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Legal status and health disparities:
An examination of health insurance coverage
among the foreign-born

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Contents

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Abstract

OBJECTIVE
This paper employs a statistical matching procedure to impute the legal status of foreign-born adults in US Census surveys in order to estimate migration status disparities in health insurance coverage.

METHODS
Using data from the Survey of Income and Program Participation, we impute the legal/citizenship (migration) status of immigrants in the National Health Interview Survey.

RESULTS
Results from the pooled data document disparities in health insurance coverage among four citizen/legal status groups: naturalized citizens, lawful permanent residents, legal nonimmigrants, and unauthorized immigrants. Naturalized citizens had the highest rate of health insurance coverage, followed by legal immigrants, legal nonimmigrants, and unauthorized immigrants.

CONTRIBUTIONS
The paper presents revised pre–Affordable Care Act (ACA) estimates of health insurance coverage among the foreign-born that are crucial for evaluating the impact of the ACA on reducing or exacerbating disparities in health coverage among migration status groups.

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1. Introduction

The population of foreign-born individuals living in the United States, numbering approximately 45 million (US Census Bureau 2018), continues to become more diverse in terms of citizenship and legal status (Lopez, Passel, and Rohal 2015; Zong, Batalova, and Hallock 2018). Currently, nearly one-half of the foreign-born are naturalized citizens, an estimated 25% are unauthorized, and the remaining are legal residents on temporary visas or lawful permanent resident (LPR) visas (Baker 2018; Zong, Batalova, and Hallock 2018). As the foreign-born population has become more diverse with respect to legal status, researchers are increasingly examining variation in outcomes such as health and well-being by legal and citizenship status.

Researchers hypothesize that an immigrant's citizenship and/or legal status (hereafter jointly referred to as migration status) operates as a risk factor and a social determinant of health outcomes and health care access (Castañeda et al. 2015; Guadamuz et al. 2020). One way this risk factor operates is through health insurance coverage, since those who are noncitizens or without legal status face coverage barriers compared to the naturalized foreign-born (Hacker et al. 2015; Hacker et al. 2011; Ro and Van Hook 2021; Vargas Bustamante et al. 2014). Despite reasonable expectations that immigrants' health coverage varies by migration status and evidence from qualitative and small-scale, geographically targeted survey samples, the lack of adequate migration status data in US Census surveys has made estimating coverage rates for different migration status groups difficult, especially for unauthorized immigrants (Capps, Bachmeier, and Van Hook 2018; Prentice, Pebley, and Sastry 2005).

To overcome the limitations of existing survey data, researchers have implemented various approaches to identify the migration status of survey respondents. One common approach utilizes respondents' demographic and socioeconomic characteristics to logically assign a legal status (Passel and Clark 1998) to foreign-born respondents in surveys lacking such a measure. Under the logical approach, foreign-born noncitizens are classified as LPRs if they meet any of the following criteria: arrived in the United States before 1980, are citizens or married to legal immigrants or citizens, are employed in the government sector or in an occupation requiring some form of licensing, reside in public housing or receive rental subsidies, are veterans or in the armed forces, were born in Cuba, receive public benefits (Borjas 2017a; Borjas and Cassidy 2019). Noncitizen foreign-born respondents who are not assigned as LPRs using these criteria are (often) presumed to be unauthorized immigrants.[4] The logical approach is increasingly used in health and social science research (Borjas and Slusky 2018; Cohen and Schpero 2018; Gunadi 2019; Pourat et al. 2014; Vargas Bustamante et al. 2014; Zuckerman, Waidmann,

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[4] Some applications of this method further code unclassified noncitizens as LPRs randomly as a final step. See Passel and Cohn (2009).

and Lawton 2011). Importantly, and central to this paper, researchers analyzing health insurance coverage and health care access across migration status groups frequently employ the logical approach to produce estimates prior to the Affordable Care Act (ACA) and then to assess the impact of the ACA.

Notably, however, recent studies demonstrate that the logical imputation approach may introduce bias into estimates of poverty and health insurance coverage by legal status, particularly because the outcomes examined are completely determinative of the logical assignment's criteria for identifying migration status (Altman et al. 2021; Ro and Van Hook 2022; Spence et al. 2020). For example, the logical method likely overstates lawful permanent residents' use of public insurance such as Medicaid (Altman et al. 2021). Consequently, studies estimating the impacts of the ACA on immigrants' health insurance coverage from models employing the logical approach may be biased, leading to estimates that vary from the policy's true effect across migration status groups. In general, researchers' ability to provide clear empirical estimates to inform public policy related to access to the nation's health care system will be hampered if the research literature provides inconsistent estimates produced by different estimation methods. Thus, to accurately assess the impact of the ACA on the health coverage of the foreign-born population, it is imperative to have valid estimates of health insurance coverage by migration status both *before* and *after* the ACA's implementation. Here we use cross-sectional data to focus on estimating coverage rates for the pre-ACA period. Insofar as any migration status imputation method is prone to biasing such estimates, it is therefore warranted that researchers train their focus on a careful and systematic assessment of such methods.

This paper contributes to the research literature on legal status disparities in health and well-being both methodologically and substantively. This study applies a statistical matching procedure that combines two surveys to probabilistically impute the legal status of immigrants in census surveys that exclude such measures. To our knowledge, ours is the first study to apply this methodology to the two samples included in the analysis. The Survey of Income and Program Participation (SIPP) is the only nationally representative survey with measures of immigrants' citizenship and (among noncitizens) legal status. The SIPP, however, has a relatively small sample for multivariate analyses and for estimates of group characteristics in subnational geographies such as states. While the National Health Interview Survey (NHIS) collects rich health data and has an indicator for citizenship status, it lacks precise measures of legal status. Using data from the 2008 SIPP, we impute the legal/citizenship status of immigrants in the NHIS and then analyze these pooled data to examine the migration status gradient in health insurance coverage. While previous peer-reviewed studies have validated the reliability of the SIPP and the matching procedure in producing unbiased estimates of migration status (Bachmeier, Van Hook, and Bean 2014; Van Hook et al. 2015), this study will be the first to implement

the method using these two samples in public-use data for research examining the association between migration status and immigrant health insurance coverage. (See Keister and Aronson 2017 for an example concerning immigrants' wealth.) We use this method to estimate disparities in health insurance coverage across migration status groups. Results from the matching method are compared to previously published results using the logical method. As a novel methodological application to this question, this study provides new and independent (of other methods) empirical evidence to this important and growing research literature. Our estimates highlight the association between migration status and health insurance coverage while also providing crucial baseline estimates for health coverage disparities across migration status groups before ACA implementation. Given the present immigration and health policy climates, our study will therefore support future research as well as inform and guide future immigration and health policy discussions.

2. Background

Health insurance coverage plays a critical role in health care access and utilization, and health-related outcomes. The majority of prior national research, both pre- and post-ACA, has focused on variation in health insurance coverage by making broad distinctions between US-born citizens, naturalized citizens, and foreign-born noncitizens (Alcalá et al. 2017; Carrasquillo, Carrasquillo, and Shea 2000; Durden and Dean 2013; Young et al. 2019) but has been unable to examine differences among noncitizens residing in the United States. An exception is a recent study (Ro and Van Hook 2022) that uses the restricted SIPP to make more refined migration status comparisons among Asian and Hispanic immigrants.[5] Overall, the literature finds that citizenship status is associated with health insurance coverage and access among immigrants. Noncitizen adults have lower rates of health insurance coverage than native or naturalized citizens (Alcalá et al. 2017; Carrasquillo, Carrasquillo, and Shea 2000; Durden and Dean 2013) and are more than twice as likely to report having no health insurance rather than private insurance coverage (Durden and Dean 2013). Pre-ACA estimates from 2000 showed that while 44% of noncitizens in the United States were uninsured, only 14% of US-born citizens and about 19% of naturalized citizens lacked health insurance (Carrasquillo, Carrasquillo,

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[5] The public-use SIPP only distinguishes between foreign-born individuals who entered the United States with or without an LPR visa, or green card. The restricted SIPP measures more detailed entry statuses, including three classes of LPR entry visas, entry as a refugee or asylee, and entry as a legal temporary migrant (e.g., H1B). Using the restricted SIPP, Ro and Van Hook (2022) leveraged the more detailed categories in the restricted SIPP and through microsimulations found that a logical approach to imputing the legal status of noncitizens produced biased estimates of the effects of status on self-reported health. Biases were especially pronounced among immigrants from Asia.

and Shea 2000). Rates of uninsurance have persisted over time. During the period 2011–2013, about 17% and 20% of US-born and naturalized citizens, respectively, were uninsured, while 52% of noncitizens with less than five years of US residency and 38% of noncitizens with more than five years of US residency were uninsured (Bustamante et al. 2019).

