INEQUALITIES IN THE STRUCTURE AND DELIVERY OF U.S. HEALTH CARE

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ABSTRACT

INEQUALITIES IN THE STRUCTURE AND DELIVERY OF U.S. HEALTH CARE

Rebecca Anna Schut

Chenoa A. Flippen

Although healthcare inequalities by race-ethnicity and nativity have been widely explored, more research is needed to investigate how these inequalities result from structures of racial stratification and immigrant exclusion operating within U.S. health care. My dissertation employs hand coded restricted-access medical record data, linked survey data, and rich administrative data to examine the factors generating healthcare inequalities experienced by both patients and physicians. I contextualize these inequalities within a broader U.S. landscape characterized by structural racism and nativism. In the first chapter, I examine the impact of state immigration policy contexts on healthcare access of U.S. agricultural workers representing various racial-ethnic identities and legal statuses between 2005-2012. I find state-level immigration policy contexts are strongly associated with healthcare access among documented non-White Latinx agricultural workers, who report lower levels of healthcare access and greater barriers to care-seeking in increasingly restrictive policy contexts. In the second chapter, I use hand coded electronic medical record data to examine provider-patient communication disparities. Black and Latinx patients are less likely than White patients to receive provider communication regarding a new incidental medical finding diagnosis. This disparity may reflect interpersonal racism between providers and patients of color,

resulting from the perpetuation of racial mythologies in medicine. In the third chapter, I use geocoded data from the American Medical Association to explore whether subgroups of international medical graduates (IMGs) experience career stratification based on their country of medical education. I find IMGs trained in developing countries chart more marginalized U.S. career paths relative to those trained in developed countries, suggesting that nativism and racism within the medical profession intersect to disadvantage physicians from developing countries, who often are also people of color. My dissertation generates empirical evidence to show how racism and nativism operating within the U.S. healthcare system generate inequalities among people of color and immigrants. These findings have important implications not only for our understanding of racial inequality and social stratification broadly, but also for informing policy and intervention to promote equity within U.S. health care.

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CHAPTER 1: Introduction

Systemic racism has created and maintained a racially stratified U.S. society in which people of color encounter disadvantage and marginalization within all subsystems and institutions, including the education system, the labor market, and health care (Reskin 2012). In health care, specifically, the perpetuation of *racial mythologies* (Hoberman 2007; 507) and the prevalence of White racial framing has profoundly hindered people of color and immigrants from accessing and utilizing healthcare services, from navigating the complex U.S. healthcare system, and from engaging in the practice of medicine and delivery of health care itself (Feagin and Bennefield 2014). Consequently, the U.S. healthcare system is fundamentally racialized for both patients and healthcare providers (Nguemeni Tiako et al. 2021).

A large body of literature finds that Black and Latinx individuals are less likely than Whites to possess a regular source of medical care, to have continuity of care, and to obtain routine health screenings (Brown, 2018; Chavez, 2012; Tejeda et al., 2009). Furthermore, the implementation of federal, state, and local immigration policies and enforcement actions has dramatically reduced healthcare seeking among Latinx individuals, regardless of their nativity and legal status (Philbin et al. 2018; Perreira and Pedroza 2019). Moreover, although African Americans are more likely to have chronic health conditions than Whites, they are often treated less effectively by healthcare providers for such conditions. Black patients also more commonly receive less complex courses of medical care, including transplants and bypasses, relative to White patients,

and are more likely to experience inadequate provider-patient communication and increased delays related to their medical care (Washington 2006; Reskin 2012; Phelan and Link 2015).

Finally, the impact of racism in health care extends even to those who *work* within it, as immigrant physicians and physicians of color are regularly exposed to racism in their medical practice (Filut et al. 2020; Alam 2020; Jenkins 2020). Not only do these physicians experience an abundance of interpersonal racism and nativism from patients and fellow healthcare workers, but they also experience limitations in their medical training and careers, with racial stratification and nativism impacting each step of their medical school and residency trainings, specialty choices, and ultimate career outcomes (Chen et al. 2010; Filut et al. 2020).

Building on this body of evidence, the focus of my dissertation is to further explore how the racism and nativism that stratifies the United States as a broader society also works to generate inequalities in the realm of U.S. health care. Utilizing quantitative methods to analyze unique sets of survey, administrative, and medical record data, my dissertation presents new evidence to show how racism and nativism reach into the U.S. health care system, dramatically shaping the experiences and outcomes of people of color and immigrants in their roles both as patients and as healthcare workers.

In exploring first how nativism and racism shape access to health care, the aim of Chapter 2 is to examine how "policies of exclusion" (Perreira and Pedroza 2019) implemented in the United States in the past several decades have impacted healthcare access and created barriers to healthcare seeking among U.S.-citizen people of color and

documented and undocumented immigrants. Specifically, the impact of state immigration policies, fundamentally informed by racism and intended to prevent integration of immigrants into U.S. society, is examined for agricultural workers. This population of individuals represents a unique and particularly vulnerable group that may experience greater barriers to care-seeking and more risk of occupational health hazards in the face of restrictive immigration policies. Leveraging restricted-access, geocoded data from the National Agricultural Workers Survey (NAWS) and a novel dataset of state immigration policies, this chapter contributes to our understanding of the impacts of "policies of exclusion" on the lives of various marginalized groups in the United States. Specifically, as the data allow for an examination of undocumented, documented, and U.S. citizen individuals of multiple racial-ethnic identities, this chapter allows for an intersectional examination of how various subgroups of individuals experience hindered healthcare access and barriers to care due to immigration policies.

Understanding that racism does not cease to impact individuals of color after they gain access to health care, in Chapter 3 I further delve into how, once access to health care is gained, racism works to impact interactions between patients of color and their providers. I utilize a novel dataset of electronic medical records (EMR), radiology records, and U.S. Census data to investigate racial disparities in provider-patient communication among individuals diagnosed with incidental medical findings requiring follow-up surveillance. My findings indicate that racial disparities in adherence to follow-up surveillance stem from initial racial disparities in provider-patient communication, which persist even after accounting for multiple patient socioeconomic, health, and

healthcare provider characteristics. I find healthcare providers are less likely to communicate the presence of incidental medical findings to Black and Latinx, relative to White, patients. These findings shed new light on why lower rates of adherence among patients of color are often observed in the literature, and in doing so, aim to contribute to a growing body of recent literature that shifts the focus away from blaming patients for poor "compliance" with medical directives, and towards understanding the role of structural and interpersonal racism in generating low rates of follow-up adherence. Specifically, I argue that the racism embedded within the structure of health care and medical training results in providers being less aware of and attuned to structural and interpersonal training, which then translates to the reproduction of racial inequality via lower provision of patient care (Schut 2021; Nguemeni Tiako et al. 2021).

Furthermore, few studies to date have examined the real-world impact of interpersonal racism on healthcare outcomes and have relied on hypothetical vignettes to identify "provider bias." Thus, this work provides insight into provider-patient communication and interpersonal racism through empirical analysis of a unique dataset that allows for a "bird's-eye" perspective of patient contacts with the healthcare system. Thus, I demonstrate the advantages of using EMR data for empirical analysis of healthcare inequalities in the sociological study of health care and health (Schut 2021).

Finally, in Chapter 4 I highlight an understudied axis of racial stratification in health care through theorizing that racism and nativism in the medical profession jointly stratify the careers of immigrant physicians. Although existing research indicates that international medical graduates (IMGs) fill gaps in U.S. health care left by U.S. medical

graduates (USMGs) (e.g., Jenkins 2020; Chen et al. 2010) the extent to which *all* IMGs experience stratified career outcomes relative to USMGs remains understudied. I use restricted-access data from the American Medical Association Physician Masterfile to examine the career outcomes of IMGs by the development status of the country in which they attended medical school, (developed economy versus developing economy) and by the specific global region of their medical school (e.g., South Asia, Sub-Saharan Africa). I find that IMGs from developed countries largely chart a much less disadvantaged path in the United States relative to those from developing countries; they are more likely to practice in competitive medical specialties, to attend prestigious residency programs, and to practice in less disadvantaged U.S. counties that employ more USMGs relative to IMGs. Specifically, IMGs trained in Latin America, Southeast Asia, Sub-Saharan Africa, and English-speaking Caribbean countries chart more marginalized paths in their careers relative to those from English-speaking non-Caribbean, Western European, and East Asian countries.

Findings from this chapter suggest IMGs experience divergent outcomes in the United States based on their place of medical education, with IMGs from developing countries facing more constraints in their careers relative to IMGs from developed countries. This understudied axis of stratification in medicine has important implications for our understanding of the existence of inequalities in the medical profession and in the structure and delivery of healthcare. Stratification of healthcare professionals, resulting from nativism that creates informal hierarchies in the medical profession, ultimately decreases diversity in prestigious, academic institutions, limits the quality-of-care

patients of color receive, and discourages IMGs, a group of high skilled immigrants, from pursuing medicine as a career in the United States at all.

In conclusion, my three dissertation chapters outlined above contribute to the literature on racism and inequality in health care through exploring how racism fundamentally stratifies the U.S. healthcare system, and generates unequal access to, and unequal treatment of, people of color and immigrants situated within the U.S. healthcare system in various roles and capacities. In highlighting this new evidence on stratification in health care, I aim to advance understanding of how inequalities in health care are produced, and I draw conclusions regarding how such inequalities generate larger downstream disparities in the health and life chances of marginalized groups in the United States.

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CHAPTER 2: State Immigration Policy Contexts and Racialized Legal Status Disparities in Healthcare Access among U.S. Agricultural Workers: 2005-2012

Abstract

Research links restrictive immigration policies to immigrant health and healthcare outcomes. Still, most studies in this area focus on the impacts of single policies, with few assessing how broader state-level immigration policy contexts impact groups by nativity, race-ethnicity, and legal status. Linking data from the National Agricultural Workers Survey (2005-2012) with information on state immigration policies, I use an intersectional approach to examine the links between state-level immigration policy contexts and healthcare access by nativity, race-ethnicity, and legal status. I also assess the associations between two specific types of state immigration policies—those governing immigrant access to Medicaid and driver's licenses—with healthcare access disparities. I find that state-level immigration policy contexts are strongly associated with healthcare access among documented non-White Latinx agricultural workers, who report lower levels of healthcare access and greater barriers to care-seeking in more restrictive policy contexts. By contrast, I find little evidence that state policies shape healthcare access among undocumented workers. These findings advance understanding of the impacts of "policies of exclusion" on the lives of marginalized groups and underscore the importance of *racialized legal status* in considering the links between sociopolitical contexts and health and healthcare disparities.

Introduction

State legislatures have seized considerable control over immigration policy in the United States over the past several decades, playing an increasingly large role in governing and shaping the contexts where immigrants live and work (Reich 2017; Reich 2019). A substantial body of research investigates how state immigration policies—both punitive and more accommodating—shape pathways of immigrant incorporation and impact the health and well-being of immigrants. Findings from this research highlight the critical role of states in shaping the life chances and outcomes of immigrants and their descendants and contributing to broader patterns of inequality in the United States (Arcury and Quandt 2007; Friedman and Venkataramani 2021; Hatzenbuehler et al. 2017; Perreira and Pedroza 2019; Philbin et al. 2018; Stanhope et al. 2019; Torche and Sirois 2019; Torres et al. 2018). Specifically, these sociopolitical contexts pattern access to services, such as health care, that are vital for immigrants' societal incorporation and overall well-being, with large and enduring consequences for racial, nativity, and legal status disparities across a host of outcomes (Menjívar 2021; Asad and Clair 2018).

Despite increased attention to the links between state immigration policies and contexts and immigrant well-being in the United States, two gaps warrant attention. First, given that the political messaging and enforcement of these policies has largely centered on Latinx immigrants and communities, much of the research in this area focuses on the impacts of immigration policies and environments on Latinx immigrants (Wang et al. 2021; Ornelas et al. 2020; Hatzenbuehler et al. 2017). Still, questions about how state immigration policy contexts differentially impact individuals by nativity, race-ethnicity,

and legal status—as well as at the intersections of these axes of social stratification—remain unanswered. For one, undocumented immigrants are often underreported in administrative and survey data, with many surveys not collecting information on respondents' legal status. This limitation is consequential, as the effects of immigration policies may be particularly deleterious for undocumented individuals given that many immigration policies specifically target undocumented immigrants. However, because of data limitations, studies often cannot directly measure the effects of immigration policies on undocumented individuals. Similarly, how state policies differentially impact groups by race-ethnicity remains unclear. For example, it is possible that state immigration policies disparately impact Latinx individuals racialized as White versus Black, and the impacts may be further stratified by legal status (Brown 2018). Still, these intersectional inequalities are underexplored. As a result, the role of immigration policy in patterning health and well-being within and across multiple intersecting systems of stratification and in simultaneously producing racialized, nativity, and legal status inequalities remains to be better understood.

Second, most existing studies examining state immigration policies have focused on specific state policies implemented in specific years, in what Philbin et al. (2018) describe as a "one-policy, one-level, one-outcome" approach (29). However, state legislatures have passed thousands of laws on immigration-related issues in the last decade, producing tremendous variation in policy environments across both place and time (Reich 2017, 2019). Exposure to these broad policy environments may shape patterns of health and health care inequality beyond what research on the implementation

or repeal of singular policies in single years can reveal. As such, more research on how the temporal and geographic patterning of these broader state immigration policy contexts contribute to population-level inequalities is needed.

The present study expands understanding of the links between state immigration policy and racial-ethnic, nativity, and legal status inequalities in health care by leveraging data from several sources, including restricted-access, geocoded data from the National Agricultural Workers Survey (NAWS) (2005-2012) and two state-level datasets on immigration policy contexts. I both document nativity, racial-ethnic, and legal status disparities in healthcare access and investigate the roles of both broad state immigration policy contexts (both restrictive and accommodating) as well as the implementation of specific domains of state immigration policy in the production of these disparities among a nationally representative sample of U.S. agricultural workers.

Agricultural workers represent an important but understudied group in research on the impacts of immigration policy. There are approximately 11 million undocumented immigrants in the United States, around a quarter of whom work in the agricultural sector (Passel and Cohn 2018). Their lack of legal status and limited public visibility, which leaves them susceptible to social isolation and lower levels of access to public and social resources, suggests that immigrant agricultural workers may be particularly vulnerable to changes in state immigration policy contexts (Culp and Umbarger 2004). This study therefore aims to elucidate the roles of both macro-level state immigration policy contexts as well as specific types of immigration laws in the production of nativity, racial-ethnic, and legal status inequalities in healthcare access and reported barriers to

healthcare—including perceived xenophobia and logistical barriers to seeking care—among this potentially vulnerable group of workers.

My findings highlight the complex ways that state immigration policy contexts shape the lives and health care access of marginalized groups in the United States. Notably, I find that broad state immigration policy contexts (in the form of either more restrictive or more accommodating) have little impact on healthcare access among those who generally face the most marginalization in U.S. society: undocumented immigrants. However, more restrictive policy contexts *do* chill access to health care among foreign-born documented non-White Latinx workers, in particular; by contrast, more accommodating contexts improve healthcare access among this group. Foreign-born documented non-White Latinx workers are also most likely to report information, cost, and transportation barriers to seeking care in more restrictive policy climates. Still, despite not experiencing chilled or increased access to health care in the context of changing policy climates, both White Latinx and non-White Latinx undocumented immigrants report greater perceptions of xenophobia in more restrictive policy contexts and decreased perceptions of xenophobia in more accommodating contexts. Together, these findings highlight the complex and nuanced role of *racialized legal status* (Asad and Clair 2018) in patterning healthcare access and barriers to care, with important implications for science, policy, and intervention.

Background

Impacts of U.S. Immigration Policies

In addition to federal policies that have long aimed to prevent Latin American immigration to the U.S. in the first place (Tienda and Sanchez 2013), Latinx immigrants and their descendants are also subjected to a series federal, state, and local immigration policies *once inside* the United States that shape their ability to integrate into society (Pereirra and Pedroza 2019). These policies are often categorized along a "restrictive" or "accommodating" continuum. Restrictive policies are those that discourage immigrant integration through creating "icy" policy contexts in which immigrants face increased surveillance, restricted access to public and social services, and greater risk of deportation via the ability of state-level institutions and agencies to enforce federal immigration law. Accommodating policies, on the other hand, expand immigrants' rights and access to public and social resources (e.g., through enabling access to health coverage), often regardless of legal status (De Trinidad et al. 2019).

State immigration policies can shape patterns of healthcare access through several mechanisms. For one, these policies can directly restrict access to social safety net programs (such as Medicaid and SNAP) and healthcare services (Waters and Pineau 2015). State legislatures can use immigration policy to maintain a system of segregation that prevents immigrants from accessing resources that promote well-being (Taylor 2020). Importantly, restrictive state-level policies and state implementation of federal policies (i.e., Immigration Authority Section 287g) have been passed and/or implemented unevenly across U.S. states (Torche and Sirois 2019; Rhodes et al. 2015; Martinez et al. 2015). These policies can directly prevent immigrants from accessing services by restricting their ability to access government-funded services (e.g., federally funded

programs that provide HIV testing and perinatal care) (Rhodes et al. 2015). These policies may also indirectly limit immigrants' access to services through denying them the material resources that facilitate access to care, such as the ability to obtain driver's licenses, which—among other things—limits immigrants' transportation options, particularly in rural areas where public transit is less accessible. These indirect efforts to hinder access to services create logistical barriers to accessing care through reducing immigrants' transportation, information, or financial capital.

Additionally, restrictive legislation can generate stress and anxiety among immigrant communities stemming from fear of surveillance and increased risk of deportation (Bernstein et al. 2019). Namely, some restrictive policies require healthcare workers to report patients to immigration enforcement (ICE) if they are suspected to be undocumented. Such collaboration between immigration enforcement and the healthcare system can have devastating consequences for immigrant healthcare seeking and can erode provider-patient trust (Martinez et al. 2015). Thus, these policies can have important downstream effects on health and mortality through causing delays in care-seeking or forgone preventative, diagnostic, and treatment services (Dondero and Altman 2020; Rhodes et al. 2015).

Although much work to date has focused on restrictive immigration policies and their impacts on the lives of immigrants, a growing body of research assesses the impacts of accommodating immigration policies, providing mixed evidence on their benefits for expanding and increasing immigrant access to care (Young et al. 2020; 2018; Hainmueller et al. 2017). This mixed evidence may be due to the fact that states often

implement a mixture of both restrictive and accommodating policies, which may send conflicting messages to immigrants, resulting in psychological harm and exacerbation of socioeconomic, health, and other disparities across nativity, race-ethnicity, and legal status groups (Taylor 2020).

"Spillover" Effects of State Immigration Policies

Immigration policies play a critical role in shaping the context of reception that immigrants encounter post-migration. Restrictive policies have long been used to maintain immigrant precarity and to integrate immigrants into the labor market to satisfy the demand for cheap labor, while at the same time ensuring that they remain vulnerable and exploitable (Gleeson and Gonzales 2012). But restrictive state immigration policies are also emblematic of deeper systems of racialized oppression and domination that exist in the United States (Taylor 2020). These policies serve as reactions to unfolding demographic processes, including the ageing of the U.S. White population (Richeson and Sommers 2016; Colby and Ortman 2015) and increasing ethno-racial and immigrant diversity (Alba 2020). Scholars suggest that these broader demographic processes generate concern among U.S.-born Whites, in particular, that existing racial hierarchies, which privilege Whites and U.S. citizens, will be dismantled (Zuberi 2019). Thus, although the primary target of restrictive immigration policies is often undocumented immigrants, these policies may have a "spillover" effect to other marginalized groups, including documented immigrants and U.S. born people of color who may resemble the targeted groups in some way (Asad and Clair 2018). Immigration policies can further marginalize those with *racialized legal statuses* who may be "lumped in" with

undocumented immigrants due to perceived social, nativity, racial-ethnic, and language proximity to this group (Asad and Clair 2018; Philbin et al. 2018).

Consequently, even documented immigrants and U.S.-born people of color may be targeted by immigration policies that render certain groups of individuals "illegal," subjecting them to stereotypes that associate them with the undocumented to produce a "racialization of illegality" (Menjívar 2021, 94). Recent research finds evidence in support of this notion; namely, federal immigration enforcement activities and restrictive policy implementation has been found, for example, to reduce Medicaid uptake among Mexican legal permanent residents in the United States (Watson 2014). After local law enforcement in North Carolina signed 287(g) agreements with Immigrations and Customs Enforcement, allowing them to carry out federal immigration laws, pregnant documented Latinx women were found to delay prenatal care-seeking and were more likely to report mistrust of health services and avoidance of healthcare seeking due to fear of surveillance and perceived risk of deportation (Rhodes et al. 2015). Together, research in this area provides compelling evidence of potential spill-over effects of immigration policies to, specifically, U.S.-born citizen and documented immigrant Latinx individuals.

The Health and Health Care Needs of Immigrant Agricultural Workers

Immigration policies may have particularly salient effects on immigrants and people of color working in U.S. agriculture, who represent a particularly vulnerable and marginalized group in U.S. society. Alongside the "Latinization" of agricultural work that has unfolded in the United States since the 1960s (Mines et al. 2007), U.S. agricultural workers have long been at the receiving end of "racialized illegality" that generalizes

them and links their occupation with specific nativities (i.e., foreign-born), race-ethnicities (i.e., non-White and Latinx), and legal statuses (i.e., undocumented). Qualitative work on agricultural workers shows that not only are agricultural workers marginalized outside of the agriculture industry, but also within the industry, as labor hierarchies have been constructed within agriculture that correlate strongly with nativity, racial-ethnic, and legal status. Holmes (2013) argues that the agricultural "ethno-labor" hierarchy positions White U.S. citizens at the top (doing mostly indoor work that involves standing, as opposed to kneeling), followed by Latinx U.S. citizens or legal residents, undocumented Mestizo Latinx workers, and undocumented indigenous Latinx workers (who do mostly outdoor work that involves bending or kneeling). This hierarchy is further linked to access to resources, including health care, and is also linked to physical health, as agricultural workers at the middle and bottom of the ethno-labor hierarchy face not only structural disadvantages that impact their well-being, including lack of financial capital, but also poorer health outcomes directly related to the strenuous and manual nature of their work (Holmes 2013).

Consequently, agricultural workers experience unique healthcare and health concerns related to their marginalized social position and to their specific occupational hazards (Caxaj and Cohen 2019). Health issues commonly faced include musculoskeletal pain (Hamilton et al. 2019), infectious diseases (Medel-Herrero et al. 2018), cancers resulting from close and prolonged contact with pesticides and carcinogenic chemicals (Mills et al. 2009), and traumatic injuries and disability (Chari et al. 2018; Moyce and Schenker 2018). Still, despite these serious health conditions, research shows that

agricultural workers are often not offered sick leave, have been found to less frequently seek health care, and often work through pain and illness (Arcury and Oudant 2007). Bleiweis et al. (1977) found that migrant agricultural workers in Florida made fewer visits to physicians each year compared to the average U.S. citizen. More recent work (e.g., Mazzoni et al. 2007; Arroyo et al. 2018; Caxaj and Cohen 2019) finds that barriers to healthcare access among agricultural workers remain significant and often result from lack of social capital and knowledge as to where to access healthcare services (Weathers et al. 2004). These factors preventing agricultural workers from accessing health care may be particularly exacerbated in the context of increasing restrictiveness of policy climates.

Research Questions

Merging survey data from the NAWS with longitudinal data on state immigration policies, this study aims to answer the following overarching questions:

1. How is access to health care among U.S. agricultural workers patterned by nativity, race-ethnicity, and legal status, as well as at the intersections of these axes of stratification?
2. How do state-level immigration policy contexts and specific types of restrictive and accommodating immigration policies shape nativity, racial-ethnic, and legal status disparities in healthcare access among U.S. agricultural workers?
3. How do state-level immigration policy contexts and specific types of restrictive and accommodating immigration policies shape barriers to care-seeking among U.S. agricultural workers by nativity, race- ethnicity, and legal status?

Data and Methods

Data

To examine the links between state policy contexts, state immigration laws, and disparities in health care access, this study draws on data from three key sources: restricted geocoded data from the National Agricultural Workers Survey (NAWS), the Correlates of State Policy Project (CSPP), and state immigration policy data from Reich (2019). Individual-level data come from the restricted-access NAWS, which is administered by the U.S. Department of Labor. This is an annual, repeated cross-sectional survey that currently includes information on U.S. native and immigrant agricultural workers working in U.S. agriculture. The NAWS draws on a national multistage probability sample stratified by region, crop cycle, farming clusters, counties, and employers. The survey excludes farm workers with H-2A temporary work visas but includes other types of temporary workers. At each wave, NAWS interviews between 1,500-3,600 agricultural workers. The NAWS includes detailed information on respondent sociodemographic characteristics—including nativity, race-ethnicity, and legal status—as well as information on health conditions and healthcare access. I obtained restricted-access geocoded NAWS data to enable merging of individual-level survey data to state-level immigration enforcement and other contextual data at the state level. I use 7 waves of the NAWS, spanning from 2005-2012 (U.S. Department of Labor 2018).

