Population data methods to understanding mechanisms of inadequate prenatal care usage among Asian American women in Arizona vs. California

A Graduate Practicum Project Report to Satisfy MPH Program Requirements at the University of California, Irvine

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June 3, 2022

Abstract

BACKGROUND: Access to prenatal care is vital to ensuring the health of the mother and baby during pregnancy. Asian American mothers have historically been understudied in discourse around access to prenatal care outcomes and need to be included to continue decreasing racial disparities in prenatal care access.

OBJECTIVE: This project serves to use 2018-2020 NCHS Natality data sets to elucidate the mechanisms for inadequate prenatal care access (i.e. inadequate initiation of prenatal care vs. inadequate adherence to prenatal care appointments) and the role of sociodemographic factors between Asian American mothers in California and Arizona.

DISCUSSION: Our research for this project found that the experiences of Asian American women strongly differ across state lines. In Arizona, Asian American women were more likely to have inadequate initiation of prenatal care, while in California, Asian American women were more likely to have inadequate adherence to prenatal care. Throughout my role in managing the data aspects of this project, several challenges came up. These challenges, among others, include errors in the coding and data management process, lack of a focused research question at the start of the project, and an inability to gain access the necessary datasets until late in the project timeline.

PERSONAL ASSESSMENT: Two public health core competencies addressed in this project are *Evidence-Based Approaches to Public Health* and *Health Equity and Social Justice*.

RECOMMENDATIONS: For Arizona, interventions should focus on changing institutional systems for administering care and working with communities to increase health literacy. For California, interventions should focus on improving prenatal care itself through provider training and implementing technologies to increase access to prenatal care.

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Introduction

Description of the Public Health Question

Receiving adequate prenatal care is essential for health promotion of mothers and their babies. Adequate prenatal care–receiving the recommended amounts of prenatal care on time–has been associated with greater access to health information about pregnancy, care and delivery and it can also help identifying the potential risk factors associated with pregnancy complications for mothers.[1] Consequently, adequate prenatal care has been linked to more salubrious birth outcomes (e.g., less prevalence of low birth weights and infant mortality) through multiple interconnected mechanisms.[1–3] Thus, receiving adequate prenatal care is a key determinant of "strong start for mothers and newborns"[2] with lasting implications for their health across their lifespans.[4] At the population level, maternal morbidity –health complications from pregnancy and delivery– and associated maternal and child health outcomes have been estimated to cost $32.3 billion in health care expenses and social support services in 2019.[5] Healthy People 2030 has identified increasing adequate prenatal care utilization as one of the main mechanisms for addressing health inequities in maternal morbidity – with the goal of increasing the adequate prenatal care utilization to at least 80.5 percent of women in the United States by Year 2030.[6]

Understanding the contributing factors for inadequate prenatal care utilization initially stems from the public health efforts to reduce the racial inequities in low birth weights.[7] While the majority research on racial inequities in low birth weights and prenatal care utilization has predominantly focused on the Black-White binary[8] and slowly began to include Hispanic women,[9] there remains a critical need for meaningful inclusion of numerically-small populations (e.g., Asian American, Native Hawaiian, Pacific Islander, American Indian and Alaska Native women). While Asian American women have lower prenatal care utilization than non-Hispanic

white mothers (80.6% compared to 82.3% in 2016),[10] and there are unique cultural and linguistic needs in accessing adequate health care; Asian American women's experiences with prenatal care utilization are often overlooked for several reasons. First, Asian Americans are inaccurately racialized as model minorities where they are reimagined as a homogenous racial group with socioeconomic success, upper mobility and overall wellbeing – contributing to the invisibility of Asian American women's needs in accessing adequate prenatal care.[11] Second, lack of quality data for disaggregation within the panethnic Asian American category masks the important heterogeneous experiences across different Asian ethnic groups.[12,13] However, a greater inclusion of Asian Americans in racial prenatal health inequity is essential for not only Asian American women but all women.[14]

Description of the Project

The overarching goal of the project was to elucidate the current states and challenges of Asian American women's experiences with prenatal care utilization in Arizona. With lack of quality data which includes a large sample of Asian Americans, Asian Americans are often invisible from prenatal care utilization research by either excluding them (i.e., deleting the Asian American sample) or race misclassification through aggregation (i.e., grouping Asian Americans into the aggregated "Other" category). Invisibility of Asian American women's health is even more prevalent for Asian Americans who reside in emerging destinations like Arizona. With the needs of data and information for local health advocacy, the project aimed to investigate the individual-level predictors of inadequate prenatal care utilization in Arizona. In doing so, the project used Asian American women in California and Asian American women in the United States as the comparison groups to highlight the unique challenges for Asian American women's health equity in Arizona.