Noting the disparities in coverage between foreign-born citizens and noncitizens, one can presume that differences in coverage rates likely exist among noncitizens. Coverage disparities by citizenship status alone likely hide distinctions among noncitizens, a group that consists of individuals who may be legally entitled to public benefits and others who are not.[6] The categorization of all noncitizens as a single, homogenous group assumes that all noncitizen migration statuses operate as a risk factor for poor health in the same way as for unauthorized immigrants. Yet whether and the degree to which various categories of noncitizens vary in their rates of health coverage is an empirical question that remains largely unaddressed at the national level. Ro and Van Hook (2021) make advances on this empirical front through the use of the restricted SIPP to disaggregate Asian and Hispanic noncitizens as unauthorized and legal nonimmigrants. However, they exclude legal nonimmigrants from their analysis and compare naturalized citizens, LPRs, and the unauthorized.

Prior efforts to examine these disparities at the national level have either utilized the aforementioned logical approach to impute the legal status of respondents in census surveys or have relied on other data sources. One study employing the logical approach to data from the 2004 March supplement of the Current Population Survey (CPS) found that 14% of US natives and 26% of legal immigrants (naturalized citizens, lawful permanent residents, refugees and asylees, and temporary legal residents) did not have health insurance (Fortuny, Capps, and Passel 2007). Conversely, 59% of unauthorized immigrants reported being uninsured (Fortuny, Capps, and Passel 2007). Using data from the 2015 Latino National Health and Immigration Survey (LNHIS) – a representative survey of the US Hispanic population designed to evaluate the effect of the ACA on the US Hispanic community – Sanchez and colleagues (2017) examined health insurance coverage by legal status before and after ACA implementation. In 2014, both lawful permanent residents and unauthorized immigrants had higher uninsured rates (37% and 33%, respectively) compared to naturalized citizens (30%). Additionally, the gap in insurance coverage rates between unauthorized immigrants and naturalized Hispanic citizens increased significantly after the ACA, with unauthorized immigrants being five times more likely to be uninsured in 2015 (Sanchez et al. 2017). These findings highlight that the ACA may have exacerbated existing disparities in coverage rates across migration status groups, but to the extent that estimates of status differences in health

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[6] Legal status refers to lawful presence in the United States, while citizenship status indicates whether a foreign-born individual has become a US citizen through the formal naturalization process.

coverage vary considerably based on imputation method, the impacts of the ACA on different segments of the foreign-born population in America will remain uncertain.

While much of the focus of national-level research concerning the foreign-born is on differences by citizenship status (whether an immigrant has become a naturalized US citizen or not), current evidence linking migration status (the visa status of noncitizens) with health insurance coverage is restricted primarily to small, geographically specific samples or ethnographic studies. Geographically specific analyses show that unauthorized immigrant adults are less likely to be insured (Chavez 2012; Chavez et al. 1997; Goldman, Smith, and Sood 2005; Marshall et al. 2005; Montealegre and Selwyn 2014; Nandi et al. 2008; Navarro, Ibarra, and Anglemyer 2017; Ortega et al. 2018; Prentice, Pebley, and Sastry 2005; Ybarra, Ha, and Chang 2017) and have less access to health care (Marshall et al. 2005; Montealegre and Selwyn 2014; Nandi et al. 2008; Navarro, Ibarra, and Anglemyer 2017; Ortega et al. 2018) compared to US citizens and other legally resident immigrant groups. In California in 2011–2012, for example, 16% of naturalized citizens, 28% of lawful permanent residents, and 52% of unauthorized immigrants were uninsured (Navarro, Ibarra, and Anglemyer 2017). Similarly, among California's Hispanic population, 21% of naturalized citizens, 32% of lawful permanent residents, and 53% of unauthorized immigrants were uninsured (Ortega et al. 2018). Though informative, geographically specific studies obscure recent immigration trends of growing new immigrant destinations (Massey and Capoferro 2008), diversity by region of origin (Radford 2019), and increasingly polarized immigration policies at the state and local level (Huang and Liu 2018; Walker and Leitner 2011).

There remains a critical need for nationally representative research examining variation in health insurance coverage by carefully disaggregating the foreign-born population by migration status – that is, the combination of both citizenship and legal statuses. We build on the recent work of Ro and Van Hook (2021), who document a migration status gradient in any health insurance (public or private) among Hispanics and Asians, by focusing explicitly on health insurance coverage and type of coverage among the target-age population for Medicaid expansion. We are the first to our knowledge to evaluate insurance coverage rates by migration status prior to the implementation of the ACA, comparing whether and how coverage rates vary by the method used to assign migration status. This research is particularly important, as health coverage remains at the fore of the health policy domain, with ongoing evaluations of the impact of the ACA and continued health reform debates.

3. Data and methods

3.1 Data and sample

We used data from the 2007–2009 samples of the NHIS pooled with the 2008 panel of the SIPP. As preeminent surveys, both are widely used to examine the health (NHIS) and material well-being (SIPP) of the US-born and non-US-born populations. The NHIS is one of the largest annual, nationally representative cross-sectional health surveys of the noninstitutionalized US population. The NHIS includes data on health status, limitations, health insurance coverage, health care access and utilization, and personal injuries. While the NHIS also captures data on respondents' demographic and socioeconomic characteristics, including nativity (whether respondents were born in the United States), citizenship status, region of birth, and period of US arrival, the survey does not gather data on legal status among noncitizens.

Since 1996 the SIPP has collected and published information on noncitizens' legal status, and it is the only nationally representative survey to do so. As a household longitudinal study, the SIPP collects data on income, data on labor force and social program participation, and extensive information on economic well-being. We used the 2008 panel of the SIPP not only for pre-ACA baseline estimates but also because it is the most recent panel of the SIPP that measures adjustment of visa status. Subsequent panels of the SIPP identify only the permanent residency status of noncitizen immigrants upon their arrival to the United States, leaving researchers unable to discern changes in status post-arrival. Using the 2008 SIPP – which indicates whether noncitizen arrivals, including temporary visa holders and the unauthorized, have adjusted their status to permanent resident by the time of the survey – provides a more accurate snapshot of the noncitizen population than would be possible to obtain with any other survey source. Like other national surveys, however, the SIPP is limited in its ability to accurately measure noncitizens with precarious legal standing, who may shift in and out of legal authorization to reside or work in the United States. For example, an individual may arrive with a temporary visa but remain in the United States after their visa has expired. While in reality this person would be considered unauthorized, their visa arrival status and characteristics from the survey would suggest that they are a legal nonimmigrant (LNI). Despite this limitation, due to the relatively small size of the legal nonimmigrant population,[7] we do not expect this uncertainty in measurement of the status of a small subset of the LNI population (that is, those whose statuses may have lapsed) to meaningfully alter the conclusions of our study.

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[7] According to US Department of Homeland Security estimates, around 1.8 million nonimmigrants resided in the United States in 2008 – about 6% of the total foreign-born population.

