race/ethnicity precluded our ability to assess all specific health conditions included in the chronic condition measure.

The independent variables are nativity, race/ethnicity, and citizenship. Each of these variables were measured using similar questions and language in the NHIS and SPI. We created the variable *foreign-born* based on whether a person was born in the U.S. (0) or in some other country (1) to measure nativity. We divided *race/ethnicity* into four mutually exclusive categories: Black, Latino, other race, and White (reference). Lastly, to evaluate the role of U.S. citizenship, we created a combined *nativity/citizenship* measure with three categories based on respondents’ statuses at the time of survey participation: U.S.-born citizen (reference), foreign-born U.S. citizen, and foreign-born non-U.S. citizen.

Covariates included age and educational attainment. *Age* is a categorical variable, measured at the time of survey participation, and includes 18–34 (reference), 35–49, and 50 years or older. *Education* measures respondents’ highest completed level of schooling: less than high school (reference), high school graduate, some college, and college degree or higher. For the incarcerated sample, respondents were specifically asked about their educational attainment prior to imprisonment.

2.3. Analytic strategy

The present study consisted of two sets of analyses for the (1) NHIS sample and the (2) SPI sample. For each of the samples, we first conducted adjusted Wald tests to compare mean rates of number of chronic conditions and specific conditions for U.S.- versus foreign-born men. Then, we estimated zero-inflated Poisson regressions to obtain the incidence rate ratios of having a higher number of chronic conditions. The choice of a zero-inflated Poisson model reflects the overdispersion and excessive number of zeros (41.74% in NHIS; 49.48% in SPI) in the outcome variable (number of chronic conditions). These excess zeros may ensue from separate processes compared to the other count values (1–4+); for example, a respondent may report zero conditions because they regularly visit the doctor and do not have any clinical signs warranting a diagnosis or because they do not have access to or utilize health services in order to receive a diagnosis. Results from a likelihood ratio test of the equivalence of alpha to zero ($p > 0.05$) indicated that a zero-inflated Poisson is a more appropriate model than a zero-inflated negative binomial. We employed robust standard errors for the zero-inflated Poisson model, as suggested by Cameron and Trivedi (2009). For diabetes, hypertension, and heart conditions, we estimated logistic regressions to obtain odds of reporting each of the three health outcomes by nativity, while controlling for age, education, and race/ethnicity.

To address our second research question, we next estimated regressions for each of the samples (a) stratified by race/ethnicity in order to compare nativity differences in each health outcome within each

racial/ethnic group; and (b) using the three-category nativity/citizenship measure to assess differences by U.S. citizenship status. To display these results, we generated and graphed predicted probabilities for each health outcome, using a dichotomous measure of presence of a chronic condition in order to simplify the presentation of predicted probabilities. Results from the regressions and adjusted Wald tests for the comparison of predicted probabilities were substantively similar, with one exception: Foreign-born Latino individuals in the non-incarcerated population were statistically significantly advantaged in terms of having a heart condition when modeling results as predicted probabilities but not when viewing the regression model coefficients.

We utilized listwise deletion to exclude respondents missing any of the variables included in the models given that the vast majority of individuals had complete information (96.2% in NHIS and 96.9% in SPI). We restricted the sample to men, for several reasons. First, most incarcerated individuals are men. The weighted percentage of women in the SPI is 7%, which reflects national estimates of the prisoner population (Federal Bureau of Prisons, 2022). Second, and relatedly, the criminalization of immigrants and racial/ethnic minorities is gendered, with assumptions of criminality disproportionately targeting Black and Latino men (Douglas et al., 2013; Hinton & Cook, 2021). Third, the social characteristics of incarcerated men and women, and their experiences and needs within prisons, are qualitatively different (Moloney et al., 2009). While an examination of incarcerated immigrant women's health is an important future endeavor, the present study thus narrowed in on the health of incarcerated men.

Of the 33,028 individuals who completed the NHIS, 18,037 were excluded because they were women and 572 men were excluded for missing one or more of the variables of interest. The variable in NHIS with the highest level of missingness was diabetes status (2.8%). In the SPI, of the 24,848 individuals who completed the interview, 6307 were women and 578 were missing data. The variable with the highest level of missingness in the SPI was race/ethnicity (1.4%). Final analytic samples were 14,419 for the NHIS survey and 17,963 for the SPI survey.

All analyses were conducted in Stata-14 and weighted using the *pweight* command for the zero-inflated Poisson models and the *svy* command for all other models to accommodate for survey design, ratio, nonresponse, and post-stratification adjustment. We weighted the NHIS data using the Sample Adult weight, which produces national estimates of the civilian, noninstitutionalized adult population (National Center for Health Statistics, 2017b). The SPI data used weights that BJS statisticians calculated separately for state and federal prison populations in order to produce national estimates of the adult prisoner population (U. S. Department of Justice, 2020).

3. Results

3.1. Main results

Table 1 presents weighted descriptive statistics for the two samples. As this table demonstrates, incarceration is not uniformly distributed across the population, with individuals under the age of 50, those with less than a high school degree, and racial/ethnic minorities over-represented among imprisoned men. Among both the non-incarcerated and incarcerated samples, foreign-born men reported significantly fewer chronic conditions¹ compared to U.S.-born men. Foreign-born men also less frequently reported hypertension ($p < 0.001$) or a heart condition ($p < 0.001$) than U.S.-born men. However, the percentage of individuals reporting diabetes did not differ by nativity.

Table 2 presents a summary of the present study's main multivariate regression analyses. Full models can be found in the Appendix. In the non-incarcerated sample, foreign-born men experienced significantly

¹ Includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke.

Table 1
Weighted Descriptive Statistics for 2016 National Health Interview Survey and 2016 Survey of Prison Inmates.

	Non-incarcerated Men		Incarcerated Men	
	U.S.-born	Foreign-born	U.S.-born	Foreign-born
Age (%)				
18–34	32.14	29.51	41.80	34.73***
35–49	23.30	34.76***	36.90	43.41***
50+	44.56	35.73***	21.31	21.86
Education (%)				
Less than high school	9.89	24.59***	62.11	65.82**
High school	26.07	23.00*	23.00	19.12***
Some college	32.69	20.42***	11.24	8.99**
College degree or more	31.35	31.99	3.64	6.08***
Race/ethnicity (%)				
Black	11.69	9.74	37.87	6.91***
Latino	8.98	48.14***	16.57	78.89***
Other race	3.06	23.28***	13.49	7.72***
White	76.27	18.83***	32.07	6.47***
US citizen (%)	100.00	52.89***	100.00	31.97***
Health Outcomes				
Number of Chronic Conditions ^a (%)				
0	44.64	62.56***	50.46	63.30***
1	27.34	22.14***	28.36	22.37***
2	14.62	9.31***	12.68	7.84***
3	8.38	3.91***	5.28	4.67
4+	5.02	2.09***	3.21	1.82***
Diabetes (%)	10.02	9.29	7.71	8.54
Hypertension (%)	32.98	24.78***	29.72	22.85***
Heart condition (%)	13.08	6.57***	7.19	5.47**
Sample size	12,455	1964	15,877	2086

*Indicates significant difference from U.S.-born, same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

^a Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

lower risk of having a higher number of chronic conditions ($p < 0.001$) as well as lower odds of hypertension ($p < 0.001$) and heart conditions ($p < 0.01$) compared to U.S.-born men. Odds of diabetes again did not differ by nativity among the non-incarcerated sample.

Now that baseline immigrant health advantages within the non-institutionalized population are established, we next address the first research question: Is there evidence of an immigrant health advantage among incarcerated individuals? As Table 2 shows, foreign-born respondents had significantly lower risk of having a higher number of chronic conditions ($p < 0.001$) and lower odds of hypertension ($p < 0.001$) compared to U.S.-born respondents. In contrast, incarcerated respondents did not differ in their odds of diabetes or heart conditions by nativity.

Next, we consider the second research question: Are there nativity differences in health among incarcerated individuals by race/ethnicity or citizenship status? As Table 2 and Figs. 1–4 show, health patterns by incarceration status and nativity became more nuanced when stratified by race/ethnicity. Although non-incarcerated foreign-born White men had a significantly lower predicted probability of having a chronic condition (40.8%) relative to their U.S.-born counterparts (56.3%; $p < 0.001$), this trend did not apply to incarcerated White men (Fig. 1). For all other racial/ethnic groups, foreign-born respondents had significantly lower predicted probabilities of having a chronic condition compared to their U.S.-born counterparts, in both the non-incarcerated and incarcerated samples.

