

How Social Status Permeates Inequalities in Health  
Three Studies on Experiences of Social Disadvantage

by

Joshua G. Rivenbark

Public Policy  
Duke University

Date: \_\_\_\_\_

Approved:

\_\_\_\_\_  
Candice Odgers, Supervisor

\_\_\_\_\_  
Kathryn Whetten, Supervisor

\_\_\_\_\_  
Jay Pearson

\_\_\_\_\_  
Elizabeth Ananat

\_\_\_\_\_  
Gary Bennett

Dissertation submitted in partial fulfillment of  
the requirements for the degree of Doctor  
of Philosophy in Public Policy Studies  
in the Graduate School of Duke University

2019

ABSTRACT

How Social Status Permeates Inequalities in Health

Three Studies on Experiences of Social Disadvantage

by

Joshua G. Rivenbark

Public Policy  
Duke University

Date: \_\_\_\_\_

Approved:

\_\_\_\_\_  
Candice Odgers, Supervisor

\_\_\_\_\_  
Kathryn Whetten, Supervisor

\_\_\_\_\_  
Jay Pearson

\_\_\_\_\_  
Elizabeth Ananat

\_\_\_\_\_  
Gary Bennett

An abstract of a dissertation submitted in partial  
fulfillment of the requirements for the degree  
of Doctor of Philosophy in Public Policy Studies  
in the Graduate School of Duke University

2019

Copyright by  
Joshua G. Rivenbark  
2019

## **Abstract**

The social gradient of health is pervasive and unrelenting. Across nearly any layer of society – race, religion, economic standing, or others – the populations worst off in terms health are also the most socially disadvantaged. Over three studies, this dissertation examines some of the experiences that underlie the connection between social disadvantage and health, namely internalized perceptions of status, interpersonal interactions, and institutional actions. The first study examines the link between adolescents’ perceived social status and their mental health at a range of ages, identifying at what age mental health problems begin to track perceptions of status, as well as contextual factors that do (or do not) relate to perceptions of status. In the second study, data from a nationally representative survey in France are used to document rates of reporting discrimination within the healthcare setting by gender, immigrant status, race/ethnicity, and religion. Rates of foregoing medical care are also documented across the same groups, and the potential explanatory role of discrimination toward disparities in foregone care is then investigated. The third and final study looks at the role of institutional stigma, using state bans of Sharia law in the USA as an exemplary case of stigmatizing policies with minimal material consequences. National birth record data for the USA is used, and the variation in policy enactment over time and space is leveraged to examine birth outcomes for Muslim women who were pregnant at the time their state

passed a ban. Findings reveal a decrease in the secondary sex ratio to targeted women, suggesting the stigmatizing policy acts as a population-level stressor with consequences for maternal health.

## **Dedication**

In memory of Griff Rivenbark, whose life was a poignant and motivating demonstration of disadvantage and health.

# Contents

Abstract .....	iv
List of Tables .....	x
List of Figures .....	xii
Acknowledgements .....	xiii
1. Introduction .....	1
2. Perceived social status and mental health in the transition to adolescence: Evidence from census data to cellphones .....	5
2.1 Introduction.....	5
2.1.1 Study Description.....	6
2.1.2 Research Questions .....	7
2.2 Methods .....	13
2.2.1 Participants.....	13
2.2.2 Procedure.....	14
2.2.3 Measures.....	16
2.2.3.1 Perceived status and social standing.....	16
2.2.3.2 Adolescent mental health .....	17
2.2.3.3 Daily symptoms .....	21
2.2.3.4 Socioeconomic status and local area income inequality.....	22
2.2.4 Analyses.....	24
2.3 Results .....	25
2.4 Discussion.....	35

3. Discrimination in healthcare as a barrier to care: Experiences of socially disadvantaged populations in France from a nationally representative survey .....	42
3.1 Introduction.....	42
3.2 Methods .....	45
3.2.1 Sample.....	45
3.2.2 Measures.....	46
3.2.2.1 Healthcare Experiences .....	46
3.2.2.2 Demographic Characteristics .....	46
3.2.2.3 Covariates.....	46
3.2.2.4 Analyses .....	47
3.3 Results .....	48
3.4 Discussion.....	56
4. Policies as institutional stigma: State bans of Sharia law and the secondary sex ratio among Muslim mothers.....	62
4.1 Introduction.....	62
4.2 Methods .....	64
4.2.1 Data .....	64
4.2.2 Measures.....	65
4.2.3 Descriptive Statistics .....	66
4.2.4 Analyses.....	69
4.3 Results .....	73
4.3.1 Main Analyses.....	73
4.4 Discussion.....	77

5. Conclusions.....	82
Appendix A: Supplemental figures and tables (Chapter 2).....	83
Appendix B: Supplemental information and robustness checks for measure of exposure to bans (Chapter 4).....	88
Appendix C: Robustness checks of specification of targeted group (Chapter 4).....	95
Appendix D: Falsification tests of main DID analyses (Chapter 4) .....	102
References .....	108
Biography .....	121

## List of Tables

Table 1: Demographic and economic characteristics of study sample, by race/ethnicity.	15
Table 2: Correlates of adolescents' subjective social status (SSS)	26
Table 3: Association between pre- and early adolescents' mental health problems and subjective social status (SSS)	27
Table 4: Associations between adolescents' daily mental health symptoms and subjective social status	30
Table 5: Associations between adolescents' mental health and economic and demographic characteristics	32
Table 6: Descriptive statistics of study sample and weighted population estimates	49
Table 7: Average marginal effects (AMEs) of demographic characteristics and reports of discrimination for predicting foregoing healthcare.	53
Table 8: Proportion of disparities in foregoing healthcare explained by discrimination in healthcare.	56
Table 9: Descriptive statistics for women who gave birth in states that ever passed a ban and those who gave birth in states that never passed a ban.	67
Table 10: Descriptive statistics for women who gave birth in states that ever passed a ban.	68
Table 11: Difference-in-differences (DID) models of newborn sex, gestation length, and birthweight.	74
Table 12: Difference-in-differences (DID) models of gestation length and birthweight by newborn sex.	75
Table A1: Demographic characteristics of the Adolescents Survey, EMA subsample, and comparison population of North Carolina (NC) public school students.	83
Table A2: Associations of adolescents' subjective social status (SSS) with family, neighborhood, and school measures of socioeconomic status (SES).	85

Table A3: Age-by-SES interactions predicting adolescents’ subjective social status (SSS). .....	86
Table B1: Relative Google Trend search interest for “Sharia” by state, for months in which bans were passed .....	88
Table B2: Alternate specification of exposure: raw ratio of “Sharia” search intensity at ban month relative to Aug. 2010.....	89
Table B3: Alternate specification of exposure: log-transformed ratio of “Sharia” search intensity at ban month relative to Aug. 2010 .....	90
Table B4: Alternate specification of exposure: cube root transformation of “Sharia” search intensity at ban month relative to Aug. 2010.....	92
Table B5: Alternate specification of exposure: indicator variable for any exposure to ban .....	93
Table C1: Alternate specification of targeted group: mothers from Arab countries only	95
Table C2: Alternate specification of targeted group: mothers from majority-Muslim countries only .....	96
Table C3: Alternate specification of targeted group: mothers from USA excluded.....	98
Table C4: Alternate specification: exposure to ban after approximately 20 weeks’ gestation .....	99
Table C5: Alternate specification: exposure to ban in last trimester only .....	100
Table D1: Falsification test: sham dates of ban enactment one year prior to actual date	102
Table D2: Falsification test: identification on probability of being Buddhist.....	103
Table D3: Falsification test: identification on probability of being Hindu.....	105
Table D4: Falsification test: identification on probability of being religiously unaffiliated .....	106

## List of Figures

Figure 1: Distribution of subjective social status rankings in the total EMA sample, and split by age, race/ethnicity, and economic disadvantage. ....	19
Figure 2: Association between adolescents' subjective social status (SSS) and mental health problems, by age. ....	29
Figure 3: Adolescents' average mental health problem index score by (A) family economic status, (N=2,042) and (B) neighborhood median income (N=2,099). ....	31
Figure 4: Predicted probabilities of reporting discrimination in healthcare. ....	50
Figure 5: Predicted probabilities of foregoing healthcare, by demographic characteristics. ....	52
Figure 6: Trends in birthweight, gestation length, and proportion of male births for women from majority-Muslim countries and women from all other countries. ....	70
Figure A1: Geographic distribution of study participants and census tract-level income inequality across North Carolina. Each dot represents one participant. ....	84
Figure A2: Association between local inequality measured with the 80/20 ratio and adolescents' subjective social status (SSS). ....	87

## Acknowledgements

This dissertation, as is true for my education as a whole, has reached its current state only through the help and support of a host of people. I must first acknowledge the advising and mentorship I have received over the course of this work, beginning with my dissertation committee. Candice Odgers has taught me everything from basic analytic methods to critically appraising a field of research, with countless lessons in between. She has introduced me to opportunities and ideas I was otherwise unaware of, and occasionally allowed my interests to wander when so inclined (though hopefully never too far). I am immensely grateful for her committed mentorship. Kate Whetten welcomed me to her wonderful international research team, and has facilitated my own pursuit of research in international health. Jay Pearson has helped me keep the big picture in mind (and has given me the tools to articulate that picture), Gary Bennett first introduced me to thoughtful research design, and Elizabeth Ananat has provided the encouragement and advice I needed when undertaking a new project.

I have also received support from the research community more widely, both at Duke and abroad. I thank Seth Sanders, Marcos Rangel, and Anna Gassman-Pines, who have consistently listened to my ideas and provided thoughts and technical advice. I thank my many collaborators, especially Mathieu Ichou, who helped a spontaneous idea become a sustained research collaboration, and Temi Moffitt and Avshalom Caspi, for

sharing both their rich and thorough data as well as their sharp insights. I also thank Chris Kontos for facilitating my pursuit of a “nontraditional” PhD to combine with my MD training, and Ken Dodge for being open to the medical student who wanted to do research in the school of public policy.

Finally, I must acknowledge the wide and vital support network that inevitably lies behind this endeavor. I thank my family for their support and understanding, even when they don’t exactly know what I am doing. My friends and colleagues have made every day better, and they have provided both emotional and research support (often in the same five-minute window). They include my graduate classmates: Laura Bellows, Anna Birkenbach, Mercy DeMenno, and Faraz Usmani; fellow AdaptLab members: Madeleine George, Leonard Ng’eno, and Joy Piontak; and medical school classmates: Carlisdania Mendoza, Cody Nelson, Lowell Nicholson, Justin Silverman, and Jeff Smith. Most of all, I thank Helen Zhang, for her steadfast support, inspiration, and patience.

# 1. Introduction

There are great inequalities in the health and life expectancy of those “at the top” versus those “at the bottom”, both within the United States and around the world (Baron, Steege, Marsh, Menéndez, & Myers, 2013; Murray & Lopez, 2013). Starting even before birth and continuing throughout the life course, an individual’s social, economic, and psychological experiences and characteristics can predict where they will fall on a spectrum of health outcomes (Adler & Stewart, 2010). Those who are most likely to suffer from relatively worse health or a shorter lifespan are often members of socially disadvantaged groups, such as people of low socioeconomic standing, minority race, minority religion, or physical disability. These systematic discrepancies in health for the socially disadvantaged stand in opposition to established global and national goals of health equity (P. A. Braveman et al., 2011; P. Braveman & Gruskin, 2003).

The people within these disadvantaged groups are confronted with a multilevel web of structural barriers, interpersonal interactions, and internalized experiences that operate to maintain their relative social disadvantage (a classification originally described for levels of racism by Jones, 2000). These influences, including the recognition and internalization of the subordinate position one holds in society (Viruell-Fuentes, 2007), experiences of stigmatization and discrimination (Hatzenbuehler, Phelan, & Link, 2013; Williams, 1999), and historical insults and inequitable policies (Geronimus & Thompson, 2004), are, in turn, consistently associated with worse health. Described

within this dissertation are three studies that further explore how social disadvantage is connected to inequalities in health.

Chapter 2 probes the previously documented link between adolescents' subjective social status (SSS) and their mental health by examining how the relationship develops with age and how social context may relate to perceptions of status. Participants comprised a population-representative sample of over 2,100 young adolescents (aged 10-16), 395 of whom completed a 14-day ecological momentary assessment (EMA) study. SSS was independently associated with mental health, with stronger associations among older (aged 14 to 16) versus younger (aged 10 to 13) adolescents. Adolescents' SSS tracked family, school and neighborhood economic indicators ( $|r|$  ranging from 0.12 to 0.30), and associations did not differ by age, race, or gender. Those living in areas with higher income inequality reported significantly lower subjective social status, but this association was explained by family and neighborhood income. These findings illustrate that adolescents' SSS is correlated with their mental health, and by age 14 becomes a unique predictor of mental health problems. This chapter was a co-authored work alongside my advisor, Candice Odgers, and a number of others who contributed to data collection, study design, and manuscript feedback (William E. Copeland, Erin K. Davison, Anna Gassman-Pines, Rick H. Hoyle, Joy R. Piontak, Michael A. Russell, and Ann T. Skinner). Analyses and the initial drafting of the manuscript were my own.

In Chapter 3, I turn to interpersonal experiences, examining discrimination within healthcare settings, and how it may act as a barrier to healthcare for various socially disadvantaged groups. Data from a nationally representative survey of over 20,000 adults in France, including an oversample of immigrants, are used to examine rates of reported discrimination in healthcare settings, rates of foregoing healthcare, and whether discrimination could explain disparities in foregoing care across social groups. Rates of both reporting discrimination within healthcare settings and reporting foregone care in the past 12 months were generally highest among women and “visible minorities” – that is, immigrants from Africa or Overseas France, as well as Muslims. For all of these groups, experiences of discrimination partially explained their disparities in foregone care, up to one-third of the disparity for people from Africa and one-quarter of the disparity for Muslims. These findings indicate that experiences of discrimination in healthcare may directly relate to health behaviors, and that researchers and policymakers should the healthcare experience itself as a potential point of action to reduce inequalities in health. This work was collaborative with Mathieu Ichou, of the Institut national d’études démographiques, who provided access to the data, background on the French context, and regular manuscript feedback.

Finally, in Chapter 4 I end with an investigation of potential health effects of policy-driven stigma. Prior research examining this topic remains limited overall, and in the existing literature, identification of any effect of stigma has been confounded by

behavioral or resource consequences of a given policy (such as the laws restricting the ability of same-sex couples to marry). I avoid this confound by examining a stigmatizing policy that had negligible material consequences: state-level bans of Sharia law, which were passed by 11 states between 2010 and 2015. Data come from the National Vital Statistics System natality records for 2007 to 2015, which contain birth certificate information for every birth occurring in the USA in those years (N=33,723,488). I identify mothers' probabilities of being Muslim based on country of birth, and use data from Google Trends to create a measure of the local intensity of interest in a given state ban. Analytically I leverage the variation in state bans over time and space to determine effects of state bans on birth outcomes for targeted women. Exposure to a ban was associated with lower odds of a male birth as mothers' likelihood of being Muslim increased, consistent with prior research higher loss of male fetuses in response to maternal stress. Overall, findings suggest that the stigma attached to a given policy may have important health consequences, apart from any other more material consequences.

## **2. Perceived social status and mental health in the transition to adolescence: Evidence from census data to cellphones**

### **2.1 Introduction**

With each step up the socioeconomic ladder, the mental health of young people improves. Differences in income, education, and resources available to families account for much of the socioeconomic gradient in adolescent's mental health outcomes (Bradley & Corwyn, 2002). However, adolescents' *perceptions* of their family's resources and ranking in larger society, often referred to as their *subjective social status*, have also been uniquely associated with mental health across multiple studies (Goodman et al., 2001; Quon & McGrath, 2014). Such findings suggest that how adolescents perceive their place in the social hierarchy may be a key, and potentially malleable, determinant of their mental health and wellbeing.

Unfortunately, less is known about adolescents' perceptions of their social status during early adolescence, a time that is marked by heightened social awareness (Steinberg & Morris, 2001) and the maturation of cognitive capacities, which may facilitate a more nuanced perception of one's own social position (Goodman, Maxwell, Malspeis, & Adler, 2015). Early adolescence is also a period of heightened vulnerability for the onset and exacerbation of mental health problems (Belfer, 2008; Schwarz, 2009), and recent evidence suggests that SSS may already correspond with indicators of family socioeconomic status by 10 to 12 years of age (Mistry, Brown, White, Chow, & Gillen-

O'Neel, 2015). As such, the transition to adolescence comprises a potentially important, period for understanding the interplay between perceptions of social status and mental health problems. More specifically, it is not known: (a) how young adolescents' subjective social status (SSS) is influenced by the socioeconomic composition of the families, schools, and neighborhoods that they grow up in, including levels of income inequality, (b) whether perceptions of social status are more strongly related to mental health outcomes for certain subgroups of adolescents (e.g., gender, race/ethnicity, and socioeconomic status), and, (c) at what age subjective perceptions of social status first begin to signal poor mental health.

### **2.1.1 Study Description**

Assessments of adolescents' subjective social status were gathered as part of the Research on Adaptive Interests, Skills, and Environments (RAISE) Study, which included a large representative sample of North Carolina (NC) public school children ( $N = 2,104$ ) assessed using diverse data sources and methods including geo-coded census-level economic information and administrative record data from public schools. A subsample ( $n = 395$ ) of adolescents completed in-home assessments and a 14-day ecological momentary assessment (EMA). The EMA captured adolescents' daily experiences and mental health symptoms multiple times per day using mobile phones and wearable devices. EMA allows for the measurement of experiences, emotions, and

behaviors in near real-time and in adolescents' naturalistic settings, helping to reduce recall bias and enhance ecological validity (Shiffman, Stone, & Hufford, 2008).

### **2.1.2 Research Questions**

Using data from this diverse and representative sample of adolescents, which spanned from daily symptom assessments via mobile devices to geo-coded contextual indicators of income inequality, the following three sets of questions were addressed:

*How closely do young adolescents' perceptions of social status track with family, school and neighborhood economic indicators? Do those perceptions become more accurately calibrated with age and/or vary across racial or gender subgroups?*

Among adults, SSS tracks measures of economic resources and social class well enough that it has been suggested to represent a "cognitive average" of the multitude of factors comprising one's objective SES (Singh-Manoux, Adler, & Marmot, 2003).

Unfortunately, relatively little is known about the contextual factors that shape SSS among adolescents. In this study, we bring together independent assessments of adolescents' SES (objectively verified family income, census tract neighborhood income measures, and school-level compositional factors) to identify correlates of SSS during the early adolescent period – a time when perceptions of SSS are hypothesized to first calibrate with objective income and correlate with mental health (Odgers, 2015). We also examine potential differences in the SES-SSS relationship across age, sex, and racial groups.

The evolution of status-related perceptions over childhood and adolescence is poorly understood, although there is some evidence that adolescents' reports of SSS may become more 'accurately calibrated' as they age. Goodman and colleagues (2001) report a trend of youth's perceptions of their families' standing on the ladder becoming more strongly correlated with their mother's ratings by late adolescence, though the difference in correlation between those younger than 15 versus those 15 years and older was not statistically significant. At the same time, adolescents' reference groups for making evaluations of their SSS may be influenced by the socioeconomic characteristics of the neighborhoods and schools that they spend their days in. Increasing levels of segregation by both race and income in the United States (Reardon & Bischoff, 2011) raises questions as to how SSS is "calibrated" across different racial and ethnic groups. For example, Black adults report both higher SSS than Whites, despite well documented differences in objective indicators of economic resources favoring Whites, and show weaker links between SSS and objective measures of social status (Wolff, Acevedo-Garcia, Subramanian, Weber, & Kawachi, 2010). Thus, the relative weight given to "non-economic" inputs when appraising social status may differ by race. But again, much less is known about how socioeconomic status interacts with racial and ethnic identity among adolescent to influence status perceptions. In one longitudinal study of non-Hispanic black and white adolescents transitioning to adulthood, black youth with low SES were more likely to belong to a "downward SSS trajectory group", characterized

by high initial SSS ratings, but sharp declines over time. The authors concluded that this distinct subgroup of low-SES youth may begin with “rose-colored glasses” early in life, followed by calibration with age to more accurately reflect objective, external measures of SES (Goodman et al., 2015). These types of insights are critical to consider in light of recent evidence suggesting that even among Black youth who begin their lives at the highest rungs of the income ladder, their chances of remaining at the “top” are less than those of their White peers (Chetty, 2018). Finally, Prior research has found stronger evidence for neighborhood poverty effects on boys versus girls’ behavior (Leventhal & Brooks-Gunn, 2000), suggesting that boys may be more likely to experience negative effects of growing up in poor environments. However, to date, there is not strong evidence to suggest that subjective perceptions of social status are more predictive for boys versus girls (Quon & McGrath, 2013).

*Are adolescents’ perceptions of social status uniquely associated with mental health outcomes, both globally and in daily life? When do these associations first emerge?*

Adolescent’s SSS is uniquely associated with mental health even after controlling for objective SES, with a recent meta-analysis demonstrating robust associations for a number of mental health outcomes (Quon & McGrath, 2014). However, the majority of previous research has combined older and younger adolescents, making it difficult to discern when young people first become aware of their position on the SES ladder and, in turn, when these evaluations begin to matter for health outcomes. In addition, when

compared to adults, relationships between SSS and mental health among adolescents appear weaker and less consistent (Chen & Paterson, 2006; Ghaed & Gallo, 2007; Goodman et al., 2015). This may be because adolescents' sense of social status is still developing as their identity becomes more self- versus family-defined and, as a result, shows increasing associations with their own health outcomes with age (Goodman, Huang, Schafer-Kalkhoff, & Adler, 2007; Goodman et al., 2015). Nonetheless, the finding that adolescents' views of their social status is uniquely associated with their mental health suggests that viewing oneself as lower ranked, in addition to having fewer resources, may play a key role in the creation of health disparities (McLaughlin, Costello, Leblanc, Sampson, & Kessler, 2012).

In the current study, we examine associations between adolescents' SSS and mental health in two ways. First, we test whether adolescents' views of their SSS are uniquely correlated with global assessment of mental health (reported in a cross-sectional adolescent survey) and with symptoms captured in daily life (reported multiple times each day and averaged across the 14-day EMA). This approach extends prior research by controlling for economic indicators of family and school disadvantage, *as well as* neighborhood income and local area inequality. Second, age-variation in the sample is leveraged to test when the association between perceived status and mental health symptoms first emerges, with the expectation that SSS would be more strongly associated with mental health among older versus younger participants in our sample.

*Does local area income inequality influence adolescents' mental health and subjective social status?*

It has been argued that income inequality is bad for everyone. Indeed, high levels of income inequality at the country and state level are reliably associated with worse outcomes for children (Pickett & Wilkinson, 2007) and this is especially true for the children from the poorest families (Elgar et al., 2015). However, evidence is mixed as to how income inequality within smaller units of analyses, such as the neighborhood or school level, influences children (Pickett & Wilkinson, 2007). Understanding the influence of economic inequality – and the level at which inequality may matter – for children is important, as economic inequality in the United States has risen an estimated 40% to 50% since the 1970s (Duncan & Murnane, 2014). Among children, trends in inequality are amplified as economic inequality has increased even more among families with versus without children (Owens, 2016). At the same time, an estimated 43% of children live in “low-income” households, with family income less than 200% of the federal poverty line, and poverty is more widespread among children from ethnic minority families (Jiang, Granja, & Koball, 2017).