To utilize the advantages of the SIPP in terms of migration status measurement and the NHIS in terms of health data from a large national sample, we employed a statistical matching procedure – discussed below – to combine both datasets and treat them as a single representative sample. To leverage the utility of the cross-survey multiple imputation (CSMI) gained by large increases in the analytical sample size, but without violating the assumption that the SIPP and NHIS samples are drawn from the same underlying population, we combined the 2008 SIPP (whose collection spanned multiple years) with a pooled 2007–2009 NHIS sample (to mirror the multiple-year span of the SIPP). The analytical sample comprised 42,506 foreign-born adults aged 18 to 64 and excluded adults with Medicare coverage. [8] This is roughly quadruple the analytical sample size in the SIPP alone, and it doubles the sample size had we combined only the 2008 SIPP and the 2008 NHIS. Finally, the methodological approach undertaken here assumes that the two samples being pooled are drawn from the same underlying population (Rendall et al. 2013). As evident in Appendix Table B-1, the characteristics of the 2008 SIPP foreign-born population are remarkably similar to those based on the 2007–2009 NHIS.

3.2 Measures

We constructed three dependent variables indicating (1) whether immigrants currently had health insurance, (2) whether they were currently covered under Medicaid, and (3) the type of coverage (whether adults had private, public, or no health insurance coverage). Private insurance includes any private insurance plan paid for by the respondent, another individual, or an employer. Public insurance includes Medicaid, military insurance coverage, and coverage through the Children's Health Insurance Program (CHIP)[9] or another government program. These measures of insurance coverage allowed us to easily compare differences in coverage type across migration status groups.

The main independent variable is migration status. The NHIS asks respondents if they are US citizens, if they were born in the United States or a US territory, and their region of birth. This information allowed us to identify whether an adult was a US-born citizen, a naturalized citizen, or a noncitizen. In addition to the data captured in the NHIS, the SIPP also asks respondents to indicate the year they arrived in the United States, whether they entered the United States as an LPR, whether they adjusted to LPR status

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[8] The analytical sample varies between 42,501 and 42,506 adults due to the imputation models.

[9] The majority of adults covered under the Children's Health Insurance Program (CHIP) are 18 years old. CHIP provides coverage until age 19. Additionally, in 2000 and 2001, federal laws allowed states with leftover CHIP funds to use those funds to cover low-income, uninsured adults who do not qualify for Medicaid. In some states CHIP also provides coverage for pregnant women. In the full sample, 33 adults over the age of 19 have CHIP and no other type of insurance coverage.

(if not entering as an LPR), and the year they received their LPR visa, if applicable. These questions allowed us to identify whether a respondent in the SIPP was a naturalized citizen, a noncitizen who either arrived as a lawful permanent resident or subsequently adjusted to lawful permanent residency, or a noncitizen, non-LPR.

The latter category – noncitizen, non-LPR – is comprised of both unauthorized immigrants and legal nonimmigrants. Legal nonimmigrants (the term used by the federal government to refer to nonpermanent residents) are foreign nationals who are legally permitted to reside in the United States but are not permanent residents. These include legal temporary workers, students, refugees, asylees, employees of foreign countries or international organizations, and religious workers. Because legal nonimmigrant codes are suppressed in the public-use SIPP (employed here), we used a simple sorting algorithm to identify and assign legal nonimmigrant status to a small proportion of noncitizen, non-LPR respondents who likely possess one of these temporary visas. (See Appendix A for more detail.) Next, employing the statistical matching technique (discussed in greater detail below; Bachmeier, Van Hook, and Bean 2014; Van Hook et al. 2015), we imputed whether noncitizens in the NHIS were LPRs at time of arrival, LPR adjustees, or legal nonimmigrants. Foreign-born adults in the sample who were not naturalized citizens, lawful permanent residents at arrival, lawful permanent resident adjustees, or legal nonimmigrants were classified as unauthorized immigrants. Our final migration status measure, used in all analyses, was a categorical variable that assigns foreign-born adults to one of four mutually exclusive migration status groups: (1) naturalized citizen, (2) LPR, (3) legal nonimmigrant, (4) unauthorized immigrant.

All analytical models controlled for key demographics that might be associated with health insurance coverage, such as age, sex, and race/ethnicity, as well as educational attainment, marital status, and family composition. Race/ethnicity was categorized as non-Hispanic White, non-Hispanic Black, Hispanic, Asian, and all other races. Educational attainment was measured at four levels: less than high school, high school, some college, and having a college degree or higher. Marital status identified whether an adult was married; was widowed, divorced, or separated; or had never been married. Family status was categorized as single adult without children, single adult with children, multiple adults without children, or multiple adults with children.

Employer health insurance coverage is the main coverage source for many US adults; those with greater economic stability are also more likely to have health coverage. We therefore included measures for economic characteristics. Employment status distinguished whether adults were employed, unemployed, or not in the labor force during the week prior to the interview, while home ownership was a dichotomous indicator of whether the family residence was owned by the family. To measure family economic standing, we created a five-category variable to identify whether the ratio of total family income to poverty threshold was under 1.50, 1.50–2.99, 3.00–3.99, 4.00–

4.99, or greater than 5.00. Because adults with health conditions may be more likely to obtain health coverage, we also included two measures of health status. In the NHIS and SIPP, respondents are asked to self-evaluate their overall health using a five-point Likert scale: 1. excellent; 2. very good; 3. good; 4. fair; 5. poor. We created a binary variable equal to 1 if adults evaluated their health as fair or poor and equal to 0 if they determined their health to be excellent, very good, or good. Work disability was a dichotomous indictor for whether respondents had any physical, mental, or emotional condition at the time of interview that prevented them from working at a job or business. To control for geographic variation in health insurance coverage, we included region of residence, categorized as Northeast, Midwest, South, or West, which represents the smallest geographical unit available in public-use NHIS data. Finally, to control for any possible sampling error due to survey source, we included a binary variable equal to 1 if a respondent was originally from the NHIS and equal to 0 if the respondent was from the SIPP.

3.3 Analytical strategy

3.3.1 CSMI method

We harmonized the SIPP and NHIS using a statistical matching method (Bacher and Pradner 2018; Berchtold and Jeannin 2011; Conti, Marella, and Scanu 2016; Kaplan and McCarty 2013; Leulescu and Agafitei 2013; Rässler 2004; Saporta 2002). More specifically, we employed CSMI following guidelines and conditions outlined by Rendall and colleagues (2013). This approach is advantageous when one sample – a donor sample – is relatively small but rich in information while the recipient sample is limited in the amount of information it contains but is larger. CSMI treats information measured in the donor sample as missing in the recipient sample, and using standard multiple imputation (MI) models, it creates multiple datasets in which missing information is imputed. The SIPP acts as our donor sample, containing detailed legal status information but lacking an adequately sized sample of foreign-born adults not enrolled in Medicare. By using the pooled NHIS samples as our recipient sample, we are able to quadruple our sample size and achieve sufficient statistical power. (Refer to Appendix Table B-1 for more information on sample size.)

To guarantee unbiased parameter estimates, we ensured that our data met two necessary conditions highlighted by Rendall et al. (2013) – that the SIPP and NHIS were drawn from the same underlying population and that all variables used in the MI analysis were jointly observed in both surveys. Both the SIPP and the NHIS are administered by the US Census Bureau using the bureau's sampling frames and are designed to be

representative of the civilian US household population. This means not only that the datasets were drawn from the same underlying population but also that they had common variables that were either identically measured or could be easily recoded and harmonized in the two survey samples. In Appendix B we provide descriptive tables of the SIPP and NHIS respondents.

The first step in our CSMI approach involved identifying and harmonizing the variables to be included in the MI models, pooling the datasets, and normalizing the person weights so that the combined sample was approximately equal to the US foreign-born population in 2008. Next we reviewed the level of missingness for our variables of interest. In the 2008 SIPP, about 3% of respondents had missing data for their immigration status upon entry to the United States, and less than 1% percent had missing data on other migration status variables. Less than 1% of the respondents in the 2007–2009 NHIS had missing information on migration variables.[10] We then carried out multiple imputation by chained equations in STATA 15, which resulted in 50 imputed datasets. Appendix A provides further details on our CSMI approach.

