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Use of and Access to Abortion Services Among Asian and Immigrant Populations in the United States

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USE OF AND ACCESS TO ABORTION SERVICES AMONG ASIAN AND IMMIGRANT POPULATIONS IN THE UNITED STATES

A DISSERTATION

by

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ABSTRACT

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by

Sheila Desai

Advisor: Heidi E. Jones

Background: Abortion is common in the United States (U.S.) and a critical component of comprehensive reproductive health care. Yet, little research has documented patterns of abortion use among Asian populations or potential barriers to abortion care among immigrants in the U.S., two rapidly growing but understudied populations. In response, this dissertation aims to examine use of and access to abortion services among individuals obtaining abortions in the U.S., focusing specifically on Asians in New York City (NYC), immigrants in the U.S., and individuals living in high immigrant concentration neighborhoods in the U.S.

Methods: Using vital statistics data from the New York City Department of Health and Mental Hygiene and population data from the American Community Survey (ACS), pregnancy rates, abortion rates, and abortion ratios are calculated for Asian women overall, Indian, Chinese, Japanese, Korean, and Vietnamese women, and other racial/ethnic groups, by nativity status, from 2007-2015, and compared over time and between groups. Data from the Guttmacher Institute's 2008 and 2014 Abortion Patient Surveys (APS) are analyzed to examine differences in distance traveled to obtain an abortion and gestation at the time of abortion comparing immigrants to non-immigrants and recent to non-recent immigrants. Finally, linking together

APS and ACS data, we assess the influence of neighborhood immigrant density on these same outcomes, across racial/ethnic groups.

Results: Compared to the abortion rate for Asian women overall in NYC (11.0 per 1,000 women), Japanese and Indian populations had higher rates of abortion (14.7 and 26.5 per 1,000 women, respectively), whereas Chinese and Korean groups had lower rates (7.6 and 4.5, respectively). When data were further disaggregated by nativity status, the abortion rate and ratio were generally higher for U.S.-born compared to immigrant women, among Asians overall and within each country of origin subgroup. Rates and ratios for immigrant groups generally declined between 2008 and 2015, whereas they appeared to increase for U.S.-born groups. At a national level, immigrant abortion patients were less likely to travel 50 miles or more (aOR: 0.74; 95% CI: 0.62, 0.88) and less likely to have an abortion in the second trimester (aOR: 0.80; 95% CI: 0.68, 0.95). Abortion patients, across most racial/ethnic groups, living in neighborhoods with a higher compared to lower concentration of immigrants were less likely to travel 50 or more miles for their abortion and more likely to have a second-trimester abortions, after accounting for individual-level demographics. Both immigrant and non-immigrant abortion patients in higher density neighborhoods were less likely to travel 50 or more miles for services compared to their counterparts living in lower density neighborhoods.

Conclusions: Findings from this dissertation serve as a scientific anchor for future research and policies that seek to advance reproductive health for Asian and immigrant populations in the U.S. Future research should continue to monitor patterns of abortion within subgroups of the Asian population in the U.S., focus on elucidating the apparent protective effect observed in immigrant women, and further examine the impact of neighborhood composition on abortion access.

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DEDICATION

To my mom, Panna Desai,

and my grandmother, Shanta Desai—

the strongest women I have known.

DISCLOSURE STATEMENT

I have no conflicts of interest to disclose.

CHAPTER 1

INTRODUCTION

Background and significance

In the United States (U.S.), approximately one in five pregnancies end in induced abortion[1] and one in four women will have an abortion by age 45.[2] Almost half of unintended pregnancies resolve in abortion and, in 2014, nearly one million abortions were performed in this country.[1,3] Abortion is common in the U.S. and a critical component of comprehensive reproductive health care.[4,5]

Assessing use of abortion among Asian populations in the U.S.

Monitoring the use of abortion care is a key public health strategy to ensure equitable and needed access to abortion services across all populations.[6] Ongoing surveillance of abortion by the Centers for Disease Control and Prevention and the Guttmacher Institute indicates that the prevalence of abortion in the U.S. varies considerably between major racial/ethnic groups.[2,7] Such differences are important to identify as they may reflect disparities between population groups in access to abortion, contraceptive services, and other types of reproductive health care. Yet, surveillance mechanisms rarely calculate measures of abortion for Asian populations in the U.S., although they are the fastest growing racial/ethnic group in the country.[8] As a result, it is difficult to identify the extent to which Asians in the U.S. have access to abortion, whether there is even a demand for services, or how their use of care compares to that of other groups.

Asians living in the U.S. comprise 6.4% of the population or approximately 19 million people.[9,10] This group encompasses individuals with origins in East Asia, Southeast Asia, and South Asia, including those from the diaspora, and nearly 70% are foreign-born, which is almost twice the share of the foreign-born Hispanic population (36%).[10,11] Asians represent more than

50 ethnic groups with large variations in national origin, language, class, immigration experiences, and levels of acculturation.[12] Yet, despite the heterogeneity and size of Asian populations, data collection mechanisms and research efforts often dismiss these groups as a monolith or too small to count,[13-15] resulting in limited data to study the sexual and reproductive health of Asian Americans. Compounded by the unique challenges of collecting quality abortion data,[16] measures of abortion use (e.g., abortion rate) and access have not been well-documented for Asian populations in the U.S.

In contrast, use of and demand for abortion services among other racial/ethnic groups has been documented through existing abortion rates: 27.1 per 1,000 women of reproductive age in 2014 for non-Hispanic Black women, 18.1 per 1000 for Hispanic women, and 10.0 per 1000 women for non-Hispanic White women.[2] Without these data for Asian-Americans, it is impossible to know whether a demand or need for abortion services even exists in this population. However, data on other reproductive health indicators suggest that challenges to abortion access may exist. For example, studies of prenatal care, breast and cervical cancer screening and management, and sexually transmitted infections indicate that Asian women are less likely to receive comprehensive and culturally competent reproductive health care compared to non-Hispanic White women.[17-19] Furthermore, although on average the share of Asian women that fall below the poverty line is comparable to that of White women, nearly 40% of Asian women under age 65 are uninsured compared to 12% in the general population.[20] Over one-third of the Asian population also has limited English proficiency, with up to 60% of Vietnamese women, a large share of whom are foreign-born, experiencing linguistic isolation.[21,22] As a result, there may be an increased need for culturally competent and multilingual abortion services for Asian groups with these characteristics. Cultural norms may also discourage open conversations

among Asians related to reproductive and sexual health care, limiting information-seeking or service utilization.[18,23] Together, these factors could result in differential use of care not only between Asian and White women, but also within the Asian population and between immigrant and non-immigrant Asians.

Investigating access to abortion among immigrant populations in the U.S.

In addition to assessing the use of abortion services across population groups in the U.S., understanding how obstacles to care may hinder access to services is also critical. To obtain an abortion in the U.S., many women contend with mounting legal restrictions, logistical barriers, financial constraints, and a political and social environment that stigmatizes abortion.[24-26] These factors inevitably contribute to the documented barriers that deny, delay, and impede abortion access for many groups in the U.S.[27-29] The public health impact of such delays can include increased risk of complications associated with second- compared to first-trimester abortion,[30,31] continuing unwanted pregnancies to term,[32] and, in some cases, relying on unsafe abortion practices.[33] However, despite evident barriers to care and their consequences, no studies have focused on the potential obstacles associated with obtaining an abortion for immigrants, or compared their access to services with non-immigrants. With increasingly restrictive immigration-related policies, differences in access to abortion by nativity status may arise, or existing differences may be exacerbated. At the same time, some evidence suggests that community factors, such as neighborhood concentration of immigrants, may facilitate access to health care, particularly for immigrants.[34,35] Yet, data on barriers or facilitators to abortion care are nearly absent for immigrants in the U.S., although they comprise a growing demographic of the U.S., projected to represent nearly one-fifth of the country's overall population by 2065.[36]

Recent national-level data indicate that 16% of abortion patients in 2014 were born outside of the U.S., proportional to the overall share of immigrant women of reproductive-age (17.1%) and demonstrating demand for abortion services in the immigrant population.[37] Yet, research also suggests that this population, compared to non-immigrants, may be more likely to face culturally- and linguistically-inappropriate care, lower health literacy, and limited health insurance options;[18,38-40] indeed, many immigrants face exclusion from federal or state Medicaid programs due to existing legislation.[41] Fear of immigration enforcement may also discourage or prevent health-seeking among immigrants and their family members. Furthermore, a substantial proportion of the country's immigrant population lives in states such as Texas and Florida, where multiple abortion restrictions have been enacted, primarily aimed at closing clinics and potentially forcing patients to travel.[42] Such barriers, coupled with the social stigma specific to abortion care, suggest that immigrant populations may face increased difficulty accessing abortion, compared to their non-immigrant counterparts.

Moreover, like Asians, immigrants are a heterogeneous population and comprise a diversity of demographic groups, including a range of racial/ethnic populations. Given the pervasive history of racism and xenophobia in the U.S., immigrants of color may face distinct obstacles to care, such as discrimination and hostility based on their race and nativity, in general and within the medical system, which could additionally impact the ease with which they obtain abortion services.[43-45] Yet, limited research has examined whether access to services among immigrants varies across racial/ethnic groups.

For both Asians and immigrants, these circumstances may impact their use of abortion services or exacerbate barriers specific to abortion care, such as navigating restrictive laws and finding available providers. Consequently, some women may need to travel substantial distances

to obtain abortion services or have to delay their care, which could lead to increased costs, morbidity risks, and likelihood of facing gestational limits that could altogether inhibit care.[25,27] Although previous research on abortion patients has examined potential obstacles to care,[24,46] these studies have not documented use of or barriers to services among Asian or immigrant abortion patients, contributing to the overall absence of abortion-related research in these populations.

In response, this dissertation aims to further research on Asian and immigrant populations' use of and access to abortion services. This research uses surveillance data from the New York City (NYC) Department of Health and Mental Hygiene (DOHMH) to describe the use of abortion services among Asians in NYC. Further, this research uses the American Community Survey (ACS), and the 2008 and 2014 Guttmacher Institute's Abortion Patient Survey (APS) to test whether potential barriers to obtaining an abortion differ by nativity—either at the individual- or neighborhood-level—within racial/ethnic groups. Based on the limited data available to investigate abortion in these groups, use of and demand for services is measured using abortion rates and ratios, and indicators of barriers are operationalized as the average distance traveled to obtain an abortion and gestation at the time of abortion, among individuals successfully accessing abortion. As prior research has suggested, distance traveled to obtain services can contribute to delays in care, and gestation at the time of abortion can signal a corollary of delayed care.[42,47]Although these measures reflect two distinct indicators of access, they remain useful markers of possible obstacles to obtaining abortion care.

Specific Aims

Specifically, this research investigates the following three aims:

Aim 1: Using data from the NYC DOHMH and ACS, calculate and describe age-adjusted pregnancy rates, abortion rates, and abortion ratios for Asians overall, Asians by country of origin and nativity status, and other racial/ethnic groups in NYC, and examine trends over time (2008-2015).

Hypothesis: 1a. Asians and their subgroups will have lower abortion rates and abortion ratios compared to all other racial/ethnic groups; 1b. Immigrant women of all Asian subgroups will have lower abortion rates and ratios compared to their non-immigrant counterparts; and 1c. Abortion rates and ratios across all Asian groups will decline over time.

Aim 2: Using national-level data from the 2008 and 2014 Guttmacher Institute's APS, examine whether access to abortion (distance traveled to services and gestation at the time of abortion) differs by nativity status and length of stay in the U.S., after accounting for hypothesized confounders.

Hypothesis: 2a. Immigrants will be more likely than non-immigrants to travel farther distances to obtain an abortion and have a second-trimester abortion; 2b. Recent immigrants will be more likely to travel farther distances and have a second-trimester abortion compared to non-recent immigrants.

Aim 3: Using data from the APS, examine the association between individual-level nativity status and abortion access within racial/ethnic groups, and using data from the APS and ACS, investigate the association between neighborhood immigrant density and abortion access, stratified by racial/ethnic groups, after accounting for individual-level confounders.

Hypothesis: 3a. The association between individual-level nativity status and abortion access will vary by racial/ethnic group; 3b. Abortion patients living in neighborhoods with higher immigrant density will travel shorter distances and have earlier abortions than those patients living in neighborhoods with lower immigrant density; 3b. These associations will vary by racial/ethnic group.

Overview of methodological approach

In order to conduct this research, each Aim proposes a distinct methodological approach. Aim 1 uses pooled data from Induced Termination of Pregnancy (ITOP) certificates collected by the NYC DOHMH from 2008 to 2015 and corresponding population counts from the ACS to calculate age-adjusted pregnancy rates, abortion rates, and abortion ratios for Asian women, women of South Asian, Chinese, Japanese, Korean, and Vietnamese descent, and further disaggregated by nativity status. Trends over time are tested using a Cochran-Armitage test for linear trends. Aim 2 pools data from the 2007-2008 and 2013-2014 APS. Using logistic regression, unadjusted and adjusted odds ratios of traveling 50 miles or more to obtain an abortion and having a second-trimester abortion are estimated, comparing immigrants to non-immigrants and recent to non-recent immigrants. Finally, examining these same outcomes, Aim 3 links the combined APS data with neighborhood-level information from the U.S. Census and ACS to assess the influence of neighborhood immigrant density. Generalized estimating equations are used to fit logistic marginal models to estimate the unadjusted and adjusted odds ratios of traveling 50 miles or more to obtain an abortion and having a second-trimester abortion, comparing abortion patients living in neighborhoods below with those living at or above the median percent population of immigrants. These models are appropriate and more robust than

mixed effects models when interest centers on the fixed effects of independent variables on the outcome, as in the case of this study.

Understanding the use of abortion services among Asians, by country of origin and nativity status could help develop data-driven programs and policies that support Asian women's reproductive health and identify the need for community-relevant approaches to health service delivery. Findings related to the potential barriers and facilitators faced by immigrants and by different racial/ethnic groups seeking abortion care or those living in high immigrant density neighborhoods will help improve policies meant to reduce burdens, such as delays, travel, or out-of-pocket costs for all abortion patients.

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CHAPTER 2 – AIM 1

ASSESSING THE USE OF ABORTION SERVICES IN ASIAN POPULATIONS IN NEW YORK CITY, 2008-2015

Abstract

Introduction: Despite the size of the Asian population in New York City (NYC) and the city's robust abortion surveillance system, abortion-related estimates for Asian groups in NYC have not been calculated previously.

Methods: NYC surveillance data from 2008-2015 are used to calculate abortion rates, pregnancy rates, and abortion ratios for Asian women overall, disaggregated by country of origin (Indian, Chinese, Japanese, Korean, and Vietnamese) and nativity status (immigrant and U.S.-born), and for other major racial/ethnic groups in NYC. These measures are compared between groups and over time.

Results: The abortion rate for Asian women in NYC was 11.0 abortions per 1,000 women during 2014-2015; this rate was generally lower compared to the other three major racial/ethnic groups. When data were disaggregated, Japanese and Indian populations had higher rates of abortion (14.7 and 26.5, respectively) compared to Asians overall, whereas Chinese and Korean groups had lower rates (7.6 and 4.5, respectively). Compared to Asians overall, the abortion ratios tended to be higher for four of the five Asian subgroups, with notable between-subgroup differences. When data were further disaggregated by nativity status, the abortion rate and ratio were generally higher for U.S.-born compared to immigrant women, among Asians overall and within each subgroup. Estimates for each measure generally declined between 2008 and 2015.

Conclusion: These findings reinforce the importance of disaggregated data, which can help inform emergent policy issues affecting Asians in the U.S. Future research should continue to evaluate use of abortion services across Asian groups in NYC and the country.

Introduction

One in four women ages 15-44 years in the United States (U.S.) will have an abortion in her lifetime; it is a common experience in the U.S. and a critical component of sexual and reproductive health care.[1] Understanding socio-demographic patterns of abortions in the U.S. provides important context to identify how policies and service-related barriers such as access to contraceptive care, changes in service availability, or other structural inequities may differentially shape access to abortion for specific groups. Indeed, robust abortion surveillance is essential to identifying and addressing inequities in abortion care.

Although patterns of abortion use have been examined by racial/ethnic groups in the U.S., little is known about Asian women's use of abortion care, though they comprise nearly 10% of the female reproductive-age (15-44 years) population in the country.[2-4] Specifically, data on the prevalence of abortion, as estimated by the abortion rate and abortion ratio, respectively, are rarely calculated for Asian populations in the U.S. For example, national-level abortion data published by the Centers for Disease Control and Prevention[5] as well as the Guttmacher Institute[1] do not provide abortion counts, rates, or ratios for Asians. Instead these data are collapsed into an "other" racial/ethnic group category, despite documented demographic and health differences between Asians and other racial/ethnic groups and within the Asian population.[6-8] In contrast, abortion data are consistently updated and monitored for other major racial/ethnic groups. Furthermore, nearly 70% of Asians in the U.S. are foreign-born;[2] yet, abortion-specific measures remain non-existent by country of origin or nativity status, factors that have been shown to differentially impact health service use.[9] Even at a local level, these data are rare. For example, New York City (NYC) represents the largest Asian population in any U.S. city, with nearly 15% of the population identifying as Asian, the vast majority (80%) of whom

are immigrants.[10] Yet, despite the size of the Asian population, abortion-related estimates for Asian groups in NYC have not been calculated previously.

This lack of information may result in the reproductive health needs of Asians being overlooked and may feed into the harmful "model minority"[11] myth that Asians are a universally successful and healthy group. Research indicates that a notable share of Asians are uninsured, experience linguistic isolation, do not receive comprehensive or culturally competent health services, and face cultural norms of secrecy and silence that may uniquely stigmatize abortion.[12-15] Combined with mounting legal and logistical barriers to obtaining abortion and immigration policies that restrict health coverage for many immigrants,[16] these factors may contribute to differential access to abortion services for Asians, especially between immigrants and non-immigrants.

To help fill this gap in the literature, I use surveillance data from Asian groups in New York City (NYC) from 2014-2015, the most recently available data at the time of this study, to calculate the abortion rates, abortion ratios, and pregnancy rates for these groups, and surveillance data from 2008-2015 to examine changes in these measures over time. The four key objectives of this analysis are: 1) To compare the abortion rate, abortion ratio and pregnancy rate between Asians and other racial/ethnic groups; 2) To compare these measures among Asian subgroups; 3) To compare these measures between immigrants and non-immigrants within Asian populations; and 4) To examine changes in these measures over time by race/ethnicity.

Methods

Data sources

In order to calculate the abortion rates, abortion ratios, and pregnancy rates, I obtained data from two sources: the NYC Department of Health and Mental Hygiene (DOHMH) Bureau

of Vital Statistics and the American Community Survey (ACS). Surveillance data from the NYC DOHMH provided aggregate-level counts of abortions and pregnancies reported between 2008 and 2015 in NYC; these data were used to calculate the numerators for the three measures. The total number of pregnancies include births, spontaneous fetal losses (i.e., stillbirths and miscarriages, if women sought care), and induced abortions. The latter include in-clinic abortions up to 24 weeks gestation and medication abortions up to 10 weeks (where medications are dispensed by facilities). Counts of births and spontaneous losses were tabulated from certificates for vital events filed with the NYC DOHMH and include events occurring in or en route to NYC, regardless of individual residency status, during a particular year. The total number of abortions, including surgical and medication abortions, was obtained from data collected in an "Induced Termination of Pregnancy" report, which is completed by health care providers. The municipal health code requires reporting of all facility-based abortions performed in NYC to the DOHMH. According to a recent evaluation and findings from the Guttmacher Institute, NYC's abortion reporting system captures nearly 90% of facility-based (or facility-initiated) abortions performed in the city.[17,18] To avoid small cell sizes and preserve confidentiality, pregnancy data, including abortions, for 2008-2015 were provided in pooled years: 2008-2010, 2011-2013, and 2014-2015. These data represent a census of all facility-based pregnancy outcomes in NYC occurring between 2008 and 2015.

Population data from the ACS were used to estimate[19-22] the number of NYC women aged 15-49 years by key characteristics and provided the denominators for the group-specific abortion and pregnancy rates. The ACS is a continuously fielded survey by the U.S. Census Bureau that collects detailed information from a representative sample of the civilian non-institutional U.S. population. The Integrated Public-Use Microdata Series (IPUMS)-USA

database, provided by the University of Minnesota, was used to obtain 1% samples of the ACS for each year from 2008-2015.[4,19] Annual data were pooled to mirror the year intervals of the NYC pregnancy data. NYC population distributions by age, race/ethnicity, and nativity were estimated using weighted tabulations of the ACS; these distributions were applied to the total number of NYC women aged 15-49 years, obtained from the NYC DOHMH vital statistics reports, to estimate population counts by these characteristics. These counts then provided the denominators for the group-specific rates.

Study sample

Given the use of pregnancy surveillance data in this study, the sample for this analysis includes the entire population of women having abortions (n=497,966) and pregnancies (n=1,454,132) in or en route to NYC in 2008-2015. These data do not represent a sample, but rather a census of all NYC women.

Study outcomes

The key outcomes from this study include group-specific abortion rates, abortion ratios, and pregnancy rates in New York City (NYC), which encompasses five boroughs: the Bronx, Manhattan, Queens, Brooklyn, and Staten Island. Each of these measures is examined by racial/ethnic group, countries of origin, nativity status, and over time (from 2008-2015), as described below.

Key descriptors

Race/ethnicity: Each measure was calculated for non-Hispanic Asian, non-Hispanic White, non-Hispanic Black, and Hispanic populations in NYC. Any person who identified as Hispanic, regardless of racial group, is included in the Hispanic group. Asians include individuals who

reported having origins in the Far East, Southeast Asia, or the Indian subcontinent. Due to changes in racial/ethnic categories during the study time period, pregnancy data from 2008-2010 collapse Asians and Pacific Islanders into the same racial/ethnic category; for subsequent years, these groups are disaggregated. However, the small proportion (<1%) of Pacific Islanders living in New York City in 2008-2010 suggests that rates and ratios are still comparable across intervals.[19-22]

Country of origin: Among Asians, each measure was further disaggregated by country of origin and calculated for Indian, Chinese, Japanese, Korean, and Vietnamese women. Membership to these groups is defined by where individuals were born. They represent the five largest Asian subgroups in NYC, although they are not inclusive of all Asians in the city. Persons who identified as Asian and Hispanic are included in these country of origin groups. As a result, even when including a catch-all group of "Other Asians," the sum total of these subgroups is slightly larger than the aggregate count of non-Hispanic Asians.

Nativity status: For these five subgroups and Asians overall, each measure was also calculated for foreign-born individuals (i.e., immigrants) and U.S.-born individuals (i.e., non-immigrants).

Time: Each measure was calculated by the most recent time period: 2014-2015. Changes in each measure over time were also examined, comparing data between 2008-2010, 2011-2013, and 2014-2015.

Race/ethnicity, country of origin, and nativity status were each self-reported, making these valid measures as compared to the information from hospital discharge data, which are typically reported by facilities.

Statistical analysis

Abortion and pregnancy rates were calculated as the number of events (abortions or pregnancies) in a specific group per 1,000 women ages 15-49 years in that same group in the NYC population. Group-specific abortion ratios were calculated as the number of abortions in a specific group per 100 pregnancies in that same group in the NYC population.

Using data from 2014-2015, each measure was first calculated and compared by race/ethnicity and then calculated for the five Asian countries of origin. Nativity-specific rates and ratios were then calculated for Asians aggregated and for each Asian subgroup. Finally, group-specific measures by race/ethnicity and by nativity for Asian populations were calculated and compared by time interval: 2008-2010, 2011-2013, and 2014-2015. For this comparison, we also included a subgroup of "Other Asians," which included all other Asian groups in NYC but could not be further disaggregated. Rates and ratios with a relative standard error greater than 20% are noted. Changes between 2008 and 2015 were tested using the Cochran-Armitage test for linear trends and measured as an annual percent change. Graphical plots were created to visualize trends over time in each measure by population group.

As counts of abortions and pregnancies were obtained from surveillance data and provide a census from the entire NYC population of women, rates and ratios are based on "true" counts rather than estimates of events and we do not calculate 95% confidence intervals. Although there is likely some measurement and coverage error associated with these counts, we do not expect sampling error given these are surveillance data.

All pregnancy and abortion rates were age-standardized to the 2011-2013 NYC population of women, and abortion ratios were age-standardized to the population of pregnant women from the same time period (see Table A2.1 for population weights). Counts for these two

age-standardization reference populations were compiled from the annual Summary of Vital Statistics reports prepared by the NYC DOHMH, Office of Vital Statistics. Given minimal changes to the population of women and pregnancies in NYC between 2008 and 2015 (Table A2.1), the reference population was chosen from the midpoint interval of this timeframe.