In examining the prenatal care utilization among Asian American women, one critical factor to consider is geography as prenatal care utilization varies spatially and often different reproductive and maternal health legislations are passed by states.[15] This is particularly important for Asian American women as there has been significant geographic diversification for Asian Americans since 2000.[16] While the majority of Asian Americans has previously resided in a few key traditional destination states (e.g., California), many states have emerged as new destinations for Asian Americans (e.g., Arizona). Emerging destinations are likely to have less community health infrastructures and resources, and Asian American women may not be able to access the culturally and linguistically appropriate prenatal care (e.g., lack of Asian language speaking prenatal care providers). Furthermore, inclusion of geography is also critical for incorporating the intersectionality framework for anti-racist public health research and praxis for Asian Americans because understanding whether and how Asian American women's experiences with prenatal care differ across states can elucidate the mechanisms generating different lived experiences with differing social contexts.[17–19]

Arizona is an important place for Asian Americans. While it was one of the main places where Japanese Americans were forced to relocate for incarceration during WWII, it received relatively little attention for Asian Americans' health inequity research due to the small population size. However, since 2000, Arizona has experienced the second highest population growth of Asian Americans in the United States (after Nevada), and it is one of the popular "emerging destinations" for Asian Americans.

Description of the Community Organization Partnership

This project is a collaborative community project with the Asian Pacific Community in Action (APCA), which is the leading non-profit community health organization in Phoenix,

Arizona. APCA is also a member of the Association of Asian Pacific Community Health Organizations (AAPCHO). The mission of APCA is to inspire diverse communities to secure healthier futures. We build partnerships to promote health in ethnic minority communities, to support health equity for marginalized communities and to address health disparities, particularly for Asian American and Pacific Islander (AAPI) communities. APCA has several ongoing community health projects including the rapid response to COVID and vaccination, reproductive health justice and maternal and child health equity. In support of APCA's efforts on reproductive health justice and maternal and child health equity, APCA has agreed to collaborate with the practicum project to curate the community-facing research report to make it readily available for community members in Arizona and beyond. Dr. Kathy Nakagawa of APCA (President), Zeenat Hasan of APCA (Executive Director) and Layal Rabat of APCA (Programs Director) have provided the feedbacks from all stages of the projects – from identifying the project goals and objectives to refining the practicum project topic.

Discussion

Project Findings

Table 1 presents the descriptive statistics of all variables included in the model for Asian American women in the United States and by state (for California and Arizona). At large, 4.1% of Asian American women received no prenatal care and 17.8% of Asian American women received inadequate prenatal care from 2018 to 2020. Nearly one in ten Asian American women started their prenatal care later than the recommended time (9.1%) and received inadequate recommended received services (10.3%). The percentages of Asian American who did not receive any prenatal care were lower than the national estimate for both California (1.8%) and Arizona (3.2%). Compared to the national estimate for inadequate prenatal care (17.8%), Asian

American women in California were significantly less likely to have inadequate prenatal care (16.8%) while Asian American women in Arizona were significantly more likely to have inadequate prenatal care (19.2%). Intriguingly, two mechanisms for inadequate prenatal care showed the opposite patterns between California and Arizona. Compared to the national estimate for inadequate initiation of prenatal care (9.1%), Asian American women in California were significantly less likely to have inadequate initiation (5.8%) while Asian American women in Arizona were significantly more likely to have inadequate initiation (12.1%). On the other hand, Asian American women in California were significantly more likely to have inadequate adherence (12.0%) while Asian American women in Arizona were significantly less likely to have inadequate adherence (9.0%).

Three largest Asian ethnic groups were Asian Indian, Chinese and Filipinx for the United States, California and Arizona. About one in eight (79.0%) Asian American women were foreign born and one in three (30.3%) of Asian American women were older than 35 years of age at the time of birth. Compared to the national estimates, Asian American women in California were less likely to be foreign-born (71.6%) and older (35.7%) whereas Asian American women in Arizona were more likely to be foreign-born (83.6%) and younger (28.6%). There was greater variation for maternal education in Arizona. Asian American women in Arizona were significantly more likely to have less than high school education (6.2%) compared to the total Asian American women population (6.1%) and Asian American women in California (2.0%). Asian American in Arizona were also significantly less likely to receive WIC (12.3%) compared to the total Asian American women population (18.6%) and Asian American women in California (16.2%). Notably, a significantly higher percentage of Asian American women in

California for their prenatal care out of pocket (10.2%) compared to Asian American women in Arizona (4.2%).

Table 2 presents the results from three sets of logistic regression models predicting (1) inadequate prenatal care (APCUI), (2) inadequate initiation of prenatal care and (3) inadequate adherence of prenatal care. For inadequate prenatal care at the population level (APCUI for all Asian American women in the United States), there were significant differences in inadequate prenatal care across ethnic groups. Compared to Asian Indian American women, all other Asian American women were significantly more likely to experience inadequate prenatal care. Compared to U.S.-born Asian American women, foreign-born Asian American women had the significantly increased odds of inadequate prenatal care (OR = 1.16) whereas first birth (OR = 0.91) was associated with the decreased odds of inadequate prenatal care. Compared with women with less than a high school education, the odds of inadequate prenatal care were approximately 17% lower for women with a high school education, 24% for women with any college and 31% lower for women with college degree. Intriguingly, receiving WIC was associated with decreased odds of having inadequate prenatal care (OR = 0.93). Notably, nativity, first birth, education and WIC status had the same significant associations with inadequate prenatal care for Asian American women in California, but not for Asian American women in Arizona. While WIC status was associated with the decreased odds of inadequate prenatal care for Asian American women in California (OR = 0.92), it was associated with the increased odds of inadequate prenatal care for Asian American women in Arizona (OR = 1.18).