3.3.2 Estimation of health insurance coverage

Using the pooled, imputed datasets, logistic regression models were employed to assess the relationship between migration status and binary measures of insurance coverage and Medicaid coverage. We used multinomial logistic regression to conduct analyses on type of insurance coverage and migration status. In addition to conducting analyses on all foreign-born adults, we ran models separately comparing health insurance coverage by migration status among Hispanic and Asian immigrants – the two largest ethnic groups among the US foreign-born population. Conducting subgroup analyses on Hispanic and Asian foreign-born adults also allowed us to compare our analyses to Ro and Van Hook's (2021) analysis using restricted SIPP data. All analyses controlled for key demographics, socioeconomic characteristics, health status, region of residence, and survey source, as discussed above.[11]

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[10] Further details are available from the authors upon request.
[11] We also ran models excluding the binary indicator for survey source and found no substantial difference in our results.

4. Results

4.1 Descriptive statistics

Table 1 displays the weighted descriptive statistics by migration status. An estimated 40% of foreign-born adults in our sample were naturalized citizens, 34% were lawful permanent residents, 2% were legal nonimmigrants, and 23% were unauthorized immigrants.[12] Overall, most immigrants in the sample were Hispanic, were married, had a high school education or less, and resided in the western region of the United States. While more than one-half owned their own home and 73% were employed, 33% resided in households with family incomes less than 150% of the federal poverty level.

Comparing the characteristics of the foreign-born population by migration status, naturalized citizens were older, had the highest rate of home ownership, and were more likely to be female, married, and in the highest income category and to have a work limitation. Substantial differences were evident in the racial composition and level of educational attainment of migration status groups. A substantial proportion of LPRs, 51%, and unauthorized immigrants, 74%, were Hispanic, while 48% of legal nonimmigrants were Asian. Naturalized citizens, however, were more likely to be White than were other migration status groups. Though naturalized citizens had higher educational attainment than LPRs and unauthorized immigrants, legal nonimmigrants were more likely to have a bachelor's degree or higher compared to naturalized citizens. This high educational attainment among legal nonimmigrants is not surprising given that many nonimmigrant visa categories are for high-skilled workers.

Table 1 also provides the unadjusted rate of health insurance coverage by migration status. Unauthorized immigrants and lawful permanent residents had the lowest insured rates among migration status groups, at 34% and 55%, respectively, compared to 79% of naturalized citizens and 77% of legal nonimmigrants. For all migration status groups, the majority of the insured were covered by private insurance, with legal nonimmigrants having the highest rate of private coverage (71%). While they had the lowest coverage rates, unauthorized immigrants had the highest rate of public insurance coverage among the migration status groups (11.5%). Conversely, 9% of naturalized citizens, 10% of lawful permanent residents, and 6% of legal nonimmigrants had public coverage.

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[12] The share unauthorized is smaller than estimates cited in the literature review, which is likely due to the higher rate of undercounting the unauthorized in the SIPP relative to other national surveys, such as the American Community Survey or the Decennial US Census. See Bachmeier, Van Hook, and Bean 2014. We have not adjusted person weights for coverage error in our analyses.

Table 1:   Weighted descriptive statistics by migration status

	All adults	Naturalized citizens	LPRs	LNIs	Unauthorized
Has insurance coverage	0.603	0.786	0.553	0.768	0.339
Insurance type					
No coverage	0.397	0.214	0.447	0.232	0.661
Private coverage	0.506	0.699	0.455	0.711	0.224
Public coverage	0.097	0.087	0.098	0.058	0.115
Medicaid coverage	0.077	0.068	0.086	0.049	0.084
Age	39.3	43.6	38.4	29.0	34.3
Male	0.512	0.481	0.504	0.512	0.577
Race/ethnicity					
Non-Hispanic White	0.192	0.260	0.175	0.256	0.091
Non-Hispanic Black	0.078	0.093	0.077	0.061	0.053
Hispanic	0.476	0.308	0.516	0.158	0.742
Asian	0.222	0.298	0.201	0.478	0.096
Other race	0.033	0.041	0.031	0.047	0.018
Marital status					
Married	0.647	0.691	0.663	0.542	0.557
Widowed/divorced/separated	0.110	0.131	0.102	0.023	0.094
Never married	0.243	0.178	0.235	0.435	0.349
Educational attainment					
Less than high school	0.309	0.160	0.368	0.023	0.510
High school	0.213	0.204	0.215	0.111	0.236
Some college	0.213	0.277	0.189	0.219	0.133
BSc or higher	0.266	0.359	0.228	0.647	0.121
Family type					
One adult, no children	0.084	0.084	0.079	0.182	0.082
Multiple adults, no children	0.367	0.412	0.328	0.471	0.334
One adult, 1+ child	0.068	0.056	0.077	0.038	0.080
Multiple adults, 1+ child	0.481	0.448	0.516	0.309	0.504
Employment status					
Employed	0.729	0.784	0.708	0.469	0.689
Unemployed	0.058	0.045	0.063	0.078	0.071
Not in labor force	0.214	0.171	0.229	0.453	0.240
Home ownership	0.524	0.710	0.488	0.107	0.290
Ratio of family income to poverty level					
< 1.50	0.328	0.190	0.366	0.451	0.500
1.50–2.99	0.291	0.269	0.299	0.257	0.319
3.00–3.99	0.111	0.137	0.106	0.068	0.074
4.00–4.99	0.078	0.110	0.068	0.049	0.041
> 5.00	0.193	0.294	0.160	0.175	0.066
In poor health	0.089	0.094	0.089	0.037	0.087
Has a work limitation	0.042	0.050	0.043		0.031
Region					
Northeast	0.181	0.215	0.170	0.215	0.136
Midwest	0.120	0.121	0.117	0.170	0.116
South	0.312	0.281	0.317	0.331	0.360
West	0.387	0.383	0.397	0.284	0.388

Note: The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage.
*Source*: Authors' analysis using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

4.2 Insurance coverage by migration status

Figure 1 presents the results of our multivariate logistic regression analyses estimating the probability of having health insurance coverage and Medicaid coverage by migration status, controlling for socioeconomic and health characteristics. On average, compared

to naturalized citizens, LPRs (odds ratio [OR]: 0.570) and unauthorized immigrants (OR: 0.381) were significantly less likely to have insurance coverage. Likewise, LPRs (OR: 0.816) and unauthorized adults (OR: 0.681) were less likely to report Medicaid coverage than were naturalized citizens. Conversely, legal nonimmigrants had higher odds of being insured (OR: 1.474) compared to naturalized citizens but were less likely to have Medicaid coverage (OR: 0.515).