Results

Comparing pregnancy rates, abortion rates, and abortion ratios between Asians and other major racial/ethnic groups

During 2014-2015, the pregnancy and abortion rates for Asian women in NYC were, respectively, 66.8 per 1,000 and 11.0 per 1,000. These rates were comparable to non-Hispanic White women's pregnancy (62.4 per 1,000) and abortion (11.8 per 1,000) rates in NYC and lower than the rates for non-Hispanic Black and Hispanic women as well as the overall average (Table 2.1). The abortion ratio among Asian women was 19 per 100 pregnancies compared to 22 among non-Hispanic White women, 49 among non-Hispanic Black women, and 33 among Hispanic women.

Comparing measures between Asians and Asian subgroups

When Asians were disaggregated by country of origin, Indian women had a higher pregnancy rate (120 per 1,000), but lower abortion rate (26.5 per 1,000) and ratio (23.7 per 100), than the average (i.e., overall Asian group), which included other subgroups that we were unable to disaggregate. A similar pattern was found among Chinese women, whose pregnancy rate, abortion rate, and abortion ratio were, respectively, 70 per 1,000 women, 8 per 1,000 women, and 24 per 100 pregnancies. In contrast, the pregnancy rate for Japanese women (55 per 1,000 women) was lower compared to the overall Asian group, but their abortion rate (15 per 1,000) and ratio (34 per 100 pregnancies) were higher. The pregnancy (35 per 1,000) and abortion (5

per 1,000) rates for Korean women were also lower than the average, whereas the abortion ratio (24 per 100 pregnancies) was slightly higher. Similarly, the abortion ratio for Vietnamese women (26 per 100) was higher than that for overall Asians; however, their pregnancy (64 per 1,000) and abortion (11 per 1,000) rates were comparable to those of Asians aggregated (Table 2.1).

Comparing measures between immigrants and non-immigrants within Asian groups

When disaggregated by nativity status, among Asians overall, the pregnancy rate was lower for U.S.-born women (42.4 per 1,000) compared to foreign-born women (78.2 per 1,000, Table 2.2). Similarly, U.S.-born Chinese and Vietnamese women had lower pregnancy rates (40.1 and 49.5 per 1,000, respectively) than their foreign-born counterparts (182.9 and 68.7 per 1,000, respectively). However, this relationship was inverted for Indian, Japanese, and Korean groups, which had higher pregnancy rates for U.S.-born women (79.8, 76.0, and 40.7 per 1,000, respectively) compared to foreign-born women (63.8, 49.6, and 32.8 per 1,000, respectively). In contrast, within nearly all groups (aggregated and disaggregated Asian groups), the abortion rate was higher among U.S.-born women compared to foreign-born women. The abortion ratio was consistently higher among U.S.-born women across all groups.

Examining changes in the abortion rate, pregnancy rate, and abortion ratio over time

We examined changes over time in the pregnancy rate, abortion rate, and abortion ratio for the major racial/ethnic groups and by nativity status within Asian groups (Table A2.2 & Figs 2.1-2.9). Findings suggest that from 2008-2015, the rates and ratio declined across Asian, non-Hispanic Black, and Hispanic groups in NYC (Figs. 2.1, 2.4, 2.7). A decrease in the rates and ratio were observed for both U.S.-born and foreign-born aggregated Asian populations; however,

the decline appeared to be greater in the foreign-born Asian group with a 15% fall in the pregnancy rate, a decrease in the abortion rate from 16 abortions per 1,000 women in 2008-2010 to 10 per 1,000 in 2014-2015, and a related decrease in the abortion ratio from 19 abortions per 100 pregnancies to 14 (Figs 2.2, 2.5, 2.8); these changes were statistically significant ($p<.001$, Table A2.2). In contrast, among the five U.S.-born Asian ethnic groups, we observed an increase in each of the measures, with the largest annual changes occurring among U.S.-born Indian and Vietnamese women (Figs. 2.3, 2.6, 2.9). At the same time, we found a statistically significant decline in the abortion rate and ratio for U.S.-born Other Asians (Table A2.2). The direction and magnitude of the changes over time was not as consistent for foreign-born Asian ethnic groups. Indian women had the largest decrease in the pregnancy rate (119 to 64 pregnancies per 1,000 women) and Chinese women had the largest increase (101 to 183 pregnancies per 1,000 women). With the exception of Chinese women, all foreign-born subgroups had a decrease in their abortion rate over time; the decline was greatest among Korean and Japanese women with changes from 9 to 2 abortions per 1,000 Korean women and 18 to 8 abortions per 1,000 Japanese women. We observed an overall increase in the abortion ratio for foreign-born Indian and Vietnamese women, but a decrease for the other foreign-born groups with the largest change among Korean women whose abortion ratio declined from 30 to 13 abortions per 100 pregnancies (Table A2.2).

Discussion

We found that the pregnancy rates, abortion rates, and abortion ratios differed between Asians and other major racial/ethnic groups and within Asian subgroups, highlighting the importance of disaggregated data for Asian populations. We found that Asian women overall had lower abortion rates than the three other major racial/ethnic groups. When data were

disaggregated, Japanese and Indian populations had higher rates of abortion compared to Asians overall, whereas Chinese and Korean groups had lower rates. Given variations by race/ethnicity and country of origin in pregnancy rates, these findings may reflect differentials in the demand for abortion services; however, they may also suggest that some Asian groups in NYC face greater barriers to obtaining abortion than others. Compared to Asians overall, the abortion ratios tended to be higher for four of the five Asian subgroups examined in this study, with notable between-subgroup differences. While the abortion ratio is not a direct measure of unmet contraceptive need, it may indicate differences in the use of or access to contraceptive care, including preferred methods of contraception, within the Asian population. Indeed, prior research has shown that Asians, overall, have a relatively low rate of contraceptive use, especially effective methods, with differences in contraceptive use within the Asian population previously documented in California.[23,24] It is also possible that the ability to obtain needed abortions differs between Asian groups, especially if access to health coverage, logistic and financial resources, and supportive social networks—factors documented to impact abortion access[25-27]—varies between subgroups. However, more research is needed to better understand the underlying factors that may contribute to differences in abortion access between Asian populations.

When data were further disaggregated by nativity status, the abortion rate and ratio were generally higher for U.S.-born women compared to immigrant women, among Asians overall and within each subgroup. These differences may reveal a differential demand for services by nativity status. This finding could suggest that, among Asians in NYC, immigrants have greater access to or use of contraception compared to their non-immigrant counterparts, resulting in a smaller share of unintended pregnancies. At the same time, abortion may be less culturally acceptable to immigrants compared to non-immigrants, which could reduce their likelihood of

using these services. It is also possible that ongoing anti-immigrant rhetoric coupled with increasing fear of arrest, detention, and deportation of recent years could deter Asian immigrants in NYC from obtaining needed health care, including abortion services.[28,29] However, further research is needed to clarify the underlying reasons for the observed differences by nativity status and whether they are, indeed, indicators of differential access to or need for contraceptive or abortion services.

Observed differences between country of origin and nativity groups may also signal an overall need for improved provider outreach to and interactions with specific Asian communities. Especially in populations with limited English proficiency, such as certain Asian subgroups including immigrants, multi-lingual clinic resources (e.g., consent forms, follow-up instructions) and staff are essential to facilitating accessible and comprehensive abortion care.[30] Specific Asian groups may also hold sociocultural norms and beliefs that stigmatize pregnancy decisions, especially abortion, for some women, hindering their health-seeking behaviors or attitudes.[15]

Finally, our findings indicate that the pregnancy and abortion rates and abortion ratios among Asian, non-Hispanic Black, and Hispanic women in NYC declined between 2008 and 2015, reflecting national and State-level declines in these measures, as well as overall increases in contraceptive use.[17,31] However, when Asian women were disaggregated by nativity and ethnicity, these declines were not uniform across all subgroups. For example, the abortion rate and ratio generally increased from 2008 to 2015 for U.S.-born Asian groups, whereas the opposite was seen during this time for most Asian immigrant groups. These trends might suggest decreased demand for abortion services among immigrants, given parallel declines in group-specific pregnancy rates, or changes in and increasing consistency of contraceptive use, which

could lower the likelihood of unwanted pregnancy. Alternatively, these findings could indicate reduced access to care over time for Asian immigrants. In that case, these trends might suggest underlying structural or social barriers to care potentially related to the immigrant experience, including the changing social and political climate in the U.S. However, more research is needed to better understand the dynamics behind these trends over time.

This study has several limitations. The abortion counts used in this analysis represent only those procedures that occurred in health facilities; thus, abortions occurring outside of a hospital, clinic, or physician's office would not be captured in these data. Although the magnitude of this underreporting is likely to be relatively small, undercounting of abortions could be higher in Asian or immigrant estimates if these groups are more likely than their counterparts to obtain abortions in informal settings.[32,33] In that case, the abortion rates and ratios calculated in this study for these groups may be slightly underestimated. Furthermore, pregnancy counts, used to calculate abortion ratios, may suffer from measurement error. In particular, reporting of miscarriage can be incomplete, particularly for miscarriages that occur prior to 20 weeks gestation, with many women who experience a very early miscarriage not necessarily identifying it as such. As a result, total pregnancies are likely to be undercounted. However, given it is unlikely that this undercount would differ by racial/ethnic group, we would not expect this limitation to differentially impact the group-specific abortion ratios reported in this study. The data used for this study were aggregate counts of pregnancy outcomes; we did not have access to individual-level data related to each outcome. As a result, we were not able to examine underlying sociodemographic or health factors, such as income, length of stay in the U.S., or contraceptive history, which might inform differentials in use of and access to abortion services.[1,34] For example, given our limited data, we could not assess whether the observed

differences in abortion rates reflected racial/ethnic inequities in access to care or, alternatively, adequate service use that met the varying need for abortion in each group. Lastly, these data represent abortion use in New York City, which has a high density of abortion providers and does not have any of the major types of abortion restrictions (e.g., waiting periods, mandated parental involvement, or limitations on publicly funded abortions) often found in other states.[31] As a result, findings from this study on patterns in abortion use are not generalizable to Asian populations living in other areas of the U.S. Despite these limitations, the findings from this study serve as a valuable baseline for identifying patterns of use of abortion services in Asian populations in NYC. Compiling and updating this evidence remains particularly critical in the current political environment, in which efforts to restrict abortion may impose a significant burden on both immigrant women and women of color seeking abortion care.[35,36]

Conclusions

This study calculates pregnancy rates, abortion rates, and abortion ratios for Asians living in NYC, by country of origin and nativity, achieving greater granularity in these measures than in previous research. Our findings reinforce the importance of disaggregated data for Asian populations in the U.S., which can help shape effective, community-relevant programs and policies that improve access to reproductive health care for all. Furthermore, this study provides important baseline data to identify future changes in the use of abortion services and potential unmet contraceptive need in Asian populations in NYC, which could inform emergent policy issues affecting these groups. Future research should continue to evaluate abortion use across Asian groups in NYC and the country, more broadly.

The differences identified in this study—by race/ethnicity, country of origin, nativity, and over time—require further investigation that was not possible with our data, which were

designed to describe patterns in abortion rates and ratios. Although some of the observed differences may signal differential or changing access to care between groups, further research is needed to understand the underlying mechanisms that produce such differences and the implications for Asian women's access to abortion care. Such work can help ensure that abortion services are available, affordable, and accessible to all people, without exception.

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Table 2.1: Age-standardized pregnancy rates, abortion rates, abortion ratios among New York City women by race, ethnicity, and country of origin: 2014-2015

Race/Ethnicity	Denominators[1]		2014-2015		
	Population counts	Pregnancy counts	Pregnancy rate per 1,000 women	Abortion rate per 1,000 women	Abortion ratio per 100 pregnancies
All women	4,459,263	396,146	88.0	29.3	34.0
Asian	679,492	46,563	66.8	11.0	19.0
Non-Hispanic White	1,354,289	90,070	62.3	11.7	21.7
Non-Hispanic Black	992,899	96,662	100.5	50.0	49.0
Hispanic	1,307,315	108,421	82.9	27.7	32.6
Asian subgroups by country of origin					
Indian	133,262	16,405	119.6	26.5	23.7
Chinese	302,869	21,219	69.5	7.6	14.3
Japanese	22,194	1,365	55.5	14.7	34.3
Korean	58,871	2,344	34.9	4.5	23.8
Vietnamese	7,625	458	63.7	11.3	25.9

Table 2.2: Age-standardized pregnancy rates, abortion rates, and abortion ratios among Asian populations in New York City by nativity status, 2014-2015

Race/Ethnicity & Nativity	Denominators		2014-2015		
	Population counts	Pregnancy counts	Pregnancy rate per 1,000 women	Abortion rate per 1,000 women	Abortion ratio per 100 pregnancies
Asian					
Foreign-born	516,086	39,769	78.2	9.9	14.3
U.S. born	163,405	6,794	42.4	14.7	43.8
Asian disaggregated					
Indian					
Foreign-born	227,844	13,829	63.8	11.6	19.4
U.S. born	31,614	2,576	79.8	33.5	44.4
Chinese					
Foreign-born	101,648	18,403	182.9	14.3	10.4
U.S. born	75,024	2,816	40.1	11.3	40.5
Japanese					
Foreign-born	18,310	1,055	49.6	7.8	26.8
U.S. born	3,884	310	76.0	37.8	48.5
Korean					
Foreign-born	40,822	1,623	32.8	2.2	13.4
U.S. born	18,049	721	40.6	8.6	38.3
Vietnamese					
Foreign-born	5,973	337	68.7	8.8	20.4
U.S. born	1,653	121	49.5	14.9	39.4