Children are growing up in a society characterized by increasing economic and racial stratification and segregation (Reardon & Bischoff, 2011). Yet, relatively little is known about how young people perceive, and may be influenced by, local area socioeconomic status (SES), exposure to difference reference groups, and rising levels of

income inequality. Moreover, we are just beginning to understand how these perceptions interact with race and ethnicity to create identities around status more generally (Destin, Rheinschmidt-Same, & Richeson, 2017), and among young people more specifically (Mistry et al., 2015).

In the present study, we test whether local area inequality – defined at the census tract-level (tracts are predefined geographical spaces with populations generally ranging from 1,200 to 8,000) – is associated with adolescents’ perceptions of social status and mental health. We also test whether these associations are stronger among adolescents from low-income families (persistently disadvantaged) or among those who identify as an ethnic minority, as the risks associated with growing up in high-inequality settings may be greater for these children (C. L. Odgers & Adler, 2017). For low income children, growing up high inequality settings may lead to greater exposure to higher-income peers and, in turn, to what Sir Michael Marmot has termed the “status syndrome” (Marmot, 2004), which refers to the phenomenon of “feeling poor” in relation to others, and the negative comparisons, self-evaluations, and health outcomes linked to this appraisal. That is, high income inequality settings may cause adolescents to more acutely “feel the hierarchy” (Destin, Richman, Varner, & Mandara, 2012) and perceive themselves as having low social status.

Social status identity, or the tendency for individuals to distinguish themselves along class lines, tends to be stronger in high-inequality settings (Buttrick & Oishi, 2017),

which may, in turn, evoke stereotype threat for low-income adolescents and increase the risk of conforming to negative stereotypes about the socio-economic group that they identify with. Stereotype threat has been primarily studied in relation to racial and gender identity. However, socio-economic based stereotype threat has been shown to influence students' test performance and self-confidence within experimental paradigms (Spencer & Castano, 2007). Thus, lowered status-related perceptions and stronger class-based affiliations among low-income children in high-inequality settings would be expected to lead to a host of emotional and mental health problems associated with being positioned lower on social dominance hierarchies. Throughout each set of analyses, we test for interactions between poverty status, sex, age, and race with local area inequality and economic indicators to better understand the ways in which these factors may both intersect and be shaped by the broader social and economic context.

## **2.2 Methods**

### **2.2.1 Participants**

Participants were drawn from the population of children enrolled in grades 3-6 in North Carolina Public Schools during the 2011-2012 school year ( $N = 2,104$ ) as determined by administrative data from the North Carolina Department of Public Instruction (NCDPI). At the time of the Adolescent Survey, participants were enrolled in grades 5-8 and ranged in age from 9 to 15 ( $M_{age} = 12.36$ ,  $SD = 1.12$ ). At the time of the EMA, participants ranged in age from 10 to 16. The sample was representative of the

state population of public school children with respect to economic disadvantage, gender, and ethnicity (Appendix A, Table A1), and, as shown in Appendix A, Figure A1, participants were spread geographically across the state of North Carolina and were living in both rural and urban areas, as well as areas with varying levels of poverty and income inequality.

### **2.2.2 Procedure**

The Adolescent Survey was conducted from April to August of 2015. Participants and their parents were contacted and consented by phone. Adolescents were surveyed by phone and reported on demographics, mental health, and problem behaviors. The majority of parents provided consent to link survey data to administrative data from the NCDPI ( $n = 2,048, 97.3\%$ ) and gave permission to contact their child for future studies ( $n = 1,867, 88.7\%$ ). Table 1 details the survey sample's demographic and economic characteristics by race and ethnicity.

Of those who agreed to be contacted, 395 adolescents were recruited to participate in a Home Visit and a 14-day EMA between April 2016 and February 2017. Adolescents were selected based on their: 1) proximity to two geographically distinct locations (central, urban NC, and western, rural NC) from which staff could make in-person home visits, and 2) representation to the statewide public school population in terms of economic disadvantage, gender, race, and ethnicity. All procedures, protocols,

and measures were approved by the Duke University Institutional Review Board for the RAISE study (approval #D0396).

**Table 1: Demographic and economic characteristics of study sample, by race/ethnicity**

	<b>White</b>	<b>Black</b>	<b>Hispanic</b>	<b>Other</b>	<b>Total</b>
N <sup>a</sup>	1,011	442	280	194	1,927
<i>Female</i>	51.0%	55.2%	51.1%	54.1%	52.3%
<i>Age<sup>b</sup></i>					
<11	2.8%	2.5%	1.4%	3.1%	2.6%
11	23.3%	22.2%	23.6%	22.2%	23.0%
12	29.2%	26.0%	29.6%	33.5%	29.0%
13	28.1%	31.2%	28.2%	29.4%	29.0%
14	14.7%	14.7%	16.4%	11.3%	14.6%
15	1.9%	3.4%	0.7%	0.5%	1.9%
<i>Family economic disadvantage (ED)</i>					
Never ED	61.1%	15.2%	15.0%	40.2%	41.8%
Intermittent ED	18.5%	26.9%	25.7%	26.3%	22.3%
Persistent ED	20.4%	57.9%	59.3%	33.5%	36.0%
<i>Median neighborhood HH income<sup>3</sup></i>					
Quartile 1 (<34.4)	15.7%	43.2%	31.4%	22.7%	25.0%
Quartile 2 (34.6 - 46.8)	25.7%	20.6%	28.6%	25.8%	25.0%
Quartile 3 (46.8 - 65.0)	27.8%	24.4%	21.4%	20.1%	25.3%
Quartile 4 (>65.0)	30.8%	11.8%	18.6%	31.4%	24.7%
<i>Local area inequality (80/20 ratio)<sup>c</sup></i>					
Quartile 1 (<3.5)	26.8%	22.6%	26.1%	22.7%	25.3%
Quartile 2 (3.5 - 4.1)	23.9%	23.3%	26.4%	31.4%	24.9%
Quartile 3 (4.1 - 4.8)	27.3%	24.7%	22.1%	18.6%	25.1%
Quartile 4 (>4.8)	22.0%	29.4%	25.4%	27.3%	24.7%
<i>School % ED<sup>3</sup></i>					
Quartile 1 (<0.36)	26.1%	25.8%	23.2%	21.7%	25.2%
Quartile 2 (0.36 - 0.56)	24.8%	22.9%	26.8%	27.8%	25.0%
Quartile 3 (0.56 - 0.72)	24.1%	23.8%	27.1%	25.8%	24.7%

Quartile 4 (>0.72)	24.9%	27.6%	22.9%	24.7%	25.2%
--------------------	-------	-------	-------	-------	-------

---

<sup>a</sup>Sample size in this table includes all observations for which the tabulated measures were available (92% of total  $N = 2,104$ ). <sup>b</sup>Age at the time of the Adolescent Survey.

<sup>c</sup>Quartiles are calculated in order to best fit the full sample.

The Home Visit was conducted by two interviewers and included tests of the adolescents' executive functioning, self-reported information about perceived social status, and interviewer assessments of the participant's personality, home, and neighborhood. Interviewers also installed MetricWire (MetricWire Inc., 2016), a phone-based survey application, to deliver the EMA on the participant's own mobile phone or a study-administered phone (49.9% of adolescents used their own phone). Participants received three daily surveys for the next 14 days, one each in the morning, afternoon, and evening. Survey questions assessed participants' daily experiences, behaviors, perceptions, and mood. Eighty percent of survey prompts were answered, resulting in 13,017 total observations.

## 2.2.3 Measures

### 2.2.3.1 Perceived status and social standing

*Subjective social status (SSS)* was measured once at the Home Visit, with an adapted version of the MacArthur SES measure (Goodman et al., 2001). Adolescents were shown an image of a ladder with 5 rungs and told that "*this ladder represents how things are in the United States. At the top of the ladder are all the people who have the best jobs,*

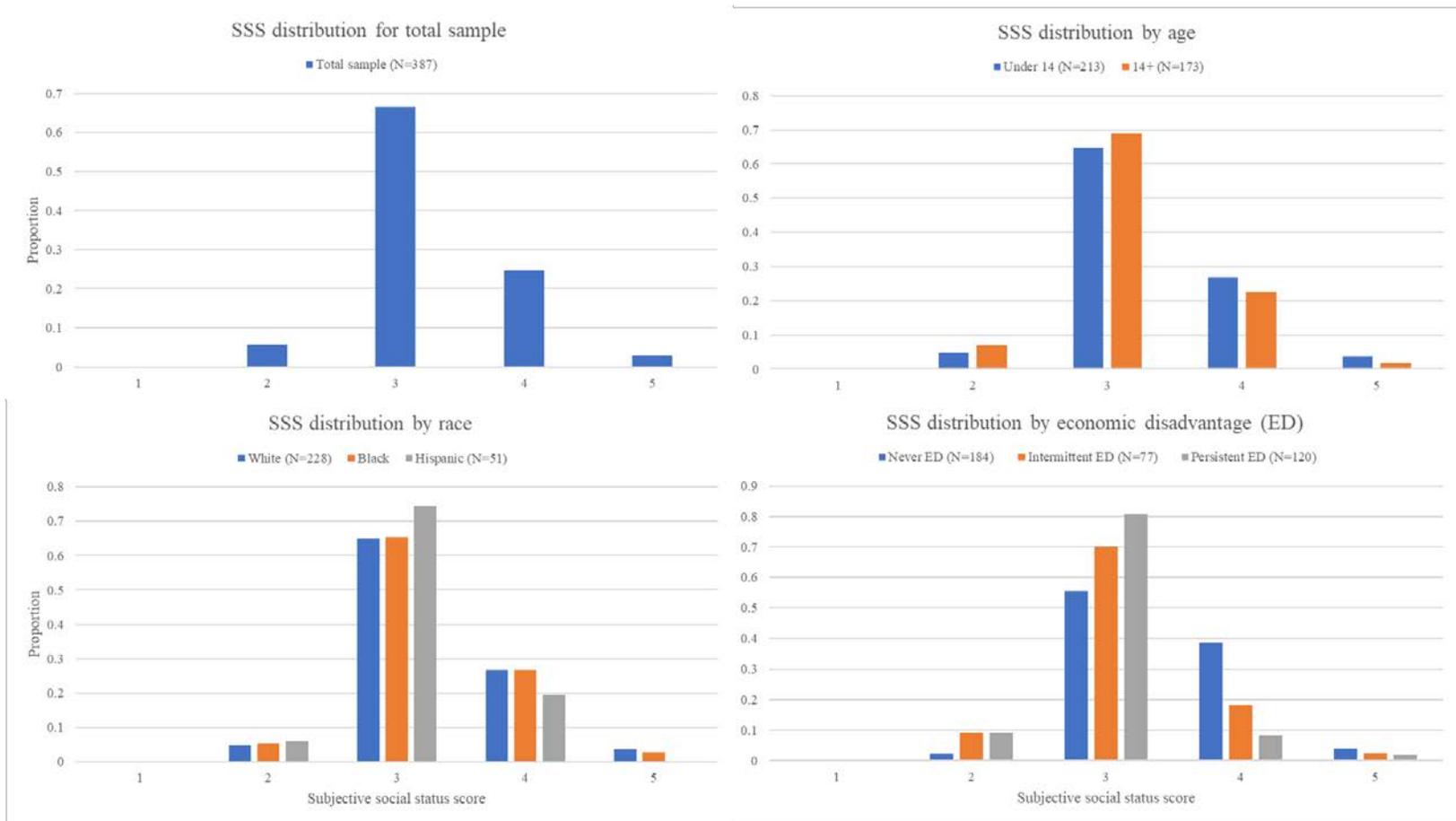
*lots of money, live in nice places, and go to the best schools. At the bottom of the ladder are those people who don't have enough money, don't live in a nice place, and might not have a job. Now think about your family - where would they be on the ladder?"* Adolescents were instructed to indicate which rung best represents their family's position with the lowest rung (1) representing "poor" and the highest rung (5) representing "rich" ( $M = 3.25$ ,  $SD = 0.60$ ; see Figure 1 for distributions by age, race, and family economic disadvantage). An abbreviated version of the SSS scale using five versus ten rungs, and adding the labels "rich" and "poor" was adopted based on pilot data collection with 10-year-old children in Britain who reported that the five-rung scale was simpler to complete and that the anchors "rich" and "poor" most clearly conveyed the "top" and "bottom" of the scale respectively.

### **2.2.3.2 Adolescent mental health**

Adolescents ( $N = 2,104$ ) reported on their levels of psychological distress, conduct problems, and substance use in the Adolescent Survey.

*Psychological distress* was assessed with six items from the Kessler (K6) Psychological Distress scale, a widely accepted scale (Furukawa, Kessler, Slade, & Andrews, 2003), with demonstrated validity for assessing emotional disturbance among adolescents (Green, Gruber, Sampson, Zaslavsky, & Kessler, 2010). Levels of depression ("*During the past 30 days, about how often did you feel hopeless?*") and anxiety ("*About how often during the past 30 days did you feel nervous?*") were scored on a 0 to 4 scale, and

summed to create a psychological distress score for each individual ( $\alpha = 0.66$ ). Based on recommended guidelines using a cutoff point of 13 or greater on the scale to classify as at risk for serious emotional disturbance (Kessler et al., 2003), our sample (4.8% at or



**Figure 1: Distribution of subjective social status rankings in the total EMA sample, and split by age, race/ethnicity, and economic disadvantage.**

above the cutoff) was roughly in line with the estimated national prevalence of 5.7% among 13 to 16 year old adolescents (Li, Green, Kessler, & Zaslavsky, 2010).

*Conduct problems* were assessed using a 25 item Problem Behavior Frequency Scale (Miller-Johnson, Sullivan, & Simon, 2004). For each item, responses capture the frequency of a behavior over the last 30 days, ranging from 0 (*never*) to 5 (*20 or more times*). Six items assessed physical aggression, seven assessed relational aggression, five assessed other aggression, and seven assessed deviant behavior. Adolescents' responses were averaged across items and domains to create a scaled score ( $M = 0.14$ ,  $SD = 0.23$ ).

*Early substance* use was assessed using four items that captured alcohol, drug, tobacco, and unauthorized prescription drug use (i.e., "*Have you ever had any alcoholic beverage to drink – more than just a few sips?*"), adopted from the Monitoring the Future study (Johnston, Bachman, O'Malley, & Schulenberg, 2010). Adolescents who responded affirmatively to any of the four items assigned were assigned value of 1 (9.7%) on this dichotomous indicator.

*A mental health problem index* was created with scores ranging from zero to three, with one point each possible for (a) scoring in the top quartile of the sample on the psychological distress scale, (b) scoring in the top quartile of the sample on the conduct problem scale, and (c) reporting any early substance use ( $M = 0.38$ ,  $SD = 0.63$ ). A majority of the sample had a score of zero on the index ( $N = 1,454$ , 69.2%), while 494 participants

(23.5%) had a score of one, 142 (6.8%) had a score of two, and 10 (0.5%) had a score of three.

### 2.2.3.3 Daily symptoms

In the EMA, adolescents ( $n = 395$ ) reported each day in the morning, afternoon, and evening on symptoms related to depression, anxiety, inattention/hyperactivity, and conduct problems (afternoon and evening only). Symptoms were summarized across the day to create a daily score and person-means were computed by averaging all daily measures from the EMA.

*Depressive symptoms* were measured by asking adolescents to use a slider scale to indicate whether they felt “sad”, “tired”, and “lonely,” on a scale ranging from *not at all* (1) to *very* (100) (person mean:  $M = 21.30$ ,  $SD = 12.39$ ;  $iSD = 9.1$ ;  $\alpha = 0.50$ ).

*Anxiety* used the same slider scale (*not at all* (1) to *very* (100)), asking adolescents to indicate whether they were “worried about something” (person mean:  $M = 18.36$ ,  $SD = 17.21$ ;  $iSD = 13.3$ ).

*Inattention and hyperactivity* were assessed with three questions based on EMA-adapted items from studies of attention-deficit hyperactivity in children (Whalen, Odgers, Reed, & Henker, 2011), assessing the presence of attention difficulties (“*Since this morning, I’m having a hard time concentrating or focusing*”) or hyperactivity (“*So far today, I’ve felt restless or like I was always ‘on the go’*”), summed in a 3-point scale (person mean:  $M = 0.40$ ,  $SD = 0.52$ ;  $iSD = 0.33$ ;  $\alpha = 0.49$ ).

*Conduct and substance use problems* were assessed with seven (yes/no) questions about whether adolescents engaged in aggressive and deviant behavior (i.e., “I took or stole something that didn’t belong to me”), and in the evening whether they had used alcohol or marijuana that day (i.e., “At any time today, have you had any alcohol, more than a few sips?”) (person mean:  $M = 0.13$ ,  $SD = 0.36$ ;  $iSD = 0.19$ ).

#### **2.2.3.4 Socioeconomic status and local area income inequality**

*Demographic information*, including age, gender, race, Hispanic ethnicity, and urbanicity, were reported by adolescents in the Adolescent Survey. Race and ethnicity (Hispanic/Latino/Spanish) were assessed in separate questions and combined into categories of non-Hispanic White, non-Hispanic Black, Hispanic, and Other Race for analyses. Descriptive information for all demographic and SES measures are reported in Table 1.

*Family economic disadvantage* was assessed based on the child’s history of eligibility for the receipt of free and/or reduced lunch, using school administrative records beginning in the third grade. Schools use verified household income to determine eligibility; cutoffs vary with household size and are on the order of 175% the federal poverty level. On average, information on participants’ family economic disadvantage was available for 91.4% of possible observation years. These longitudinal assessments were used to create a variable with three levels: never eligible, intermittently eligible (>0% and <100%), and always eligible.

*Neighborhood income* was measured as the estimated median household income within participants' neighborhood, which we defined as the census block-group (block-groups generally range in size from 600 to 3,000 people), mean-centered and standardized across the sample. Data was geocoded from the American Community Survey (ACS) 5-year estimates for 2010-2014.

*School-level economic disadvantage* was measured as the percentage of children in the school who were eligible for free and/or reduced lunch. These publicly available data were gathered from the National Center for Education Statistics for the 2014-15 school year.

*Local area income inequality* was measured with the ratio of the 80<sup>th</sup> percentile to the 20<sup>th</sup> percentile household income (the "80/20 ratio") in a given census tract, a predefined geographical spaces with populations generally ranging from 1,200 to 8,000, geocoded from the ACS 5-year estimates for 2010-2014. Household income ratios are commonly used measures of inequality (e.g., Kearney & Levine, 2016). In this sample, the 80/20 ratio ranged from 2.13 to 26.10 ( $M = 4.31$ ,  $SD = 1.29$ ), and was mean-centered and standardized for analyses. We also measured local area inequality with the tract-level GINI coefficient. The GINI coefficient is a widely used measure that takes on a value of 0 in a situation of perfect equality (i.e., all households with equal incomes) and a value of 1 in a situation of maximal inequality (i.e., all wealth concentrated in a single household). In this sample, the GINI coefficient ranged from 0.25 to 0.73 ( $M = 0.42$ ,  $SD =$

0.06), and was mean-centered and standardized for analyses. In any analyses that included local area inequality as a covariate, only the 80/20 ratio was included to avoid multicollinearity.

## **2.2.4 Analyses**

Analyses proceeded in three steps, mapping onto the aforementioned research questions. First, means and bivariate correlations were computed to describe adolescents' SSS and associations with economic indicators. Regression models were used to test for differences in mean levels of SSS across age, sex and ethnicity, and interaction terms were added to the models to test whether the associations between SSS and economic indicators became stronger at older ages or among subgroups.

Second, multiple regression models were used to test whether SSS was associated with adolescents' reports of mental health and if these associations were stronger among older versus younger participants.

Third, in the full sample, multiple regression models were used to test whether local area economic inequality measures were associated with adolescents' SSS and mental health, above and beyond economic and demographic factors. In the EMA subsample, we tested if adolescents' SSS was associated with local area economic inequality, and whether that relationship varied over race, age, gender, and SES groups.

Analyses were conducted with version 14 of StataSE. Robust standard errors were used in all regression analyses.

## 2.3 Results

*How closely does adolescents' SSS track with family, school and neighborhood economic indicators? Does SSS become more accurately calibrated with age and/or vary across racial or gender subgroups?*

First, as shown in Table 2 (Model A), adolescents from the most economically disadvantaged families ( $r = -0.26, p < 0.001$ ), higher poverty schools ( $r = -0.12, p = 0.028$ ), and lower income neighborhoods ( $r = 0.29, p < 0.001$ ) reported lower subjective social status (SSS). The majority of adolescents placed themselves on the middle rung of the ladder (66.7%;  $M = 3.25, SD = 0.60$ ), with adolescents from persistently disadvantaged families, on average, placing themselves significantly lower ( $M = 3.03, SD = 0.49$ ) than their peers from families who were never disadvantaged ( $M = 3.44, SD = 0.61$ ). In multiple regression models (see Table 2, Model B), persistent family disadvantage ( $b = -0.28, \beta = -0.21, p < 0.001$ ) and neighborhood SES ( $b = 0.0039, \beta = 0.22, p < 0.001$ ) were independently associated with adolescents' SSS. However, no differences in levels of SSS were observed across age, sex, or race.

Second, we tested whether adolescents' subjective social status became more 'accurately calibrated' with objective measures of family disadvantage, school poverty levels, or neighborhood income with age. We found no evidence of a stronger correlation between SSS and socioeconomic status measures with increasing age (see Appendix A, Table A2 for comparisons between youth under 14 years of age versus

**Table 2: Correlates of adolescents' subjective social status (SSS)**

Variable	SSS	
	(A) Bivariate Correlation <i>r</i>	(B) Multiple Regression <i>b</i> ( <i>SE</i> )
<i>Never ED</i>	0.30***	-
<i>Intermittent ED</i>	-0.09	-
<i>Always ED</i>	-0.26***	-0.163 (0.0884)
<i>Neighborhood income</i>	0.29***	-0.277*** (0.0754)
<i>School % ED</i>	-0.12*	0.00389*** (0.000919)
<i>80/20 ratio</i>	-0.07*	-0.185 (0.138)
<i>Age 14+</i>	-0.09	-0.0179 (0.0307)
<i>Female</i>	-0.01	-0.0539 (0.0609)
<i>White</i>	0.08	-0.0174 (0.0620)
<i>Black</i>	0.02	-
<i>Hispanic</i>	-0.08	0.148 (0.0870)
<i>Urban</i>	0.10	0.00369 (0.0873)
		-0.00671 (0.0728)

Notes: Coefficients are correlations in (A) and regression coefficients in (B); "Never ED" and "White" were reference variables in (B). Standard errors are robust. Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

those 14 years of age or older); interaction terms testing for age by family, school, and neighborhood economic indicators were all non-significant (Appendix A, Table A3).