Figure 1: **Estimated odds ratio of health insurance coverage and Medicaid coverage by migration status**
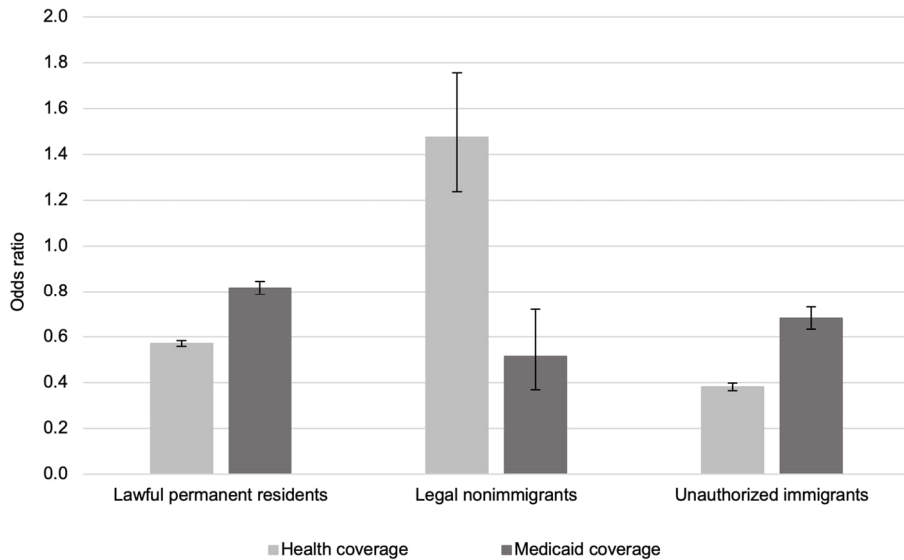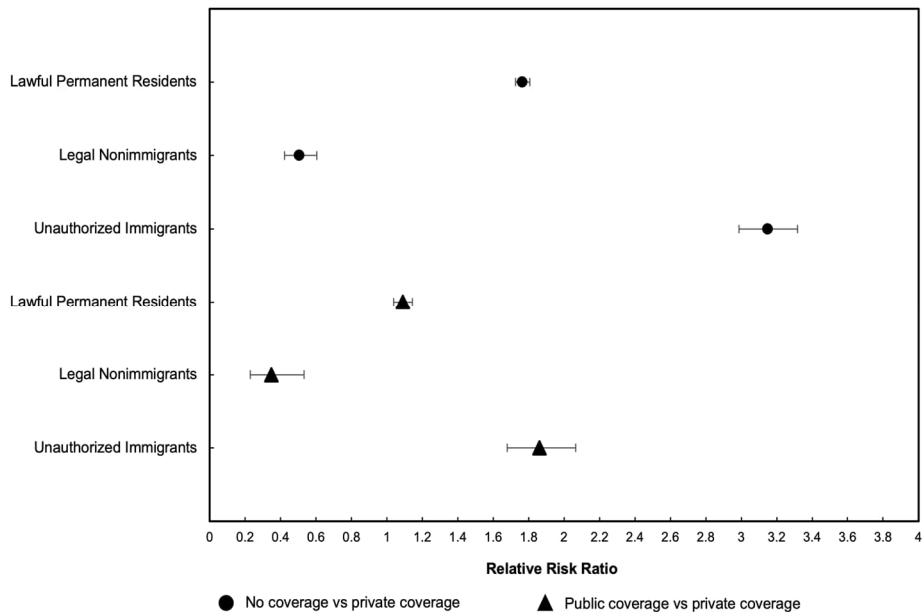

Notes: The figure presents the odds ratio of having health insurance coverage relative to having no health insurance coverage and the odds of having Medicaid coverage by migration status among all foreign-born adults. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. Naturalized citizens were the base group. Models were weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source. Error bars indicate 95% confidence intervals.
Source: Authors' analysis using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

Examination of the type of health insurance coverage by migration status for all foreign-born adults (Figure 2; multinomial logistic regression) revealed that compared to naturalized citizens, LPRs were more likely (relative risk ratio [RRR]: 1.765) to lack coverage or to have public coverage (RRR: 1.089) rather than private health insurance. Legal nonimmigrants had a lower relative risk (RRR: 0.506) of having no insurance or

public insurance (RRR: 0.349) rather than private insurance relative to naturalized citizens. Unauthorized immigrants had the highest relative risk of being uninsured among all migration status groups. Compared to naturalized citizens, unauthorized immigrants were 3.15 times more likely to be uninsured, as well as more likely (RRR: 1.862) to have public coverage rather than private health insurance.

Figure 2:   Estimated relative risk ratio of health insurance type by migration status

Notes: The figure presents the relative risk ratio of having no health insurance coverage or public insurance coverage relative to private coverage by migration status among all foreign-born adults. Naturalized citizens represent the base group. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. The model is weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source. Error bars indicate 95% confidence intervals.
Source: Authors' analysis using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

Results from models predicting insurance coverage and coverage type by migration status among Hispanic and Asian migrants separately are presented in Table 2. Among Hispanic migrants, LPRs (OR: 0.490) and unauthorized immigrants (OR: 0.327) were less likely to have any type of health insurance coverage compared to naturalized citizens. Hispanic LPRs and unauthorized immigrants were also 2.1 and 3.8 times more likely to be uninsured, respectively, rather than having private health insurance coverage, relative

to naturalized Hispanic citizens. When assessing the relative risk of having public insurance compared to private insurance, both Hispanic LPRs (RRR: 1.268) and unauthorized immigrants (RRR: 2.155) were more likely to have public insurance compared to naturalized citizens. However, we found no notable difference between Hispanic legal nonimmigrants and naturalized citizens in the relative risk of lacking coverage or of having public health insurance relative to having private health insurance.

Table 2:   Estimated odds of health insurance coverage and coverage type by migration status among Hispanic and Asian foreign-born adults

	Insurance coverage	Medicaid coverage	No coverage vs private coverage	Public vs private coverage
Hispanic immigrants				
	OR (95% CI)	OR (95% CI)	RRR (95% CI)	RRR (95% CI)
Migration status				
Naturalized citizens	Reference group			
Lawful permanent residents	0.490 (0.475; 0.504)	0.794 (0.754; 0.836)	2.109 (2.032; 2.189)	1.268 (1.188; 1.353)
Legal nonimmigrants	0.691 (0.444; 1.077)	0.667 (0.309; 1.440)	1.139 (0.722; 1.799)	0.706 (0.328; 1.523)
Unauthorized immigrants	0.327 (0.312; 0.343)	0.696 (0.647; 0.749)	3.812 (3.562; 4.080)	2.155 (1.962; 2.368)
Number of observations	14,321,274			
Asian immigrants				
	OR (95% CI)	OR (95% CI)	RRR (95% CI)	RRR (95% CI)
Migration status				
Naturalized citizens	Reference group			
Lawful permanent residents	0.643 (0.620; 0.666)	0.790 (0.735; 0.850)	1.506 (1.447; 1.568)	0.837 (0.780; 0.897)
Legal nonimmigrants	3.198 (2.219; 4.611)	0.150 (0.051; 0.447)	0.242 (0.167; 0.352)	0.127 (0.058; 0.279)
Unauthorized immigrants	0.526 (0.471; 0.587)	0.845 (0.691; 1.034)	2.066 (1.801; 2.371)	1.405 (1.150; 1.716)
Number of observations	6,682,329			

Notes: The second column presents the odds ratio of having health insurance coverage relative to having no health insurance coverage by migration status. Column 3 provides the odds ratio of having Medicaid coverage by migration status. The fourth and fifth columns present the estimated relative risk ratios of having no health insurance coverage or public insurance coverage relative to private coverage by migration status. The first panel provides results for Hispanic immigrants and the second panel for Asian immigrants. Naturalized citizens represent the base group for all models. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. All models were weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source. Abbreviations: OR = odds ratio; RRR = relative risk ratio; CI = confidence interval.
Source: Authors' analyses using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

Similar to trends among all foreign-born adults, Asian LPRs (OR: 0.643) and unauthorized immigrants (OR: 0.526) were less likely to be insured, while legal nonimmigrant Asians were three times more likely (OR: 3.198) to have health insurance coverage compared to Asian naturalized citizens. Among Asian immigrants, LPRs were

more likely to be uninsured, and unauthorized immigrants were more than twice as likely (RRR: 2.066) to be uninsured rather than having private insurance coverage compared to naturalized citizens. Legal nonimmigrants, however, were less likely (RRR: 0.242) to have no insurance rather than private insurance relative to their naturalized citizen counterparts. When examining public versus private coverage, both legal nonimmigrants (RRR: 0.127) and LPRs (RRR: 0.837) were less likely to be covered under public insurance plans relative to their naturalized counterparts. As with unauthorized immigrants in the overall sample and among Hispanic migrants, unauthorized Asian immigrants were more likely to have public health insurance rather than private coverage (RRR: 1.405) relative to their naturalized counterparts.

4.3 Sensitivity checks

To test the sensitivity of our results, we ran our analyses excluding mothers with children less than 1 year old who would have been eligible for emergency Medicaid in some states. When we exclude these respondents, the proportion of unauthorized immigrants with public coverage decreases by only half of a percentage point, from 11.5% to 11%. We also do not find any substantive changes in our main results. Results from these sensitivity analyses are presented in Appendix C.