There were no significant nativity differences in diabetes for any incarceration status or racial/ethnic group (Fig. 2). In terms of hypertension (Fig. 3), incarcerated foreign-born Latino men had a significantly lower predicted probability (18.1%) relative to their incarcerated U.S.-born counterparts (24.3%; $p < 0.001$), which parallels results in the

Table 2
Summary of Results: Nativity Differences in Health by Incarceration Status, Race/Ethnicity, and U.S. Citizenship.

	Foreign-born (ref = U.S.-born)							
	Non-incarcerated men (n = 14,419)				Incarcerated men (n = 17,963)			
Number of chronic conditions ^a	0.67***				0.73***			
Diabetes	0.86				0.88			
Hypertension	0.64***				0.73***			
Heart condition	0.62**				0.79			
	Foreign-born (ref = U.S.-born), by race/ethnicity							
	Non-incarcerated men (n = 14,419)				Incarcerated men (n = 17,963)			
	Black	Latino	Other race	White	Black	Latino	Other race	White
Number of chronic conditions ^a	0.45***	0.71***	0.63***	0.76***	0.74*	0.70***	0.51***	1.16
Diabetes	0.71	0.89	0.63	0.89	0.64	0.80	1.03	1.93
Hypertension	0.41*	0.61**	0.80	0.79	1.03	0.68***	0.50**	1.17
Heart condition	0.25*	0.58	0.31**	0.94	0.80	0.72	0.28*	1.47
	Citizenship status (ref = U.S.-born citizen)							
	Non-incarcerated men (n = 14,419)				Incarcerated men (n = 17,963)			
	Foreign-born U.S. citizen		Non-U.S. citizen		Foreign-born citizen		Non-U.S. citizen	
Number of chronic conditions ^a	0.75***		0.53***		0.92		0.63***	
Diabetes	1.04		0.52**		1.09		0.78	
Hypertension	0.73**		0.52***		0.92		0.64***	
Heart condition	0.67*		0.50**		0.93		0.71*	

Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education. *p < 0.05; **p < 0.01; ***p < 0.001.

^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0-4+).

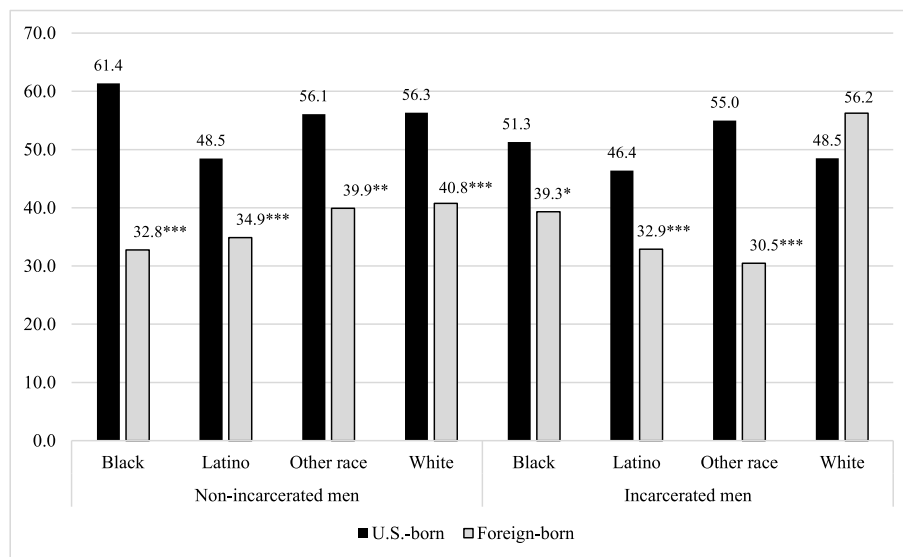


Fig. 1. Predicted Probabilities of Having a Chronic Condition^a by Incarceration Status, Nativity, and Race/Ethnicity
Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education.

^a 1 = presence of any of the following conditions: diabetes mellitus, hypertension, heart condition, arthritis, asthma, cancer, and stroke.

*Indicates significant difference from U.S.-born, same race/ethnicity, and same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

non-incarcerated population. Incarcerated foreign-born other race men also exhibited a significantly lower predicted probability of hypertension (17.1%) than their U.S.-born counterparts (29.7%; $p < 0.01$), but this immigrant health advantage was not observed in the non-incarcerated population. Similarly, while non-incarcerated foreign-born Black men experienced significantly lower likelihood of hypertension (20.2%) relative to non-incarcerated U.S.-born Black men (37.7%; $p < 0.01$), there were no nativity differences in hypertension among incarcerated Black men. The incarcerated foreign-born White sample again did not exhibit a health advantage, although this finding

aligns with patterns of hypertension in the non-incarcerated sample.

In terms of having a heart condition, foreign-born other race respondents demonstrated a significantly lower predicted probability relative to U.S.-born other race respondents in both the non-incarcerated ($p < 0.05$) and incarcerated ($p < 0.001$) sample (Fig. 4). In contrast, foreign-born Black ($p < 0.001$) and Latino ($p < 0.05$) men demonstrated statistically significantly lower predicted probabilities of having a heart condition in the non-incarcerated population, but this advantage did not extend to the incarcerated population. There were no nativity differences in having a heart condition among incarcerated or non-

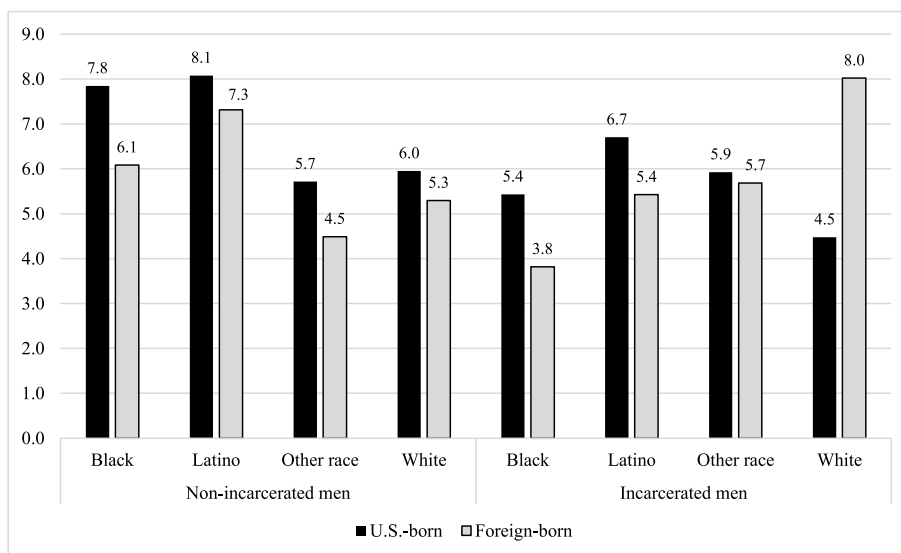


Fig. 2. Predicted Probabilities of Diabetes by Incarceration Status, Nativity, and Race/Ethnicity

Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education.

*Indicates significant difference from U.S.-born, same race/ethnicity, and same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

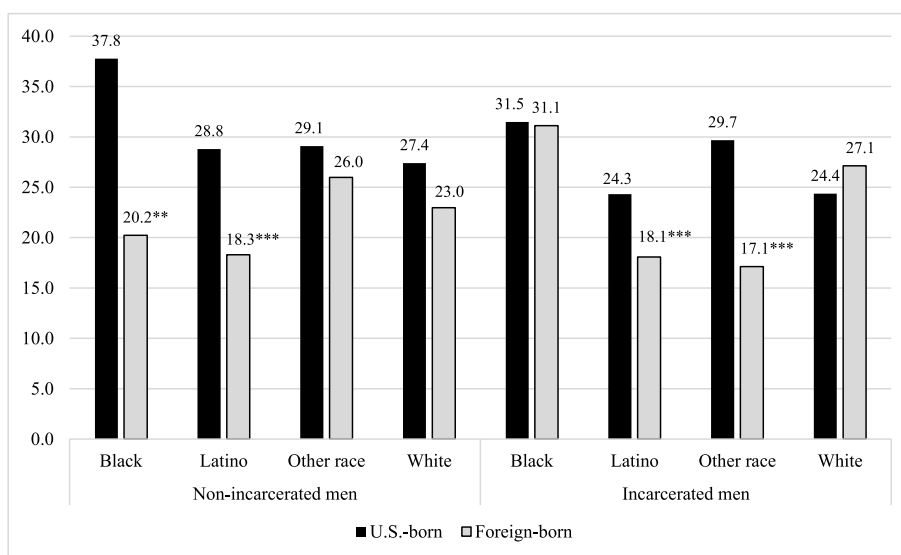


Fig. 3. Predicted Probabilities of Hypertension by Incarceration Status, Nativity, and Race/Ethnicity

Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education.