*Is adolescents' subjective social status uniquely associated with mental health outcomes, both globally and in daily life? When do these associations first emerge?*

We tested the association between SSS and mental health in three ways. First, adolescents self-reported their mental health symptoms over the last 30 days (or lifetime, for substance use) during the Adolescent Survey. Adolescents' SSS was negatively associated with psychological distress ( $\beta = -0.14, p = 0.006$ ), conduct problems ( $\beta = -0.11, p = 0.025$ ), and early substance use ( $OR = 0.41, p < 0.001$ ), as well as overall mental health problems measured with a combined mental health index ( $IRR = 0.63, p < 0.001$ ).

**Table 3: Association between pre- and early adolescents' mental health problems and subjective social status (SSS)**

	<b>Mental Health Problem Index</b>	
	(1) <i>IRR [CI]</i>	(2) <i>IRR [CI]</i>
SSS	0.650*** [0.507,0.835]	0.804 [0.594,1.090]
Age 14+	1.186 [0.876,1.606]	4.842* [1.228,19.10]
Age 14+ X SSS		0.633* [0.413,0.973]
<i>N</i>	345	345
<i>Pseudo R</i> <sup>2</sup>	.038	.042

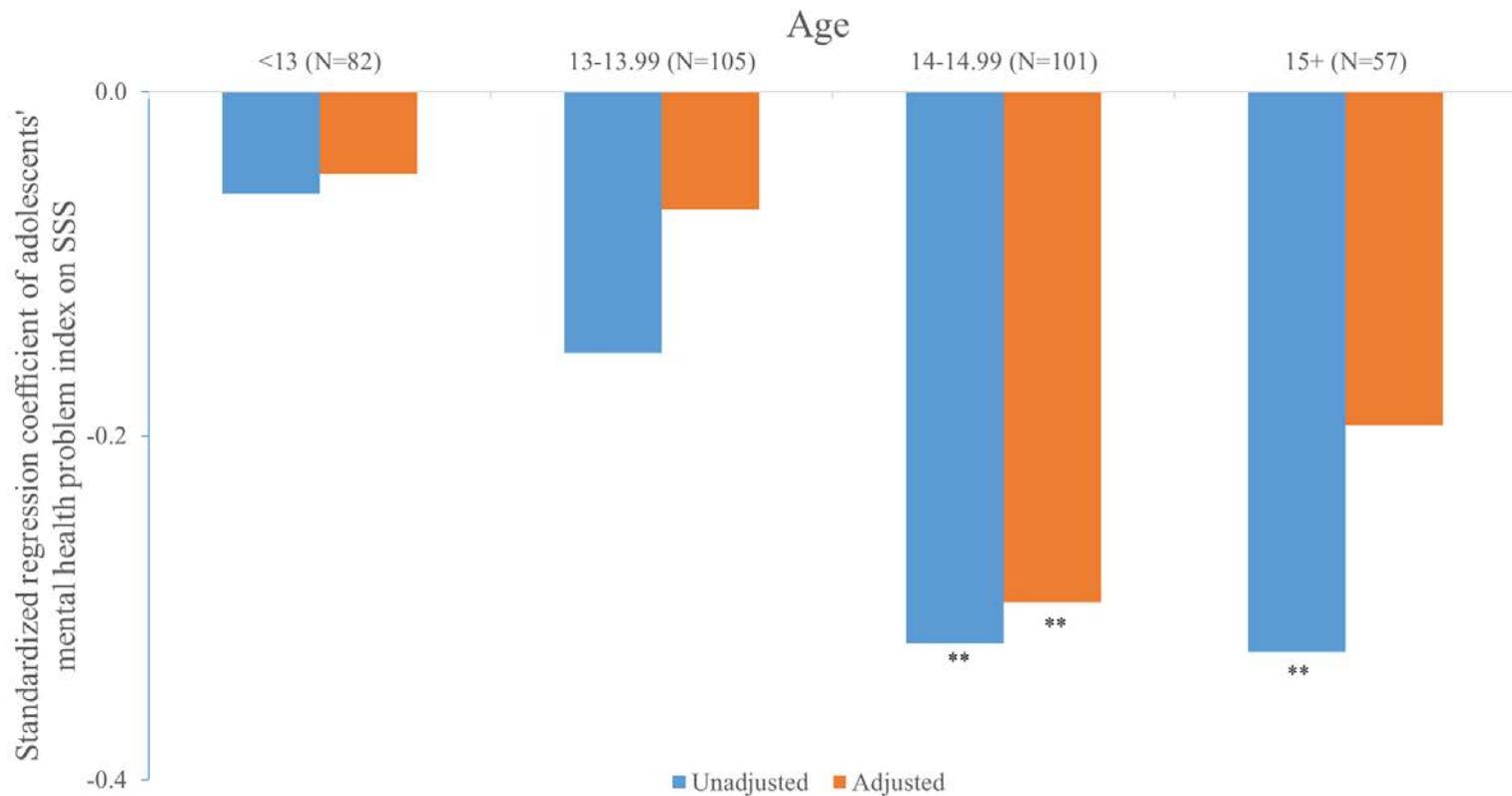
Notes: Covariates included family economic disadvantage, neighborhood income, school economic disadvantage, local inequality, age, gender, race, and urbanicity. Poisson regressions were used in both model (1) and (2). Coefficients are exponentiated to create incident rate ratios (IRR); all models estimated with robust standard errors.

Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

The association between SSS and the mental health problem index remained statistically significant ( $IRR = 0.65, p = 0.001$ ) after controlling for economic and demographic characteristics (Table 3). Further, the association between adolescents' SSS and mental health was stronger among older versus younger participants (SSS by age 14+ interaction term:  $IRR = 0.63, p = 0.037$ ). This strengthening relation across age is illustrated in Figure 2, which also shows that the association between SSS and mental health was robust to controls for family and neighborhood SES, although only among older adolescents (age 14 and above). Second, adolescents reported their mental health symptoms and perceptions of social standing each day via mobile devices during the EMA. Adolescents' subjective social status was significantly associated with daily reports of conduct problems ( $b = -0.05, B = -0.08, p = 0.030$ ), but not internalizing or attentional symptoms across the EMA period (Table 4).

*Are levels of local area income inequality uniquely associated with adolescents' mental health and subjective social status?*

Consistent with prior research, adolescents in economically disadvantaged families were more likely to report mental health problems. Analyses among the full cohort of adolescents ( $N = 2,104, n = 1,927$  with complete data for analyses), showed that those from the most persistently economically disadvantaged families scored, on average, 1.33 points higher on psychological distress ( $0.36 SD$ ), 0.06 points higher on conduct problems ( $.24 SD$ ), and had a 1.57 times higher prevalence of early substance



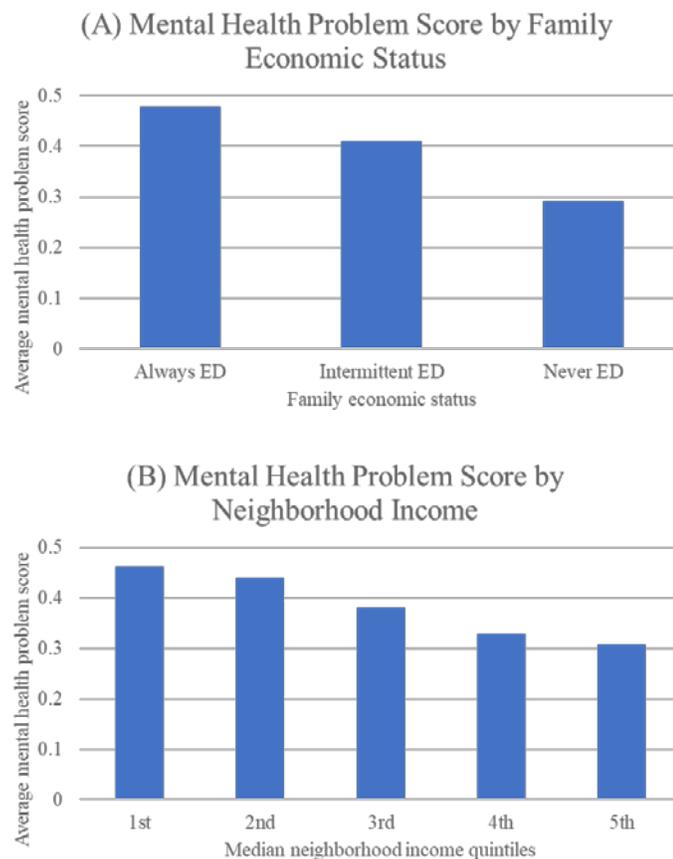
**Figure 2: Association between adolescents' subjective social status (SSS) and mental health problems, by age. Unadjusted model is a bivariate regression of mental health problem index on SSS; adjusted model includes family, neighborhood, and school economic measures, as well as demographic characteristics, as covariates. Significance levels: \*:  $p < 0.05$ ; \*\*:  $p < 0.01$ ; \*\*\*:  $p < 0.001$**

**Table 4: Associations between adolescents' daily mental health symptoms and subjective social status**

		Daily reports of mental health problems			
		Depression	Anxiety	Inattention/hyperactivity	Conduct/substance
Independent variables	<i>N</i>	<i>b</i> ( <i>se</i> )	<i>b</i> ( <i>se</i> )	<i>b</i> ( <i>se</i> )	<i>b</i> ( <i>se</i> )
<i>Subjective social status</i>	336	1.307 (1.371)	0.619 (1.582)	-0.0284 (0.0477)	-0.0490* (0.0225)

Notes: All regression models are adjusted and include covariates for family economic disadvantage, neighborhood income, school economic disadvantage, local inequality, age, gender, race, and urbanicity. All models were estimated with robust standard errors. Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

use compared to their peers who were never observed as economically disadvantaged, based on models controlling for other economic and demographic characteristics. As shown in Figure 3 (A & B), as family or neighborhood economic disadvantage increases, so too do average scores on a mental health problem index. This trend was consistent across age, sex, and racial groups.



**Figure 3: Adolescents' average mental health problem index score by (A) family economic status, (N=2,042) and (B) neighborhood median income (N=2,099).**

Adolescents' mental health outcomes were also regressed on local inequality as well as a range of sociodemographic and economic covariates. Results illustrate two

**Table 5: Associations between adolescents' mental health and economic and demographic characteristics**

	Psychological Distress		Conduct Problems		Substance Use	
	(1) <i>b (se)</i>	(2) <i>b (se)</i>	(1) <i>b (se)</i>	(2) <i>b (se)</i>	(1) <i>OR (CI)</i>	(2) <i>OR (CI)</i>
<i>80/20 ratio</i>	0.154* (0.0735)	0.0689 ( 0.0764 )	0.0120 (0.00690)	0.00772 ( 0.00633)	0.943 (0.813,1.094)	0.842 (0.691,1.026)
<i>No ED (ref)</i>		-0.0473 (0.189)		0.0113 ( 0.0122)		1.178 (0.831,1.668)
<i>Some ED</i>		-		-		-
<i>Always ED</i>		1.326*** ( 0.236 )		0.0555*** (0.0159)		1.639* (1.046,2.569)
<i>Neighborhood income</i>		-0.00222 (0.00323)		0.0000413 (0.000192)		0.991* (0.982,0.999)
<i>School % ED</i>		0.399 (0.348)		-0.00890 ( 0.0226)		0.896 (0.496,1.620)
<i>Female</i>		0.541** (0.166)		0.0384*** ( 0.0110)		0.972 (0.716,1.321)
<i>Age</i>		0.0871 (0.0757)		0.0209*** ( 0.00550)		1.450*** (1.265,1.661)
<i>White (ref)</i>		-		-		-
<i>Black</i>		0.0315		0.0437*		0.631*

		(0.239)		( 0.0173)		(0.399,0.998)
<i>Hispanic</i>		-0.0330		-0.0302		0.888
		(0.272)		(0.0165)		(0.542,1.456)
<i>Urban</i>		0.350		0.0116		1.497
		(0.291)		(0.0179)		0.925,2.424)
<i>N</i>	1877	1877	1878	1878	1878	1878
<i>R</i> <sup>2</sup> / <i>pseudo-R</i> <sup>2</sup>	.002	.042	.003	.042	<.001	.028

Notes: Model (1) is the bivariate association between a given health outcome and the 80/20 ratio, and Model (2) controls for family economic disadvantage, neighborhood income, school economic disadvantage, local inequality, age, gender, race, and urbanicity. Coefficients are not standardized; standard errors are robust. Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

main findings (Table 5). First, in bivariate models, the local 80/20 ratio was significantly associated with psychological distress, but not with conduct problems or early substance use. A one-*SD* increase in the 80/20 ratio was associated with a score 0.15 points higher on the K6 scale ( $B = 0.04$ ,  $p = 0.036$ ). This association was not moderated by age, gender, race, or family SES. Second, the relationship between inequality and psychological distress did not remain statistically significant when covariates for family, neighborhood, and school economic status and individual demographic characteristics were added. No interactions between family poverty and local area inequality were observed. Measures of local area inequality and poverty were not associated with daily reports of mental health within the EMA.

Adolescents' subjective social status was significantly associated with local area inequality, as captured by the 80/20 ratio ( $r = -0.07$ ,  $p = 0.034$ ), but not the GINI index ( $r = -0.06$ ,  $p = 0.254$ ). As illustrated in Appendix A, Figure A2, the association between local area inequality, as measured by the 80/20 ratio, and SSS was statistically significant among older ( $\beta = -0.17$ ,  $p = 0.036$ ) but not among younger ( $\beta = -0.06$ ,  $p = 0.226$ ) participants, although the interaction term was not significant at the  $p < .05$  level ( $p = 0.093$ ). There was no evidence that income inequality and status-related perceptions were more strongly associated among males versus females, or among white versus ethnic minority adolescents. However, the association between local area inequality and SSS varied by economic disadvantage (80/20 ratio X Always ED interaction term:  $b =$

0.08,  $p = 0.017$ ), such that for persistently disadvantaged youth, there was no significant association between local area inequality and SSS ( $\beta = 0.07$ ,  $p = 0.227$ ), while for the “never disadvantaged” group, there was a negative association between inequality and SSS ( $\beta = -0.09$ ,  $p = 0.011$ ).

## **2.4 Discussion**

This study examined how young adolescents perceive their social status by asking them to rank their families on a ladder representing American society, with those at the top of the ladder having the most money and best living conditions and those at the bottom not having enough money and living in worse conditions. Adolescents’ views of their subjective social status (SSS) were modestly ( $|r|$  ranging from 0.12 to 0.30), but not perfectly, correlated with levels of family disadvantage, school poverty levels, and neighborhood income. There was no evidence to suggest that the association between SSS and objective economic measures was stronger among older versus younger participants – that is, we found no “calibration” effect with age, suggesting that either SSS has already been calibrated among young adolescents, as the strength of the association is similar to those documented in studies with older adolescents and even adults (Goodman et al., 2001; Shaked, Williams, Evans, & Zonderman, 2016) or that the association between SSS and economic indicators will increase as the sample ages.

Adolescents’ views of their SSS were correlated with their overall mental health symptoms, with robust associations found among older (14 to 16-year-old) participants.

Overall, those who placed themselves higher on the ladder reported fewer mental health problems the prior year in the Adolescent Survey. The association between SSS and mental health problems was found across all mental health outcomes (psychological distress, inattention, and conduct problems), became stronger with age, and was robust at older ages to controls for multiple objective measures of SES. Although these findings cannot speak to directionality, they advance prior research by documenting a substantial and robust negative association ( $\beta = -0.28, p < .001$ ) between SSS and mental health problems among adolescents age 14 and older only.

Adolescents' SSS ratings were also associated with conduct problems in daily life captured across the EMA period ( $\beta = -0.08, p = 0.030$ ), but not with daily internalizing or inattention symptoms, even among the older adolescents in our sample. The lack of an association with daily symptoms of internalizing symptoms and inattention was surprising, given associations between SSS and more traditional measures of mental health detailed above. It is possible that the association between SSS and daily symptoms emerges later in adolescence, or that more comprehensive daily symptom assessments of internalizing problems are required to capture these associations.

Our findings advance understanding of adolescents' social status perceptions and suggests interesting avenues for future research in the following ways. First, with respect to developmental patterns, SSS tracks family, school, and neighborhood level economic indicators, even among very young adolescents (ages 10-13), and that by ages

14 to 16, adolescents' SSS uniquely correlates with a wide range of mental health symptoms, including global measures of psychological distress, inattention, and conduct problems, as well as daily reports of conduct problem symptoms. SSS was associated with multiple types of mental health problems reported over the lifetime or last 30 days, as well as conduct problems in daily life. While directionally cannot be assumed from these observational findings, it is interesting to note the common pattern of stronger associations or coupling among older versus younger adolescents and that these associations held when controlling for key confounders such as socioeconomic status, sex, race, and urbanicity.

Second, SSS was not correlated with local area inequality. Adolescents' SSS was associated with the 80/20 ratio in bivariate models. However, these associations disappeared once family income and other economic indicators were considered. There was also no evidence to suggest that SSS or mental health outcomes of adolescents from low-income or racial/ethnic minority families were more strongly associated with local area inequality. Moreover, the socioeconomic gradient in mental health (illustrated in Figure 3) did not vary as a function of local area inequality or racial/ethnic identity of the adolescent.

The absence of associations between levels of local area inequality and adolescents' outcomes is in contrast with comparisons between countries showing worse health as income inequality rises (Elgar et al., 2015), but align with conclusions from a

meta-analysis of 168 associations between income inequality and health, which showed that results and estimated effect sizes are less consistent as the size of the unit of analysis decreases (Wilkinson & Pickett, 2006). Hence, local area inequality measured at the census tract-level may be too small a geographical unit to capture a meaningful index of income inequality for health; instead, explanations for the robust associations between income inequality and child health across larger units of analysis (countries and states) may be driven by associated policies, programs, and/or societal views toward equality and resource allocation, rather than by children's perceptions of their social status and environments. To that point, a recent analysis of data from OECD countries showed that both national measures of the GINI and the percent of GDP spent on education were associated with inequalities in adolescent developmental outcomes (Keating, Siddiqi, & Nguyen, 2013). Future research using alternative measures of perceived status, local area income inequality and public spending are required to fully explore potential linkages between local area inequality and child outcomes.

Finally, while prior research and theory suggest that associations between SSS and mental health may be more pronounced among adolescents occupying disadvantaged status groups, e.g., among children from low-SES families or identifying as a racial/ethnic minority, we did not find evidence to support these patterns. In a related study, we measured perceived daily discrimination among these adolescents each day and found that race, as opposed to economic status, is associated with day-to-

day experiences of discrimination, and that perceived daily discrimination is in turn strongly coupled with mental health symptoms in daily life (manuscript in preparation). Perhaps what is needed is higher resolution data that captures how variation in day-to-day experiences across racial and ethnic groups shape adolescents' perceptions, evolving and intersecting identities, and health outcomes (Destin et al., 2017).

This study had a number of limitations. First, adolescents' mental health was assessed via self-report measures only, and independent assessments of mental health should be integrated into future studies. Second, findings reported throughout the paper are correlational, which prevents conclusions regarding directionality and the causal nature of associations between status-related perceptions, mental health, and economic correlates. Third, the EMA assessment covered only a two-week period, which may have limited the ability to capture incidents of mental health problems which are typically captured in adolescents' retrospective reports. Fourth, while measures of children's family, school and contexts were integrated into this study, future research is required to better understand how perceptions of status may be shaped by the rapidly changing landscapes of adolescents' digital lives, whereby exposure to inequality and wealth is transmitted through experiences in both offline and online contexts (C. Odgers, 2018). Finally, our sample was representative of the population of public school students in NC, the ninth most populous state, with a demographically diverse population, substantial numbers of people living in urban and rural areas, and a sociodemographic

profile that closely mirrors that of the US in terms of age, education, marital status, and employment. However, the sample was also limited to one state and generalizability of the findings to other contexts should be tested and not assumed.

With these limitations in mind, the implications of this study for advancing science and practice related to adolescents' perceptions of their social standing can be considered. First, consistent with theories about the "developmental evolution" of subjective social status (Goodman et al., 2001), we find that SSS is increasingly related to adolescents' mental health as they age. Stronger and robust associations between SSS and mental health were observed beginning at age 14, suggesting a time when parents, educators, and clinicians may want to focus more closely on the interplay between status-related perceptions and mental health. In addition, SSS was consistently associated with objective measures of SES, even among the youngest adolescents in our sample, suggesting that the calibration of adolescents' perceptions and their economic reality have already begun to converge. Future research with younger children is required to better understand when children first begin to make sense of, and "feel", socio-economic hierarchies. Finally, it is time for the measurement of social status to expand beyond a static ladder to more dynamic and multi-dimensional measures of children's social status. Such measures should capture not only how a child ranks themselves, but also who their reference group is and, where possible, how their perceptions evolve over time. Mobile devices were used here as a tool to capture mental

health symptoms, but it is also possible to record daily exposure to wealth, inequality and poverty as children move through their offline and online lives. Increasing segregation of children by race and socioeconomic status, rapidly growing income inequality, and new exposures to wealth and inequality in the online world, require that we adapt our theories, models and measures of subjective social status to better reflect contemporary adolescents, growing up in an increasingly unequal and digital age.

### **3. Discrimination in healthcare as a barrier to care: Experiences of socially disadvantaged populations in France from a nationally representative survey**

#### **3.1 Introduction**

People within minority or otherwise socially disadvantaged groups are confronted with a multilevel web of challenges that negatively impact their health and wellbeing (Adler & Stewart, 2010; Jones, 2000; Michael Marmot, 2005). Among these numerous factors, research has increasingly focused on experiences of discrimination and how they may relate to individuals' health (Lewis, Cogburn, & Williams, 2015; Williams & Mohammed, 2009). In addition to a direct influence on health via physiologic stress pathways, experiences of discrimination are also thought to influence health indirectly via behavioral responses (Clark, Anderson, Clark, & Williams, 1999; McEwen, 2007). Indeed, a meta-analysis reported a significant association between perceptions of discrimination and health-related behaviors such as diet, exercise, sleep, or substance use (Pascoe & Smart Richman, 2009). However, one health-related behavior that has received comparatively less attention in its association with discrimination is the utilization of healthcare.

Individuals who have experienced discrimination in the past may be more reluctant to seek health care, as they may perceive it as a setting of increased risk for discrimination (i.e., refusal of service or lower quality of care). This may be especially true for those who have experienced discrimination within the health care setting itself.

Perhaps the strongest evidence of a negative association between healthcare-related discrimination and utilization of care comes from research of people living with HIV, which has consistently shown that higher perceptions of HIV-related discrimination and stigma within care settings is associated with lower retention in care (Geng et al., 2010; Valenzuela et al., 2015).

