Selection, experience, and disadvantage: Examining sources of health inequalities among naturalized US citizens

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ABSTRACT

Objectives: We integrated major theories in immigrant health and assimilation into a single analytical framework to quantify the degrees to which demographic composition, pathways to citizenship, and socioeconomic assimilation account for physical and mental health disparities between naturalized immigrants by region of origin.
Methods: Using the restricted data from the 2015–2016 California Health Interview Survey, we decomposed differences in physical and mental health into demographic factors, path to citizenship, and socioeconomic characteristics by region of origin using the Karlson, Holm, and Breen (KHB) method.
Results: Differences in socioeconomic status mediated most of the disparity in physical health between naturalized immigrants from different regions. Factors associated with major immigrant health theories—demographic composition, pathways to citizenship, and socioeconomic assimilation—did not mediate disparities in mental health.
Conclusion: This article argues that the study of health disparities among immigrants must simultaneously account for differences in demographic composition, immigration experience, and socioeconomic disadvantage. The findings also underscore the need for theory development that can better explain mental health disparities among immigrants.

1. Introduction

Almost 45 million foreign-born immigrants are living in the United States, accounting for about 14 percent of the US population (Budiman, 2020). Half of the 45 million foreign-born are naturalized US citizens, with more than 700,000 immigrants becoming citizens each year (DHS, 2020). Researchers have studied the health of immigrants not only as a distinct group (Castañeda et al., 2015) but also as future American citizens (Hummer, Benjamins, & Rogers, 2010, pp. 53–94), paying attention to emerging health disparities between immigrants from different parts of the world (Reynolds, Chernenko, & Read, 2016). Scholars have often attributed disparities to individual health behaviors invoking cultural norms and practices that immigrants bring from their home regions (Lara, Gamboa, Kahramanian, Morales, & Hayes Bautista, 2005; Viruell-Fuentes, Miranda, & Abdulrahim, 2012). However, culture-driven explanations of health disparities risk ethnic stereotyping, diminishing the role of structural determinants, and sidestepping

the responsibility to achieve health equity (Hunt, Schneider, & Comer, 2004; Viruell-Fuentes, 2007; Zambrana & Carter-Pokras, 2010). Instead, this article focuses on social determinants attributed to health disparities among immigrants that can inform actionable policies and better channel resources towards public health campaigns, immigration reform, and safety-net programs.

We examined major factors from immigrant health and assimilation theories simultaneously in a single analytical framework. We focused on three potential sources of enduring health inequities—demographic composition, differential pathways to citizenship, and segmented assimilation into socioeconomic statuses—that immigrants may encounter as they enter the American population. We begin by drawing upon the healthy immigrant effect literature that attributes better health among immigrants to demographic advantage and positive selection (Goldman et al., 2014). Variation in the migration and naturalization experience contribute to disparate health trajectories (Finch, Frank, & Vega, 2004; Hall & Greenman, 2015), and as immigrants assimilate to

American society as citizens, they become subject to the health inequities borne from unequal social conditions (Andrasfay & Goldman, 2020; Phelan, Link, & Tehranifar, 2010).

We employed an analytical approach that follows the tradition of inequality scholars that decomposed socioeconomic outcomes into direct and indirect effects of social factors including class (Boudon, 1974), family resources (Deindl & Tieben, 2017), and neighborhood environment (Bygren & Szulkin, 2010). Using the California Health Interview Survey (CHIS) restricted data, we quantified direct and indirect pathways through which demographic characteristics, the naturalization process, and socioeconomic disadvantage explain health disparities between naturalized US citizens who migrated from different parts of the world. The restricted CHIS collects highly sensitive immigration information along with a broad range of demographic, socioeconomic, and health data from a population-representative sample of California—home to more than 5.5 million naturalized citizens (Migration Policy Institute, 2018).

2. Background and theory

While Mexican Americans comprise the plurality of immigrants in the US, a growing proportion of immigrants were born in other parts of the world (Pew Research, 2013). In 2018, 28 percent of the US foreign-born population were from Asia, 25 percent were from Mexico, and another 25 percent were from other Latin American countries (Budiman, 2020). Accordingly, immigrant health research has expanded its focus from the Latino/as and Mexican Americans to subpopulations from Asia (Frisbie, Cho, & Hummer 2001; Son, 2013), Africa (T. G. Hamilton & Hummer, 2011), and the Middle East (Read, Amick, & Donato, 2005; Read & Reynolds, 2012). These studies, however, have primarily focused on immigrants from one region. Relatively few studies have examined health disparities between immigrants from different global regions simultaneously (Reynolds et al., 2016). Two studies that examined differences between immigrants from different global found that immigrants from Mexico reported lower self-rated health than immigrants from other regions (Akresh & Frank, 2008; Ro, Fleischer, & Blebu, 2016). Although self-rated health is a valuable measure in examining a person's overall holistic health, it captures only one dimension of health and may be limited in its utility when translated into different languages (Santos-Lozada & Martinez, 2018). Evaluating health disparities across immigrant groups is critical in recognizing the diversity in an immigrant population of 45 million as well as understanding common factors that may drive health inequities. Our work contributes to this literature by examining factors that may produce health inequities among immigrants: demographic composition, differential time to citizenship, and socioeconomic inequalities. Our work also examines an expanded range of health outcomes, including obesity and psychological distress in addition to self-rated health.