*Indicates significant difference from U.S.-born, same race/ethnicity, and same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

incarcerated White men.

Finally, Table 2 and Fig. 5 present results for the intersecting effects of incarceration, nativity, and U.S. citizenship statuses on health, while controlling for age, education, and race/ethnicity. Among the non-incarcerated sample, foreign-born U.S. citizens (41.7%, $p < 0.001$) and non-U.S. citizens (35.1% $p < 0.001$) had significantly lower predicted probabilities of having a chronic condition relative to U.S.-born individuals (55.8%). In contrast, among the incarcerated sample, only non-U.S. citizens (32.0%) experienced a significantly lower likelihood of having a chronic condition compared to U.S.-born citizens (49.8%, $p < 0.001$). Incarcerated foreign-born U.S. citizens had a probability similar to that of their U.S.-born counterparts (46.5%).

In terms of diabetes, foreign-born U.S. citizens also exhibited predicted probabilities comparable to U.S.-born individuals, in both the

non-incarcerated and incarcerated samples. Non-U.S. citizens (3.5%) were significantly advantaged in terms of diabetes compared to U.S.-born citizens within the non-incarcerated sample (6.5%, $p < 0.001$), but not in the incarcerated sample. Similar to the findings for number of chronic conditions, non-incarcerated foreign-born men were significantly advantaged in hypertension relative to U.S.-born citizen men, regardless of their citizenship status. For incarcerated respondents, this health advantage only extended to non-U.S. citizen men. Both non-incarcerated foreign-born U.S. citizens (6.2%, $p < 0.01$) and non-U.S. citizens (4.7%, $p < 0.001$) were significantly less likely to have a heart condition relative to non-incarcerated U.S.-born citizens (9.0%), but only incarcerated non-U.S. citizens (4.0%) were advantaged in their likelihood of having a heart condition compared to their incarcerated U.S.-born counterparts (5.6%, $p < 0.05$).

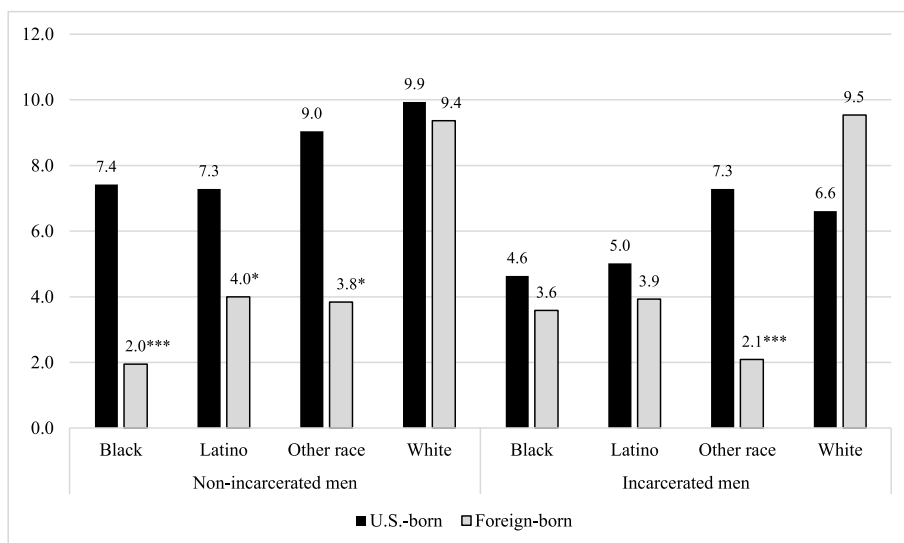


Fig. 4. Predicted Probabilities of a Heart Condition by Incarceration Status, Nativity, and Race/Ethnicity
 Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education.
 *Indicates significant difference from U.S.-born, same race/ethnicity, and same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

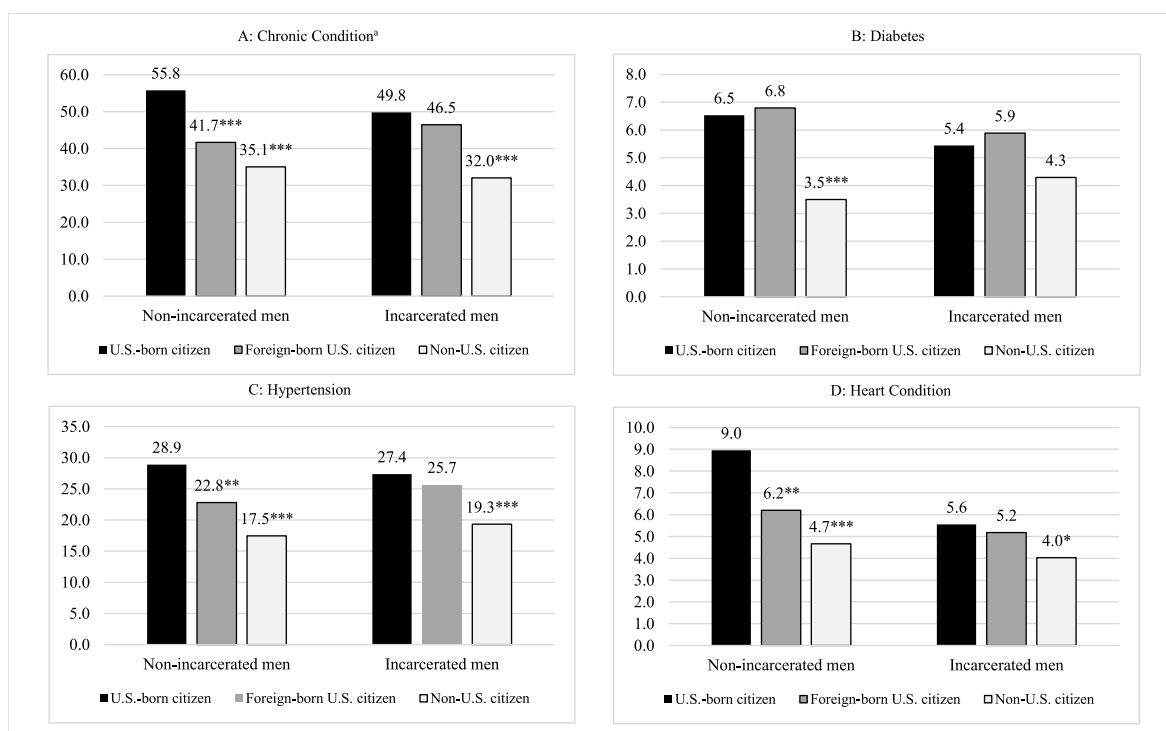


Fig. 5. Predicted Probabilities of Having a Chronic Condition, Diabetes, Hypertension, and a Heart Condition by Incarceration Status, Nativity, and U.S. Citizenship
 Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted and control for age and education.
^a 1 = presence of any of the following conditions: diabetes mellitus, hypertension, heart condition, arthritis, asthma, cancer, and stroke.
 *Indicates significant difference from U.S.-born citizen, same incarceration status sample at the 0.05 level, **0.01 level, and ***0.001 level.

3.2. Sensitivity analyses

We conducted several additional tests to check the sensitivity and robustness of our results, each of which are available upon request. First, we estimated the main analysis models presented in Table 2 with multiple imputation using chained equations for all male respondents (n = 14,991 for NHIS sample; n = 18,541 for SPI sample). These models

revealed substantively similar results to the listwise deletion models with one exception: The risk of having a heart condition for incarcerated non-U.S. citizen men relative to incarcerated U.S.-born citizen men became non-significant at the 0.05 level (p = 0.067).

Second, we estimated all zero-inflated Poisson models with number of chronic conditions as a count variable ranging from 0 to 7, instead of truncating the measure at 4+. Doing so did not substantively alter any of

the findings of interest.