Discrimination within healthcare settings, however, is not always based on health status, and can extend to other socially disadvantaged groups. Research from the US has documented disparities in rates of discrimination in healthcare settings across race/ethnicity, immigrant status, language proficiency, and insurance status (Friedman et al., 2005; Lauderdale, Wen, Jacobs, & Kandula, 2006), although the link between those experiences of discrimination and utilization of healthcare was not investigated. One European study used data from a large-scale survey in Sweden, conducted via mail questionnaire in 2004, to examine experiences of discrimination, reports of foregoing healthcare, and the potential link between the two (Wamala, Merlo, Boström, & Hogstedt, 2007). Rates of both discrimination in healthcare and foregoing healthcare were higher for women compared to men, and people who reported discrimination in healthcare over the past three months had substantially higher odds of also reporting foregoing healthcare during the same period. However, the experiences of other social groups were not explicitly examined in that study. Overall there remains little

quantitative knowledge of potential disparities in terms of discrimination in healthcare and foregone healthcare for minority groups.

France has a number of distinguishing characteristics that make it an important place for the study of discrimination in healthcare settings and its consequences. France has long been a country of immigration, as significant immigration flows began well before the Second World War (Hargreaves, 2007), and the immigrant population in contemporary France is both numerous and diverse. Among all European countries, France has the second largest population of immigrants born outside the EU after Germany, reaching 6 million in 2017 (approximately 9 percent of the total population) (Eurostat, 2018). The largest immigrant groups come from North Africa (Algeria, Morocco, and Tunisia), Southern Europe (especially Portugal), Sub-Saharan Africa, Turkey, Southeast Asia (Vietnam, Cambodia, and Laos) and, more recently, China (Beauchemin, Hamel, & Simon, 2018).

France also has a distinct political model of immigrant assimilation and ethnic diversity management, known as the French republican model (Favell, 2016). Ethnic and racial distinctions are not recognized by the state; as a result ethnic statistics are not collected for official purposes, and ethnic minorities are not considered as targets of social policies (Simon, 1999). Data and knowledge of discrimination on the basis of ethnicity or migration status are thus extremely scarce, despite the potential insight they could provide on the lived experience of minority groups in France.

Finally, the French healthcare system provides high levels of quality and access to care (World Health Organization, 2000). It is largely funded by public spending; more than three quarters of total health expenditures are publicly financed. Health insurance has a compulsory and universal coverage (Durand-Zaleski, 2015), and it includes state-funded health services for undocumented immigrants residing in France. This national context, in which the entire population should have access to healthcare, offers a valuable setting for analyzing foregone care and its potential explanatory factors.

In this study, we use data from a nationally representative study in France – with an oversampling of immigrant households – to examine social disparities of discrimination within healthcare, foregone healthcare, and how they are related. We build on prior research by documenting disparities, both in terms of discrimination and foregone care, across a wide range of demographics, including gender, immigrant status, country of origin, and religion. We also explicitly examine the extent to which discrimination in healthcare settings could explain any disparities in foregone healthcare.

## **3.2 Methods**

### **3.2.1 Sample**

Data come from the Trajectories and Origins (TeO) study (Beauchemin et al., 2018), a large-scale, nationally representative cross-sectional survey of France. The survey was conducted from 2008 to 2009 with in-person interviews across France. The

sample consisted of 21,761 individuals aged 18 to 59, with oversamples of immigrants and individuals born to at least one immigrant (>8,000 of each group).

## **3.2.2 Measures**

### **3.2.2.1 Healthcare Experiences**

Discrimination in healthcare was measured with a single yes/no question: “Has a doctor or other medical care worker ever treated you less well or received you less well than other patients?” Likewise, foregone healthcare was also assessed with a yes/no question: “During the past 12 months, have you foregone health care for yourself?”. Each measure was coded dichotomously.

### **3.2.2.2 Demographic Characteristics**

As this study was explicitly interested in group disparities in healthcare experiences, we conducted analyses across a series of demographic measures, all of which were self-reported in the survey. Characteristics of interest include gender, immigrant generation (native-born to native-born parents, first generation immigrant, or second generation immigrant), country of origin (for either the individual or parent, depending on relevant immigrant generation; grouped into geographic categories), and religion.

### **3.2.2.3 Covariates**

Additional survey items were included as control variables in this study, including age, socioeconomic status, and health status. Socioeconomic status was

measured with three variables for self-reported income, educational attainment, and employment status. Health status was also measured with three variables, consisting of self-rated health, history of chronic illnesses, and number of healthcare visits in the last year.

#### **3.2.2.4 Analyses**

Analyses proceeded in three main steps. First, we described rates of discrimination in healthcare settings experienced by various groups as the predicted probabilities of experiencing discrimination based on demographic characteristics. We calculated these predicted probabilities from logistic regression models of healthcare discrimination, and we contrasted coefficient estimates against a reference group for statistical comparison. For each demographic factor of interest (gender, migrant generation, origin, and religion), we constructed three nested models. The first model included the demographic predictor, with age and gender (if gender was not the factor investigated) as covariates; the second model added covariates for socioeconomic status; the third model added covariates for health status.

Second, we reported the predicted probabilities of foregoing healthcare across the demographic groups of interest, and then also calculated the average marginal effects (AMEs) of the demographic characteristics of interest on those predicted probabilities. We did this by modeling reports of foregone healthcare across five nested logistic regression models: the first included only the demographic factor of interest; the

second added discrimination; the third added other demographic characteristics; the fourth added socioeconomic status; the fifth added health status.

Finally, we determined how much of the disparities in foregoing healthcare across various groups is potentially explained by experiences of discrimination in healthcare. We did this by calculating the percentage of the Model 1 AME (that is, the AME of a group demographic characteristic) explained by the addition of discrimination as a covariate in Model 2, so that:  $\% \text{ explained} = 1 - (AME_{\text{Model 2}} / AME_{\text{Model 1}})$ . Statistical significance of the “percent explained” was tested by contrasting a demographic characteristic’s AME in Model 2 against the same AME in Model 1. Put another way, we tested the null hypothesis that the addition of discrimination in the model resulted in no change in the estimated AME for a demographic characteristic.

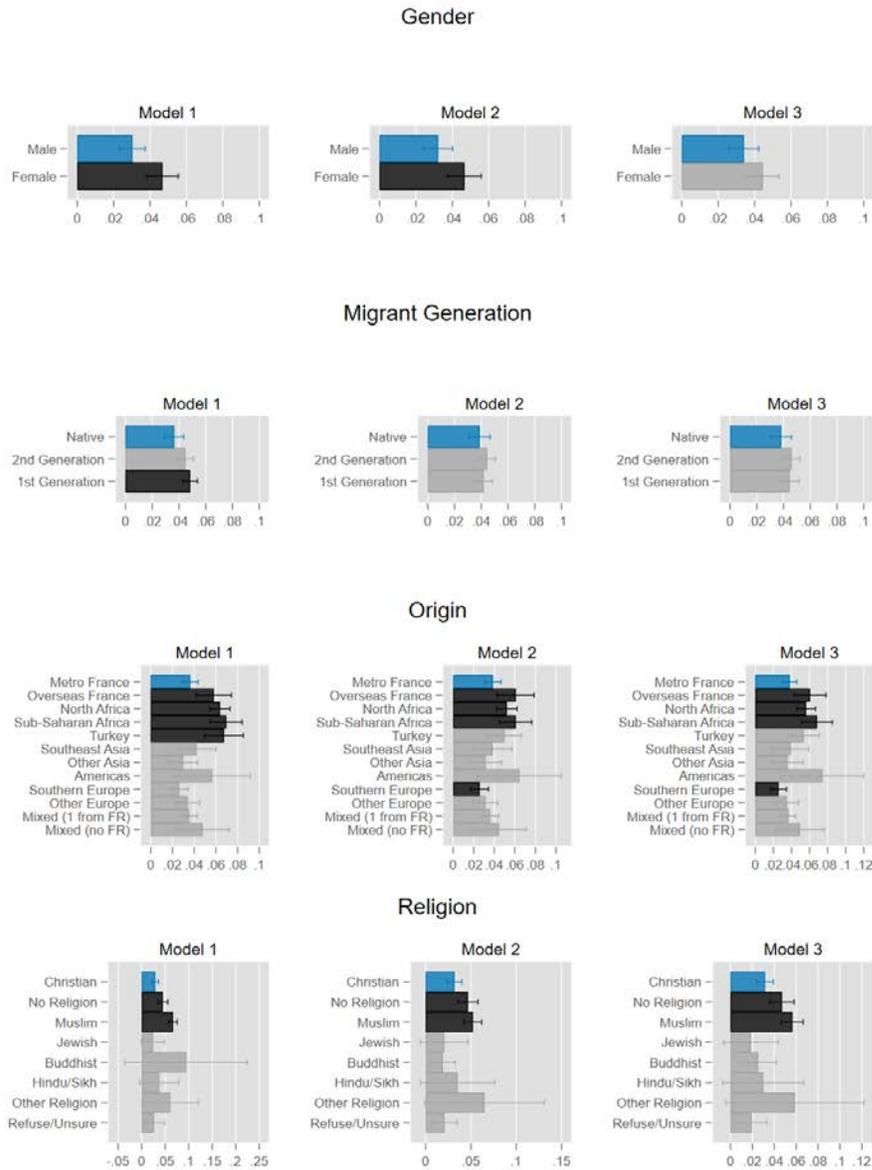
### **3.3 Results**

Descriptive statistics of the sample are shown in Table 6. Overall, the survey-weighted prevalence of reporting discrimination in healthcare settings was 3.9%, with a range of 2.6% to 9.3% across the various demographic groups examined. The survey-weighted rate of foregone healthcare was 10.9% overall, ranging from 6.2% to 22.0% across demographic groups.

The predicted probabilities of experiencing discrimination in healthcare settings are displayed in Figure 4 by gender, migrant generation, country of origin, and religion. From the baseline Model 1, we observed that women, first-generation immigrants, those

**Table 6: Descriptive statistics of study sample and weighted population estimates**

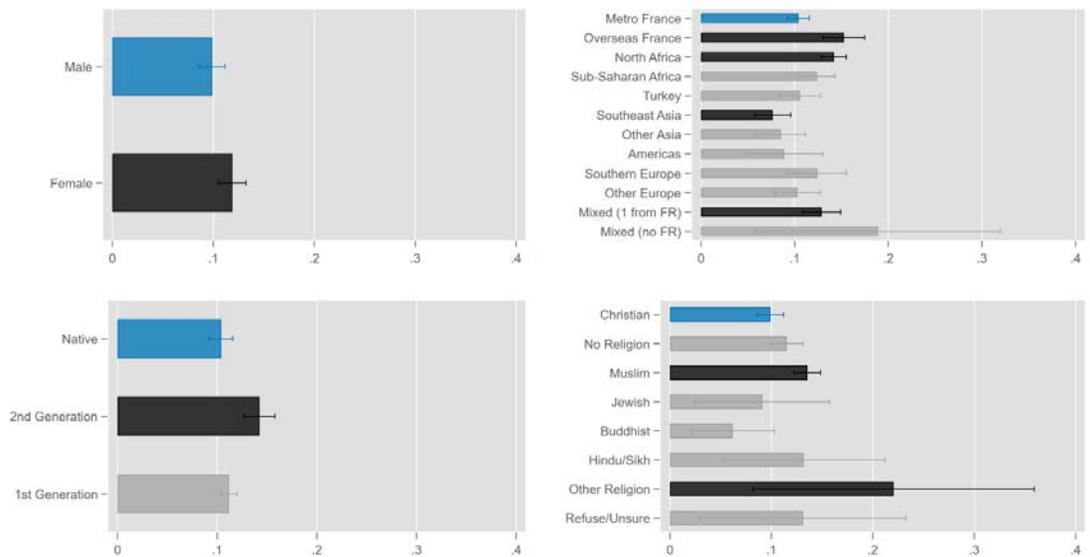
Variable	Sample <i>n</i>	Weighted %	Healthcare Discrimination (weighted %)	Foregone Healthcare (weighted %)
Men	10,281	49.2%	3.0%	9.9%
Women	11,480	50.8%	4.7%	11.9%
Native	3,781	77.7%	3.6%	10.4%
2nd Generation	8,812	11.1%	4.6%	14.2%
1st Generation	9,168	11.2%	4.8%	11.1%
Metro France	3,781	77.7%	3.6%	10.4%
Overseas France	1,345	1.5%	5.9%	15.2%
North Africa	3,706	5.4%	6.4%	14.2%
Sub-Saharan Africa	2,224	1.8%	7.1%	12.4%
Turkey	1,242	0.8%	6.8%	10.6%
Southeast Asia	1,101	0.5%	4.2%	7.7%
Other Asia	558	1.0%	3.0%	8.5%
Americas	282	0.4%	5.7%	8.9%
Southern Europe	2,483	3.4%	2.6%	12.4%
Other Europe	1,129	1.6%	3.4%	10.3%
Mixed (1 from FR)	3,521	5.5%	3.5%	12.9%
Mixed (no FR)	389	0.4%	4.7%	18.9%
Christian	8,405	49.1%	2.9%	9.9%
No religion	6,291	41.2%	4.5%	11.5%
Muslim	5,706	7.0%	6.7%	13.5%
Jewish	167	0.5%	2.4%	9.1%
Buddhist	579	0.6%	9.3%	6.2%
Hindu/Sikh	68	0.1%	3.8%	13.2%
Other Religion	203	0.6%	6.2%	22.0%
Refuse/Unsure	318	1.1%	2.6%	13.1%
Total	21,761	100.0%	3.9%	10.9%



**Figure 4: Predicted probabilities of reporting discrimination in healthcare, derived from nested logistic regression models of discrimination on demographic characteristics of interest. Model 1 includes the featured demographic characteristic plus age and gender, Model 2 adds measures of socioeconomic status, and Model 3 then adds measures of health status. FR: France. Bar colors represent statistical significance in logistic regression of discrimination in healthcare on demographic characteristics: blue = reference group; black = ( $p < .05$ ); grey = ( $p > .05$ ).**

with origins in Africa, Turkey, or Overseas France, and Muslims or non-religious individuals were more likely to experience discrimination in healthcare settings, when compared to their reference groups (respectively: men, native children of native parents, respondents born in metropolitan France, and Christians). Furthermore, examination of trends across models showed that most of these group differences were robust to the addition of socioeconomic and health status covariates. However, the probability of reporting healthcare discrimination among both first-generation immigrants and people with Turkish origins was no different from that of the reference groups after the addition of socioeconomic covariates in Model 2, and the probability for women was no different from that of men after the inclusion of health status covariates in Model 3.

Similarly, Figure 5 displays predicted probabilities of foregoing healthcare across demographic groups, derived from bivariate logistic regressions of foregoing healthcare on the demographic characteristics of interest. The probability of foregoing care was higher for women, second-generation immigrants, people with origins in Overseas France, North Africa, or mixed origin (partially from France), as well as Muslims and those who reported "Other Religion". In contrast, the probability of foregoing care was lower for people of southeast Asian origin.



**Figure 5: Predicted probabilities of foregoing healthcare, by demographic characteristics. Probabilities derived from logistic regression of foregoing healthcare on demographic characteristics, with no covariates. FR: France. Bar colors represent statistical significance in logistic regression of foregoing healthcare on demographic characteristics: blue = reference group; black = ( $p < .05$ ); grey = ( $p > .05$ ).**

Predicted probabilities of foregoing healthcare were then calculated across a series of nested models; the results are displayed in Table 7 and illustrate three main findings. First, discrimination in healthcare settings was strongly associated with having foregone healthcare across all models in which it was included (Models 2 through 5). In the fully adjusted Model 5, the AME of discrimination was 0.14 – the largest effect size of all covariates, corresponding to a 14-percentage point increase in the predicted probability of foregoing care. Second, the AMEs associated with Muslim, Buddhist, or other religion, as well as origin in North Africa or Southeast Asia, which were

**Table 7: Average marginal effects (AMEs) of demographic characteristics and reports of discrimination for predicting foregoing healthcare.**

	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>		<i>Model 5</i>	
	<i>AME</i>	<i>s.e</i>								
Men (ref)	-	-	-	-	-	-	-	-	-	-
Women	0.020**	0.009	0.016*	0.009	0.019**	0.009	0.016	0.010	0.012	0.010
No HC discrim (ref)			-	-	-	-	-	-	-	-
HC discrim			0.217***	0.037	0.209***	0.037	0.180***	0.034	0.140***	0.033
<hr/>										
Metro France (ref)	-	-	-	-	-	-	-	-	-	-
Overseas France	0.037***	0.014	0.032**	0.013	0.031**	0.013	0.029**	0.014	0.027**	0.014
North Africa	0.037***	0.009	0.030***	0.009	0.016	0.014	0.009	0.015	0.013	0.015
Sub-Saharan Africa	0.021*	0.011	0.013	0.011	0.006	0.012	0.001	0.013	0.008	0.013
Turkey	0.002	0.013	-0.005	0.012	-0.014	0.015	-0.027*	0.015	-0.024	0.015
Southeast Asia	-0.027**	0.011	-0.028**	0.011	-0.014	0.017	-0.021	0.017	-0.024	0.017
Other Asia	-0.019	0.015	-0.018	0.015	-0.021	0.016	-0.018	0.018	-0.011	0.019
Americas	-0.015	0.022	-0.019	0.020	-0.022	0.020	-0.014	0.023	-0.003	0.025
Southern Europe	0.020	0.017	0.023	0.017	0.024	0.018	0.021	0.019	0.020	0.019
Other Europe	-0.001	0.014	-0.001	0.014	-0.005	0.013	-0.003	0.015	0.003	0.016
Mixed (1 from FR)	0.025*	0.013	0.025*	0.013	0.025*	0.013	0.028**	0.014	0.029**	0.013
Mixed (no FR)	0.044**	0.020	0.044**	0.020	0.045**	0.021	0.047**	0.023	0.050**	0.022
No HC discrim (ref)			-	-	-	-	-	-	-	-
HC discrim			0.219***	0.038	0.209***	0.037	0.180***	0.034	0.140***	0.033
<hr/>										
Native (ref)	-	-	-	-	-	-	-	-	-	-
2nd Generation	0.039***	0.010	0.036***	0.010	0.033***	0.011	0.034***	0.011	0.035***	0.011
1st Generation	0.008	0.007	0.005	0.007	0.000	0.008	-0.001	0.009	0.002	0.009

No HC discrim (ref)			-	.	-	-	-	-	-	-
HC discrim			0.219***	0.038	0.209***	0.037	0.179***	0.034	0.140***	0.033
Christian (ref)	-	-	-	-	-	-	-	-	-	-
No Religion	0.016	0.010	0.013	0.010	0.014	0.011	0.013	0.011	0.013	0.011
Muslim	0.036***	0.009	0.028***	0.009	0.018	0.015	0.003	0.015	0.005	0.016
Jewish	-0.008	0.034	-0.007	0.035	-0.009	0.033	-0.038	0.026	-0.043	0.026
Buddhist	-0.037*	0.022	-0.046**	0.022	-0.042	0.026	-0.035	0.031	-0.025	0.032
Hindu/Sikh	0.033	0.041	0.031	0.042	0.043	0.048	0.025	0.047	0.010	0.044
Other Religion	0.121*	0.071	0.112*	0.068	0.100	0.063	0.094	0.072	0.088	0.069
Refuse/NSP	0.032	0.052	0.033	0.053	0.036	0.055	0.067	0.070	0.060	0.065
No HC discrim (ref)			-	-	-	-	-	-	-	-
HC discrim			0.216***	0.038	0.209***	0.037	0.180***	0.034	0.140***	0.033

Notes: Each panel (i.e., gender, origin, migrant generation, religion) is a separate set of nested logistic regression models predicting foregoing healthcare. Model 1 contains only the demographic characteristic of interest as a predictor. Model 2 adds discrimination in healthcare as a predictor, Model 3 then adds other demographic characteristics, Model 4 then adds measures of socioeconomic status, and finally Model 5 adds measures of health status. For conciseness, only the average marginal effects of demographic characteristics of interest and reported discrimination in healthcare are tabulated. HC: healthcare; FR: France. Significance levels: \*:  $p < .1$ ; \*\*:  $p < .05$ ; \*\*\*:  $p < .01$ .

statistically significant in Models 1 and 2, were no longer significant with the combined addition of discrimination and other demographic factors as covariates in Model 3.

Additionally, the AME for women was significant across Models 1 through 3, but not after the addition of socioeconomic status covariates from Model 4 onward. Third, the AME of certain demographic characteristics was not fully explained by any of the added covariates (i.e., it remained statistically significant even in the most strictly controlled model). Namely, in Model 5 there were significant AMEs of foregone healthcare for second-generation immigrants, those with an origin in Overseas France, or those with mixed origin (regardless of whether or not it was partially from France).

Finally, we examined the proportion of the disparities in foregone healthcare potentially explained by reporting discrimination in healthcare settings; the results are shown in Table 8. Discrimination explained a statistically significant proportion of the disparity for women relative to men (18%), second-generation immigrants relative to native-born individuals (6%), people with origins in Overseas France (15%), North Africa (19%), and Sub-Saharan Africa (38%) relative to those with origins in metropolitan France, and Muslims (24%) relative to Christians.

**Table 8: Proportion of disparities in foregoing healthcare explained by discrimination in healthcare.**

Variable	Proportion of disparity explained	<i>p</i>
Men	(ref)	(ref)
Women	0.18	0.012
Native	(ref)	(ref)
2nd Generation	0.06	0.036
Metro France	(ref)	(ref)
Overseas France	0.15	0.037
North Africa	0.19	<0.001
Sub-Saharan Africa	0.38	0.002
Southeast Asia	-0.04	0.569
Mixed (no FR)	0.01	0.837
Christian	(ref)	(ref)
Muslim	0.24	<0.001
Buddhist	-0.25	0.269
Other Religion	0.08	0.319

Notes: The proportion explained is calculated from coefficients in Table 2, as  $(1 - (\text{Model 1 AME} / \text{Model 2 AME}))$ . The *p* value corresponds to testing the null hypothesis that the proportion explained is equal to zero. Only variables with a statistically significant AME in Model 1 are tabulated here, as they represent baseline gaps in foregoing healthcare across demographic characteristics. FR: France.

### **3.4 Discussion**

This study used data from a national population-representative survey to look at the experiences of people in socially disadvantaged groups within the healthcare setting in France. We examined rates of reported discrimination and how they may explain

disparities in rates of foregoing needed healthcare among those groups. Overall, our findings suggest that discrimination in healthcare is associated with foregoing medical care, and that this is especially important for “visible minority” groups.

More specifically, our results suggest three main points. First, we showed that disadvantaged social groups – particularly women, immigrants, those of African origin, and Muslim religion – are more likely to have experienced discrimination in healthcare settings. For many of these groups, this finding is consistent with a broad base of existing literature, as they have been shown to face higher risks of discrimination in French society. Ethnic groups considered “visible minorities” (immigrants and their children from Sub-Saharan Africa, North Africa, and the French overseas territories) report higher rates of perceived discrimination, measured through both general and setting-specific discrimination questions (at school, on the labor or housing markets, etc.) (Brinbaum, Safi, & Simon, 2015). These minority groups also face racism more frequently (Hamel, Lesné, & Primon, 2015). Among religious groups, our observation of a high rate of discrimination against Muslims in the healthcare system echoes previous findings of discrimination in other settings (Brinbaum et al., 2015), especially the labor market (Adida, Laitin, & Valfort, 2010), and high levels of anti-Muslim prejudice in French society overall (Bleich, 2009). In contrast, there seems to be a specificity of the healthcare setting for women. Our findings are consistent with qualitative evidence showing that women tend to report discrimination in healthcare settings more often

than men (Cognet, Hamel, & Moisy, 2012), but differ from findings in other settings (school, the labor and housing markets) where women are less likely to perceive discrimination (Brinbaum et al., 2015). This may be partially related to higher utilization of healthcare by women, as the comparison to men was not significant after health status controls were added.