2.1. Demographic composition

Health researchers have documented better health among immigrants despite their socioeconomic disadvantage compared to non-immigrant natives (Rosenwaike, 1987; Turra & Goldman, 2007). Several selection effects account for this "paradoxical" pattern. Healthier people are more likely to move to a different country (Goldman et al., 2014), and immigrants who encounter poor health may decide to return to their home countries (Turra & Elo, 2008). Immigrants in the US tend to be younger on average and are more likely to live with family members than the native population—factors associated with better health (Crimmins & Saito, 2001; Goldman, Korenman, & Weinstein, 1995; Waite, 1995). Together, they contribute to the healthy immigrant effect (HIE) (Ichou & Wallace, 2019), which diminishes in size and significance, the longer the immigrant lives in the US (Antecol & Bedard, 2006; Riosmena, Wong, & Palloni, 2013). Thus, differences in demographic composition and average time in the US may also contribute

to health disparities between immigrants from different regions.

2.2. Pathways to citizenship

Stressful experiences of migration and assimilation may be detrimental to immigrants' health, and they may erode any health advantages that they may have had before moving to the US (Cornelius, 2001; Finch & Vega, 2003; Goldman et al., 2014; Massey, 2010). The varied experiences of emigrating to the US and becoming citizens may contribute to health disparities between immigrants from different regions. Notably, scholars have identified immigrants' liminal legal status as a risk for poor health outcomes (Hacker, Anies, Folb, & Zallman, 2015; Oropesa, Landale, & Hillemeier, 2016; Perreira & Pedroza, 2019); immigrants that do not have full citizenship face exclusion from public safety-net programs (Joseph, 2017), discrimination in the workplace (Strully, Bozick, Huang, Lane, & Burgette, 2019), and psychological distress from uncertainty and harassment (Hacker, Chu, Arsenault, & Marlin, 2012; Philbin, Flake, Hatzenbuehler, & Hirsch, 2018). Obtaining citizenship is often a lengthy and expensive process (Capps & Echeverria-Estrada, 2020), and most immigrants endure multiple years and even decades living in the US without the full benefits and rights of a citizen (Sumption & Flamm, 2012). In the US, an immigrant with permanent residency can generally apply to naturalize after five years. However, the path to US citizenship varies widely, with large differences by immigrants' region of origin. On the lower end, immigrants from Africa spent about six years on average as legal permanent residents before naturalizing to become citizens. Immigrants from North America, including Mexico and Central American countries, spent about 11 years on average as legal permanent residents before becoming US citizens (Teke, 2019). These differences in time can be due to several factors, including the processing time for one's naturalization application and the reapplication process for a visa (i.e., for those who adjust from a temporary to permanent residence visa). Such disparities in time to naturalization may contribute to health disparities. Immigrants who spend more time in liminal legal states may accumulate more health disadvantages that persist even after becoming citizens.

2.3. Segmented assimilation by socioeconomic status

Assimilation into American society is accompanied by integration into the unequal power structure that Link and Phelan (1995) posited as a "fundamental cause" of disease and illness. As naturalized citizens, immigrants continue to encounter barriers to care, discrimination in health systems and heightened health risks stemming from socioeconomic disadvantage (Elo & Preston, 1996; Lleras-Muney, 2005; Meara, Richards, & Cutler, 2008; Montez, Hummer, & Hayward, 2012; Olshansky et al., 2012; H.; Sohn, 2017). Inequities associated with socioeconomic differences among immigrants translate to inequities as naturalized citizens. Studies have observed socioeconomic gradients in health among immigrants from the same country or region (Goldman, Kimbro, Turra, & Pebley, 2006; Li & Hummer, 2015). Similarly, differences in socioeconomic endowment may account for health disparities between immigrants from different regions.

Taken together, the variability across the three domains—demographic composition, pathways to citizenship, and socioeconomic assimilation— is likely to exert complex influences on inequities between immigrants from different regions. Asian immigrants tend to be older than immigrants from Mexico and Latin America when arriving in the US, and poor health and chronic conditions may be more prevalent. At the same time, Asian immigrants have lived fewer years in the US on average, which may offer health advantages compared to same-aged immigrants from other regions (Mizoguchi, Walker, Trevelyan, & Ahmed, 2019). The degrees to which demographic composition shapes health differences between people from Asia and Mexico are not clear-cut. Naturalization and socioeconomic factors suggest that immigrants from Asia may have better health outcomes than immigrants from

Mexico when demographic factors are controlled. Faster time to naturalization, higher levels of educational attainment, and higher average incomes among Asian immigrants may contribute to better health outcomes compared to immigrants from Mexico and Central America (Budiman, 2020). Like Asian immigrants, speedier naturalization and more socioeconomic resources among people from Europe and Africa likely contribute to their better health status when compared to people from Mexico (Teke, 2019). However, health advantages may be muddied by their older ages and longer residence in the US. Immigrants from Mexico are younger on average and more likely to be male than immigrants from other Latin American countries, which may contribute to better health. This demographic advantage may mask the full negative impact of lengthy transitions to citizenship and relative socioeconomic disadvantage. Differentiating and quantifying how opposing factors contribute to health differences among immigrants directs researchers towards modifiable sources of inequity in the immigration experience.