Figure 2.1: Pregnancy rates by major racial/ethnic groups: NYC, 2008-2015

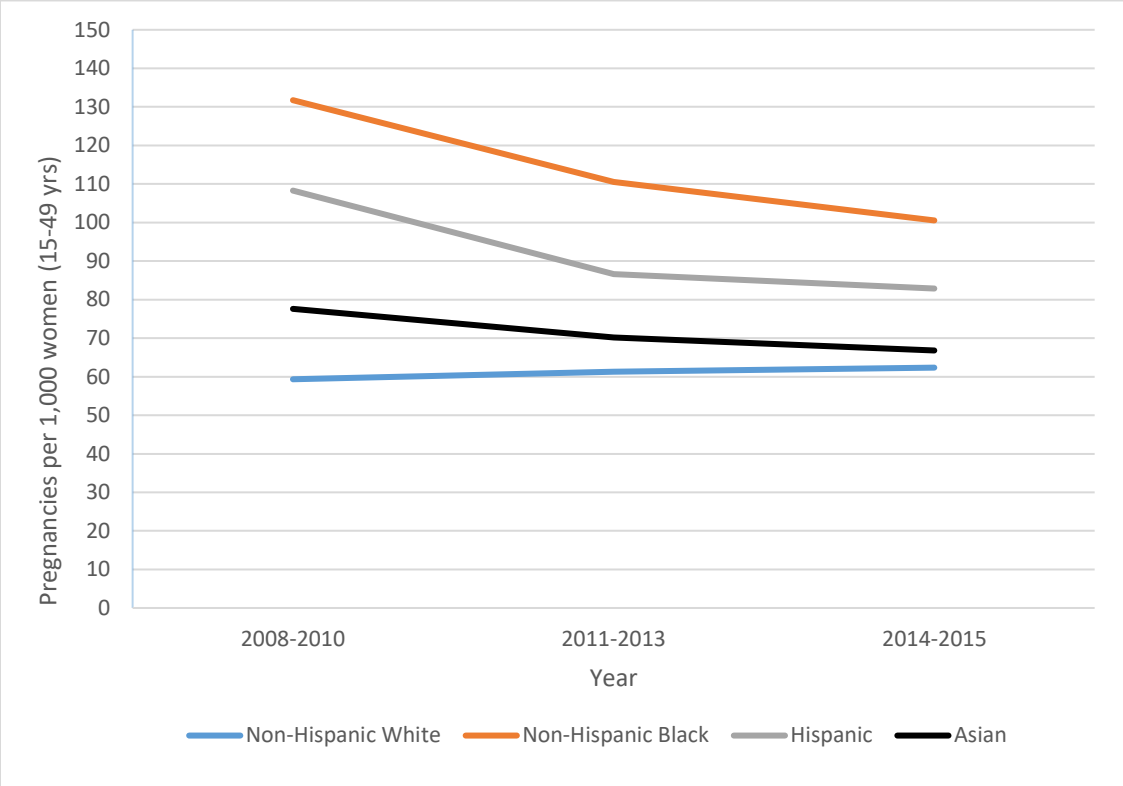


Figure 2.2: Pregnancy rates by foreign-born Asian groups: NYC, 2008-2015

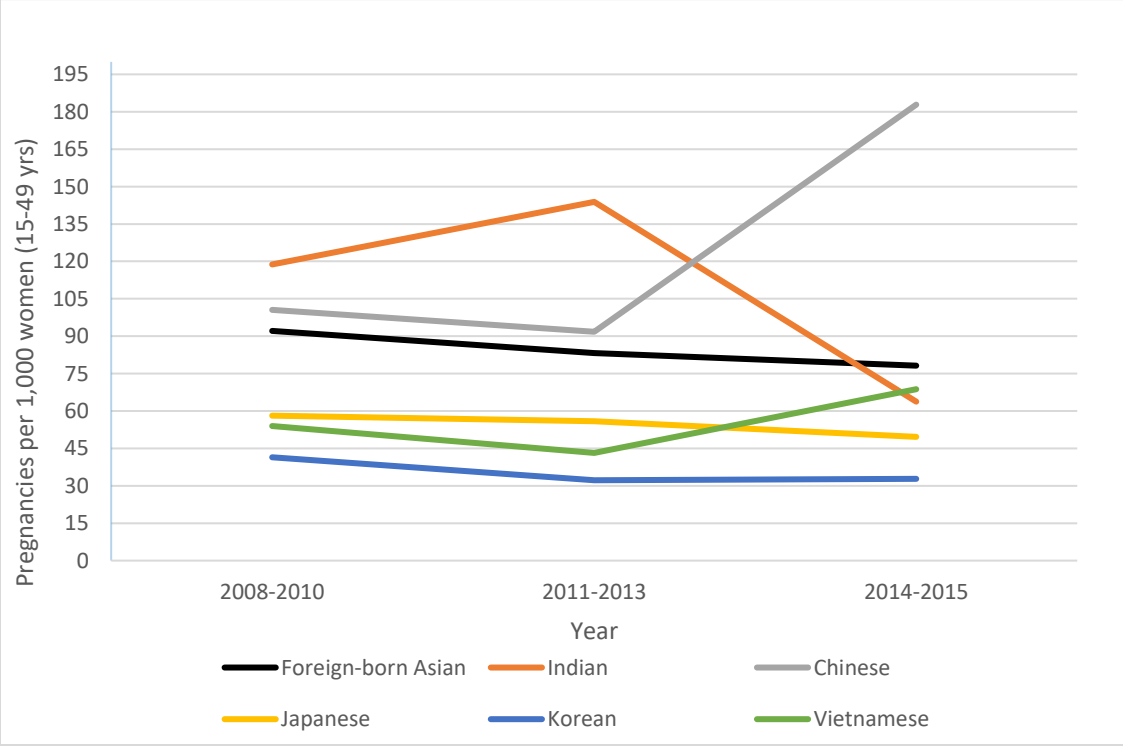


Figure 2.3: Pregnancy rates by U.S.-born Asian groups: NYC, 2008-2015

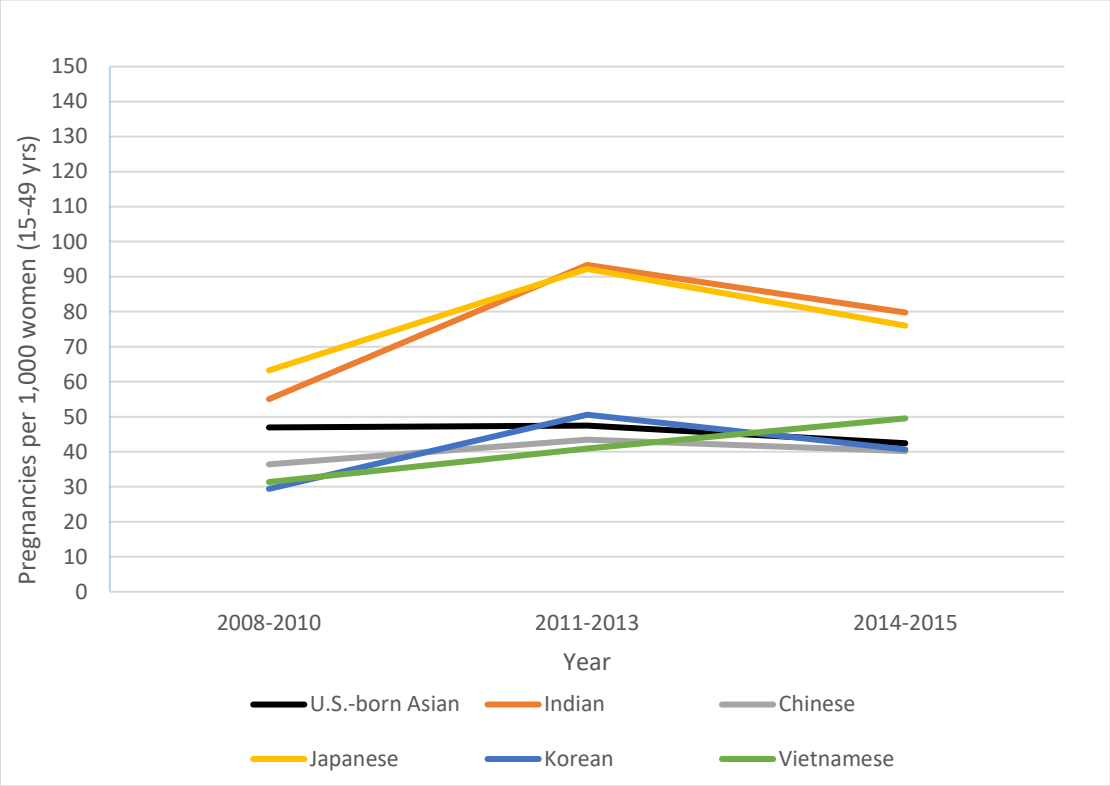


Figure 2.4: Abortion rates by major racial/ethnic groups: NYC, 2008-2015

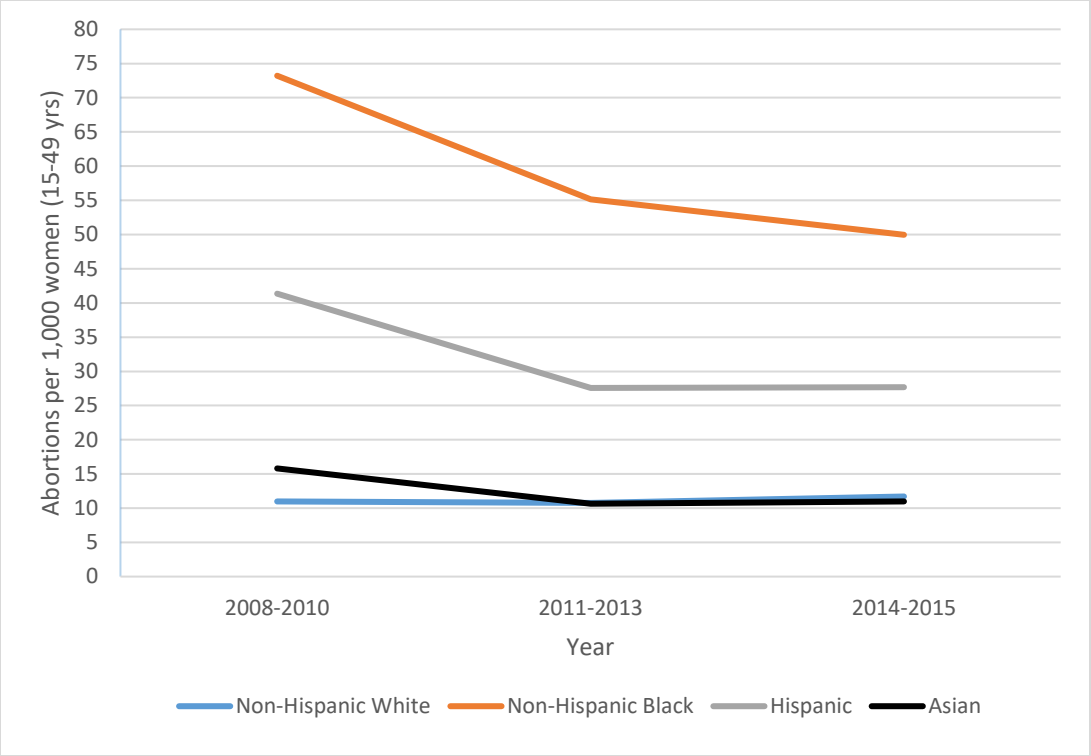


Figure 2.5: Abortion rates by foreign-born Asian groups: NYC, 2008-2015

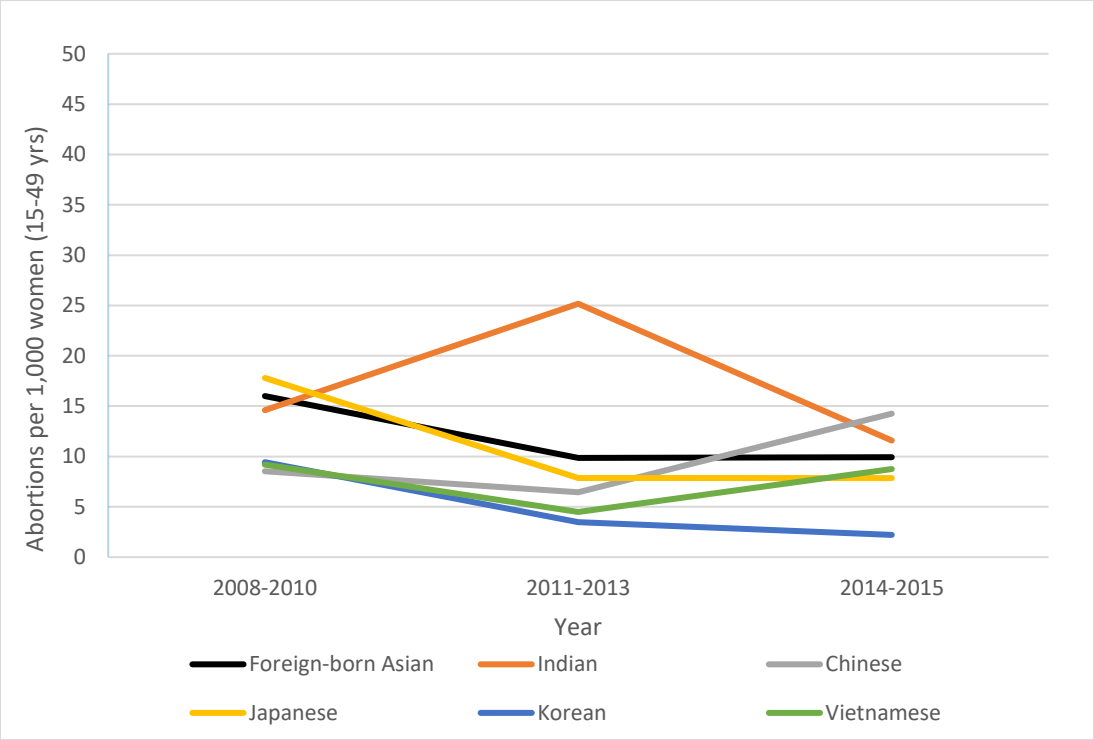


Figure 2.6: Abortion rates by U.S.-born Asian groups: NYC, 2008-2015

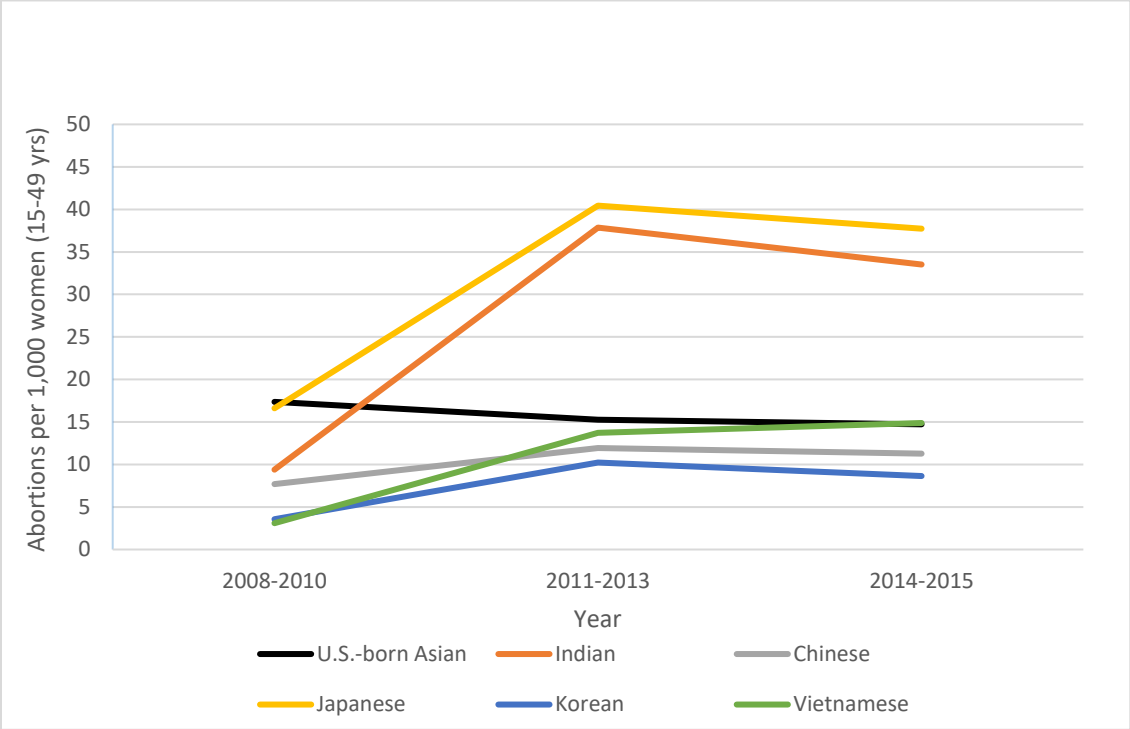


Figure 2.7: Abortion ratios by major racial/ethnic groups: NYC, 2008-2015

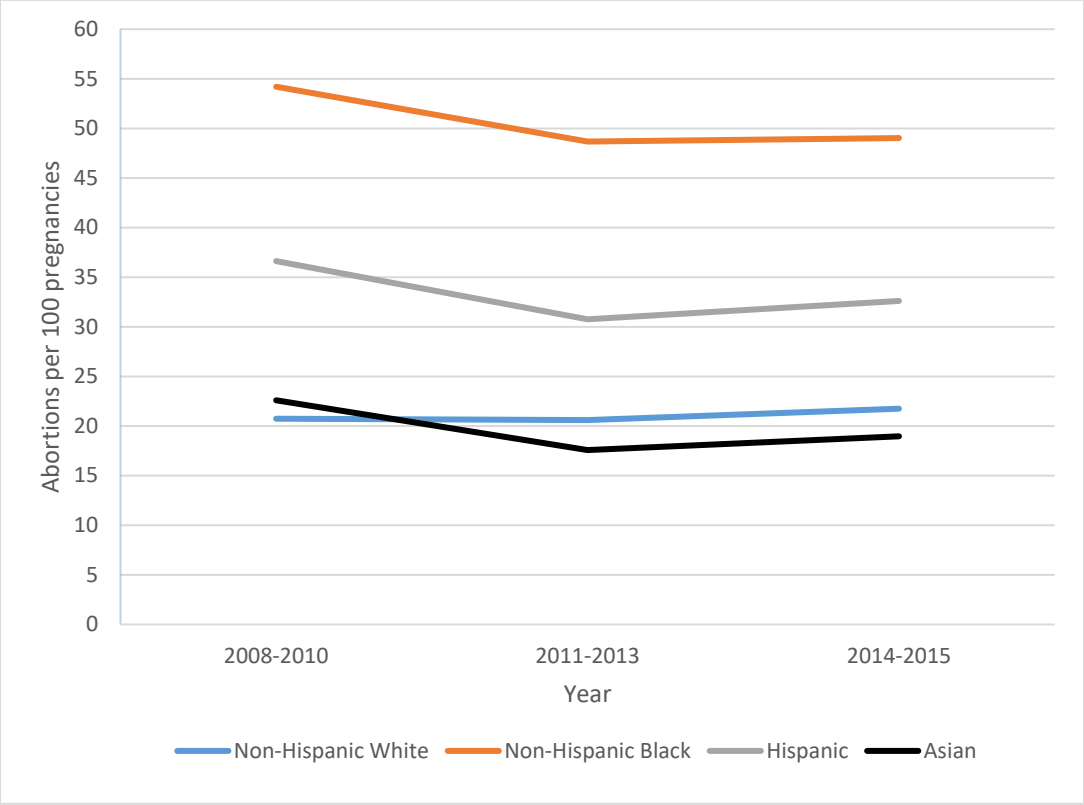


Figure 2.8: Abortion ratios by foreign-born Asian groups: NYC, 2008-2015

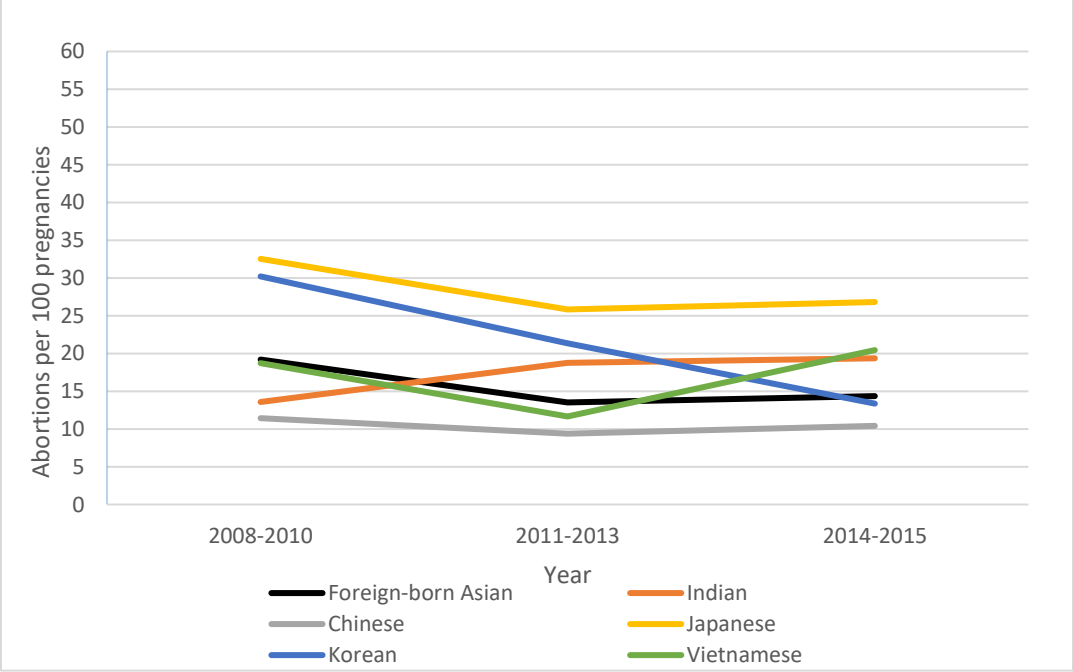
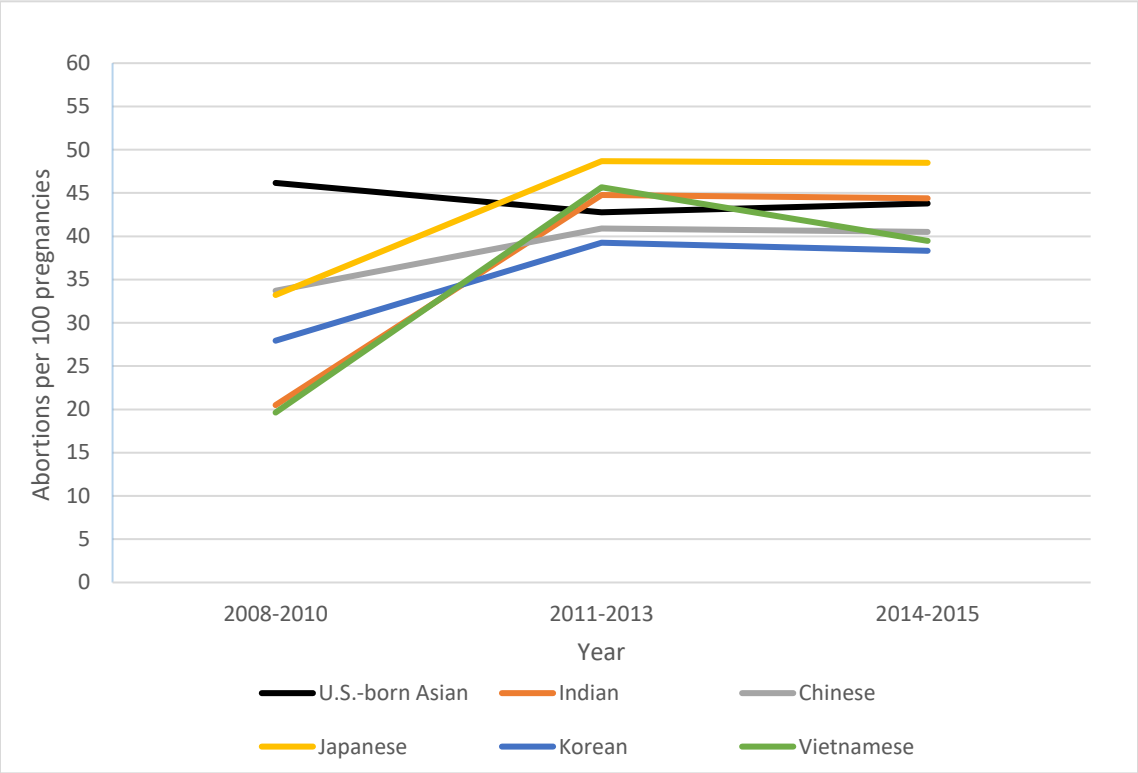


Figure 2.9: Abortion ratios by U.S.-born Asian groups: NYC, 2008-2015



CHAPTER 3 – AIM 2

DISTANCE TRAVELED FOR AN ABORTION AND GESTATION AT THE TIME OF ABORTION COMPARING IMMIGRANTS AND NON-IMMIGRANTS IN THE UNITED STATES, 2008 AND 2014

Abstract

Introduction: Little research exists examining if immigrants in the United States (U.S.) face greater obstacles to obtaining reproductive health care, such as abortion, than their U.S.-born counterparts. The present study addresses this gap by examining differences in distance traveled to obtain abortion care and gestation at the time of care by nativity status and length of stay in the U.S.

Methods: We use the Guttmacher Institute's 2008 and 2014 Abortion Patient Survey (APS), a nationally representative sample of abortion patients in the U.S., to examine if nativity status and length of stay in the U.S. are associated with traveling 50 miles or more to obtain an abortion and having a second-trimester abortion in immigrant and non-immigrant women.

Results: In adjusted analyses, immigrant women had 0.74 times the odds of traveling 50 miles or more compared to non-immigrants (Odds Ratio (OR): 0.74; 95% Confidence Interval (CI): 0.62, 0.88) and 0.80 times the odds of having an abortion in the second trimester than non-immigrants (OR: 0.80; 95% CI: 0.68, 0.95). There were no observed differences by length of stay among immigrants for either outcome.

Conclusions: Immigrants traveled shorter distances for their abortions and had them at earlier gestations than non-immigrants. These findings may indicate that immigrants face fewer barriers to abortion care than non-immigrants, but they may also suggest differential access to abortion between immigrants and non-immigrants, as only those who successfully obtained services were

included in the study. Further study is needed to better elucidate the apparent protective effect observed in immigrant women.

Introduction

One in four women in the United States (U.S.) will have an abortion during her lifetime.[1] Abortion is an essential component of reproductive health care that enables individuals to determine their own fertility, care for their own and their families' well-being and health, and, in many cases, prevent pregnancy-related morbidity and mortality.[2] Indeed, ensuring access to abortion is a public health goal.[3] However, to obtain abortion services in the U.S., women must contend with factors such as restrictive laws, prohibitive costs, and a political and social context that stigmatizes abortion.[4,5] Populations such as immigrants, who account for 17% of women of reproductive age in the U.S. and 23% of births[6] may face additional barriers. For example, restrictive federal immigration and health policies, such as legislation that bars some immigrants from using public insurance programs based on their legal status or duration of residence in the U.S.,[7] and heightened anti-immigrant sentiments[8] have been shown to impede immigrants' access to health services.[9,10] Furthermore, a substantial proportion of the country's immigrant population lives in states such as Texas and Florida, where multiple abortion restrictions have been enacted, primarily aimed at closing clinics and potentially forcing patients to travel farther to obtain care.[11]

Traveling far for abortion care may be a significant barrier for many women, especially given its associated costs such as lost wages, expenses for child care, transportation, and accommodations.[4,11,12] Furthermore, legal, logistical, and financial barriers to obtaining abortion in the U.S. can contribute to delays in care that increase the likelihood of having a second-

trimester abortion.[13,14] Such constraints, coupled with limited culturally- and linguistically-appropriate care options and low rates of health coverage and service use in immigrant populations, [15-17] could require some immigrant women to travel farther distances for care or present for their abortion later in pregnancy than non-immigrants. Although previous studies have examined potential obstacles to abortion care in national or state-specific populations,[11,18,19] little to no research has yet examined indicators of abortion access among immigrants and, more specifically, the barriers they may face to obtaining services relative to their U.S.-born counterparts.

This study uses a nationally representative sample of abortion patients to examine whether the distance traveled to obtain an abortion and gestation at the time of abortion, two indicators of potential obstacles to care, differ for immigrant patients compared to their U.S.-born counterparts. Differences are also examined within the immigrant abortion patient population by length of stay in the U.S., which has been documented to influence immigrants' health service use and access.[20]

Methods

Data source and study sample

Data for this study came from the Guttmacher Institute's 2008 and 2014 Abortion Patient Survey (APS), which provides the most recently available data on a nationally representative sample of abortion patients in the U.S. Data collection for both the 2008 and 2014 surveys used a similar sampling design, questionnaire, and fieldwork protocol to that of previous APS in 1987, 1994-1995, and 2000-2001.[21-24] One notable exception was that the 2014 APS excluded hospitals. As hospital abortions made up only 4% of total abortions in that year, excluding these

facilities from the sampling frame was not expected to have a substantive impact.[1] The samples from both survey rounds comprised patients obtaining abortions at facilities in the U.S. that provided 30 or more abortions in the survey year (not including hospitals in 2014). Participating facilities were identified from all known abortion-providing facilities based on data from the Guttmacher Institute's 2006 and 2011 Abortion Provider Census.[25,26] These facilities were stratified by facility type (defined as hospitals or non-hospitals in 2008 and, in 2014, facilities affiliated or unaffiliated with a national organization for women's reproductive health) and caseload (30-399; 400-1,999; 2,000-4,999; and 5,000 or more) and, within each stratum, organized by census region and state. Facilities within each stratum were then systematically sampled, using a specified interval for selection; the interval varied by stratum in order to oversample facilities with larger caseloads, ensuring adequate representation of facility types.

All patients obtaining an abortion at a selected facility during a specified fielding period were asked to complete a four-page, paper-and-pencil, self-administered questionnaire, available in English and Spanish. The questionnaire collected data on patient demographics, reproductive health-related characteristics such as the patient's gestation at the time of the abortion, and geographic information including respondent state and zip code of residence. Respondents were provided with a sealable envelope in which to return the survey so that their responses would not be seen by facility staff.

A detailed description of the data collection and weighting procedures can be found in previously published studies[19] and are summarized here. Data for the 2008 and 2014 APS were collected from April 2008 to May 2009 and April 2014 to May 2015, respectively. The 2008 APS approached 217 abortion-providing facilities across the U.S. and 95 (44%) participated, which was 89% of the sampling goal (N=107). Out of the 12,865 patients surveyed across these

facilities, 9,493 surveys were completed, obtaining a 74% respondent response rate. The 2014 APS approached 190 facilities and 87 (46%) participated, which was 77% of the original goal (N=113). Out of 11,024 patients surveyed in 2014, 8,230 surveys were completed, resulting in a 76% respondent response rate. To increase the sample size of immigrant abortion patients, this study combined the 2008 and 2014 APS for a total sample of 17,873 abortion patients, 16% (n=2,790) of whom identified as being born outside of the U.S. Although hospitals were not sampled in the 2014 APS, the hospital data from 2008 was retained in the pooled sample as 4.5% of immigrant respondents from that survey round obtained care at a hospital. Data from each survey round were weighted to account for unequal probability of selection and non-response at the respondent- and facility-levels, rendering a nationally representative sample of abortion patients in 2008 and 2014.[24,27] Survey-specific weights were retained when the survey rounds were combined for this study, and survey year was included in all analytic models to account for possible secular changes during the six intervening years between the pooled study periods. The APS and data collection procedures were approved by the Guttmacher Institute's Institutional Review Board (IRB). The current secondary analysis of these data was considered exempt from review by the City University of New York's IRB.

Outcome measures

The primary outcome of interest was distance traveled to obtain an abortion. Distance was estimated as the number of road miles between the centroids of the patient's zip code of residence, which was self-reported on the survey, and the zip code of the facility where they received services. Distance was computed using the Stata program *osrmtime*, which accesses Open Source Routing Machine 4.9 to calculate the driving distance (rather than the straight line distance) between two sets of geographic points.[28] Patients who obtained abortions in their zip

code of residence were coded as having traveled zero miles. One-way distance traveled to obtain an abortion was categorized into four groups: <25 miles, 25–49 miles, 50–100 miles, and >100 miles and dichotomized as <50 miles and ≥50 miles; these categories have been established in previous research.[18,29] Approximately 10% (n=1,712) of abortion patients did not provide a valid zip code and, therefore, the one-way distance to their abortion provider could not be calculated. As a result, these respondents were excluded from the distance traveled analyses.

Gestation at the time of abortion was examined as a secondary indicator of potential barriers to obtaining an abortion. Gestation was calculated in weeks based on self-reported last menstrual period (LMP) and dichotomized into first trimester (≤12 weeks gestation) and second trimester or later (13+ weeks). Data on gestation were available for all respondents.

Exposures and hypothesized confounders

Our primary exposures of interest are individual-level nativity status and length of stay in the U.S. Nativity status was dichotomized based on the survey question: "Were you born in the United States?" Respondents who answered "yes" were categorized as U.S.-born and those who answered "no" as immigrants. Length of stay in the U.S. was only asked of immigrant respondents and calculated as the difference between the survey year and the year provided in response to the survey question: "When did you come to live in the United States?" Length of stay was dichotomized as <10 years in the U.S. versus 10 or more years in the U.S. These categories are consistent with stratification used in previous research[30-32] as well as an earlier definition of acculturation in which "lower" acculturation was considered as residing in the U.S. for less than 10 years and "higher" acculturation as residing in the U.S. for 10 or more years.[33] Analyses of length of stay were restricted to immigrants in order to examine within-group

differences in either distance traveled or gestation. Nineteen percent (n=519) of immigrants were missing data on length of stay and excluded from analyses of this exposure.

Based on two prior studies,[18,34] we examined the following as *a priori* hypothesized confounders: age (12-53 years), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, Asian, and Other races), health insurance status, poverty level (measured relative to an annual income of approximately $24,000 for a four-person household, as per the Health and Human Services poverty guidelines[35]), level of education, relationship status, number of prior births (0, 1-2, and ≥3 births), gestation at the time of abortion (in the distance traveled model), distance traveled (in the gestation model), residence in a Metropolitan Statistical Area (MSA, i.e., urban or rural), region of residence, and state-level hostility related to abortion restrictions. This variable was categorized as supportive, middle-ground, hostile, or extremely hostile. These categories are based on the number of restrictive abortion policies in a given state during each survey year and focusing on 10 major restrictions (e.g., clinic regulations, gestational limits, abortion coverage restrictions); supportive states are those with 0-1 restrictions; middle-ground states are those with 2-3 restrictions; hostile states have 4-5 restrictions; and extremely hostile states have 6-10 restrictions.[36] Although we descriptively assessed both region of residence and state-level hostility, both were closely correlated and only the latter of the two variables was included in our multivariable models. This decision was based on prior evidence that abortion restrictions were associated with a decrease in the number of abortions and providers,[25] which could have direct implications for access to abortion.[11,19]

After excluding respondents with missing data on the outcome, the analytic sample used for distance traveled was 16,161 abortion patients (excluding the 1,712 respondents with missing data on distance traveled) and 17,873 patients to examine the association for gestation at time of

abortion. Analyses that assessed the length of stay-distance traveled relationship consisted of 2,086 immigrant abortion patients (excluding 519 foreign-born respondents missing data on length of stay in addition to 185 missing data on distance traveled) and the length of stay-gestation model included 2,271 immigrant patients (excluding the 519 foreign-born respondents without length of stay data).