Next, we considered if prison facility type accounted for some of the variation in nativity differences in health. Whether an individual is tried by state or federal officials can result in divergent consequences, including variation in living conditions and much longer sentences at the federal level (Butcher & Piehl, 2000). Among individuals in state and federal prisons, results were similar for number of chronic conditions, diabetes, and heart conditions. That is, regardless of prison facility type, incarcerated foreign-born individuals had significantly lower risk of having a higher number of chronic conditions than their U.S.-born counterparts, but odds of diabetes and heart conditions did not differ by nativity. However, foreign-born respondents in federal prisons had lower odds of hypertension than U.S.-born respondents in federal prisons, but differences in hypertension by nativity were not pronounced in state prisons. These results demonstrate that the health of incarcerated men varies somewhat by prison facility type.

Differences in the health of individuals by type of offense may partially account for the variation in immigrant health between state and federal facilities. Men who are convicted of an immigration-related act, for example, fall under federal jurisdiction and may be healthier than those convicted of violent offenses, who are more likely to be in state prisons (U.S. Government Accountability Office, 2018). To explore this possibility, we estimated additional models that control for primary offense type (i.e., violent, property, drug, public order, and unknown crime). These analyses provide some support for this explanation and indicate that imprisoned men convicted of a violent offense were both significantly more likely to be imprisoned by the state and had higher odds of hypertension relative to men in federal prisons and those convicted of non-violent offenses. We were unable to account for offenses specifically related to immigration due to suppression of the relevant variables in the released SPI data. Overall results remained unchanged when controlling for offense type, though, with incarcerated foreign-born men exhibiting a significant advantage in terms of number of chronic conditions and hypertension, but not diabetes or heart conditions.

Lastly, differences in average length of residence in the U.S. may be influencing findings on the relationship between incarceration, nativity, and citizenship statuses and health given that (1) naturalized U.S. citizens tend to have lived in the U.S. longer than non-U.S. citizens given citizenship residency requirements (Witsman, 2017) and (2) longer length of residency is associated with convergence to the health of U.S.-born individuals (Argeseanu Cunningham et al., 2008). As such, additional analyses suggest that some of the observed disadvantages in health for incarcerated foreign-born U.S. citizens relative to incarcerated non-U.S. citizens are a product of their lengthier time spent in the U.S. Among incarcerated immigrant men, longer duration of residence was associated with significantly elevated risk of having a higher number of chronic conditions and greater odds of having hypertension or a heart condition. Upon controlling for duration of residence, there was no difference in the odds of reporting hypertension or a heart condition between incarcerated foreign-born U.S. citizens and non-U.S. citizens. However, duration of residence did not explain incarcerated foreign-born U.S. citizen men's increased risk of reporting a higher number of chronic conditions relative to incarcerated non-U.S. citizen men.

4. Discussion

Using data from the 2016 National Health Interview Survey and 2016 Survey of Prison Inmates, the current study addressed two critical and unresolved questions: Is there evidence of an immigrant health advantage among incarcerated individuals? Are there nativity differences in health among incarcerated individuals by race/ethnicity or citizenship status? Extant literature has established that incarceration in immigrant detention (Saadi et al., 2022; Singer et al., 2022; Von Werthern et al., 2018) and correctional facilities (Kuper & Turanovic, 2021)

are associated with mental health, infectious disease, and/or self-rated health. We extended upon this emerging body of work to show that there are differing patterns in physical health among incarcerated and non-incarcerated populations by nativity, race/ethnicity, and citizenship status.

Results indicated that foreign-born men had an advantage in terms of number of chronic conditions and hypertension, irrespective of incarceration status. In other words, similar patterns in these health outcomes observed among the non-incarcerated population also existed in the incarcerated population, when race/ethnicity and citizenship were not considered. Findings for number of chronic conditions and hypertension align with much of the existing literature on the immigrant health advantage (Argeseanu Cunningham et al., 2008; Jasso et al., 2004; Riosmena et al., 2017). It is likely that self-selection of healthier individuals into migration contributes to the observed trends (Riosmena et al., 2013, 2017). The finding that nativity did not predict odds of diabetes also supports prior research indicating that many foreign-born groups experience similar or even higher rates of diabetes relative to the U.S.-born population (Argeseanu Cunningham et al., 2008). This pattern may be linked to the higher obesity rates and faster rates of "unhealthy" weight gain—significant predictors of diabetes (Narayan et al., 2007)—among more recent immigrant cohorts compared to those who arrived in previous decades (Giuntella & Stella, 2017).

Nevertheless, despite previous evidence of a foreign-born advantage in heart disease (Jasso et al., 2004), the immigrant health advantage among imprisoned men did not extend to heart conditions. Immigrants who experience incarceration may be less healthy, and face greater barriers to health care (Balcazar et al., 2015), than those who do not experience incarceration. Imprisonment—a highly stressful experience (Porter, 2019)—may exacerbate these vulnerabilities, as psychological distress, perceived discrimination, and worry about deportation predict cardiovascular risk among immigrants (Martos-Méndez et al., 2020; Torres et al., 2018). Furthermore, incarceration removes social support (Poehlmann, 2005), one proposed contributor to the overall immigrant health advantage (Eschbach et al., 2004). This isolation from social support may act as another mechanism worsening the health of incarcerated immigrants.

Consideration of two other influential factors—race/ethnicity and citizenship—also complicated findings. Incarcerated Latino and other race immigrant men exhibited better health compared to their U.S.-born counterparts, which parallels patterns in the non-incarcerated population. Yet the immigrant health advantage was weakened for incarcerated foreign-born Black men and did not extend to incarcerated foreign-born White men. These findings provide limited support that incarcerated individuals may experience diminished health disparities by race/ethnicity because of racialized inequalities in imprisonment and health care prior to incarceration. Mass incarceration affects a wider, generally healthier population of Black and Latino persons compared to White persons (Dumont et al., 2013), meaning that imprisoned foreign-born White individuals may be less representative of the broader White immigrant population. Moreover, health care access and/or quality for the general Black and Latino population may be so inadequate that the receipt of health care services upon imprisonment reduces some racial/ethnic health disparities (Patterson, 2010). When viewed this way, partial findings of an immigrant health advantage should not be interpreted as evidence that incarceration is not detrimental to health, but rather as an indictment of the racial/ethnic disparities in health care access and imprisonment (Dumont et al., 2013; Patterson, 2010).

Importantly, though, this finding of reduced racial/ethnic health inequalities among imprisoned individuals does not explain the nativity patterns in specific health outcomes for Black immigrant men. Incarcerated Black immigrants' lack of health advantage in terms of diabetes, hypertension, and heart conditions may reflect a carceral system that disproportionately targets Black men and immigrants. Because Black (Kovera, 2019; Kutateladze et al., 2014) and non-U.S. citizen (Light, 2014) populations experience unduly severe charges and longer

sentences, the criminal legal system may create an environment that is particularly corrosive to specific aspects of health for individuals at the intersection of these identities. Future research should explore the potential contributions of health selection into imprisonment, as well as the health-eroding consequences of incarceration, on individuals by nativity and race/ethnicity.

Citizenship also accounted for some of the variation in health by nativity among incarcerated individuals, with results indicating that the immigrant health advantage did not extend to incarcerated immigrant men who obtained citizenship. This particular finding counters existing literature on citizenship and health. Since citizenship grants social, civil, and economic advantages to immigrants (Castañeda et al., 2015), it shapes immigrants' ability to access health insurance (Goldman et al., 2005) and subsequent health (Campbell et al., 2012). However, the health of immigrants declines over time as their length of residency in the U.S. increases, and eventually converges with that of the U.S.-born population (Argeseanu Cunningham et al., 2008). The present study demonstrates that duration of residence explained some, but not all, of the observed disadvantages in health for incarcerated immigrant U.S. citizens relative to incarcerated immigrant non-U.S. citizens. Additional research is needed to disentangle the mechanisms generating the health disadvantages of incarcerated immigrants who have obtained citizenship.

4.1. Limitations

The current study has some limitations. First, due to data constraints, we were only able to examine the health of individuals at a single point in time. It is therefore unknown to what extent health selection plays in the observed patterns. Despite this limitation, empirical evidence suggests that the criminal legal system is a structural force that erodes incarcerated individuals' health over time (Patterson, 2013; Schnittker & John, 2007) and not simply an institution that individuals select into based on their health status (Bačák & Wildeman, 2015).

Second, we restricted analyses to number of chronic physical health conditions and three specific conditions based on available measures and sample size limitations. It is possible that incarcerated immigrants experience significant disadvantages in health for unexamined outcomes, such as self-rated health, infectious diseases, or depression.