I merge individual-level data from the NAWS to data on state immigration policy contexts—including data on restrictive and accommodating laws—from the CSPP

(Jordan and Grossman 2020). CSPP data on restrictive and accommodating immigration policies came from an original coding of 1,393 laws approved by state legislatures between 2005-2012 by Reich (2017) that labels policies as "restrictive" or "accommodating." The data are available by state and year. In the coding of these data, Reich (2017) coded legislation as restrictive if it sought to bar immigrant access to social services, employment, state licenses including driver's licenses, and/or housing and/or enlisted state and local law enforcement in efforts to identify unauthorized immigrants. Accommodating legislation is that which sought to integrate immigrants into society and encourage access to various public and social services. Reich (2017) coded state legislation as accommodating if, for example, it protected immigrants from exploitative or abusive labor practices, or ensured that immigrants--particularly those who were victims of a crime--were not denied their civil rights and liberties.

Finally, in addition to data on broad state-level immigration policy contexts, I also include data on specific types of immigration laws passed by state legislatures between 2005 and 2012. These data, described in Reich (2019), are available by state and year and include information about a range of specific types of accommodating and restrictive policies passed by state legislatures over the period. In this study, I examine two specific domains of state-level immigration policies: 1) policies that do not extend Medicaid to immigrants beyond what is required by federal law (a restrictive law); and 2) policies that allow undocumented immigrants to obtain a driver's license or license privileges (an accommodating law).

Analytic Samples

The analytical sample for my investigation of the links between state policy contexts and the outcomes includes 11,592 NAWS workers interviewed between 2005 and 2012. This analytic sample resulted from dropping individuals who were surveyed before 2005 or after 2012 (n = 57,170) during which time policy information was unavailable. I further dropped individuals who identified as non-Latinx Black or non-Latinx Asian (n = 4) and those who had missing data on key variables [missing data on: race-ethnicity (n = 376); healthcare access information (n = 53); family poverty status (n = 141); and education (n =11)].

The analysis of the specific types of healthcare barriers reported by NAWS respondents includes 8,092 workers. This analytic sample resulted from dropping 3,500 workers who were not asked about information pertaining to their healthcare-seeking barriers (both workers who *did* and *did not* access health care in the past two years were asked about their care-seeking barriers in the NAWS).

Measures

Outcomes

Outcomes come from the NAWS. The first outcome is a binary measure of whether workers had *utilized health care in the past two years* (1= yes, accessed health care in the past two years). The second outcome is a categorical measure of the barriers respondents reported facing the last time they either successfully or unsuccessfully attempted to access health care. This measure includes five categories: 1) no barriers to care-seeking; 2) information, cost, or transportation barriers to care-seeking; 3) healthcare-related barriers to care-seeking; 4) xenophobia-related barriers to care-

seeking; and 5) other barriers to care-seeking. *Information, cost, or transportation barriers* reflect workers' responses about facing barriers to care-seeking due to lack of transportation, lack of information on how or where to access health care, lack of financial resources to access care, or fear of job loss if they took time off from work to seek care. *Healthcare barriers* capture whether workers reported that healthcare facilities were not open when needed, whether available healthcare centers did not offer the medical services workers needed, whether workers believed healthcare providers did not understand their needs, and whether available healthcare centers did not have language interpreters available. *Xenophobia-related barriers* reflect whether workers reported not feeling welcome to access health care, and whether they did not seek care because they were undocumented and feared they would not be treated well. Finally, *other barriers* include various free-text-responses, including, among other reasons, whether workers did not seek care because they believed their healthcare providers would shame them for their health issues.

Key Exposures

I include two sets of exposures that are longitudinal (2005-2012), time-varying, and available across the 48 contiguous United States represented in the NAWS. The first set includes two continuous measures of the proportions of immigration policies passed by each state between 2005-2012 that were either "restrictive" or "accommodating" (where the numerator of the proportion is the total number of policies that are restrictive/accommodating in a given year and the denominator of the proportion is the total number of immigration-related policies passed in the state in a given year). These continuous policy measures were lagged across a two-year period to account for the fact

that the first outcome, workers' healthcare access, reflects a two-year period. Alternative operationalizations of these variables (including categorical and continuous measures of total restrictive/accommodating state immigration policies passed in each state and year) produced substantively similar results.

The second set of exposures allows me to assess how the implementation of two specific types of state immigration policies shape disparities in healthcare access. These policy exposures include those which: 1) did not extend health insurance coverage to immigrants beyond what was required by federal law; and 2) extended driver's licenses or driver's licenses privileges to undocumented immigrants, relate to the outcomes. These are operationalized as binary measures, where "1" indicates that the policy was passed in that state/year. Like the state immigration policy contexts variables, these are included as lagged variables, reflecting policy exposures two years prior to the survey.

Covariates

NAWS workers report whether they are: U.S. citizens (U.S. born); foreign-born documented immigrants (including naturalized citizens, green card holders, or temporary visa holders); or undocumented immigrants. Workers also self-identify their race (Black/African American; American Indian/Alaska Native/Indigenous; Asian; Native Hawaiian/Pacific Islander; or Other) and Latinx or non-Latinx ethnicity. Respondent race was operationalized as a binary variable, White or non-White, with non-White workers including those who identified racially as Black/African American; American Indian/Alaskan Native/Indigenous; Asian; Native Hawaiian/Pacific Islander; or Other).[1] I

[1] These specific racial groupings were categorized together as "non-White" due to the small sample size of respondents who identified their race as either Black or Asian (n = 406 respondents who identified as Black or Asian).

combine this information on nativity, race-ethnicity, and legal status to generate a six category measure that includes: U.S. born White non-Latinx; U.S. born non-White Latinx; foreign-born documented White Latinx; foreign-born documented non-White Latinx; undocumented White Latinx; and undocumented non-White Latinx. Of note, the inclusion of U.S. born White non-Latinx—who, theoretically, are less likely to be affected by immigration enforcement—allows me to better account for secular changes that might affect immigration enforcement activity and health risk and healthcare access, thereby reducing concerns about unmeasured confounding.

Models adjust for continuous measures of age, age^2, a binary measure of sex (1 = female), a continuous measure of the number of health conditions reported (range: 1-7), a continuous measure of years of education, a binary measure of whether the farmworker "follows the crop" (i.e., moves seasonally to work on different crops across the United States), and a binary measure of whether the respondent and their family lived under the federal poverty line (1 = under the poverty line). All models also include state, year, and month fixed effects. Year fixed effects are included to account for temporal variation in sociopolitical and historical contexts. Month fixed effects are included to account for seasonal variation in healthcare access.

Analytic Strategy

I first show weighted descriptive statistics of all measures; time-varying measures reflect means over the study period. I also show disparities in health care access and reported barriers to care-seeking by nativity, racial-ethnic, and legal status.

Multivariate analyses of the two outcomes (health care access and reported barriers to care) proceeds in two stages. In the first stage I assess disparities in healthcare

access across state policy contexts. First, I examine disparities in healthcare access by running a baseline OLS model assessing nativity, racial-ethnic, and legal status disparities in care, adjusting for the full set of covariates, including state, year, and month fixed effects. Next, to examine how access disparities vary across more restrictive (or more accommodating) policy contexts, I run two fully interacted OLS models that include interactions between the combined nativity, race-ethnicity, and legal status variable and all individual-level measures, including the proportion of restrictive or accommodating policies implemented in the state of residence that year. These models assess how nativity, racial-ethnic, and legal status disparities in healthcare access vary across state immigration policy contexts. Finally, I examine how disparities in health care access vary across states with and without the specific restrictive and accommodating policies (restrictive policy: state did not extend health insurance coverage to immigrants beyond what was required by federal law; accommodating policy: state extended driver's licenses or driver's licenses privileges to undocumented immigrants change). For these analyses I run two fully interacted OLS models of healthcare access disparities by the combined nativity, race-ethnicity, and legal status variable, again including all covariates. I model healthcare access using linear (as opposed to logistic) probability regression models as linear regressions allow for an easier interpretation of models and allow for direct comparisons to be made between models (Gomila 2021).

In the second stage of the analysis, I use multinomial logistic regression models to examine the associations between state immigration policy contexts and respondent-reported *barriers* to healthcare access by nativity, race-ethnicity, and legal status. These

models adjust for the full set of covariates and include interactions of all individual-level covariates with the combined nativity, race-ethnicity, and legal status measure. I do not run separate models of the associations between specific state immigration policies and agricultural worker reported barriers to healthcare access due to being underpowered for several of the specific barrier types.

The basic form of the models included in this study is presented below; Y_{ij} denotes the likelihood of accessing health care (or, in models of barriers, of reporting barriers to care), *RE* is race-ethnicity, *FE* indicates fixed effects, and *X* is a vector of covariates:

$$Y_{ij} = \beta_1 + \beta_2 immigration.policy * nativity.RE.legal\ status_i + X_i * nativity.RE.legal\ status_i + state\ FE + month\ FE + year\ FE$$

The parameter of interest is β_2, which indicates state policy contexts and specific immigration policies differentially relate to health care access by agricultural workers across nativity, race-ethnicity, and legal status.

Results

Descriptive Statistics

Table 1 presents weighted demographic, socioeconomic, and health characteristics of agricultural workers included in this analysis. Forty-seven percent of agricultural workers are undocumented (with 18% identifying as White Latinx and 35% identifying as non-White Latinx). Twenty nine percent are foreign-born and documented, 10% of whom identify as White Latinx and 18% of whom identify as non-White Latinx. Seventeen percent of agricultural workers are U.S. born White non-Latinx and 8% are

U.S. born non-White Latinx. The mean age is 36 years, and women account for 24% of agricultural workers. Generally, educational attainment among this population is low, at 8.1 years. Only 5.8% of workers "follow the crop," and 32% of workers report their family is living below the U.S. federal poverty level. Most workers reside in California (33%), in the U.S. Midwest (19%) or in the U.S. Northwest (15%).

Table 2 presents healthcare outcomes among agricultural workers. Fifty-eight percent of agricultural workers report they accessed healthcare services at least once in the past two years, but this varied substantially by nativity, racial-ethnic, and legal status. Notably, U.S. born agricultural workers are more likely than all other workers to access health care. For example, 84% of U.S. born White workers and 75% 0f U.S. born White Latinx workers accessed care in the past two years. Moreover, within nativity and legal status groups, those who identify their race-ethnicity as non-White Latinx are consistently less likely than White Latinx workers to access health care. Namely, 60% of foreign-born documented non-White Latinx workers accessed care relative to 72% of their White Latinx counterparts ($p < 0.001$ for both groups relative to U.S. born White non-Latinx workers); 42% of non-White Latinx undocumented workers accessed care relative to 46% of their White Latinx counterparts ($p < 0.001$ for both groups relative to U.S. born White non-Latinx workers).

When asked about the barriers they face to accessing health care, 49% of all agricultural workers report they face no barriers, and 44% report they face information, cost, or transportation barriers to accessing health care. Four percent of workers report that they have difficulties accessing health care because of xenophobia-related reasons

(including not feeling welcome by healthcare providers), 1% report they face healthcare-specific barriers (for example, healthcare facilities not having services they needed or not understanding their specific medical problems), and 3% report they face some other barrier to accessing care (including feeling disrespected by a healthcare provider). Sixty-five percent of U.S. born non-White Latinx workers face no barriers to care relative to 70% of U.S. born White non-Latinx workers ($p<0.001$). Documented workers are most likely to face information, cost, or transportation barriers (42% for White Latinx and 43% for non-White Latinx workers; $p<0.001$ for both groups relative to U.S. born White non-Latinx workers). Undocumented immigrants are most likely to report xenophobia-related barriers (6% for White Latinx and 7% for non-White Latinx workers) relative to 0.5% of U.S. born White non-Latinx respondents ($p<0.001$).

Multivariable Fixed Effects Regression Analyses: State Immigration Policy Contexts and Healthcare Access

Table 3 presents coefficient estimates for three OLS models regressing healthcare access. These models predict the probability of agricultural workers accessing health care by nativity, race-ethnicity, and legal status (Model 1) and accessing health care in the context of more restrictive (Model 2) and more accommodating (Model 3) policy contexts.

Results from Model 1 show that healthcare access disparities are large among most groups of agricultural workers relative to U.S. born White non-Latinx workers, controlling for demographic, socioeconomic, and health factors. Model 1 indicates that, compared to U.S. born White non-Latinx individuals, all other nativity, racial-ethnic, and

legal status groups are less likely to access health care, net of controls, including state, year, and month fixed effects. Notably, undocumented White Latinx (coef = -0.219) and undocumented non-White Latinx (coef = -0.231) individuals experience the greatest gaps in healthcare access relative to U.S. born White non-Latinx workers.

In Model 2, I include the measure of restrictive state policy context, interacting all covariates with the combined nativity, race-ethnicity, and legal status variable. Results indicate that more restrictive policy contexts are associated with especially chilled access to health care among foreign-born documented non-White Latinx workers (coef = -0.132), net of other factors. I find no evidence that more restrictive contexts differentially impact healthcare access among other groups of workers, including those who are undocumented.

Model 3 shows healthcare access disparities in the context of more accommodating policy contexts. Results for the interaction term between the proportion of policies that are accommodating in a state and workers' nativity, race-ethnicity, and legal-status, indicate that controlling for demographic, socioeconomic, health, and policy factors, foreign-born documented non-White Latinx workers experience increased access to health care (coef = 0.097) in more accommodating policy contexts. However, no other groups of agricultural workers appear to experience increased access to health care in more accommodating policy climates.

Specific State Immigration Policies

Results from Table 3 demonstrate wide disparities in healthcare access among agricultural workers, and particularly, among those who are foreign-born documented non-White Latinx, undocumented and White Latinx, and undocumented and non-White

Latinx. More restrictive and more accommodating policy contexts appear to exacerbate healthcare access disparities (or mitigate them, in the context of more accommodating policy contexts) only among foreign-born documented non-White Latinx workers.

Turning to investigating how the implementation of specific state immigration policies impacts healthcare disparities among agricultural workers, Table 4 presents disparities in healthcare access among NAWS workers in the context of specific policies that do not extend health coverage (specifically, Medicaid) to undocumented immigrants (Model 1) or that extend driver's licenses or license privileges to undocumented immigrants (Model 2).

In Model 1, I investigate how state policies governing immigrant access to Medicaid pattern healthcare access disparities. My results show that, in states where Medicaid was not extended to immigrants beyond what was required by federal law, U.S. born non-White Latinx workers (coef = - 0.105) and foreign-born documented non-White Latinx workers (coef = -0.069) saw chilled access to health care.

Moreover, Model 2 presents disparities in access to health care in contexts where driver's licenses or license privileges were extended to undocumented immigrants (an accommodating policy). The interaction between policy implementation and workers' nativity, race-ethnicity, and legal status indicates that U.S. born non-White Latinx (coef = 0.193) and undocumented non-White Latinx workers (coef = 0.118) had improved health care access after these laws were implemented.

Barriers to Healthcare Seeking

Figure 1 presents results from the fully interacted multinomial regression models that regress respondent reported barriers to healthcare seeking on the measure of restrictive state immigration policy context. More detailed model results can be found in Appendix 1. For most groups, living in more restrictive policy contexts is associated with declines in facing no barriers to care, suggesting that restrictive policy contexts increase barriers to care-seeking. In general, reports of healthcare-related and other barriers remain relatively low and stable across varying levels of restrictive policy contexts. Reports of xenophobia-related barriers to care increase for undocumented groups as state policy contexts become more restrictive, but not U.S.- or foreign-born documented groups. Results further indicate that the probability of reporting information, cost, or transportation barriers to care-seeking increase among most nativity-race-ethnicity-legal status groups as the restrictiveness of the policy context increases. This is the case for all groups except for foreign-born documented White Latinx workers and undocumented non-White Latinx workers, for whom the predicted probability is flat as the restrictiveness of the policy context increases. For undocumented White Latinx workers, the predicted probability of reporting information, transportation, and cost barriers decreases as the proportion of restrictive policies increases.

Figure 2 presents the predicted probabilities of workers reporting healthcare seeking barriers in the context of more accommodating policy contexts, with more detailed model results in Appendix 2. For nearly all groups, the predicted probability of reporting no barriers to care-seeking increases as the proportion of accommodating policies increases, except among foreign-born documented White Latinx workers (for

whom the predicted probabilities remain flat) and undocumented White Latinx workers (for whom the predicted probabilities decrease). Declines in the probability of reporting information, cost, or transportation barriers are also noted among all groups of workers except for foreign-born documented White Latinx and undocumented White Latinx workers, who experience an increased probability of reporting such barriers as the proportion of accommodating policies increased. Notably, among both undocumented White and non-White Latinx immigrants, there is a decline in the probability of reporting xenophobia-related barriers as the proportion of accommodating policies increased.

Discussion and Conclusion

A growing body of research examines the impacts of state immigration policies on access to health care among immigrants in the United States. Still, research in this area generally focuses on singular state policies, which can mask how broader state immigration policy contexts pattern healthcare inequalities over time and space. Further, because of data limitations, few studies are able to assess differential impacts of immigration policy on undocumented groups or consider impacts at the intersection of multiple dimensions of social and legal status stratification. In this study, I link survey and state policy data to assess the links between state immigration policy contexts, specific types of restrictive and accommodating state immigration policies, and disparities in healthcare access within and between multiple intersecting axes of social stratification, including nativity, race-ethnicity, and legal status. I focus my study on U.S. agricultural workers, who are a particularly vulnerable group given their relative positions within both legal status and occupational hierarchies in the U.S., and who

experience substantial barriers to care-seeking and higher risk of occupational health hazards. My findings provide new evidence of the roles of state immigration policy in patterning racialized legal status inequities in healthcare access.

A key contribution of this study is its use of an intersectional structural approach (Crenshaw 1991; Dill and Zambrana 2009; Viruell-Fuentes et al. 2012; Homan et al. 2021) to document and interrogate healthcare disparities among agricultural workers. Findings from this study show tremendous inequities in healthcare access between and within nativity, racial-ethnic, and legal status groups. Among U.S. agricultural workers, U.S. born White non-Latinx workers report the highest levels of healthcare access and the fewest barriers to care. Irrespective of the state policy contexts (restrictive or accommodating), most groups of workers (but especially, foreign-born documented non-White Latinx, undocumented White Latinx, and undocumented non-White Latinx workers) are less likely to access health care relative to U.S. born White non-Latinx workers. These findings are consistent with the notion that systems of racial-ethnic, nativity, and legal status stratification jointly pattern healthcare access in the U.S.

My findings also showed that state immigration policy contexts play a critical role in patterning inequality in healthcare access. Importantly, my findings showed that healthcare access among U.S. and foreign-born documented non-White Latinx individuals was particularly sensitive to state level immigration policy. In Table 3, results showed that, as state immigration policy contexts became more restrictive, healthcare access among foreign-born documented non-White Latinx individuals decreased; by contrast, as state immigration policy contexts became more accommodating, healthcare

access for this group increased. Results from Table 4 further showed that healthcare access among U.S. and foreign-born non-White Latinx individuals was also responsive to the specific state immigration policies examined. For example, when states chose not to extend health care coverage to immigrants, healthcare access among U.S. born non-White Latinx individuals and foreign-born documented White Latinx individuals declined. When states extended drivers licenses to undocumented immigrants, healthcare access among U.S. born non-White Latinx individuals improved. Taken together, these findings highlight that the impacts of state immigration policy have spillovers to U.S. born and documented immigrants, with evidence of differential impacts by race-ethnicity. In these ways, results from this study suggest that state policies governing immigration play an important role in generating and maintaining broader patterns of racism and xenophobia in the U.S., with consequences for both documented immigrants and U.S. born Latinx people (Friedman and Venkataramani 2021).

While I expected that state immigration policies would have especially pronounced impacts on access to health care among undocumented immigrants, my results did not provide evidence of this. My results were robust to different specifications of state policy contexts (e.g., operationalizing these variables as the total number of restrictive policies implemented as opposed to the proportion of total policies that were restrictive) and respondent nativity, race-ethnicity, and legal status (i.e., separating foreign-born documented workers from foreign-born naturalized U.S. citizens).

Further analysis of the specific barriers workers report facing when accessing health care suggest that many groups (and namely, foreign-born documented non-White

Latinx workers) report more information, cost, and transportation barriers as the restrictiveness of a policy context increases, with the opposite being true in contexts where the proportion of accommodating policies in a context increase. For undocumented immigrants, increasing restrictiveness of policy contexts is associated with greater probabilities of reporting xenophobia-related barriers, with the opposite being true in more accommodating policy contexts.

Together, these findings paint a complex picture of how the lives and healthcare access of immigrants and U.S. born people of color are shaped by state immigration policy. Drawing on Asad and Clair's (2018) concept of *racialized legal status*, findings from this study indicate that state immigration policy contexts have the greatest impact on healthcare access among those who share some similarities to the undocumented (i.e., foreign-born status and/or race-ethnicity), but who are not themselves undocumented. Healthcare access among foreign-born documented non-White Latinx individuals may be particularly sensitive to more restrictive immigration policy contexts because they may share nativity, racial-ethnic, and language (or perceived language), and occupation commonalities with the undocumented, who are generally the targets of these state policies. These shared experiences and identities may subject them to stigmatization, fear, and discrimination, via increasing their risk of being profiled by law enforcement or experiencing acts of discrimination or violence, which may prevent them from accessing services such as health care. Thus, this group of workers may believe that the risk of potential surveillance or contact with law enforcement outweighs the risk of forgoing health care (Friedman and Venkataramani 2021).

Another potential explanation for the chilled healthcare access faced by foreign-born documented non-White Latinx workers is that members of this group may not possess permanent U.S. residency status, and therefore may be unclear about the impact of more restrictive policy contexts on their lives. Recent qualitative research on barriers to care-seeking among immigrants surveyed in an urban safety-net hospital found that only half of interviewees were aware of recent changes that had been made to the public charge rule and had adjusted their care-seeking accordingly (Wang et al. 2021). The present study's analysis of the care-seeking barriers may provide evidence to support this point, as foreign-born documented non-White Latinx workers had a higher probability of reporting information, transportation, and cost barriers to care-seeking in more restrictive policy contexts.

Another important finding from this study is that, despite undocumented workers reporting heighted perceptions of xenophobia in the context of more restrictive policy climates, state immigration policy contexts (either more restrictive or accommodating) do not appear to additionally chill access to health care among the undocumented, who experience the lowest levels of healthcare access relative to U.S. born White non-Latinx workers across all policy contexts. This finding may reflect a "floor" effect; because undocumented immigrants face high levels of marginalization in the United States resulting from federal immigration policies, political campaigns, and cultural and media messages that portray their presence as undesirable and "illegal" (Cobb et al 2017), undocumented immigrants often rely closely on their social networks and are less likely to enter the mainstream to access services such as health care where they are more likely

to encounter surveillance and discrimination. Thus, undocumented immigrants may be generally less likely to utilize mainstream health care and social services relative to other groups, such that changes in state-level policy contexts matter little for further chilling their access to care (Arcury and Quandt 2007).

Several limitations in this article warrant mention. First, this study relies on pooled cross-sectional data and thus is unable to address workers' access to health care and barriers to access longitudinally. However, due to the paucity of longitudinal data on immigrants, and specifically, data that collect respondent legal status, the NAWS allows for the examination of the impact of state policies to be measured along multiple dimensions of inequality (nativity, race-ethnicity, and legal status) in a way that other datasets typically cannot. Relatedly, because of the pooled cross-sectional nature of the NAWS, there may be selection processes at play regarding who remains in agriculture across time and who selects out of agriculture. Specifically, as Hamilton et al. (2019) note, documented immigrants and U.S. citizens who remain employed in agriculture over time may have lower human, social, and financial capital than those who find subsequent work outside of agriculture. Second, because the CSPP data and policy data from Reich (2019; 2017) are only available for the period between 2005 and 2012, the effects of policies implemented in earlier (pre-2005) or more recent (2012+) years could not be explored. Further data collection pursuits should work to gather data on state immigration policies during these years for further analysis of the impact of these policies on the lives of immigrants and Latinx individuals. Third, underreporting healthcare access may bias the estimates presented here. Namely, because the NAWS asks workers whether they

accessed health care sometime in the past two years, recall bias may affect whether workers remember accessing care in this relatively long time period. Finally, the NAWS asks whether workers were *ever* diagnosed with a chronic condition in their lifetime, rather than more current questions about their health (i.e., self-rated health). Given that undocumented immigrants have less access to health care than documented immigrants and U.S. born citizens, undocumented immigrants may be less likely to have a known health condition. Thus, estimates of workers' health presented in this article, proxied through the number of health conditions reported, may underestimate workers' current health status.

Critically, findings from this study highlight the pivotal role of state immigration policy in shaping *racialized legal status* inequities in health care access. I find that U.S. born and documented Latinx immigrants—especially those who are non-White—are particularly vulnerable to state immigration policies; racialized legal status hierarchies *render* these groups vulnerable. State policies that restrict immigrant access to critical social resources like healthcare, employment, and housing or that increase rates of immigrant surveillance and enforcement work to segregate and oppress minoritized individuals, even when they possess legal status. These policies not only hinder immigrant incorporation and well-being, but they maintain nativist, racist, and legal status hierarchies in the United States.

Moreover, despite a broad literature arguing for the importance of broadly construed "cultural" factors and individual behaviors in shaping disparities among minoritized groups (see Viruell-Fuentes et al. 2012 for a review), this study shows that

efforts to reduce healthcare and health disparities in the United States must continue to shift away from this focus and towards an understanding of how systemic racism and xenophobia operate through state policies and institutions to generate, maintain, and exacerbate disparities in life chances. Exploring how structures of racial stratification and immigrant exclusion shape healthcare and health inequalities should be the focus of future research in this area, as such focus will provide deeper understanding of the fundamental causes of racial-ethnic and nativity inequalities that can be used to enact social change.