4.4 Comparing Results to those from the logical approach

We compared our estimates to two studies (Fried et al. 2014; Zuckerman, Waidmann, and Lawton 2011), also using data from 2007–2009, that employed the logical method for assigning migration status. We observed notable differences when comparing our findings to coverage rates estimated using the logical method. In both logical method studies, unauthorized immigrants had lower uninsured rates as well as lower rates of public coverage compared to our estimates produced using CSMI. Using data from the CPS, a US Census Bureau survey of roughly 60,000 US households, Zuckerman, Waidmann, and Lawton (2011) found that 20% of naturalized citizens, 35% of LPRs, and 57% of unauthorized immigrants in the United States were uninsured in 2007. Conversely, 21% of naturalized citizens, 45% of LPRs, and 66% of unauthorized immigrants in our sample were uninsured. While we found that 11.5% of unauthorized immigrants in our study had public insurance, only 7% of the unauthorized in Zuckerman and colleagues' (2011) sample had public coverage and slightly more than a third were covered through private health insurance plans. Similarly, Fried et al. (2014) found that 58% of unauthorized immigrants were uninsured, 36% had private insurance, and 6%

were on public insurance. Among LPRs in Fried et al.'s (2014) study, however, 42% were uninsured, 46% were covered through a private plan, and 11% had public coverage. Consequently, the logical method may bias insurance coverage estimates for the unauthorized and LPRs. As a result, conclusions about the potential impact of the ACA on coverage – when using logically assigned migration statuses – may overstate the benefit of the ACA for LPRs and underestimate the growth in coverage disparities for the unauthorized.

5. Discussion

Using an innovative statistical matching approach and two nationally representative surveys, this study examines health insurance coverage by migration status among the foreign-born population prior to implementation of the ACA. In so doing, we provide revised national estimates of health insurance coverage by migration status that serve as pre-ACA baseline estimates – crucial for subsequent evaluations of the impact of the ACA on disparities between migration status groups. Our results provide evidence of a migration status gradient in health insurance coverage prior to the ACA: Immigrant citizens have the highest rate of any health insurance coverage followed by legal immigrants, with unauthorized immigrants having the lowest insured rate. Unauthorized immigrants are also more likely to lack health insurance or to have public insurance rather than private coverage relative to naturalized citizens. Disparities by migration status were most prominent among Hispanic immigrants, with lawful permanent residents and unauthorized Hispanic immigrants being twice and four times more likely, respectively, to be uninsured rather than to have private coverage compared to Hispanic naturalized citizens.

Our findings using the statistical matching approach are largely consistent with results from studies with geographically limited samples (Goldman, Smith, and Sood 2005; Navarro, Ibarra, and Anglemyer 2017; Ortega et al. 2018) and work using the restricted SIPP (Ro and Van Hook 2021). While our analysis revealed that 21% of naturalized citizens, 45% of LPRs, and 66% of unauthorized immigrants were uninsured, Goldman, Smith, and Sood (2005) found that 23% of naturalized citizens, 38% of permanent residents, and 68% of unauthorized immigrant adults in Los Angeles were uninsured. In California, 52% of the unauthorized were uninsured, compared to 14% and 16% of US-born citizens and naturalized citizens, respectively (Navarro, Ibarra, and Anglemyer 2017). Among Hispanics, we find that 32% of naturalized citizens, 60% of LPRs, and 74% of unauthorized immigrants lack insurance coverage, similar to estimates made by Ro and Van Hook (2021) using restricted SIPP; they show that 31% of

naturalized, 58% of LPR, and 77% of unauthorized immigrant Hispanic adults were uninsured.

We find some differences in coverage rates for particular groups (Goldman, Smith, and Sood 2005; Navarro, Ibarra, and Anglemyer 2017; Prentice, Pebley, and Sastry 2005). Compared to studies in Los Angeles County and California, legal nonimmigrants in our sample have lower uninsured rates and public insurance coverage rates (Goldman, Smith, and Sood 2005), whereas lawful permanent residents have higher uninsured rates (Prentice, Pebley, and Sastry 2005) and lower rates of private and public health insurance coverage (Navarro, Ibarra, and Anglemyer 2017). Unauthorized immigrants in California have also been found to have higher private coverage rates (34.7%) than those in our sample (22.2%; Navarro, Ibarra, and Anglemyer 2017). These differences in coverage rates are possibly driven in part by state-level policies prior to the ACA or differences in the classification of immigrants into various migration status groups. California is one of 23 states that provide coverage to some or all legal immigrants who are ineligible for Medicaid or CHIP as a result of restrictions under the 1996 PROWRA law (Henry J. Kaiser Family Foundation 2004). The state also provides prenatal Medicaid/CHIP coverage regardless of migration status (Kemmick Pintor and Call 2019). Immigrants in California may therefore have a higher coverage rate compared to national averages.

Prior studies focusing on legal status categorized legal nonimmigrants with either lawful permanent residents or unauthorized citizens, or excluded them from the analysis. As is evident from our results, however, this group is not only distinct from other noncitizen migration status groups with respect to socioeconomic characteristics, but it also has high rates of insurance coverage – particularly private coverage. The legal nonimmigrants in our sample were predominately enrolled in tertiary education institutions or employed in professional occupations, which largely accounts for the high insured rate among this group.[13] Additionally, legal nonimmigrants are ineligible for Medicaid, Medicare, and other state-sponsored insurance programs.

The high uninsured rate we identified among unauthorized immigrants before the ACA is particularly concerning, especially considering that unlike LPRs, unauthorized immigrants are ineligible for many provisions under the ACA aimed at increasing insurance coverage rates, such as marketplace plans or tax credits and subsidies. Additionally, while research has shown that being uninsured increases the probability of seeking care in other countries (De Jesus and Xiao 2013), this option may not be feasible for many unauthorized immigrants currently residing in the United States. Unauthorized immigrants' high uninsured rate is likely attributable to their employment patterns and

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[13] Examination of the potential visa categories of legal nonimmigrants in the SIPP revealed that the largest visa categories included student visas (F1), specialty occupation visas (H1B), and intra-company transfer visas (L1), with more than 50% being on student visas. Forty-two percent of legal nonimmigrants with student visas had employer or private health insurance, while 96% and 78.1% of legal nonimmigrants residing in the United States through H1B and L1 visas, respectively, had either employer or private health insurance.

social positions (Henry J. Kaiser Family Foundation 2004; Vargas Bustamante et al. 2014). Though more than 60% of the unauthorized immigrants in our sample were employed, unauthorized immigrants are disproportionally concentrated in low-income jobs with limited health insurance benefits (Henry J. Kaiser Family Foundation 2004; Passel and Cohn 2015). Additionally, unauthorized immigrants may be unable to secure private health insurance due to either limited financial resources or their legal status (Amuedo-Dorantes and Bansak 2006; Vargas Bustamante et al. 2014). Our findings suggest that unauthorized immigrants, despite low rates of public coverage and unlike other migration status groups, may be more likely to utilize public insurance coverage, when permitted, to meet their insurance needs than to utilize private health insurance,[14] highlighting the financial and employment barriers faced to obtain private coverage.

6. Limitations

Despite our contributions to the literature, this study has limitations. Data come from the public-use SIPP files, which limits the precision of measurement of legal status among survey respondents. To improve precision, we employed an algorithm (see Appendix A) that impacted 151 respondents within the non-LPR population. We are therefore confident that any bias in the algorithm is unlikely to change the general pattern of our results. Nevertheless, the direction and magnitude of the bias are unknown. English language proficiency is often used as a covariate in analyses focusing on the foreign-born population. However, at the time our data were collected, the NHIS did not acquire information on the English language abilities of respondents. As a result, we did not control for English proficiency in our analytical models. Some states have special programs that provide health care or health coverage to immigrant groups regardless of legal status. We are unable to control for variation in state-level policies because the public-use NHIS data do not provide information on state of residence. To overcome this shortcoming, we include region of residence as a proxy measure in all analytical models.