Third, the physical health outcomes we assessed were all self-reported based on a physician diagnosis. Given that immigrants (Balcasar et al., 2015; Goldman et al., 2005) and imprisoned individuals (Wilper et al., 2009) often face substantial barriers to health care, relying on self-reported physician diagnoses may result in an underestimation of the prevalence of chronic health conditions among incarcerated immigrants.

Fourth, the relationship between incarceration and health may vary according to sending country and national heritage. We were unable to explore this possibility given that the SPI does not ask all foreign-born individuals where they were born. The SPI does include a question regarding country of citizenship for respondents who report not being born in the U.S., but this variable is currently suppressed in the dataset.

Lastly, due to data limitations, we were not able to account for immigrants held in local jails or ICE facilities. In 2016, local jurisdictions detained 83,700 individuals in jails (Carson, 2018) and ICE detained 352,882 individuals in civil detention facilities (Office of Immigration Statistics, 2016). This represents an even larger population of immigrants caught up in the legal system than those incarcerated at the state and federal level. It is unknown if the present findings of a diminished immigrant health advantage among incarcerated men extends to these other confined populations. Future research should examine the physical health of immigrants jailed in local and ICE facilities.

4.2. Conclusions

This study is the first to investigate the physical health of immigrants incarcerated in state and federal correctional facilities. Results demonstrate that the immigrant health advantage extends to some incarcerated immigrants, but it is weaker or nonexistent for Black and White immigrants and foreign-born U.S. citizens. The present study highlights the importance of including institutionalized populations in health research. When researchers examine the immigrant health advantage using survey data from standard, nationally representative samples of the non-institutionalized population alone, studies portray patterns in health that do not exist for many immigrants experiencing incarceration. In the context of a society plagued by systems of mass incarceration and the racialized criminalization of immigrants, the exclusion of this population in previous immigrant health research hinders the illumination of health disparities. Ultimately, our findings highlight that the health profiles of incarcerated immigrants differ from immigrants who are not incarcerated; thus, addressing existing inequities requires tailored policies and interventions.

Future research should continue to uncover the health needs of understudied populations such as incarcerated immigrants, and explore additional health outcomes and nuances by factors such as gender and national heritage. It is not clear, for instance, if observed patterns by immigration status and race/ethnicity extend to women experiencing incarceration. Research should also examine the mechanisms underlying these patterns in health for the designing of targeted interventions to remedy disparities. For example, providing greater opportunities for social connection between incarcerated individuals and members of their family and communities may be one way to promote the well-being of incarcerated immigrant and non-immigrant populations alike. Still, improving population health along social lines such as incarceration and immigration status necessitates broader changes to the immigration, legal, and social systems in the U.S. These macro-level changes include reducing the criminalization of population groups according to their racial/ethnic identities and immigration statuses and prioritizing the funding of policies and programs to improve social conditions for marginalized populations.

Ethical statement

There are no conflicts of interest or financial declarations to disclose.

Declarations of interest

None.

CRediT authorship contribution statement

Rachel A. Zajdel: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Evelyn J. Patterson:** Conceptualization, Methodology, Resources, Writing – review & editing.

Data availability

The authors do not have permission to share data.

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Appendix

Table A1

Nativity Differences in Number of Chronic Conditions, Diabetes, Hypertension, and Heart Conditions among Non-Incarcerated and Incarcerated Men

		A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
		Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Model 1: Non-Incarcerated (n = 14,419)	Foreign-born Race/ethnicity (ref = White)	0.67***	[0.61–0.74]	0.86	[0.66–1.10]	0.64***	[0.53–0.78]	0.62**	[0.46–0.82]
	Black	1.06	[0.98–1.14]	1.32*	[1.04–1.69]	1.51***	[1.26–1.81]	0.67**	[0.52–0.86]
	Other race	0.99	[0.88–1.11]	0.90	[0.64–1.28]	1.29*	[1.01–1.64]	0.71	[0.49–1.05]
	Latino	0.88*	[0.80–0.98]	1.43**	[1.09–1.86]	0.98	[0.79–1.20]	0.65**	[0.47–0.89]
	Age (ref = 18–34)								
	35–49	1.85***	[1.67–2.04]	3.55***	[2.34–5.38]	3.24***	[2.70–3.90]	1.85***	[1.34–2.57]
	50+	4.45***	[4.10–4.83]	15.16***	[10.41–22.08]	11.00***	[9.33–12.97]	8.81***	[6.76–11.48]
	Education (ref=<HS)								
	High school	0.86***	[0.80–0.92]	0.76*	[0.61–0.96]	0.72***	[0.61–0.86]	0.74**	[0.60–0.91]
	Some college	0.85***	[0.79–0.91]	0.68**	[0.55–0.85]	0.74**	[0.62–0.89]	0.70**	[0.57–0.87]
College degree or higher	0.75***	[0.70–0.80]	0.49***	[0.39–0.62]	0.62***	[0.53–0.74]	0.54***	[0.44–0.67]	
Model 2: Incarcerated (n = 17,963)	Foreign-born Race/ethnicity (ref = White)	0.73***	[0.67–0.80]	0.88	[0.69–1.13]	0.73***	[0.62–0.85]	0.79	[0.61–1.04]
	Black	0.97	[0.93–1.02]	1.19*	[1.01–1.42]	1.42***	[1.29–1.57]	0.67***	[0.57–0.80]
	Other race	1.15***	[1.09–1.22]	1.32*	[1.07–1.63]	1.27***	[1.12–1.45]	1.06	[0.86–1.29]
	Latino	0.93*	[0.87–0.99]	1.45**	[1.15–1.81]	0.97	[0.85–1.10]	0.73**	[0.59–0.90]
	Age (ref = 18–34 years)								
	35–49 years	1.75***	[1.66–1.85]	4.25***	[3.28–5.49]	2.59***	[2.35–2.85]	1.65***	[1.35–2.01]
	50+ years	3.46***	[3.28–3.66]	12.59***	[9.79–16.19]	7.11***	[6.40–7.90]	6.13***	[5.08–7.40]
	Education (ref=<HS)								
	High school	0.98	[0.93–1.02]	0.89	[0.76–1.05]	1.01	[0.92–1.11]	1.04	[0.88–1.24]
	Some college	1.06	[1.00–1.12]	1.07	[0.88–1.29]	1.10	[0.98–1.25]	1.42***	[1.17–1.72]
College degree or higher	1.10*	[1.01–1.20]	1.26	[0.96–1.64]	1.10	[0.91–1.33]	1.32*	[1.01–1.74]	

Notes: Authors' calculations using data from the 2016 National Health Interview Survey (non-incarcerated sample) and 2016 Survey of Prison Inmates (incarcerated sample). Models are weighted. *p < 0.05; **p < 0.01; ***p < 0.001.

^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

Table A2

Nativity Differences in Number of Chronic Conditions, Diabetes, Hypertension, and Heart Conditions among 2016 National Health Interview Survey Sample, Models Stratified by Race/Ethnicity

		A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
		Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Model 1: White (n = 10,526)	Foreign-born	0.76***	[0.65–0.88]	0.89	[0.59–1.35]	0.79	[0.59–1.06]	0.94	[0.65–1.36]
	Age (ref = 18–34)								
	35–49	1.78***	[1.58–2.00]	2.37**	[1.42–3.95]	3.42***	[2.75–4.27]	1.66**	[1.15–2.40]
	50+	4.27***	[3.87–4.70]	10.63***	[7.08–17.16]	11.44***	[9.42–13.88]	8.03***	[5.99–10.76]
	Education (ref=<HS)								
	High school	0.86***	[0.79–0.93]	0.78	[0.59–1.03]	0.73**	[0.59–0.90]	0.68**	[0.54–0.86]
	Some college	0.81***	[0.75–0.87]	0.64**	[0.49–0.84]	0.65***	[0.52–0.80]	0.62***	[0.49–0.78]
College degree or higher	0.72***	[0.66–0.77]	0.45***	[0.34–0.59]	0.54***	[0.44–0.67]	0.49***	[0.49–0.62]	
Model 2: Black (n = 1317)	Foreign-born	0.45***	[0.33–0.61]	0.71	[0.35–1.44]	0.41*	[0.21–0.81]	0.25*	[0.07–0.84]
	Age (ref = 18–34)								
	35–49	2.13***	[1.63–2.79]	8.48***	[2.93–24.53]	3.56***	[2.14–5.92]	2.63	[0.94–7.37]
	50+	4.24***	[3.44–5.23]	23.69***	[8.95–62.72]	9.29***	[5.77–14.94]	10.68***	[4.44–25.66]
	Education (ref=<HS)								
	High school	0.78**	[0.66–0.93]	0.65	[0.37–1.15]	0.53**	[0.34–0.83]	1.03	[0.56–1.88]
	Some college	0.86	[0.73–1.02]	0.72	[0.41–1.26]	0.77	[0.49–1.22]	0.77	[0.42–1.41]
College degree or higher	0.88	[0.72–1.08]	0.97	[0.48–1.96]	0.77	[0.47–1.28]	0.65	[0.29–1.47]	