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Tables and Figures

Table 1: Weighted Demographic, Socioeconomic, and Health Characteristics of Study Sample

Nativity, race-ethnicity, legal status (%)	
U.S. born citizen White non-Latinx	16.5
U.S. born citizen non-White Latinx	7.7
Foreign-born U.S. citizen or documented White Latinx	10.1
Foreign-born U.S. citizen or documented non-White Latinx	18.4
Undocumented White Latinx	12.7
Undocumented non-White Latinx	34.7
Mean age	36.2
Women (%)	23.5
Mean years of education	8.1
Family below poverty level (%)	32.1
Worker "follows the crop" (%)	5.8
Number of reported health conditions (%)	
0	81.0
1	15.2
2+	3.8
U.S. region (%)	
Northeast	13.5
Southeast	11.8
Midwest	19.0
Southwest	7.6
Northwest	15.1
California	33.0
N	11,592

Source: National Agricultural Workers Survey, 2005-2012.

Table 2: Cross Tabulation of Healthcare Access and Barriers to Care-Seeking across Respondent Nativity, Race-ethnicity, and Legal Status

	All workers	U.S. born citizen White non-Latinx	U.S. born citizen non-White Latinx		Foreign-born U.S. citizen or documented White Latinx		Foreign-born U.S. citizen or documented non-White Latinx		Undocumented White Latinx		Undocumented non-White Latinx	
Accessed care in past 2 years (%)	58.4	84.0	74.7	***	71.6	***	59.9	***	45.5	***	41.9	***
N	11592	1583	698		1507		2073		1907		3824	
Healthcare access barriers (%)												
No barriers	48.7	69.5	65.2	***	52.5	***	53.8	***	42.6	***	35.2	***
Information, cost, transportation	43.7	22.2	33.5	***	41.7	***	42.6	***	47.3	***	54.9	***
Healthcare-related	1.2	4.4	0.5	***	2.1	***	0.4	***	0.5	***	1.2	***
Xenophobia-related	3.8	0.5	0.0	***	1.1	***	2.2	***	6.4	***	6.5	***
Other	2.5	3.3	0.8	***	2.6	***	1.1	***	3.3	***	2.9	***
N	8092	1248	612		805		1394		1143		2890	

Source. National Agricultural Workers Survey, 2005-2012

Note. ***p<0.001, **p<0.001, *p<0.05, †p<0.1

Significance tests are of difference in means/proportions between all other nativity, racial-ethnicity, and legal status groups of respondents relative to U.S. citizen White workers.

Table 3: OLS Models of Healthcare Access with State, Month, and Year Fixed Effects - Restrictive/Accommodating Policy Contexts

	Model 1: Demographics, Socioeconomic, and Health		Model 2: Model 1 + Proportion of Restrictive Policies in a Context (Fully interacted)		Model 3: Model 1 + Proportion of Accommodating Policies in a Context (Fully interacted)	
Characteristics	***Coefficients***	***SE***	***Coefficients***	***SE***	***Coefficients***	***SE***
Nativity, race-ethnicity, legal status (ref = U.S. born White non-Latinx)						
U.S. born non-White Latinx	-0.086 ***	-0.022	-0.055	-0.187	-0.052	-0.191
Foreign-born documented White Latinx	-0.060 ***	-0.019	-0.054	-0.167	-0.091	-0.169
Foreign-born documented non-White Latinx	-0.121 ***	-0.019	-0.394 *	-0.166	-0.492 **	-0.167
Undocumented White Latinx	-0.219 ***	-0.019	-0.875 ***	-0.152	-0.910 ***	-0.153
Undocumented non-White Latinx	-0.231 ***	-0.018	-0.877 ***	-0.130	-0.873 ***	-0.132
Age	0.005 **	-0.002	-0.012 **	-0.004	-0.012 **	-0.004
Age^2	0.000 *	0.000	0.000 **	0.000	0.000 **	0.000
Women (ref = Men)	0.221 ***	-0.011	0.054 †	-0.028	0.054 †	-0.028
Number of health conditions	0.195 ***	-0.008	0.108 ***	-0.020	0.107 ***	-0.020
Worker "follows the crop" (ref = does not "follow the crop")			0.035	-0.182	0.037	-0.182
Family below poverty level (ref = Family above poverty level)	-0.059 ***	-0.010	-0.020	-0.035	-0.022	-0.035
Years of education	0.013 ***	-0.001	0.016 **	-0.006	0.015 **	-0.006
Proportion of restrictive or accommodating policies / total policies			0.068 †	-0.039	-0.062	-0.043
Proportion of restrictive or accommodating policies x U.S. born non-White Latinx			0.005	-0.067	-0.008	-0.074
Proportion of restrictive or accommodating policies x Foreign-born documented White Latinx			-0.062	-0.059	0.019	-0.060
Proportion of restrictive or accommodating policies x Foreign-born documented non-White Latinx			-0.132 *	-0.054	0.097 †	-0.056
Proportion of restrictive or accommodating policies x Undocumented White Latinx			-0.058	-0.055	0.014	-0.056
Proportion of restrictive or accommodating policies x Undocumented non-White Latinx			0.002	-0.049	-0.017	-0.050
Age x U.S. born non-White Latinx			0.002	-0.008	0.002	-0.008
Age x Foreign-born documented White Latinx			0.002	-0.007	0.002	-0.007
Age x Foreign-born documented non-White Latinx			0.016 *	-0.007	0.016 *	-0.007
Age x Undocumented White Latinx			0.032 ***	-0.007	0.032 ***	-0.007
Age x Undocumented non-White Latinx			0.030 ***	-0.006	0.029 ***	-0.006
Age^2 x U.S. born non-White Latinx			0.000	0.000	0.000	0.000
Age^2 x Foreign-born documented White Latinx			0.000	0.000	0.000	0.000
Age^2 x Foreign-born documented non-White Latinx			0.000 *	0.000	0.000 *	0.000
Age^2 x Undocumented White Latinx			0.000 ***	0.000	0.000 ***	0.000
Age^2 x Undocumented non-White Latinx			0.000 ***	0.000	0.000 ***	0.000

Women x U.S. born non-White Latinx				0.061		-0.060	0.061	-0.060
Women x Foreign-born documented White Latinx				0.117	**	-0.041	0.117	** -0.041
Women x Foreign-born documented non-White Latinx				0.107	**	-0.038	0.107	** -0.038
Women x Undocumented White Latinx				0.266	***	-0.038	0.265	*** -0.038
Women x Undocumented non-White Latinx				0.250	***	-0.034	0.250	*** -0.034
Number of health conditions x U.S. born non-White Latinx				0.075	*	-0.031	0.075	* -0.031
Number of health conditions x Foreign-born documented White Latinx				0.061	*	-0.027	0.062	* -0.027
Number of health conditions x Foreign-born documented non-White Latinx				0.109	***	-0.025	0.109	*** -0.025
Number of health conditions x Undocumented White Latinx				0.105	***	-0.033	0.106	*** -0.033
Number of health conditions x Undocumented non-White Latinx				0.163	***	-0.027	0.164	*** -0.027
Worker "follows the crop" x U.S. born non-White Latinx				-0.116		-0.211	-0.119	-0.211
Worker "follows the crop" x Foreign-born documented White Latinx				-0.061		-0.195	-0.063	-0.195
Worker "follows the crop" x Foreign-born documented non-White Latinx				-0.208		-0.188	-0.021	-0.188
Worker "follows the crop" x Undocumented White Latinx				-0.096		-0.186	-0.099	-0.186
Worker "follows the crop" x Undocumented non-White Latinx				-0.079		-0.184	-0.080	-0.184
Family below poverty x U.S. born non-White Latinx				0.010		-0.053	0.010	-0.053
Family below poverty x Foreign-born documented White Latinx				-0.035		-0.047	-0.034	-0.047
Family below poverty x Foreign-born documented non-White Latinx				-0.018		-0.043	-0.017	-0.043
Family below poverty x Undocumented White Latinx				-0.091	*	-0.041	-0.090	* -0.041
Family below poverty x Undocumented non-White Latinx				-0.046		-0.038	-0.045	-0.038
Years of education x U.S. born non-White Latinx				-0.011		-0.009	-0.010	-0.009
Years of education x Foreign-born documented White Latinx				-0.005		-0.007	-0.004	-0.007
Years of education x Foreign-born documented non-White Latinx				-0.005		-0.007	-0.004	-0.007
Years of education x Undocumented White Latinx				0.001		-0.007	0.001	-0.007
Years of education x Undocumented non-White Latinx				0.001		-0.006	0.001	-0.006
State Fixed Effects		X			X			X
Year Fixed Effects		X			X			X
Month Fixed Effects		X			X			X
Constant	0.446	***	-0.043	0.774	***	-0.108	0.835	*** -0.109
Adj. R2		0.181			0.196			0.195
N		11592			11592			11592

Source: National Agricultural Workers Survey, 2005-2012; Correlates of State Policy Project

Note. ***p<0.001, **p<0.01, *p<0.05, †p<0.1.

Table 4: OLS Models of Healthcare Access with State, Month, and Year Fixed Effects - Implementation of Specific State-Level Immigration Laws

Characteristics	Model 1: Policies Implemented that Do Not Extend Health Coverage for Immigrants (Fully interacted)			Model 2: Policies Implemented that Extend Driver's License Privileges to Undocumented Immigrants (Fully		
	Coefficients		*SE*	*Coefficients*		*SE*
Nativity, race-ethnicity, legal status (ref = U.S. born White non-Latinx)						
U.S. born non-White Latinx	-0.046		-0.186	-0.085		-0.186
Foreign-born documented White Latinx	-0.075		-0.166	-0.075		-0.166
Foreign-born documented non-White Latinx	-0.419	***	-0.165	-0.440	*	-0.165
Undocumented White Latinx	-0.892	***	-0.151	-0.906	***	-0.150
Undocumented non-White Latinx	-0.890	***	-0.129	-0.888	***	-0.129
Age	-0.012	**	-0.004	-0.012	**	-0.004
Age^2	0.000	**	0.000	0.000	**	0.000
Women (ref = Men)	0.051	†	-0.028	0.054	†	-0.028
Number of health conditions	0.107	***	-0.020	0.107	***	-0.020
Worker "follows the crop" (ref = does not "follow the crop")	0.029		-0.182	0.037		-0.182
Family below poverty level (ref = Family above poverty level)	-0.022		-0.035	-0.020		-0.035
Years of education	0.016	**	-0.006	0.016	**	-0.006
Policy implemented (ref = policy not implemented)	0.048		-0.037	-0.013		-0.055
Policy implemented x U.S. born non-White Latinx	-0.105	*	-0.043	0.193	*	-0.079
Policy implemented x Foreign-born documented White Latinx	-0.014		-0.039	0.010		-0.062
Policy implemented x Foreign-born documented non-White Latinx	-0.069	*	-0.036	-0.036		-0.058
Policy implemented x Undocumented White Latinx	-0.041		-0.036	0.039		-0.061
Policy implemented x Undocumented non-White Latinx	-0.009		-0.032	0.118	*	-0.054
Age x U.S. born non-White Latinx	0.004		-0.008	0.002		-0.008
Age x Foreign-born documented White Latinx	0.002		-0.007	0.002		-0.007
Age x Foreign-born documented non-White Latinx	0.016	*	-0.007	0.016	*	-0.007
Age x Undocumented White Latinx	0.032	***	-0.007	0.032	***	-0.007
Age x Undocumented non-White Latinx	0.030	***	-0.006	0.029	***	-0.006
Age^2 x U.S. born non-White Latinx	0.000		0.000	0.000		0.000
Age^2 x Foreign-born documented White Latinx	0.000		0.000	0.000		0.000
Age^2 x Foreign-born documented non-White Latinx	0.000	*	0.000	0.000	*	0.000
Age^2 x Undocumented White Latinx	0.000	***	0.000	0.000	***	0.000
Age^2 x Undocumented non-White Latinx	0.000	***	0.000	0.000	***	0.000

Age^2 x U.S. born non-White Latinx	0.000		0.000	0.000		0.000
Age^2 x Foreign-born documented White Latinx	0.000		0.000	0.000		0.000
Age^2 x Foreign-born documented non-White Latinx	0.000	*	0.000	0.000	*	0.000
Age^2 x Undocumented White Latinx	0.000	***	0.000	0.000	***	0.000
Age^2 x Undocumented non-White Latinx	0.000	***	0.000	0.000	***	0.000
Women x U.S. born non-White Latinx	0.065		-0.053	0.069		-0.060
Women x Foreign-born documented White Latinx	0.120	**	-0.047	0.117	**	-0.041
Women x Foreign-born documented non-White Latinx	0.111	**	-0.043	0.103	**	-0.038
Women x Undocumented White Latinx	0.269	***	-0.041	0.269	***	-0.038
Women x Undocumented non-White Latinx	0.253	***	-0.038	0.252	***	-0.034
Number of health conditions x U.S. born non-White Latinx	0.078	*	-0.031	0.075	*	-0.031
Number of health conditions x Foreign-born documented White	0.062	*	-0.027	0.061	*	-0.027
Number of health conditions x Foreign-born documented non-W	0.111	***	-0.025	0.109	***	-0.025
Number of health conditions x Undocumented White Latinx	0.106	***	-0.033	0.105	***	-0.033
Number of health conditions x Undocumented non-White Latin	0.163	***	-0.027	0.161	***	-0.027
Worker "follows the crop" x U.S. born non-White Latinx	-0.115		-0.211	-0.103		-0.211
Worker "follows the crop" x Foreign-born documented White Latinx	-0.055		-0.196	-0.063		-0.195
Worker "follows the crop" x Foreign-born documented non-White Latinx	-0.204		-0.189	-0.216		-0.188
Worker "follows the crop" x Undocumented White Latinx	-0.088		-0.186	-0.098		-0.186
Worker "follows the crop" x Undocumented non-White Latinx	-0.071		-0.184	-0.077		-0.184
Family below poverty x U.S. born non-White Latinx	0.012		-0.053	0.012		-0.053
Family below poverty x Foreign-born documented White Latin	-0.036		-0.047	-0.037		-0.047
Family below poverty x Foreign-born documented non-White L	-0.016		-0.043	-0.020		-0.043
Family below poverty x Undocumented White Latinx	-0.091	*	-0.041	-0.093	*	-0.041
Family below poverty x Undocumented non-White Latinx	-0.045		-0.038	-0.047		-0.038
Years of education x U.S. born non-White Latinx	-0.012		-0.009	-0.010		-0.009
Years of education x Foreign-born documented White Latinx	-0.005		-0.007	-0.005		-0.007
Years of education x Foreign-born documented non-White Lat	-0.004		-0.007	-0.005		-0.007
Years of education x Undocumented White Latinx	0.001		-0.007	0.001		-0.007
Years of education x Undocumented non-White Latinx	0.001		-0.006	0.000		-0.006
State Fixed Effects		X			X	
Year Fixed Effects		X			X	
Month Fixed Effects		X			X	
Constant	0.79	***	-0.107	0.8	***	-0.107
Adj. R2		0.195			0.196	
N		11592			11592	

Source: National Agricultural Workers Survey, 2005-2012; Reich (2019) Dat

Note. ***p<0.001, **p<0.01, *p<0.05, †p<0.1.

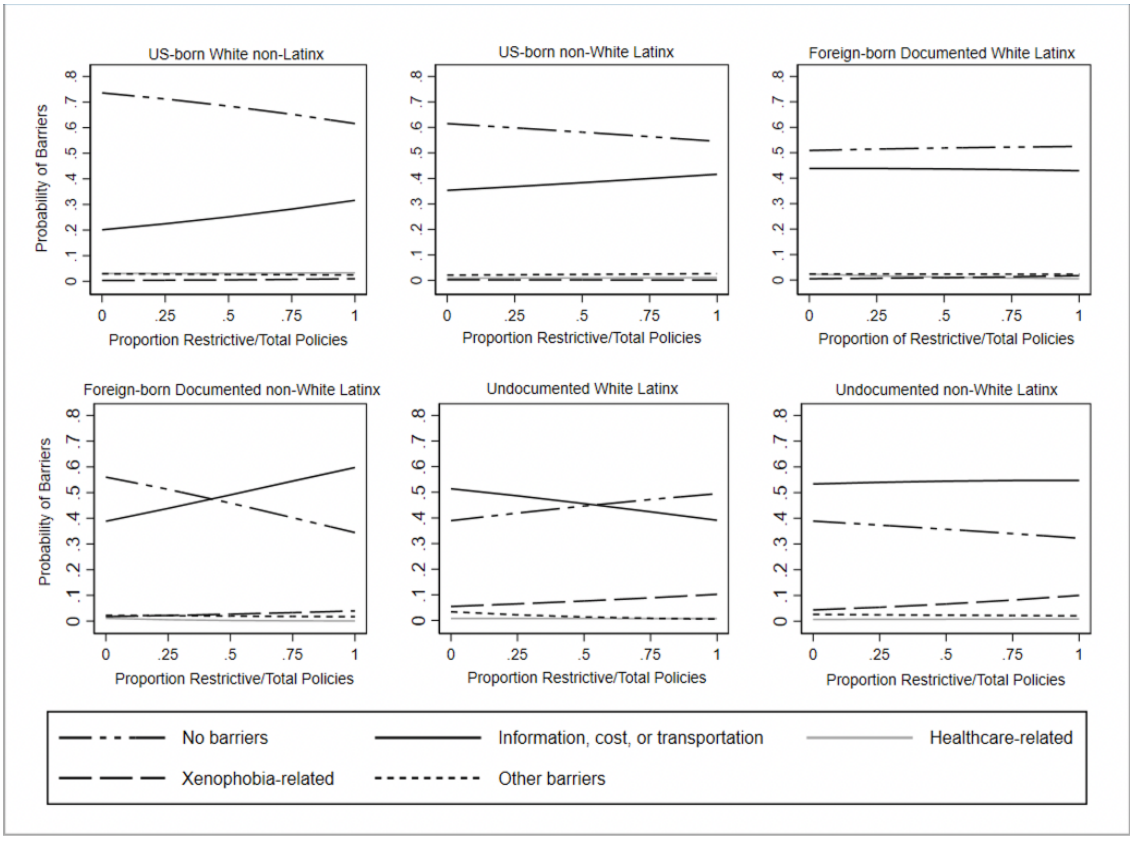

Figure 1: Respondent Reported Barriers to Care-seeking in More Restrictive Policy Climates

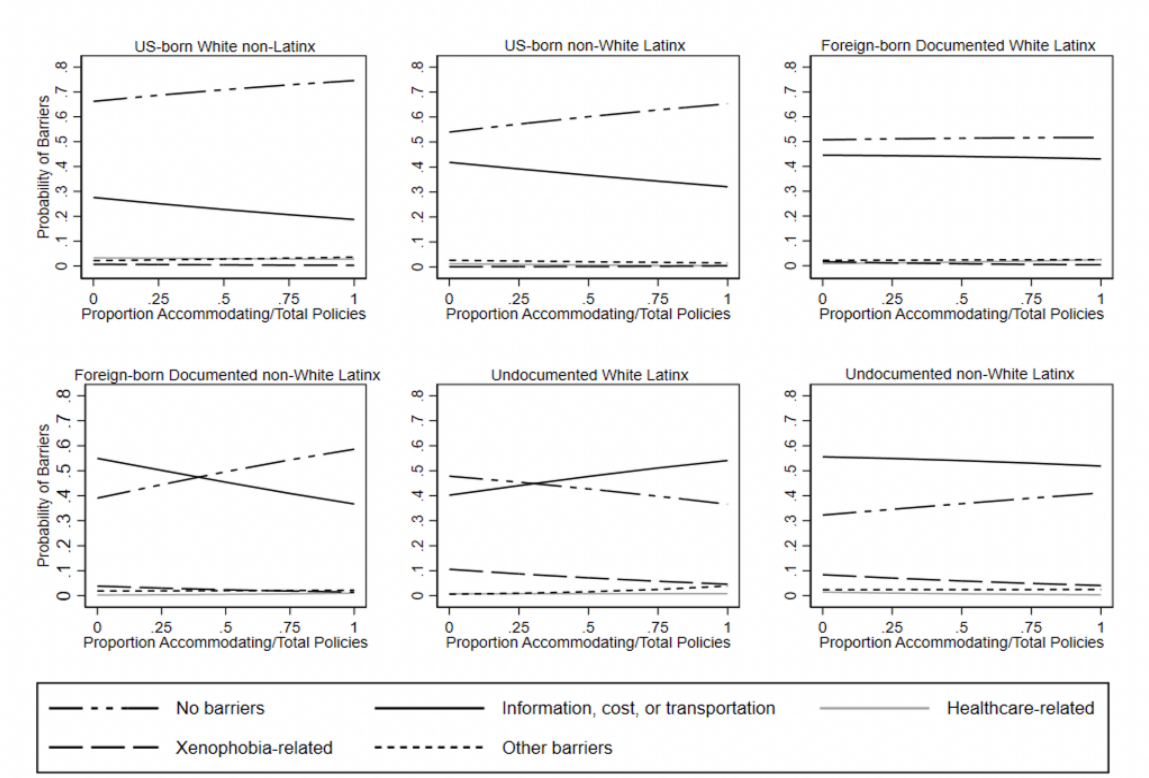

Figure 2: Respondent Reported Barriers to Care-seeking in More Accommodating Policy Climates

Appendices

Appendix Table 1: Predicted Probabilities of Reporting Barriers to Healthcare Access in the Context of Increasing Restrictive Policies

	Restrictive policies 0% of total policies		…25% of total		…50% of total		…75% of total		…100% of total	
No barriers										
U.S. born White non-Latinx	0.651 ***	-0.015	0.63 ***	-11	0.606 ***	-0.013	0.577 ***	-0.025	0.545 ***	-0.041
U.S. born non-White Latinx	0.557 ***	-0.027	0.542 ***	-0.018	0.526 ***	-0.019	0.51 ***	-0.031	0.493 ***	-0.047
Foreign-born documented White Latinx	0.499 ***	-0.021	0.504 ***	-0.013	0.508 ***	-0.022	0.512 ***	-0.036	0.514 ***	-0.051
Foreign-born documented non-White Latinx	0.535 ***	-0.015	0.489 ***	-0.01	0.438 ***	-0.015	0.384 ***	-0.026	0.329 ***	-0.037
Undocumented White Latinx	0.419 ***	-0.021	0.451 ***	-0.012	0.481 ***	-0.018	0.508 ***	-0.03	0.533 ***	-0.041
Undocumented non-White Latinx	0.416 ***	-0.014	0.399 ***	-0.008	0.382 ***	-0.013	0.364 ***	-0.022	0.345 ***	-0.032
Information, cost, or transportation barriers										
U.S. born White non-Latinx	0.263 ***	-0.02	0.285 ***	-0.014	0.31 ***	-0.015	0.338 ***	-0.025	0.37 ***	-0.04
U.S. born non-White Latinx	0.405 ***	-0.029	0.419 ***	-0.02	0.433 ***	-0.02	0.447 ***	-0.032	0.462 ***	-0.049
Foreign-born documented White Latinx	0.447 ***	-0.022	0.447 ***	-0.014	0.445 ***	-0.022	0.442 ***	-0.036	0.438 ***	-0.051
Foreign-born documented non-White Latinx	0.408 ***	-0.016	0.457 ***	-0.011	0.507 ***	-0.016	0.559 ***	-0.026	0.609 ***	-0.038
Undocumented White Latinx	0.493 ***	-0.021	0.462 ***	-0.013	0.43 ***	-0.018	0.396 ***	-0.028	0.362 ***	-0.038
Undocumented non-White Latinx	0.513 ***	-0.014	0.521 ***	-0.009	0.527 ***	-0.013	0.531 ***	-0.022	0.533 ***	-0.031
Healthcare-related barriers										
U.S. born White non-Latinx	0.038 **	-0.012	0.038 ***	-0.008	0.038 ***	-0.011	0.038 ***	-0.011	0.038 *	-0.016
U.S. born non-White Latinx	0.011	-0.008	0.011 *	-0.006	0.012 *	-0.008	0.012	-0.008	0.012	-0.012
Foreign-born documented White Latinx	0.023 **	-0.008	0.016 ***	-0.004	0.011 *	-0.006	0.078	-0.006	0.005	-0.006
Foreign-born documented non-White Latinx	0.011 *	-0.005	0.006 **	-0.002	0.003	-0.002	0.001	-0.002	0.001	-0.001
Undocumented White Latinx	0.008 *	-0.003	0.007 **	-0.002	0.007 *	-0.004	0.007	-0.004	0.007	-0.006
Undocumented non-White Latinx	0.007 **	-0.002	0.007 ***	-0.002	0.008 ***	-0.003	0.008 *	-0.004	0.008 †	-0.005
Xenophobia-related barriers										
U.S. born White non-Latinx	0.004	-0.004	0.006 †	-0.003	0.007 *	-0.003	0.009	-0.005	0.012 †	-0.009
U.S. born non-White Latinx	0.003	-0.004	0.002	-0.002	0.002	-0.004	0.002	-0.003	0.002	-0.004
Foreign-born documented White Latinx	0.005 †	-0.003	0.007 *	-0.003	0.01 *	-0.002	0.013	-0.008	0.018 †	-0.015
Foreign-born documented non-White Latinx	0.019 ***	-0.005	0.024 ***	-0.004	0.029 ***	-0.005	0.035 ***	-0.009	0.041 **	-0.016
Undocumented White Latinx	0.052 ***	-0.008	0.061 ***	-0.007	0.071 ***	-0.008	0.082 ***	-0.014	0.094 ***	-0.022
Undocumented non-White Latinx	0.041 ***	-0.005	0.051 ***	-0.004	0.063 ***	-0.006	0.077 ***	-0.01	0.095 ***	-0.018
Other barriers										
U.S. born White non-Latinx	0.044 ***	-0.014	0.041 ***	-0.009	0.039 ***	-0.007	0.037 ***	-0.009	0.035 **	-0.012
U.S. born non-White Latinx	0.024 *	-0.01	0.026 ***	-0.008	0.027 **	-0.008	0.029 **	-0.011	0.03 *	-0.015
Foreign-born documented White Latinx	0.026 ***	-0.007	0.026 ***	-0.005	0.026 ***	-0.006	0.026 **	-0.009	0.025 *	-0.013
Foreign-born documented non-White Latinx	0.027 ***	-0.006	0.025 ***	-0.004	0.023 ***	-0.005	0.022 ***	-0.006	0.02 *	-0.008
Undocumented White Latinx	0.029 ***	-0.006	0.018 ***	-0.004	0.011 ***	-0.004	0.007 *	-0.004	0.004	-0.003
Undocumented non-White Latinx	0.023 ***	-0.004	0.022 ***	-0.003	0.021 ***	-0.003	0.02 ***	-0.004	0.019 ***	-0.005

Source: National Agricultural Workers Survey, 2005-2012; Correlates of State Policy Project

Note. ***p<0.001, **p<0.01, *p<0.05, †p<0.1.