Second, our analysis documented disparities in the rates of foregoing needed medical care across socially disadvantaged groups. Many of the groups with higher rates of foregoing healthcare were the same as those who reported higher rates of discrimination in healthcare – women, immigrants (though second-generation, rather than first), people with origins in Africa or Overseas France, and Muslims. Other groups with comparatively high rates of foregoing healthcare were those with mixed origins, and those who reported as “Other Religion”. For some groups, these findings are in line with previous research on foregoing care: for example, there is evidence of higher rates of foregoing needed healthcare among adult women in Sweden and adolescent girls in the USA (Samargia, Saewyc, & Elliott, 2006; Wamala et al., 2007). Similarly, prior research has consistently documented higher rates of foregoing care among disadvantaged racial and ethnic minority groups in the US (Burgard & Hawkins, 2014; DuBard, Garrett, & Gizlice, 2006). However, there is less existing research on migrant generation and foregoing care, and our finding of higher rates of foregoing care among second-generation immigrants in France differs from a study of immigrant children in the USA,

which documented higher rates of foregone care for first-generation immigrants, but not second-generation (Blewett, Johnson, & Mach, 2010). We are not aware of other reports of foregone healthcare by religion.

Finally, we examined the potential explanatory role of experiences of discrimination in the healthcare setting on foregoing healthcare. We found reports of discrimination to be robustly linked with foregoing care: in our fully adjusted model of foregoing care, discrimination in the healthcare setting was associated with an average 14 percentage-point increase in the predicted probability of foregoing care. We also contextualized this relationship by determining the potential proportion of disparities in foregoing care that could be explained by experiences of discrimination in healthcare. Groups for whom discrimination explained an especially large proportion of disparities in foregone care were people with origins in Sub-Saharan Africa (38%) and Muslims (24%). Also of note were women (18%); although the proportion explained was lower for women than for some other groups, the fact that they constitute half of the population points toward a large potential effect of discrimination when considered at the level of French society. Interestingly, the proportion of the disparity in foregoing care for second-generation immigrants explained by discrimination was small (6%). Taken together with the findings by region of origin, this suggests that discrimination may only be of high importance for certain groups of immigrants – namely, those who are phenotypically “visible minorities”.

This study has a number of limitations that should be noted. First, this was cross-sectional and thus no causal inference regarding discrimination and foregoing healthcare can be made – it is for this reason that results are framed in terms of the potential explanatory nature of discrimination. Future studies should consider possible natural experiments or other quasi-experimental designs in order to more rigorously test any causal relation between discrimination and foregoing healthcare. Second, we use a single-item measure of discrimination in healthcare settings, framed as being treated poorly compared to other patients. It is possible that a more comprehensive assessment of discrimination would reveal higher overall rates of discrimination. Third, although this study was nationally representative of France, findings may be dependent on the societal dynamics and healthcare setting specific to France, and consequently not generalizable to other settings. However, the rates of both discrimination in healthcare settings and of foregoing care are generally similar to those described in Sweden (Wamala et al., 2007) – which has a different healthcare system and a more homogenous population – suggesting that similar trends may exist at least in other parts of Europe.

With these potential limitations in mind, the implications of this study can be discussed. We observe disparities between social groups in terms of discrimination in healthcare settings – a negative phenomenon itself – as well rates of foregone healthcare, an important hurdle in the functioning of any health system (Allin & Masseria, 2009). The affected groups represent large sections of French society (e.g., women, major

immigrant groups, etc.), suggesting a substantial burden when considered at the national level. These disparities for the socially disadvantaged contradict the global goals of health equity (P. Braveman & Gruskin, 2003; Ministère des Solidarités et de la Santé, 2018; Whitehead et al., 1992), and should be considered in the discussion and design of health policies. Furthermore, the robust linkage between experiences of discrimination and foregoing healthcare, especially among “visible minority” groups, adds additional context to the web of barriers that people in socially disadvantaged groups face.

The health status of disadvantaged and minority populations is a topic of increasing policy and scientific relevance for many countries around the world (P. A. Braveman et al., 2011; Hamel & Moisy, 2015; Rechel, Mladovsky, Ingleby, Mackenbach, & McKee, 2013). This study provides evidence that discrimination within healthcare settings themselves may contribute to the disparities that disadvantaged groups face. Researchers and policymakers who aim to improve the health of disadvantaged groups should consider that some barriers to healthcare for those groups may lie in the experiences of healthcare itself, and those experiences are a potential place of action from which future policy and research can proceed.

## **4. Policies as institutional stigma: State bans of Sharia law and the secondary sex ratio among Muslim mothers**

### ***4.1 Introduction***

The health consequences of policies and laws are a frequent topic of discussion and research. Indeed, many policies are created with explicit goals to improve population health. Policy-focused research often assumes that changes in individuals' behavior or material resources form the bridge between enacted policies and outcomes. However, these are not the only pathways through which policies may impact health – policies can also convey messages that become a part of the social environment, in turn influencing people's health and wellbeing. In some cases, these messages and their effects can be positive, as seen with the association between state legalization of same-sex marriage and reduced rates of attempted suicide among sexual minority high school students (Raifman et al, 2017). Conversely, policies also have the potential to send negative messages regarding groups of people, especially when they target socially disadvantaged groups, enforcing a form of institutional stigma for those targeted.

Previously documented examples of policy-level stigmatization include the mass institutionalization of people with mental illnesses in the USA or, more recently, the passage of the Defense of Marriage Act at the federal level and similar laws at the state level (Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010; Hatzenbuehler et al., 2013). Policies such as these may send a signal reinforcing the lower social status of their targeted groups, with harmful psychological consequences. However, research

examining this messaging pathway remains limited. One study documented increases in psychiatric disorders among sexual minority individuals living in states that passed laws banning same-sex marriage (Hatzenbuehler et al., 2010). Relatedly, passage – but not enforcement – of a strict immigration law in Arizona was associated with lower birth weight among Latina immigrant mothers (Torche & Sirois, 2018). These studies describe potential health consequences as a result of policy-driven stigma, but because the policies in question have tangible repercussions on individuals' resources and opportunities, it is difficult to separate any effects of stigma from peoples' responses to the expected policy implementation (e.g., the opportunity to marry, or the risk of deportation).

The confounding of a policy's as-written consequences with any stigmatizing effects of the policy is avoided in this study by examining a unique case in which a stigmatizing policy had negligible legal implications: state-level bans of Sharia law or other foreign laws. From 2010 to 2015, 11 states (ID, LA, OK, TN, AZ, KS, SD, NC, AL, FL, and MS) passed laws banning Sharia law or foreign laws from their courts (Cotterell, 2014; Edwards, 2014; Mitchell & Toner, 2016; Sacriponte, 2015). Sharia law is the religious code of Islam, and these policies were passed alongside rhetoric regarding the threat it posed to the US legal system. More broadly worded bans of "foreign laws" were adopted in lieu of Sharia law after the first ban on Sharia law was ruled unconstitutional; however, the intent and discussion surrounding the laws remained anti-Islamic (Patel, Duss, & Toh, 2013). Though the exact wording of these laws varies,

they are generally considered to describe no meaningful changes from prior legal practices in US courts – rather, their purpose was to draw negative public attention to a specific group (Shanmugasundaram, 2018). To account for different degrees of public attention given to bans across states, Google trend data is used to create an index of exposure in each state (Google Inc., 2019).

This study uses a quasi-experimental design, leveraging the variation over time and states in enacting Sharia law or foreign law bans (“bans” from here forward) to examine whether policy-driven institutional stigma can influence the health of the stigmatized group. National data on religious minority groups in the USA are scarce, so birth certificate data are used to observe birth outcomes for women who are likely to be Muslim. Specifically, the newborn sex ratio is the primary outcome, as the sex ratio has been shown to respond to population-level stressors, with fewer male births correlating with higher maternal stress (Bruckner & Catalano, 2018; Bruckner, Catalano, & Ahern, 2010; R. A. Catalano, 2003; Torche & Kleinhaus, 2012).

## **4.2 Methods**

### **4.2.1 Data**

Data come from the National Vital Statistics System (NVSS) natality files for 2007 to 2015, which contain birth certificate information for every birth occurring in the United States and its territories during that time. From the full set of 36,573,793 births, those occurring outside of the 50 states (0.2%), multiple births (3.4%), cases in which the

mother's country of birth was not known (2.8%), and cases missing outcome or covariate information (1.3%) were dropped from analyses, leaving 33,723,488 births (92.2%).

#### **4.2.2 Measures**

Birth data do not contain information about women's religion, so an alternate approach for identifying the targeted group was used. Each woman was assigned a probability of being Muslim based on the estimated proportion of Muslim people in their country of birth (Pew Research Center, 2011). For example, a woman born in the USA was assigned a probability of being Muslim of 0.8%, whereas a woman born in Iran was assigned a probability of 99.7%.

Women were also assigned a measure of exposure to a ban, which was continuous in order to capture relative intensity of exposure. Using Google Trends (Google Inc., 2019), the exposure measure was constructed for each state as the ratio of search intensity for "Sharia" at the time a ban was passed relative to search interest in August of 2010, when anti-Islamic protests were receiving national attention. The ratio took on a value of zero for all women in states that never passed a ban. Ratios were root-transformed ( $M = 1.01$ ,  $SD = 0.63$ ,  $N = 558,605$ ). Further details on the Google Trends data, as well as analyses using alternate specifications of exposure intensity (raw, log-transformed, and cube-root transformed measures of search intensity) as robustness checks to this approach, are in Appendix B.

Demographic information that was available for all or nearly all women included age (measured continuously), race (categorized as non-Hispanic White, non-Hispanic Black, Hispanic, and Other), marital status (indicator for married vs not), nativity (indicator for immigrant vs not), and gravidity (indicator for primigravid vs not). Outcome measures included newborn sex at birth, birth weight in grams, and gestation length.

### **4.2.3 Descriptive Statistics**

Table 9 displays characteristics of births in states that passed a ban during the observation period (2007 to 2015) compared to those in states that never passed a ban. Mothers in states that passed a ban were, on average, younger (27.0 [5.9] vs. 27.9 [6.0] years), less likely to be married (54.8% vs. 60.0%), and less likely to be Hispanic (18.9% vs. 25.2%). There were roughly half as many mothers from Arab countries in states that passed a ban, though there were relatively few across both groups (0.42% vs. 0.76%), and the average assigned probability of being Muslim in states that passed a ban was nearly half that of other states (.016 vs. .026). Newborns in states that passed a ban were, on average, lighter (3270 [568] vs. 3310 [558] grams) and had a shorter gestation (38.6 [2.5] vs. 38.8 [2.3] weeks); sex ratio at birth was nearly identical across the two groups of states (51.2%).

**Table 9: Descriptive statistics for women who gave birth in states that ever passed a ban and those who gave birth in states that never passed a ban.**

	<b>Non-ban states</b> <i>Mean (SD) or %</i>	<b>Ban states</b> <i>Mean (SD) or %</i>
Age	27.9 (6.0)	27.0 (5.9)
Race		
White (NH)	54.8%	55.7%
Black (NH)	13.0%	21.0%
Hispanic	25.2%	18.9%
Other	7.0%	4.4%
Married	60.0%	54.8%
Non-native	21.9%	16.5%
Primigravid	40.4%	40.3%
Ramadan	77.6%	77.5%
Prob(Muslim)	0.026 (.118)	0.016 (.079)
Arab origin	0.76%	0.42%
Birth weight (g)	3,310 (558)	3,270 (568)
Gestation weeks	38.8 (2.3)	38.6 (2.5)
Male birth	51.2%	51.2%
<i>N</i>	26,842,773	6,880,715

Notes: Ramadan refers to women who were pregnant during the holy month of Ramadan, which is included as a covariate in later analyses as it may influence birth outcomes for those who practice fasting. Prob(Muslim) is the assigned probability a woman is Muslim based on country of birth. Arab origin refers to women who were born in an Arab country. NH = Non-Hispanic.

Within states that passed a ban, mothers who were pregnant at the time the ban was passed (“Exposed” mothers) are compared to those who were pregnant at other times (“Non-exposed”) in Table 10. Overall, exposed and non-exposed populations were demographically similar. Exposed mothers gave birth to newborns who were, on

**Table 10: Descriptive statistics for women who gave birth in states that ever passed a ban, split by those who were pregnant at the time a ban was passed (“Exposed”) and those who were pregnant at other times during the 2007 to 2015 period (“Non-exposed”).**

	<b>Non-exposed</b> <i>Mean (SD) or %</i>	<b>Exposed</b> <i>Mean (SD) or %</i>
Age	26.9 (5.9)	27.4 (5.9)
Race		
White (NH)	55.7%	56.0%
Black (NH)	21.2%	19.2%
Hispanic	18.8%	19.8%
Other	4.3%	4.9%
Married	54.7%	55.5%
Non-native	16.4%	17.8%
Primigravid	40.3%	39.9%
Ramadan	76.8%	85.4%
Prob(Muslim)	0.015 (.078)	0.018 (.090)
Arab	0.41%	0.56%
Birth weight (g)	3,267 (570)	3,299 (548)
Gestation weeks	38.6 (2.5)	38.8 (2.4)
Male	51.2%	51.2%
<i>N</i>	6,322,110	558,605

Notes: Ramadan refers to women who were pregnant during the holy month of Ramadan, which is included as a covariate in later analyses as it may influence birth outcomes for those who practice fasting. Prob(Muslim) is the assigned probability a woman is Muslim based on country of birth. Arab origin refers to women who were born in an Arab country. NH = Non-Hispanic.

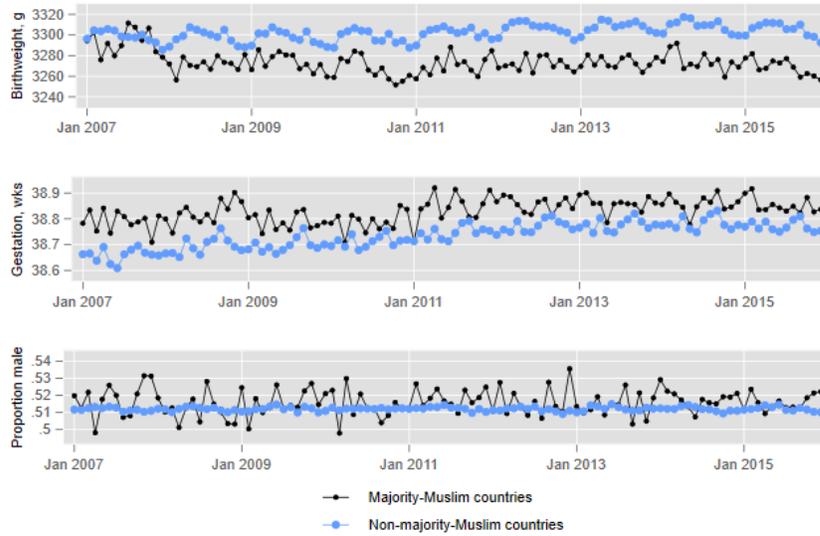
average, heavier (3299 [548] vs. 3267 [570] grams) and had longer gestations (38.8 [2.4] vs. 38.6 [2.5] weeks), although the sex ratio at birth was similar (51.2%) across both groups.

#### 4.2.4 Analyses

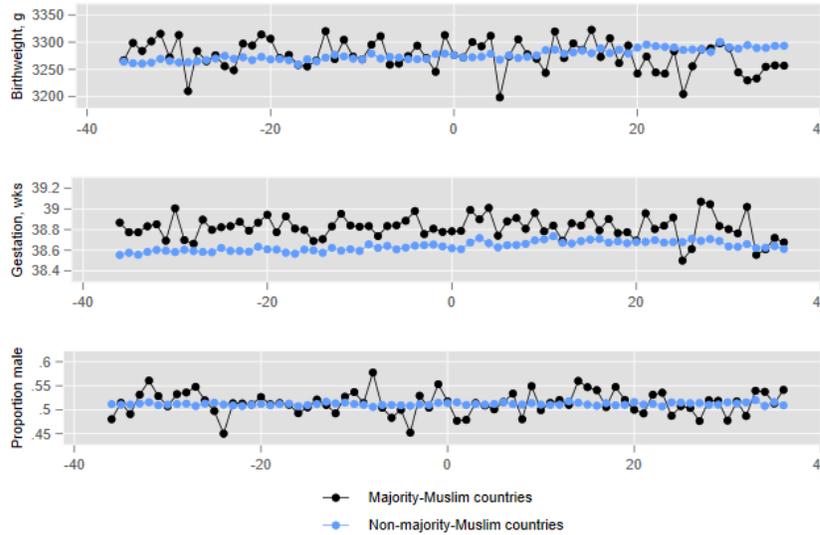
The effect of states enacting a ban was estimated using a generalized form of the difference-in-differences (DID) approach, a widely used analytic tool for estimating policy or intervention impact. In a typical DID, the change in outcome for the control group before and after the policy is subtracted from the change in outcome for the treated group before and after the policy. This approach accounts for all time-invariant differences between the two groups, including differences in mean levels of the outcome. This study uses a generalized form of that framework, in which continuous measures of exposure intensity and probability of being targeted replace the standard indicators used for treatment/control and pre/post. Because the stigmatizing nature of a ban stems from the act of passing the policy rather than any legal or material consequences, this study examines bans' effects only for the women who were pregnant at the time they were enacted, rather than comparing pre- and post-enactment.

An important caveat of DID is that it relies on the parallel trends assumption, which specifies that outcome trends did not differ between the two groups prior to treatment. For example, if local trends in birth outcomes over the months preceding enactment of a ban differed for Muslim women compared to non-Muslim women, the analysis would not be valid. Figure 6 examines this assumption, by showing all birth outcomes over time (Panel A) and then only in the ten states that passed bans over the three years leading up to and following enactment (Panel B). Outcomes are displayed

A: Over calendar months; all states



B: Over months relative to date ban was passed; only states which passed a ban



**Figure 6: Trends in birthweight, gestation length, and proportion of male births for women from majority-Muslim countries and women from all other countries. Panel A shows calendar months, while Panel B shows months relative to local passage of a Sharia ban.**

separately for women who were born in majority-Muslim countries (i.e., have an assigned probability of being Muslim greater than 0.50) versus those born in other countries.

Panel A shows that average levels of outcomes substantially differed between the two groups over time. After a brief period of higher birthweight newborns in 2007, women from majority-Muslim countries then consistently gave birth to lower birthweight newborns, and they consistently had longer average gestation lengths, relative to their peers from minority-Muslim countries. There was also greater variation over time in the sex ratio for women from majority-Muslim countries, likely related to the smaller size of the group. However, as seen in Panel B, the relative time trends for the two groups' sex ratio and average gestation length do not appreciably differ, and while trends in birthweight in months after a ban appear to differ between the two groups, the trends in birthweight prior to the passage of local bans appear similar. Overall, these visualizations support the parallel trend assumption, and suggest that DID is an appropriate analytic approach to identify the effect of state bans.

The formal regression specification for the DID analyses was as follows:

$$\begin{aligned} \text{logit}(Y_{ijmt}) = & \beta_0 + \beta_1 \text{MUSLIM}_i + \beta_2 \text{EXPOSE}_{jmt} + \beta_3 (\text{MUSLIM}_i \times \text{EXPOSE}_{jmt}) \\ & + (\text{MUSLIM}_i \times \text{TIME}_t) + (\text{MUSLIM}_i \times \text{RAMADAN}_{mt}) + X_{ijmt} \theta + \alpha_j \\ & + \sigma_m + \gamma_t + \varepsilon_{ijmt} \end{aligned}$$

Where  $i$ ,  $j$ ,  $m$ , and  $t$  were levels of individual, state, calendar month, and calendar year, respectively.  $Y$  represented the given outcomes of interest: male sex, which was specified in a logistic regression as seen above, and gestation length birth weight, which were specified in linear regressions (but otherwise modeled the same).  $MUSLIM_i$  was the assigned probability that a woman was Muslim based on their country of birth, and  $EXPOSE_{jmt}$  was the continuous measure of exposure intensity to a state ban. Thus  $\beta_3$  was the main coefficient of interest, representing the unique effect of passing a ban on Muslim women.

Control terms included continuous time trends for Muslim women and an indicator for being pregnant during Ramadan, as it has been shown to influence birth outcomes for pregnant Arab women (Almond & Mazumder, 2011). Individual covariates were estimated in  $X_{ijmt}$ , including age and age-squared, race, marital status, nativity, gravity, and newborn sex (for models of gestation length and birth weight). Finally,  $\alpha_j$ ,  $\sigma_m$ , and  $\gamma_t$  were state, month, and year fixed effects, respectively. Errors were clustered at the state level.

The main analyses consisted of separate models for newborn sex, gestation length, and birth weight for the whole population. Since maternal stress is expected to have different effects for male versus female fetuses (Bruckner & Catalano, 2018; R. Catalano & Bruckner, 2006), follow-up analyses explicitly tested moderation by newborn

sex by adding a ( $MUSLIM_i \times EXPOSE_{mt}$ )  $\times$  MALE interaction term, and models of gestation length and birth weight were run separately by newborn sex.

Several robustness checks were also carried out, including alternate specifications of the targeted group and narrowing of the exposure window to only include later in pregnancy. Falsification tests included analyses with “sham” bans created exactly one year prior to real bans, as well as separate analyses with assigned probabilities of different minority religions (Buddhist, Hindu, and unaffiliated) for each of the birth outcomes.

## **4.3 Results**

### **4.3.1 Main Analyses**

The results of the main DID analyses of state bans and newborn sex, gestation length, and birth weight are displayed in Table 11. State passage of a ban resulted in lower odds of a male birth for exposed Muslim women (interaction term  $OR = 0.94$ , 95%  $CI = [0.91 - 0.98]$ ). Exposure to a local ban was not associated with any change in newborn sex for the population overall, nor was the probability of being Muslim. There was no unique effect of exposure to state bans on Muslim women in terms of gestation length or newborn birth weight. Muslim women had newborns with lower birth weight on average ( $b = -47.2$ ,  $s.e. = 11.2$ ; corresponding to  $\sim 0.09 SD$ ), though they were no different in terms of gestation length. Exposure to a ban for the population as a whole

**Table 11: Difference-in-differences (DID) models of newborn sex, gestation length, and birthweight.**

	Male sex		Gestation (wks)		Birth weight (g)	
	OR	[95% CI]	<i>b</i>	( <i>s.e.</i> )	<i>b</i>	( <i>s.e.</i> )
<i>MUSLIM</i>	1.00	[1.00-1.00]	0.032	(0.032)	-47.2***	(11.2)
<i>EXPOSE</i>	1.00	[0.99-1.00]	0.127*	(0.060)	12.0*	(5.9)
<i>MUSLIM X EXPOSE</i>	0.94**	[0.91-0.98]	0.030	(0.054)	-4.9	(17.7)
<i>N</i>	33,723,488		33,723,488		33,723,488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight; all models include state, year, and calendar month fixed effects. Covariates included maternal age, race, marital status, gravity, an indicator for being non-native to the US, an interaction term between *MUSLIM* and an indicator for pregnancy during Ramadan, and linear time trends interacted with *MUSLIM*. Standard errors were clustered at the state level. Significance levels: \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

was associated with higher gestation length ( $b = 0.127$ ,  $s.e. = 0.060$ ; corresponding to  $\sim 0.05$  *SD*) and birth weight ( $b = 12.0$ ,  $s.e. = 5.9$ ; corresponding to  $\sim 0.02$  *SD*).