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Table A2 (continued)

		A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
		Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Model 3: Other race (n = 965)	Foreign-born	0.63***	[0.51–0.77]	0.63	[0.34–1.17]	0.80	[0.52–1.25]	0.31**	[0.15–0.65]
	Age (ref = 18–34)								
	35–49	1.35	[0.91–2.00]	10.12**	[2.54–40.31]	3.03**	[1.55–5.93]	3.18	[0.71–14.18]
	50+	4.59***	[3.30–6.39]	81.76***	[23.41–285.6]	16.45***	[8.83–30.64]	22.16***	[6.63–74.02]
	Education (ref=<HS)								
	High school	0.97	[0.68–1.36]	1.00	[0.41–2.43]	1.07	[0.50–2.25]	0.87	[0.30–2.52]
	Some college	0.82	[0.58–1.16]	0.86	[0.32–2.29]	0.86	[0.42–1.76]	0.45*	[0.15–1.36]
College degree or higher	0.91	[0.67–1.24]	1.17	[0.49–2.81]	0.91	[0.47–1.74]	0.88	[0.32–2.38]	
Model 4: Latino (n = 1611)	Foreign-born	0.71***	[0.60–0.86]	0.89	[0.56–1.41]	0.61**	[0.43–0.86]	0.58	[0.31–1.11]
	Age (ref = 18–34)								
	35–49	2.11***	[1.56–2.86]	5.09**	[1.82–14.26]	2.83***	[1.75–4.59]	2.41	[0.82–7.14]
	50+	5.52***	[4.27–7.12]	23.25***	[8.95–60.39]	10.46***	[6.55–16.70]	11.08***	[4.28–28.66]
	Education (ref=<HS)								
	High school	0.84	[0.69–1.03]	0.76	[0.42–1.36]	0.64*	[0.42–0.96]	0.56	[0.28–1.09]
	Some college	1.14	[0.90–1.45]	0.83	[0.48–1.45]	1.05	[0.67–1.66]	1.41	[0.67–2.98]
College degree or higher	0.75*	[0.58–0.97]	0.30***	[0.16–0.58]	0.73	[0.44–1.22]	0.47*	[0.19–1.14]	

Notes: Models are weighted and restricted to men. *p < 0.05; **p < 0.01; ***p < 0.001 ^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

Table A3

Nativity Differences in Number of Chronic Conditions, Diabetes, Hypertension, and Heart Conditions among 2016 Survey of Prison Inmates Sample, Models Stratified by Race/Ethnicity

		A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
		Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Model 1: White (n = 5223)	Foreign-born	1.16	[0.92–1.48]	1.93	[0.95–3.93]	1.17	[0.69–1.97]	1.47	[0.75–2.90]
	Age (ref = 18–34)								
	35–49	1.80***	[1.61–2.01]	4.46***	[2.55–7.79]	2.41***	[1.99–2.93]	1.35	[0.94–1.95]
	50+	3.50***	[3.14–3.89]	11.71***	[6.84–20.06]	6.42***	[5.27–7.83]	5.92***	[4.27–8.20]
	Education (ref=<HS)								
	High school	0.97	[0.89–1.06]	0.83	[0.61–1.13]	1.03	[0.86–1.22]	1.15	[0.87–1.52]
	Some college	1.06	[0.97–1.17]	0.90	[0.64–1.25]	1.18	[0.95–1.44]	1.38*	[1.02–1.86]
College degree or higher	1.06	[0.94–1.17]	1.07	[0.72–1.58]	0.99	[0.76–1.30]	1.35	[0.94–1.93]	
Model 2: Black (n = 6190)	Foreign-born	0.74*	[0.59–0.94]	0.64	[0.29–1.39]	0.95	[0.63–1.45]	0.79	[0.34–1.84]
	Age (ref = 18–34)								
	35–49	1.85***	[1.70–2.01]	4.83***	[3.40–6.87]	3.07***	[2.65–3.55]	1.82**	[1.30–2.55]
	50+	3.32***	[3.05–3.61]	13.82***	[9.75–19.57]	7.79***	[6.57–9.23]	5.46***	[3.93–7.60]
	Education (ref=<HS)								
	High school	0.96	[0.89–1.04]	1.04	[0.79–1.36]	1.05	[0.90–1.22]	0.75	[0.54–1.05]
	Some college	1.01	[0.91–1.12]	1.09	[0.77–1.53]	1.02	[0.82–1.26]	1.19	[0.80–1.78]
College degree or higher	1.24*	[1.02–1.50]	2.14**	[1.21–3.77]	1.38	[0.93–2.06]	1.27	[0.61–2.63]	
Model 3: Other race (n = 2273)	Foreign-born	0.51***	[0.38–0.68]	1.03	[0.48–2.20]	0.50**	[0.30–0.81]	0.28*	[0.08–0.91]
	Age (ref = 18–34)								
	35–49	1.50***	[1.30–1.73]	3.49***	[1.95–6.26]	2.22***	[1.72–2.87]	1.23	[0.76–1.97]
	50+	3.11***	[2.74–3.57]	11.85***	[6.89–20.39]	6.14***	[4.67–8.07]	4.56***	[3.00–6.92]
	Education (ref=<HS)								
	High school	1.02	[0.90–1.15]	0.72	[0.46–1.12]	1.00	[0.77–1.29]	1.39	[0.92–2.08]
	Some college	1.12	[0.98–1.27]	1.26	[0.81–1.97]	1.25	[0.92–1.71]	2.22***	[1.45–3.39]
College degree or higher	1.07	[0.86–1.32]	0.89	[0.42–1.89]	1.14	[0.66–2.00]	1.31	[0.56–3.06]	
Model 4: Latino (n = 4277)	Foreign-born	0.70***	[0.64–0.78]	0.80	[0.61–1.05]	0.68***	[0.56–0.81]	0.72	[0.52–1.00]
	Age (ref = 18–34)								
	35–49	1.76***	[1.55–2.00]	3.84***	[2.16–6.81]	2.28***	[1.84–2.83]	2.68***	[1.71–4.19]
	50+	3.97***	[3.50–4.51]	13.18***	[7.43–23.37]	7.71***	[6.01–9.88]	10.32***	[6.58–16.20]

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Table A3 (continued)

	A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
	Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
High school	0.96	[0.85–1.08]	0.88	[0.61–1.28]	0.92	[0.74–1.15]	1.03	[0.66–1.58]
Some college	1.05	[0.91–1.23]	1.22	[0.79–1.90]	0.96	[0.71–1.30]	1.27	[0.75–2.16]
College degree or higher	1.08	[0.87–1.35]	1.11	[0.62–1.97]	1.13	[0.73–1.76]	1.41	[0.72–2.75]

Notes: Models are weighted and restricted to men. *p < 0.05; **p < 0.01; ***p < 0.001.

^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

Table A4

Intersecting Nativity and Citizenship Differences in Number of Chronic Conditions, Diabetes, Hypertension, and Heart Conditions among 2016 National Health Interview Survey Sample (n = 14,419)

	A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
	Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Nativity & citizenship (ref = U.S.-born citizen)								
Foreign-born U.S. citizen	0.75***	[0.67–0.83]	1.04	[0.79–1.38]	0.73**	[0.59–0.90]	0.67*	[0.49–0.93]
Non-U.S. citizen	0.53***	[0.45–0.63]	0.52**	[0.34–0.79]	0.52***	[0.38–0.71]	0.50**	[0.31–0.80]
Race/ethnicity (ref = White)								
Black	1.06	[0.98–1.14]	1.33*	[1.04–1.69]	1.51***	[1.26–1.81]	0.67**	[0.52–0.86]
Other race	0.98	[0.87–1.10]	0.89	[0.63–1.26]	1.28*	[1.00–1.63]	0.71	[0.49–1.04]
Latino	0.89*	[0.81–0.98]	1.45**	[1.12–1.89]	0.99	[0.80–1.21]	0.65**	[0.48–0.89]
Age (ref = 18–34)								
35–49	1.85***	[1.67–2.04]	3.56***	[2.34–5.40]	3.24***	[2.69–3.90]	1.85***	[1.34–2.57]
50+	4.38***	[4.03–4.75]	14.53***	[9.97–21.18]	10.81***	[9.17–12.74]	8.71***	[6.67–11.37]
Education (ref=<high school)								
High school	0.85***	[0.79–0.91]	0.74**	[0.59–0.93]	0.71***	[0.60–0.84]	0.73**	[0.59–0.90]
Some college	0.84***	[0.78–0.90]	0.66***	[0.53–0.82]	0.73***	[0.61–0.87]	0.70**	[0.56–0.86]
College degree or higher	0.74***	[0.69–0.79]	0.47***	[0.38–0.60]	0.61***	[0.51–0.73]	0.53***	[0.43–0.66]

Notes: Models are weighted and restricted to men. *p < 0.05; **p < 0.01; ***p < 0.001.