3. Data

Data for this analysis come from the restricted version of the 2015–2016 California Health Interview Survey (CHIS). The CHIS is one of the few large population-representative surveys that collected detailed information on the immigration and naturalization process. The survey also takes care to include hard-to-reach immigrant populations (California Health Interview, 2017). More than a quarter of California's population is foreign-born, and its immigrant population is one of the most diverse in the US (Public Policy Institute of California, 2019). We restricted our sample to naturalized immigrant adults aged 18 and above (n = 4717), and our analyses were weighted to represent the naturalized population in California. We opted to focus on naturalized citizens 1) to limit the confounding effect of current immigration status on health, 2) to examine health disparities associated with the naturalization process, and 3) to study the process of stratification as immigrants become permanent members of the US population.

3.1. Health outcomes

We examined eight health outcomes: self-rated fair/poor health, severe psychological distress within the past 30 days, the likelihood of having any chronic condition, diabetes, high blood pressure, heart disease, and asthma. Following previous studies, we operationalized self-rated poor health as 0 = Excellent/Very Good/Good and 1 = Fair/Poor (Abuelezam, El-Sayed, & Galea, 2019; Bakhtiari, Olafsdottir, & Beckfield, 2018; La Parra-Casado, Stornes, & Solheim, 2017). We evaluated the likelihood of severe distress using the Kessler-6 (K6) Psychological Distress scale. The scale ranges from 0 to 24, which increases with greater psychological distress. We used a score greater than 13 to indicate whether participants had severe psychological distress in the past 30 days (Kessler et al., 2003). Having "any chronic condition" was determined by examining if participants indicated if they had diabetes, high blood pressure, heart disease, congestive heart failure (CHF), or asthma. While we included CHF in our chronic condition variables, we did not report it separately as it yielded unstable estimates due to its low prevalence rate.

3.2. Independent variable

We coded the primary variable of interest, "region of origin," based on each respondent's country of birth. CHIS originally coded birth regions into seven categories: United States (and associated territories), Mexico, Central America, Latin America, Asia and the Pacific Islands, Europe, and "other countries." Our analysis excluded all people born in the US and categorized region of origin into the following categories: Mexico, Central and Latin America, Asia and the Pacific Islands, and other regions, which include Europe. We separated Mexico as a distinct group because it represents the most populous and most studied

immigrant population in the US. Immigrants from Mexico also served as the reference group in our multivariable regression analyses. We combined immigrants from Central America with immigrants from Latin America to account for their small sample sizes.

3.3. Covariates

We examined three sets of mediating factors that could explain the association between health and region of origin: demographic selection, pathways to citizenship, and socioeconomic assimilation. Our demographic selection factors included: age, age-squared, the number of years lived in the US, years lived in the US-squared, gender (male and female), and marital status (married or living with a partner, widowed/separated/divorced, and never married). We used participant's time to naturalization to operationalize "pathways to citizenship." We calculated time to naturalization from two variables: the number of years the respondent had lived in the United States and the number of years the respondent had been a naturalized citizen. We then applied a log transformation to allow for the variable to be normally distributed. Finally, we used socioeconomic characteristics to capture the potential disadvantage that respondents faced at the time of the survey. Socioeconomic factors included educational attainment (less than high school, high school graduate, some college or vocational school, and college graduate and above) and the percentage that the participant is above the Federal Poverty Level (FPL) (0–99% FPL, 100–199% FPL, 200–299% FPL, 300+% FPL). In addition, to account for differences in chronic conditions stemming from differential access to health care (E. R. Hamilton, Hale, & Savinar, 2019; Villarejo et al., 2010), we also included a variable to indicate whether the respondent had a usual source of care other than an emergency room.

4. Analytical approach

Our analytical approach clarifies the roles of demographic composition, pathways to citizenship, and segmented assimilation by socioeconomic status in the relationships between immigrants' health and their regions of origin. The first set of analyses examined health disparities between immigrants from different regions by regressing each health outcome on their region of origin. Naturalized citizens from Mexico served as the reference group in the regression models. Not only do people from Mexico comprise the largest immigrant population in California, but the migration flow from Mexico to the US has long been the largest in the world (Budiman, 2020; Public Policy Institute of California, 2019). Data collection efforts and research on immigrant health are substantially developed for migrants from Mexico, and we describe variation in health by region of origin against this baseline.