7. Conclusion

Previous research assessing the impact of the ACA on health coverage among the foreign-born often employed a logical approach to identify migration status. Recent research,

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[14] In our sample, 12.5% of unauthorized immigrants had public insurance coverage. Examination of our sample revealed that 63% of unauthorized immigrants with public coverage were women, 50% lived in the West, 21% lived in the Northeast, and 67% were part of families with children.

however, highlights that the logical approach introduces bias into estimates of health insurance coverage by legal status (Altman et al. 2021; Ro and Van Hook 2022). To measure migration status in survey data, this study employs an innovative method to disaggregate the US foreign-born population by citizenship and legal status. We present national estimates of health insurance coverage among foreign-born immigrants by citizenship and legal status prior to ACA implementation. Results reveal disparities in insurance coverage that are obscured in studies focused exclusively on variation by citizenship status. We also find higher insured rates and public coverage rates than do studies using the logical approach. Our results highlight the significance of national estimates of insurance coverage by migration status and provide needed baseline data to more precisely estimate the impact of the ACA on migration groups, which may inform policy decisions. Given that researchers predicted that ACA implementation would have done little to attenuate barriers to access among unauthorized immigrants, the stark disparities by migration status we measure may have worsened since 2014 (Sommers 2013). Future studies can build from our findings by employing the CSMI method using large nationally representative data to evaluate the impact of the ACA on disparities in health coverage, health care access and utilization, and health outcomes by migration status.

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Appendix A: Statistical matching procedure: cross-survey multiple imputation (CSMI)

We combined the SIPP and the NHIS into a harmonized dataset using an approach known generally as statistical matching (Conti, Marella, and Scanu 2016; Kaplan and McCarty 2013; Leulescu and Agafitei 2013) or data fusion (Bacher and Prandner 2018; Berchtold and Jeannin 2008; Rässler 2004; Saporta 2002). More specifically, we employ cross-survey multiple imputation (CSMI) following guidelines and conditions outlined by Rendall and colleagues (2013; see also, Dong, Elliott, and Raghunathan 2014; Raghunathan et al. 2007; Raymer, Smith, and Giulietti 2011; Tighe et al. 2010). This approach is advantageous when one sample is relatively small but rich in information (a donor sample) while the other is limited in the amount of information it contains but is larger (the recipient sample). CSMI treats the information measured in the donor sample as missing in the recipient sample, and using standard multiple imputation (MI) models, it creates multiple datasets in which missing information is imputed. Models are then estimated on each imputed dataset, and cross-imputation variation is factored into the calculation of the standard errors in the health insurance outcome models using Rubin's combining rules.

Rendall et al. (2013) highlight two key conditions that must be satisfied to ensure unbiased parameter estimates. The first is that the two samples must be drawn from the same underlying population or same universe. Satisfying this condition ensures that any between-sample differences in the multivariate associations among all variables included in the analysis are due to sampling error rather than to differences in the underlying populations from which the samples were drawn. In Appendix B, we compare estimates of demographic and socioeconomic characteristics of the foreign-born in the 2008 SIPP to their foreign-born peers in the three years of the NHIS. The similarity of the estimates between the two surveys provides an indication that the same-universe assumption underlying the CSMI method is satisfied.

The second condition applies to all applications of MI analyses and holds that all variables used in MI analyses must be jointly observed. Consider a hypothetical scenario involving an outcome, Y, and two independent variables, X and Z, where Z has a non-negligible share of missing data and where the ultimate objective is to estimate the effect of Z on Y, net of X. If the imputation model used to fill in missing data for Z does not include both Y and X, then MI-based estimates of the effects of Z on Y will be biased. Below we return in greater detail to each of these conditions in the specification of the CSMI method in order to perform SIPP-based imputations of legal status among noncitizen respondents in the NHIS. (For a more detailed statistical discussion of the same-universe condition, see Rässler 2004).

Unlike other methods used to impute legal status in US Census surveys – especially variations of the logical method commonly used in contemporary research (Borjas 2017b; Passel and Cohn 2010; Warren 2014) – the CSMI method explicitly adheres to two aforementioned conditions that guard against bias in the estimation of associations between legal status and other variables. Within the CSMI framework, it is possible to assess this bias using simulations in which these conditions are violated. Research by Van Hook and colleagues (2015) has shown that logical imputation methods are prone to substantial bias, so much so that logical imputation may produce legal status effects that are different in magnitude, and in some cases sign, than the 'true' parameter estimates of the effects.

A SIPP-based CSMI approach to imputing legal status in the NHIS

The methodological objective of the manuscript is to combine the SIPP and NHIS into a single, harmonized dataset in order to estimate the association between legal status and health coverage. The same-universe condition is met by the fact that the two samples are both collected by the US Census Bureau using the bureau's sampling frames and are designed to be representative of the civilian US household population.

The second assumption, of joint observation, requires more discussion. First, multiple imputation (MI) methods have become widely used for handling missing data within a given survey sample or dataset, given the increased availability of statistical software packages that now allow users to perform MI relatively easily as a stage in their analyses. This condition is analogous to the ubiquitous practice in within-sample MI methods and ensures that imputed values are always based on observed relationships among variables used in the imputation model. In practice, this means that the association between any two variables must always be observed in the data to be included in the imputation model. Violation of the joint observation rule can greatly increase the risk of bias in estimating population-level outcomes (Van Hook et al. 2015). All the imputation models estimated for this paper strictly adhere to the condition of jointly observed variables in the imputation model.

Step 1: Edits to the public-use SIPP: legal nonimmigrant (LNI) status

The public-use version of the SIPP does not permit differentiation between unauthorized immigrants and legal nonimmigrants based on responses to immigrant legal status questions alone. Therefore we employ a simple algorithm – introduced by Passel and colleagues (2006) – that assigns legal nonimmigrant status to respondents based on sets of characteristics that align with specific temporary visa categories, such as

employment status, occupation, duration of residence in the United States, and school enrollment. Other LNI status assignments were based on information about temporary visas for diplomats, students, exchange visitors, nurses, intra-company transfers, employees of international organizations, religious workers, athletes/entertainers, and au pairs.

Step 2: Pooling and harmonizing the samples

The next step involved combining the two samples and then constructing a set of common variables that were coded harmoniously. We identified all possible common indicators and harmonized the coding in order to run the pooled imputation models described in step 4. Fortunately, given that both surveys are Census Bureau surveys, many of the common measures are identical or can be made to be identical through recoding.

Step 3: Normalizing the person weights

After combining the two samples of foreign-born respondents, the sum of the person weights – the number of people in the US population the respondents represent – was approximately twice the size of the US foreign-born population. We therefore adjusted each respondent's person weight so that the sum of all weights in the combined sample was approximately equal to the US foreign-born population in 2008.

Step 4: Specifying the imputation models

In specifying our imputation models, we used multiple imputation with chained equations (MICE) and adhered to the best practices and rules now firmly established in the MI literature (Lee et al. 2016). Our models included four legal status variables – naturalized, LPR at arrival, LPR adjustee, and legal nonimmigrant – and all variables used in our analytical models. In addition, to help predict the missing information for our main variables of interest, we used age squared, number of children in household, household size, years of education squared, years in the United States, and region of birth, as well as indicators for whether respondents had an LPR, US-born, naturalized, or noncitizen spouse and whether they received food stamps or Social Security income as auxiliary variables. Some of the auxiliary variables also had missing data, which were imputed during the imputation process. We carried out multiple imputation using 50 imputed datasets and included adjusted weights.

Step 5: Specifying the estimation models

All analyses were conducted using STATA 15. We used the MI ESTIMATE: PROPORTION command in Stata with relevant weights to estimate descriptive statistics for the study sample. To test differences of means between naturalized citizens and other migration status groups, we ran MI ESTIMATE: REGRESS. All logistic regression and multinomial logistic regressions analyses were performed using the MI ESTIMATE, OR: LOGISTIC and MI ESTIMATE, RRR: MLOGIT commands, respectively, and we used our adjusted person weights to ensure that estimates were representative of the US foreign-born population. All analytical models controlled for key demographics and socioeconomic characteristics, health status, geographical residence, and survey source.