Statistical Analysis

We ran bivariate analyses of all hypothesized confounders and nativity status and length of stay using Chi-squared statistics. We calculated the median values, estimated 95% confidence intervals, and tested differences in the percent distribution of distance traveled by nativity status and length of stay. We next ran bivariate and multivariable logistic regression models to estimate unadjusted and adjusted odds ratios of traveling 50 miles or more to obtain an abortion by each exposure.

To examine the secondary outcome of gestation, we calculated the median, 95% confidence intervals, and range of weeks' gestation by nativity status and length of stay, and assessed differences in the proportion of patients who had first- versus second or later-trimester abortions by each independent variable. Logistic regression was used to estimate unadjusted and adjusted odds ratios of having a second or later-trimester abortion by nativity status and length of stay. All adjusted estimates control for hypothesized confounders, including survey year.

Sensitivity Analyses

Given the 19% of immigrant respondents missing data on length of stay, we ran two additional multivariable models for each outcome as sensitivity analyses to assess the influence of: 1) including length of stay with missing as a category; and 2) applying multiple imputation

techniques. Furthermore, as prior research has indicated that the distance traveled for abortion may vary between urban and rural residents based on factors such as proximity and availability of providers, we restricted the logistic regression models estimating distance traveled to urban patients as another sensitivity analysis.[18] As a final sensitivity analysis, unadjusted and adjusted proportional odds ratios and predicted probabilities were estimated using ordinal regression models, in which variables for distance traveled and gestation included ordered categories of <25, 25-49, 50-100, and >100 miles (for distance) and ≤12 weeks, 13-15 weeks, and ≥16 weeks (for gestation). These additional analyses were conducted to assess if the exposure-outcome associations changed when the outcomes were categorical rather than dichotomous.

Statistical significance was set at $p<.05$ for all comparisons. All analyses were weighted and conducted using the *svyset* command in Stata version 15.1 to account for the complex sampling design, including clustering within facilities.

Results

Sample description

Immigrants comprised 16% (n=2,790) of the analytic sample, proportional to the share of immigrants in the U.S. population of women of reproductive age during both survey time periods.[37,38] The sample characteristics differed in several ways by nativity status. For example, immigrants in the sample were generally older than non-immigrants (median age of 28 vs. 24 years, $p<.001$), and identified predominantly as Hispanic (49%) and Asian (20%), while non-immigrants were primarily non-Hispanic White (43%) and non-Hispanic Black (31%, $p<.001$). A larger share of immigrant compared to non-immigrant patients lacked insurance coverage (45% vs 32%, $p<.001$) and had poverty-level incomes (<100% of FPL) (50% vs 45%, $p<.01$). The vast

majority of both groups lived in a metropolitan area, although a smaller proportion of immigrant patients lived in rural areas compared to non-immigrants (6% vs 12%, p<.001). Compared to non-immigrant respondents, a larger share of immigrants lived in the Northeast and West of the country (58% vs 47%, p<.01), and in states with generally supportive policies toward abortion (49% vs 39%, p=.01). These findings are included in Table 3.1.

Among immigrant abortion patients who provided data on length of stay, over half (57%, n=1,283) had been in the country for 10 or more years (non-recent immigrants) and 43% (n=988) had been in the U.S. for less than 10 years (recent immigrants). Recent immigrants appeared generally younger than non-recent immigrants. A higher proportion were also uninsured (48% vs 39%, p<.01), had poverty level incomes (53% vs 46%, p<.01), were married (35% vs 27%, p<.001), and had no prior births (38% vs 30%, p<.001) compared to non-recent immigrants. (Table 3.1.)

Distance traveled to obtain an abortion

Overall, immigrants traveled an estimated median distance of 11.1 miles (95% CI: 10.7, 11.7) for their abortion procedures, while non-immigrants had a longer median travel distance of 15.2 miles (95% CI: 14.9, 15.6). Using distance categories, a larger share of immigrants compared to non-immigrants traveled under 25 miles for their procedure (77% vs 66%) and a smaller share traveled over 50 miles (11% vs 18%, p<0.05). The median distance traveled by non-recent (11.2 miles, 95% CI: 10.6, 12.3) immigrant patients was slightly higher than that for recent (10.3 miles, 95% CI: 9.6, 11.1) immigrants, and those missing data on length of stay traveled a median of 12.5 miles (95% CI: 11.7, 13.8); a similar pattern was observed using the categorical distance measure (Table 3.2).

In adjusted analyses, immigrants had 0.74 odds of traveling 50 miles or more compared to non-immigrants (aOR: 0.74; 95% CI: 0.61, 0.88; Table 3). With regard to length of stay, recent immigrants compared to non-recent immigrants had 0.95 odds of traveling travel distances over 50 miles for their abortion (aOR: 0.95; 95% CI: 0.68, 1.32). However, this difference was not statistically significant.

Gestation at the time of abortion

The median gestation for immigrants was 7 weeks and for non-immigrants, 8 weeks; these estimates reflect a higher proportion of non-immigrants (11%) obtaining second or later-trimester abortions compared to immigrants (8%) ($p<.001$). No differences were seen in gestation at the time of abortion by length of stay categories (Table 3.4).

Table 3.5 presents unadjusted and adjusted odds ratios of having a second or later-trimester abortion by nativity status and length of stay. In adjusted models, immigrants had 0.79 odds of having an abortion in the second trimester compared to non-immigrants (aOR: 0.79; 95% CI: 0.67, 0.94). Compared to non-recent immigrants, recent immigrants had 0.89 odds of having an abortion after the first trimester (aOR: 0.89; 95% CI: 0.62, 1.25). However, this difference was not statistically significant.

Sensitivity Analyses

When the analytic sample was restricted to urban residents, findings from multivariable analyses of distance traveled did not differ substantively from analyses of the entire sample (Table A3.1). With regard to missing data on length of stay, using imputed values produced estimates for both outcomes that were similar to those from the main analyses (Table A3.2). Furthermore, when we ran multivariable models that included length of stay with a missing

category, no differences in distance traveled or gestation by length of stay were observed (Table A3.3). Finally, adjusted findings from the ordinal logistic models were consistent with those from the logistic models: immigrants were less likely to travel farther distances or to have second trimester procedures compared to non-immigrants, with no associations by length of stay in the U.S. (Tables A3.4 and A3.5).

Discussion

Findings from this study suggest that among individuals obtaining abortion services, immigrants generally traveled shorter distances for their abortion compared to their U.S.-born counterparts. Both recent and non-recent immigrants were less likely than non-immigrants to travel over 50 miles to obtain an abortion, with no differences by length of stay among immigrants. With regard to gestation at the time of abortion, immigrants were less likely than non-immigrants to have an abortion after their first trimester, with no differences between recent and non-recent immigrants.

Prior research has shown that White, educated, and higher income women travel farther for abortion services than their counterparts.[18] However, these studies have not focused on immigrants specifically. Findings from this study indicate that, among people who obtain abortion services, immigrants may face fewer obstacles than non-immigrants to obtaining care as measured by distance traveled and gestation at time of abortion. One possible explanation for this finding is that the majority of immigrants in the U.S. are concentrated in urban areas, which also have a higher density of abortion providers.[37,39] Furthermore, even in a sensitivity analysis, restricting the sample to urban residents, immigrants traveled shorter distances than non-immigrants for their care. These findings might reflect immigrants' general geographic proximity

to abortion facilities, which could reduce their need to travel for services, facilitate care without delay, and help offset other potential barriers to care. However, it is also possible that immigrants have less choice over where to obtain abortion services, and our findings may reflect those who had no other recourse but to receive care closer to home.[40] For many immigrants, legal and administrative barriers to obtaining drivers licenses in addition to perceived fear of leaving one's community and the financial resources required to travel could limit their mobility.[40-42] Indeed, those groups that have been previously found to travel farther for abortion care traditionally have access to resources and privilege, which may suggest that traveling for care is an indicator of better access to care.[4]

Similarly, with regard to gestation, immigrants were less likely than non-immigrants to have second-trimester abortions. There are at least two possible explanations for this finding. The first is that, given immigrant abortion patients are older and a higher proportion have had children, it is possible that they were able to recognize their pregnancies earlier and obtain abortion care with fewer delays than their U.S.-born counterparts. The second possible explanation is that a larger proportion of immigrants seeking second-trimester abortions were unable to obtain them compared to non-immigrants and, thus, not captured in our dataset of abortion patients. In that case, immigrants compared to non-immigrants seeking second-trimester abortions may have been differentially missing from these data and those who successfully obtained their services would not represent the experience of all immigrants seeking this care. As a result, our findings may underestimate the likelihood of immigrants obtaining second-trimester abortions. Subsequent research should explore the factors that contribute to patterns in gestation among immigrant and non-immigrant abortion patients.

We did not identify significant differences in the outcomes between recent and non-recent immigrants. These findings may have been influenced by substantial missing data on length of stay in our sample. However, even when including missing as a category of length stay, we did not see significant differences within the immigrant sample. Furthermore, our estimates using multiple imputation were nearly the same as those from the complete case analyses. Instead, it may be the case that, in the context of abortion access, aspects of the immigrant experience other than length of stay may be more salient to examine.

This study has several limitations. Most notably, it only contains data from individuals who were able to access clinical abortion services. Women who wanted an abortion but were unable to have one—whether due to lack of information, economic resources, or providers in their geographic area—were not captured in our data, thereby potentially resulting in bias towards the null if non-differential. Similarly we did not obtain information from individuals who were able to successfully self-manage their abortions outside of a clinical setting. Immigrants could be differentially excluded from this study if they are more likely than their non-immigrant counterparts to obtain abortions in non-clinical settings or face barriers that altogether prevent access to abortion. To that end, this study is able to highlight indicators of *potential* barriers to abortion among those successfully accessing care, but may miss other critical barriers that prevented some individuals from obtaining abortion care. Moreover, that less than half of recruited facilities participated in this study may challenge the representativeness of our sample; however, the response rates are comparable to other large-scale surveys[43,44] and survey weights were also applied to all analyses to account for facility- and individual-level non-response.

Furthermore, this study's measurement of distance assumes car travel and does not take into account public transit routes, which could take substantially more or less time than driving a car even when the distance in miles is minimal. Our measure of gestation was also based on self-reported information and not ultrasound. While gestation based on individuals' reports of LMP are usually comparable to those based on ultrasound, when they are inaccurate they tend to underestimate gestation.[34,45,46] However, we would not expect this misclassification to be differential by immigrant status. It is possible that respondents born outside of the U.S. provided inaccurate information on their nativity status or were more likely than non-immigrants to decline to fill out the survey. Similarly, the survey may have been too time-consuming or difficult to complete for individuals for whom English (or Spanish) was not their primary language. Such language barriers could differentially impact survey and study participation among immigrants compared to non-immigrants.

Our analyses were also affected by missing data on the length of stay exposure and distance traveled outcome. For the former, nineteen percent (n=519) of immigrants were missing data on length of stay; however, their demographic characteristics were generally similar to those who provided information on length of stay, although a higher proportion were uninsured (52.6% vs 42.7%, $p<.001$) and non-Hispanic Black (20.9% vs 14.1%, $p<.01$) compared to those with data (Table A3.6). Furthermore, slightly more immigrant than non-immigrant patients were missing residential zip code (11% for immigrants vs. 9% for non-immigrants, $p=.02$) and, thus, we were unable to include these respondents in analyses of distance traveled. However, the demographic composition of patients with valid zip code data was similar to that of the overall pooled sample of abortion patients (Table A3.7). Although the data for this study are from earlier years, they are the most recent data available to examine the circumstances of obtaining abortion

care in a nationally representative sample. Given recent policy changes regarding abortion and immigration, it will be important to update these data and analyses in upcoming years to understand how potential obstacles to care may be shifting for immigrants in the U.S. Finally, combining non-continuous abortion data from 2008 and 2014 may have masked temporal changes in the population of abortion patients; however, we adjusted for survey year in our analyses as one approach to account for such shifts.

Conclusion

Using data from a nationally representative sample of abortion patients in the U.S. from 2008 and 2014, this study compares potential barriers to obtaining abortion care between immigrants and non-immigrants. Contrary to our original hypothesis, this study found that immigrants traveled shorter distances for their abortions and had them at earlier gestations than non-immigrants. These findings may indicate that immigrants face fewer barriers to abortion care than non-immigrants, but they may also reflect sampling bias related to access to abortion care altogether for immigrants and non-immigrants. Further research should investigate the underlying mechanisms that contribute to these associations to better understand the extent to which immigrants are able to obtain the abortion care they need. With increasingly restrictive abortion legislation, such work could inform health policies that seek to safeguard or improve the availability of abortion services for immigrants moving forward. Indeed, with rising anti-immigrant sentiments in the U.S., immigrants may face new or augmented challenges to obtaining abortion care. Finally, increased study of location-specific factors associated with abortion access would advance understanding of potential barriers and facilitators to care, including how national and local immigration-related policies shape access to reproductive

services. Together, this work will be critical to help bring to bear if and how the changing policy environments impact immigrant women's abortion use, and ultimately, better serve and support the reproductive health needs of all women seeking abortion.

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Table 3.1: Characteristics of people obtaining abortions in U.S. facilities by nativity status and length of stay in the U.S., 2008-2014

	All women (N= 17,873)					Immigrant women (N= 2,271)[1]				
	Non-immigrants (n=15,083)		Immigrants (n=2,790)			≥10 yrs living in the U.S. (n=1,283)		<10 yrs living in the U.S. (n=988)		
Characteristic	N	%	N	%	p-value[2]	N	%	N	%	p-value[2]
Age, y					<.001					<.001
<18	857	5.7	76	2.8		26	2.1	39	4.2	
18-19	1,570	10.5	152	5.4		72	5.5	59	6.1	
20-24	5,406	35.3	692	24.2		290	21.5	270	27.0	
25-29	3,773	25.0	759	27.1		310	24.4	296	29.2	
30-34	2,001	13.5	554	20.3		265	21.3	189	19.3	
35+	1,476	9.9	557	20.2		320	25.1	135	14.2	
Race/ethnicity					<.001					<.01
Non-Hispanic White	6,510	42.6	296	10.4		155	12.1	96	9.6	
Non-Hispanic Black	4,726	31.2	428	15.4		176	13.6	145	14.6	
Hispanic	2,928	20.2	1,361	49.0		647	50.4	456	46.5	
Asian	340	2.3	554	19.7		224	17.4	249	24.9	
Other	579	3.7	151	5.5		81	6.4	42	4.4	
Health insurance					<.001					<.01
No coverage	4,805	32.3	1,236	44.6		494	39.0	472	47.6	
Medicaid	5,067	33.9	756	27.2		376	29.0	254	26.3	
Private	4,968	32.2	766	27.1		397	30.8	247	24.7	
HealthCare.gov / State exchange	243	1.6	32	1.1		16	1.2	15	1.4	
Poverty status, %					<.01					<.01
<100	6,769	44.7	1,402	50.4		597	46.4	528	53.2	
100-199	4,019	26.7	657	23.3		310	24.1	225	22.7	
≥200	4,295	28.6	731	26.3		376	29.5	235	24.1	
Highest level of education					<.001					<.01
Less than high school	2,072	13.8	667	24.4		275	21.4	254	26.5	

High school graduate/GED	4,489	29.8	750	26.6		340	26.5	257	25.5	
Some college	5,992	39.5	744	26.3		381	29.3	239	23.6	
College graduate	2,530	16.9	629	22.7		287	22.8	238	24.5	
Relationship status					<.001					<.001
Married	1,739	11.5	845	30.3		345	27.1	343	34.8	
Cohabiting	4,706	31.3	655	23.6		324	25.1	211	21.7	
Never married	7,243	48.0	892	32.0		406	31.7	328	33.1	
Previously married	1,395	9.1	398	14.1		208	16.2	106	10.4	
Number of previous births					<.001					<.001
0	6,241	41.2	930	32.8		393	30.0	380	38.1	
1-2	7,920	52.7	1,597	57.8		741	58.5	545	55.5	
≥3	922	6.1	263	9.4		149	11.5	63	6.4	
Resides in MSA[3]					<.001					.98
No (Rural)	1,720	11.8	163	6.1		71	5.7	57	5.6	
Yes (Urban)	12,090	88.2	2,327	93.9		1,125	94.3	850	94.4	
Region of residence[4]					<.01					.63
Northeast	3,325	22.8	698	26.9		301	25.3	256	27.9	
Midwest	2,534	16.5	266	9.1		116	8.6	99	9.4	
South	5,469	36.3	903	32.7		416	33.0	317	31.9	
West	3,755	24.4	917	31.3		450	33.1	316	30.8	
State-level hostility toward abortion					.01					.42
Supportive	5,753	38.5	1,351	48.7		638	49.3	469	47.9	
Middle-ground	1,779	12.5	316	12.1		134	11.0	129	14.0	
Restrictive	4,429	28.2	629	22.1		288	21.9	213	20.7	
Extremely restrictive	3,120	20.8	469	17.0		222	17.8	173	17.4	
Survey year					.89					.06
2008	8,009	53.0	1,484	53.5		653	50.8	549	56.1	
2014	7,074	47.0	1,306	46.5		630	49.2	439	43.9	

[1] Among 2,790 immigrants in the sample, 519 (19%) did not report on length of stay. Thus, distribution of immigrant sample by length of stay only includes 2,271 immigrant respondents who reported this information.

[2] P-values calculated using chi-sqaure statistics.

[3] MSA = Metropolitan statistical area; data missing for 1,273 non-immigrant and 300 immigrant patients; among immigrants with length of stay information, data missing for 87 non-recent and 81 recent immigrant patients.

[4] Data missing on region of residence for 6 immigrant patients.

Table 3.2: Median, range, and weighted percent distribution of U.S. abortion patients by distance traveled[1] to abortion facility, 2008-2014

	Distance from residence zip code to facility zip code (Miles)				Categorical distances from residence zip code to facility zip code (%)				
	Obs	Median	95% CI	Range	<25 miles	25-49 miles	50-100 miles	>100 miles	p-value[2]
Nativity[3]									<.001
Non-immigrant	13,684	15.2	14.9 - 15.6	(0 - 4,949)	65.8	15.8	10.3	8.1	
Immigrant	2,477	11.1	10.7 - 11.7	(0 - 4,000)	77.3	12.1	5.1	5.5	
Length of stay[4]									<.01
≥10 years	1,190	11.2	10.6 - 12.3	(0 - 2,684)	76.6	13.3	5.6	4.4	
<10 years	896	10.3	9.6 - 11.1	(0 - 3,503)	80.8	9.8	4.3	5.1	
Missing	391	12.5	11.7 - 13.8	(0 - 4,000)	71.7	13.3	5.5	9.5	

[1] Distance traveled analyses only included those respondents who provided valid residence zip codes.

[2] P-values calculated using chi-squared statistics

[3] 9% (n=1,399 fo 15,083) of non-immigrants and 11% (n=313 of 2,790) of immigrants did not provide valid zip codes.

[4] 7% (n=92 of 1,283) of non-recent and 9% (n=93 of 988) of recent immigrants did not provide valid zip codes. 24% (n=128 of 519) of immigrant respondents who did not report their length of stay in the U.S. also did not provide valid zip codes.

Table 3.3: Unadjusted and adjusted odds ratios of traveling 50 or more miles for an abortion, by nativity status and length of stay, 2008-2014

Characteristic	Unadjusted model				Adjusted models[1]							
					Analysis on full sample (N=16,161[2])				Analysis restricted to immigrants (N=2,086[3])			
	Unadjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value
Nativity												
Non-immigrant	1.00				1.00							
Immigrant	0.53	0.43	0.65	.00	0.74	0.61	0.88	.00				
Length of stay in the U.S.												
≥10 years	1.00								1.00			
<10 years	0.93	0.69	1.26	.64					0.95	0.68	1.32	.75

[1] Both adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion, urban/rural residence, state-level hostility toward abortion, and survey year.

[2] Excludes 1,712 respondents who did not provide valid zip codes.

[3] Excludes 185 immigrant respondents who did not provide valid zip codes and 519 immigrant respondents who did not report on their length of stay in the U.S.

[4] OR = Odds ratio

[5] CI = Confidence interval

Table 3.4: Median, range, and weighted percent distribution of U.S. abortion patients by gestation at the time of abortion, 2008-2014

	Gestation at the time of abortion (weeks)					Trimester[2] (%)		
	Obs	Median	95% CI[1]		Range	1st trimester	≥2nd trimester	p-value[3]
Nativity								<.001
Non-immigrant	15,083	8.0	8.0	8.0	(4 - 24)	89.3	10.7	
Immigrant	2,790	7.0	7.0	7.0	(4 - 24)	91.9	8.1	
Length of stay								.17
≥10 years	1,283	7.0	7.0	7.0	(4 - 23)	92.3	7.7	
<10 years	988	7.0	7.0	7.0	(4 - 23)	92.4	7.6	
Missing	519	7.0	7.0	8.0	(4 - 24)	89.8	10.2	

[1] CI = Confidence interval

[2] First trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[3] P-values calculated using chi-squared statistics

Table 3.5: Unadjusted and adjusted odds ratios of having a second or later-trimester[1] abortion, by nativity status and length of stay, 2008-2014

Characteristic	Unadjusted models				Adjusted models[2]							
					Analysis on full sample (N=17,873)				Analysis restricted to immigrants (N=2,271[3])			
	Unadjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value
Nativity												
Non-immigrant	1.00				1.00							
Immigrant	0.74	0.64	0.86	.00	0.79	0.67	0.94	.01				
Length of stay in the U.S.												
≥10 years	1.00								1.00			
<10 years	0.98	0.72	1.32	.88					0.89	0.62	1.25	.49

[1] Second trimester or later is defined as 13 or more weeks and first trimester is defined as ≤12 weeks based on the date of last menstrual period

[2] Both adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, distance traveled to obtain an abortion, urban/rural residence, state-level hostility toward abortion, and survey year.

[3] Excludes 519 immigrant respondents who did not report on their length of stay in the U.S.

[4] OR = Odds ratio

[5] CI = Confidence interval

CHAPTER 4 – AIM 3

THE INFLUENCE OF INDIVIDUAL- AND NEIGHBORHOOD-LEVEL NATIVITY ON POTENTIAL BARRIERS TO ABORTION CARE IN THE UNITED STATES

Abstract

Introduction: Approximately 16% of immigrants in the United States (U.S.) obtain abortion services. Ensuring their ability to obtain this care is critical; yet, limited research has examined how potential barriers to abortion differ by nativity, either as an individual- or neighborhood-level measure. Furthermore, these differences are rarely examined within racial/ethnic groups. To address this gap, this study investigates differences by individual-level nativity status and neighborhood-level immigrant density in the one-way distance traveled to obtain care and gestation at the time of abortion, two potential indicators of obstacles to abortion care, within major racial/ethnic groups.

Methods: This study analyzes data from the Guttmacher Institute's 2008 and 2014 Abortion Patient Survey (APS), a nationally representative sample of abortion patients in the U.S. (n=17,873). Individual-level data from the APS are linked to neighborhood-level data from the U.S. Census Bureau and American Community Survey by Zip Code Tabulation Area. The primary exposures of interest are individual-level nativity status, neighborhood immigrant density, and a measure combining both variables stratified by race/ethnicity. Unadjusted and adjusted odds ratios of traveling 50 miles or more to obtain an abortion and having a second-trimester abortion are estimated, comparing immigrants to non-immigrants and neighborhoods with higher and lower concentration of immigrants.

Results: In adjusted analyses, Hispanic (aOR: 0.65; 95% CI: 0.45, 0.92) and non-Hispanic White (aOR: 0.63; 95% CI: 0.43, 0.93) immigrants were significantly less likely than their non-immigrant counterparts to travel 50 or more miles to obtain an abortion. At the neighborhood-

level, across all racial/ethnic groups, we found that abortion patients living in neighborhoods with higher compared to lower concentration of immigrants were less likely to travel 50 or more miles for their abortion. Hispanic (aOR: 1.48; 95% CI: 1.16, 1.90) and non-Hispanic Black (aOR: 1.27; 95% CI: 1.02, 1.58) respondents in neighborhoods with higher versus lower proportion of immigrants were significantly more likely to have a second-trimester abortion. When nativity status and immigrant density were examined together, across all racial/ethnic groups, both immigrant and non-immigrant abortion patients in higher density neighborhoods were less likely to travel 50 or more miles for services compared to their counterparts living in neighborhoods with lower immigrant density.