Differences in composition and endowment may account for health differences distinct from regional effects on health. We examined four models that progressively included more variables to account for differences in composition and endowment. Model 1 examined the bivariate association between health and region of origin. Model 2 included factors that accounted for demographic selection. Model 3 built upon Model 2 and added time to naturalization, an indicator for the pathway to citizenship. Model 4 added socioeconomic factors to Model 3. We used Model 4, which includes the full set of covariates, to conduct the decomposition analyses.

Our second set of analyses quantified the extent to which demographic selection, pathways to citizenship, and socioeconomic assimilation explain health disparities by immigrants' regions of origin. We examined the three potential pathways as being simultaneously associated with regions of origin and health (Model 4) and applied the Karlson, Holm, and Breen (KHB) method to decompose the overall association to health into direct and indirect effects. While the original framework implies causal pathways (Freedman, 2009), we interpret the models as essentially quantifying the degrees to which observed differences in composition mediated health disparities between immigrants

from different regions. Unlike other decomposition analyses that are restricted to linear regressions, the KHB method can be used for non-linear models, including logistic regressions. Previous studies have successfully used KHB decomposition on binary health outcomes (Bacong & Sohn, 2020; Harnois & Bastos, 2018). We report Average Partial Effects (APE), which corresponds to the direct contribution of mediators (demographic, naturalization, and socioeconomic factors) on each health outcome.

5. Results

5.1. Differences in health, demographic factors, time to naturalization, and socioeconomic factors by region of origin

Table 1 presents the univariate and bivariate distributions of health, demographic characteristics, time to naturalization, and socioeconomic status by immigrants' regions of origin.

Health by region of origin Unadjusted prevalence of poor physical health was highest among immigrants from Mexico compared to people from other regions. Almost 23 percent of immigrants from Mexico reported having diabetes, compared to about 15 percent of people from Central or other Latin America, 11 percent of people from Asia or the

Pacific Islands, and 9 percent of people from Europe or other regions. Rates of obesity reflected regional patterns in diabetes; over 41 percent of immigrants from Mexico were obese. Immigrants from Mexico were also more likely to rate their health as poor or fair (42 percent) compared to immigrants from other regions. While Mexican immigrants had elevated levels of high blood pressure, heart disease, and asthma, regional differences in these conditions were not as pronounced as obesity and diabetes, and the differences were not statistically significant. In contrast to reports of physical health, immigrants from Mexico had lower rates of severe psychological distress than immigrants from other Central/Latin America, Asia, and the Pacific Islands. While the difference was not statistically significant at the 0.05 alpha level, about 6 percent of immigrants from Central and Latin America reported severe psychological distress, which was about twice as high as the prevalence among immigrants from other regions. The health differences by region in Table 1 likely reflect compositional differences in immigrants' profiles in demographic composition, time to naturalization, and socioeconomic status.

Demographic characteristics by region of origin People from Europe and other regions were the oldest among immigrant groups on average (56 years), while people from Asia or the Pacific Islands were the youngest (50 years). Immigrants had lived in the US on average for

Table 1
Characteristics of naturalized immigrants' region of origin (n = 4717).

	Full Sample (n = 4717)	Mexico Only (n = 1358)	Central or Other Latin America (n = 477)	Asia or Pacific Islands (n = 2096)	Europe or Other Region (n = 786)	p-value
Health Outcomes						
Fair or poor health (%)	27.69	41.49	28.54	21.54	11.56	<0.0001
Severe distress in the past 30 days (%)	3.23	2.62	5.77	3.4	1.51	0.1076
Any Chronic Condition (%)	45.97	53.86	41.48	42.47	42.15	0.0313
High Blood Pressure (%)	33.44	39.42	32.98	30.06	30.22	0.1461
Heart Disease (%)	6.6	8.06	5.16	5.23	9.48	0.1322
Diabetes (%)	14.8	22.8	14.89	10.53	8.69	0.0003
Obesity (%)	25.76	41.31	35.92	12.75	21.89	<0.0001
Asthma (%)	9.61	9.53	8.56	10.32	8.09	0.8444
Demographic Factors						
Age (mean, SD)	52.36 (0.44)	53.18 (0.82)	53.83 (1.59)	50.44 (0.79)	56.08 (1.22)	0.003
Years lived in the U.S. (mean, SD)	30.66 (0.45)	33.43 (0.63)	32.13 (1.06)	26.69 (0.70)	36.94 (1.30)	<0.0001
Male (%)	46.26	47.79	42.18	44.97	51.74	0.452
Marital status (%)						0.0009
Married or living with partner	69.24	70.43	60.19	72.23	63.8	
Widowed/separated/ divorced	17.86	19.68	27.05	11.87	26.53	
Never Married	12.9	9.89	12.76	15.9	9.68	
Pathway to Citizenship						
Years to naturalization (mean, SD)	13.06 (0.35)	17.73 (0.65)	15.37 (0.52)	9.38 (0.37)	11.79 (0.65)	<0.0001
Sociodemographic Characteristics						
Educational attainment (%)						<0.0001
Less than high school	26.14	54.69	34.71	9.02	2.97	
High school graduate/GED	16.75	20.64	17.39	14.59	13.45	
Some college/AA/ vocational school	15.88	13.75	23.1	14.95	17.78	
Bachelor's degree and above	41.24	10.92	24.81	61.44	65.79	
Poverty Level (%)						<0.0001
0–99% FPL	17.03	23.92	20.58	13.59	7.03	
100–199% FPL	24.12	35.53	28.85	18.27	9.5	
200–299% FPL	14.54	21.44	15.92	10.48	9.4	
300+% FPL	44.31	19.12	34.65	57.66	74.07	
Usual source of care other than ED (%)	85.83	84.2	85.28	86.29	89.23	0.6847