Appendix B: Comparisons of descriptive statistics in the 2008 SIPP and the 2007–2009 NHIS

Table B-1: Descriptive statistics of US-born and foreign-born populations aged 15 years and older in the SIPP and NHIS

	US-born		Foreign-born	
	SIPP	2007–2009 NHIS	SIPP	2007–2009 NHIS
Region				
Northeast	18.38	17.64	18.99	19.33
Midwest	23.59	25.05	11.91	11.93
South	37.15	37.19	32.56	30.96
West	20.88	20.11	36.54	37.79
Male	48.23	48.12	49.66	50.08
Age				
0–17	5.85	5.9	2.45	2.45
18–24	12.54	12.58	9.19	9.91
25–33	15.9	15.81	22.15	22.43
35–44	16.14	16.37	23.83	23.43
45–54	18.42	18.41	19.03	18.82
55+	31.16	30.93	23.35	22.97
Race				
Non-Hispanic White	75.35	77.4	25.72	20.97
Non-Hispanic Black	11.7	12.81	9.06	7.56
Hispanic	8.93	7.45	44.05	48.65
Asian	1.17	1.34	19.52	22.21
Other race	2.84	0.99	1.65	0.6
Marital status				
Married, spouse present	49.6	50.6	57.36	60.1
Married, spouse absent	0.98	0.71	3.56	3.07
Widowed	5.98	5.85	4.92	4.41
Divorced	10.76	8.36	7.04	5.35
Separated	1.71	1.76	2.83	2.68
Never married	30.97	32.72	24.28	24.39
Highest education level				
Less than high school	14.25	17.24	28.38	33.13
High school	26.1	28.72	25.02	21.63
Some college	34.59	29.2	22.4	18.66
BSc or more	25.07	24.84	24.2	26.58
Family type				
One adult, no children	14.49	17.29	8.83	11.53
Multiple adults, no children	47.68	44.02	41.67	35.7
One adult, 1+ child	10.07	4.02	10.67	2.74
Multiple adults, 1+ child	27.77	34.67	38.82	50.03
Minor children present in family	37.83	38.75	49.49	52.87
Owns home	72.74	72.17	54.41	55.46

Table B-1:   (Continued)

	US-born		Foreign-born	
	SIPP	2007–2009 NHIS	SIPP	2007–2009 NHIS
Household size				
1	14.49	17.29	8.83	11.53
2	34.11	33.62	23.53	22.09
3	19.25	18.38	19.39	18.8
4	17.31	17.32	19.74	21
5	8.56	8.26	13.55	13.24
6	3.74	2.99	6.95	7.19
7	1.36	1.22	3.82	3.13
8	0.54	0.45	1.74	1.38
9	0.33	0.22	0.96	0.86
10	0.17	0.15	0.6	0.34
11	0.06	0.08	0.5	0.13
12	0	0.01	0.27	0.18
13	0.03	0	0.05	0.03
14	0.01	0.01	0.07	0.08
15	0.03	0.00	0	0.01
Employment status				
Employed	61.07	60.45	62.86	64.02
Unemployed	4.22	3.95	5.5	4.87
Not in labor force	34.71	35.61	31.64	31.11
Class of worker				
Public employee	16.75	18.14	8.79	10.41
Private employee	71.89	72.95	78.67	79.44
Self-employed	11.36	8.9	12.54	10.15
Receives SSI	2.79	2.24	3.15	2.16
Receives SNAP	9.36	5.56	11.1	4
Poor	12.89	11.16	20.95	18.55
Type of insurance				
Not covered	14.11	13.43	36.08	33.87
Medicare	18.63	18.29	11.58	11.23
Medicaid	7.36	5.82	8.46	6.81
Employer/union	53.18	45.99	38.37	34.11
Military	1.45	1.86	0.67	1.18
Privately purchased	4.54	13.1	4.2	10.81
Other	0.74	1.51	0.64	1.98
Self-rated health				
Excellent	24.86	30.38	21.99	30.12
Very good	34.05	31.8	33.94	28.78
Good	27.56	25.68	31.32	29.97
Fair	10.31	9.02	9.87	8.67
Poor	3.21	3.12	2.88	2.46
Has a work limitation or disability	12.96	12.54	7.23	5.99
N	67,217	144,667	10,530	39,446

Note: Models weighted using survey weights to be representative of the US population.
Source: Authors' analysis of the 2008 SIPP and the 2007–2009 NHIS.

Appendix C: Results from sensitivity analyses

Table C-1: **Estimated odds of health insurance and Medicaid coverage, and coverage type by migration status among foreign-born adults, excluding mothers of children less than 1 year old**

	Insurance coverage	Medicaid coverage	No coverage vs private coverage	Public vs private coverage
	OR (95% CI)	OR (95% CI)	RRR (95% CI)	RRR (95% CI)
Naturalized citizens	Reference group			
Lawful permanent residents	0.572 (0.559; 0.585)	0.820 (0.789; 0.853)	1.767 (1.726; 1.808)	1.101 (1.044; 1.162)
Legal nonimmigrants	1.494 (1.241; 1.798)	0.535 (0.384; 0.744)	0.511 (0.423; 0.617)	0.369 (0.238; 0.570)
Unauthorized immigrants	0.378 (0.363; 0.394)	0.671 (0.620; 0.726)	3.166 (3.004; 3.336)	1.833 (1.689; 2.098)
Number of observations	29,383,686			

Notes: The second column presents the odds ratio of having health insurance coverage relative to having no health insurance coverage by migration status. Column 3 provides the odds ratio of having Medicaid coverage by migration status. The fourth and fifth columns present the estimated relative risk ratios of having no health insurance coverage or public insurance coverage relative to having private coverage by migration status. Naturalized citizens represent the base group for all models. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. All models were weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source. Abbreviations: OR = odds ratio; RRR = relative risk ratio; CI = confidence Interval.
Source: Authors' analyses using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

Appendix D: Results from main analyses

Table D-1: Estimated odds ratio of health insurance coverage and Medicaid coverage by migration status

	(1) Insurance coverage	(2) Medicaid coverage
	OR (95% CI)	OR (95% CI)
Naturalized citizens	Reference group	
Lawful permanent residents	0.570 (0.558; 0.583)	0.816 (0.787; 0.846)
Legal nonimmigrants	1.474 (1.238; 1.755)	0.515 (0.369; 0.720)
Unauthorized immigrants	0.381 (0.365; 0.397)	0.681 (0.633; 0.732)
N	42,506	

Notes: The table presents the odds ratio of having health insurance coverage relative to having no health insurance coverage (model 1) and the odds of having Medicaid coverage (model 2) by migration status among all foreign-born adults. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. Naturalized citizens were the base group. Models were weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source.
Source: Authors' analysis using pooled data from the 2008 SIPP and the 2007–2009 NHIS.

Table D-2: Estimated relative risk ratio of health insurance type by migration status

	No coverage vs private coverage	Public vs private coverage
	RRR (95% CI)	RRR (95% CI)
Naturalized citizens	Reference group	
Lawful permanent residents	1.765 (1.725; 1.806)	1.089 (1.037; 1.144)
Legal nonimmigrants	0.506 (0.423; 0.605)	0.349 (0.228; 0.533)
Unauthorized immigrants	3.149 (2.988; 3.318)	1.862 (1.678; 2.065)
N	42,506	

Notes: The table presents the relative risk ratio of having no health insurance coverage relative to private coverage (column 2) and having public insurance coverage relative to private coverage (column 3) by migration status among foreign-born adults. Naturalized citizens represent the base group. The sample is limited to US foreign-born adults aged 19–64 without Medicare coverage. All models were weighted to be representative of the US foreign-born population and controlled for age, sex, marital status, educational attainment, family type, employment status, home ownership, ratio of family income to poverty level, health status, whether the respondent had a work limitation, region of residence, and survey source.
Source: Authors' analysis using pooled data from the 2008 SIPP and the 2007–2009 NHIS.