Conclusions: This study found that immigrants traveled shorter distances for their abortions than non-immigrants across most racial/ethnic groups. Findings at the neighborhood-level suggest that higher immigrant density may influence the distance traveled to obtain an abortion and gestation at time of the abortion; however, results were not always consistent across racial/ethnic groups. Efforts to further study potential barriers and facilitators to abortion care among immigrants in the U.S. should continue to examine the heterogeneity of this population and investigate the mechanisms through which neighborhood-level factors, such as immigrant density, may influence access to services.

Introduction

The immigrant population comprises a rapidly growing and ethnically diverse demographic of the United States (U.S.), projected to represent nearly one-fifth of the country's overall population by 2065.[1] Further, immigrants in the U.S. comprise 17% of women of reproductive age (15-44 years) in the country and some 16% of individuals obtaining abortions in

the U.S.[2,3] Given the growth of immigrants in this country, understanding and ensuring their ability to obtain reproductive health services, including abortion, is critical. Yet, limited research has examined how potential barriers to abortion care differ by immigrant-specific determinants—either at the individual or neighborhood-level—and even less is known about how these associations vary across racial/ethnic groups.

Studies-focused on individual level determinants, including results from Chapter 3 of this dissertation, have suggested that immigrants in the U.S. obtaining abortion services travel shorter distances to obtain their care and present at earlier gestations compared to non-immigrants. However, these findings have not been examined within racial/ethnic groups, despite documented disparities in abortion access by race/ethnicity in the U.S.[4-6] and racial and ethnic diversity of the immigrant population. Indeed, immigrants are not a monolithic group and studies examining heterogeneity by racial/ethnic origins have revealed important differences in health behaviors and access to care, including use of reproductive cancer screenings, prenatal care, and contraceptive care.[7-11] Furthermore, given the pervasive history of racism and xenophobia in the U.S., immigrants of color may face distinct obstacles to care, such as discrimination and hostility based on their race and nativity, which could additionally impact the ease with which they obtain abortion services.[12-14]

Research also continues to demonstrate the importance of neighborhood characteristics in shaping access to health care.[15,16] For immigrants, who are likely to reside in neighborhoods with high proportions of other immigrants,[17] prior research has suggested that immigrant enclaves (neighborhoods with high proportion of immigrants) may confer health benefits, including better access to care.[15,18,19] These studies suggest that neighborhood immigrant composition may be associated with health-relevant social features of neighborhoods such as community and health

services that cater to immigrants, lower communication costs for non-English language speakers, and kinship networks that serve as a resource for obtaining care.[18,20] These features of immigrant enclaves could contribute to an environment in which information about the availability and location of care, as well as how to navigate the health system can be shared,[18] and may confer a protective effect by surrounding residents with informal social resources that help facilitate access to care.[21,22] These factors may be particularly salient for foreign-born women, who have been shown to have strong place-based social ties based on nativity and country of origin.[23] At the same time, the protective effect of immigrant neighborhoods is not always consistent, varying based on ethnic group, nativity status, and health outcome.[18,24,25] However, it could also have particular benefit in the context of obtaining abortion services, which may require additional sensitivity and knowledge to navigate, given the legal, logistical, and cultural barriers associated with abortion care.[5,26] To this end, it is possible that residing in a neighborhood with concentrations of foreign-born individuals may protect against potential barriers to obtaining abortion care; however, studies that investigate this relationship remain rare. In a time when abortion and immigration-related policies in the U.S. may serve to constrain access to reproductive health care for immigrants, better understanding potential facilitators and barriers to care for this population is important.

Using a nationally representative sample of abortion patients, this study furthers previous analyses by investigating the influence of individual-level nativity on potential barriers to abortion care within major racial/ethnic groups to elucidate any differences between immigrants and non-immigrants within these groups. We then examine neighborhood immigrant density as another predictor of abortion access, stratified by race/ethnicity. Based on the limited data available to investigate abortion in the immigrant population, indicators of potential barriers to

care are operationalized as the one-way distance traveled to obtain an abortion and gestation at the time of abortion. Prior research has suggested that traveling for abortion care may be a significant barrier for many women, especially given its associated costs such as lost wages, expenses for child care, transportation, and accommodations.[5,27,28] Furthermore, legal, logistical, and financial barriers to obtaining abortion in the U.S. can contribute to delays in care that increase the likelihood of having a second-trimester abortion.[29,30] Although these measures reflect distinct indicators of access, they remain useful markers of possible obstacles to obtaining abortion care.

Methods

Data sources and study sample

Individual-level data were obtained from the Guttmacher Institute's 2008 and 2014 Abortion Patient Survey (APS), which provides the most recently available data on a nationally representative sample of abortion patients in the U.S. Data collection for both the 2008 and 2014 surveys used a similar sampling design, questionnaire, and fieldwork protocol to that of previous APS in 1987, 1994-1995, and 2000-2001.[31-34] One notable exception was that the 2014 APS excluded hospitals. As hospital abortions made up only 4% of total abortions in 2014, excluding these facilities from the sampling frame should not have a large impact on findings.[35] The samples from both survey rounds consist of patients obtaining abortions at facilities in the U.S. that provided 30 or more abortions in the survey year (not including hospitals in 2014). Participating facilities were identified from all known abortion-providing facilities based on data from the Guttmacher Institute's 2006 and 2011 Abortion Provider Census.[36,37] These facilities were stratified by facility type (defined as hospitals or non-hospitals in 2008 and, in 2014, facilities affiliated or unaffiliated with a national organization for women's reproductive health)

and caseload (30-399; 400-1,999; 2,000-4,999; and 5,000 or more) and, were organized by census region and state within each stratum. Facilities within each stratum were then systematically sampled, using a specified interval for selection; the interval varied by stratum in order to oversample facilities with larger caseloads, ensuring sufficient numbers of abortion patients.

All patients obtaining an abortion at a selected facility during a specified fielding period were asked to complete a four-page, paper-and-pencil, self-administered questionnaire, available in English and Spanish. The questionnaire collected data on patient demographics, reproductive health-related characteristics such as the patient's gestation at the time of the abortion, and geographic information including respondent state and zip code of residence. Respondents were provided with a sealable envelope in which to return the survey so that their responses would not be seen by facility staff.

A detailed description of the data collection and weighting procedures can be found elsewhere[38] and are summarized here. Data for the 2008 and 2014 APS were collected from April 2008 to May 2009 and April 2014 to May 2015, respectively. The 2008 APS approached 217 abortion-providing facilities across the U.S. and 95 (44%) participated, which was 89% of the sampling goal (N=107). Out of the 12,865 patients surveyed across these facilities, 9,493 surveys were completed, obtaining a 74% respondent response rate. The 2014 APS approached 190 facilities and 87 (46%) participated, which was 77% of the original goal (N=113). Out of 11,024 patients surveyed in 2014, 8,230 surveys were completed, resulting in a 76% respondent response rate. To increase the sample size of immigrant abortion patients, the 2008 and 2014 APS were combined for a total sample of 17,873 abortion patients, 16% (n=2,790) of whom identified as being born outside of the U.S. Although hospitals were not sampled in the 2014 APS, the hospital data from 2008 was retained in the pooled sample as 4.5% of immigrant respondents from that

survey round obtained care at a hospital. Data from each survey round were weighted to account for unequal probability of selection and non-response at the respondent- and facility-levels, and to create a nationally representative sample of abortion patients in 2008 and 2014.[3,34] Survey-specific weights were retained when the survey rounds were combined for this study, and survey year was included in all analytic models to account for possible secular changes during the six intervening years between the pooled study periods.

Additional data sources included the U.S. Census 2010 and American Community Survey (ACS; 2008 and 2014, 5-year estimates), a nationally-representative survey administered by the Census, to obtain information on the percent of foreign-born residents in a given neighborhood.[39,40] Neighborhoods were defined by Zip Code Tabulation Areas (ZCTAs) as zip codes were the lowest level of geography available in the APS. ZCTAs are geographic approximations created by the U.S. Census Bureau to aggregate census block boundaries into zip code-like areas. Although ZCTAs do not always correspond to U.S. Postal Service zip codes, in many instances they are the same for an area.[41] Data on the percent of population in a ZCTA that is foreign-born was merged with the APS, based on respondent zip code. APS respondents were distributed across 6,261 ZCTAs (mean respondents per ZCTA = 2.6; median = 1; range: 1-37). Half (51%) of ZCTAs had only one respondent; in a sensitivity analysis excluding these ZCTAs, we found our results were qualitatively similar to those from the main neighborhood-level analyses (including all ZCTAs).

The APS and data collection procedures were approved by the Guttmacher Institute's Institutional Review Board (IRB). The current secondary analysis of these data was considered exempt from review by the City University of New York's IRB.

Outcome measures

The primary outcome of interest was distance traveled to obtain an abortion. Distance was estimated as the number of road miles between the centroids of the patient's zip code of residence, which was self-reported on the survey, and the zip code of the facility where they received services. Distance was computed using the Stata program *osrmtime*, which accesses Open Source Routing Machine 4.9 to calculate the driving distance between two sets of geographic points.[42] Patients who obtained abortions in their zip code of residence were coded as having traveled <1 mile. One-way distance traveled to obtain an abortion was categorized into four groups: <25 miles, 25–49 miles, 50–100 miles, and >100 miles and dichotomized as <50 miles and ≥50 miles; these categories have been established in previous research.[38,43] Approximately 10% (n=1,712) of abortion patients did not provide a valid zip code and, therefore, the one-way distance to their abortion provider could not be calculated. Respondents without valid zip codes were not concentrated at a particular provider(s) (range: 0.1%-2.8% of respondents per site). As a result, these respondents were excluded from the distance traveled analyses. Slightly more immigrant than non-immigrant patients were missing residential zip code (11% for immigrants vs. 9% for non-immigrants, p=.02); however, the demographic composition of patients with valid zip code data was similar to that of the overall pooled sample of abortion patients (Table A4.1).

Gestation at the time of abortion was examined as a secondary indicator of potential barriers to obtaining an abortion. Gestation was calculated in weeks based on self-reported last menstrual period (LMP) and dichotomized into first trimester (≤12 weeks gestation) and second trimester or later (≥13 weeks). Given the high cost and limited providers of second-trimester abortions in many settings,[29,30,36] individuals seeking abortions in the second trimester may face

logistic and economic barriers that increase obstacles related to obtaining an abortion.[29,30,36] Data on gestation were available for all respondents.

Exposure measures

Individual-level nativity

Individual-level nativity status was based on the survey question: "Were you born in the United States?" Respondents who answered "yes" were categorized as U.S.-born and those who answered "no" as immigrants.

Neighborhood-level immigrant density

Our additional exposure of interest was neighborhood immigrant density defined as the percentage of the population in a patient's area of residence that was foreign-born. ZCTA-level data from the ACS was used to create this variable and linked to APS respondent data. In addition to the 1,712 APS respondents who did not provide a valid zip code, another 137 respondents lived in zip codes that did not correspond to a ZCTA. It is possible that these zip codes were associated with PO Boxes or represented very few addresses and, therefore, would not appear in the ZCTA universe;[41] indeed, over two-thirds of the "unmatched" zip codes were classified as rural. As a result, information on the neighborhood-level share of foreign-born residents was not available for 1,849 abortion patients in our sample. These respondents were excluded from analyses of this exposure, yielding an analytic sample of 16,024 (90% of the initial sample size) for models with neighborhood immigrant density. A higher proportion of these respondents (those patients living in neighborhoods without corresponding information on percent population foreign-born) were immigrants, Hispanic, ever married, living in rural areas, and living in the Northeast compared to those without missing information on this exposure (Table A4.2).

Similar to prior research,[16] to simplify interpretation, and because there is no generally accepted threshold at which immigrant density is thought to be most influential, we dichotomized the neighborhood exposure at the median in order to allow an adequate distribution of respondents in both exposed and unexposed categories. Median cut points were identified for each racial/ethnic group. Values at or above the median were considered neighborhoods with higher immigrant density and values below the median were defined as lower immigrant density. As a sensitivity analysis, we also examined the exposure variable categorized into quartiles (with cut points based on the racial/ethnic-specific sample distribution) to ensure that results were not driven by a single cut point. The overall pattern of findings remained unchanged from this analysis.

Nativity status with immigrant density

A final exposure examined in this study is nativity status with immigrant density, which assesses the combined influence of the first two exposures. This variable consisted of four categories: non-immigrant, living in low immigrant density areas (i.e., areas below the median percent foreign-born); non-immigrant, living in high immigrant density areas (i.e., areas at or above the median percent foreign-born); immigrant, living in low immigrant density areas, and immigrant, living in high immigrant density areas.

Additional variables

Race/ethnicity

Participants self-identified their race and ethnicity based on the options available in the APS: Hispanic, Asian, non-Hispanic Black, non-Hispanic White, and other race. All analyses were stratified by this measure.

Hypothesized confounders

Based on prior studies,[38,44] we included the following hypothesized confounders in all adjusted models: age (12-53 years), health insurance status, poverty level (measured relative to an annual income of approximately $24,000 for a four-person household, as per the Health and Human Services poverty guidelines[45]), level of education, relationship status, number of prior births (0, 1-2, and ≥3 births), gestation at the time of abortion (in the distance traveled models), distance traveled (in the gestation models), residence in a Metropolitan Statistical Area (MSA, i.e., urban or rural), and region of residence. In addition, individual-level nativity was adjusted for in the neighborhood-level models of immigrant density. Survey year was also included in all models.

After excluding respondents with missing data on the exposure and/or outcome, the analytic sample to examine individual-level nativity status and distance traveled was 16,161 abortion patients (including 3,815 Hispanic respondents, 803 Asian respondents, 4,637 non-Hispanic Black respondents, and 6,263 non-Hispanic White respondents) and 17,873 patients (including 4,289 Hispanic respondents, 894 Asian respondents, 5,154 non-Hispanic Black respondents, and 6,806 non-Hispanic White respondents) to examine the nativity status-gestation at time of abortion relationship. Analyses of immigrant density or nativity status with immigrant density included 16,024 abortion patients (including 3,767 Hispanic respondents, 765 Asian respondents, 4,602 non-Hispanic Black respondents, and 6,225 non-Hispanic White respondents).

Statistical Analysis

We ran bivariate analyses of all confounders and individual- and neighborhood-level measures of nativity using Chi-squared statistics. We then calculated the median miles traveled to obtain an abortion and tested differences in the percent distribution of categorical distance

traveled by nativity status and immigrant density. We ran bivariate and multivariable logistic regression models to estimate the unadjusted and adjusted odds ratios of traveling 50 miles or more to obtain an abortion comparing immigrants to non-immigrants. To test the effect of 1) immigrant density, and 2) nativity and immigrant density on distance traveled, generalized estimating equations were used to fit logistic marginal models, accounting for clustering within the same zip code. These models are appropriate and more robust than mixed effects models when interest centers on the fixed effects of independent variables on the outcome, as in the case of this study.[18,46] The same analytic approach was used to examine the distribution of gestation at the time of abortion by nativity status and immigrant density, and to model the unadjusted and adjusted odds ratios of having a second- or later-trimester abortion by 1) nativity status; 2) immigrant density; and 3) the combined measure of nativity and immigrant density.

All analyses were stratified by race/ethnicity to examine the exposure-outcome relationships within each racial/ethnic group; model stratification was deemed preferable to testing for effect measure modification given small cell sizes. Statistical significance was set at $p<.05$ for all comparisons and 95% confidence intervals are reported. All analyses were weighted and conducted using the *svyset* command in Stata version 15.1 to account for the complex sampling design, including clustering within facilities.

Results

Sample description

Among U.S. abortion patients in 2008 and 2014, 16% identified as immigrants; Asian and Hispanic groups had the highest proportion, with 63% of Asian women and 32% of Hispanic women identifying as foreign-born. Overall, abortion patients lived in zip codes with a median

10.9% foreign-born population. However, this percentage varied widely by race/ethnicity with Hispanic and Asian women living in areas with a median of 25% (range: 0-75%) and 20% (range: 0.4%-73%), respectively, foreign-born population (data shown in Table A4.3).

Table 4.1 shows the distribution of select characteristics within each racial/ethnic group by individual-level nativity status. Across all racial/ethnic groups, immigrant abortion patients were generally older than non-immigrants and a higher proportion were uninsured. There were significant differences in health insurance status, education level, and relationship status by nativity among Hispanic, Asian, and non-Hispanic Black respondents ($p \leq .01$). Non-Hispanic White immigrants also tended to be wealthier than their non-immigrant counterparts and live in urban areas ($p < .05$). In general, compared to non-immigrant respondents, immigrants in all racial/ethnic groups lived in zip codes with a higher median concentration of immigrants.

Table 4.2 presents the distribution of selected characteristics of the sample by median immigrant density and stratified by racial/ethnic group. Across all racial/ethnic groups, other than Asian, a significantly larger share of abortion patients living in zip codes with greater immigrant density (i.e., at or above the median percent population foreign-born) were foreign-born compared to those living in areas with less immigrant density ($p < .001$). Furthermore, a larger proportion of Hispanic, Asian, and non-Hispanic Black abortion patients living in neighborhoods with more foreign-born residents were enrolled in Medicaid and a smaller proportion lived in rural areas compared to those residing in zip codes with lower immigrant density.

Distance traveled to obtain an abortion

Overall, immigrant respondents in all racial/ethnic groups traveled shorter distances for their abortion than non-immigrants. Non-Hispanic White abortion patients who were U.S.-born traveled the farthest median distance of 20.5 miles (95% CI: 19.7, 21.4) compared to all other

groups and, using distance categories, traveled significantly farther than their immigrant counterparts. Within each racial/ethnic group, respondents who lived in neighborhoods with the immigrant density at or above the median proportion traveled shorter distances to obtain their abortion compared to individuals living in neighborhoods with immigrant density below the median proportion (Table 4.3).

Results on the association between individual and neighborhood-level nativity and distance traveled are presented in Table 4.4. For each exposure, crude and adjusted estimates were comparable in direction and magnitude. After adjusting for potential confounders, Hispanic immigrants were 35% (aOR:0.65; 95% CI: 0.45, 0.92) less likely to travel 50 or more miles and non-Hispanic White immigrants were 37% (OR:0.63; % CI: 0.43, 0.93) less likely to travel compared to non-immigrants. In contrast, Asian immigrants were 24% (aOR: 1.24; 95% CI: 0.69, 2.24) more likely to travel 50 or more miles compared to their non-immigrant counterparts. Hispanic respondents living in neighborhoods with a higher concentration of immigrants had nearly 70% (aOR:0.31; 95% CI: 0.21, 0.46) lower odds of traveling over 50 miles for their abortion compared to those living in neighborhoods with a lower immigrant concentration. Similarly, Asians were 73% (aOR:0.27; 95% CI: 0.13, 0.56) less likely to travel, and both non-Hispanic Black (a95%OR: 0.36; CI: 0.26, 0.52) and non-Hispanic White (a95%OR: 0.36; CI: 0.30, 0.44) patients were 64% less likely to travel than their counterparts living in neighborhoods with lower immigrant density. Finally, across all racial/ethnic groups, both immigrants and non-immigrants living in neighborhoods with higher immigrant density were less likely to travel 50 or more miles compared to non-immigrants living in low-density neighborhoods, after adjusting for hypothesized confounders. For example, Hispanic abortion patients who were immigrants or non-immigrants living in neighborhoods with higher concentration of immigrants were 78% (aOR:

0.22; 95% CI: 0.13, 0.37) and 69% (aOR: 0.31; 95% CI: 0.19, 0.49) less likely to travel 50 or more miles than non-immigrants in low-density neighborhoods.

Gestation at the time of abortion

In general, higher proportions of immigrant women in each racial/ethnic group had first-trimester abortions compared to non-immigrants in each group; however, this difference was only significant within the Hispanic and non-Hispanic Black groups. There were no significant associations between neighborhood immigrant density and gestation at time of abortion, although in nearly all racial/ethnic groups, a slightly greater proportion of residents living in neighborhoods with higher immigrant density had second-trimester abortions compared to their counterparts living in neighborhoods with lower immigrant density (Table 4.5).

Table 4.6 presents crude and adjusted odds ratios of having a second- or later-trimester abortion by nativity status, immigrant density, and nativity status with immigrant density. At the individual-level, although immigrants in all racial/ethnic groups were less likely to have a second trimester abortion compared to their non-immigrant counterparts, crude odd ratios were only significant for Hispanic (OR: 0.76; 95 CI: 0.62, 0.93) and non-Hispanic Black (OR: 0.69; 95% CI: 0.50, 0.95) respondents, which were no longer significant after adjustment. At the neighborhood level, adjusted analyses suggest that abortion patients were generally more likely to have a second or later-trimester procedure if they were living in neighborhoods with higher immigrant density compared to those living in neighborhoods with lower density. Finally, non-immigrant Hispanic respondents, living in areas with higher immigrant density, were 68% (aOR: 1.68; 95% CI: 1.26, 2.23) more likely to have a second-trimester abortion than non-immigrant Hispanic respondents living in low-density neighborhoods.

Discussion

This study examines the influence of individual- and neighborhood-level nativity on both the distance traveled to obtain an abortion and gestation at the time of abortion within racial/ethnic groups. Our results suggest that immigrants of all races/ethnicities traveled shorter distances than their non-immigrant counterparts. However, in adjusted analyses, this difference was statistically significant only among Hispanic and non-Hispanic White respondents. We found little relationship between individual-level nativity and gestation within any racial/ethnic groups, although immigrants in each group appeared less likely to have a second-trimester abortion compared to non-immigrants. At the neighborhood-level, across all racial/ethnic groups, we found that abortion patients living in higher compared to lower density neighborhoods were less likely to travel 50 or more miles for their abortion. In contrast, they were more likely to have a second-trimester abortion, although this finding was only significant among Hispanic and non-Hispanic Black respondents. When nativity status and immigrant density were examined together, across all racial/ethnic groups, our results suggest a potentially "protective" effect of neighborhood immigrant density on distance traveled insofar as immigrant and non-immigrant abortion patients in higher density neighborhoods were less likely to travel farther distances for services compared to their counterparts living in neighborhoods with lower immigrant density. We found little evidence of an association between this third exposure and gestation.

At an individual level, the relationship between nativity and distance traveled within racial/ethnic groups was generally consistent with findings from Chapter 3 of this dissertation. That the association was statistically significant only among Hispanic and non-Hispanic White groups reinforces the value of disaggregating data, given prior findings that have found that White women, overall, travel farther for their abortion services than women of other racial/ethnic

groups.[38] The absence of the expected associations between individual nativity and gestation at time of abortion, as observed in Chapter 2 of this dissertation, may relate to limited sample size within racial/ethnic groups.

At a neighborhood-level, our results suggest that immigrant density may ease the potential barrier of travel distance to obtain an abortion. As prior evidence suggests, immigrant enclaves may promote health or positively influence an area's social environment by facilitating social networks among individuals.[7,15] In the context of abortion care, these networks could provide avenues to exchange information about the availability and quality of nearby services, potentially easing the distance one would need to travel to obtain trusted abortion care. At the same time, it is possible that neighborhoods with spatial concentration of immigrants overlap with urban areas, which also have a higher density of abortion providers, reducing the need to travel for services.[37,47] This overlap may also help explain the association between high immigrant density neighborhoods and increased likelihood of second-trimester abortions; indeed, the limited number of second-trimester abortion providers are primarily located in major cities.[37] Alternatively, the association between immigrant density and gestation may suggest negative effects of living in neighborhoods with high concentrations of immigrants,[18,25] including increased discrimination and isolation [14] as well as cultural stigma associated with abortion.[48]. Furthermore, some evidence suggests that neighborhoods with high immigrant density, especially in urban areas, may signal residential segregation,[49] which has been associated with lack of resources and limited access to health care.[50] Together, these factors could potentially discourage, delay, or impede care-seeking behaviors, including timely access to abortion.

That both immigrants and non-immigrants living in higher density neighborhoods traveled shorter distances than non-immigrants living in lower density neighborhoods suggests that

immigrant density may ease the burden of travel, regardless of individual-level nativity status. In some ways, this finding is unexpected given prior findings that indicate that benefits of immigrant density are particularly salient for immigrants.[18] At the same time, residents of neighborhoods with high immigrant density may live in general geographic proximity to abortion facilities, especially if these neighborhoods are primarily urban. Notably, all neighborhood-level analyses were also conducted on samples restricted to urban respondents, and the results did not substantively change. Therefore, it is possible that the measure of neighborhood immigrant density captured other unmeasured attributes of the zip code area that influence access to abortion care.

Finally, although some of our findings were consistent for all racial/ethnic groups, our findings also indicate that the influence of individual- and neighborhood-level nativity may be stronger for some groups than others. To this end, the association between nativity, immigrant density, and indicators of abortion access may be more complex than often presented.