Values are weighted to represent the non-institutionalized population of California. Analysis is restricted to naturalized immigrant adults. p-values are derived from chi-squared tests. Data source: Restricted data from the California Health Interview Survey 2015–2016 (n = 4717).

about 30 years, with statistically significant differences by region of origin (p < 0.0001). People from Europe or other regions had lived in the US the longest (almost 37 years), whereas people from Mexico or Central/other Latin America had lived in the US for about 33 years. People from Asia or the Pacific Islands had lived in the US for about 27 years. There are also significant differences by region of origin by marital status (p = 0.0009). People from Asia or the Pacific Islands had the highest proportion of people who were married or living with their partner (72 percent), followed by people from Mexico (70 percent) and people from Central or Other Latin America (60 percent).

Time to naturalization by region of origin People from Asia or the Pacific Islands had the shortest time to naturalization (9 years), followed by people from Europe or other regions (12 years), and people from Central or Latin America (15 years). People from Mexico had the longest average time to naturalization (18 years).

Socioeconomic status by region of origin Forty-one percent of the overall naturalized sample had at least a bachelor's degree, and the data shows significant differences by region of origin. About 11 percent of people from Mexico and about 25 percent of people from Central and Latin America had a bachelor's degree. In comparison, about 61 percent of people from Asia and the Pacific Islands and about 66 percent of people from Europe or other regions had a bachelor's degree. The data showed a similar trend for the poverty level. About 44 percent of the sample had incomes that were more than 300 percent above the federal poverty level (FPL). Only about 19 percent of people from Mexico had incomes above 300 percent FPL. Incomes among people from Central or other Latin America were somewhat higher, with about 35 percent above 300 percent FPL. Fifty-eight percent of immigrants from Asia and the Pacific Islands and 74 percent of immigrants from Europe and other

regions had incomes above 300 FPL. Despite the variation in educational attainment and poverty level between immigrants from different regions, the proportion of immigrants with a usual source of care other than the emergency department was not significantly different across groups. This likely reflects California's relatively numerous safety-net health clinics as well as the fact that all the immigrants in our sample are US citizens (Mcconville, 2013).

5.2. Contribution of demographic, naturalization, and socioeconomic factors in health disparities by region of origin

Table 2 presents the abbreviated multivariable binary logistic regression of the eight health outcomes on respondents' regions of origin. Table 3 presents the KHB decomposition results on the relationship between regions of origin and health based on the regressions in Table 2. Table 3 reports the APE derived from the KHB decomposition. The APE is interpreted as the degree to which a set of factors mediates the relationship between regions of origin and health. For example, a 30 percent APE implies that 30 percent of the health difference is explained by mediating factors alone. Negative APE percentages indicate that the mediating factors are associated in the opposite direction. Percentages over 100 percent indicate that the mediators have a larger effect on the health outcome than the region of origin.

Immigrants from Central and Latin America. In the unadjusted model (Table 2, Model 1), people from Central or Latin America had lower odds of having poor self-rated health (OR = 0.56, 95% CI: 0.32, 0.99) and having any chronic condition (OR = 0.61, 95% CI: 0.39, 0.96) compared to people from Mexico. People from Central or Latin America also had marginally lower odds of diabetes (OR = 0.59, 95% CI: 0.33,

Table 2
Multivariable binary logistic regression of health outcomes by region of origin.