Follow-up analyses showed no significant moderation by newborn sex for the effect of state bans on Muslim women’s birth weight or gestation length. Sex-specific analyses of gestation length and birth weight are shown in Table 12. There were no unique effects of exposure to a state ban on birthweight or gestation length for either male or female newborns, and the estimates of the DID coefficients were similarly small in both groups.

**Table 12: Difference-in-differences (DID) models of gestation length and birthweight by newborn sex.**

	MALE NEWBORNS				FEMALE NEWBORNS			
	Gestation (wks)		Birth weight (g)		Gestation (wks)		Birth weight (g)	
	<i>b</i>	( <i>s.e.</i> )	<i>b</i>	( <i>s.e.</i> )	<i>b</i>	( <i>s.e.</i> )	<i>b</i>	( <i>s.e.</i> )
<i>MUSLIM</i>	0.037**	(0.014)	-41.3***	(3.303)	0.028*	(0.014)	-53.4***	(3.2)
<i>BAN</i>	0.13***	(0.004)	12.1***	(1)	0.12***	(0.004)	12.0***	(1.0)
<i>MUSLIM X BAN</i>	0.042	(0.047)	-6.1	(11.17)	0.017	(0.046)	-3.5	(10.6)
<i>N</i>	17,265,037		17,265,037		16,458,451		16,458,451	

Notes: Models were linear; all models include state, year, and calendar month fixed effects. Covariates included maternal age, race, marital status, gravity, indicator for being non-native to the US, interaction term between *MUSLIM* and an indicator for pregnancy during Ramadan, and linear time trends interacted with *MUSLIM*. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

The results of the full set of robustness checks are tabulated in Appendix C, while falsification tests are in Appendix D. They are summarized here only with respect to the main finding of interest: lower odds of a male being born to Muslim women exposed to state bans. In two alternate specifications of the targeted group (an indicator for women from Arab countries or an indicator for women from majority-Muslim countries), the estimated effect on newborn sex was similar to the main analysis (*ARAB X EXPOSE*:  $OR = 0.95$ ,  $95\% CI = [0.91 - 1.00]$ ; *MAJORITYMUSLIM X EXPOSE*:  $OR = 0.96$ ,  $95\% CI = [0.93 - 0.99]$ ). A model which excluded all women born in the USA ( $n = 7,024,167$ ) also estimated a similar effect on newborn sex as the main analysis (*MUSLIM X EXPOSE*:  $OR = 0.94$ ,  $95\% CI = [0.91 - 0.98]$ ). Finally, two models that identified exposure to state bans only late in pregnancy, minimizing any potential effects of voluntary abortions, also produced similar results, though less precisely estimated and not always statistically significant (*MUSLIM X post-20-week EXPOSE*:  $OR = 0.94$ ,  $95\% CI = [0.86 - 1.01]$ ; *MUSLIM X last trimester EXPOSE*:  $OR = 0.90$ ,  $95\% CI = [0.81 - 0.99]$ ).

In the first type of falsification test, sham dates of ban enactment were set exactly one year prior to their actual occurrence, and the main analysis was otherwise kept identical. There was a small but significant effect of exposure to a ban on the odds of a male birth across the entire population (*BAN*:  $OR = 0.99$ ,  $95\% CI = [0.99 - 1.00]$ ), but there was no association specific to Muslim women (*MUSLIM X EXPOSE*:  $OR = 0.97$ ,  $95\% CI = [0.94 - 1.01]$ ). In the second type of falsification test, alternative ‘placebo’ religious

identifications were used in place of Muslim. There were no significant effects of bans in either the Buddhist model (*BUDDHIST X EXPOSE*:  $OR = 1.05$ , 95%  $CI = [0.96 - 1.14]$ ), or the Unaffiliated model (*UNAFFILIATED X EXPOSE*:  $OR = 0.96$ , 95%  $CI = [0.87 - 1.06]$ ). Interestingly, the Hindu model produced estimates similar to that of the main analyses for Muslim women (*HINDU X EXPOSE*:  $OR = 0.91$ , 95%  $CI = [0.88 - 0.95]$ ).

#### **4.4 Discussion**

Policies can impact peoples' health; indeed, improvements in health are a goal behind many policy decisions. However, policy discussions often fail to consider the messages those policies may convey, and how those messages themselves may impact people's wellbeing. This study is one of few to investigate the stigmatizing effects of a policy – in this case, state bans of Sharia law. Passage of these policies was associated with changes in birth outcomes for Muslim women. Specifically, fewer males were born to Muslim women who were pregnant at the time a ban was passed, consistent with the stigmatizing policy acting as a population stressor for targeted women.

Passage of a Sharia law ban had no effect on the proportion of males born to the general population, but as a woman's likelihood of being Muslim rose, being pregnant at the time of ban enactment substantially lowered the odds of a male child being born. As an illustrative example, this corresponded to a predicted probability of 0.469 that a newborn is male for exposed women from Egypt (0.95 probability Muslim) living in Oklahoma, a state where the ban was highly publicized and controversial, compared to

a predicted probability of 0.510 for similarly exposed women from Switzerland (0.05 probability Muslim), or a probability of 0.501 for exposed women from Egypt living in Florida, where the ban received far less coverage. This finding held up to a broad set of robustness checks, including more restrictive specifications of the targeted group, examining exposure only late in pregnancy (suggesting that findings are not driven by voluntary terminations of pregnancies), and excluding the US native-born population of women. In all cases, the DID estimates were in the same direction as the main analysis, though the statistical power was reduced and thus not all were as precisely estimated.

The main analysis was also subject to a range of falsification tests. In the first approach, a set of “sham” exposures were constructed one year prior to actual policies; these had negligible effects on the sex ratio as the likelihood that exposed women were Muslim increased. In the second approach, individuals were assigned probabilities of identifying with minority religions other than Islam (Buddhism, Hinduism, or no religion/unaffiliated). There were no effects of bans conditional on women’s probability of being Buddhist or religiously unaffiliated, although the DID estimate for unaffiliated was similar to that for Muslim. Of particular note, however, the estimated effect of exposure to a ban as a woman’s probability of being Hindu increased was statistically significant and very similar to that for parallel analyses with Muslims. This may in part be due to the conflation of physical appearance with religious identity in the public’s view (Dunn, Klocker, & Salabay, 2007; Hopkins, Botterill, Sanghera, & Arshad, 2017),

and given high-profile examples of hate crimes involving mistaken identity, it is perhaps not surprising if anti-Islamic messaging also affects other religious minorities who may be viewed similarly by many Americans (Basu, 2016). Taken together, the falsification tests generally support findings from the main analyses, and provide additional insight into possible non-specificity of the policies' targeted groups.

The finding that a stigmatizing policy stressed targeted women and led to a lower newborn sex ratio is consistent with a wide body of research documenting population-level decreases in the sex ratio in response to stressors, pointing to a higher rate of male fetal loss (Bruckner et al., 2010; R. A. Catalano, 2003; Ralph Catalano, Bruckner, Anderson, & Gould, 2005; Ralph Catalano, Bruckner, Gould, Eskenazi, & Anderson, 2005; Torche & Kleinhaus, 2012). Although the mechanistic details of this process remain unknown, two explanatory theories include cohort "culling" – a selective pressure against the delivery of weaker male fetuses – and cohort "damage" – adverse developmental consequences that occur in response to the *in utero* environment (Bruckner & Catalano, 2018; R. Catalano & Bruckner, 2006). The two hypotheses have opposite implications for outcomes among surviving males: if "culling" occurs, surviving males would be expected to be more robust, whereas if "damage" occurs, they would be more frail overall. In this study, there was no unique effect of a state ban on birthweight or gestation length for births to Muslim women, and furthermore, the estimated coefficients were similarly small for male versus female newborns. Thus, with

the limited set of outcomes and window of time considered here, this study is not able to suggest either hypothesis over the other.

More broadly, however, this study builds upon previous research on institutional stigma and health in two main ways. First, this study examined a case in which the policy itself had no significant legal or material consequences, allowing any observed consequence to be more strongly attributed to the stigmatizing aspect of Sharia law bans. Prior research of institutional stigma or other non-material effects of policies has considered instances of marriage laws or immigration policies, in which any responses to messaging effects of the policies are difficult to separate from responses to the legal consequences of those policies (Hatzenbuehler et al., 2010; Raifman, Moscoe, Austin, & McConnell, 2017; Torche & Sirois, 2018). Second, this expanded previous research of stigmatized groups to include the Muslim population in the USA, an important religious minority group that receives comparatively less attention from researchers, in spite of persistently high levels of anti-Islamic sentiment (Pew Research Center, 2017).

There are a number of limitations of this study that should be noted. First, religious affiliation was inferred rather than observed, introducing an additional degree of measurement uncertainty. However, the findings were consistent across various alternative methods used to proxy for Muslim religious identity, providing reassurance that they are not driven solely by choice of religion proxy. Nonetheless, future research

on institutional stigma and disadvantage would benefit from incorporating data sources that include self-reported measures of religion, potentially by examining settings in which publicly available data include information on religion. Another limitation is that this study is unable to identify the proximal stressor to targeted women. In addition to the direct stress of a stigmatizing policy being passed, it is possible that the policy led to increased levels of interpersonal aggression or discrimination toward people perceived to be Muslim, which was then the more salient stressor for targeted women. Regardless of the mechanistic pathway, however, it is important to examine the role of policies, as they are generally a more relevant target for intervention or prevention efforts than the behaviors of the population at large. Finally, this study examined the case of one specific policy across a selection of states, and it is unclear whether the birth consequences observed here would translate to other policies or settings. Rather, future policy research should keep in mind that the institutional stigma attached to policies *can* lead to health consequences for targeted groups, and consider it on a case-by-case basis.

Overall, these findings provide evidence of negative population health consequences that stem from a stigmatizing policy, with effects appearing *in utero* for targeted women. This study suggests that policy makers should consider the potential messages their actions may convey to the population at large, and if necessary, the public should hold policy makers accountable for decisions with harmful consequences.

## 5. Conclusions

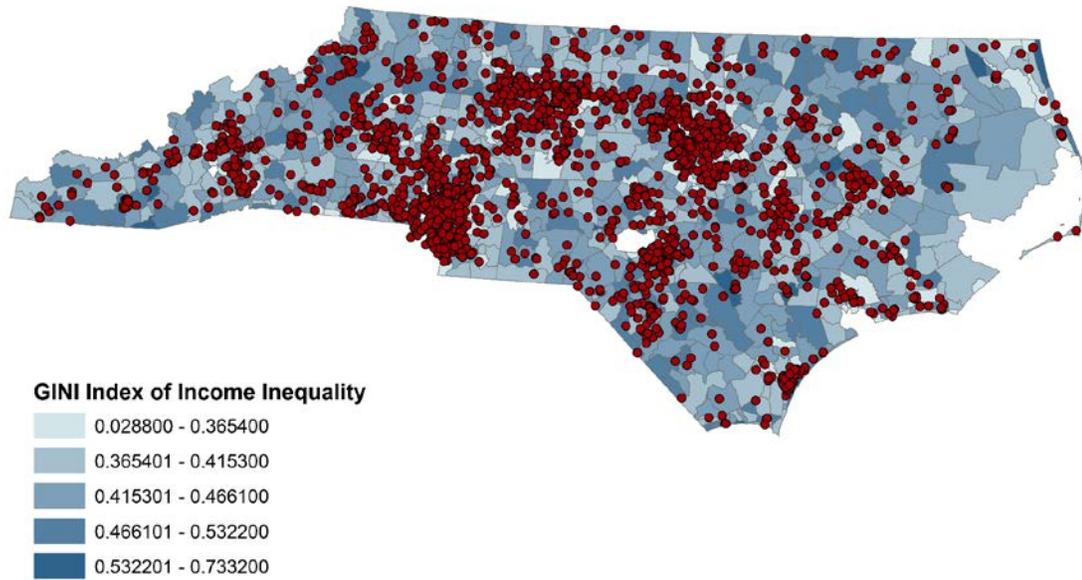
This dissertation examined ways that social disadvantage and health are connected across three studies. The first study investigated at what age mental health problems begin to track adolescents' perceptions of their social status, and the contextual factors that may influence perceptions of status. The second study described rates of reporting discrimination within healthcare and rates of foregoing medical care in France, and identified a potential explanatory role of discrimination toward disparities in foregone care for disadvantaged social groups. The final study used the case of state bans of Sharia law in the USA to examine policy-related stigma, and found evidence that stigmatizing policies can act as population-level stressors with consequences for maternal health. Overall, these three studies show how internalized perceptions of status, interpersonal interactions, and institutional actions can connect social disadvantage with inequalities in health.

## Appendix A: Supplemental figures and tables (Chapter 2)

**Table A1: Demographic characteristics of the Adolescents Survey, EMA subsample, and comparison population of North Carolina (NC) public school students**

Demographic	Adolescent Survey ( <i>N</i> = 2104)	EMA subsample ( <i>n</i> = 395)	Population ( <i>N</i> = 460,760)
Sex			
Male	47.91%	50.38%	51.38%
Female	52.09%	49.62%	48.62%
Race/ethnicity			
White	52.14%	60.57%	51.34%
Black	23.04%	19.33%	25.56%
Hispanic	14.50%	4.90%	15.04%
Asian	3.46%	2.06%	2.80%
American Indian	2.07%	1.03%	1.32%
Pacific Islander	0.19%	0.25%	0.10%
Multiracial <sup>1</sup>	13.42%	11.86%	3.83%
Economically disadvantaged			
No	53.65%	59.17%	44.65%
Yes	46.35%	40.83%	55.35%

Notes: The EMA subsample differed from the larger population of NC public school students and the Adolescent Survey sample, as it was comprised of a higher proportion of non-Hispanic white adolescents (60.6%, versus 51.3% in the population) and a lower proportion of adolescents in economically disadvantaged families (40.8% versus 55.4% in the population). Relative to the national population, NC has slightly lower percentage of non-Hispanic whites. <sup>1</sup> Multiracial was a mutually exclusive category in population demographics only.



**Figure A1: Geographic distribution of study participants and census tract-level income inequality across North Carolina. Each dot represents one participant.**

**Table A2: Associations of adolescents' subjective social status (SSS) with family, neighborhood, and school measures of socioeconomic status (SES).**

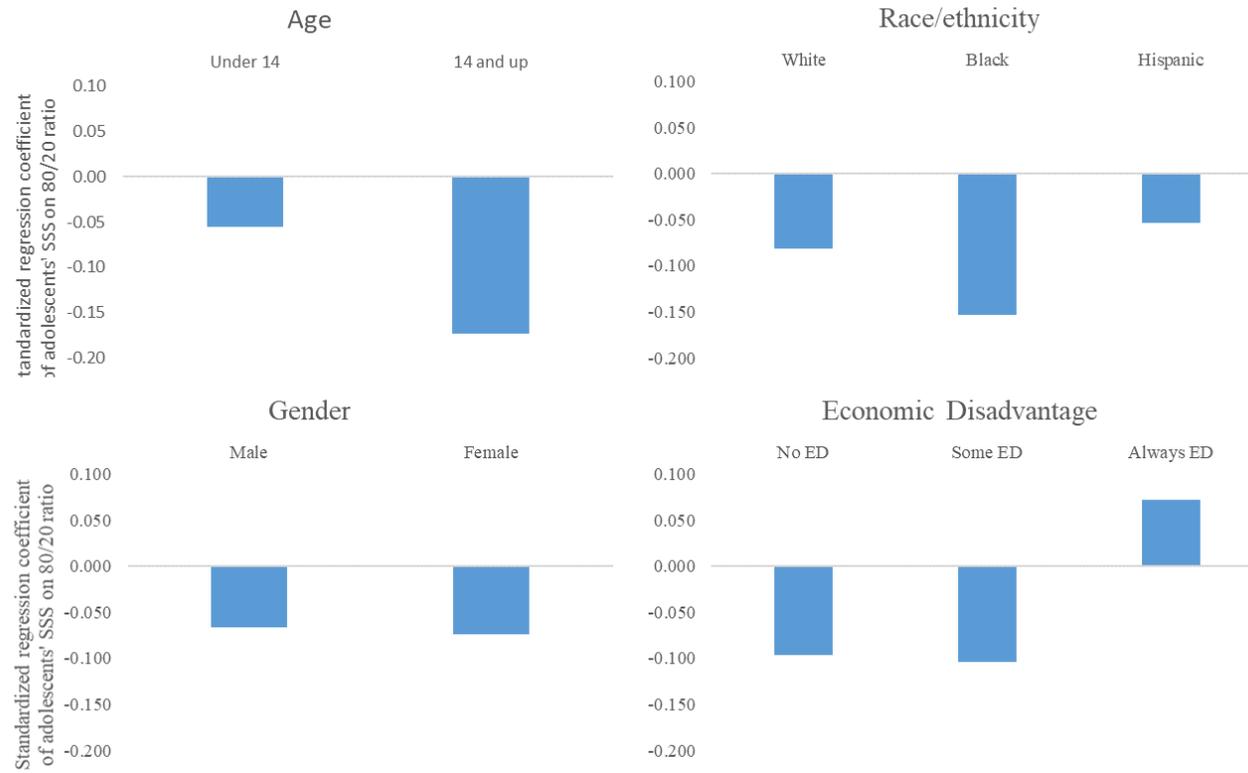
	SSS	
<i>Family SES</i>	<i>Under 14</i>	<i>14 and up</i>
Never ED	0.317***	0.278***
Intermittent ED	-0.0818	-0.0865
Persistent ED	-0.279***	-0.213**
N	211	169
<hr/>		
<i>Neighborhood SES</i>		
Neighborhood income	0.335***	0.338***
N	213	173
<hr/>		
<i>School SES</i>		
School % ED	-0.0931	-0.147
N	200	165

Notes: Standardized bivariate regression coefficients of adolescents' subjective social status (SSS) on various SES measures, by age. Estimated standard errors are robust. Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

**Table A3: Age-by-SES interactions predicting adolescents' subjective social status (SSS).**

SSS			
	Family SES	Neighborhood SES	School SES
	<i>b</i> ( <i>se</i> )	<i>b</i> ( <i>se</i> )	<i>b</i> ( <i>se</i> )
Age 14+	-0.107 ( 0.0884 )	-0.132 ( 0.108 )	0.0165 ( 0.165 )
Never ED ( <i>ref</i> )	-		
Intermittent ED	-0.293* ( 0.118 )		
Persistent ED	-0.450*** ( 0.0829 )		
Intermittent ED X age 14+	0.0180 ( 0.163 )		
Persistent ED X age 14+	0.0924 ( 0.128 )		
Neighborhood income		0.00549*** ( 0.000964 )	
Neighborhood income X age 14+		0.000807 ( 0.00154 )	
School % ED			-0.232 ( 0.185 )
School % ED X age 14+			-0.167 ( 0.278 )
N	380	386	365

Notes: Coefficients on interaction terms were not significant regardless of whether age was measured dichotomously, as above, or with a continuous measure. Coefficients are not standardized; standard errors are robust. Significance levels: \*:  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .



**Figure A2: Association between local inequality measured with the 80/20 ratio and adolescents' subjective social status (SSS), by various demographic and economic characteristics.**

## Appendix B: Supplemental information and robustness checks for measure of exposure to bans (Chapter 4)

Table B1: Relative Google Trend search interest for “Sharia” by state, for months in which bans were passed

State	Interest in Aug. 2010	Month of ban	Peak interest in 3 mos. surrounding ban	(Ratio of ban-month to Aug. 2010) <sup>.5</sup>
USA	100		NA	
North Carolina	76	08/2013	100	1.15
South Dakota	74	03/2012	33	.67
Kansas	70	05/2011	53	.87
Arizona	100	04/2011	56	.75
Tennessee	71	05/2010	21	.55
Oklahoma	10	11/2010	100	3.16
Louisiana	86	06/2010	0	0
Idaho	72	03/2010	32	.66
Alabama	77	11/2014	100	1.14
Mississippi	74	03/2015	51	.83
Florida	100	05/2014	67	.82

Notes: For all states except Mississippi, the time window over which Google Trend data were gathered was 01/2007 – 12/2014. Data from 2015 were not included, as search interest for “Sharia” rose dramatically that year in line with the US presidential campaign and the November terror attacks in Paris. This rise has the effect of suppressing interest values in previous months, making integer values less precise (i.e., the ratio is still roughly the same regardless of whether 2015 is included, but it is less precise). For Mississippi, 2015 was included since the ban occurred in that year.