This study has several limitations. Most notably, it only contains data from individuals who were able to access clinical abortion services. Women who wanted an abortion but were unable to have one—whether due to lack of information, economic resources, or providers in their geographic area—were not captured in our data. Similarly, we did not obtain information from individuals who were able to successfully self-manage their abortions outside of a clinical setting. Immigrants could be differentially excluded from this study if they are more likely than their U.S.-born counterparts to obtain abortions in non-clinical settings or face barriers that altogether prevent access to abortion. Thus, this study is able to highlight indicators of *potential* barriers to abortion among those successfully accessing care, but may miss other critical barriers that prevented some individuals from obtaining abortion care. Furthermore, although the data for this

study are from 2008 and 2014, they are the most recent data available to examine the circumstances of obtaining abortion care in a nationally representative sample.

As with other studies of neighborhood effects, this study is also limited by the measurement of immigrant density. Because APS data were geocoded at the zip code level, immigrant density was measured at the zip code tabulation area. Although limited, there may have been some spatial mismatch between zip codes and ZCTAs. Furthermore, had we used a different geographic scale, our density measure may have produced different results. This modifiable areal unit problem is a common challenge in spatial analyses, and future research should test the robustness of this study's findings using an alternative scale of geographic aggregation.[51] Relatedly, ZCTAs are also large spatial and administrative boundaries that may not reflect the geographical distribution of factors that link together the social environment and access to care.[52,53] As a result, immigrant density, as measured here, may not meaningfully capture the impact of residential context for abortion patients, especially if respondents do not align their neighborhoods along Census boundaries. Additionally, due to data limitations, this study did not include additional measures of the neighborhood environment, including ethnic density, poverty, urbanicity, or spatial concentration of abortion providers—each potential confounders of the relationship between immigrant density and access to abortion care. It is also possible that associations at the neighborhood-level were indicative of unmeasured individual-level associations, or that individuals may have self-selected into neighborhoods based on unmeasured attributes. As a result, the observed associations in this study may have been inflated estimates.

This study's measurement of distance assumes car travel and does not account for public transit routes, which could take substantially more or less time than driving a car even when the distance in miles is minimal. Our measure of gestation was also based on self-reported

information and not ultrasound. While gestation based on individuals' reports of LMP are usually comparable to those based on ultrasound, when they are inaccurate they tend to underestimate gestation.[44,54,55] However, we would not expect this misclassification to be differential by immigrant status. It is possible that respondents born outside of the U.S. provided inaccurate information on their nativity status or were more likely than non-immigrants to decline to fill out the survey. Similarly, the survey may have been too time-consuming or difficult to complete for individuals for whom English (or Spanish) was not their primary language. Such language barriers could differentially impact and exclude survey and study participation among immigrants compared to non-immigrants. Furthermore, although we were able to investigate subgroup differences by race/ethnicity, stratifying on characteristics such as country of origin, language proficiency, or citizenship status—attributes that were not available in the APS, but have been documented to influence immigrants' health service use[56,57]—may have provided more meaningful subgroup distinctions in the context of this research. Nevertheless, the current study contributes to our understanding of differences across racial/ethnic and immigrant groups in potential obstacles to abortion care. Finally, combining non-continuous abortion data from 2008 and 2014 may have masked temporal changes in the population of abortion patients. However, we adjusted for survey year in our analyses as one approach to account for such shifts.

Conclusions

Findings from this study provide insight into the influence of individual- and neighborhood-level components of nativity on potential barriers to care among abortion patients in the U.S. Individual-level findings generally support preliminary analyses that immigrants obtaining abortion care travel shorter distances for services, although these results were not

consistent across all racial/ethnic groups. This study also provides some evidence that neighborhood immigrant density may facilitate abortion access across racial/ethnic groups; however, these findings should be interpreted cautiously given limitations to our neighborhood measure. Efforts to further study potential barriers and facilitators to abortion care among immigrants in the U.S. should continue to examine the heterogeneity of this population and investigate the mechanisms through which neighborhood-level factors, such as immigrant density, may influence access to services. Furthermore, study of the role of immigrants' receiving *and* sending communities is needed to better understand how pre- and post-migration experiences may inform neighborhood-level or social patterns of immigrant health in the U.S.[58] Assessing if and how neighborhood context matters in obtaining adequate and timely abortion services can help inform multi-level strategies, including policies and programs that promote adequate and accessible distribution of abortion services, community-relevant education, and multi-lingual providers that serve to advance access to abortion for all groups. This evidence continues to be critical as increasing abortion clinic closures and regulation of abortion providers in the U.S. may impose a significant burden on immigrant women as well as all individuals seeking abortion care.

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Table 4.1: Distribution of select individual and neighborhood-level characteristics of people obtaining abortions in U.S. facilities by nativity status and stratified by race/ethnicity, 2008-2014 (N=17,873)

	Hispanic women (N=4,289)					Asian women (N=894)					Non-Hispanic Black women (N=5,154)					Non-Hispanic White women (N=6,806)					Women of other races (N=730)				
	Non-immigrants (n=2,928)		Immigrants (n=1,361)			Non-immigrants (n=340)		Immigrants (n=554)			Non-immigrants (n=4,726)		Immigrants (n=428)			Non-immigrants (n=6,510)		Immigrants (n=296)			Non-immigrants (n=579)		Immigrants (n=151)		
Characteristic	N[1]	%	N[1]	%	p-value[2]	N[1]	%	N[1]	%	p-value[2]	N[1]	%	N[1]	%	p-value[2]	N[1]	%	N[1]	%	p-value[2]	N[1]	%	N[1]	%	p-value[2]
Individual-level factors																									
Age, y					<.001					<.001					<.001					<.001					.03
<18	207	7.0	50	3.8		18	5.3	4	0.7		335	7.0	9	2.2		261	4.1	8	2.6		36	6.4	5	3.9	
18-19	374	13.1	79	6.0		51	16.3	20	3.6		479	10.1	24	5.2		614	9.4	21	6.8		52	9.4	8	5.0	
20-24	1,132	38.5	332	24.0		133	38.7	112	19.5		1,714	35.7	143	31.7		2,227	33.3	68	22.6		200	33.9	37	25.5	
25-29	690	23.7	384	28.0		74	21.1	162	28.8		1,196	25.7	104	25.0		1,661	25.4	70	23.3		152	25.5	39	25.0	
30-34	316	10.7	255	19.3		34	9.8	127	23.9		606	12.8	81	19.1		965	15.5	57	19.1		80	14.0	34	22.0	
35+	209	7.0	261	18.9		30	8.8	129	23.5		396	8.7	67	16.8		782	12.3	72	25.6		59	10.8	28	18.6	
Health insurance					<.001					.01					<.001					.55					.02
No coverage	972	33.3	681	50.8		116	34.4	208	37.7		1,306	28.1	162	37.8		2,234	34.8	117	38.4		177	30.9	68	45.1	
Medicaid	1,235	42.5	440	32.2		85	25.9	90	16.3		1,997	42.4	125	29.5		1,537	23.7	61	21.0		213	37.2	40	27.3	
Private	689	23.1	228	16.1		134	38.2	248	44.6		1,324	27.4	133	30.9		2,641	40.0	115	39.6		180	30.4	42	27.0	
HealthCare.gov / State exchange	32	1.1	12	0.9		5	1.5	8	1.3		99	2.1	8	1.7		98	1.5	3	1.0		9	1.5	1	0.5	
Poverty status, %					<.01					.18					.22					.02					.22
<100	1,599	54.4	842	62.2		125	36.6	199	35.5		2,498	52.4	205	47.9		2,278	34.8	91	29.9		269	46.7	65	44.8	
100-199	751	25.7	306	22.5		91	27.1	123	21.9		1,243	26.4	119	27.6		1,768	27.1	73	23.7		166	28.5	36	22.7	
≥200	578	19.8	213	15.3		124	36.2	232	42.6		985	21.2	104	24.5		2,464	38.1	132	46.4		144	24.8	50	32.5	
Highest level of education					<.001					<.001					<.001					<.001					.70
Less than high school	565	19.2	529	39.3		25	7.1	41	7.3		690	14.5	40	9.9		702	10.9	32	10.4		90	15.8	25	18.8	
High school graduate/GED	924	31.7	385	28.3		73	21.5	126	22.1		1,548	33.1	137	31.1		1,781	27.1	65	21.7		163	28.4	37	24.4	
Some college	1,105	37.6	292	21.2		150	44.8	144	25.6		1,841	38.6	149	34.6		2,670	40.8	103	34.3		226	38.2	56	35.6	
College graduate	334	11.5	155	11.1		92	26.5	243	45.0		647	13.8	102	24.4		1,357	21.2	96	33.6		100	17.7	33	21.2	
Relationship status					<.001					<.001					<.001					<.001					<.001
Married	373	12.6	342	24.9		48	14.1	269	49.1		322	6.8	95	22.7		916	14.2	91	31.7		80	13.9	48	30.1	
Cohabiting	935	32.1	294	21.7		86	24.5	128	22.7		1,455	31.1	116	28.0		2,034	31.3	78	26.4		196	33.1	39	26.2	
Never married	1,346	46.1	450	33.4		188	56.3	127	22.8		2,673	56.4	181	41.0		2,791	42.8	88	29.3		245	42.9	46	32.1	
Previously married	274	9.2	275	20.0		18	5.1	30	5.5		276	5.8	36	8.3		769	11.7	39	12.5		58	10.1	18	11.6	
Number of previous births					<.001					<.001					.82					.69					.05
0	1,145	39.1	377	27.8		210	62.2	216	38.3		1,460	30.8	148	32.0		3,187	48.7	139	46.6		239	41.5	50	33.2	
1-2	1,579	54.2	807	59.3		115	33.4	301	54.8		2,912	61.7	253	61.2		3,016	46.5	143	49.0		298	51.7	93	62.1	
≥3	204	6.7	177	12.9		15	4.4	37	6.9		354	7.5	27	6.7		307	4.8	14	4.4		42	6.8	8	4.7	
Resides in MSA[3]					.98					.95					.21					<.01					<.001
No (Rural)	158	5.6	70	5.6		19	5.9	32	6.0		407	8.8	26	6.2		1,026	16.3	30	10.3		110	19.9	5	3.1	
Yes (Urban)	2,487	94.4	1,127	94.4		295	94.1	467	94.0		3,881	91.2	356	93.8		5,019	83.7	247	89.7		408	80.1	130	96.9	
Region of residence					<.01					.03					<.01					.08					<.001
Northeast	634	23.3	293	23.3		54	17.5	114	22.2		1,178	26.2	173	42.7		1,381	21.0	67	24.2		78	14.2	51	37.7	
Midwest	204	6.7	82	5.6		29	8.5	65	11.6		692	14.1	53	11.7		1,512	23.4	51	17.0		97	16.4	15	9.7	
South	761	26.8	495	37.4		66	19.4	137	24.7		2,385	50.2	150	34.6		2,131	32.7	86	28.4		126	22.0	35	22.1	
West	1,329	43.1	488	33.8		191	54.6	237	41.6		471	9.5	52	11.0		1,486	22.8	90	30.4		278	47.4	50	30.5	

Survey year				.93			.58			.63			.12			<.01
2008	1,538	53.3	711	53.0	181	53.0	308	55.8	2,599	55.1	225	52.5	3,399	51.6	138	45.2	292	50.5	102	67.8
2014	1,390	46.7	650	47.0	159	47.0	246	44.2	2,127	44.9	203	47.5	3,111	48.4	158	54.8	287	49.5	49	32.2
Neighborhood-level factor																				
Immigrant density[4]																				
Median (Range)	23.3 (0.0-73.6)		28.8 (0.0-73.6)	<.001	19.0 (0.8-72.9)		20.5 (0.4-72.9)	.41	8.2 (0.0-73.6)		18.1 (0.4-60.4)	<.001	7.2 (0.0-64.2)		12.0 (0.4-58.5)	<.001	9.2 (0.0-72.6)		24.2 (0.9-64.2)	<.001

[1] Frequencies may not add up to column totals due to missing data.

[2] P-values calculated using chi-square statistics.

[3] MSA = Metropolitan statistical area.

[4] Defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born, using data from the 2010-2014 American Community Survey 5-Year Estimates.

Table 4.2: Distribution of select characteristics of people obtaining abortions in U.S. facilities by median immigrant density[1] and stratified by race/ethnicity, 2008-2014 (N=16,024)

	Hispanic women (N=3,767)					Asian women (N=795)					Non-Hispanic Black women (N=4,602)					Non-Hispanic White women (N=6,225)					Women of other races (N=635)				
	Below the median % foreign-born (n=1,886)		Above the median % foreign-born (n=1,881)			Below the median % foreign-born (n=395)		Above the median % foreign-born (n=400)			Below the median % foreign-born (n=2,324)		Above the median % foreign-born (n=2,278)			Below the median % foreign-born (n=3,126)		Above the median % foreign-born (n=3,099)			Below the median % foreign-born (n=317)		Above the median % foreign-born (n=318)		
Characteristic	N	%	N	%	p-value[2]	N	%	N	%	p-value[2]	N	%	N	%	p-value[2]	N	%	N	%	p-value[2]	N	%	N	%	p-value[2]
Individual-level nativity					<.001					.25					<.001					<.001					<.001
Non-immigrant	1,396	74.0	1,198	63.4		159	40.1	146	35.4		2,218	95.6	2,011	87.6		3,049	97.6	2,904	93.5		282	88.2	222	67.7	
Immigrant	490	26.0	683	36.6		236	59.9	254	64.6		106	4.4	267	12.4		77	2.4	195	6.5		35	11.8	96	32.3	
Age, y					.22					.55					.04					.08					.03
<18	105	5.5	128	6.8		8	1.9	11	2.9		172	7.2	125	5.4		124	4.1	122	4.0		14	4.9	26	8.2	
18-19	212	11.6	198	10.7		31	7.8	35	9.4		202	8.8	242	10.5		318	10.3	253	8.1		24	7.4	30	9.9	
20-24	680	35.9	618	32.6		127	31.4	102	25.2		860	36.5	809	34.8		1,082	33.6	1,042	32.9		115	36.3	90	27.9	
25-29	464	24.3	463	24.9		95	24.4	109	25.8		586	25.3	586	26.3		778	24.9	811	25.8		89	26.6	80	24.2	
30-34	232	12.5	256	13.5		65	16.7	70	18.4		313	13.7	300	13.1		449	14.9	483	16.4		46	15.3	45	14.3	
35+	193	10.2	218	11.5		69	17.8	73	18.3		191	8.5	216	9.9		375	12.2	388	12.8		29	9.5	47	15.6	
Health insurance					.01					<.001					.01					.22					.90
No coverage	759	40.4	678	36.6		137	35.4	146	36.4		708	31.2	602	26.7		1,115	36.4	1,020	33.2		111	35.7	107	34.1	
Medicaid	658	35.1	825	43.7		58	14.7	105	26.6		872	37.4	1,004	44.1		743	23.9	733	23.8		115	35.6	110	35.5	
Private	444	23.3	359	18.6		194	48.5	144	35.8		683	28.7	636	27.6		1,218	38.1	1,300	41.6		85	27.0	97	29.2	
HealthCare.gov / State exchange	25	1.3	19	1.0		6	1.4	5	1.2		61	2.6	36	1.6		50	1.5	46	1.5		6	1.7	4	1.2	
Poverty status, %					.52					.73					.08					<.001					.86
<100	1,052	55.7	1,101	58.3		139	35.3	156	37.9		1,258	53.9	1,150	50.0		1,145	36.4	1,013	32.7		143	44.5	144	46.5	
100-199	471	25.1	460	24.6		98	24.5	95	24.2		609	26.2	616	27.2		880	28.4	810	25.8		94	29.3	87	27.0	
≥200	363	19.2	320	17.1		158	40.2	149	37.9		457	19.9	512	22.8		1,101	35.2	1,276	41.6		80	26.2	87	26.5	
Highest level of education					.01					.46					.64					<.001					.18
Less than high school	412	21.5	529	28.2		31	7.6	31	7.8		318	13.5	307	13.4		340	11.0	323	10.6		42	13.5	58	19.0	
High school graduate/GED	597	31.9	564	30.1		85	21.0	94	23.1		745	32.6	747	32.6		921	29.3	777	24.9		98	30.6	75	24.4	
Some college	667	35.4	582	30.8		138	35.8	124	30.4		940	40.1	883	38.7		1,309	42.0	1,252	40.0		129	39.9	121	37.2	
College graduate	210	11.2	206	10.9		141	35.6	151	38.7		321	13.8	341	15.3		556	17.8	747	24.5		48	15.9	64	19.5	
Relationship status					.06					.54					.48					.04					.94
Married	282	14.9	325	17.0		138	35.1	138	35.3		185	8.2	186	8.0		449	14.5	465	15.2		51	16.2	53	16.2	
Cohabiting	583	30.9	505	27.3		103	25.5	87	21.4		688	29.8	726	32.2		988	31.4	951	31.0		104	32.2	106	32.6	
Never married	770	40.9	826	44.1		132	33.7	155	38.3		1,316	56.1	1,230	53.9		1,286	41.4	1,363	43.6		134	42.4	125	40.6	
Previously married	251	13.3	225	11.7		22	5.7	20	4.9		135	5.8	136	5.8		403	12.7	320	10.3		28	9.3	34	10.6	
Number of previous births					.68					.15					.09					<.001					.07
0	680	35.6	673	36.2		184	45.8	200	49.8		661	28.0	758	32.9		1,375	43.7	1,679	53.6		117	37.0	138	43.2	
1-2	1,022	54.5	1,038	55.2		185	47.1	183	46.2		1,482	64.1	1,340	59.0		1,589	51.1	1,289	42.0		172	54.7	166	52.7	
≥3	184	9.8	170	8.6		26	7.1	17	4.0		181	7.8	180	8.0		162	5.3	131	4.3		28	8.3	14	4.1	
Resides in MSA[3]					<.001					<.001					<.001					<.001					<.001
No (Rural)	159	7.8	22	1.3		39	9.6	0	0.0		345	14.3	50	1.9		825	26.0	161	4.9		99	29.6	2	0.5	
Yes (Urban)	1,727	92.2	1,859	98.7		356	90.4	400	100.0		1,979	85.7	2,228	98.1		2,301	74.0	2,938	95.1		218	70.4	316	99.5	
Region of residence					.30					<.001					<.001					<.001					<.001

Northeast	343	19.1	448	26.0		65	17.0	80	23.1		311	13.1	874	40.0		621	19.1	684	22.5		32	10.3	79	27.5	
Midwest	210	11.0	48	2.3		69	18.1	15	3.6		491	20.9	174	7.5		1,062	34.7	368	12.1		97	31.2	7	2.1	
South	596	32.5	501	27.7		132	32.5	48	13.3		1,491	64.7	799	35.2		1,086	34.3	952	31.2		92	29.1	50	16.5	
West	736	37.4	884	44.0		129	32.4	257	60.0		31	1.3	431	17.2		357	11.9	1,095	34.2		96	29.3	182	53.9	
Survey year					.09					.12					.61					.81					<.001
2008	859	46.2	1,068	57.4		186	46.9	239	59.7		1,274	55.4	1,175	51.2		1,611	51.4	1,587	50.1		125	39.4	204	63.7	
2014	1,027	53.8	813	42.6		209	53.1	161	40.3		1,050	44.6	1,103	48.8		1,515	48.6	1,512	49.9		192	60.6	114	36.3	

[1] Immigrant density defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born, using data from the 2008 and 2014 American Community Survey 5-Year Estimates. Median cutpoints are specific to each racial/ethnic groups and based on the distribution within each group. Information on the share of foreign-born residents was not available for a 1,849 abortion patients in our sample. As a result, these respondents were excluded from analyses of this exposure.

[2] P-values calculated using chi-sqaure statistics.

[3] MSA = Metropolitan statistical area.

Table 4.3: Median, range, and weighted percent distribution of distance traveled to abortion facility[1] among abortion patients in the U.S. by nativity and immigrant density, stratified by racial/ethnic groups: 2008-2014

	Distance from residence zip code to facility zip code (Miles)				Categorical distances from residence zip code to facility zip code (%)				
	Median	95% CI[4]		Range	<25 miles	25-49 miles	50-100 miles	>100 miles	p-value[5]
Nativity status[2]									
Hispanic									.07
Non-immigrant	12.4	11.9	13.0	(0 - 2,486)	74.6	14.9	6.0	4.5	
Immigrant	10.9	10.2	11.7	(0 - 4,000)	79.5	11.4	4.3	4.7	
Asian									.65
Non-immigrant	13.1	11.4	14.6	(0-344)	77.0	13.7	5.2	4.0	
Immigrant	10.8	10.2	12.3	(0-2,714)	76.3	12.1	5.6	6.0	
Non-Hispanic Black									.21
Non-immigrant	11.7	11.2	12.1	(0 - 4,948)	73.1	11.2	9.4	6.3	
Immigrant	11.0	9.9	12.2	(0 - 2,146)	77.5	10.8	5.4	6.3	
Non-Hispanic White									<.01
Non-immigrant	20.5	19.7	21.4	(0 - 3,237)	56.3	19.8	13.5	10.4	
Immigrant	15.0	11.8	18.6	(0 - 1,311)	67.3	18.0	7.8	6.9	
Other									<.01
Non-immigrant	16.9	14.9	19.4	(0 - 2,564)	61.4	14.2	7.8	16.5	
Immigrant	10.6	9.8	11.9	(0 - 3,503)	81.1	9.2	4.4	5.3	
Immigrant density[3]									
Hispanic									<.001
< Median % foreign-born	15.7	15.0	16.7	(0-2,525)	66.3	18.4	8.7	6.6	
≥ Median % foreign-born	9.8	9.3	10.1	(0-2,683)	86.7	9.5	2.4	1.4	
Asian									<.001
< Median % foreign-born	15.6	14.0	18.2	(0-2,714)	63.6	17.6	8.9	10.0	
≥ Median % foreign-born	10.3	9.5	10.8	(0-543)	88.5	8.5	2.4	0.6	

Non-Hispanic Black									<.001
< Median % foreign-born	14.2	12.8	15.2	(0-2,449)	63.1	12.2	14.7	9.9	
≥ Median % foreign-born	10.0	9.6	10.6	(0-4,498)	83.2	10.1	3.9	2.8	
Non-Hispanic White									<.001
< Median % foreign-born	32.9	30.8	34.7	(0-1,972)	41.5	22.5	20.2	15.7	
≥ Median % foreign-born	13.6	13.0	14.3	(0-3,237)	71.6	17.1	6.4	4.9	
Other									<.001
< Median % foreign-born	30.3	23.2	37.7	(0-2,564)	46.9	15.5	12.3	25.4	
≥ Median % foreign-born	11.0	10.2	12.0	(0-543)	83.8	10.9	2.5	2.9	

[1] Distance traveled analyses only included those patients who provided valid residence zip codes.

[2] Analysis includes 16,161 abortion patients (those who provided valid residence zip codes)

[3] Defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born based, using data from the2008 and 2014 American Community Survey 5-Year Estimates, and dichotomized as neighborhoods with populations below or at/above the median percent foreign-born for each racial/ethnic group. Analysis includes 16,024 abortion patients (those who provided valid residence zip codes *and* lived in a zip code with corresponding immigrant density data avaialable).