Region (Mexico ref.)	Model 1 - Unadjusted		Model 2 - Region + Demographic Factors		Model 3 - Region + Demographic Factors + Pathway to Citizenship		Model 4 - Region + Demographic Factors + Pathway to Citizenship + Socioeconomic Factors	
Central or Other Latin America	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Self-Rated Poor Health	0.56*	0.32–0.99	0.48*	0.27–0.87	0.49*	0.27–0.89	0.66	0.36–1.21
Distress	2.28*	1.08–4.78	2.23*	1.04–4.76	2.27*	1.06–4.88	2.56*	1.19–5.53
Obesity	0.80	0.45–1.41	0.81	0.47–1.39	0.81	0.47–1.39	0.92	0.52–1.62
Any Chronic Condition	0.61*	0.39–0.96	0.55*	0.34–0.87	0.55*	0.35–0.88	0.57*	0.35–0.94
Diabetes	0.59+	0.33–1.07	0.59+	0.32–1.08	0.61	0.33–1.12	0.63	0.34–1.17
High Blood Pressure	0.76	0.47–1.21	0.70	0.42–1.17	0.71	0.43–1.17	0.75	0.44–1.30
Heart Disease	0.62	0.28–1.39	0.64	0.27–1.48	0.66	0.28–1.54	0.55	0.20–1.47
Asthma	0.89	0.47–1.68	0.89	0.45–1.77	0.89	0.45–1.78	0.82	0.40–1.66
Asia and the Pacific Islands	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Self-Rated Poor Health	0.39***	0.27–0.56	0.38***	0.26–0.56	0.42***	0.29–0.61	1.15	0.69–1.91
Distress	1.31	0.61–2.80	1.29	0.59–2.82	1.46	0.66–3.21	2.14+	0.90–5.09
Obesity	0.21***	0.14–0.30	0.23***	0.15–0.34	0.23***	0.15–0.35	0.33***	0.21–0.52
Any Chronic Condition	0.63**	0.46–0.87	0.71+	0.48–1.06	0.76	0.50–1.17	0.85	0.54–1.34
Diabetes	0.40***	0.23–0.68	0.44**	0.24–0.80	0.49*	0.25–0.95	0.58	0.29–1.16
High Blood Pressure	0.66*	0.46–0.94	0.75	0.50–1.13	0.77	0.49–1.20	0.94	0.60–1.46
Heart Disease	0.63	0.35–1.14	0.79	0.43–1.45	0.89	0.45–1.75	0.67	0.28–1.56
Asthma	1.09	0.58–2.07	1.28	0.64–2.54	1.30	0.61–2.78	1.16	0.53–2.56
Europe or Other Region	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Self-Rated Poor Health	0.18***	0.10–0.35	0.16***	0.09–0.31	0.18***	0.09–0.33	0.55	0.26–1.17
Distress	0.57	0.18–1.85	0.46	0.13–1.69	0.52	0.16–1.76	0.86	0.24–3.07
Obesity	0.40**	0.23–0.70	0.42**	0.24–0.76	0.43**	0.23–0.78	0.67	0.35–1.26
Any Chronic Condition	0.62+	0.37–1.05	0.48*	0.27–0.84	0.51*	0.28–0.92	0.58	0.30–1.15
Diabetes	0.32**	0.16–0.67	0.27**	0.12–0.58	0.29**	0.13–0.63	0.36*	0.15–0.88
High Blood Pressure	0.67	0.35–1.26	0.50+	0.25–1.04	0.51+	0.24–1.10	0.65	0.30–1.45
Heart Disease	1.19	0.70–2.04	0.93	0.51–1.72	1.03	0.57–1.89	0.74	0.33–1.63
Asthma	0.84	0.40–1.73	0.79	0.37–1.70	0.80	0.34–1.88	0.73	0.27–1.94

+ p < 0.10; *p < 0.05; **p < 0.01; **p < 0.001.

Values are weighted to represent the non-institutionalized population of California. Analysis is restricted to naturalized immigrant adults. Demographic factors includes age in years, age-squared, the number of years lived in the US, years lived in the U.S.-squared, gender (male and female), and marital status (married or living with a partner, widowed/separated/divorced, and never married). Pathway to citizenship was measured by the logged number of years between year first lived in the US and the year naturalized. Socioeconomic factors include educational attainment (less than high school, high school graduate, some college or vocational school, and college graduate and above), the percentage that the participant is above the Federal Poverty Level (FPL) (0–99% FPL, 100–199% FPL, 200–299% FPL, 300+% FPL), and whether participants had a usual source of care other than an emergency room. Data source: Restricted data from the California Health Interview Survey 2015–2016 (n = 4717).

Table 3
Mediation of the relationship between naturalized citizens' health and region of origin by demographic, immigration, and socioeconomic factors using KHB Method, California Health Interview Survey, 2015–2016.