**Table B2: Alternate specification of exposure: raw ratio of “Sharia” search intensity at ban month relative to Aug. 2010**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim Exposure	-47.09**	-11.17	0.0337	-0.0329	1	[1,1]
Muslim X Exposure	-0.235	-3.874	0.00598	-0.0111	0.978***	[0.966,0.989]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.334	-0.503***	-0.0143	0.980***	[0.978,0.982]
Hispanic	-57.84***	-6.001	-0.194***	-0.0167	0.987***	[0.984,0.989]
Other race	-157.0***	-13.34	-0.248***	-0.0164	1.004	[0.997,1.011]
Non-native	18.74*	-9.307	0.119***	-0.0306	1.003***	[1.002,1.005]
Non-native X Exposure	1.576	-2.299	0.0112	-0.00906	1	[0.996,1.003]
Married	76.96***	-6.674	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.957	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.04***	-0.878	0.0841***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-4E-05	1.000***	[1.000,1.000]
Muslim X Time	-0.472	-1.285	-0.00085	-0.00487	1	[0.998,1.001]
Ramadan	147.1***	-2.473	1.212***	-0.0352	0.973***	[0.971,0.975]
Muslim X Ramadan	-8.957**	-2.747	-0.0670**	-0.0213	1.009	[0.994,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	



Non-native X						
Exposure	4.325	-4.234	0.00365	-0.0214	1.004	[0.998,1.009]
Married	76.96***	-6.675	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.958	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.04***	-0.878	0.0841***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-4E-05	1.000***	[1.000,1.000]
Muslim X Time	-0.429	-1.292	-0.00053	-0.00493	1	[0.998,1.001]
Ramadan	147.1***	-2.464	1.211***	-0.0351	0.973***	[0.970,0.975]
Muslim X Ramadan	-8.943**	-2.752	-0.0669**	-0.0213	1.009	[0.994,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Exposure* was the log-transformation of the ratio of search intensity at the time of the ban to Aug. 2010 (all ratio values initially had a constant value of  $k = 0.2$  added to handle log transformation with zeros). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

**Table B4: Alternate specification of exposure: cube root transformation of "Sharia" search intensity at ban month relative to Aug. 2010**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim	-47.21***	-11.19	0.0319	-0.0328	1	[1,1]
Exposure	16.51**	-5.028	0.170***	-0.0432	0.998	[0.993,1.003]
Muslim X Exposure	-6.63	-21.73	0.0416	-0.0685	0.939*	[0.886,0.996]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.335	-0.503***	-0.0143	0.980***	[0.978,0.982]
Hispanic	-57.85***	-5.996	-0.194***	-0.0166	0.987***	[0.984,0.989]
Other race	-157.0***	-13.34	-0.248***	-0.0164	1.004	[0.997,1.011]
Non-native	18.65	-9.368	0.119***	-0.0309	1.003***	[1.002,1.004]
Non-native X						
Exposure	7.792	-7.445	0.00298	-0.0392	1.007	[0.998,1.016]
Married	76.96***	-6.675	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.958	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.03***	-0.878	0.0840***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-4E-05	1.000***	[1.000,1.000]
Muslim X Time	-0.427	-1.292	-0.00052	-0.00493	1	[0.998,1.001]
Ramadan	147.1***	-2.465	1.212***	-0.0351	0.973***	[0.970,0.975]
Muslim X Ramadan	-8.945**	-2.753	-0.0669**	-0.0213	1.009	[0.994,1.024]

State fixed effects	Y	Y	Y
Month fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
N	33723488	33723488	33723488

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Exposure* was the cube-root-transformation of the ratio of search intensity at the time of the ban to Aug. 2010. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

**Table B5: Alternate specification of exposure: indicator variable for any exposure to ban**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim	-47.21***	-11.2	0.0316	-0.0328	1	[1,1]
Exposure	20.49***	-1.946	0.204***	-0.0142	1	[0.994,1.006]
Muslim X Exposure	-8.555	-23.02	0.0445	-0.0786	0.943	[0.881,1.010]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.336	-0.503***	-0.0143	0.980***	[0.978,0.982]
Hispanic	-57.85***	-5.995	-0.194***	-0.0166	0.987***	[0.984,0.989]
Other race	-157.0***	-13.34	-0.248***	-0.0164	1.004	[0.997,1.011]
Non-native	18.64	-9.382	0.119***	-0.0309	1.003***	[1.002,1.004]

Non-native X						
Exposure	8.662	-7.963	-0.0128	-0.0433	1.006	[0.998,1.013]
Married	76.96***	-6.676	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.958	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.03***	-0.878	0.0840***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-4E-05	1.000***	[1.000,1.000]
Muslim X Time	-0.413	-1.295	-0.00041	-0.00495	1	[0.998,1.001]
Ramadan	147.1***	-2.473	1.212***	-0.0352	0.973***	[0.970,0.975]
Muslim X Ramadan	-8.979**	-2.757	-0.0672**	-0.0213	1.009	[0.994,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Exposure* was an indicator variable for any exposure to a ban (i.e., no Google Trend data was used). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

## Appendix C: Robustness checks of specification of targeted group (Chapter 4)

Table C1: Alternate specification of targeted group: mothers from Arab countries only

	Birth weight		Gestation Length		Male	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	95% <i>CI</i>
Arab Exposure	-41.50**	-14.61	0.0695	-0.0412	1.009	[0.989,1.029]
Arab X Exposure	11.94*	-5.825	0.127*	-0.0526	0.997	[0.994,1.001]
	-11.85	-18.48	0.0313	-0.0719	0.954*	[0.911,0.999]
Male	112.6***	-1.656	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-207.4***	-3.328	-0.504***	-0.0144	0.980***	[0.978,0.982]
Hispanic	-56.22***	-5.85	-0.193***	-0.016	0.987***	[0.985,0.989]
Other race	-159.2***	-13.49	-0.248***	-0.0169	1.005	[0.998,1.012]
Non-native	16.12	-9.007	0.117***	-0.0305	1.003***	[1.001,1.004]
Non-native X Exposure	7.505	-6.394	0.0174	-0.0285	1.002	[0.992,1.013]
Married	76.56***	-6.677	0.157***	-0.00823	1.005***	[1.003,1.007]
Primigravid	-65.15***	-2.954	0.193***	-0.00843	1.003**	[1.001,1.004]
Age	23.05***	-0.875	0.0841***	-0.00252	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-0.0000399	1.000***	[1.000,1.000]
Arab X Time	-2.866	-2.1	-0.00735	-0.0076	1.001	[0.998,1.003]
Ramadan	146.9***	-2.456	1.210***	-0.0354	0.973***	[0.971,0.975]
Arab X Ramadan	-9.922*	-4.025	-0.0496*	-0.0209	1.015	[0.994,1.037]

State fixed effects	Y	Y	Y
Month fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
N	33723488	33723488	33723488

Notes: Models were logistic for male sex and linear for gestation length and birthweight. *Arab* is an indicator variable for women who were born in Arab countries. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

**Table C2: Alternate specification of targeted group: mothers from majority-Muslim countries only**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Majority-Muslim Exposure	-45.52***	-8.959	0.0187	-0.0273	0.999	[0.987,1.011]
Majority-Muslim X Exposure	0.0891	-14.09	0.035	-0.0453	0.960*	[0.930,0.992]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-207.4***	-3.366	-0.503***	-0.0145	0.980***	[0.978,0.982]
Hispanic	-57.62***	-5.938	-0.196***	-0.0162	0.987***	[0.984,0.989]
Other race	-157.7***	-13.39	-0.249***	-0.0165	1.004	[0.997,1.011]
Non-native	18.46	-9.257	0.121***	-0.0306	1.003***	[1.002,1.005]

Non-native X Exposure	6.817	-6.575	0.0162	-0.0287	1.003	[0.993,1.014]
Married	76.89***	-6.674	0.158***	-0.00824	1.005***	[1.003,1.007]
Primigravid	-65.16***	-2.954	0.193***	-0.00848	1.003**	[1.001,1.004]
Age	23.00***	-0.874	0.0840***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.015	-0.00179***	-0.0000401	1.000***	[1.000,1.000]
Majority-Muslim X Time	-1.927	-1.135	-0.00439	-0.00462	1.001	[0.999,1.002]
Ramadan	147.0***	-2.456	1.211***	-0.0352	0.973***	[0.971,0.975]
Majority-Muslim X Ramadan	-9.336***	-2.181	-0.0602**	-0.0176	1.009	[0.995,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. *Majority-Muslim* is an indicator variable for women who were born in majority-Muslim countries (as of estimates for 2010; (Pew Research Center, 2011)). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

Table C3: Alternate specification of targeted group: mothers from USA excluded

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim Exposure	-54.30***	-9.83	-0.0198	-0.0318	1	[1,1]
Muslim X Exposure	10.78	-6.717	0.140*	-0.0541	1.003	[0.992,1.015]
Muslim X Exposure	1.865	-9.686	0.0165	-0.0386	0.944**	[0.906,0.983]
Male	101.0***	-1.468	-0.131***	-0.0041		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-116.3***	-16.14	-0.342***	-0.0468	0.981***	[0.972,0.990]
Hispanic	-55.67***	-4.969	-0.166***	-0.0204	0.982***	[0.975,0.989]
Other race	-174.6***	-3.611	-0.208***	-0.00911	1.008*	[1.000,1.015]
Married	22.82***	-1.338	0.0949***	-0.00906	1.004*	[1.000,1.007]
Primigravid	-88.61***	-1.652	0.143***	-0.0119	1.002	[0.999,1.005]
Age	29.90***	-0.951	0.107***	-0.00694	0.998*	[0.997,1.000]
Age^2	-0.479***	-0.0146	-0.00219***	-0.000119	1	[1.000,1.000]
Muslim X Time	0.559	-0.783	0.00788*	-0.00378	1	[0.998,1.002]
Ramadan	130.2***	-4.219	1.140***	-0.0673	0.970***	[0.967,0.974]
Muslim X Ramadan	4.859	-3.504	-0.0303	-0.0204	1.011	[0.995,1.027]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. Standard

errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

**Table C4: Alternate specification: exposure to ban after approximately 20 weeks' gestation**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim	-47.12***	-11.17	0.0332	-0.0328	1	[1,1]
20wk+ Exposure	24.32**	-8.784	0.233**	-0.0758	0.996	[0.990,1.003]
Muslim X 20wk+ Exposure	0.0504	-16.53	0.00416	-0.0784	0.935	[0.863,1.014]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.335	-0.503***	-0.0143	0.980***	[0.978,0.982]
Hispanic	-57.85***	-5.999	-0.194***	-0.0167	0.987***	[0.984,0.989]
Other race	-157.0***	-13.34	-0.248***	-0.0164	1.004	[0.997,1.011]
Non-native	18.66	-9.342	0.119***	-0.0308	1.003***	[1.002,1.004]
Non-native X 20wk+ Exposure	7.083	-7.114	0.0327	-0.0235	1.002	[0.991,1.014]
Married	76.96***	-6.675	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.958	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.04***	-0.878	0.0841***	-0.00254	0.998***	[0.997,0.998]

Age^2	-0.370***	-0.0151	-0.00179***	-0.0000401	1.000***	[1.000,1.000]
Muslim X Time	-0.462	-1.286	-0.000712	-0.00488	1	[0.998,1.001]
Ramadan	147.0***	-2.466	1.211***	-0.035	0.973***	[0.971,0.975]
Muslim X Ramadan	-8.950**	-2.747	-0.0669**	-0.0213	1.009	[0.994,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

**Table C5: Alternate specification: exposure to ban in last trimester only**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim	-46.82***	-11.16	0.0359	-0.0333	1	[1,1]
Last-tri Exposure	-5.51	-3.477	-0.0441	-0.0229	1.002	[0.996,1.009]
Muslim X Last-tri Exposure	-15.65	-16.96	-0.0917	-0.0888	0.898*	[0.814,0.989]

Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.337	-0.503***	-0.0144	0.980***	[0.978,0.982]
Hispanic	-57.88***	-5.995	-0.195***	-0.0166	0.987***	[0.984,0.989]
Other race	-157.0***	-13.35	-0.248***	-0.0165	1.004	[0.997,1.011]
Non-native	18.48	-9.31	0.117***	-0.0307	1.003***	[1.002,1.005]
Non-native X Last- tri Exposure	19.66*	-9.599	0.150**	-0.0472	1	[0.990,1.011]
Married	76.95***	-6.675	0.158***	-0.00823	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.958	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.04***	-0.878	0.0841***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-0.0000402	1.000***	[1.000,1.000]
Muslim X Time	-0.496	-1.285	-0.00106	-0.00487	1	[0.998,1.001]
Ramadan	147.1***	-2.477	1.212***	-0.0353	0.973***	[0.970,0.975]
Muslim X Ramadan	-9.031**	-2.751	-0.0675**	-0.0214	1.008	[0.994,1.024]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

## Appendix D: Falsification tests of main DID analyses (Chapter 4)

Table D1: Falsification test: sham dates of ban enactment one year prior to actual date

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Muslim	-46.97***	-11.19	0.034	-0.0328	1	[1,1]
Sham Exposure	11.25*	-4.638	0.115**	-0.0357	0.993***	[0.990,0.997]
Muslim X Sham Exposure	-9.06	-14.28	-0.00927	-0.0336	0.974	[0.943,1.007]
Male	112.6***	-1.657	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-206.9***	-3.336	-0.503***	-0.0143	0.980***	[0.978,0.982]
Hispanic	-57.87***	-5.995	-0.194***	-0.0166	0.987***	[0.984,0.989]
Other race	-157.0***	-13.34	-0.248***	-0.0165	1.004	[0.997,1.011]
Non-native	18.55	-9.33	0.119***	-0.0308	1.003***	[1.002,1.005]
Non-native X Sham Exposure	13.49	-7.988	0.0363	-0.0282	0.999	[0.989,1.008]
Married	76.95***	-6.675	0.158***	-0.00822	1.005***	[1.003,1.007]
Primigravid	-65.04***	-2.957	0.193***	-0.00844	1.003**	[1.001,1.004]
Age	23.04***	-0.878	0.0841***	-0.00254	0.998***	[0.997,0.998]
Age^2	-0.370***	-0.0151	-0.00179***	-0.0000402	1.000***	[1.000,1.000]
Muslim X Time	-0.468	-1.286	-0.000836	-0.00488	1	[0.998,1.001]
Ramadan	147.1***	-2.46	1.212***	-0.0352	0.973***	[0.971,0.975]
Muslim X Ramadan	-8.972**	-2.751	-0.0671**	-0.0213	1.009	[0.994,1.024]

State fixed effects	Y	Y	Y
Month fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
N	33723488	33723488	33723488

Notes: Models were logistic for male sex and linear for gestation length and birthweight. *Sham Exposure* is a measure of exposure created in an identical fashion to the measure in the main analysis, but the exposed women were those who were pregnant exactly one month prior to the actual passage of a local ban. Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

**Table D2: Falsification test: identification on probability of being Buddhist**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>		
Buddhist Exposure	-54.56	-29.9	-0.0272	-0.108	1	[1,1]
Buddhist X Exposure	11.94	-5.98	0.127*	-0.053	0.997*	[0.994,1.000]
	2.041	-15.12	0.0325	-0.0509	1.047	[0.958,1.143]
Male	112.6***	-1.654	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-207.6***	-3.246	-0.504***	-0.0144	0.980***	[0.978,0.982]

Hispanic	-54.67***	-5.667	-0.193***	-0.0153	0.986***	[0.984,0.989]
Other race	-151.6***	-15.12	-0.245***	-0.0183	1.003	[0.997,1.009]
Non-native	13.21	-8.792	0.117***	-0.0306	1.004***	[1.002,1.006]
Non-native X Exposure	7.204	-6.282	0.0173	-0.0294	1	[0.988,1.013]
Married	76.07***	-6.699	0.157***	-0.00832	1.005***	[1.003,1.007]
Primigravid	-65.01***	-2.952	0.193***	-0.0084	1.003**	[1.001,1.004]
Age	23.13***	-0.881	0.0841***	-0.0025	0.998***	[0.997,0.998]
Age^2	-0.371***	-0.0152	-0.00179***	-0.0000397	1.000***	[1.000,1.000]
Muslim X Time	2.899*	-1.172	0.0134***	-0.00375	0.997	[0.994,1.000]
Ramadan	147.2***	-2.36	1.211***	-0.0343	0.973***	[0.971,0.975]
Buddhist X Ramadan	-18.70*	-8.378	-0.0852	-0.089	0.987	[0.962,1.014]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Buddhist* refers to the probability that a given mother is Buddhist, based on country of birth and Pew Research Center data (Pew Research Center, 2011). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

**Table D3: Falsification test: identification on probability of being Hindu**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Hindu Exposure	-142.0***	-26.31	0.0538	-0.055	1	[1,1]
Hindu X Exposure	11.93*	-5.834	0.127*	-0.0527	0.997	[0.994,1.001]
Hindu X Exposure	-2.124	-9.044	0.0495	-0.056	0.913***	[0.875,0.953]
Male	112.6***	-1.655	-0.112***	-0.00313		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-207.3***	-3.283	-0.504***	-0.0144	0.980***	[0.978,0.982]
Hispanic	-55.51***	-5.76	-0.193***	-0.0154	0.986***	[0.984,0.989]
Other race	-140.4***	-15.07	-0.242***	-0.0181	1.004	[0.997,1.011]
Non-native	16.76	-9.198	0.118***	-0.031	1.004***	[1.003,1.006]
Non-native X Exposure	7.2	-6.528	0.0166	-0.0294	1.004	[0.993,1.015]
Married	77.14***	-6.746	0.158***	-0.00838	1.005***	[1.003,1.007]
Primigravid	-64.39***	-2.996	0.193***	-0.00831	1.003**	[1.001,1.004]
Age	23.56***	-0.865	0.0843***	-0.00252	0.998***	[0.997,0.998]
Age^2	-0.379***	-0.0149	-0.00180***	-0.0000405	1.000***	[1.000,1.000]
Muslim X Time	-1.01	-0.571	-0.000103	-0.00285	0.997	[0.992,1.001]
Ramadan	147.0***	-2.443	1.211***	-0.0352	0.973***	[0.971,0.975]
Hindu X Ramadan	-12.58***	-3.414	-0.137***	-0.0254	0.979	[0.957,1.003]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	

N 33723488 33723488 33723488

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Hindu* refers to the probability that a given mother is Hindu, based on country of birth and Pew Research Center data (Pew Research Center, 2011). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\* :  $p < .01$ ; \*\*\* :  $p < .001$ .

**Table D4: Falsification test: identification on probability of being religiously unaffiliated**

	Birth weight		Gestation Length		Male	95% CI
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	
Unaffiliated	-10.58	-35.27	0.0442	-0.131	1	[1,1]
Exposure	5.619	-6.263	0.144*	-0.0644	1.004	[0.986,1.022]
Unaffiliated X Exposure	37.38	-21.66	-0.109	-0.0892	0.961	[0.871,1.061]
Male	112.6***	-1.656	-0.112***	-0.00314		
White (ref)	0	(.)	0	(.)	1	[1,1]
Black	-207.1***	-3.292	-0.502***	-0.0145	0.981***	[0.979,0.983]
Hispanic	-53.25***	-5.878	-0.190***	-0.0155	0.987***	[0.984,0.989]
Other race	-160.7***	-14.67	-0.261***	-0.0201	1.002	[0.995,1.008]
Non-native	17.1	-8.579	0.131***	-0.0265	1.007***	[1.005,1.009]
Non-native X Exposure	10.84	-6.563	0.0132	-0.0274	0.998	[0.980,1.017]

Married	76.12***	-6.712	0.157***	-0.00838	1.005***	[1.003,1.007]
Primigravid	-65.25***	-3.026	0.192***	-0.00822	1.002**	[1.001,1.004]
Age	23.20***	-0.891	0.0842***	-0.00251	0.998***	[0.997,0.998]
Age^2	-0.373***	-0.0154	-0.00180***	-0.0000389	1.000***	[1.000,1.000]
Unaffiliated X Time	13.15***	-2.896	0.0561**	-0.0204	1.005**	[1.002,1.009]
Ramadan	143.3***	-2.426	1.223***	-0.0402	0.975***	[0.971,0.978]
Hindu X Ramadan	23.67**	-7.984	-0.0873	-0.0541	0.99	[0.974,1.005]
State fixed effects	Y		Y		Y	
Month fixed effects	Y		Y		Y	
Year fixed effects	Y		Y		Y	
N	33723488		33723488		33723488	

Notes: Models were logistic for male sex and linear for gestation length and birthweight. In this analysis, *Unaffiliated* refers to the probability that a given mother is religiously unaffiliated, based on country of birth and Pew Research Center data (Pew Research Center, 2011). Standard errors were clustered at the state level. Significance levels: \* :  $p < .05$ ; \*\*:  $p < .01$ ; \*\*\*:  $p < .001$ .

## References

- Adida, C. L., Laitin, D. D., & Valfort, M.-A. (2010). Identifying barriers to Muslim integration in France. *Proceedings of the National Academy of Sciences*, 107(52), 22384–22390. <https://doi.org/10.1073/pnas.1015550107>
- Adler, N. E., & Stewart, J. (2010). Health disparities across the lifespan: Meaning, methods, and mechanisms. *Annals of the New York Academy of Sciences*, 1186, 5–23. <https://doi.org/10.1111/j.1749-6632.2009.05337.x>
- Allin, S., & Masseria, C. (2009). Unmet need as an indicator of health care access. *Eurohealth*, 15(3), 7–9.
- Almond, D., & Mazumder, B. (2011). Health Capital and the Prenatal Environment: The Effect of Maternal Fasting During Pregnancy. *American Economic Journal: Applied Economics*, 3(4), 56–85. <https://doi.org/10.1257/app.3.4.56>
- Baron, S. L., Steege, A. L., Marsh, S. M., Menéndez, C. C., & Myers, J. R. (2013). CDC Health Disparities and Inequalities Report- United States, 2013. *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, D.C. : 2002)*. <https://doi.org/PMID: 24264501>
- Basu, M. (2016). 15 years after 9/11, Sikhs still victims of anti-Muslim hate crimes. Retrieved from <https://www.cnn.com/2016/09/15/us/sikh-hate-crime-victims/index.html>
- Beauchemin, C., Hamel, C., & Simon, P. (Eds.). (2018). *Trajectories and Origins: Survey on the Diversity of the French Population* (Vol. 8). Springer.
- Belfer, M. L. (2008). Child and adolescent mental disorders: The magnitude of the problem across the globe. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 49(3), 226–236. <https://doi.org/10.1111/j.1469-7610.2007.01855.x>
- Bleich, E. (2009). Where do Muslims stand on ethno-racial hierarchies in Britain and France? Evidence from public opinion surveys, 1988-2008. *Patterns of Prejudice*, 43(3–4), 379–400. <https://doi.org/10.1080/00313220903109326>

- Blewett, L. A., Johnson, P. J., & Mach, A. L. (2010). Immigrant children's access to health care: Differences by global region of birth. *Journal of Health Care for the Poor and Underserved, 21*, 13–31. <https://doi.org/10.1353/hpu.0.0315>
- Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology, 53*(1), 371–399. <https://doi.org/10.1146/annurev.psych.53.100901.135233>
- Braveman, P. A., Kumanyika, S., Fielding, J., LaVeist, T., Borrell, L. N., Manderscheid, R., & Troutman, A. (2011). Health disparities and health equity: The issue is justice. *American Journal of Public Health, 101*(SUPPL. 1), 1–7. <https://doi.org/10.2105/AJPH.2010.300062>
- Braveman, P., & Gruskin, S. (2003). Defining equity in health. *Journal of Epidemiology & Community Health, 57*(January 2006), 254–258. <https://doi.org/10.1136/jech.57.4.254>
- Brinbaum, C., Safi, M., & Simon, P. (2015). Les discriminations en France: Entre perception et expérience. In C. Beauchemin, C. Hamel, & P. Simon (Eds.), *Trajectoires et origines. Enquête sur la diversité des populations en France* (pp. 413–442). Paris: Éditions de l'Ined.
- Bruckner, T. A., & Catalano, R. (2018). Selection in utero and population health: Theory and typology of research. *SSM - Population Health, 5*(May), 101–113. <https://doi.org/10.1016/j.ssmph.2018.05.010>
- Bruckner, T. A., Catalano, R., & Ahern, J. (2010). Male fetal loss in the U.S. following the terrorist attacks of September 11, 2001. *BMC Public Health, 10*, 273. <https://doi.org/10.1186/1471-2458-10-273>
- Burgard, S. A., & Hawkins, J. M. (2014). Race/ethnicity, educational attainment, and foregone health care in the United States in the 2007-2009 recession. *American Journal of Public Health, 104*(2), 134–141. <https://doi.org/10.2105/AJPH.2013.301512>
- Buttrick, N. R., & Oishi, S. (2017). The psychological consequences of income inequality. *Social and Personality Psychology Compass, 11*(3), e12304.