[4] CI = Confidence interval

[5] P-values calculated using chi-squared statistics

Table 4.4: Unadjusted and adjusted odds ratios of traveling 50 or more miles for an abortion by nativity status, immigrant density, and nativity status with immigrant density, stratified by race/ethnicity: 2008-2014

	Hispanic women								Asian women								Non-Hispanic Black women								Non-Hispanic White women							
Characteristic	Unadjusted OR[3]	95% CI[4]		p-value	Adjusted OR[3]	95% CI[4]		p-value	Unadjusted OR[3]	95% CI[4]		p-value	Adjusted OR[3]	95% CI[4]		p-value	Unadjusted OR[3]	95% CI[4]		p-value	Adjusted OR[3]	95% CI[4]		p-value	Unadjusted OR[3]	95% CI[4]		p-value	Adjusted OR[3]	95% CI[4]		p-value
Nativity status[1]																																
Non-immigrant	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
Immigrant	0.85	0.61	1.18	.32	0.65	0.45	0.92	.02	1.29	0.81	2.04	.29	1.24	0.69	2.24	.47	0.71	0.44	1.17	.18	0.94	0.61	1.46	.78	0.55	0.38	0.79	.00	0.63	0.43	0.93	.02
Immigrant density[2]																																
< Median % foreign-born	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
≥ Median % foreign-born	0.22	0.15	0.34	.00	0.31	0.21	0.46	.00	0.13	0.07	0.26	.00	0.27	0.13	0.56	.00	0.22	0.16	0.29	.00	0.36	0.26	0.52	.00	0.23	0.19	0.27	.00	0.36	0.30	0.44	.00
Nativity status with immigrant density[2]																																
Non-immigrant, living in low density areas	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
Non-immigrant, living in high density areas	0.23	0.14	0.36	.00	0.31	0.19	0.49	.00	0.06	0.01	0.26	.00	0.12	0.03	0.58	.01	0.22	0.16	0.30	.00	0.37	0.26	0.54	.00	0.23	0.19	0.27	.00	0.35	0.29	0.44	.00
Immigrant, living in low density areas	0.84	0.62	1.13	.24	0.67	0.45	1.00	.05	1.26	0.73	2.18	.40	1.19	0.61	2.34	.61	1.06	0.65	1.72	.82	1.25	0.72	2.18	.42	0.56	0.32	0.98	.04	0.57	0.30	1.06	.07
Immigrant, living in high density areas	0.18	0.11	0.31	.00	0.22	0.13	0.37	.00	0.21	0.09	0.47	.00	0.41	0.16	1.00	.05	0.22	0.13	0.38	.00	0.40	0.23	0.69	.00	0.20	0.13	0.33	.00	0.33	0.20	0.55	.00

[1] Distance traveled analyses only included those patients who provided valid zip codes. Analysis includes 16,161 abortion patients (those who provided valid residence zip codes): the Hispanic sample includes 3,815 respondents; the Asian sample includes 803 respondents; the non-Hispanic Black sample includes 4,637 respondents, and the non-Hispanic White sample includes 6,263 respondents. Model adjusted for age, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion, urban/rural residence, region of residence, and survey year.

[2] Immigrant density defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born based, using data from the 2008 and 2014 American Community Survey 5-Year Estimates, and dichotomized as neighborhoods with populations below or at/above the median percent foreign-born for each racial/ethnic group. Analysis includes 16,024 abortion patients (those who provided valid residence zip codes *and* lived in a zip code with corresponding immigrant density data avaialable): the Hispanic sample includes 3,767 respondents; the Asian sample includes 795 respondents; the non-Hispanic Black sample includes 4,602 respondents, and the non-Hispanic White sample includes 6,225 respondents. Adjusted models control for nativity (only in the immigrant density model), age, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion,

[3] OR = Odds ratio

[4] CI = Confidence interval

Table 4.5: Median, range, and weighted percent distribution of gestation at time of abortion among abortion patients in the U.S. by nativity and immigrant density, stratified by racial/ethnic groups: 2008-2014

	Gestation (weeks)				Trimester[4] (%)		
	Median	95% CI[3]		Range	1st trimester	≥2nd trimester	p-value[5]
Nativity status[1]							
Asian							.12
Non-immigrant	7.0	7.0	8.0	(4 - 22)	90.6	9.4	
Immigrant	7.0	7.0	7.0	(4 - 21)	94.0	6.0	
Non-Hispanic White							.61
Non-immigrant	7.0	7.0	8.0	(4 - 24)	91.4	8.6	
Immigrant	7.0	7.0	7.0	(4 - 24)	92.4	7.6	
Non-Hispanic Black							.02
Non-immigrant	8.0	8.0	8.0	(4 - 24)	86.4	13.6	
Immigrant	7.0	7.0	7.0	(4 - 23)	90.2	9.8	
Hispanic							<.01
Non-immigrant	8.0	8.0	8.0	(4 - 24)	89.6	10.4	
Immigrant	7.0	7.0	7.0	(4 - 22)	91.9	8.1	
Other							.96
Non-immigrant	8.0	8.0	8.0	(4 - 24)	88.0	12.0	
Immigrant	7.0	7.0	8.0	(4 - 22)	87.8	12.2	
Immigrant density[2]							
Asian							.51
< Median % foreign-born	7	7	8	(4-18)	93.5	6.5	
≥ Median % foreign-born	7	7	7	(4-22)	92.1	7.9	
Non-Hispanic White							.91
< Median % foreign-born	8	7	8	(4-24)	91.6	8.4	
≥ Median % foreign-born	7	7	7	(4-24)	91.5	8.5	

Non-Hispanic Black							.08
< Median % foreign-born	8	8	8	(4-24)	88.0	12.0	
≥ Median % foreign-born	8	8	8	(4-24)	85.7	14.3	
Hispanic							.06
< Median % foreign-born	8	7	8	(4-24)	91.5	8.5	
≥ Median % foreign-born	7	7	8	(4-24)	89.0	11.0	
Other							.95
< Median % foreign-born	8	8	9	(4-22)	87.4	12.6	
≥ Median % foreign-born	8	7	8	(4-22)	87.6	12.4	

[1] Analysis includes full pooled sample (N=17,873)

[2] Defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born based, using data from the 2010-2014 American Community Survey 5-Year Estimates, and dichotomized as neighborhoods with populations below or at/above the median percent foreign-born for each racial/ethnic group. Analysis includes 16,024 abortion patients (those who provided valid residence zip codes *and* lived in a zip code with corresponding immigrant density data available).

[3] CI = Confidence interval

[4] First trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[5] P-values calculated using chi-squared statistics

Table 4.6: Unadjusted and adjusted odds ratios of having a second or later- (vs. first-) trimester[1] abortion by nativity status, immigrant density, and nativity status with immigrant density, stratified by race/ethnicity: 2008-2014

	Hispanic women								Asian women								Non-Hispanic Black women								Non-Hispanic White women							
	Unadjusted				Adjusted				Unadjusted				Adjusted				Unadjusted				Adjusted				Unadjusted				Adjusted			
Characteristic	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value	OR[4]	95% CI[5]		p-value
Nativity status[2]																																
Non-immigrant	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
Immigrant	0.76	0.62	0.93	.01	0.80	0.61	1.04	.10	0.62	0.34	1.15	.13	0.88	0.45	1.73	.71	0.69	0.50	0.95	.02	0.74	0.50	1.09	.12	0.87	0.52	1.47	.61	0.88	0.51	1.50	.64
Immigrant density[3]																																
< Median % foreign-born	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
≥ Median % foreign-born	1.33	1.06	1.68	.02	1.48	1.16	1.90	.00	1.24	0.71	2.19	.45	1.41	0.72	2.74	.32	1.23	1.03	1.48	.03	1.27	1.02	1.58	.03	1.02	0.84	1.23	.87	1.16	0.94	1.44	.16
Nativity status with immigrant density																																
Non-immigrant, living in low density areas	1.00				1.00				1.00				1.00				1.00				1.00				1.00				1.00			
Non-immigrant, living in high density areas	1.53	1.16	2.01	.00	1.68	1.26	2.23	.00	1.42	0.61	3.32	.41	1.48	0.59	3.71	.40	1.24	1.03	1.50	.02	1.24	1.00	1.54	.05	1.01	0.83	1.22	.93	1.15	0.93	1.43	.20
Immigrant, living in low density areas	0.94	0.63	1.40	.76	1.04	0.68	1.60	.85	0.84	0.36	1.98	.70	1.00	0.39	2.59	1.00	0.45	0.17	1.22	.12	0.45	0.16	1.27	.13	0.59	0.22	1.63	.31	0.64	0.22	1.83	.40
Immigrant, living in high density areas	0.95	0.68	1.33	.77	1.08	0.74	1.56	.69	0.97	0.43	2.16	.94	1.35	0.56	3.30	.50	0.89	0.59	1.35	.59	0.97	0.61	1.52	.88	0.96	0.53	1.71	.88	1.07	0.59	1.96	.81

[1] Second trimester or later is defined as 13 or more weeks and first trimester is defined as ≤12 weeks based on the date of last menstrual period

[2] Analysis includes full pooled sample (N=17,873)of abortion patients: the Hispanic sample includes 4,289 respondents; the Asian sample includes 894 respondents; the non-Hispanic Black sample includes 5,154 respondents, and the non-Hispanic White sample includes 6,806 respondents. Model adjusted for age, health insurance status, poverty status, education level, relationship status, number of prior births, distance traveled for an abortion, urban/rural residence, region of residence, and survey year.

[3] Immigrant density defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born based, using data from the 2010-2014 American Community Survey 5-Year Estimates, and dichotomized as neighborhoods with populations below or at/above the median percent foreign-born for each racial/ethnic group. Analysis includes 16,024 abortion patients (those who provided valid residence zip codes *and* lived in a zip code with corresponding immigrant density data avaialable): the Hispanic sample includes 3,767 respondents; the Asian sample includes 795 respondents; the non-Hispanic Black sample includes 4,602 respondents, and the non-Hispanic White sample includes 6,225 respondents. Model adjusted for nativity (only in the immigrant density model), age, health insurance status, poverty status, education level, relationship status, number of prior births, distance traveled for an abortion, urban/rural residence, region of residence, and survey year.

[4] OR = Odds ratio

[5] CI = Confidence interval

CHAPTER 5

CONCLUSIONS

Summary of results

This dissertation aimed to examine use of and access to abortion services among individuals obtaining abortions in the United States (U.S.), focusing specifically on Asians in New York City (NYC), immigrants in the U.S., and individuals living in high immigrant concentration neighborhoods in the U.S. Aim 1 calculated age-standardized pregnancy rates, abortion rates, and abortion ratios for Asians living in NYC, by country of origin and nativity status, and compared measures between groups. We found that the abortion rate and ratio among Asian women in NYC was generally lower compared to the other three major racial/ethnic groups. When data were disaggregated, Japanese and Indian populations had higher rates of abortion (14.7 and 26.5 per 1,000 women, respectively) compared to Asians overall (11.0 per 1,000 women), whereas Chinese and Korean groups had lower rates (7.6 and 4.5, respectively). Abortion ratios tended to be higher for four of the five Asian subgroups compared to Asians overall (19.0 per 100 pregnancies). When data were further disaggregated by nativity status, the abortion rate and ratio were generally higher for U.S.-born compared to immigrant women, among Asians overall and within each country of origin subgroup. Rates and ratios for immigrant groups generally declined between 2008 and 2015, whereas they appeared to increase for U.S.-born groups.

Aim 2 compared potential indicators of barriers to obtaining abortion between immigrants and non-immigrants in the U.S. Contrary to our original hypothesis, we found that immigrants were less likely to travel 50 miles or more (aOR: 0.74; 95% CI: 0.62, 0.88) and less likely to have an abortion in the second trimester (aOR: 0.80; 95% CI: 0.68, 0.95) compared to non-immigrants

after adjusting for age, race/ethnicity, health insurance status, poverty, education level, relationship status, number of prior births, gestation at time of abortion (in the distance traveled model), distance traveled (in the gestation at time of abortion model), urban/rural residence, state-level hostility toward abortion, and survey year. These findings persisted when the analysis was restricted to urban residents. We also did not find any evidence of differences in distance traveled or gestation at abortion among immigrants by length of stay in the U.S.

Finally, the fourth chapter of this dissertation, Aim 3, expanded upon Aim 2 by investigating the same associations by individual-level nativity and neighborhood immigrant density across racial/ethnic groups. Adjusted analyses at the individual-level suggested that Hispanic (aOR: 0.65; 95% CI: 0.45, 0.92) and non-Hispanic White (aOR: 0.63; 95% CI: 0.43, 0.93) immigrant abortion patients were significantly less likely than their non-immigrant counterparts to travel 50 or more miles to obtain an abortion. At the neighborhood-level, across all racial/ethnic groups, we found that abortion patients living in neighborhoods with a higher compared to lower concentration of immigrants were less likely to travel 50 or more miles for their abortion, after accounting for individual-level demographics. With regard to gestation, after adjustment, Hispanic (aOR: 1.48; 95% CI: 1.16, 1.90) and non-Hispanic Black (aOR: 1.27; 95% CI: 1.02, 1.58) respondents in neighborhoods with high compared to low immigrant density were significantly more likely to have a second-trimester abortion. When nativity status and immigrant density were examined together, across all racial/ethnic groups, both immigrant and non-immigrant abortion patients in higher density neighborhoods were less likely to travel 50 or more miles for services compared to their counterparts living in lower density neighborhoods.

Taken together, and given limited information on access to and use of abortion services in Asian and immigrant populations in the U.S., these findings offer a step forward in the

measurement, surveillance, and understanding of abortion care in two inter-related and understudied populations. Our results suggest notable variation in the abortion rates and ratios within the Asian population in NYC. Indeed, they reinforce prior calls for improved and disaggregated data analysis on Asians in order to identify and address important subgroup differences.[1-3] Furthermore, our findings indicate that immigrant abortion patients, overall and across most racial/ethnic groups, may face fewer potential barriers to obtaining an abortion than non-immigrants, insofar as distance traveled for services and gestation at the time of abortion serve as indicators of delay or difficulty in obtaining care. At the neighborhood level, abortion patients residing in high immigrant density neighborhoods were found to travel shorter distances for their abortion but present at later gestations compared to those living in low-density neighborhoods. The latter finding is contrary to our original hypothesis that individuals living in neighborhoods with a higher concentration of immigrants would have earlier abortions. This hypothesis was based on prior findings[4] that higher immigrant density may be health protective and potentially facilitate more timely care. However, in the context of this study, higher immigrant density may have had a negative effect on access to timely care. Indeed, some evidence suggests that neighborhoods with high immigrant density may be associated with increased discrimination,[5] cultural stigma of abortion,[6] or a lack of resources that could delay care-seeking.[7]

Study limitations

As with all studies, this dissertation has several limitations. The NYC abortion surveillance data analyzed in Aim 1 were collected at or by health facilities. As a result, abortions occurring outside of a hospital, clinic, or physician's office would not be captured by the surveillance system. Although the magnitude of this underreporting is likely to be relatively

small, there could be differential misclassification of the outcome, if Asians were more likely than their counterparts to obtain abortions in informal settings.[8,9] In that case, the reported abortion rates and ratios for Asian groups may be underestimated. Pregnancy counts, used to calculate abortion ratios, may also suffer from some measurement error given accurate estimates of the incidence of pregnancy include outcomes (e.g., miscarriages, stillbirths, and ectopic pregnancies) that do not result in induced abortion or live birth. In particular, reporting of miscarriage data can be incomplete, particularly for miscarriages that occur prior to 20 weeks gestation; many women, too, may experience a very early miscarriage as what they believe is a late period. As a result, some proportion of pregnancies may be excluded from total counts, potentially overestimating the abortion ratios reported in Aim 1. Furthermore, small sample sizes within the Asian population may have resulted in unstable or imprecise estimates; however, pooling data over multiple years was one approach to mitigate this issue.[2,10]

Most notably for Aims 2 and 3, the APS only contains data from individuals who successfully obtained facility-based abortion services. Women who were unable to present at an abortion facility or turned away—whether due to distance, gestational limits, or other barriers to care—were not included in this research and we cannot estimate how such obstacles could have led to differential use of services. Indeed, even unique efforts such as the Turnaway Study, which examined the experiences of women who did not obtain a wanted abortion because of clinic gestational limits, have documented notable challenges in recruiting and studying this particular population.[11] Furthermore, we did not obtain information from individuals who were able to successfully self-manage their abortions outside of a clinical setting.[8,9,12] Immigrants could be differentially excluded from this study if they were more likely than their counterparts to obtain abortions in non-clinical settings or face barriers that altogether prevented access to abortion. To

that end, this dissertation highlights indicators of *potential* barriers to abortion among those successfully accessing care, but may miss other critical barriers that prevented some individuals from obtaining their abortion. Furthermore, the outcome of distance traveled assumes that women are seeking abortions at the facility nearest to their residence. However, previous research has suggested that factors such as cost, appointment availability, and preference for a particular provider also influence where women seek abortion care.[13-15] To this end, for some women, traveling farther distances for services may be a preferred or beneficial option. Our measure of gestation was also based on self-reported information and not ultrasound. While gestation based on individuals' reports of LMP are usually comparable to those based on ultrasound, when they are inaccurate they tend to underestimate gestation.[16-18] However, we would not expect this misclassification to be differential by nativity status. Furthermore, due to data limitations in Aims 2 and 3, we were only able to disaggregate immigrants by length of stay in the U.S. and race/ethnicity; differences by factors such as country of origin and immigration status, which have also been documented to influence immigrants' health service use, could not be examined.[19]

Because APS data are geocoded at the zip code level, immigrant density in Aim 3 was measured at the zip code tabulation area (ZCTA). Although limited, there may have been some spatial mismatch between zip codes and ZCTAs. Furthermore, ZCTAs are large spatial and administrative boundaries that may not reflect the geographic distribution of factors that link together the social environment and access to care.[20,21] As a result, immigrant density, as measured in this study, may not meaningfully capture the impact of residential context for abortion patients, especially if respondents do not align their neighborhoods along Census boundaries. Additionally, due to data limitations, this study did not include additional measures of the neighborhood environment, including poverty, urbanicity, or spatial concentration of abortion

providers—each potential confounders of the relationship between immigrant density and the outcomes of interest. It is also possible that associations at the neighborhood-level were indicative of unmeasured individual-level associations, or that individuals may have self-selected into neighborhoods based on unmeasured attributes. As a result, the observed associations in Aim 3 may have been inflated estimates.

Public health relevance

Despite these limitations, findings from this dissertation serve as a scientific anchor for future research and policies that seek to advance reproductive health for Asian and immigrant populations in the U.S. For example, ensuring multilingual care options, eliminating bans on public health coverage, and expanding public funding of abortion may be useful starting points to protect access in these and other groups. However, to identify additional effective and community-relevant interventions, robust evidence and data on abortion in Asian and immigrant groups are needed.[22] Although prior research has examined demand for and barriers to abortion in the U.S., this work has rarely focused on Asian and immigrant populations. To this end, results from each Aim of this dissertation provide a valuable baseline for monitoring use of and access to abortion in both populations. These data will be particularly relevant to assess any public health impact of the current political environment, in which increasing abortion clinic closures, targeted regulation of abortion provider laws, and increasing immigration enforcement may impose a significant burden on both immigrant women and women of color seeking abortion care.[23,24]

Findings from this dissertation also improve our understanding of abortion prevalence across diverse Asian populations in NYC and, to a lesser degree, immigrants in the U.S. Comprehensive and granular data are integral to understanding public health trends, including trends in abortion access and use, and this dissertation underscores the value and feasibility of

examining fertility data disaggregated at multiple levels. Continued monitoring of these data will help identify future group-specific changes in the demand for abortion services as well as potential unmet contraceptive need in Asian populations in NYC. This information will be essential to design interventions that ensure ongoing access to abortion for all. Finally, bringing into focus data on abortion from Asian and immigrant women, populations that often go uncounted in reproductive health research and policy, helps to center and prioritize their experiences, and contributes to dismantling harmful racial and cultural myths about these groups.

Implications for further research

Findings from this dissertation underscore the importance of examining the heterogeneity of Asian and immigrant populations, and further research should continue to monitor patterns of abortion within subgroups of these populations. Specifically, future studies should explore and examine the underlying mechanisms that contribute to the observed differences in abortion statistics between Asian groups in NYC and the implications for Asian women's access to abortion and contraceptive care. For example, better understanding the extent to which reproductive health providers offer multilingual outreach and services to Asian populations in NYC could help contextualize the differences observed in Aim 1, and highlight potential points of intervention to protect or improve access to abortion care in these groups.

Furthermore, additional study of immigrant-specific determinants of health care access such as immigrant generation, English language proficiency, and other nuanced measures of acculturation may help elucidate the apparent protective effect observed in immigrant abortion patients, who, based on our results, seemed to face fewer potential barriers and delays to obtaining care compared to non-immigrants. At the same time, it is important to examine the factors that contribute to the longer distances traveled and later gestations at time of abortion

among non-immigrant abortion patients. Continued efforts to study abortion access in the U.S. among immigrants and non-immigrants should also examine other indicators of access, beyond distance traveled to obtain an abortion and gestation. Indeed, both are only part of a constellation of factors that influences an individual's ability to obtain care. For example, Upadhyay has argued that models of abortion access in the U.S. need to incorporate institutional prohibitions, restrictions on the types of qualified providers, reimbursement rates from public and private insurance, access to medication abortion, and telemedicine.[25] Others have suggested the value of monitoring measures of abortion delay, such as wait time to obtain an appointment or the share of abortions performed in the second trimester, as obstacles to access.[26] Given the increased risk of complications associated with childbirth,[27] there may be greater public health implications from measuring the inability to obtain a wanted abortion or delays in obtaining care, in addition to distance traveled.

Importantly, to gain a more comprehensive understanding of access to abortion among immigrants, in particular, examining the influence of immigration policy—alone and in combination with reproductive health restrictions—on abortion care is critical. Indeed, immigrant communities will likely be most impacted by the intersecting effects of these two sets of policies. Building on research conducted by Hatzenbuehler et al.[28] and Philbin et al.,[29] future work could consider developing a multi-sectoral state-level policy climate index, including local and neighboring states' policies related to immigration and reproductive health, to assess both the independent and intersecting influences of such policies on measures of abortion use and access. This information could help bring to bear if and how the changing policy environments impact immigrant women's abortion use, and ultimately, better serve and support the reproductive health needs of all women seeking abortion. Finally, future research should try to examine and explore

the experiences of immigrants who are unable to access abortion care. Although identifying this population is difficult, study designs could consider leveraging data from local abortion funds or even crisis pregnancy centers, insofar as both entities likely engage with individuals facing some difficulty in obtaining their abortion care. Qualitative research that retrospectively explores immigrant women's experiences of abortion care-seeking could also serve as an important next step in building this body of research.

Future work should also continue to investigate how neighborhood-level factors, such as immigrant density, operate to influence access to services. For example, further research is needed to understand the underlying factors that contribute to later gestations among abortion patients residing in high immigrant density neighborhoods. Such research may be strengthened by examining the role of ethnic density or measures of neighborhood socioeconomic status, factors that may better inform access to abortion. Additionally, study of state- or community-level stigma, may be relevant in the context of abortion access, given prior evidence that abortion stigma can influence the number and distribution of abortion providers, which could have direct implications for access.[6,25] These research directions could help elucidate the role of neighborhood context in obtaining adequate and timely abortion services and inform multi-level strategies that advance access to abortion for all groups.

In conclusion, this research contributes to the evidence base on use of and access to abortion services in Asian and immigrant populations in the U.S. Some of our results indicate relationships contrary to our original hypotheses; these findings provide opportunities for further research to improve our understanding of abortion in these populations. Continued work in this area will help design reproductive health programs and policies that support the needs of immigrant communities. Indeed, with mounting and increasingly restrictive state-level abortion

policies, which will inevitably most impact low-income women and women of color, including immigrants, ensuring that abortion services remain available and accessible to all people, without exception, will be paramount.