Appendix Table 2: Predicted Probabilities of Reporting Barriers to Healthcare Access in the Context of Increasing Accommodating Policies

	Accommodating policies 0% of total policies		…25% of total		…50% of total		…75% of total		…100% of total	
No barriers										
U.S. born White non-Latinx	0.589 ***	-0.023	0.607 ***	-0.013	0.627 ***	-0.011	0.644 ***	-0.015	0.660 ***	-0.020
U.S. born non-White Latinx	0.488 ***	-0.034	0.517 ***	-0.02	0.544 ***	-0.017	0.569 ***	-0.025	0.592 ***	-0.035
Foreign-born documented White Latinx	0.497 ***	-0.036	0.501 ***	-0.028	0.503 ***	-0.014	0.505 ***	-0.016	0.507 ***	-0.027
Foreign-born documented non-White Latinx	0.373 ***	-0.028	0.424 ***	-0.018	0.474 ***	-0.011	0.519 ***	-0.012	0.559 ***	-0.018
Undocumented White Latinx	0.515 ***	-0.029	0.489 ***	-0.019	0.46 ***	-0.013	0.429 ***	-0.016	0.395 ***	-0.027
Undocumented non-White Latinx	0.345 ***	-0.021	0.369 ***	-0.014	0.394 ***	-0.009	0.417 ***	-0.011	0.439 ***	-0.018
Information, cost, or transportation barriers										
U.S. born White non-Latinx	0.334 ***	-0.025	0.31 ***	-0.015	0.287 ***	-0.014	0.266 ***	-0.02	0.246 ***	-0.027
U.S. born non-White Latinx	0.464 ***	-0.035	0.441 ***	-0.021	0.419 ***	-0.019	0.398 ***	-0.028	0.377 ***	-0.038
Foreign-born documented White Latinx	0.453 ***	-0.037	0.451 ***	-0.024	0.448 ***	-0.015	0.444 ***	-0.017	0.439 ***	-0.028
Foreign-born documented non-White Latinx	0.562 ***	-0.029	0.517 ***	-0.018	0.471 ***	-0.012	0.428 ***	-0.013	0.388 ***	-0.019
Undocumented White Latinx	0.376 ***	-0.028	0.415 ***	-0.019	0.452 ***	-0.013	0.488 ***	-0.017	0.521 ***	-0.027
Undocumented non-White Latinx	0.541 ***	-0.022	0.533 ***	-0.014	0.522 ***	-0.009	0.51 ***	-0.011	0.497 ***	-0.018
Healthcare-related barriers										
U.S. born White non-Latinx	0.04 **	-0.013	0.039 ***	-0.008	0.038 ***	-0.008	0.037 ***	-0.011	0.036 *	-0.015
U.S. born non-White Latinx	0.016	-0.01	0.012 *	-0.006	0.01 †	-0.006	0.008	-0.007	0.006	-0.008
Foreign-born documented White Latinx	0.009	-0.007	0.011 *	-0.006	0.015 **	-0.004	0.019 ***	-0.005	0.024 *	-0.01
Foreign-born documented non-White Latinx	0.003	-0.003	0.004	-0.003	0.005 *	-0.002	0.008 **	-0.003	0.011 †	-0.006
Undocumented White Latinx	0.007	-0.005	0.007 *	-0.003	0.008 **	-0.002	0.008 **	-0.003	0.008 †	-0.004
Undocumented non-White Latinx	0.014 *	-0.006	0.01 ***	-0.003	0.007 ***	-0.002	0.005 ***	-0.002	0.004 *	-0.002
Xenophobia-related barriers										
U.S. born White non-Latinx	0.009	-0.006	0.008 *	-0.004	0.006 *	-0.003	0.005	-0.004	0.004	-0.005
U.S. born non-White Latinx	0.001	-0.002	0.002	-0.002	0.003	-0.003	0.004	-0.005	0.006	-0.011
Foreign-born documented White Latinx	0.017	-0.011	0.012 *	-0.005	0.008 **	-0.003	0.006 *	-0.003	0.004	-0.003
Foreign-born documented non-White Latinx	0.04 ***	-0.013	0.032 ***	-0.007	0.025 ***	-0.004	0.02 ***	-0.004	0.016 **	-0.005
Undocumented White Latinx	0.097 ***	-0.018	0.081 ***	-0.011	0.066 ***	-0.007	0.054 ***	-0.007	0.044 ***	-0.009
Undocumented non-White Latinx	0.079 ***	-0.012	0.066 ***	-0.007	0.055 ***	-0.004	0.046 ***	-0.004	0.038 ***	-0.006
Other barriers										
U.S. born White non-Latinx	0.032 ***	-0.01	0.036 ***	-0.008	0.042 ***	-0.008	0.047 ***	-0.013	0.054 *	-0.021
U.S. born non-White Latinx	0.031 **	-0.012	0.028 ***	-0.008	0.025 **	-0.008	0.022 *	-0.011	0.019	-0.014
Foreign-born documented White Latinx	0.024 *	-0.011	0.025 **	-0.008	0.026 ***	-0.006	0.026 ***	-0.006	0.027 ***	-0.008
Foreign-born documented non-White Latinx	0.022 **	-0.008	0.023 ***	-0.005	0.024 ***	-0.004	0.025 ***	-0.005	0.026 ***	-0.007
Undocumented White Latinx	0.005 †	-0.003	0.009 *	-0.003	0.013 ***	-0.004	0.021 ***	-0.004	0.033 ***	-0.008
Undocumented non-White Latinx	0.021 ***	-0.005	0.021 ***	-0.004	0.022 ***	-0.003	0.022 ***	-0.003	0.022 ***	-0.004

Source: National Agricultural Workers Survey, 2005-2012; Correlates of State Policy Proj

Note. ***p<0.001, **p<0.01, *p<0.05, †p<0.1.

CHAPTER 3: Racial-ethnic Disparities in Provider-Patient Communication: The Case of Incidental Medical Findings

Abstract

Health disparities research often focuses on the social patterning of health outcomes. Increasingly, there has been an emphasis on understanding the mechanisms perpetuating disparities, even after issues of patient access to health care are addressed. This study utilizes an original dataset of retrospective electronic medical records (EMR), radiology records, and U.S. Census data to investigate the racial-ethnic patterning of provider-patient communication of incidental medical findings that may require follow-up. Results indicate that racial-ethnic disparities in follow-up adherence for incidentally detected pulmonary nodules stem from initial disparities in provider-patient communication. These disparities persist even after accounting for multiple socioeconomic, health, and provider characteristics, indicating a bias in medicine whereby providers are less likely to provide equal levels of communication to their patients of color compared to their White patients. This paper has important clinical implications, as it sheds new light on low adherence to medical advice among patients of color. Findings also have social, political, and policy relevance, as they suggest an important mechanism through which health inequalities continue to persist, as communication failures may reflect the presence and perpetuation of *racial mythologies* in medical practice. To finally eliminate health inequalities across racial-ethnic lines in the United States, racial bias and discrimination within medical and public health infrastructures must be eliminated.

Introduction

Despite an abundance of research demonstrating the existence of health inequalities by race and ethnicity, questions remain surrounding the mechanisms generating disparities. One mechanism is via differential access to healthcare services, whereby disparities in financial and social capital prevent individuals of color from accessing preventative, screening, and diagnostic services, participating in clinical research trials, and receiving medical treatment. Yet, research shows that even when people of color access health services, their experiences within the healthcare system are marred by prejudice and discrimination, deterring many from engaging in future health-seeking behavior (Williams and Wyatt 2015; Johnson et al. 2004). Whereas health disparities can result from access barriers, they are also the consequence of hurdles faced during the process of navigating complex health systems, insurance schema, and interactions with medical providers themselves. As Ashton et al. (2003) describe, "…some disparities emerge after the patient gets to the doctor, not from difficulties in getting to the doctor in the first place…some disparities are emerging from the context of the doctor-patient interaction" (146). To date, a handful of audit and observational studies have documented disparate treatment within the context of doctor-patient visits, however disparities in other patient interactions with providers and health systems, such as follow-up adherence, have not yet been adequately explored.

This study utilizes an original dataset of electronic medical records (EMR), radiology records, and U.S. Census data to examine interactional-level data on provider-patient communications among a retrospective cohort of patients diagnosed with

incidental medical findings requiring follow-up surveillance. The specific incidental findings examined here are small pulmonary nodules, "spots" on the lung that represent a potential biomarker for lung cancer and other malignancies. Radiology research shows follow-up adherence for these nodules is low, with estimates suggesting less than 40% of patients receive timely follow-up (McDonald et al. 2017).

Within this context of low overall follow-up adherence for incidental pulmonary nodules, findings from the present study suggest follow-up is particularly low among Black and Latinx patients. Adherence, however, is actually the last step in a complex process of diagnosis, communication of findings, ordering/scheduling follow-up, and finally, patient adherence. Therefore, one goal of this study is to problematize an exclusive focus on disparities in adherence, theorizing provider-patient communication is a key pre-requisite, as individuals can only follow advice and recommendations they are aware of in the first place. Critically, my findings show that provider-patient communication, as adherence, is highly patterned across patient race-ethnicity. I find striking evidence that wide gaps in provider-patient communication of incidental findings persist even after adjusting for socioeconomic, health, and provider characteristics. I argue these communication disparities result from the perpetuation of *racial mythologies* – stereotypes about racial differences in behavior and biology – in medical practice. These mythologies include narratives that people of color are less likely to adhere to medical directives than White patients and can therefore serve as a justification for communicating less and lower quality information to patients of color relative to White patients (Hoberman 2007; Washington 2006). Communication disparities have tangible

consequences for healthcare-seeking and medical adherence, potentially magnifying health inequalities between racial-ethnic groups in the United States downstream.

Background

Racial-ethnic Inequalities in Health and Healthcare

Although advancements in public health and medical technology during the 20th century led to significant reductions in morbidity and mortality in the United States, research demonstrates vast disparities in the health of people of color (Williams et al. 2019; Phelan and Link 2015; Williams and Wyatt 2015; Feagin and Bennefield 2014; Viruell-Fuentes et al. 2012). These disparities have social and historical origins, arising from "generations of unjust enrichment from oppression [that] have resulted in whites having superior resources" (Feagin and Bennefield 2014, 8). This history of oppression has resulted in a racial hierarchy in the United States, enabling Whites to maintain power and resources by systematically withholding opportunities, resources, and access to institutions to people of color (Williams et al. 2019). In other words, whereas Whites and those at the upper end of the SES spectrum are often protected from many causes of ill-health due to their ability to access more human and financial capital, people of color and individuals of low socioeconomic status have difficulty navigating the costly and complex health system to receive necessary preventative care and treatment (Phelan et al. 2010). For example, hospitals and providers can view people of color and low-SES patients as "financial disincentives," as they are more likely to possess lower-reimbursing Medicaid insurance than their White counterparts, and low-resource patients are often provided lower-quality and less rigorous care (Alexander and Sehgal 1998). patients of

color are more likely to receive inadequate treatment recommendations for a variety of health indications such as breast cancer and cardiovascular disease (Williams and Wyatt 2015). Ashton et al. (2003) and Mayberry et al. (2000) showed Black patients often receive less clinical attention and fewer diagnostic tests than White patients, even when controlling for multiple health characteristics. Black women are less likely to be given innovative treatments or combination therapies as part of their cancer treatment (Beyer et al. 2019), even though they experience higher rates of certain cancers compared with White women (Feagin and Bennefield 2014).

Medical adherence (or "compliance"), the degree to which a patient follows the recommendations of health care providers, is theorized to be an important contributor to health inequalities. Nonadherence is an issue of major clinical relevance because it directly affects the efficacy of preventative, treatment, and other medical outcomes, and is linked to poor survival outcomes for a variety of conditions (Jin et al. 2008). Yet, literature on medical adherence has historically been patient-focused, often seeking to blame patients for their failure to heed the authority of healthcare providers. In more recent years, such literature has come under criticism, particularly in the field of public health, "as many argue that patients should not be viewed simply as opportunities to reinforce instructions around treatment and around the existing hierarchy in which physicians are in command" (Bissell et al., 2004). Researchers have largely abandoned arguments that patient nonadherence is the result of deviance and have instead attempted to understand barriers to adherence among patients of color, such as institutional racism and differential access to resources. Studies have found significant racial and social

disparities are a fundamental source of poor adherence to a multitude of medical conditions, rooted in financial, social, and human capital differences (Wheeler et al. 2017; Braveman et al. 2010; Jin et al. 2008; Dominick et al. 2005; Bissell et al. 2004; and Kaplan et al. 2004).

Adherence is also shaped by the nature of provider-patient interactions. One meta-analysis showed high-quality communication was strongly associated with better patient adherence. Specifically, patients with whom physicians communicated poorly exhibited a 19% higher risk of nonadherence, and when physicians were trained to communicate better, adherence significantly improved (Zolnierick and DiMatteo, 2010). In exploring how provider-patient communication affects adherence of patients of color, studies show that experiencing racism within the medical encounter is associated with delays in seeking health care and reduced adherence to medical recommendations. A meta-analysis by Williams et al. (2019) showed perceptions of biased physician encounters limited the desire to communicate with and trust that provider. In turn, patients experiencing bias are less comfortable to ask questions or otherwise initiate dialogue with their treating providers.

Multiple studies to date have shown that provider bias is common in healthcare settings and has a profound impact on patient care (Beyer et al. 2019; Feagin and Bennefield 2014; Blair et al. 2013; Mayberry et al. 2000; Alexander and Sehgal 1998). Studies find providers often make *a priori* judgements as to which patients are more likely to be "compliant" and follow advice, and then use these judgements to determine who is deserving of providers' communication. These judgments can occur across the

lines of patient race, constituting what Hoberman (2007) terms *racial mythologies*, stereotypes that healthcare providers hold against their patients of color regarding their behavior or biology. For example, healthcare providers have been found to "blame patients of color for being too passive, in contrast to White patients who have better health because they 'actively' seek it" (Feagin and Bennefield 2014, 11). These stereotypes and preconceived notions about racial differences in health behaviors may serve as a justification for failure to communicate adequately with patients of color and are perpetuated explicitly and implicitly in both medical education and practice across generations of healthcare professionals (Washington 2006). Physicians not only exhibited lower levels of communication with their Black patients, but also engaged in lower quality communication with them. Notably, physician visits with Black and other patients of color were characterized by increased provider verbal dominance and slower speech, and generally less patient-centeredness. Similar to findings from Blair et al (2013), this study showed that physicians exhibiting more implicit bias were given poor ratings of interpersonal care by their patients of color (Cooper et al 2012).

Still, unanswered questions remain regarding how exactly these provider-patient level communication interactions play out, including how complex pathways of healthcare utilization and adherence are interrupted by breaks in the communication chain. Whereas other work focuses on in-office visits and rarely on follow-up adherence, the present study assesses whether and how communication failures serve as a barrier to receiving quality medical care through impacting adherence. I aim to provide insight into the provider-patient communication process through empirical analysis of a unique

dataset that allows for a "bird's-eye" perspective of patient contact with the health system, analyzing whether instances of communication between patients and their providers occur.

Significance of Incidental Medical Findings

Incidental findings in the medical context are undiagnosed health conditions discovered unintentionally during evaluation for another medical condition. One common type of incidental finding is the small pulmonary nodule. This "spot" on the lung is often discovered on imaging exams, such as computed tomography (CT), undergone by patients for an unrelated indication, such as trauma or cancer screening/staging. After a patient receives an imaging exam, the images are routed to a radiologist to be "read." The radiologist summarizes findings from the exam into a report, noting all clinically significant and/or incidental findings and their established follow-up guidelines. Afterwards, the report is electronically routed to the provider who ordered the exam. This ordering provider is primarily responsible for discussing the results and recommendations for follow-up with the patient, to ensure the patient not only receives information about his/her diagnosis but is also able to understand the technical medical language used radiology reports. Pulmonary nodules are often of unclear etiology and undetermined significance at their diagnosis and often require follow-up (in the form of an imaging or invasive procedure) to ensure they do not further develop into a primary lung cancer, metastasis, or other clinically relevant condition. After disclosing the diagnosis of an incidental pulmonary nodule to a patient, the provider discusses and arranges any recommended follow-up imaging/procedures with the patient.

Incidental pulmonary nodules provide a good opportunity to examine provider-patient communication for three reasons. The annual frequency of chest CT imaging increased during 2006-2012 from 1.3 to 1.9%, as did the identification of pulmonary nodules (24 to 31%). As advanced imaging techniques such as CT and MRI increase in use for many indications, so will the identification of incidental nodules (Gould et al. 2015). As small pulmonary nodules are a clinically relevant issue, potentially indicative of early lung cancer, their surveillance is an important way by which morbidity and mortality from lung cancer can be reduced or prevented. Some pulmonary nodules, however, are deemed to pose no risk to a patient at their diagnosis, denoted as "benign" in a radiology report, and do not require any follow-up. Even when this is the case, being diagnosed with a "spot" on the lungs may have implications for inciting behavioral change (for example, smoking cessation). Therefore, it may still be important for providers to communicate benign incidental findings to their patients and discuss any implications for the patient's future health and behaviors.

Second, pulmonary nodules are ideal for examining provider-patient communication and follow-up adherence disparities because 1) the provider who orders a patients' exam must record in the EMR that he/she discussed the follow-up guidelines with the patient in order to release the report to the patient, as patients are unable to receive the radiology report without it being released to them by their provider, and 2) because radiologists include explicit, standardized follow-up guidelines in their report, such that there is little ambiguity for ordering providers regarding how a pulmonary nodule should be followed over time. Despite these standardized recommendations that

have been developed to ensure patients receive follow-up for their incidental pulmonary nodules, qualitative research finds that providers vary in their approaches to notifying patients of incidental finding diagnoses. Providers argue they use their own clinical judgement and their evaluation of the patient themselves in determining whether to notify them of an incidental finding diagnosis (Zafar et al. 2016). This means providers may employ stereotypes about the likelihood of Black and Latinx patients adhering to follow-up recommendations in deciding whether to communicate incidental finding diagnoses to them, resulting in disparate communication across the lines of patient race.

Finally, because the ordering provider serves as an intermediary between the radiologist's recommendations and the patient, it is straightforward to determine if a provider succeeded in communicating follow-up recommendations to the patient, as providers must report they communicated with a patient in the EMR for the radiology report to be released to patients. From the researcher's perspective, it is simple to follow this communication and these provider-patient interactions to determine if a provider communicated an incidental pulmonary nodule diagnosis and follow-up recommendations to a patient.

Data and Methods

Data are drawn from the electronic medical record (EMR) database and radiology records of a major tertiary healthcare system located in the northeastern United States, as well as U.S. Census data. The EMR database includes records of around 4 million patients who have received care at the health system since the 1990s. The health system examined in this analysis is representative of other major health centers in the United

States, with a central urban hospital and multiple suburban satellites. As hospital consolidation and mergers become increasingly common, we can expect such systems to become dominant providers of healthcare services in the future.

EMR data has not been widely adopted in health research in the social sciences, both because it is difficult to gain access to and challenging to navigate for those without prior exposure. It has major advantages, however, as EMR data allow for observation of nuanced interactions between providers and patients, and for patients' health and healthcare utilization to be tracked over time and across multiple institutions that allow for medical record sharing (Schneeweiss and Avorn 2005). Moreover, EMR data are becoming more popular for studying racism in the healthcare system (e.g., Sun et al. 2022).

This study received local Institutional Review Board approval with HIPAA (Health Information Portability and Privacy Act) waiver of informed consent prior to any data extraction, management, or analysis. A radiology-centric search engine was then utilized to identify all patients who received a chest CT for any medical indication in 2016, in which a previously undiagnosed incidental pulmonary nodule was also detected. This was done using a unique search to identify all pulmonary nodule codes included in CT chest reports that categorize the nodule by size, composition, and risk-level (Schut and Barbosa 2020; Barbosa and Osuntokun 2019). The search resulted in 1,846 unique patient records. I excluded 3 patients under the age of 18 at the time of their initial CT scans, resulting in a final analytic sample of 1,843 patients.

After identifying the study cohort, a digital REDCap (Research Electronic Data Capture, a web-based, open access, HIPAA-compliant secure database) form was created to collect patient data (Harris et al. 2009). I manually searched for each patient in the EMR and collected demographic, social, and clinical information at baseline (defined as the date of the initial chest CT), as well as the demographic, training, and locational information of the patients' primary care and ordering providers. Finally, I collected information regarding patient adherence and other clinical outcomes from the time of the initial CT (2016) until 2019.

I geocoded cross-streets of patient addresses and matched them to their census block group. Then, I collected block group-level SES data (median household income and educational attainment) from the 2016 American Community Survey (ACS) 5-year estimates in order to proxy patient socioeconomic status (SES) via neighborhood SES (Ruggles et al. 2019). This was done following an approach described by Krieger (1992) to overcome inconsistent and often inaccurate patient SES information recorded in the EMR. I collected block group-level data because the block group is the smallest geographical unit for which the U.S. Census Bureau publishes sample data, such as median household income and education.

Outcome Measure

I present descriptive statistics demonstrating disparities in the first step towards patient adherence, provider-patient communication of the discovery of an incidental pulmonary nodule after a patient's CT exam. To determine if such provider-patient communication occurred, I conducted an extensive review of the EMR, including

provider notes, visit summaries, phone calls/messages between provider and patients, and discharge notes. I constructed the communication variable as binary, with 0 indicating "no communication occurred" and 1 indicating "communication occurred."

I then show that stark disparities in adherence to timely follow-up exist across patient race-ethnicity. I do this by presenting the proportion of all patients, (and by racial-ethnic group), who adhered to follow-up imaging/procedures for their incidental pulmonary nodule within the radiologist-recommended timeline. I determined if follow-up was obtained within the studied healthcare system through extensive review of the EMR. I was also able to determine if follow-up was obtained outside of the studied healthcare system, (i.e., in another hospital), through a feature of the EMR which allows for record sharing across 1,700 institutions in the United States (Healthcare Information and Management Systems Society 2016).

Key Explanatory Measures

Key explanatory variables are grouped into three categories: patient social, economic, and demographic characteristics; patient health characteristics; and healthcare provider characteristics. I include these categories of explanatory measures to test various hypotheses regarding why we might expect to see racial-ethnic disparities in provider-patient communication. For example, studies suggest that subgroup differences in SES, social support, health status, and provider characteristics might contribute to racial-ethnic disparities in patient-provider communication. Key patient demographic factors are race-ethnicity (Black, White, Asian, and Latinx). I also control for nativity (foreign-born/native-born), age, sex, marital status (single, married, widowed, divorced,

separated), and whether patients have a support network involved in their care. Race-ethnicity, nativity, age, sex, and marital status were self-reported by patients and captured in the "Demographics" section of the EMR. I defined "support network" as any family member, spouse, or friend who was explicitly mentioned in the EMR as participating in scheduling a patient's hospital visits, serving as a patient's power of attorney, and/or managing a patient's medications or provider communications.