Region (Mexico Ref.)	Mediation by Demographic Factors			Mediation by Pathway to Citizenship			Mediation by Socioeconomic Characteristics		
	Average Partial Effects[1]	Sig.[2]	% Confounding	Average Partial Effects[1]	Sig.[2]	% Confounding	Average Partial Effects[1]	Sig.[2]	% Confounding
Central or Other Latin America									
Self-Rated Poor Health	0.135		−48.74	−0.002		0.48	−0.421	***	50.54
Distress	−0.029		−3.18	−0.005		−0.53	−0.127		−15.62
Obesity	−0.083		49.70	0.001		−1.20	−0.197	*	89.14
Any Chronic Condition	0.173		−45.17	−0.003		0.54	−0.050		8.26
Diabetes	0.225		−97.40	−0.004		0.87	−0.061		11.82
High Blood Pressure	0.191		−203.19	−0.001		0.35	−0.071		19.89
Heart Disease	0.214		−54.73	−0.006		0.98	0.132		−27.91
Asthma	−0.006		2.91	−0.001		0.50	0.092		−85.19
Asia or Pacific Islands									
Self-Rated Poor Health	0.054		28.27	−0.028		−25.69	−1.073	***	114.64
Distress	−0.120		−18.69	−0.077		−11.24	−0.402	+	−111.67
Obesity	−0.207	*	15.61	0.013		−1.17	−0.383	***	25.48
Any Chronic Condition	0.200		606.06	−0.050		23.04	−0.110		39.71
Diabetes	0.222		−67.68	−0.061	*	10.00	−0.184		25.07
High Blood Pressure	0.193	*	148.46	−0.011		14.86	−0.209	*	76.84
Heart Disease	0.208		−104.52	−0.087	+	17.61	0.278	+	−215.50
Asthma	−0.095		−169.64	−0.012		−8.63	0.128		45.88
Europe and Other Region									
Self-Rated Poor Health	0.219	*	−57.33	−0.022		3.53	−1.304	***	68.42
Distress	0.04		−36.36	−0.06	+	28.44	−0.527	+	77.84
Obesity	−0.224	*	−0.67	0.01		−2.53	−0.469	***	53.54
Any Chronic Condition	0.554	***	3957.14	−0.039		6.74	−0.151	+	21.82
Diabetes	0.639	**	−168.60	−0.047		4.41	−0.255	+	20.05
High Blood Pressure	0.574	***	385.23	−0.009	+	2.07	−0.255	*	37.44
Heart Disease	0.746	**	169.16	−0.068	+	18.23	0.331	+	1273.08
Asthma	0.048		−17.91	−0.01		3.07	0.122		−62.89

+ p < 0.10; *p < 0.05; **p < 0.01; **p < 0.001.
Notes: Average partial effects can be interpreted as the average change in probability of having a health outcome for one standard deviation change in the mediators. Negative partial effects indicate mediators having a positive influence on health outcomes. 2 Significance of mediators derived from unexponentiated coefficients. Numbers greater than 100 indicates mediators having greater association with health than region of origin. Demographic factors includes age in years, age-squared, the number of years lived in the US, years lived in the U.S.-squared, gender (male and female), and marital status (married or living with a partner, widowed/separated/ divorced, and never married). Pathway to citizenship was measured by the logged number of years between year first lived in the US and the year naturalized. Socioeconomic factors include educational attainment (less than high school, high school graduate, some college or vocational school, and college graduate and above), the percentage that the participant is above the Federal Poverty Level (FPL) (0–99% FPL, 100–199% FPL, 200–299% FPL, 300+% FPL), and whether participants had a usual source of care other than an emergency room. Data source: Restricted data from the California Health Interview Survey 2015–2016 (n = 4717).

1.07) than those from Mexico (Table 3, Model 1). Central and Latin American immigrants' better physical health compared to Mexican immigrants was largely explained by additional observable characteristics. Higher socioeconomic status among immigrants from Central or Latin America explained 51 percent (p < 0.001) of their better self-rated health compared to people from Mexico (Table 3). Socioeconomic status also accounted for 90 percent of lower obesity levels among immigrants from Central and Latin America. Time to naturalization and demographic factors, however, did not significantly explain physical health advantages. People from Central and Latin America also had higher odds of psychological distress (OR = 2.28, 95% CI: 1.08, 4.78) compared to people from Mexico (Table 3, Model 1). Unlike the disparities in physical health, accounting for all factors (Table 2, Model 4) did not reduce the strength of the relationship (OR = 2.56, 95% CI: 1.19–5.53). The decomposition analysis in Table 3 confirms that none of the three mediating pathways significantly mediated Central/Latin American's elevated levels of psychological distress.

Immigrants from Asia or the Pacific Islands. People from Asia or the Pacific Islands had better physical health than immigrants from Mexico, even after accounting for demographic differences and time to naturalization (Table 3). Socioeconomic differences, however, attenuated much of the physical health advantage among Asian immigrants. Formal decomposition analysis in Table 3 confirms socioeconomic factors' roles in health disparities between immigrants from Mexico and people from

Asia and the Pacific Islands. Socioeconomic factors accounted for 115 percent of Asian immigrants' advantages in self-rated health, 40 percent of the advantage in chronic health conditions, and 26 percent of the advantage in obesity levels. Controlling for socioeconomic factors revealed a marginally higher rate of psychological distress among Asian immigrants; people from Asia and the Pacific Islands are more likely to experience psychological distress (OR = 2.14, 95% CI = 0.90, 5.09) compared to people from Mexico after controlling for all potential confounders (Table 2, Model 4). KHB decomposition also indicates that Asian immigrants' higher socioeconomic resources masked their higher levels of psychological distress.