<https://doi.org/10.1111/spc3.12304>

- Catalano, R. A. (2003). Sex ratios in the two Germanies: A test of the economic stress hypothesis. *Human Reproduction*, *18*(9), 1972–1975.  
<https://doi.org/10.1093/humrep/deg370>
- Catalano, R., & Bruckner, T. (2006). Secondary sex ratios and male lifespan: Damaged or culled cohorts. *Proceedings of the National Academy of Sciences*, *103*(5), 1639–1643. <https://doi.org/10.1073/pnas.0510567103>
- Catalano, R., Bruckner, T., Anderson, E., & Gould, J. B. (2005). Fetal death sex ratios: A test of the economic stress hypothesis. *International Journal of Epidemiology*, *34*(4), 944–948. <https://doi.org/10.1093/ije/dyi081>
- Catalano, R., Bruckner, T., Gould, J., Eskenazi, B., & Anderson, E. (2005). Sex ratios in California following the terrorist attacks of September 11, 2001. *Human Reproduction*, *20*(5), 1221–1227.  
<https://doi.org/10.1093/humrep/deh763>
- Chen, E., & Paterson, L. Q. (2006). Neighborhood, family, and subjective socioeconomic status: How do they relate to adolescent health? *Health Psychology*, *25*(6), 704–714. <https://doi.org/10.1037/0278-6133.25.6.704>
- Clark, R., Anderson, N. B., Clark, V. R., & Williams, D. R. (1999). Racism as a stressor for African Americans. A biopsychosocial model. *The American Psychologist*, *54*(10), 805–816. <https://doi.org/10.1037/0003-066X.54.10.805>
- Cognet, M., Hamel, C., & Moisy, M. (2012). Santé des migrants en France®: l'effet des discriminations liées à l'origine et au sexe. *Revue Européenne Des Migrations Internationales*, *28*(2), 11–34.
- Cotterell, B. (2014). Florida legislature forbids use of foreign law in state court. Retrieved from <https://www.reuters.com/article/us-usa-florida-sharialaw/florida-legislature-forbids-use-of-foreign-law-in-state-court-idUSBREA3T14H20140430>
- Destin, M., Rheinschmidt-Same, M., & Richeson, J. A. (2017). Status-based

- identity: A conceptual approach integrating the social psychological study of socioeconomic status and identity. *Perspectives on Psychological Science*, 12(2), 270–289. <https://doi.org/10.1177/1745691616664424>
- Destin, M., Richman, S., Varner, F., & Mandara, J. (2012). “Feeling” hierarchy: The pathway from subjective social status to achievement. *Journal of Adolescence*, 35(6), 1571–1579. <https://doi.org/10.1016/j.adolescence.2012.06.006>
- DuBard, C. A., Garrett, J., & Gizlice, Z. (2006). Effect of language on heart attack and stroke awareness among U.S. hispanics. *American Journal of Preventive Medicine*, 30(3), 189–196. <https://doi.org/10.1016/j.amepre.2005.10.024>
- Duncan, G. J., & Murnane, R. T. (2014). Growing income inequality threatens American education. *The Phi Delta Kappan*, 95(6), 8–14. <https://doi.org/10.1177/003172171409500603>
- Dunn, K. M., Klocker, N., & Salabay, T. (2007). Contemporary racism and Islamophobia in Australia: Racializing religion. *Ethnicities*, 7(4), 564–589. <https://doi.org/10.1177/1468796807084017>
- Durand-Zaleski, I. (2015). *The French health care system, 2014*. (E. Mossialos, M. Wenzl, R. Osborn, & C. Anderson, Eds.), *International Profiles of Health Care Systems*. Retrieved from [https://accessh.org/wp-content/uploads/2015/02/1802\\_Mossialos\\_intl\\_profiles\\_2014\\_v6.pdf](https://accessh.org/wp-content/uploads/2015/02/1802_Mossialos_intl_profiles_2014_v6.pdf)
- Edwards, J. (2014). Alabama Voters Pass Sharia Law Ban. Retrieved January 10, 2017, from [http://www.huffingtonpost.com/2014/11/05/alabama-sharia-law\\_n\\_6105086.html](http://www.huffingtonpost.com/2014/11/05/alabama-sharia-law_n_6105086.html)
- Elgar, F. J., Pfortner, T. K., Moor, I., De Clercq, B., Stevens, G. W. J. M., & Currie, C. (2015). Socioeconomic inequalities in adolescent health 2002-2010: A time-series analysis of 34 countries participating in the Health Behaviour in School-aged Children study. *The Lancet*, 385(9982), 2088–2095. [https://doi.org/10.1016/S0140-6736\(14\)61460-4](https://doi.org/10.1016/S0140-6736(14)61460-4)
- Eurostat. (2018). Population on 1 January by age group, sex and country of birth.

Retrieved from

[http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=migr\\_pop3ctb&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=migr_pop3ctb&lang=en)

- Favell, A. (2016). *Philosophies of integration: Immigration and the idea of citizenship in France and Britain*. Basingstoke: Palgrave MacMillan.
- Friedman, J. Y., Anstrom, K. J., Weinfurt, K. P., McIntosh, M., Bosworth, H. B., Oddone, E. Z., ... Schulman, K. A. (2005). Perceived racial/ethnic bias in healthcare in Durham County, North Carolina: A comparison of community and national samples. *North Carolina Medical Journal, 66*(4), 267–275.
- Furukawa, T. A., Kessler, R. C., Slade, T., & Andrews, G. (2003). The performance of the K6 and K10 screening scales for psychological distress in the Australian National Survey of Mental Health and Well-Being. *Psychological Medicine, 33*(2), 357–362. <https://doi.org/10.1017/S0033291702006700>
- Geng, E. H., Nash, D., Kambugu, A., Zhang, Y., Braitstein, P., Christopoulos, K. A., ... Martin, J. N. (2010). Retention in care among HIV-infected patients in resource-limited settings: Emerging insights and new directions. *Current HIV/AIDS Reports, 7*(4), 234–244. <https://doi.org/10.1007/s11904-010-0061-5>
- Geronimus, A. T., & Thompson, J. P. (2004). To Denigrate, Ignore, or Disrupt: Racial Inequality in Health and the Impact of a Policy-induced Breakdown of African American Communities. *Du Bois Review, 1*(2), 247–279. <https://doi.org/10.1017/S1742058X04042031>
- Ghaed, S. G., & Gallo, L. C. (2007). Subjective social status, objective socioeconomic status, and cardiovascular risk in women. *Health Psychology, 26*(6), 668–674. <https://doi.org/10.1037/0278-6133.26.6.668>
- Goodman, E., Adler, N. E., Kawachi, I., Frazier, A. L., Huang, B., & Colditz, G. A. (2001). Adolescents' perceptions of social status: Development and evaluation of a new indicator. *Pediatrics, 108*(2), 1–8. <https://doi.org/10.1542/peds.108.2.e31>
- Goodman, E., Huang, B., Schafer-Kalkhoff, T., & Adler, N. E. (2007). Perceived

- socioeconomic status: A new type of identity that influences adolescents' self-rated health. *Journal of Adolescent Health*, 41(5), 479–487.  
<https://doi.org/10.1016/j.jadohealth.2007.05.020>
- Goodman, E., Maxwell, S., Malspeis, S., & Adler, N. (2015). Developmental trajectories of subjective social status. *Pediatrics*, 136(3), e633–e640.  
<https://doi.org/10.1542/peds.2015-1300>
- Google Inc. (2019). Google Trends. Retrieved from  
<https://www.google.com/trends>
- Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Improving the K6 short scale to predict serious emotional disturbance in adolescents in the USA. *International Journal of Methods in Psychiatric Research*, 19(S1), 23–35. <https://doi.org/10.1002/mpr.314>
- Hamel, C., Lesné, M., & Primon, J.-L. (2015). La place du racisme dans l'étude des discriminations. In C. Beauchemin, C. Hamel, & P. Simon (Eds.), *Trajectoires et origines. Enquête sur la diversité des populations en France* (pp. 443–470). Paris: Éditions de l'Ined.
- Hamel, C., & Moisy, M. (2015). Migration et conditions de vie: Leur impact sur la santé. In *Trajectoires et origines. Enquête sur la diversité des populations en France* (pp. 263–287). Paris: Éditions de l'Ined.
- Hargreaves, A. G. (2007). *Multi-ethnic France: Immigration, politics, culture and society*. London: Routledge.
- Hatzenbuehler, M. L., McLaughlin, K. A., Keyes, K. M., & Hasin, D. S. (2010). The impact of institutional discrimination on psychiatric disorders in lesbian, gay, and bisexual populations: A prospective study. *American Journal of Public Health*, 100(3), 452–459. <https://doi.org/10.2105/AJPH.2009.168815>
- Hatzenbuehler, M. L., Phelan, J. C., & Link, B. G. (2013). Stigma as a fundamental cause of population health inequalities. *American Journal of Public Health*, 103(5), 813–821. <https://doi.org/10.2105/AJPH.2012.301069>

- Hopkins, P., Botterill, K., Sanghera, G., & Arshad, R. (2017). Encountering Misrecognition: Being Mistaken for Being Muslim. *Annals of the American Association of Geographers*, 107(4), 934–948.  
<https://doi.org/10.1080/24694452.2016.1270192>
- Jiang, Y., Granja, M. R., & Koball, H. (2017). *Basic facts about low-income children: Children under 18 years, 2015*. New York, NY.  
<https://doi.org/10.1017/CBO9781107415324.004>
- Johnston, L. D., Bachman, J. G., O'Malley, P. M., & Schulenberg, J. E. (2010). *Monitoring the future: A continuing study of american youth (8th-and 10th-grade surveys), 2005*. Ann Arbor, MI. <https://doi.org/10.3886/ICPSR04537.v2>
- Jones, C. P. (2000). Levels of racism: A theoretic framework and a gardener's tale. *American Journal of Public Health*, 90(8), 1212–1215.  
<https://doi.org/10.2105/AJPH.90.8.1212>
- Kearney, M. S., & Levine, P. B. (2016). Income inequality, social mobility, and the decision to drop out of high school. *Brookings Papers on Economic Activity*, 333–367. <https://doi.org/10.1353/eca.2016.0017>
- Keating, D. P., Siddiqi, A., & Nguyen, Q. (2013). Social resilience in the Neoliberal Era: National differences in population health and development. In P. A. Hall & M. Lamont (Eds.), *Social Resilience in the Neoliberal Era* (pp. 239–263). New York: Cambridge University Press.
- Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., ... Zaslavsky, A. M. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry*, 60(2), 184–189.  
<https://doi.org/10.1001/archpsyc.60.2.184>
- Lauderdale, D. S., Wen, M., Jacobs, E. A., & Kandula, N. R. (2006). Immigrant perceptions of discrimination in health care: The California Health Interview Survey 2003. *Medical Care*, 44(10), 914–920.
- Lewis, T. T., Cogburn, C. D., & Williams, D. R. (2015). *Self-reported experiences of discrimination and health: scientific advances, ongoing controversies, and emerging*

- issues. *Annual Review of Clinical Psychology* (Vol. 11).  
<https://doi.org/10.1146/annurev-clinpsy-032814-112728>
- Li, F., Green, J. G., Kessler, R. C., & Zaslavsky, A. M. (2010). Estimating prevalence of serious emotional disturbance in schools using a brief screening scale. *International Journal of Methods in Psychiatric Research*, 19(S1), 88–98. <https://doi.org/10.1002/mpr.315>
- Marmot, M. (2004). *Status syndrome: How social standing affects our health and longevity*. New York, NY: Owl Books.
- McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiological Reviews*, 87, 873–904.  
<https://doi.org/10.1152/physrev.00041.2006>
- McLaughlin, K. A., Costello, E. J., Leblanc, W., Sampson, N. A., & Kessler, R. C. (2012). Socioeconomic status and adolescent mental disorders. *American Journal of Public Health*, 102(9), 1742–1750.  
<https://doi.org/10.2105/AJPH.2011.300477>
- MetricWire Inc. (2016). MetricWire. Retrieved from  
<https://play.google.com/store?hl=en>
- Michael Marmot. (2005). Social determinants of health inequalities. *The Lancet*, 365(9464), 1099–1104.
- Miller-Johnson, S., Sullivan, T. N., & Simon, T. R. (2004). Evaluating the impact of interventions in the Multisite Violence Prevention Study: Samples, procedures, and measures. *American Journal of Preventive Medicine*, 26(1S), 48–61. <https://doi.org/10.1016/j.amepre.2003.09.015>
- Ministère des Solidarités et de la Santé. (2018). *La stratégie nationale de santé 2018-2022*. Ministère des Solidarités et de la Santé. Retrieved from [https://solidarites-sante.gouv.fr/IMG/pdf/dossier\\_sns\\_2017\\_vdefpost-consult.pdf](https://solidarites-sante.gouv.fr/IMG/pdf/dossier_sns_2017_vdefpost-consult.pdf)
- Mistry, R. S., Brown, C. S., White, E. S., Chow, K. A., & Gillen-O'Neel, C. (2015). Elementary school children's reasoning about social class: A mixed-methods

- study. *Child Development*, 86(5), 1653–1671.  
<https://doi.org/10.1111/cdev.12407>
- Mitchell, J. L., & Toner, B. (2016). Exploring the Foundations of US State-Level Anti-Sharia Initiatives. *Politics and Religion*, 1–24.  
<https://doi.org/10.1017/S1755048316000419>
- Murray, C. J. L., & Lopez, A. D. (2013). Measuring the Global Burden of Disease. *New England Journal of Medicine*, 369(5), 448–457.  
<https://doi.org/10.1056/NEJMra1201534>
- Odgers, C. (2018). Smartphones are bad for some teens, not all. *Nature*, 554(7693), 432–434. <https://doi.org/10.1038/d41586-018-02109-8>
- Odgers, C. L. (2015). Income inequality and the developing child: Is it all relative? *American Psychologist*, 70(8), 722–731.  
<https://doi.org/10.1037/a0039836> Children
- Odgers, C. L., & Adler, N. E. (2017). Challenges for low-income children in an era of increasing income inequality. *Child Development Perspectives*, 0(0), 1–6.  
<https://doi.org/10.1111/cdep.12273>
- Owens, A. (2016). Inequality in children’s contexts: The economic segregation of households with and without children. *American Sociological Review*, 81(3), 1–26. <https://doi.org/10.1177/0003122416642430>
- Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin*, 135(4), 531–554.  
<https://doi.org/10.1037/a0016059>
- Patel, F., Duss, M., & Toh, A. (2013). *Foreign law bans: Legal uncertainties and practical problems*.
- Pew Research Center. (2011). *The Future of the Global Muslim Population: Projections for 2010-2030*. <https://doi.org/10.1021/ic0611948>
- Pew Research Center. (2017). *U.S. Muslims concerned about their place in society, but continue to believe in the American dream*. Retrieved from

<http://www.pewforum.org/wp-content/uploads/sites/7/2017/07/U.S.-MUSLIMS-FULL-REPORT-with-population-update-v2.pdf>

Pickett, K. E., & Wilkinson, R. G. (2007). Child wellbeing and income inequality in rich societies: Ecological cross sectional study. *BMJ*, 335(7629), 1080. <https://doi.org/10.1136/bmj.39377.580162.55>

Quon, E. C., & McGrath, J. J. (2014). Subjective socioeconomic status and adolescent health: A meta-analysis. *Health Psychology*, 33(5), 433–447. <https://doi.org/10.1037/a0033716>

Raifman, J., Moscoe, E., Austin, S. B., & Mcconnell, M. (2017). Difference-in-Differences Analysis of the Association Between State Same-Sex Marriage Policies and Adolescent Suicide Attempts, *21205*, 1–7. <https://doi.org/10.1001/jamapediatrics.2016.4529>

Reardon, S. F., & Bischoff, K. (2011). Income inequality and income segregation. *American Journal of Sociology*, 116(4), 1092–1153. <https://doi.org/10.1086/657114>

Rechel, B., Mladovsky, P., Ingleby, D., Mackenbach, J. P., & McKee, M. (2013). Migration and health in an increasingly diverse Europe. *The Lancet*, 381(9873), 1235–1245. [https://doi.org/10.1016/S0140-6736\(12\)62086-8](https://doi.org/10.1016/S0140-6736(12)62086-8)

Sacriponte, A. (2015). Mississippi House approves bill banning use of foreign law. Retrieved January 10, 2017, from <http://www.jurist.org/paperchase/2015/02/mississippi-house-approves-bill-banning-use-of-foreign-law.php>

Samargia, L. A., Saewyc, E. M., & Elliott, B. A. (2006). Foregone mental health care and self-reported access barriers among adolescents. *The Journal of School Nursing*, 22(1), 17–24. <https://doi.org/10.1177/10598405060220010401>

Schwarz, S. W. (2009). Adolescent mental health in the United States: Facts for policymakers. Retrieved from [http://www.nccp.org/publications/pdf/text\\_878.pdf](http://www.nccp.org/publications/pdf/text_878.pdf)

- Shaked, D., Williams, M., Evans, M. K., & Zonderman, A. B. (2016). Indicators of subjective social status: Differential associations across race and sex. *SSM - Population Health*, 2, 700–707. <https://doi.org/10.1016/j.ssmph.2016.09.009>
- Shanmugasundaram, S. (2018). Anti-Sharia law bills in the United States. Retrieved March 5, 2019, from <https://www.splcenter.org/hatewatch/2018/02/05/anti-sharia-law-bills-united-states>
- Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological Momentary Assessment. *Annual Review of Clinical Psychology*, 4(1), 1–32. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091415>
- Simon, P. (1999). Nationality and origins in French statistics. Ambiguous Categories. *Population: An English Selection*, 11(1999), 193–219.
- Singh-Manoux, A., Adler, N. E., & Marmot, M. G. (2003). Subjective social status: Its determinants and its association with measures of ill-health in the Whitehall II study. *Social Science and Medicine*, 56(6), 1321–1333. [https://doi.org/10.1016/S0277-9536\(02\)00131-4](https://doi.org/10.1016/S0277-9536(02)00131-4)
- Spencer, B., & Castano, E. (2007). Social class is dead. Long live social class! Stereotype threat among low socioeconomic status individuals. *Social Justice Research*, 20(4), 418–432. <https://doi.org/10.1007/s11211-007-0047-7>
- Steinberg, L., & Morris, A. S. (2001). Adolescent development. *Annual Review of Psychology*, 52(1), 83–110. <https://doi.org/10.1146/annurev.psych.52.1.83>
- Torche, F., & Kleinhaus, K. (2012). Prenatal stress, gestational age and secondary sex ratio: The sex-specific effects of exposure to a natural disaster in early pregnancy. *Human Reproduction*, 27(2), 558–567. <https://doi.org/10.1093/humrep/der390>
- Torche, F., & Sirois, C. (2018). Restrictive Immigration Law and Birth Outcomes of Immigrant Women. *American Journal of Epidemiology*, 188(1), 24–33. <https://doi.org/10.1093/aje/kwy218>

- Valenzuela, C., Ugarte-Gil, C., Paz, J., Echevarria, J., Gotuzzo, E., Vermund, S. H., & Kipp, A. M. (2015). HIV stigma as a barrier to retention in HIV care at a general hospital in Lima, Peru: A case-control study. *AIDS and Behavior, 19*(2), 235–245. <https://doi.org/10.1007/s10461-014-0908-7>
- Viruell-Fuentes, E. A. (2007). Beyond acculturation: Immigration, discrimination, and health research among Mexicans in the United States. *Social Science and Medicine, 65*(7), 1524–1535. <https://doi.org/10.1016/j.socscimed.2007.05.010>
- Wamala, S., Merlo, J., Boström, G., & Hogstedt, C. (2007). Perceived discrimination, socioeconomic disadvantage and refraining from seeking medical treatment in Sweden. *Journal of Epidemiology and Community Health, 61*(5), 409–415. <https://doi.org/10.1136/jech.2006.049999>
- Whalen, C. K., Odgers, C. L., Reed, P. L., & Henker, B. (2011). Dissecting daily distress in mothers of children with ADHD: An electronic diary study. *Journal of Family Psychology, 25*(3), 402–411. <https://doi.org/10.1037/a0023473>
- Whitehead, M., Marmot, M., J. Allen, J., Solar, O., Irwin, A., Roper, W. L., ... Marandi, A. (1992). The concepts and principles of equity and health. *International Journal of Health Services: Planning, Administration, Evaluation, 22*(3), 429–445. <https://doi.org/10.1093/heapro/6.3.217>
- Wilkinson, R. G., & Pickett, K. E. (2006). Income inequality and population health: A review and explanation of the evidence. *Social Science and Medicine, 62*(7), 1768–1784. <https://doi.org/10.1016/j.socscimed.2005.08.036>
- Williams, D. R. (1999). Race, Socioeconomic Status, and Health The Added Effects of Racism and Discrimination. *Annals of the New York Academy of Sciences, 896*(1), 173–188. <https://doi.org/10.1111/j.1749-6632.1999.tb08114.x>
- Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine, 32*(1), 20–47. <https://doi.org/10.1007/s10865-008-9185-0>
- Wolff, L. S., Acevedo-Garcia, D., Subramanian, S. V., Weber, D., & Kawachi, I. (2010). Subjective Social Status, a New Measure in Health Disparities

Research: Do Race/Ethnicity and Choice of Referent Group Matter? *Journal of Health Psychology*, 15(4), 560–574. <https://doi.org/10.1177/1359105309354345>

World Health Organization. (2000). *The world health report 2000: health systems: improving performance*. World Health Organization.

## Biography

Joshua Rivenbark attended Iowa State University and graduated *summa cum laude* in 2010 with a degree in Biochemistry and a minor in Spanish. He was admitted to the Duke University School of Medicine Medical Scientist Training Program and received funding for medical and graduate school from the program's NIH T-32 grant. In the course of his doctoral studies in public policy, Joshua received funding from the Duke Global Health Institute Doctoral Scholars Program (2017-2019), as well as a visiting research fellowship at the Institut national d'études démographiques (INED) in Paris. While at Duke he has published three articles in peer-reviewed journals, including: "A survey of healthcare practices and perceptions among community- and street-based children in Cambodia" in *International Health* (with Lily Martyn, Kate Whetten, and Lavanya Vasudevan); "The high societal costs of childhood conduct problems: Evidence from administrative records up to age 38 in a longitudinal birth cohort" in the *Journal of Child Psychology and Psychiatry* (with Candice Odgers, Avshalom Caspi, HonaLee Harrington, Sean Hogan, Renate Houts, Richie Poulton, and Terrie Moffitt); and "Adolescents' social standing and mental health: Evidence from census data to cellphones" in *Developmental Psychology* (with William Copeland, Erin Davisson, Anna Gassman-Pines, Rick Hoyle, Joy Piontak, Michael Russell, and Candice Odgers).