I control for patient SES via a neighborhood "SES index." I constructed the index by cross-tabulating block group median household income by educational attainment, resulting in a binary variable coded as 0 for low-SES block groups (where the median household income was under the median household income in 2016 in the United States, $64,000, and where > 50% of the population in that block group had not attended college) and 1 for mid/high-SES block groups (where the median annual income is greater than $64,000 and >50% of the population had a college degree). SES was divided between low and mid/high SES because some communication bias may function through visual and verbal "cues" providers perceive when interacting with patients, therefore altering the nature of their communication. Providers may less easily distinguish patients of mid-SES from those of high-SES; however, they may be more easily able to distinguish low-SES from mid/high-SES patients (Street et al. 2007). SES information was coded as "missing" for 27 patients who had a P.O. Box as opposed to a residential address in their EMR. Sensitivity analyses showed the results of bivariate models remained similar with and without "missing" cases. Furthermore, for 92 patients, median income was not able to be obtained due to missing data in the ACS file for their census

block groups. I imputed median household income for these block groups as an average of the three surrounding block groups.

The second group of patient characteristics I control for pertain to patient health and clinical experiences, which may impact a provider's likelihood of communicating the presence of incidental findings to patients. I include smoking history (current, past, never), context of visit in which the patient obtained his/her first CT (outpatient, inpatient, ER), and relevant comorbidities reported in the EMR. Comorbidities reflect ICD-10 diagnoses pertaining to chronic diseases or specific acute conditions (i.e., trauma), grouped by etiologic groups, including cardiovascular, immunologic, oncologic, respiratory, environmental, psychological, musculoskeletal, gastrointestinal, and genitourinary conditions. In the descriptive statistics and regression models, patients are categorized as either having "any comorbidity" or "no comorbidities."

I also include a variable for the malignancy risk-level of the pulmonary nodule, as determined by the radiologist. Low risk nodules are solid or "ground-glass" in composition, under 6 millimeters in diameter, and have the longest recommended interval from initial diagnosis to follow-up. Nodules posing intermediate risk for malignancy are solid or ground-glass and 6-10 millimeters in diameter. High risk nodules are solid or part-solid and 10 millimeters or larger and require follow-up within the shortest time interval from initial diagnosis (Schut and Barbosa 2020; Barbosa and Osuntokun 2019).

Last, I collected characteristics pertaining to a patient's healthcare providers. Two provider-types were examined in this study: primary care providers (PCP) and "ordering" providers (providers who ordered the patients' initial CT). I documented if a patient had a

PCP listed in their EMR and if the patient had visited that PCP in 2016, as these factors indicate a patient's utilization of healthcare services. I also obtained information on the practice location of the PCP (within the studied health system, a different hospital, clinic, etc.), and the degree/training of the PCP. For a patient's ordering provider, I collected information on degree/training and area of medical specialty.

Analytic Strategy

My analysis presents descriptive statistics and binomial logistic regression models. Descriptive statistics show variation across my key outcome (whether a patient was told of the incidental findings present in his/her CT scan), as well as information on the percentage of patients who adhered to follow-up recommendations within the recommended timeframe. I also present descriptive statistics pertaining to patient and provider characteristics. All descriptive statistics are presented for the full sample (all racial-ethnic groups combined), and by each racial-ethnic group separately.

Next, I show a series of binomial logistic models predicting provider-patient communication. The equation for this model is presented below, where *p* indicates the probability a provider will disclose the incidental finding to a patient ($y_i = 1$). The racial-ethnic disparities are indicated by the race-ethnicity variable, where White is the reference category. X_{ik} indicates all control variables, including other patient demographic, SES, and health characteristics, as well as provider characteristics:

$$ln\frac{p(yi=1)}{1-p(yi=1)} = \beta_0 + \beta_1 Black + \beta_2 Asian + \beta_3 Hispanic + \sum_K \gamma_k \cdot X_{ik}$$

I include five separate logistic models for my outcome variable. Model 1 includes the racial-ethnic patterning of provider-patient communication, adjusting for nativity, age

and sex. Model 2 builds on Model 1, adjusting for socioeconomic characteristics (insurance status, neighborhood SES, and marital status), in order to assess the extent to which racial-ethnic patterning of provider-patient communication can be explained by racial-ethnic patterning in socioeconomic characteristics. Models 3-4 build on Model 1 by adjusting for health and provider characteristics, in a stepwise fashion. Finally, Model 5 presents the fully adjusted model, including all explanatory characteristics. Across models, I pay particular attention to whether the racial-ethnic disparities in the outcome are attenuated by the inclusion of explanatory measures.

Results

Descriptive Statistics

As shown in Table 1, timely adherence to follow-up recommendations among patients with incidental pulmonary nodules occurred for only 37% of all patients, leaving nearly half of all patients who did not receive follow-up in the recommended timeframe (after accounting for the 15% of patients for whom follow-up was not recommended by a radiologist). White patients were most likely to obtain follow-up on time compared to patients of any other race-ethnicity, with around 45% doing so. Asian, Latinx, and Black patients, on the other hand, were least likely to adhere to follow-up recommendations on time (33, 33 and 26%, respectively).

Disparities observed in provider-patient communication of incidental findings likely contribute to these disparities in adherence. Among all patients examined in this study, 68% were notified of their incidental pulmonary nodule by a provider, leaving nearly one third of patients who were never notified of their diagnosis. This provider-patient communication was highly patterned by patient race-ethnicity. Whereas nearly

80% of all White patients were notified of their incidental nodule by a provider, only 65% of Asian patients were notified. Black and Latinx patients were least likely to receive notification of diagnosis, with only 54% and 48% notified, respectively.

Table 2 displays summary statistics of patient demographic, socioeconomic, and health characteristics. Among 1,843 patients included in this analysis, a majority were either White (60%) or Black (35%). A minority were of Asian or Latinx origin (3% and 4%, respectively). Around 9% of patients were foreign-born. Foreign-born patients were largely Asian (37%) or White (29%). Most patients were above age 60 at the time of their initial CT (63%). Younger patients (18-28 years of age) were more likely to be Black or Latinx than White or Asian. Older patients were more likely to be White or Asian.

More than 50% of patients resided in mid/high-SES block groups, yet a substantial minority were from low-SES block groups (38%). Racial-ethnic disparities in neighborhood SES are apparent. Black patients were most likely to reside in low-SES neighborhoods (74%). A substantial proportion of Latinx patients (40%) also lived in low-SES neighborhoods. Around 80% of White and Asian patients lived in mid/high SES neighborhoods, a larger proportion than any other racial-ethnic group. Over half of all patients were on Medicare at the time of their initial CT scan (56%), and a small percentage of patients (14%) were on Medicaid. Black patients were generally more likely to be on Medicaid than other racial-ethnic group (29%), and there were more patients on Medicare who were White than of any other race (60%).

Smoking was common among patients with incidentally detected pulmonary nodules and was patterned by patient race-ethnicity. Nearly 40% of all patients were

former smokers, and 14% were current smokers. The majority of Latinx and Asian patients were never smokers, and White patients were most likely to be former smokers. Around a quarter of Black patients (23%) were current smokers, the largest proportion among all racial-ethnic groups.

Most patients received their initial CT exam in an outpatient context (61%), but a significant minority (22%) received their initial CT exam in the ER. Black and Latinx patients were most likely to enter the health system via the ER (38 and 30%, respectively). Nodules varied similarly in risk-level across racial-ethnic groups, and most patients were diagnosed with nodules that were deemed to pose low risk for cancer (63-71%). Notably, however, Black patients were most likely to be diagnosed with high risk nodules (14%), and Asian patients were least likely to be diagnosed with such nodules (7%).

Table 3 presents descriptive statistics for three healthcare provider roles: PCPs, ordering providers, and pulmonologists. Almost all (87%) patients had a PCP listed in their EMR, and this did not vary substantially by patient race-ethnicity. However, Asian patients presented a slightly lower likelihood of having a PCP (80%) compared with White, Black, and Latinx patients (90, 82, and 82%, respectively). Among all patients in the study sample, only 37% visited their PCP in 2016. Asian patients demonstrated the lowest likelihood of having seen a PCP in 2016 (27%). Black patients were most likely to see their PCP within the hospital system in which they received their initial CT (47%). Asian patients were most likely to see their PCP in a private practice or clinic (32%).

Ordering providers represented a range of medical specialties. Around 23% were primary care/internal medicine providers, 26% were ER providers, and 21% were pulmonologists. Around 26% were from some other specialty (i.e., rheumatology, oncology, endocrinology, etc.). A small proportion of patients had a thoracic surgeon order their initial CT exam (5%). A substantial proportion of Black and Latinx patients (45 and 32%, respectively) had a pulmonologist order their initial CT, which was more than any other patient racial-ethnic group. Although a substantial proportion of all patients (79-83%) had their initial CT ordered by an attending physician, Latinx and Black patients were most likely among all patient racial-ethnic groups to have a resident physician order their initial CT exam (17 and 15%, respectively). This was relative to only 6% of Whites. Finally, only a minority of patients had established specialty pulmonary care prior to their initial CT exam (25%). Of those patients who did not have pulmonary care established before their initial scan, only a small percentage did so after their initial CT scan (17%).

Logistic Regression Analysis

Table 4 presents odds ratios for binary logistic regressions predicting provider-patient communication of an incidental pulmonary nodule diagnosis. Model 1 shows that the odds-percent of a Black or Latinx patient being informed of an incidental finding was roughly 70% less than those of a White patient, adjusting for other demographic characteristics. Foreign-born patients were also less likely than native-born patients to be told of an incidental finding by an odds-percent of 30%, holding all other demographic characteristics constant. Models 2-4 show Black-White and Latinx-White gaps persist

across models; if racial-ethnic differences in patient communication were due to differences in socioeconomic characteristics, we would expect to see the effects of race-ethnicity disappear in Model 2. The effects do become slightly smaller for Black patients, but this change is minimal in magnitude, and the racial-ethnic effects become larger for Latinx patients. In the fully adjusted model, it is striking to note that even when demographic, socioeconomic, health, and provider characteristics are controlled for, the odds-percent that Black and Latinx patients were notified of an incidental pulmonary nodule was lower than that of White patients by an odds-percent of 30% and 70%, respectively.

Discussion and Conclusion

This study provides evidence of striking racial-ethnic disparities in provider-patient communication of incidental findings, which is of significant clinical, social, and policy relevance. The disparities investigated in this study do not appear to be the result of disparities in patient socioeconomic status, health status, or provider characteristics. This study makes several key contributions to our understanding of racial-ethnic disparities in adherence, examining the issue as a potential consequence of provider communication bias that stems from *racial mythologies* present in everyday medical practice.

As shown in Table 1, wide disparities in adherence to follow-up recommendations exist, with particularly wide gaps apparent between Black and Latinx patients compared to White patients. These disparities in follow-up adherence are likely magnified by initial racial-ethnic disparities in provider-patient communication of an

incidental nodule diagnosis. Therefore, a novel finding of this study is that I suggest to fully understand issues of low adherence, we must first examine how communication failures are contributory to the issue. Patients must first *possess* knowledge about a given diagnosis and its follow-up recommendations to then adhere to medical advice regarding that diagnosis.

As shown in the regression analyses, disparities in socioeconomic, health, and provider characteristics may shape communication disparities between Black-White patients, though these compositional demographic differences do not appear substantial. Between Latinx-White patients, few covariates can explain communication disparities. Latinx patients are less likely than Whites to be notified of their incidental nodule by the most significant margin. Results for Asian patients were not statistically significant. Overall, this analysis demonstrates concerning racial-ethnic patterning of communication, showing providers appear to disparately notify patients of color of their incidental findings in a way that likely impacts ultimate patient adherence to follow-up. As patient adherence is central in preventing unnecessary morbidity and mortality, diagnostic communication disparities may contribute to racial-ethnic disparities in health downstream.

This study had several limitations. First, utilizing a specific health system's EMR data presents unique challenges, and patients studied in this analysis may not be generalizable to those receiving care in small community or rural hospitals in other states. However, there are many strengths of this dataset, and while it only examines one health system, the number of patients examined is substantial and representative of all patients

who received chest CTs with an incidental nodule in 2016. Furthermore, EMR data allow for detailed examination of provider-patient interactions and patient contact with the healthcare system, and do not require reliance on patient self-report of health and diagnoses or patient recall.

Second, as only one year's worth of patients was analyzed, the sub-sample of Asian and foreign-born groups in this study was also quite small, thus limiting statistical power and likely affecting the statistical significance of results pertaining to these groups in logistic models. Alternatively, it may also be that Asian and foreign-born patients shared many socioeconomic and health characteristics with White patients, such that no difference between those groups could be observed, or, on the contrary, that those included within the Asian and foreign-born groups were too diverse to be analyzed together. Finally, this study relies on the assumption that what providers recorded (or did not record) in the EMR is the same as what happened. Whereas one might question this assumption, I am inclined to believe that providers are more likely to over-report communication with patients than underreport it, as documentation is critical for ensuring continuation and quality of patient care. Under this assumption, the findings of this study are likely conservative, and racial-ethnic disparities highlighted here may be larger and more striking than is estimated in this research.

Martin Luther King Jr. once stated, "Of all the forms of inequality, injustice in health is the most shocking and inhumane" (Tweedy 2015). Despite its limitations, this study provides a unique picture of the ways in which bias may influence provider-patient communication, through demonstrating that even when all other characteristics are equal,

provider-patient interactions are indeed patterned by patient race-ethnicity to the detriment of patients of color. This finding is concerning as it exemplifies how the practice of medicine is not immune to the intense system of racial stratification present in the United States, with the most at-risk populations still at a disadvantage even after they gain access to health services.

Further emphasis on eliminating bias and racism in medicine is a meaningful area of research, practice, and policy that merit further examination. More research must be done to investigate the ways cultural, structural, and interpersonal racism impacts patient healthcare utilization and adherence. In addition, research must link disparities in provider-patient interactions to health outcomes. I have shown here that unequal communication between providers and their patients of color serves as a hindrance for patient adherence, particularly for Black and Latinx patients, suggesting health policy and training programs must work at the organizational and individual levels to ameliorate provider bias in the practice of medicine. This may be accomplished in several ways. First, more should be done to increase diversity and representation of people of color in medicine in order to create a more representative and integrative space in U.S. health care. Second, at the interpersonal level, training programs may be implemented for new and already-practicing healthcare providers to attune them to the structural origins of health inequalities and to eliminate stereotyping and prejudice against patients of color. Finally, understandings of cultural, structural, and interpersonal racism must become more integral to U.S. medical education and continuing medical education, such that physicians and other healthcare providers become more versed in "structural

competency" and the social determinants of health (Metzl and Roberts 2014). Combining these efforts can help dismantle racism present in health care and improve the provision of care for the most vulnerable groups in the United States.

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Table 1: Patient Adherence and Provider-Patient Communication of Incidental Nodule Diagnosis

	Full Sample	…by Race-ethnicity			
Outcomes	**All Races**	**White**	**Black**	**Asian**	**Latinx**
N	1843	1064	654	60	65
Patient Adherence (%)					
Follow-up obtained within recommended timeframe*** ††† §§§	36.7	44.6	25.8	33.3	32.5
Follow-up not recommended and not obtained *** ††† §§§	15.3	17.2	10.8	23.4	17.5
Patients Notified of Incidental Nodule Diagnosis (%) *** ††† §§§	67.7	77.7	53.7	65.0	47.7

* White/Black, *** $p < 0.005$; † White/Asian, ††† $p < 0.005$; § White/Latinx, §§§ $p < 0.005$

Table 2: Patient Characteristics

Patient Demographic, SES, and Health Characteristics	Full Sample	…By Race-ethnicity			
	All Races	White	Black	Asian	Latinx
N	1843	1064	654	60	65
%	100.0	57.7	35.5	3.3	3.5
Foreign-Born (%)	8.5	28.9	18.6	36.5	16.0
Female (%)	54.8	52.3	60.7	40.0	50.8
Age (%)					
18-28	2.8	2.0	4.1	0.0	6.2
29-39	4.8	3.9	5.5	8.3	10.8
40-49	9.7	8.4	11.5	15.0	7.7
50-59	20.2	17.9	23.7	10.0	32.3
60+	62.5	68.0	55.2	66.7	43.1
Employment Status (%)					
Employed	30.6	34.7	22.9	35.0	36.9
Unemployed	4.3	1.9	8.1	5.0	4.6
Retired	41.7	45.5	37.0	41.7	27.7
Out of labor force	16.1	10.4	25.1	10.0	23.1
Unknown	7.3	7.5	6.9	8.3	7.7
Neighborhood SES (%)					
Low	38.3	17.4	73.7	21.7	40.0
Mid/High	60.2	80.9	24.9	78.3	60.0
Missing	1.5	1.7	1.4	0.0	0.0
Health Insurance Type (%)					
Private	28.6	34.9	17.6	38.3	27.7
Medicaid	14.1	4.5	29.1	10.0	23.1
Medicare	55.9	59.9	51.1	48.3	46.2
None	1.5	0.8	2.3	3.3	3.1
Marital Status (%)					
Single	29.8	19.2	50.8	16.7	29.3
Married	51.0	63.2	29.4	71.7	49.2
Widowed	9.4	8.4	11.3	6.7	9.2
Divorced	8.0	8.3	8.1	0.0	10.8
Separated	1.8	1.0	0.5	5.0	1.5

Support Network Involved in Care (%)	13.3	12.3	11.2	33.3	32.3
Spouse	43.7	56.5	30.1	25.0	28.6
1st degree (children, parents)	46.1	35.9	56.2	65.0	57.1
2nd Degree+ (grandparents, cousins, etc.)	10.2	7.6	13.7	10.0	14.3
Smoking status (%)					
Never smoker	46.1	47.2	40.4	71.7	60.0
Former smoker	39.8	43.6	36.2	25.0	27.7
Current smoker	14.2	9.2	23.4	3.3	12.3
Comorbidities (%)					
Any	91.3	90.8	92.8	81.7	92.3
None	8.7	9.2	7.2	18.3	7.7
Context of Initial CT (%)					
Outpatient	60.7	72.1	43.0	61.7	50.8
Inpatient	17.4	16.4	18.7	18.3	20.0
Emergency	21.9	11.6	38.4	20.0	29.2
Nodule (Risk for Malignancy) (%)					
Low	67.1	65.6	69.7	63.3	70.8
Intermediate	19.9	21.8	15.9	30.0	18.4
High	13.0	12.6	14.4	6.7	10.8

Table 3: Healthcare Provider Characteristics

	Full Sample	...By Patient Race-ethnicity			
Provider Characteristics	**All Races**	**White**	**Black**	**Asian**	**Latinx**
N	1843	1064	654	60	65
PRIMARY CARE PROVIDER CHARACTERISTICS					
PCP listed in EMR (%)	86.8	89.6	82.1	80.0	81.5
PCP Visit in 2016 (%)					
Yes	36.7	34.6	41.4	26.7	32.3
No	6.1	5.5	8.0	1.7	3.1
Unknown	44.2	50.3	33.3	51.7	46.2
No provider listed (N/A)	13.0	9.7	17.3	20.0	18.5
PCP Location (%)					
Hospital system being studied	39.0	35.2	46.9	28.3	30.8
Other tertiary care center	14.3	16.9	10.2	16.7	10.8
Private practice	26.5	27.2	24.6	31.7	29.2
Hospital/practice outside of region	7.0	10.7	0.9	3.3	10.8
No provider listed (N/A)	13.2	10.0	17.3	20.0	18.5
PCP Degree/Training (%)					
Attending	79.8	86.9	69.3	76.7	72.3
Resident	3.1	0.6	7.2	3.3	3.1
Physician's assistant or CRNP	3.7	2.5	5.8	0.0	4.6
No provider listed (N/A)	13.4	10.0	17.7	20.0	20.0
ORDERING PROVIDER CHARACTERISTICS					
Area of Practice (%)					
Primary care	22.5	26.1	13.5	18.3	13.9
Emergency	26.2	21.8	23.2	25.0	23.1
Pulmonary	20.9	14.5	44.5	28.3	32.3
Other (rheumatology, oncology, etc.)	25.6	31.5	16.2	23.3	24.6
Thoracic surgery	4.8	6.1	2.6	5.0	6.2
Ordering Provider Degree/Training (%)					
Attending	81.2	83.2	78.4	80.0	78.5
Resident	9.4	5.6	14.7	11.7	16.9
Physician's assistant or CRNP	9.4	11.3	6.9	8.3	4.6
PULMONARY CARE CHARACTERISTICS					
Pulmonary Care Established before Initial CT (%)	25.1	30.4	16.7	31.7	18.5
Pulmonary Care Established after Initial CT (%)	17.0	17.7	16.9	17.1	9.4

Table 4: Binary Logistic Regression Models Predicting Provider-Patient Communication of Incidental Nodule Diagnosis

Characteristics	(1) Demographics	(2) M1 + SES	(3) M1 + Health	(4) M1 + Provider	(5) Full Model
Race (ref = White)					
Black	0.3***	0.5***	0.5***	0.6***	0.6**
	(0.0)	(0.1)	(0.1)	(0.1)	(0.2)
Asian	0.8	0.9	0.6	0.8	0.7
	(0.3)	(0.3)	(0.3)	(0.4)	(0.3)
Latinx	0.3***	0.4***	0.3***	0.4***	0.3***
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Nativity (ref = Native-born)					
Foreign-born	0.7*	0.6**	1.1	1.0	1.2
	(0.1)	(0.1)	(0.3)	(0.3)	(0.4)
Age	1.0***	1.0**	1.0	1.0	1.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Sex (ref = Female)					
Male	0.7***	0.7***	0.7**	0.8*	0.8
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
SES (ref = Low-SES)					
Mid/High-SES		1.4***			1.3
		(0.2)			(0.2)
Missing		0.7			0.9
		(0.3)			(0.4)
Insurance Status (ref = Private)					
Medicaid		0.6***			0.9
		(0.1)			(0.2)
Medicare		0.7***			0.8
		(0.1)			(0.2)
None		0.4**			0.9
		(0.2)			(0.5)
Marital Status (ref = Single)					
Married		1.9***			1.3
		(0.3)			(0.2)
Widowed		1.1			0.9
		(0.2)			(0.3)
Divorced		1.7**			1.4
		(0.4)			(0.4)
Separated		1.7			1.2
		(0.7)			(0.6)
Smoking Status (ref = Never Smoker)					
Former Smoker			2.0***		1.8***
			(0.3)		(0.3)
Current Smoker			1.2		1.2
			(0.2)		(0.2)
Hospital Context (ref = Outpatient)					
Emergency			0.1***		0.1***
			(0.0)		(0.0)
Inpatient			0.1***		0.1***
			(0.0)		(0.0)
Comorbidities (ref = None)					
Any			0.8		0.7
			(0.2)		(0.2)

Nodule (ref = Low Risk)					
Intermediate			1.2		1.2
			(0.2)		(0.2)
High			6.6***		7.1***
			(1.6)		(1.8)
Ordering Specialty (ref = Pulmonary)					
Internal Medicine				0.3***	0.4***
				(0.1)	(0.1)
ER				0.1***	0.2***
				(0.0)	(0.1)
Other				0.2***	0.4***
				(0.0)	(0.1)
Surgery				0.4***	0.4**
				(0.1)	(0.2)
Ordering Degree/Training (ref = Attending)					
Resident				1.3	1.5
				(0.3)	(0.3)
CRNP, PA-C, Other				2.8***	1.6
				(0.7)	(0.4)
Has PCP (ref = No)					
Yes				2.2***	1.5**
				(0.4)	(0.3)
PCP Visit in 2016 (ref = No)					
Yes				2.6***	2.4***
				(0.4)	(0.4)
Constant	2.0***	1.4	9.0***	4.1***	6.2***
Standard Errors	(0.5)	(0.4)	(3.2)	(1.6)	(3.3)
Observations	1,843	1,843	1,843	1,843	1,843

Note. Binomial logistic regression models presented in odds ratios. Base outcome for these models is "provider did not communicate finding to patient." *** p<0.01, ** p<0.05, * p<0.1

CHAPTER 4: Disaggregating Inequalities in the Career Outcomes of International Medical Graduates in the United States

Abstract

Although research indicates international medical graduates (IMGs) fill gaps in U.S. health care left by U.S. medical graduates (USMGs), the extent to which all IMGs experience stratified career outcomes remains understudied. I use data from the 2019 American Medical Association Physician Masterfile (n=19,985) to examine career outcomes of IMGs working in the United States. I find IMGs from developed economies chart a less disadvantaged path in the United States relative to IMGs from developing countries; they are more likely to practice in competitive medical specialties, to attend prestigious residency programs, and to practice in less disadvantaged counties that employ more USMGs relative to IMGs. Findings suggest IMGs experience divergent outcomes in the United States based on their place of medical education, with IMGs from developing countries facing more constraints in their careers relative to IMGs from developed countries. Examining the extent to which IMGs from different training contexts experience divergent outcomes in the United States sheds light on a critical but largely ignored axis of stratification in the medical profession that has major implications for understanding disparities in medicine and healthcare delivery in the United States.

Introduction

International medical graduates (IMGs) are an important part of U.S. health care, constituting nearly a quarter of the country's total physician labor force (Jenkins 2020; Jenkins et al. 2019; Mick and Lee 1999). Moreover, IMGs take on positions both in medical specialties and in geographic locations that U.S. medical graduates (USMGs) eschew (Guo and Nambudiri 2021; American Immigration Council 2018; Irigoyen and Sambrana 1979). Notably, IMGs disproportionately practice in less-competitive medical specialties, such as family medicine and psychiatry, and often practice in low-income communities (Dussault and Franceschini 2006; Mick and Lee 1999).