Immigrants from Europe and other regions Compared to people from Mexico, people from Europe or other regions had significantly lower odds of poor self-rated health (OR = 0.18, 95% CI: 0.10, 0.35), obesity (OR = 0.40, 95% CI: 0.23, 0.70), and diabetes (OR = 0.32, 95% CI: 0.16, 0.67) (Table 2). People from Europe and other regions also had marginally lower odds of having any chronic condition compared to people from Mexico (OR = 0.62, 95% CI: 0.37, 1.05). Similar to health differences between immigrants from Asia and Mexico, socioeconomic factors accounted for much of the observed health advantages among immigrants from Europe and other regions. Only prevalence in diabetes remained marginally different (OR = 0.36, 95% CI: 0.15, 0.88) after accounting for demographic, naturalization and socioeconomic factors. Sixty-nine percent of the difference in self-rated health and 54 percent of

the difference in obesity between immigrants from Mexico versus Europe and other regions were due to socioeconomic factors.

6. Limitations

The study's findings should be interpreted and generalized with consideration to the data's limitations. First, the analysis only examined immigrants who were naturalized to become US Citizens. Limiting the study to naturalized citizens reduces confounding from shifting immigration policies (Philbin et al., 2018), selective return migration to home countries (Arenas, Goldman, Pebley, & Teruel, 2015), and differential effects of demographic and socioeconomic factors by legal status (Hall & Greenman, 2015). It also allows for an examination of the relationship between health and pathways to citizenship. While about 700,000 immigrants are naturalized each year, about 25 million, including the 11 million undocumented, live in the US as non-citizens (DHS, 2020; Passel & Cohn, 2018). In general, naturalized immigrants tend to be older, more likely to be female and married, and have more education and income than non-citizen immigrants (Bacong & Sohn, 2020). The naturalization rate among eligible permanent-resident immigrants is particularly low among people from Mexico (Gonzalez-Barrera, 2017). In 2015, only about 42 percent of eligible Mexican immigrants naturalized to become US citizens compared to 74 percent of eligible immigrants from all other countries. Language, financial, and administrative barriers were leading reasons for not applying to naturalize despite an overwhelming majority of Mexican immigrants stating that they would naturalize if they could (Gonzalez-Barrera, 2017). Greater socioeconomic selection into naturalization among Mexican immigrants compared to immigrants from other regions suggests the results may understate the role of socioeconomic factors in health disparities. Second, the data comprised a sample of immigrants living in California. Immigrants in California are more likely to be from Mexico than from other countries and have lived in the US longer compared to immigrants living in other parts of the country (Sohn and Pebley, 2018). Furthermore, California's relatively inclusive policies towards immigrants during the study period may also limit the generalizability of our findings to the broader national immigrant population (De Trinidad Young, León-Pérez, Wells, & Wallace, 2018). Despite these differences, the State's demographically and socioeconomically diverse immigrant population allows for a robust examination of the complex relationships between regions of origin and health disparity. California's large employers in agriculture, health, and information technology attract immigrants from a wide socioeconomic spectrum, and its long history as an immigrant destination has created a population representing both recent and past immigrants (Public Policy Institute of California, 2019). Lastly, the CHIS's unique sampling design that over-sampled under-represented ethnic minorities allowed for reliable analyses of immigrant sub-groups (California Health Interview, 2017).

7. Discussion

This study examined the extent to which factors can explain health disparities between immigrants from different regions that immigration theories—demographic selection, pathways to citizenship, and segmented socioeconomic assimilation—identify as sources of inequity. Our analysis quantified the contributions of the three sources of inequity to disparities in a range of mental and physical health outcomes using a population-representative sample of naturalized immigrants living in California.

Our findings on physical health outcomes supported existing theories and empirical studies on health disparities between immigrants from different world regions. Immigrants from Mexico reported worse physical health on average than immigrants from other places. While the pathway to citizenship was notably the longest for Mexican immigrants, their health disadvantages were driven predominantly by demographic and socioeconomic factors. Immigrants from Mexico had lower levels of

education and were more likely to live below or near the poverty level than immigrants from other regions. They were also older and have lived in the US longer than immigrants from Asia/Pacific Islands and other Latin American countries. Socioeconomic factors, in particular, were significant drivers of physical health differences between people from Mexico and Asia, the leading birthplace of recent immigrants in California (Public Policy Institute of California, 2019).

The major theories of immigrant health were inadequate in explaining disparities in mental health. Notably, immigrants from Central and Latin America (other than Mexico) reported the worst levels of mental health. None of the three potential pathways explained these immigrants' significantly elevated levels of severe psychological distress. Controlling for demographic selection, pathways to citizenship, and socioeconomic status only further increased the mental health inequity between immigrants from Mexico and immigrants from other Central and Latin American countries. These results underscore a need to develop and test theories that can better describe processes that create mental health inequities throughout the immigration experience. While our study did not directly examine the effects of race and ethnicity independently of immigrants' region of origin, racial discrimination and its associated stresses (Finch & Vega, 2003) may have contributed to mental health inequities that were not mediated by demographic, citizenship pathway, and socioeconomic differences (Bonilla-Silva, 2002; Gee & Ford, 2011). Past studies have documented immigrants' physical health converging to their same-race native counterparts (Andrasfay & Goldman, 2020), and parallel studies in immigrants' mental health trajectories may reveal similar processes.

Declaration of competing interest

Authors do not have any competing interests to declare.

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