^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

Table A5

Intersecting Nativity and Citizenship Differences in Number of Chronic Conditions, Diabetes, Hypertension, and Heart Conditions among 2016 Survey of Prison Inmates Sample (n = 17,963)

	A: Number of Chronic Conditions ^a		B: Diabetes		C: Hypertension		D: Heart Condition	
	Incidence rate ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]	Odds ratio	[CI]
Nativity & citizenship (ref = U.S.-born citizen)								
Foreign-born U.S. citizen	0.92	[0.82–1.04]	1.09	[0.76–1.55]	0.92	[0.72–1.17]	0.93	[0.62–1.39]
Non-U.S. citizen	0.63***	[0.57–0.70]	0.78	[0.59–1.02]	0.64***	[0.53–0.75]	0.71*	[0.52–0.97]
Race/ethnicity (ref = White)								
Black	0.97	[0.93–1.02]	1.19*	[1.01–1.42]	1.42***	[1.29–1.57]	0.67***	[0.57–0.80]
Other race	1.15***	[1.09–1.22]	1.32*	[1.07–1.63]	1.27***	[1.12–1.44]	1.05	[0.86–1.29]
Latino	0.94	[0.88–1.00]	1.46**	[1.16–1.83]	0.98	[0.86–1.11]	0.73**	[0.59–0.91]
Age (ref = 18–34)								
35–49	1.76***	[1.66–1.86]	4.25***	[3.29–5.50]	2.60***	[2.36–2.86]	1.65***	[1.35–2.01]
50+	3.46***	[3.28–3.66]	12.59***	[9.79–16.19]	7.11***	[6.40–7.91]	6.13***	[5.09–7.40]
Education (ref=<high school)								
High school	0.97	[0.93–1.02]	0.89	[0.75–1.05]	1.01	[0.92–1.11]	1.04	[0.88–1.23]
Some college	1.05	[0.99–1.11]	1.06	[0.88–1.29]	1.10	[0.97–1.24]	1.41***	[1.17–1.71]
College degree or higher	1.09*	[1.00–1.19]	1.25	[0.95–1.63]	1.09	[0.91–1.32]	1.32*	[1.00–1.73]

Notes: Models are weighted and restricted to men. *p < 0.05; **p < 0.01; ***p < 0.001.

^a Results from zero-inflated Poisson regression; results in all other panels from logistic regressions. Number of chronic conditions includes diabetes mellitus, hypertension, heart conditions, arthritis, asthma, cancer, and stroke (0–4+).

References

Abraído-Lanza, A. F., Echeverría, S. E., & Flórez, K. R. (2016). Latino immigrants, acculturation, and health: Promising new directions in research. *Annual Review of Public Health, 37*(1), 219–236. <https://doi.org/10.1146/annurev-publhealth-032315-021545>

Argeseanu Cunningham, S., Ruben, J. D., & Narayan, K. M. (2008). Health of foreign-born people in the United States: A review. *Health & Place, 14*(4), 623–635. <https://doi.org/10.1016/j.healthplace.2007.12.002>

Bačak, V., & Wildeman, C. (2015). An empirical assessment of the "healthy prisoner hypothesis". *Social Science & Medicine, 138*, 187–191. <https://doi.org/10.1016/j.socscimed.2015.05.039>

Balcazar, A. J., Grineski, S. E., & Collins, T. W. (2015). The durability of immigration-related barriers to health care access for hispanics across generations. *Hispanic Journal of Behavioral Sciences, 37*(1), 118–135. <https://doi.org/10.1177/0739986314567074>

Binswanger, I. A., Krueger, P. M., & Steiner, J. F. (2009). Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general