Health services research argues that IMGs present a solution for the United States' growing physician shortage (Douaiher et al. 2018; Heiser 2019). During the COVID-19 pandemic, scholars have argued that policymakers should grant IMGs provisional licenses to temporarily bolster the physician workforce (Larkin Jr. 2020). Although such recommendations intend to fill gaps in the physician workforce, encouraging IMGs to take on "safety net" roles may reify already-present inequalities in the medical profession (Jenkins 2020; Peterson et al. 2014; Alam 2016; Shin and Chang 1988). Systematically tracking IMGs towards underserved locations creates a two-tiered system of medical care in the United States, in which USMGs are granted opportunities to occupy more lucrative specialties and career positions, leaving IMGs responsible for the care of marginalized communities. This consequently leads IMGs to themselves experience marginalization in return for acceptance into the highly restrictive and regulated medical profession (Alam 2016).

Although research indicates IMGs fill gaps in U.S. health care left by USMGs, the extent to which all IMGs experience stratified career outcomes remains understudied. IMGs have been found to face greater marginalization relative to USMGs, however less is known about whether divergent outcomes are experienced *among* IMG subgroups representing various countries of training, racial-ethnic, and immigration backgrounds. Despite increasing diversification of the medical profession, substantial evidence shows that racism against both U.S.-trained physicians of color and immigrant physicians is prevalent in the medical profession (Olsen 2019; Filut et al. 2020; Wingfield 2019). As many IMGs were born and trained in the Global South and are people of color (Young et al. 2019), these IMGs may be disproportionately subjected to xenophobic racism that stratifies their career outcomes and marginalizes them within the medical profession.

Thus, the aim of this research is to explore whether IMGs trained in different regions of the world experience divergent pathways in their U.S. careers. I draw on data from the AMA Physician Masterfile to compare career outcomes among IMGs from developing and developed countries. Results show that IMGs who completed medical school in developing countries (e.g., India, Brazil, etc.) experience more marginalized career outcomes relative to IMGs trained in developed countries (e.g., United Kingdom, Sweden, etc.), which is potentially explained by greater experiences of discrimination based on their medical school pedigree, perceived English ability, or "cultural" differences with U.S. medical graduates and patients (Alam 2016; Desbiens and Vidaillet 2010). Examining the extent to which IMGs from different training contexts experience divergent outcomes in the United States sheds light on a critical but largely ignored axis

of stratification in the medical profession that has major implications for understanding disparities in medicine and healthcare delivery in the United States.

Background

In response to a growing physician shortage during the 1960s, the U.S. government facilitated entry of IMGs to the United States via a "special skills exception" for immigrants under the Hart Cellar Act of 1965 (Alam 2020). The Hart Cellar Act also introduced caps on migration from Western Hemisphere countries, opening the United States to migration streams from Asia and Africa (Agrawal 2016). These policy changes, combined with sociopolitical upheaval in many countries around the globe, further "pushed" high-skilled migrants (such as IMGs) towards greater opportunity in the United States (Agrawal 2016).

In 1963, around 33,000 IMGs practiced in the United States (Haug and Stevens 1973). Today, the number of IMGs in the United States has reached 250,000, constituting a quarter of all licensed physicians in 2019 (Young et al., 2019). The migration stream of IMGs has also grown more diverse over time. Although early on, the majority (around 60%) of IMGs were from Europe and Latin America (Haug and Stevens 1973), today, most IMGs originate from India, Pakistan, the Philippines, South Africa, the United Kingdom, and Germany (Young et al., 2019). The pull of IMGs to the United States is so strong that "cultures of medical migration" have become embedded in the process of medical education around the globe. For example, in West African countries, migration is an essential part of training for medical students, and many enter training with the intention of migrating to the United States upon graduation (Tankwanchi et al., 2013).

Although the increasing presence and diversity among IMGs during the past several decades has led some to question the quality of medical training IMGs receive (Dublin 1972; Haug and Stevens 1973), research largely finds that IMGs share equivalent levels of training quality relative to USMGs across a wide range of metrics. This likely results from selection processes leading only a small group of IMGs to be able to immigrate and meet the numerous requirements needed to obtain full U.S. medical licensure (Jenkins 2018; Peterson et al. 2014). Nevertheless, IMGs disproportionately experience stratified career trajectories relative to USMGs, which includes placement in less-competitive, "IMG-friendly" (Jenkins 2020) medical specialties and residency programs, and location in inner-city and rural community practices that have fewer resources and limited opportunities for career advancement (Chen et al. 2010).

The relegation of IMGs to lower tiers of U.S. health care likely results from a process of intentional, but covert, exploitation by the U.S. medical profession (Irigoyen and Sambrana 1979). Such exploitation begins with IMGs' first contact with the U.S. medical profession: selection into residency programs. In the United States, medical students "match" into U.S. residency programs to continue their post-medical school training for a period of several years before they are able to practice independently under a full medical license. The residency matching process requires an application process during which students' metrics, including USMLE scores, medical school transcripts, and interviews, are evaluated by residency programs with open positions. Oftentimes, subjective metrics are also used to determine a medical graduate's ability to match with a residency program. Specifically, residency program administrators regularly exhibit

discriminatory means of sorting through residency applicants, privileging those who attended more prestigious medical schools (Jenkins 2020) and filtering out international graduates (Goldberg 2021). Indeed, net of other factors, residency programs are nearly twice as likely to respond to USMG, relative to IMG, applicants (Nasir 1994). As a result, IMGs are more likely to place into lower quality, community-based (as opposed to university-based) residency programs. Jenkins (2020; 2018) terms this routine placement of IMGs in "IMG-friendly" residencies *status separation.* This systematic offering of lower-quality community residency positions to IMGs allows U.S. medical institutions to keep their side of a social contract with USMGs, reserving more competitive residency programs (in more competitive medical specialties) for them (Jenkins et al. 2019).

Moreover, IMGs also disproportionately take on positions in "IMG-friendly" specialties (Jenkins 2020), which are those facing persistent physician shortages due to USMGs rejecting them in favor of higher-paying, more prestigious specialties, (e.g., radiology, dermatology) (Lefebvre et al. 2020). Mick and Worobrey (1984) show that during the 1960s-1980s, IMGs were recruited to the United States specifically to fill positions in shortage specialties, and immigration policies and hospitals intentionally recruited physicians from South Asia to fill shortages in family medicine and psychiatry (Alam 2020). The selection of IMGs into less-competitive specialties reflects their broader marginalization within the medical profession. Shin and Chang (1988) argue that the high proportion of Korean IMGs in "peripheral" (versus "core") medical specialties reflects their marginal economic activity in the professional market, which parallels the role of unskilled immigrant workers within the nonprofessional labor markets. This

discrimination and resulting marginalization has also been observed more recently, with Agrawal (2016) and Chen et al. (2010) finding that IMGs find parallels between their own marginalized role in U.S. health care and that of immigrant low-wage workers.

Segregation of IMGs also extends to impact their practice locations (Chen et al. 2010; Mick and Lee, 1999). In an interview study of IMGs, Agrawal (2016) found 70% of IMGs believed they were tracked towards low-income areas more than USMGs. Twenty-two percent of IMGs believed they themselves would serve for longer periods in underserved areas, due to a lack of better opportunities elsewhere. Mick and Lee (1999) show that in 14 U.S. cities with populations of 2.5 million or more, IMGs were significantly more likely to be in low-income areas of half of the cities examined. Chen et al. (2010) further find that IMGs perceive professional limitations, including tracking towards underserved areas, as part of "the deal" (949), understanding their relegation to low-income areas as the result of "a transactional cost of living and working as physicians in the United States" (949) that also allows USMGs to maintain dominance in high-income areas (Alam 2020; 2016). Irigoyen and Sambrana (1979) argue U.S. immigration policies and institutional demands most impact where IMGs are able to practice, and IMGs may receive immigration benefits (such as a "J" visa), which allow them to remain in the United States in return for practicing in rural communities.

Previous work therefore highlights how the marginalization of IMGs is vital for sustaining a system of stratification within the U.S. medical profession allowing for the systematic prioritization of USMGs in residency positions, medical specialties, and geographic locations. Yet less is known about whether IMGs from different racial-ethnic,

immigration, and regional backgrounds experience stratified career outcomes. Racism is widespread in the medical profession, and shapes the everyday experiences of physicians of color, including IMGs (Filut et al. 2020; Wingfield 2019). A review by Filut et al. (2020) finds that the everyday experiences of physicians of color are patterned by discrimination, with Black, Asian, and Latinx physicians facing the greatest levels of workplace discrimination, harassment, and limited opportunities for career advancement. Still, although these studies provide ample evidence demonstrating how racism and xenophobia shape the everyday experiences and daily practices of IMGs and physicians of color, little is known regarding how systemic racism stratifies the outcomes of physicians in the medical profession more broadly. As Olsen (2019) has observed, "…medical sociology as a subfield has very little empirical data on how racial minorities may be disproportionately impacted in the course of their professional training" (57). Furthermore, previous literature contrasts IMGs and USMGs without paying sufficient attention to heterogeneity with the former group. For example, if professional and geographic outcomes are highly stratified within IMGs by region of training, then simply comparing IMGs to USMGs will underestimate the disadvantage faced by IMGs from, for example, developing country contexts.

Thus, this article examines whether IMGs experience divergent outcomes in the United States based on their place of medical education, specifically examining professional outcomes (medical specialty and residency program pedigree) and geographic outcomes (sociodemographic and healthcare infrastructure characteristics of IMGs' practice counties). I aim to enhance understanding of the extent to which IMGs'

"foreignness" and the country/region of medical education compounds or minimizes the disadvantages they face in their U.S. careers, therefore broadening our understanding of the extent to which racism operates within the medical profession to shape physician outcomes.

Data and Methods

Data

I draw on a nationally representative sample of IMGs (n=19,985) from the de-identified 2019 American Medical Association (AMA) Physician Masterfile (MMS 2021) for this article's analysis. The AMA Physician Masterfile is a census of 1 million presently licensed physicians practicing in the 50 United States, Washington D.C., Guam, and Puerto Rico, including around 250,000 IMGs (American Medical Association 2019). The AMA Physician Masterfile is the most comprehensive census of physicians practicing in the United States, and includes detailed information on physicians' sociodemographic characteristics, medical specialty, training information, and geographic location.

IMGs included in this article are physicians who were born and attended medical school outside of the United States (including Puerto Rico and Guam). Furthermore, IMGs included in this article actively practiced medicine in the United States (including Puerto Rico and Guam) with a full medical license in 2019 and had state and county Federal Information Processing (FIPS) information available for their medical practice location. This geocoded information allowed me to merge on information about the sociodemographic features and healthcare infrastructure of the communities in which

IMGs practiced to the AMA physician Masterfile. Sociodemographic and healthcare infrastructure characteristics were obtained from the CDC Social Vulnerability Index (Flanagan et al. 2011) and from the Area Health Resources File (U.S. Health Resources and Services Administration 2019).

Measures

Three sets of dependent variables are examined in this article. The first set pertains to IMGs' professional outcomes (U.S. residency program type and medical specialty). Jenkins et al. (2019) argues IMGs are more likely to attend community hospital residency programs (relative to university programs) compared to USMGs. Community programs often offer less support to their residents, and provide less hands-on training, which can have negative implications for patient care. I include *"residency program type"* as a dependent variable to examine the extent to which different origin groups of IMGs are tracked towards certain more (or less) prestigious residency programs. Following a similar categorization method used by Jenkins et al. (2019), I construct residency program type as a five-category variable (premier university-based (residency programs that are situated with the top 50 medical schools in the United States); public university-based; private university-based; federal-based (e.g., Veterans Affairs systems, military hospitals); and community-based).

I also examine IMGs' *medical specialties*. Research argues that IMGs are disproportionately tracked towards lower-paying, less-prestigious medical specialties, including primary care specialties (Guo and Nambudiri 2021; American Immigration Council 2018). This occurs both because of physician shortages in these specialties (as

USMGs forgo them in favor of higher-paying specialties), and due to discrimination that keeps more competitive specialties restrictive towards IMGs (Rios-Diaz and Azoury 2021). In this article, "medical specialty" is operationalized as a categorical variable, including primary care specialties (internal medicine; family medicine; OB-GYN, pediatrics; and psychiatry); specialty internal medicine (e.g., cardiology; nephrology; etc.); surgical specialties (e.g., general surgery; urology, etc.); "E-ROAD" specialties (emergency medicine; radiology; ophthalmology; anesthesiology; and dermatology), and diagnostic specialties (pathology). E-ROAD and surgical specialties are particularly competitive, with E-ROAD specialties being highly desirable due to their, on average, higher salaries, and more balanced work schedules (DeZee et al. 2013). A detailed description of the medical specialties included in each category is in Appendix A (Table 4).

The second set of dependent variables pertain to the sociodemographic characteristics of counties in which IMGs' practice (*"practice counties"*). These characteristics are measured by two indices of county disadvantage: a county's *"overall" vulnerability* and its *racial-ethnic composition/English language ability of residents.* I draw these measures from the CDC's Social Vulnerability Index (SVI) data, which is comprised of a series of indices used to measure social vulnerability of communities across the United States and Puerto Rico. The SVI includes indicators of disadvantage using 15 variables from the U.S. Census (Flanagan et al. 2011). "Overall vulnerability" is measured via a series of variables derived from the U.S. Census and pertaining to the socioeconomic status, household composition, minority status/English language, and

housing/transportation characteristics of a county. The "racial-ethnic composition and English language ability of residents" index measures the proportion of a county identifying as a racial-ethnic minority and the proportion of residents speaking English "less than well." The SVI indices are operationalized as continuous variables, ranging from 0.0 to 1.0, representing the percentile ranking for the proportion of counties that are of equal or lesser social vulnerability than the county of interest. For example, a county with a ranking of 0.9 for "overall" vulnerability is more disadvantaged than 90% of counties in the United States (Flanagan et al. 2011).

The final set of outcomes pertains to the healthcare infrastructure of an IMG's practice county. Research finds IMGs contribute significantly to the physician labor force in *healthcare professional shortage areas (HPSAs)* (U.S. Health and Human Services 2019). Thus, I examine whether certain groups of IMGs are more likely to practice in counties that are at least partly comprised of HPSAs (areas lacking critical primary care providers or infrastructure). In regression models, HPSA is treated as a binary categorical variable, with "1" indicating an IMG practices in a county that is at least partly a HPSA, and "0" indicating an IMG is practicing in a county with no HPSAs.

As the U.S. population ages (Crimmins and Zhang 2019) and as medicine becomes more technologically advanced (Smith et al. 2013), the need for specialty medicine has increased (Heiser 2019). Counties with fewer specialty care physicians may be unable to adequately provide care to individuals with complicated comorbidities, including cancers. To examine the extent to which an IMG's practice county can provide specialty care, I include an outcome measuring whether a county's physician workforce

is mostly comprised of specialty care (as opposed to primary care) physicians. This variable is measured continuously, with greater values indicating a higher proportion of specialty medicine physicians in a county. This was constructed by subtracting the quotient of the number of primary care physicians practicing in a county divided by the total number of physicians practicing in the corresponding county (acquired from the AHRF) from 100.

The final healthcare infrastructure outcome is the proportion of physicians in each county that are USMG as opposed to IMG. This variable was obtained directly from the AHRF. It is measured continuously, with higher values indicating a county has a higher proportion of USMGs practicing in a county. This outcome measures whether certain subgroups of IMGs are working *alongside* as opposed to *in place* of USMGs in counties across the United States.

Independent Variables

Key predictor variables in this analysis are 1) the development status of the country in which an IMG attended medical school and 2) the specific region of the world in which an IMG attended medical school. Development status of an IMG's training country is dichotomized into "developed" and "developing" countries, using the United Nations' definition; "developing economy countries" include those defined by the UN as either "developing" and "economies in-transition" (UN DESA 2014). A detailed description of IMGs' countries of training and their corresponding development status is included in Appendix A (Table 2).

The global region where IMGs attended medical school is operationalized as a categorical variable consisting of 11 regions: English-speaking countries (English-speaking Caribbean and English-speaking non-Caribbean); Latin American countries (Central America/non-English speaking Caribbean and South America); European countries (Western Europe and non-Western Europe); African and Middle Eastern Countries (Middle East and North Africa and Sub-Saharan Africa); and Asian countries (South Asia, Southeast Asia, and East Asia). A detailed description of IMGs' countries of training and their region may be found in Appendix A (Tables 1 and 2).

IMGs from English-speaking countries were separated into their own category because of certain factors related to their training that may lead them to experience advantages in their U.S. careers over other IMG subgroups. For example, English-speaking IMGs may be perceived to possess higher levels of English fluency and perceived "cultural" similarities to USMGs (Chen et al. 2010). However, whereas IMGs trained in English-speaking non-Caribbean countries (e.g., the United Kingdom) may experience advantages in their U.S. careers relative to other IMGs, IMGs trained in English-speaking Caribbean countries (e.g., Dominica, Grenada) may experience more disadvantages, as Caribbean medical education is stigmatized in the United States, and often stereotyped as offering lower-quality, for-profit medical training (Jenkins 2020).

I adjust for several control variables, including age, age-squared, sex, medical school ranking, U.S. census region, and decade of U.S. arrival ("arrival cohort").[2] Medical school ranking is a binary variable capturing whether the medical school an IMG

2 Regression models presented in the main text do not include control variable coefficient estimates. Models with all control estimates shown are available in Appendix B (Tables 3a-6a).

attended is ranked within the QS World University Rankings list, which includes the top-600 medical schools in the world (QS Top Universities 2020). Without information on IMGs' U.S. Medical Licensing Exam (USMLE) scores (which partly determine IMGs' ability to matriculate into U.S. residency programs and obtain a medical license), medical school ranking is a useful proxy for assessing the extent to which U.S. residency programs might recognize the reputations or quality of medical education IMGs receive abroad.

The "arrival cohort" control was constructed using methods from Tankwanchi et al. (2013). This control estimates the decade of U.S. migration, as this information is not provided in the AMA Physician Masterfile. To construct this variable, I obtained the year of IMGs' U.S. residency completion from the AMA Physician Masterfile data and then identified and assigned IMGs' medical specialties a "residency length" (the average number of years required in residency for each medical specialty) (Murphy 2020). I further added a 2-year "buffer" period to the residency length variable, to account for additional time, post-migration, that IMGs may need before being accepted into a residency program. The resulting value (average residency length + 2-year buffer) was then subtracted from year of residency training completion (acquired from the AMA Physician Masterfile) resulting in estimated year of U.S. arrival. These years were then grouped into decades, beginning from 1970-1980 and ending with 2009-2019.

Analytic Methods

The analysis is comprised of descriptive statistics (Tables 1 and 2) and regression analyses (Tables 3-6). Regression analyses model the professional and geographic

outcomes of IMGs. Table 3 includes regression models predicting IMGs' medical specialty (Model 1) and residency program type (Model 2) by the development status of IMGs' training countries. Table 4 includes regression models of IMGs' geographic outcomes; these include the IMGs' practice county vulnerability (Model 1); the proportion of the county that is racial-ethnic and immigrant composition of the county (Model 2); whether the county has any healthcare professional shortage areas (Model 3); the proportion of specialty care physicians in the county (Model 4); and the proportion of USMGs practicing in the county (Model 5). Analyses presented in Table 5 mirror those in Table 3 (and those in Table 6 mirror analyses in Table 3), however the main predictor for models included in these tables is the specific region of the world in which IMGs trained. All regression tables present coefficients, however, I discuss the results for logistic regression models using odds ratios (ORs).

Results

Descriptive Statistics

Table 1 presents sociodemographic, immigration, and geographic characteristics of IMGs in the analytical sample. These characteristics are presented for the full sample, by the development status of IMGs' country of training (developed and developing), and by the global regions in which IMGs trained (e.g., South Asia, Sub-Saharan Africa, etc.).

Consistent with estimates from Young et al. (2019), most IMGs were trained in developing countries (85%), particularly in South Asia (38%) and in the Middle East/North Africa (12%). The mean age across IMGs in this sample was 53, with IMGs trained in developing countries being slightly younger (53) relative to IMGs trained in

developed economies (56). Specifically, English-speaking Caribbean IMGs averaged the youngest ages (45) and Western European IMGs, the oldest (59). Furthermore, although only 37% of all IMGs were women, IMGs trained in developed countries were more likely to be women (40%) relative to IMGs trained in developing countries (36%). Non-Western European IMGs were most likely to be women (50%) and Middle Eastern/North African IMGs were least likely to be women (20%).

Thirty-two percent of IMGs attended a medical school ranked within QS' global top-600 medical schools, with 66% of IMGs trained in developed countries having attended a "top-600" school, relative to only 27% of developing country IMGs. This varied significantly across regions of training; although 96% of IMGs trained in English-speaking non-Caribbean countries attended a "top-600" medical school, 0% of IMGs trained in English-speaking Caribbean schools trained in a "top-600" school.

IMGs were predominantly located in the U.S. Southeast (36%) and were least likely to practice in U.S. territories (Guam and Puerto Rico) (0.1%) and the U.S. West (19%). IMGs trained in developing countries were concentrated in the U.S. Southeast (37%), whereas IMGs trained in developed countries were most likely to practice in the U.S. Northeast (30%). Specifically, 52% of South American and Central American/Caribbean IMGs and 46% of Sub-Saharan African IMGs practiced in the U.S. Southeast. Non-Western and Western European IMGs were most likely to practice in the U.S. Northeast (33%), Middle Eastern/North African IMGs were most likely to practice in the U.S. Midwest (31%), and Southeast Asian and English-Speaking non-Caribbean IMGs were most likely to practice in the U.S. West (33%).

Table 2 presents descriptive statistics for the dependent variables in the analysis. Panel 1 shows IMGs' professional outcomes. Most IMGs in this sample attended public university-based (35%) or community-based programs (33%). However, there is clear variation by place of medical education. IMGs trained in developing countries were more likely than those from developed countries to have attended community-based residency programs (34 versus 27%) and were less likely to have attended premier university residencies (18 versus 29%). By region of medical education, striking differences were noted in the U.S. residency programs IMGs attended. IMGs trained in English-speaking Caribbean and Southeast Asian countries were least likely to have attended premier university residencies (12% for each), whereas IMGs trained in Western Europe and English-speaking non-Caribbean countries were most likely to have attended premier university programs (31 and 40%, respectively).

Although IMGs, regardless of their training country, were most likely to practice in primary care (53%), IMGs from developing countries were more highly concentrated in primary care than IMGs from developed countries (54 versus 44%). Specifically, IMGs from Southeast Asia, Central America and the Caribbean, and English-Speaking Caribbean countries were most likely to practice in primary care specialties (71, 66, and 69% respectively) relative to only 34% of English-speaking non-Caribbean IMGs and 43% of Middle Eastern and North African and Western European IMGs. Contrarily, IMGs trained in developed countries were more concentrated in less "IMG-friendly" specialties, including surgical and E-ROAD specialties (9 and 15%, respectively). Notably, English-speaking non-Caribbean IMGs and Western European IMGs were most

likely to practice in surgical and E-ROAD specialties (16 and 20% for English-speaking non-Caribbean IMGs, and 8 and 14% for Western European IMGs).

Panel 2 shows IMGs trained in developing countries were more likely (21%) than IMGs from developed countries (16%) to currently practice in the most disadvantaged U.S. counties. IMGs trained in Central American/Caribbean, South American, and Southeast Asian countries were particularly likely to practice in disadvantaged counties. Although there was no difference in the likelihood of IMGs from developing versus developed countries practicing in counties with the highest proportion of minority/immigrant residents (around 71% for each), Central and South American IMGs were most likely among IMG subgroups to practice in counties with the highest proportion of minority/immigrant residents (81% for each).

The third panel of Table 2 presents characteristics pertaining to the healthcare infrastructure of IMGs' practice counties. Most IMGs practiced in counties that were at least partly healthcare professional shortage areas (93% of IMGs practiced in counties with primary care professional shortage areas, 94% in counties with mental health professional shortage areas). Still, more variation was noted in the specialty care infrastructure of IMGs' practice counties, and IMGs from developing countries were less likely to practice in counties where more than 76% of the physician workforce practiced specialty medicine (40%), relative to 47% of IMGs from developed countries. Southeast Asian IMGS were most likely among IMGs to practice in areas with the lowest proportion of specialty medicine physicians (3%) followed by English-speaking Caribbean and Central American/Caribbean IMGs (2% for each).

Finally, IMGs trained in developing countries (5%) appeared to be tracked away from geographic areas where USMGs practiced and were most likely to practice in counties with lower proportions of USMGs (3%). Strikingly, although 56% of English-speaking non-Caribbean IMGs practiced in counties where >76% of physicians were USMGs, Central American/Caribbean IMGs (31%), English-speaking Caribbean physicians (39%) and Southeast Asian physicians (39%) were least likely to practice in counties with the highest proportion of USMG physicians.

Regression Analyses

IMG Outcomes by Development Status of Training Country

Table 3 presents results of regression analyses examining the relationship between training country development status and IMG professional outcomes. Model 1 shows a multinomial logistic regression examining IMGs' medical specialties. Findings indicate that relative to IMGs from developing countries, IMGs from developed countries are more likely to practice in specialized internal medicine (OR 1.28), surgical (OR 1.52), E-ROAD (OR 1.38), and diagnostic specialties (OR 1.43) relative to primary care specialties, net of sociodemographic, training, and geographic factors.