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A2.1: New York City reference population counts and weights for age standardization: Women ages 15-49 years, 2008-2015

Age group	2008-2010		2011-2013[1]		2014-2015	
	Population count	Weight	Population count	Weight	Population count	Weight
15-19 yrs	791,665	0.119806	733,654	0.110745	467,786	0.104902
20-29 yrs	1,966,503	0.297599	2,158,457	0.325818	1,452,722	0.325776
30-39 yrs	2,005,336	0.303476	1,978,512	0.298655	1,376,611	0.308708
40-49 yrs	1,844,393	0.279120	1,754,107	0.264782	1,162,144	0.260613
Total	6,607,897	1.0	6,624,730	1.0	4,459,263	1.0

[1]The 2011-2013 population and weights were used as the reference for age-standardization

A2.2: Trends in age-standardized pregnancy rates, abortion rates, and abortion ratios among New York City women by race/ethnicity, nativity status, and country of origin, 2008-2015

Race/Ethnicity, Nativity status, & Country of origin	2008-2010				2011-2013				2014-2015				Change over time: 2008-2010 to 2014-2015[1]					
													Pregnancy rate		Abortion rate		Abortion ratio	
	N of pregnancies	Pregnancy rate	Abortion rate	Abortion ratio	N of pregnancies	Pregnancy rate	Abortion rate	Abortion ratio	N of pregnancies	Pregnancy rate	Abortion rate	Abortion ratio	Annual change (%)	p-value	Annual change (%)	p-value	Annual change (%)	p-value
Asian	64,954	77.6	15.8	22.6	67,984	70.2	10.7	17.6	46,563	66.8	11.0	19.0	-13.9	<.001	-30.5	<.001	-16.0	<.001
Non-Hispanic White	125,974	59.3	11.0	20.7	130,044	61.3	10.8	20.6	90,070	62.3	11.7	21.7	5.1	<.001	6.7	.014	4.8	<.001
Non-Hispanic Black	196,923	131.7	73.2	54.2	159,617	110.5	55.2	48.7	96,662	100.5	50.0	49.0	-23.7	<.001	-31.8	<.001	-9.5	<.001
Hispanic	200,175	108.3	41.4	36.6	166,745	86.6	27.6	30.8	108,421	82.9	27.7	32.6	-23.5	<.001	-33.0	<.001	-11.0	<.001
Asians groups by nativity status																		
U.S.-born Asians																		
Aggregated[2]	8,174	47.0	17.4	46.2	9,802	47.5	15.3	42.8	7,054	42.4	14.7	43.8	-9.6	.088	-15.2	<.001	-5.1	<.001
Indian	1,357	55.0	9.4	20.5	3,012	93.3	37.9	44.8	2,576	79.8	33.5	44.4	45.0	<.001	256.7	<.001	116.6	<.001
Chinese	2,552	36.4	7.7	33.7	3,700	43.4	11.9	40.9	2,816	40.1	11.3	40.5	10.3	<.001	46.5	<.001	20.2	.024
Japanese	280	63.2	16.6	33.2	380	92.2	40.4	48.7	310	76.0	37.8	48.5	20.1	.017	127.3	<.001	45.9	<.01
Korean	578	29.4	3.6	27.9	958	50.6	10.2	39.3	721	40.6	8.6	38.3	38.3	<.001	142.1	<.001	37.2	<.001
Vietnamese	76	31.3	3.1	19.6	178	40.9	13.7	45.7	121	49.5	14.9	39.4	58.0	<.001	380.6	.885	100.9	.501
Other Asian	3,331	140.9	83.8	64.8	1,574	46.2	11.9	36.0	510	34.5	11.8	42.1	-75.5	<.001	-85.9	<.001	-35.1	<.01
Foreign-born Asians																		
Aggregated[2]	58,515	92.1	16.0	19.2	59,870	83.2	9.9	13.5	40,250	78.2	9.9	14.3	-15.1	.019	-38.0	<.001	-25.3	<.001
Indian	13,962	118.8	14.6	13.6	19,446	143.9	25.2	18.8	13,829	63.8	11.6	19.4	-46.3	<.001	-20.7	<.001	42.6	<.001
Chinese	25,531	100.5	8.5	11.4	27,823	91.8	6.4	9.4	18,403	182.9	14.3	10.4	81.9	<.001	67.3	<.001	-8.8	<.001
Japanese	1,648	58.1	17.8	32.5	1,557	55.8	7.9	25.8	1,055	49.6	7.8	26.8	-14.6	.083	-55.9	.016	-17.6	<.01
Korean	3,419	41.4	9.4	30.2	2,786	32.2	3.5	21.3	1,623	32.8	2.2	13.4	-21.0	<.001	-76.6	<.001	-55.8	<.001
Vietnamese	620	54.0	9.2*	18.7*	541	43.2	4.5	11.7	337	68.7	8.8	20.4	27.4	.239	-4.8	.282	9.3	.088
Other Asian	13,335	103.5	38.1	36.8	7,717	49.2	7.2	16.0	5,003	40.4	6.8	18.2	-61.0	<.001	-82.1	<.001	-50.6	<.001

*Relative standard error is greater than 20%, estimate should be interpreted with caution.

[1]P-values calculated using the Cochran-Armitage test for linear trends

[2]The sum of the aggregated foreign-born and U.S.-born pregnancy counts may not equal the counts for the overall Asian group, given the country of origin subgroups include individuals who identified as Asian *and* Hispanic, whereas these individuals would have been excluded from the overall Asian racial grouping.

A3.1: Unadjusted and adjusted odds ratios of traveling 50 or more miles for an abortion among patients residing in *urban areas*, by nativity status and length of stay: 2008-2014

	Unadjusted model				Adjusted models[1]							
					Analysis on full sample (N=14,417[2])				Analysis restricted to immigrants (N=1,975[3])			
Characteristic	Unadjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value	Adjusted OR[4]	95% CI[5]		p-value
Nativity												
Non-immigrant	1.00				1.00							
Immigrant	0.54	0.44	0.66	.00	0.72	0.59	0.87	.00				
Length of stay in the U.S.												
≥10 years	1.00								1.00			
<10 years	0.84	0.61	1.17	.30					0.82	0.58	1.16	.27

[1] Both adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion, urban/rural residence, state-level hostility toward abortion, and survey year.

[2] Includes survey respondents who live in urban areas, as indicated by metropolitan statistical areas.

[3] Excludes 352 immigrant respondents living in urban areas who did not report on their length of stay in the U.S.

[4] OR = Odds ratio

[5] CI = Confidence interval

A3.2: Results from multiple imputation of length of stay: Unadjusted and adjusted odds ratios of traveling 50 or more miles for an abortion or having a second-trimester abortion by length of stay, 2008-2014 (N=2,790)

	Odds of traveling 50 or more miles[1]							Odds of having a second-trimester abortion[1]						
Characteristic	Unadjusted OR[2]	95% CI[3]		p-value	Adjusted OR[2]	95% CI[3]		p-value	Unadjusted OR[2]	95% CI[3]		p-value	Adjusted OR[2]	95% CI[3]		p-value
Length of stay in the U.S.																
≥10 years	1.00				1.00				1.00				1.00			
<10 years	0.96	0.72	1.29	.80	0.93	0.66	1.31	.69	1.00	0.74	1.35	.99	0.93	0.67	1.28	.65

[1] Adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion (in the distance traveled model), travel distance (in the gestation model), urban/rural residence, state-level hostility toward abortion, and survey year.

[2] OR = Odds ratio

[3] CI = Confidence interval

A3.3: Unadjusted and adjusted odds ratios of traveling 50 or more miles for an abortion or having a second-trimester abortion by length of stay with missing category, 2008-2014 (N=2,790)

	Odds of traveling 50 or more miles[1]							Odds of having a second-trimester abortion[1]							
Characteristic	Unadjusted OR[2]	95% CI[3]		p-value	Adjusted OR[2]	95% CI[3]		p-value	Unadjusted OR[2]	95% CI[3]		p-value	Adjusted OR[2]	95% CI[3]		p-value
Length of stay in the U.S.																
≥10 years	1.00				1.00				1.00				1.00			
<10 years	0.93	0.69	1.26	.64	0.91	0.67	1.24	.53	0.98	0.72	1.32	.88	0.92	0.66	1.27	.60
Missing	1.59	0.99	2.56	.06	1.20	0.82	1.76	.35	1.36	0.93	1.98	.11	1.28	0.86	1.93	.23

[1] Distance traveled analyses only included those patients who provided valid zip codes

[2] Gestation at the time of abortion; first trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[3] MSA = Metropolitan statistical area

[4] OR = Odds ratio

[5] CI = Confidence interval

A3.4: Unadjusted and adjusted proportional odds ratios and predicted probabilities for categorical distance traveled to obtain an abortion, by nativity status and length of stay, 2008-2014

	Unadjusted models								Adjusted models													
									Analysis on full sample (N=16,161[2])								Analysis restricted to immigrants (N=2,271[3])							
					Predicted probabilities								Predicted probabilities								Predicted probabilities			
Characteristic	Unadjusted OR[4]	95% CI[5]		p-value	<25 miles	25-49 miles	50-100 miles	>100 miles	Adjusted OR[4]	95% CI[5]		p-value	<25 miles	25-49 miles	50-100 miles	>100 miles	Adjusted OR[4]	95% CI[5]		p-value	<25 miles	25-49 miles	50-100 miles	>100 miles
Nativity																								
Non-immigrant	1.00				65.8%	15.9%	10.1%	8.2%	1.00				67.3%	15.8%	9.4%	7.5%								
Immigrant	0.56	0.48	0.67	.00	77.3%	11.5%	6.4%	4.8%	0.76	0.66	0.87	.00	72.1%	13.9%	8.0%	6.0%								
Length of stay in the U.S.																								
≥10 years	1.00				76.8%	12.6%	5.5%	5.1%									1.00				77.4%	12.6%	5.2%	4.8%
<10 years	0.80	0.65	0.99	.04	80.6%	10.8%	4.5%	4.1%									0.82	0.65	1.03	.09	80.2%	11.1%	4.6%	4.1%

[1] Both adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, gestation at time of abortion, urban/rural residence, state-level hostility toward abortion, and survey year.

[2] Excludes 1,712 respondents who did no provide valid zip codes.

[3] Excludes 185 immigrant respondents who did not provide valid zip codes and 519 immigrant respondents who did not report on their length of stay in the U.S.

[4] OR = Odds ratio

[5] CI = Confidence interval

A3.5: Unadjusted and adjusted proportional odds ratios and predicted probabilities for categorical weeks gestation[1], by nativity status and length of stay, 2008-2014

	Unadjusted models							Adjusted models[2]											
								Analysis on full sample (N=17,873)							Analysis restricted to immigrants (N=2,271[3])				
					Predicted probabilities						Predicted probabilities						Predicted probabilities		
Characteristic	Unadjusted OR[4]	95% CI[5]		p-value	≤12 weeks	13-15 weeks	≥16 weeks	Adjusted OR[4]	95% CI[5]		p-value	≤12 weeks	13-15 weeks	≥16 weeks	Adjusted OR[4]	95% CI[5]		p-value	≤12 weeks	13-15 weeks	≥16 weeks
Nativity																					
Non-immigrant	1.00				89.3%	6.3%	4.3%	1.00				89.5%	6.2%	4.3%							
Immigrant	0.74	0.64	0.87	.00	91.8%	4.9%	3.3%	0.81	0.68	0.95	.01	91.3%	5.2%	3.5%							
Length of stay in the U.S.																					
≥10 years	1.00				92.3%	4.4%	3.3%								1.00				91.9%	4.6%	3.5%
<10 years	0.99	0.73	1.33	.95	92.4%	4.4%	3.3%								0.92	0.66	1.28	.61	92.5%	4.3%	3.2%

[1] Second trimester or later is defined as 13 or more weeks and first trimester is defined as ≤12 weeks based on the date of last menstrual period

[2] Both adjusted models control for age, race/ethnicity, health insurance status, poverty status, education level, relationship status, number of prior births, distance traveled to obtain an abortion, urban/rural residence, state-level hostility toward abortion, and survey year.

[3] Excludes 519 immigrant respondents who did not report on their length of stay in the U.S.

[4] OR = Odds ratio

[5] CI = Confidence interval

A3.6: Distribution of immigrant abortion patients in the U.S. across select charactersitics and by non-missing vs missing on length of stay 2008-2014

Characteristic	Non-missing vs missing on distance traveled		
	Non-missing (n=2,271)	Missing[3] (n=519)	
	%	%	p-value[4]
Age, y			.32
<18	3.0	2.0	
18-19	5.8	4.1	
20-24	23.9	25.6	
25-29	26.5	29.5	
30-34	20.4	19.5	
35+	20.4	19.3	
Race/ethnicity			<.01
Non-Hispanic White	11.0	8.1	
Non-Hispanic Black	14.1	20.9	
Hispanic	48.7	50.2	
Asian	20.7	15.5	
Other	5.6	5.4	
Health insurance			<.001
No coverage	42.7	52.6	
Medicaid	27.8	24.7	
Private	28.1	22.5	
HealthCare.gov / State exchange	1.3	0.2	
Poverty status, %			.06
<100	49.4	54.9	
100-199	23.5	22.5	
≥200	27.2	22.7	
Highest level of education			.09
Less than high school	23.6	27.5	
High school graduate/GED	26.0	29.0	
Some college	26.8	24.0	
College graduate	23.5	19.5	
Relationship status			.54
Married	30.4	29.7	
Cohabiting	23.6	23.5	
Never married	32.3	30.7	
Previously married	13.6	16.1	

Gestation trimester[1]			.08
First trimester	92.3	89.8	
Second trimester or later	7.7	10.2	
Number of previous births			.28
0	33.5	29.6	
1-2	57.2	60.5	
≥3	9.3	9.8	
Resides in MSA[2]			.07
No (Rural)	5.6	8.7	
Yes (Urban)	94.4	91.3	
Region of residence			.35
Northeast	26.4	29.3	
Midwest	9.0	9.7	
South	32.6	33.2	
West	32.1	27.7	

[1] Gestation at the time of abortion; first trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[2] MSA = Metropolitan statistical area

[3] Respondents who did not provide information on length of stay in the U.S.

[4] P-values calculated using chi-squared statistics

A3.7: Distribution of abortion patients in the U.S. across select characteristics and by non-missing vs missing on distance, 2008-2014

Characteristic	Full sample of abortion patients (N=17,873)	Non-missing vs missing on distance traveled		
		Non-missing (n=16,161)	Missing[3] (n=1,712)	
	%	%	%	p-value[4]
Nativity				.02
Non-immigrant	83.7	84.0	81.2	
Immigrant	16.3	16.0	18.8	
Length of stay				<.001
≥10 years	7.4	7.6	5.6	
<10 years	5.7	5.7	5.6	
Missing	86.8	86.6	88.9	
Age, y				.09
<18	5.2	5.2	5.5	
18-19	9.7	9.8	9.1	
20-24	33.5	33.8	30.3	
25-29	25.4	25.3	26.0	
30-34	14.6	14.4	16.3	
35+	11.6	11.5	12.7	
Race/ethnicity				<.001
Non-Hispanic White	37.3	38.1	30.6	
Non-Hispanic Black	28.7	28.5	30.0	
Hispanic	24.9	24.4	29.1	
Asian	5.1	5.1	5.2	
Other	4.0	3.9	5.0	
Health insurance				.21
No coverage	34.3	34.1	36.0	
Medicaid	32.8	32.8	33.0	
Private	31.4	31.6	30.0	
HealthCare.gov / State exchange	1.5	1.6	1.0	
Poverty status, %				.22
<100	45.7	45.5	47.4	
100-199	26.1	26.3	24.3	
≥200	28.2	28.2	28.3	
Highest level of education				<.001
Less than high school	15.5	15.0	19.9	
High school graduate/GED	29.3	29.3	29.0	
Some college	37.3	38.0	30.9	
College graduate	17.9	17.6	20.3	

Relationship status				<.01
Married	14.6	14.3	17.1	
Cohabiting	30.1	30.3	28.1	
Never married	45.4	45.7	43.0	
Previously married	9.9	9.7	11.7	
Gestation trimester[1]				.53
First trimester	89.7	89.8	89.3	
Second trimester or later	10.3	10.2	10.7	
Number of previous births				<.001
0	39.8	40.1	37.2	
1-2	53.5	53.1	58.0	
≥3	6.6	6.8	4.9	
Resides in MSA[2]				<.001
No (Rural)	10.9	10.0	100.0	
Yes (Urban)	89.1	90.0	0.0	
Region of residence				.05
Northeast	23.4	23.0	27.8	
Midwest	15.3	15.5	14.1	
South	35.7	35.9	33.8	
West	25.5	25.7	24.3	

[1] Gestation at the time of abortion; first trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[2] MSA = Metropolitan statistical area

[3] Respondents who did not provide a valid zip code

[4] P-values calculated using chi-square statistics

A4.1: Distribution of abortion patients in the U.S. across select characteristics and by non-missing vs missing on distance, 2008-2014

Characteristic	Full sample of abortion patients (N=17,873)	Non-missing vs missing on distance traveled		
		Non-missing (n=16,161)	Missing[3] (n=1,712)	
	%	%	%	p-value[4]
Nativity				.02
Non-immigrant	83.7	84.0	81.2	
Immigrant	16.3	16.0	18.8	
Length of stay				<.001
≥10 years	7.4	7.6	5.6	
<10 years	5.7	5.7	5.6	
Missing	86.8	86.6	88.9	
Age, y				.09
<18	5.2	5.2	5.5	
18-19	9.7	9.8	9.1	
20-24	33.5	33.8	30.3	
25-29	25.4	25.3	26.0	
30-34	14.6	14.4	16.3	
35+	11.6	11.5	12.7	
Race/ethnicity				<.001
Non-Hispanic White	37.3	38.1	30.6	
Non-Hispanic Black	28.7	28.5	30.0	
Hispanic	24.9	24.4	29.1	
Asian	5.1	5.1	5.2	
Other	4.0	3.9	5.0	
Health insurance				.21
No coverage	34.3	34.1	36.0	
Medicaid	32.8	32.8	33.0	
Private	31.4	31.6	30.0	
HealthCare.gov / State exchange	1.5	1.6	1.0	
Poverty status, %				.22
<100	45.7	45.5	47.4	
100-199	26.1	26.3	24.3	
≥200	28.2	28.2	28.3	
Highest level of education				<.001
Less than high school	15.5	15.0	19.9	
High school graduate/GED	29.3	29.3	29.0	

Some college	37.3	38.0	30.9	
College graduate	17.9	17.6	20.3	
Relationship status				<.01
Married	14.6	14.3	17.1	
Cohabiting	30.1	30.3	28.1	
Never married	45.4	45.7	43.0	
Previously married	9.9	9.7	11.7	
Gestation trimester[1]				.53
First trimester	89.7	89.8	89.3	
Second trimester or later	10.3	10.2	10.7	
Number of previous births				<.001
0	39.8	40.1	37.2	
1-2	53.5	53.1	58.0	
≥3	6.6	6.8	4.9	
Resides in MSA[2]				<.001
No (Rural)	10.9	10.0	100.0	
Yes (Urban)	89.1	90.0	0.0	
Region of residence				.05
Northeast	23.4	23.0	27.8	
Midwest	15.3	15.5	14.1	
South	35.7	35.9	33.8	
West	25.5	25.7	24.3	

[1] Gestation at the time of abortion; first trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[2] MSA = Metropolitan statistical area

[3] Respondents who did not provide a valid zip code

[4] P-values calculated using chi-square statistics

A4.2: Distribution of abortion patients in the U.S. across select characteristics and by non-missing vs missing on neighborhood immigrant density, 2008-2014

Characteristic	Non-missing vs missing on neighborhood immigrant density		
	Non-missing (n=16,024)	Missing[3] (n=1,849)	
	%	%	p-value[4]
Nativity			<.01
Non-immigrant	84.1	80.5	
Immigrant	15.9	19.5	
Age, y			.08
<18	5.2	5.3	
18-19	9.8	9.3	
20-24	33.8	30.3	
25-29	25.3	26.0	
30-34	14.4	16.1	
35+	11.4	13.0	
Race/ethnicity			<.001
Non-Hispanic White	38.2	30.4	
Non-Hispanic Black	28.5	29.6	
Hispanic	24.3	29.8	
Asian	5.1	5.3	
Other	3.9	5.0	
Health insurance			.13
No coverage	34.0	36.1	
Medicaid	32.8	32.9	
Private	31.6	30.1	
HealthCare.gov / State exchange	1.6	0.9	
Poverty status, %			.21
<100	45.5	47.3	
100-199	26.3	24.4	
≥200	28.2	28.3	
Highest level of education			<.001
Less than high school	15.1	19.3	
High school graduate/GED	29.3	29.0	
Some college	38.1	31.2	
College graduate	17.5	20.5	
Relationship status			<.001
Married	14.3	17.2	
Cohabiting	30.3	28.0	

Never married	45.7	43.1	
Previously married	9.7	11.7	
Gestation trimester[1]			.56
First trimester	89.8	89.3	
Second trimester or later	10.2	10.7	
Resides in MSA[2]			<.001
No (Rural)	9.9	66.3	
Yes (Urban)	90.1	33.7	
Region of residence			.04
Northeast	23.0	27.3	
Midwest	15.5	13.5	
South	35.9	34.1	
West	25.6	25.1	

[1] Gestation at the time of abortion; first trimester is defined as ≤12 weeks based on date of last menstrual period and second trimester or later is defined as 13 or more weeks.

[2] MSA = Metropolitan statistical area

[3] Respondents who lived in zip codes that did not have corresponding data on percent population foreign-born

[4] P-values calculated using chi-squared statistics

A4.3: Select characteristics of people obtaining abortions in U.S. facilities overall and by racial/ethnic group, 2008-2014

Characteristic	All women (N= 17,873)		Hispanic women (N=4,289)		Asian women (N=894)		Non-Hispanic Black women (N=5,154)		Non-Hispanic White women (N=6,806)		Women of other races (N=730)	
	N	%	N	%	N	%	N	%	N	%	N	%
Nativity												
Non-immigrant	15,083	83.7	2,928	68.0	340	37.2	4,726	91.3	6,510	95.5	579	77.7
Immigrant	2,790	16.3	1,361	32.0	554	62.8	428	8.7	296	4.5	151	22.3
Age, y												
<18	933	5.2	257	6.0	22	2.4	344	6.5	269	4.0	41	5.9
18-19	1,722	9.7	453	10.8	71	8.3	503	9.7	635	9.3	60	8.4
20-24	6,098	33.5	1,464	33.9	245	26.7	1,857	35.4	2,295	32.8	237	32.1
25-29	4,532	25.4	1,074	25.1	236	25.9	1,300	25.7	1,731	25.3	191	25.4
30-34	2,555	14.6	571	13.5	161	18.6	687	13.4	1,022	15.7	114	15.8
35+	2,033	11.6	470	10.8	159	18.0	463	9.4	854	12.9	87	12.5
Health insurance												
No coverage	6,041	34.3	1,653	38.9	324	36.5	1,468	28.9	2,351	35.0	245	34.1
Medicaid	5,823	32.8	1,675	39.2	175	19.9	2,122	41.3	1,598	23.6	253	35.0
Private	5,734	31.4	917	20.9	382	42.2	1,457	27.7	2,756	39.9	222	29.7
HealthCare.gov / State exchange	275	1.5	44	1.0	13	1.4	107	2.0	101	1.5	10	1.2
Poverty status, %												
<100	8,171	45.7	2,441	56.9	324	35.9	2,703	52.0	2,369	34.6	334	46.3
100-199	4,676	26.1	1,057	24.7	214	23.9	1,362	26.5	1,841	27.0	202	27.2
≥200	5,026	28.2	791	18.4	356	40.2	1,089	21.5	2,596	38.4	194	26.5
Highest level of education												
Less than high school	2,739	15.5	1,094	25.6	66	7.2	730	14.1	734	10.9	115	16.4
High school graduate/GED	5,239	29.3	1,309	30.6	199	21.8	1,685	32.9	1,846	26.9	200	27.5
Some college	6,736	37.3	1,397	32.4	294	32.8	1,990	38.3	2,773	40.5	282	37.6
College graduate	3,159	17.9	489	11.4	335	38.1	749	14.7	1,453	21.7	133	18.5

Relationship status												
Married	2,584	14.6	715	16.5	317	36.1	417	8.1	1,007	15.0	128	17.5
Cohabiting	5,361	30.1	1,229	28.8	214	23.3	1,571	30.8	2,112	31.1	235	31.6
Never married	8,135	45.4	1,796	42.1	315	35.3	2,854	55.0	2,879	42.2	291	40.5
Previously married	1,793	9.9	549	12.7	48	5.3	312	6.0	808	11.7	76	10.4
Number of previous births												
0	7,171	39.8	1,522	35.5	426	47.2	1,608	30.9	3,326	48.6	289	39.6
1-2	9,517	53.5	2,386	55.8	416	46.9	3,165	61.6	3,159	46.7	391	54.0
≥3	1,185	6.6	381	8.7	52	6.0	381	7.4	321	4.8	50	6.3
Resides in MSA[1]												
No (Rural)	1,883	10.9	228	5.6	51	5.9	433	8.6	1,056	16.1	115	16.1
Yes (Urban)	14,417	89.1	3,614	94.4	762	94.1	4,237	91.4	5,266	83.9	538	83.9
Region of residence												
Northeast	4,023	23.4	927	23.3	168	20.4	1,351	27.7	1,448	21.1	129	19.4
Midwest	2,800	15.3	286	6.4	94	10.4	745	13.9	1,563	23.2	112	14.9
South	6,372	35.7	1,256	30.2	203	22.7	2,535	48.8	2,217	32.5	161	22.1
West	4,672	25.5	1,817	40.1	428	46.4	523	9.7	1,576	23.2	328	43.6
Survey year												
2008	9,493	53.1	2,249	53.2	489	54.7	2,824	54.8	3,537	51.3	394	54.4
2014	8,380	46.9	2,040	46.8	405	45.3	2,330	45.2	3,269	48.7	336	45.6
Neighborhood-level factor												
Immigrant density[2]												
Median (Range)	10.9 (0-74.6)		25.1 (0-74.6)		20 (0.4-72.9)		8.6 (0-73.6)		7.4 (0-64.2)		12.0 (0-72.6)	

[1] MSA = Metropolitan statistical area

[2] Defined as the percentage of the population in the respondent's zip code tabulation area that is foreign-born, using data from the 2008 and 2014 American Community Survey 5-Year Estimates.