- population. *Journal of Epidemiology & Community Health*, 63(11), 912–919. <https://doi.org/10.1136/jech.2009.090662>
- Boen, C. E., & Hummer, R. A. (2019). Longer-but harder-lives?: The hispanic health paradox and the social determinants of racial, ethnic, and immigrant-native health disparities from midlife through late life. *Journal of Health and Social Behavior*, 60(4), 434–452. <https://doi.org/10.1177/0022146519884538>
- Bronson, J., Stroop, J., Zimmer, S., & Berzofsky, M. (2017). *Drug use, dependence, and abuse among state prisoners and jail inmates, 2007-2009*. <https://bjs.ojp.gov/library/publications/drug-use-dependence-and-abuse-among-state-prisoners-and-jail-inmates-2007-2009>.
- Butcher, K. F., & Piehl, A. M. (2000). The role of deportation in the incarceration of immigrants. In G. J. Borjas (Ed.), *Issues in the economics of immigration* (pp. 315–386). University of Chicago Press. <https://www.nber.org/system/files/chapters/c6060/c6060.pdf>.
- Cameron, A. C., & Trivedi, P. K. (2009). *Microeconometrics using Stata*. Stata Press.
- Campbell, K., Garcia, D. M., Granillo, C. V., & Chavez, D. V. (2012). Exploring the Latino paradox: how economic and citizenship status impact health. *Hispanic Journal of Behavioral Sciences*, 34(2), 187–207. <https://doi.org/10.1177/0739986312437552>
- Carson, E. A. (2018). *Prisoners in 2016*. <https://bjs.ojp.gov/content/pub/pdf/p16.pdf>.
- Castaneda, H., Holmes, S. M., Madrigal, D. S., Young, M.-E. D., Beyeler, N., & Quesada, J. (2015). Immigration as a social determinant of health. *Annual Review of Public Health*, 36(1), 375–392. <https://doi.org/10.1146/annurev-publhealth-032013-182419>
- Douglas, K. M., xe, & enz, R. (2013). The criminalization of immigrants & the immigration-industrial complex. *Dædalus*, 142(3), 199–227. <http://www.jstor.org/stable/43297260>.
- Dumont, D. M., Allen, S. A., Brockmann, B. W., Alexander, N. E., & Rich, J. D. (2013). Incarceration, community health, and racial disparities. *Journal of Health Care for the Poor and Underserved*, 24(1), 78–88. <https://doi.org/10.1353/hpu.2013.0000>
- Engelman, M., & Ye, L. Z. (2019). The immigrant health differential in the context of racial and ethnic disparities: The case of diabetes. *Advances in Medical Sociology*, 19, 147–171. <https://doi.org/10.1108/s1057-62902019000019008>
- Eschbach, K., Ostir, G. V., Patel, K. V., Markides, K. S., & Goodwin, J. S. (2004). Neighborhood context and mortality among older Mexican Americans: Is there a barrio advantage? *American Journal of Public Health*, 94(10), 1807–1812. <https://doi.org/10.2105/ajph.94.10.1807>
- Federal Bureau of Prisons. (2022). *Inmate gender*. Retrieved November 13 from https://www.bop.gov/about/statistics/statistics_inmate_gender.jsp.
- Giuntella, O., & Stella, L. (2017). The acceleration of immigrant unhealthy assimilation. *Health Economics*, 26(4), 511–518. <https://doi.org/10.1002/hec.3331>
- Goldman, D. P., Smith, J. P., & Sood, N. (2005). Legal status and health insurance among immigrants. *Health Affairs*, 24(6), 1640–1653. <https://doi.org/10.1377/hlthaff.24.6.1640>
- Hammett, T. M. (2006). HIV/AIDS and other infectious diseases among correctional inmates: Transmission, burden, and an appropriate response. *American Journal of Public Health*, 96(6), 974–978. <https://doi.org/10.2105/ajph.2005.066993>
- Hinton, E., & Cook, D. (2021). The mass criminalization of Black Americans: A historical overview. *Annual Review of Criminology*, 4(1), 261–286. <https://doi.org/10.1146/annurev-criminol-060520-033306>
- Jasso, G., Massey, D. S., Rosenzweig, M. R., & Smith, J. P. (2004). Immigrant health: Selectivity and acculturation. In N. B. A. R. A. Bulatao, & B. Cohen (Eds.), *Critical perspectives on racial and ethnic differences in health in late life* (pp. 227–266). National Academies Press.
- Kovera, M. B. (2019). Racial disparities in the criminal Justice system: Prevalence, causes, and a search for solutions. *Journal of Social Issues*, 75(4), 1139–1164. <https://doi.org/10.1111/josi.12355>
- Kuper, J. L., & Turanovic, J. J. (2021). Undoing resilience: Immigrant status and poor health following incarceration. *Health Justice*, 9(1), 5. <https://doi.org/10.1186/s40352-021-00129-7>
- Kutateladze, B. L., Andiloru, N. R., Johnson, B. D., & Spohn, C. C. (2014). Cumulative disadvantage: Examining racial and ethnic disparity in prosecution and sentencing. *Criminology*, 52(3), 514–551. <https://doi.org/10.1111/1745-9125.12047>
- Landale, N. S., Gorman, B. K., & Oropesa, R. S. (2006). Selective migration and infant mortality among Puerto Ricans. *Maternal and Child Health Journal*, 10(4), 351–360. <https://doi.org/10.1007/s10995-006-0072-4>
- Light, M. T. (2014). The new face of legal inequality: Noncitizens and the long-term trends in sentencing disparities across U.S. District courts, 1992-2009. *Law & Society Review*, 48(2), 447–478. <http://www.jstor.org/stable/43670399>.
- Martos-Méndez, M. J., García-Cid, A., Gómez-Jacinto, L., & Hombrados-Mendieta, I. (2020). Perceived discrimination, psychological distress and cardiovascular risk in migrants in Spain. *International Journal of Environmental Research and Public Health*, 17(12). <https://doi.org/10.3390/ijerph17124601>
- Moloney, K. P., van den Bergh, B. J., & Moller, L. F. (2009). Women in prison: The central issues of gender characteristics and trauma history. *Public Health*, 123(6), 426–430. <https://doi.org/10.1016/j.puhe.2009.04.002>
- Narayan, K. M., Boyle, J. P., Thompson, T. J., Gregg, E. W., & Williamson, D. F. (2007). Effect of BMI on lifetime risk for diabetes in the U.S. *Diabetes Care*, 30(6), 1562–1566. <https://doi.org/10.2337/dc06-2544>
- National Center for Health Statistics. (2017a). *2016 data release centers for disease control and prevention*. U.S. Department of Health and Human Services https://www.cdc.gov/nchs/nhis/nhis_2016_data_release.htm.
- National Center for Health Statistics. (2017b). *2016 national health interview survey (NHIS) public use data release: Survey description*. <https://www.cdc.gov/nchs/nhis/1997-2018.htm#2016>.
- Nowotny, K. M., Rogers, R. G., & Boardman, J. D. (2017). Racial disparities in health conditions among prisoners compared with the general population. *SSM Popul Health*, 3, 487–496. <https://doi.org/10.1016/j.ssmph.2017.05.011>
- Office of Immigration Statistics. (2016). *DHS immigration enforcement: 2016*. <https://www.dhs.gov/sites/default/files/publications/DHS%20Immigration%20Enforcement%202016.pdf>.
- Patterson, E. J. (2010). Incarcerating death: Mortality in U.S. State correctional facilities, 1985-1998. *Demography*, 47(3), 587–607. <https://doi.org/10.1353/dem.0.0123>
- Patterson, E. J. (2013). The dose-response of time served in prison on mortality: New York state, 1989-2003. *American Journal of Public Health*, 103(3), 523–528. <https://doi.org/10.2105/ajph.2012.301148>
- Pettit, B. (2012). *Invisible men: Mass incarceration and the myth of Black progress*. Russell Sage Foundation.
- Poehlmann, J. (2005). Incarcerated mothers' contact with children, perceived family relationships, and depressive symptoms. *Journal of Family Psychology*, 19(3), 350–357. <https://doi.org/10.1037/0893-3200.19.3.350>
- Porter, L. C. (2019). Being “on point”: Exploring the stress-related experiences of incarceration. *Society and Mental Health*, 9(1), 1–17. <https://doi.org/10.1177/2156869318771439>
- Read, J. N. G., & Reynolds, M. M. (2012). Gender differences in immigrant health. *Journal of Health and Social Behavior*, 53(1), 99–123. <https://doi.org/10.1177/0022146511431267>
- Riosmena, F., Kuhn, R., & Jochem, W. C. (2017). Explaining the immigrant health advantage: Self-selection and protection in health-related factors among five major national-origin immigrant groups in the United States. *Demography*, 54(1), 175–200. <https://doi.org/10.1007/s13524-016-0542-2>
- Riosmena, F., Wong, R., & Palloni, A. (2013). Migration selection, protection, and acculturation in health: A binational perspective on older adults. *Demography*, 50(3), 1039–1064. <https://doi.org/10.1007/s13524-012-0178-9>
- Saadi, A., Patler, C., & De Trinidad Young, M. E. (2022). Cumulative risk of immigration prison conditions on health outcomes among detained immigrants in California. *Journal of Ethnic and Racial Health Disparities*, 9(6), 2518–2532. <https://doi.org/10.1007/s40615-021-01187-1>
- Schnittker, J., & John, A. (2007). Enduring stigma: The long-term effects of incarceration on health. *Journal of Health and Social Behavior*, 48(2), 115–130. <https://doi.org/10.1177/002214650704800202>
- Singer, E. K., Molyneux, K., Kaur, K., Kona, N., Malave, G. S., & Baranowski, K. A. (2022). The impact of immigration detention on the health of asylum seekers during the COVID-19 pandemic. *SSM - Qualitative Research in Health*, 2, Article 100072. <https://doi.org/10.1016/j.ssmqr.2022.100072>
- Singh, G. K., & Miller, B. A. (2004). Health, life expectancy, and mortality patterns among immigrant populations in the United States. *Canadian Journal of Public Health*, 95(3), 114–121. <https://doi.org/10.1007/bf03403660>
- Torres, J. M., Deardorff, J., Gunier, R. B., Harley, K. G., Alkon, A., Kogut, K., & Eskenazi, B. (2018). Worry about deportation and cardiovascular disease risk factors among adult women: The center for the health assessment of mothers and children of salinas study. *Annals of Behavioral Medicine*, 52(2), 186–193. <https://doi.org/10.1093/abm/kax007>
- U.S. Department of Justice. (2019). *Alien incarceration report fiscal year 2018. quarter 2* <https://www.justice.gov/archives/opa/page/file/1154711/download>.
- U.S. Department of Justice, B. o. J. S. (2020). *Survey of prison inmates*. Inter-University Consortium for Political and Social Research.
- U.S. Government Accountability Office. (2018). *Criminal alien statistics: Information on incarcerations, arrests, convictions, costs, and removals*. Retrieved November 13 from <https://www.gao.gov/products/gao-18-433>.
- Viruell-Fuentes, E. A. (2007). Beyond acculturation: Immigration, discrimination, and health research among Mexicans in the United States. *Social Science & Medicine*, 65(7), 1524–1535. <https://doi.org/10.1016/j.socscimed.2007.05.010>
- Von Werthern, M., Robjant, K., Chui, Z., Schon, R., Ottisova, L., Mason, C., & Katona, C. (2018). The impact of immigration detention on mental health: A systematic review. *BMC Psychiatry*, 18(1). <https://doi.org/10.1186/s12888-018-1945-y>
- Wildeman, C., & Wang, E. A. (2017). Mass incarceration, public health, and widening inequality in the USA. *Lancet*, 389(10077), 1464–1474. [https://doi.org/10.1016/s0140-6736\(17\)30259-3](https://doi.org/10.1016/s0140-6736(17)30259-3)
- Wilper, A. P., Woolhandler, S., Boyd, J. W., Lasser, K. E., McCormick, D., Bor, D. H., & Himmelstein, D. U. (2009). The health and health care of US prisoners: Results of a nationwide survey. *American Journal of Public Health*, 99(4), 666–672. <https://doi.org/10.2105/ajph.2008.144279>
- Witsman, K. (2017). *U.S. Naturalizations: 2016*. Office of Immigration Statistics Retrieved from https://www.dhs.gov/sites/default/files/publications/Naturalizations_2016.pdf.