Model 2 presents a multinomial regression of the relationship between the development status of an IMG's training country and type of U.S. residency program attended. Results indicate that relative to having attended public university-based programs, IMGs from developed countries are more likely than IMGs from developing countries to have attended premier university-based programs (OR 1.20) and are less likely to have attended community-based programs (OR 0.79).

Table 4 presents results for regression models predicting the sociodemographic and healthcare infrastructure characteristics of IMGs' practice counties. Model 1 shows that IMGs from developed countries are less likely than IMGs from developing countries to practice in more vulnerable counties (-0.08), net of other factors. They are also less likely to practice in counties with a higher proportion of racially minoritized and immigrant individuals (-0.3) relative to IMGs trained in developing countries (Model 2).

Models 3-5 in Table 4 show results for regression models predicting the healthcare infrastructure of IMGs' practice counties. Model 3 shows that IMGs from developed countries are more likely than IMGs from developing countries to practice in counties that have any HPSA versus no HPSA (OR 1.19). On the other hand, IMGs from developed countries are more likely (0.94) than IMGs from developing countries to practice in counties where a higher proportion of the physician workforce practices specialty (relative to primary care) medicine (Model 4). Finally, Model 5 indicates that IMGs trained in developed countries have a much higher likelihood of practicing in counties with more USMGs (OR 2.65) relative to IMGs trained in developing countries.

IMG Outcomes by Region of Training

The previous set of models examine IMGs' professional and geographic outcomes by the development status of IMGs' training countries. To identify specifically *which* groups of IMGs face disadvantaged outcomes, in the next series of models I examine IMGs' outcomes according to specific regions of medical education.

Table 5, Model 1 shows that most groups of IMGs are less likely than IMGs trained in English-speaking non-Caribbean countries to practice in specialized internal

medicine, E-ROAD, and surgical specialties. IMGs trained in Central America and the Caribbean, Southeast Asian, and English-speaking Caribbean countries are least likely among IMGs (OR 0.39, 0.41, and -0.43) to practice in specialized internal medicine. IMGs from Southeast Asia, Central America and the Caribbean, and Sub-Saharan Africa are also particularly unlikely to practice in surgical and E-ROAD specialties relative to IMGs trained in English-speaking non-Caribbean countries. Furthermore, findings from Model 2 indicate that relative to IMGs trained in English-speaking non-Caribbean countries, Southeast Asian (OR 0.39) and English-speaking Caribbean (OR 0.41) IMGs are least likely to be in premier university-based residency programs relative to public university programs, whereas Central American and Caribbean (OR 2.01) and Southeast Asian (OR 1.95) IMGs are more likely to have attended community-based residency programs.

Regarding the distribution of IMGs within U.S. counties, Table 6, Model 1 indicates that IMGs from Central America and the Caribbean, South America, and Southeast Asia, are particularly more likely to practice in disadvantaged counties relative to IMGs from English-speaking non-Caribbean countries, with IMGs from Central and South America being most likely to practice in more disadvantaged (0.37 and 0.29, respectively). Similarly, Central American and Caribbean, South American, and Sub-Saharan African IMGs are more likely than English-speaking non-Caribbean IMGs to practice in counties with a higher proportion of people of color/immigrants (Model 2). Alternatively, Southeast Asian IMGs are less likely to practice in counties with a higher

concentration of people of color and immigrant individuals relative to English-speaking non-Caribbean IMGs (-0.07).

Table 6, Models 3-5 predict the healthcare infrastructure of counties in which IMGs practice. Although Model 3 indicates that relative to IMGs from English-speaking non-Caribbean countries, most IMG subgroups are less likely to practice in HPSAs, Sub-Saharan African and Western European IMGs appear least likely to practice in HPSAs relative to English-speaking non-Caribbean IMGs. Contrarily, most IMG subgroups are less likely than English-speaking non-Caribbean IMGs to practice in counties with fewer specialty care physicians; Model 4 shows that Southeast Asian (-3.13) and English-speaking Caribbean (-2.25) IMGs are least likely among IMG subgroups to practice in counties with higher concentrations of specialty care physicians.

Relative to IMGs from English-speaking non-Caribbean countries, most subgroups of IMGs are less likely to practice in counties with a higher proportion of USMGs (Model 5). Notably, the gap between Western European IMGs and English-speaking non-Caribbean IMGs is relatively small (-1.18), but IMGs from Central America and the Caribbean and South America (-5.95 and -4.77) and Southeast Asia (-4.11) are least likely relative to English-speaking non-Caribbean IMGs two practice in counties with a higher proportion of USMGs.

Discussion and Conclusion

This article highlights an important but understudied axis of stratification within the U.S. medical profession. Although prior research has developed our understanding of the marginalized role of IMGs in the medical profession, such analyses have treated

IMGs as a homogenous group, overlooking the stratified outcomes experienced across IMG subgroups. This article exposes salient differences in the career outcomes of IMGs by place of medical education, which may reflect a process of stratification extending beyond physicians simply being IMG/USMG.

IMGs trained in developed countries face fewer disadvantages relative to IMGs from developing countries in their U.S. careers. These IMGs place into higher-prestige, university-based residencies, and practice in specialties that are typically more restrictive towards IMGs. In their current practice, they practice in less disadvantaged/segregated counties, which are also more equipped with a higher proportion of specialty care physicians. Importantly, IMGs from developed countries appear to practice *among* USMGs in their practice counties, not *in place* of them.

Moreover, the magnitude of IMGs' disadvantage varies widely across specific IMG subgroups. Notably, Southeast Asian, Central American/Caribbean, and English-speaking Caribbean IMGs face consistently more marginalized career outcomes relative to English-speaking non-Caribbean IMGs. Compared to IMGs from English-speaking non-Caribbean countries, Caribbean/Central American and Southeast Asian IMGs are most likely to practice in "IMG-friendly" specialties and are most likely to have attended "IMG-friendly" residency programs. Central/South American and Southeast Asian IMGs are also more likely to practice in more disadvantaged practice counties where a lower proportion of USMGs practice.

Although measures of race-ethnicity are not included in the AMA Physician Masterfile data, and therefore race is not directly measured in this article, I argue that

disparate career outcomes across IMG subgroups likely reflects racism within the medical profession that shapes the outcomes of IMGs from developing countries. Specifically, IMGs from developing countries experience limited access to opportunities in institutions (residency programs, hospitals, specialties) that are reserved for USMGs and certain subgroups of IMGs, namely those from Western Europe, English-speaking non-Caribbean countries, and East Asian countries. These IMG subgroups experience fewer professional limitations than IMGs from developing countries, which may be because IMGs from developed countries are less likely to experience discrimination at multiple points along their path towards practicing medicine in the United States. For example, when applying to residency programs, IMGs from developed countries may be less likely to experience the arbitrary "IMG filtering" process of residency program administrators, perhaps because they are perceived to have better medical training relative to IMGs trained in developing countries. Furthermore, certain groups of IMGs, such as those from English-speaking non-Caribbean countries, may be perceived as "less foreign" relative to other IMG subgroups, and therefore may be assumed to possess more cultural and linguistic similarities to USMGs, facilitating their integration into U.S. medical practice (Jenkins 2020).

Moreover, the relatively advantaged career outcomes among East Asian physicians may reflect a new "expected racial corollary" of physicians in the United States (Alam 2020, 138). In other words, the broader racialization of East Asians as the "model minority," stereotypes them as being inherently hard-working and academically high achieving, particularly in STEM (Chen and Buell 2017). Such stereotypes may lead

hospital administrators, residency program directors, and the medical profession, broadly, to place East Asian (and perhaps, to a lesser extent, South Asian) IMGs in positions in the profession that are substitutionary, rather than complementary, to USMGs.

Several limitations in this study warrant mention. First, as this article uses cross-sectional data, IMGs' career trajectories could not be examined longitudinally. Furthermore, the nature of this data cannot determine why precisely it is that certain groups of IMGs chose their respective residency programs, medical specialties, and current geographic locations. Finally, although USMLE scores would allow for a measurement that is standardized of physician "ability," this variable is not present in the data. Instead, medical school ranking served as a potentially useful proxy for IMGs' "pedigree," broadly construed.

As the burden of caring for marginalized populations in the United States falls largely on IMGs from developing countries, these IMGs become marginalized within the medical profession upon performing this critical role in U.S. health care. This finding has important implications for inequities in the delivery of health care in the United States for two key reasons. First, stratification within organized medicine disproportionally limits the career opportunities of IMGs from developing countries, which moves the medical profession away from its goal of increasing diversity, and instead splits the profession into upper and lower tiers (Alam 2016). Furthermore, tracking IMGs from developing countries away from prestigious residency programs and hospital institutions decreases the diversity of these institutions, and limits the representation and opportunities of professionals of color, particularly in academic research hospitals. Given observations

that the career limitations of IMGs result in higher levels of career dissatisfaction (Chen et al. 2010), preventing career advancement among IMGs from developing countries may ultimately dissuade them from pursuing medicine in the United States at all, causing a loss both for these high-skilled immigrants' themselves, and for U.S. health care, which faces a serious and continuing physician shortage in the coming decade (Heiser 2019).

Second, as Jenkins (2018) argues, the patient populations IMGs serve are done a disservice when IMGs from developing countries are stratified into residency programs, such a low-tier community-based programs, which provide little support to residents, and which offer fewer resources and lower quality training. Upon residency completion, these IMGs may offer lower quality of care to the populations they serve, which are largely immigrants, people of color, and individuals of low socioeconomic status. Consequently, filtering IMGs, particularly from developing countries, out of university-based residency programs has the potential to further exacerbate, rather than alleviate, healthcare and health disparities in the United States. Ultimately, healthcare policy should encourage that the care of marginalized populations be shared equally among physicians in the United States, regardless of their country of training. Doing so promotes equity and reduces care disparities, particularly across the lines of race, nativity, and socioeconomic status.

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Table 1: IMGs' Socioeconomic and Demographic Characteristics

	Full Sample	Training Country Development Status		Training Region										
				English-Speaking Countries		Latin America		Europe		Africa and Middle East		Asia		
		Developed Economies	*Developing Economies*	*English-Speaking Non-Caribbean*	*English-Speaking Caribbean*	*Central America & Caribbean*	*South America*	*Western Europe*	*Non-Western Europe*	*Middle East/North Africa*	*Sub-Saharan Africa*	*South Asia*	*Southeast Asia*	*East Asia*
Mean Age	53	56	53****	56	44.9††††	55††††	52††††	59††††	55	53††††	56††	52††††	55	56††††
SD	*9.8*	*8.6*	*9.8*	*8.9*	*9.0*	*10.0*	*9.0*	*7.4*	*8.3*	*9.6*	*8.3*	*10.0*	*9.1*	*7.6*
Women (%)	36.2	40.1	35.7****	31.9	39.6††††	26.3††††	33.2††††	34.4††††	49.9††††	20.1††††	25.5††††	38.4††††	48.5††††	41.1††††
Medical School Ranked in the QS Global 600	31.8	66.1	27.0****	95.5	0.0††††	6.7††††	51.6††††	84.4††††	34.5††††	58.2††††	52.0††††	14.5††††	39.0††††	32.5††††
US Region (%)														
Northeast	22.9	29.7	21.9****	25.4	25.9†	17.4††††	19.5††††	32.9††††	33.3††††	20.0††††	15.5††††	22.0††††	19.9††††	27.5††††
South	35.6	26.7	36.9****	24.1	36.0††††	52.8††††	51.8††††	30.7††††	25.4††††	31.6††††	45.5††††	36.8††††	29.1††††	25.6††††
Midwest	22.7	20.5	23.1****	16.8	16.8	13.1††††	16.3††	15.6††††	24.3††††	30.8††††	25.9††††	25.8††††	18.2††††	18.9††††
West	18.7	22.9	18.1****	33.8	21.3††††	15.8††††	12.2††††	20.7††††	17.0††††	17.6††††	13.1††††	15.3††††	32.5††††	27.9††††
Territories	0.1	0.1	0.1	0.0	0.0	0.9	0.3	0.2	0.1	0.0	0.0	0.0	0.3	0.1
US Arrival Coh														
1970-79	4.4	7.1	4.0****	12.8	1.2††††	5.9††††	2.1††††	9.2††††	1.6††††	3.9††††	5.1††††	5.0††††	3.2††††	3.0††††
1980-89	18.8	25.9	17.8****	35.6	6.3††††	31.3††††	17.0††††	32.9††††	12.6††††	21.1††††	23.3††††	16.5††††	22.5††††	12.8††††
1990-99	35.1	40.1	34.4****	32.2	16.9††††	24.5††††	35.1††††	40.2††††	50.6††††	34.1††††	23.2††††	33.2†††	41.1††††	43.1††††
2000-09	33.6	23.7	35.0****	16.4	49.6††††	30.4††††	39.7††††	16.1	30.9††††	32.5††††	31.4††††	36.6††††	28.1††††	35.4††††
2010-19	8.1	3.2	8.8****	3.0	26.1††††	7.9††††	6.1††††	1.7††††	4.3††††	8.5††††	17.0††††	8.7††††	5.1††††	5.8††††
%	100.0	12.3	84.9	3.8	5.7	6.6	6.6	3.0	8.8	12.3	3.1	37.5	7.6	5.1
N	19,985	2,454	17,531	761	1,131	1,322	1,315	590	1,752	2,459	613	7,497	1,519	1,026

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Significance test are of difference in means/proportions between IMGs from developing relative to developed training countries (*) and between IMGs from all other training regions relative to English-speaking non-Caribbean IMGs (†).

Table 2: IMGs' Professional and Geographic Outcomes

	Full Sample	Training Country Development Status		Training Region										
				English-Speaking		Latin America		Europe		Africa and Middle		Asia		
		Developed Economies	*Developing Economies*	*English-Speaking Non-Caribbean*	*English-Speaking Caribbean*	*Central America & Caribbean*	*South America*	*Western Europe*	*Non-Western Europe*	*Middle East/North Africa*	*Sub-Saharan Africa*	*South Asia*	*Southeast Asia*	*East Asia*
PROFESSIONAL														
Residency Program Type (%)														
Premier University	19.3	28.8	17.9****	39.7	11.9††††	17.6††††	29.4††††	31.0††††	20.4††††	20.1††††	22.7††††	15.3††††	12.4††††	27.8††††
Public University	35.3	33.3	35.6****	31.7	34.2††††	31.3††††	32.2†	32.5††	32.7††††	41.0††††	31††	36.8††††	33.3††††	35.4††††
Private University	10.8	8.9	11.1****	5.9	12.2††††	7.9††††	10.4††††	9.7††††	12.0††††	10.3††††	15.0††††	11.6††††	11.0††††	9.0††††
Federal (VA, Military)	1.2	1.7	1.1****	2.4	0.4††††	1.0††††	0.7††††	1.7††††	1.4††††	1.0††††	0.7††††	1.2††††	1.1††††	1.9††††
Community	33.4	27.3	34.3****	20.4	41.3††††	42.2††††	27.2††††	25.1††††	33.6††††	27.7††††	30.7††††	35.1††††	42.1††††	26.0††††
Medical Specialty (%)														
Primary Care	52.6	43.9	53.9****	33.5	68.7††††	66.0††††	46.6††††	43.4††††	52.7††††	42.7††††	54.5††††	52.6††††	71.2††††	40.2††††
Specialty Medicine	32.1	29.8	32.4****	28.9	21.6††††	20.1††††	34.8††††	30.0††††	28.6	39.2††††	31.2††††	36.5††††	20.1††††	34.3††††
Surgical Specialties	4.5	8.6	3.9****	15.5	3.6††††	4.2††††	7.8††††	8.1††††	4.1††††	6.5††††	4.2††††	2.9††††	1.7††††	2.6††††
E-ROAD Specialties	8.5	14.6	7.6****	20.1	5.8††††	8.2††††	8.3††††	13.7††††	11.5††††	9.3††††	8.2††††	6.6††††	5.1††††	11.9††††
Diagnostic Specialties	2.3	3.2	2.2****	2.0	0.4††††	1.5††††	2.5††††	4.8††††	3.0††††	2.4††††	2.0	1.4††††	1.9	11.0††††
SOCIODEMOGRAPHIC CHARACTERISTICS OF PRACTICE COUNTY														
Overall County Vulnerability§ (%)														
Least Vulnerable (<0.25)	19.5	20.3	19.4***	17.7	18.7††††	13.5††††	12.6††††	20.2††††	21.4††††	19.6††††	18.8††††	22.4††††	15.9††††	20.0††††
0.26 - 0.50	23.8	26.6	23.5****	30.1	20.9††††	15.4††††	19.2††††	24.4††††	24.9††††	21.2††††	24.6††††	25.6††††	23.8††††	29.7
0.51 - 0.75	35.2	36.9	35.0****	33.6	36.7††††	34.4††††	40.7††††	37.1††††	37.3†	38.2††††	38.7††††	33.5	32.7††††	31.0††††
Most Vulnerable (0.76+)	21.4	16.3	22.2****	18.5	23.8††††	36.6††††	27.5††††	18.3	16.3††††	21.0††††	17.9††	18.6	27.7††††	19.3†††
Minority/Immigrant in														
Least Diverse (<0.25)	2.3	2.0	2.5****	1.8	2.7††††	2.3††††	1.1††††	1.9	2.1†††	3.7††††	1.1††††	2.1††††	4.1††††	1.0††††
0.26 - 0.50	6.7	7.3	6.6****	5.5	6.5††††	4.5††††	4.2††††	6.8††††	7.5††††	7.6††††	6.4††††	7.6††††	6.5††††	3.9††††
0.51 - 0.75	17.9	17.8	17.9	16.6	16.6	12.6††††	14.1††††	15.9††	18.4††††	18.4††††	16.2	20.1††††	16.8	17.7††††
Most Diverse (0.76+)	73.1	73	73.1	76.1	74.1††††	80.5††††	80.6††††	75.4††	72.0††††	70.4††††	76.4	70.2††††	72.6††††	77.5††††
HEALTHCARE INFRASTRUCTURE OF PRACTICE COUNTY														
Primary Care HPSA§ (%)	92.9	93.9	92.8**	96.5	92.8††††	95.5††††	95.2††††	91.9††††	93.4††††	93.2††††	90.7††††	91.6††††	93.5††††	93.8††††
Mental Health HPSA§ (%)	93.5	94.1	93.4	95.9	93.4††††	95.8††††	95.4††††	92.7††††	94.0††††	93.4††††	91.8††††	92.5††††	93.5††††	94.0††††
Physicians in County Practicing Specialty Medicine§ (%)														
<50%	1.6	1.0	1.6****	0.9	2.4††††	2.3††††	1.1†††	1.2†††	1.1†††	1.3†††	1.1†††	1.5††††	3.2††††	0.4††††
50-75%	57.5	52.6	58.2****	55.6	61.5††††	55.3	49.4††††	48.3††††	52.7††††	52.7††††	59.9††††	59.2††††	70.9††††	59.2††††
76%+	41.0	46.5	40.2****	43.5	36.1††††	42.4†††	49.6††††	50.5††††	46.2††††	46.0††††	39.0††††	39.3††††	25.9††††	40.5††††
USMGs Practicing in County§ (%)														
<50% USMG	5.0	3.1	5.3****	1.2	5.9††††	7.9††††	5.4††††	3.2††††	6.6††††	4.5††††	2.6††††	4.5††††	7.0††††	4.9††††
50-75% USMG	54.3	48.3	55.1****	43.2	55.5††††	61.4††††	58.0††††	49.0††††	52.1††††	55.8††††	54.3††††	54.5††††	53.7††††	50.5††††
76%+ USMG	40.7	48.7	39.6****	55.6	38.6††††	30.7††††	36.7††††	47.8††††	41.3††††	39.7††††	43.1††††	41.1††††	39.4††††	44.6††††
%	100	12.3	84.9	3.8	5.7	6.6	6.6	3.0	8.8	12.3	3.1	37.5	7.6	5.1
N	19,985	2,454	17,531	761	1,131	1,322	1,315	590	1,752	2,459	613	7,497	1,519	1,026

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Significance test are of difference in means/proportions between IMGs from developing relative to developed training countries (*) and between IMGs from all other training regions relative to English-speaking non-Caribbean IMGs (†). Variables marked with (§) are only available for 19,978 individuals, as county information was not available for 7 IMGs practicing in Guam. Note. Variables marked with (§) are only available for 19,978 individuals, as county information was not available for 7 IMGs practicing in Guam. These individuals were trained in South America (n=1), in Southeast Asia (n=5), and in East Asia (n=1).

Table 3: Regression Models Predicting IMGs' Professional Outcomes

	M1 - Multinomial Logistic Regression Predicting Medical Specialty Choice (ref = Primary Care Specialties)								M2 - Multinomial Logistic Regression Predicting Residency Program (ref = Public University)							
	Specialized Internal Medicine		Surgical		E-ROAD		Diagnostic		Premier University		Private University		Federal		Community	
Characteristics	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Developed Economy Training Country (ref = Developing)	0.25****	-0.08	0.42***	-0.14	0.32***	-0.11	0.36*	-0.20	0.18**	-0.09	-0.17	-0.12	0.20	-0.28	-0.23***	-0.08
Age	0.30****	-0.02	0.30****	-0.06	0.22****	-0.05	0.69****	-0.09	0.04	-0.03	-0.01	-0.04	0.11	-0.11	-0.14****	-0.03
Age2	-0.00****	0.00	-0.00****	0.00	-0.00****	0.00	-0.01****	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.001****	0.00
Sex (ref = Men)	-0.77****	-0.04	-2.22****	-0.12	-0.59****	-0.06	0.13	-0.10	-0.03	-0.04	0.08	-0.05	0.00	0.00	0.15****	-0.04
Medical School Rank (ref = Not Top 600)	0.31****	-0.04	0.84****	-0.08	0.47****	-0.06	0.38****	-0.10	0.36	-0.04	-0.02	-0.06	0.08	-0.15	-0.31****	-0.04
US Census Region (ref = South)																
Northeast	-0.06	-0.08	0.17	-0.17	0.40**	-0.12	0.31	-0.21	0.98	-0.10	0.11	-0.13	0.70**	-0.35	0.57****	-0.09
Midwest	0.22****	-0.08	0.43***	-0.16	-0.03	-0.14	-0.68**	-0.23	0.12	-0.10	-0.17	-0.11	-0.53	-0.45	-0.50****	-0.09
West	-0.39****	-0.06	-0.13	-0.13	-0.19**	-0.09	-0.61****	-0.18	0.31	-0.07	-0.24***	-0.09	0.99****	-0.22	0.03	-0.06
Territories	-0.18*	-0.56	-0.72	-1.06	-0.60	-0.76	-14.07*	-1117.67	-1.27	-1.07	0.18	-0.69	-11.80	-767.87	0.61	-0.47
US Arrival Cohort (ref = 1970-79)																
1980-89	-0.53****	-0.10	-1.74****	-0.15	-1.05****	-0.12	0.35	-0.30	-0.19	-0.12	0.32*	-0.16	0.28	-0.30	-0.12	-0.10
1990-99	-0.93****	-0.11	-2.57****	-0.19	-1.15****	-0.14	0.38	-0.31	-0.31	-0.13	0.30*	-0.17	0.85	-0.03	-0.32****	-0.11
2000-09	-0.66****	-0.12	-2.19****	-0.23	-1.62****	-0.17	1.00****	-0.34	-0.54	-0.15	0.19	-0.19	0.40	-0.41	-0.50****	-0.12
2010-19	-0.60****	-0.14	-3.87****	-0.36	-2.36****	-0.25	0.93**	-0.47	-0.63	-0.17	0.18	-0.22	0.62	-0.54	-0.46****	-0.14
N	19985								19985							
Constant	-6.64****	-0.60	-6.52****	-1.47	-5.87****	-1.22	-24.31****	-2.56	-1.33*	-0.78	-1.16	-0.93	-8.45***	-3.05	-0.31****	-0.04
Adj. R2	0.06								0.03							

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Models 1 and 2 include controls for age, age2, sex, medical school ranking, US region, and arrival cohort.

Table 4: Regression Models Predicting Sociodemographic and Healthcare Infrastructure Characteristics of IMGs' Practice Counties

	SOCIODEMOGRAPHIC CHARACTERISTICS				HEALTHCARE INFRASTRUCTURE CHARACTERISTICS					
	M1 - OLS Model of Overall Practice County Vulnerability		M2 - OLS Model Predicting Practice County Minority and Immigrant Composition		M3 - Binomial Logistic Regression Predicting Health Care Shortage Area (ref = No)		M4 - OLS Model Predicting Proportion of Specialty Care Physicians in Practice County		M5 - OLS Model Predicting Proportion USMG in Practice County	
Characteristics	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Developed Economy Training Country (ref = Developing)	-0.08****	-0.02	-0.03**	-0.02	0.17*	-0.11	0.94****	-0.17	2.65****	-0.23
Age	-0.04****	-0.01	0.01	-0.01	-0.11**	-0.05	0.05	-0.08	0.07**	-0.11
Age2	0.00****	0.00	0.00	0.00	0.00**	0.00	0.00	0.00	0.00	0.00
Sex (ref = Men)	-0.08****	-0.01	0.06****	-0.01	-0.21****	-0.07	0.27**	-0.11	0.34**	-0.16
Medical School Rank (ref = Not Top 600)	0.02	-0.02	0.03***	-0.01	0.00	-0.07	0.83****	-0.12	0.78****	-0.16
Residency Program Type (ref = Premier University)										
Public University	-0.14****	-0.02	-0.12****	-0.01	0.03	-0.08	-2.03****	-0.15	0.49**	-0.21
Private University	-0.11****	-0.02	-0.06****	-0.01	-0.23**	-0.10	-2.05****	-0.21	-0.09	-0.23
Federal Programs	-0.20****	-0.07	-0.13****	-0.04	-0.04	-0.33	-1.99****	-0.51	0.03	-0.68
Community Programs	-0.08****	-0.02	-0.08****	-0.01	0.32****	-0.10	-3.09****	-0.16	-1.32****	-0.23
US Arrival Cohort (ref = 1970-79)										
1980-89					0.05	-0.20				
1990-99					-0.07	-0.21				
2000-09					0.04	-0.24				
2010-19					0.03	-0.27				
N	19978		19978		19978		19978		19978	
Constant	3.67****	-0.26	3.43****	-0.18	5.09****	-1.23	73.30****	-2.06	71.28****	-2.74
Adj. R2	0.11		0.15		0.06		0.09		0.19	

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Models 1, 2, 4, and 5 include controls for age, age2, sex, medical school ranking, residency program type, and fixed-effects for US region and arrival cohort. Model 3 includes controls for age, age2, sex, medical school ranking, residency program type, and arrival cohort.

Table 5: Regression Models Predicting IMGs' Professional Outcomes

	M1 - Multinomial Logistic Regression Predicting Medical Specialty Choice (ref = Primary Care								M2 - Multinomial Logistic Regression Predicting Residency Program (ref = Public University)							
	Specialized Internal Medicine		Surgical		E-ROAD		Diagnostic		Premier University		Private University			Federal		Community
Characteristics	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Training Region (ref = English-speaking Non-Caribbean)																
English-Speaking Caribbean	-0.85****	-0.12	-1.39****	-0.22	-1.13****	-0.18	-1.71****	-0.58	-0.88****	-0.14	0.71****	-0.20	-0.89	-0.55	0.58****	-0.13
Central America & Caribbean	-0.94****	-0.12	-1.53****	-0.20	-1.17****	-0.16	-0.79**	-0.37	-0.40****	-0.13	0.39**	-0.21	-0.51	-0.41	0.70****	-0.13
South America	-0.12	-0.12	-0.64****	-0.16	-0.88****	-0.15	0.03	-0.33	-0.07	-0.12	0.60***	-0.19	-0.81*	-0.43	0.38***	-0.13
Western Europe	-0.13	-0.14	-0.68****	-0.20	-0.59****	-0.17	0.45	-0.33	-0.18	-0.14	0.41*	-0.22	-0.33	-0.41	0.13	-0.15
Non-Western Europe	-0.21*	-0.11	-1.00****	-0.18	-0.60****	-0.14	-0.06	-0.31	-0.44****	-0.12	0.61****	-0.19	-0.14	-0.34	0.41****	-0.12
Middle East/North Africa	0.00	-0.11	-0.98****	-0.15	-0.81****	-0.13	0.04	-0.30	-0.73****	-0.11	0.31*	-0.18	-0.72**	-0.33	0.12	-0.12
Sub-Saharan Africa	-0.43****	-0.13	-1.54****	-0.24	-1.22****	-0.19	-0.53	-0.40	-0.29**	-0.15	0.98****	-0.21	-0.99*	-0.57	0.51****	-0.15
South Asia	-0.06	-0.10	-1.51****	-0.16	-1.11****	-0.13	-0.60**	-0.30	-0.74****	-0.10	0.58****	-0.18	-0.19	-0.30	0.39****	-0.11
Southeast Asia	-0.88****	-0.12	-2.32****	-0.24	-1.72****	-0.16	-0.67**	-0.33	-0.95****	-0.13	0.59***	-0.19	-0.59	-0.36	0.67****	-0.12
East Asia	0.22*	-0.12	-1.25****	-0.24	-0.28*	-0.16	1.54****	-0.30	-0.18	-0.12	0.30	-0.21	-0.15	-0.36	0.12	-0.14
Age	0.29****	-0.02	0.26****	-0.06	0.19****	-0.05	0.54****	-0.10	0.01	0.00	0.00	-0.04	0.11	-0.11	-0.13****	-0.03
Age2	-0.00****	0.00	0.00	0.00	-0.00****	0.00	-0.00****	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00****	0.00
Sex (ref = Men)	-0.77****	-0.04	-2.16****	-0.12	-0.57****	-0.06	1.00	-0.10	-0.02	-0.04	0.05	-0.05	0.06	-0.14	0.13****	-0.04
Medical School Rank (ref = Not Top 600)	0.25****	-0.04	0.60****	-0.09	0.35****	-0.07	0.15	-0.12	0.25****	-0.05	0.03	-0.06	0.18	-0.17	-0.21****	-0.04
US Census Region (ref = South)																
Northeast	-0.07	-0.08	0.13	-0.17	0.36****	-0.12	0.13	-0.21	0.93****	-0.10	0.12	-0.13	0.69**	-0.35	0.58****	-0.09
Midwest	0.22***	-0.08	0.44**	-0.16	-0.04	-0.14	0.07	-0.23	0.09	-0.10	-0.18	-0.11	-0.55	-0.45	-0.50****	-0.09
West	-0.32****	-0.06	-0.13	-0.13	-0.22**	-0.10	-0.77****	-0.18	0.28****	-0.07	-0.23**	-0.09	0.99****	-0.22	0.00	-0.06
Territories	-0.63	-0.57	-0.25	-1.06	-0.37	-0.76	-12.65	-586.91	-1.39	-1.07	0.20	-0.70	-11.90	-854.19	0.41	-0.05
US Arrival Cohort (ref = 1970-79)																
1980-89	-0.49****	-0.10	-1.71****	-0.15	-1.04****	-0.12	0.31	-0.30	-0.19	-0.12	0.29*	-0.16	0.33	-0.31	-0.14	-0.10
1990-99	-0.95****	-0.11	-2.50****	-0.20	-1.18****	-0.14	0.09	-0.32	-0.31***	-0.13	0.27	-0.17	0.12	-0.35	-0.32****	-0.11
2000-09	-0.68****	-0.12	-2.13****	-0.24	-1.70****	-0.17	0.42	-0.35	-0.61****	-0.15	0.18	-0.19	0.10	-0.42	-0.50****	-0.12
2010-19	-0.60****	-0.14	-3.84****	-0.36	-2.48****	-0.25	0.22	-0.49	-0.72****	-0.17	0.17	-0.22	0.72	-0.55	-0.45****	-0.15
N					19,985								19,985			
Constant	-6.11****	-0.63	-4.33****	-1.5	-3.87****	-1.24	-18.91****	-2.63	0.34	-0.81	-1.90**	-0.96	-8.16***	-3.11	3.15****	-0.67
Adj. R2					0.072								0.033			

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Models 1 and 2 include controls for age, age2, sex, medical school ranking, US region, and arrival cohort.

Table 6: Regression Models Predicting Sociodemographic and Healthcare Infrastructure Characteristics of IMGs' Practice Counties

	SOCIODEMOGRAPHIC CHARACTERISTICS				HEALTHCARE INFRASTRUCTURE CHARACTERISTICS					
	M1 - OLS Model of Practice County Overall Vulnerability		M2 - OLS Model Predicting Practice County Minority and Immigrant Composition		M3 - Binomial Logistic Regression Predicting Practice in Health Care Professional Shortage Area (ref = No)		M4 - OLS Model Predicting Proportion of Specialty Care Physicians in Practice County		M5 - OLS Model Predicting Proportion USMGs in Practice County	
Characteristics	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Training Region (ref = English-speaking Non-Caribbean)										
English-Speaking Caribbean	0.12**	-0.05	0.03	-0.03	-0.68***	-0.27	-2.25****	-0.39	-3.62****	-0.52
Central America & Caribbean	0.37****	-0.05	0.10***	-0.03	-0.24	-0.28	-1.28****	-0.38	-5.95****	-0.49
South America	0.29****	-0.05	0.12****	-0.03	-0.38	-0.27	-0.17	-0.36	-4.77****	-0.47
Western Europe	0.05	-0.05	0.01	-0.04	-0.86***	-0.29	-0.17	-0.42	-1.18**	-0.56
Non-Western Europe	0.06	-0.04	0.03	-0.03	-0.43	-0.26	-0.77**	-0.35	-1.81****	-0.46
Middle East/North Africa	0.11***	-0.04	0.01	-0.03	-0.75***	-0.25	-0.50	-0.32	-3.38****	-0.43
Sub-Saharan Africa	0.04	-0.05	0.10***	-0.04	-0.93****	-0.28	-1.26***	-0.42	-1.94****	-0.56
South Asia	-0.02	-0.04	0.02	-0.03	-0.78****	-0.24	-1.61****	-0.31	-2.89****	-0.42
Southeast Asia	0.16****	-0.04	-0.07**	-0.03	-0.64***	-0.26	-3.13****	-0.35	-4.11****	-0.47
East Asia	-0.03	-0.05	0.08**	-0.03	-0.68***	-0.27	-0.28	-0.38	-1.73****	-0.50
Age	-0.05****	-0.01	0.01	-0.01	-0.10**	-0.05	-0.02	-0.08	0.04	-0.11
Age2	0.00****	0.00	0.00	0.00	0.00**	0.00	0.00	0.00	0.00	0.00
Sex (ref = Men)	-0.07****	-0.01	0.07****	-0.01	-0.19****	(0.070	0.40****	-0.12	0.29*	-0.15
Medical School Rank (ref = Not Top 600)	0.00	-0.02	0.03**	-0.01	0.01	-0.08	0.49****	-0.14	0.74****	-0.18
Residency Program Type (ref = Premier University)										
Public University	-0.14****	-0.02	-0.11****	-0.01	-0.23**	-0.10	-1.91****	-0.15	0.48**	-0.21
Private University	-0.10****	-0.02	-0.05****	-0.02	-0.57****	-0.12	-1.88****	-0.21	-0.08	-0.23
Federal Programs	-0.17***	-0.06	-0.12***	-0.04	-0.10	-0.33	-1.87****	-0.51	-0.12	-0.68
Community Programs	-0.08****	-0.02	-0.07****	-0.01	-0.34****	-0.10	-2.87****	-0.16	-1.23****	-0.23
US Arrival Cohort (ref = 1970-79)										
1980-89					0.03	-0.19				
1990-99					-0.08	-0.21				
2000-09					0.03	-0.24				
2010-19					-0.02	-0.28				
N	19,978		19,978		19,978		19,978		19,978	
Constant	3.67****	-0.27	3.45****	-0.18	6.14****	-1.26	76.66****	-2.11	75.52****	-2.80
Adj. R2	0.12		0.15		0.01		0.10		0.19	

Note. **** p<0.001; *** p<0.01; ** p<0.05; *p<0.10. Models 1, 2, 4, and 5 include controls for age, age2, sex, medical school ranking, residency program type, and fixed-effects for US region and arrival cohort. Model 3 includes controls for age, age2, sex, medical school ranking, residency program type, and arrival cohort.

Appendix Table 1: Region of Training/Birth

English-Speaking	**English-Speaking Non-Caribbean**	Australia; Canada; Ireland; New Zealand; United Kingdom
	English-Speaking Caribbean	Antigua & Barbuda; Barbados; Bahamas; Grenada; Guyana; Jamaica; Nevis/Anguilla; Trinidad & Tobago
Latin America	**Latin American South America**	Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela
	Central America and Latin American Caribbean	Cuba; Dominican Republic; El Salvador; Haiti; Guatemala; Honduras; Costa Rica; Panama; Mexico; Nicarauga
Europe	**Non-Western Europe**	Albania; Armenia; Azerbaijan; Belarus; Bulgaria; Cyprus; Czech Republic; Greece; Hungary; Malta; Moldova; Poland; Romania; Turkey; Ukraine; Russia/USSR; Uzbekistan
	Western Europe	Austria; Belgium; Denmark; Estonia; Finland; France; Germany; Iceland; Italy; Latvia; Lithuania; Netherlands; Norway; Portugal; Spain; Sweden; Switzerland
Africa	**Middle East and North Africa**	Afghanistan; Algeria; Bahrain; Egypt; Jordan; Iran; Iraq; Israel; Kuwait; Lebanon; Libya; Morocco; Palestine; Qatar; Saudi Arabia; Syria; Tunisia; Yemen
	Sub-Saharan Africa	Benin; Botswana; Cameroon; Congo; Ethiopia; Gabon; Ghana; Ivory Coast; Kenya; Liberia; Mauritius; Namibia; Nigeria; Niger; Senegal; Sierra Leone; Somalia; South Africa; Sudan; Tanzania; Uganda; Zimbabwe
Asia	**South Asia**	Bangladesh; India; Nepal; Pakistan; Sri Lanka
	Southeast Asia	Brunei; Cambodia; Indonesia; Laos; Malaysia; Myanmar; Philippines; Singapore; Thailand; Vietnam
	East Asia	China; Hong Kong; Japan; South Korea; Taiwan

Appendix Table 2: Development Status of Country of Training/Birth

Developed Countries	Australia; Austria; Bulgaria; Belgium; Canada; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Italy; Japan; Lithuania; Latvia; Malta; Netherlands; Norway; Poland; Portugal; Romania; Spain; Switzerland; Sweden; United Kingdom; New Zealand
In-Transition Countries	Albania; Armenia; Azerbaijan; Belarus; Moldova; Russia/USSR; Ukraine; Uzbekistan
Developing Countries	Afghanistan; Algeria; Antigua & Barbuda; Argentina; Barbados; Bahamas; Bahrain; Bangladesh; Benin; Bolivia; Botswana; Brazil; Brunei; Cambodia; Cameroon; Chile; China; Colombia; Congo; Costa Rica; Cuba; Dominican Republic; Ecuador; Egypt; El Salvador; Ethiopia; Gabon; Ghana; Grenada; Guatemala; Guyana; Haiti; Honduras; Hong Kong; Indonesia; India; Iraq; Iran; Israel; Ivory Coast; Jamaica; Jordan; Kenya; Kuwait; Laos; Lebanon; Liberia; Libya; Mauritius; Malaysia; Mexico; Morocco; Myanmar; Nevis & Anguilla; Namibia; Nepal; Nicaragua; Nigeria; Niger; Qatar; Pakistan; Palestine; Panama; Paraguay; Peru; Philippines; Saudi Arabia; Senegal; Sierra Leone; Singapore; Somalia; South Africa; South Korea; Sri Lanka; Sudan; Syria; Taiwan; Tanzania; Thailand; Trinidad & Tobago; Tunisia; Turkey; Uganda; Uruguay; Venezuela; Vietnam; Yemen; Zimbabwe

Source: UN DESA (2014)

Appendix Table 3: US Census Regions

Northeast	New Hampshire; Massachusetts; Rhode Island; Connecticut; Vermont; New York; Pennsylvania; New Jersey
South	Washington DC; Delaware; Maryland; Virginia; West Virginia; North Carolina; South Carolina; Georgia; Florida; Kentucky; Tennessee; Mississippi; Alabama
Midwest	North Dakota; South Dakota; Nebraska; Kansas; Minnesota; Iowa; Missouri; Texas; Oklahoma; Arkansas; Louisiana; Wisconsin; Michigan; Ohio; Indiana; Illinois
West	Colorado; Arizona; New Mexico; Utah; Nevada; Wyoming; Idaho; Montana; California; Alaska; Hawaii; Oregon; Washington
Territories	Guam; Puerto Rico

Source: US Health Resources and Services Administration (2019)

Appendix Table 4: Medical Specialties, Grouped

Primary Care	Family medicine; Internal medicine; OB-GYN; Pediatrics; Psychiatry
Specialty Internal Medicine	Allergy; Cardiology; Hepatology; Gastroenterology; Infectious Disease; Medical Genetics; Nephrology; Neurology; Nutrition; Oncology; Rheumatology; Radiation Oncology
E-ROAD	Emergency; Anesthesiology; Radiology; Dermatology; Ophthalmology
Surgical	Colorectal; General; Neurosurgery; Otolaryngology; Physical Medicine; Plastic; Surgery; Thoracic; Urology; Vascular
Diagnostic	Pathology

Appendix Table 5: IMGs by Birth Region and Training Region

		Training Country Development Status		Training Region										
				English-Speaking Countries		Latin America		Europe		Africa and Middle East		Asia		
	Full Sample	*Developed Economies*	*Developing Economies*	*English-Speaking Non-Caribbean*	*English-Speaking Caribbean*	*Central America & Caribbean*	*South America*	*Western Europe*	*Non-Western Europe*	*Middle East/North Africa*	*Sub-Saharan Africa*	*South Asia*	*Southeast Asia*	*East Asia*
Birth Region (%)														
English-Speaking Countries	5.2	23.3	2.7	69.8	25.9	6.4	0.2	2.2	1.8	0.7	3.6	0.5	0.5	0.1
Latin America	11.4	2.2	12.7	0.7	5.5	67.9	95.5	8.1	0.0	0.3	0.3	0.1	0.1	0.0
Europe	10.8	56.7	4.4	5.5	6.9	3.6	1.1	70.0	85.2	1.7	1.5	0.2	0.1	0.2
Middle East & Africa	18.5	9.6	19.7	11.3	20.1	9.4	0.2	16.1	7.2	96.2	88.1	1.6	0.3	0.3
Asia	53.9	8.0	60.3	12.5	41.4	12.4	2.9	3.2	4.9	1.0	6.5	97.6	99.0	98.4
%	100.0	12.3	84.9	3.8	5.7	6.6	6.6	3.0	8.8	12.3	3.1	37.5	7.6	5.1
N	19,985	2,454	17,531	761	1,131	1,322	1,315	590	1,752	2,459	613	7,497	1,519	1,026

CHAPTER 5: Conclusion

I began working on this dissertation in late 2019, prior to the Covid-19 pandemic and period of racial reckoning that followed the murder of George Floyd. Since then, there has been heightened public discourse and research interest surrounding inequalities in the structure and delivery of U.S. health care. Today, there is greater discussion of the ways that macro-level structural forces, including racism and nativism, generate unequal healthcare and health outcomes for people of color and immigrants. My dissertation has argued that the racism and nativism that stratifies the United States as a broader society also works to generate inequalities in multiple realms of U.S. health care. Utilizing quantitative methods to analyze unique sets of survey, administrative, and medical record data, my dissertation presents new evidence to show how racism and nativism reach into the U.S. health care system, dramatically shaping the experiences and outcomes of people of color and immigrants in their roles both as patients and as physicians. This dissertation contributes to recent literature in medical sociology on the medical profession and on the health care system itself (Jenkins et al. 2021). This work also serves as a call to continue sociological research and policy work that provides deeper understanding of the ways that macro-level structural forces contribute to micro-level disparities in health care.

In Chapter 2 of my dissertation, I show that the U.S. "crimmigration" system (Armenta 2017) impacts *who does* and *who does not* have access to U.S. health care. Specifically, I explore how "policies of exclusion" (Perreira and Pedroza 2019), in the form of state immigration policy contexts, impact healthcare access and create barriers to

healthcare seeking among U.S.-citizen people of color and documented and undocumented immigrants. The findings of this chapter have major implications for our understanding of how those in precarious jobs and those with *racialized legal statuses* are at greater risk of disproportionately facing healthcare inequalities, particularly in policy contexts that are hostile to immigrant incorporation.

Although the criminal legal and U.S. immigration systems are often implicated for their role in generating disadvantage among migrants and Latinx individuals, I argue the U.S. healthcare system also plays a role in these disparities. Notably, recent work has shown that individuals of color who work in essential, yet precarious jobs, such as agriculture and food preparation, are at higher risk for Covid-19 infection, and face numerous structural barriers to accessing vital testing and treatment resources for the virus (Reitsma et al. 2021). Moreover, reports from the ongoing migrant crisis at the U.S./Mexico border show that Latinx migrants are regularly denied access to health care, medical informed consent processes, and language translation services when communicating with physicians and nurses (Treisman 2020).

Healthcare professionals must therefore play a more active role in improving access to much-needed health care among migrant and other vulnerable populations. For example, physicians and nurses become more cognizant of racism and nativism that is perpetuated against Latinx patients, which often receives less attention in discussions of racism in medicine. Research on the healthcare access and utilization of Latinx individuals must continue to move away from arguing that "cultural differences" are responsible for disadvantage and must move towards taking a structural approach to

understanding disparities in healthcare and health outcomes among Latinx individuals (Viruell-Fuentes et al. 2012). In policy and practice, there must be greater collaboration between healthcare systems and community organizations, migrant advocates, and legal systems that can assist healthcare professionals in advocating for the health rights of vulnerable populations (Aaron and Stanford 2022). Moreover, healthcare professionals must resist restrictive immigration policies, existing legal frameworks, and law enforcement that aims to hinder healthcare access and utilization (Wickramage et al. 2019).

In Chapter 3 of my dissertation, I describe how, once access to health care is obtained, structural, cultural, and interpersonal racism impact the interactions between patients of color and their healthcare providers, creating tangible healthcare disparities downstream. I utilize a novel dataset of electronic medical records (EMR), radiology records, and U.S. Census data to investigate racial disparities in provider-patient communication among individuals diagnosed with incidental medical findings requiring follow-up surveillance. My findings indicate that racial disparities in adherence to follow-up surveillance stem from initial racial disparities in provider-patient communication, which persist even after accounting for multiple patient socioeconomic, health, and healthcare provider characteristics.

Recent research conducted during the Covid-19 pandemic has demonstrated the myriad of ways racism impacts the experiences of patients navigating their way through the complex U.S. healthcare system. Work shows that maintaining “race correction” in medical practice reduces diagnosis of and treatment for people of color across numerous

medical conditions (Amutah et al. 2021; Tsai et al. 2021). Moreover, "colorblind" methods used to ration hospital care (such as ventilators for Covid-19) can also exacerbate racial disparities in morbidity and mortality downstream (Schmidt et al. 2022). Further, although EMR data are less often utilized to answer sociological research questions that interrogate inequalities in health care, recent research has utilized this data to interrogate racialized language used by healthcare providers in their treatment of patients of color (Sun et al. 2022), demonstrating how cultural and structural racism informs interpersonal racism in medical encounters.

In response to this burgeoning literature and outcry regarding racism perpetrated in medical education and in the treatment of patients of color, medical organizations including the American Medical Association and the Association of American Medical Colleges, have made public statements that pledge to address racism in medicine. To accomplish the goals enumerated in these statements, there must be increased collaboration between sociologists and healthcare professionals to conduct research and educational initiatives that interrogate and implicate racism in medicine. Additionally, there must be continued efforts to change the medical education system by integrating structural and social determinants of health perspectives into medical school curricula and continuing medical education (Nguemeni Tiako et a. 2021).

Finally, in Chapter 4 of my dissertation I use geocoded data from the American Medical Association to explore whether inequalities in the experiences of minoritized physicians. Specifically, I explore whether international medical graduates (IMGs) experience career stratification in their U.S. medical careers based on their country of

medical education. I find IMGs trained in developing countries chart more marginalized U.S. career paths relative to those trained in developed countries, suggesting that nativism and racism within the medical profession intersect to disadvantage physicians from developing countries, who often represent racially minoritized groups in the United States.

Immigrant physicians and physicians of color have been profoundly taxed by the Covid-19 pandemic (Malayala et al. 2021; Filut and Carnes 2020). These physicians are particularly at risk for experiencing burnout, as they who face major hurdles to obtaining medical licensure in the United States (Kugler and Sauer 2005), encounter substantial discrimination from the medical profession (Jenkins 2020), and disproportionately care for low-income and racially-minoritized groups in under-resourced areas (Schut 2022). Two years into the Covid-19 pandemic, U.S. physicians are increasingly leaving the workforce due to burnout, lack of institutional support, increasing patient and administrative responsibilities, and hazardous working conditions (Filut and Carnes 2020; Wilensky 2022). Consequently, the U.S. physician workforce faces massive shortages in both primary and secondary health care.

To maintain a robust physician workforce in the United States and to ensure the well-being of physicians of color and immigrant physicians, research must further investigate the experiences of and challenges facing physicians of color and international medical graduates. Specifically, there must be greater understanding of the macro-level structural factors that may lead to "brain waste" among international medical graduates who are tracked out of medical practice. Such understanding is critical not only for

addressing physician shortages, but also for understanding how selection processes might be responsible for the reproduction of inequality in medical practice across the lines of race-ethnicity, nativity, and country of medical education.

In this dissertation, I have demonstrated that sociological perspectives on inequality are critical for interrogating the many challenges facing U.S. health care and the medical profession. As the medical profession and the U.S. healthcare system contends with its racist and nativist history and the ways this affects healthcare delivery today, more collaborative research is needed to transcend disciplinary boundaries to understand and more fully address healthcare inequalities. Sociologists, physician and nurse researchers, public health and health services researchers, and community advocates, must generate collaborative research that explores racial and nativity inequalities in health and health care (Lett et al. 2022). We must implicate racism, nativism, and other sources of structural disadvantage in the process, and use our work to activity inform policy and practice to promote justice. These efforts are vital for dismantling racism and nativism present in health care, and for improving the health and lives of those who have long experienced marginalization and exclusion in the United States.

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