In examining the specific mechanisms for inadequate prenatal care at the population level (APCUI for all Asian American women in the United States), some important contrasting patterns emerged. While foreign-born nativity status was associated with the increased odds of

inadequate initiation of prenatal care (OR = 1.46), it was associated with the decreased odds of inadequate adherence of parental care (OR = 0.98). Similarly, first-born parity was associated with the increased odds of inadequate initiation of prenatal care (OR = 1.17), it was associated with the decreased odds of inadequate adherence of parental care (OR = 0.74). Foreign-born nativity status was significantly associated with the increased odds of inadequate initiation of prenatal care for Asian American women in California only. Notably, ethnicity, education and insurance types were not significantly associated with inadequate adherence of parental care for Asian American women in Arizona. For Asian American women in California, having self-pay insurance was associated with the increased odds of inadequate initiation of prenatal care (OR = 8.73) and the decreased odds of inadequate adherence of parental care (OR = 0.89).

Significance of Project Findings

With significant diversification of Asian Americans' residence outside of the traditional destination states, understanding Asian American women's health inequities requires more nuanced investigation at the intersection of race/ethnicity and place. Understanding inadequate prenatal care utilization for Asian American women in Arizona using population data unveils the critical importance of place in women's health.

Several of our findings are noteworthy. First, Asian American women's experiences with inadequate prenatal care utilization meaningfully differed by state (i.e., the across-state differences). Asian American women in Arizona were significantly more likely to have inadequate prenatal care compared to those in California; and Asian American women in California were significantly less likely to have inadequate initiation while Asian American women in Arizona were significantly more likely to have inadequate initiation. This is consistent with previous research documenting the spatial variations in prenatal care utilization.[15] The

findings provide important empirical evidence for the needs to include Asian Americans' health in the new destinations for Asian Americans. They also provide different place-based policy implications to reduce the prevalence of inadequate prenatal care utilization for Asian American women in each state. Asian American women in Arizona experience a higher prevalence of inadequate initiation of prenatal care, which may be attributed to systemic barriers that affect Asian American women from accessing prenatal care. On the other hand, Asian American women in California experience a higher prevalence of inadequate adherence to prenatal care appointments, which could be attributed to barriers in navigating the healthcare system. Furthermore, while maternal educational attainment and insurance status were important correlates for both inadequate initiation and inadequate adherence for Asian American women in California, they were only significantly associated with inadequate initiation of prenatal care utilization for Asian American women in Arizona.

Second, there were important within-state differences. For Asian American women in California only, having Medicaid and self-pay insurance status was significantly associated with the increased odds of inadequate initiation of prenatal care utilization and the decreased odds of inadequate adherence of prenatal care utilization. This suggests that for designing the policy for Asian American women in California, the policies need to go beyond ensuring coverage to ensure that Asian American women do not only initiate prenatal care on time but also receive the recommended services when they have Medicaid or no insurance (self-pay).

Third, the use of the APCUI measure without assessing two mechanisms of inadequate prenatal care utilization (i.e., inadequate initiation of prenatal care and inadequate adherence of prenatal care) can be misleading as two mechanisms have contrasting associations for some correlates. For example, while the first birth is associated with the decreased odds of inadequate

prenatal care when the APCUI measure is used, it is actually used with the increased odds of inadequate initiation. The differing associations between a correlate and two mechanisms of inadequate prenatal care utilization can mask the specific pathways leading to erroneous conclusions. The findings suggest that beyond the use of the APCUI measure, investigating the mechanisms generating inadequate prenatal care utilization can provide additional information useful for designing policies for the targeted populations (e.g., Asian American women in Arizona).

Project Limitations

Despite these notable findings, this project has several limitations. First, we used the cross-sectional data and design, causal relationships between the individual-level correlates and inadequate prenatal utilization mechanisms cannot be established. Second, the project only focused on individual-level correlates. Future research and projects should move beyond the individual-centered approach to examine how structural factors at contextual level (e.g., neighborhoods) influence the inadequate prenatal care utilization. Such efforts will contribute to elucidating the mechanisms of inadequate prenatal care utilization differences across two states. Lastly, the results of this data analysis only focused on two states. With the rapid population growth and geographic diversification of Asian Americans, a greater inclusion of other states can lead to better understanding of how Asian Americans' health inequities vary at the intersection of race/ethnicity and place.

Critical Assessment of Project Goals and Objectives

The overarching goal of the project was to elucidate the current states and challenges of Asian American women's experiences with prenatal care utilization in Arizona. Using the 2018-2020 U.S. natality population data, this study examines the individual-level predictors for

inadequate prenatal care utilization among Asian American women in California and in Arizona. We have two main objectives. The first objective of the project is to investigate the specific mechanisms of inadequate prenatal care utilizations for Asian American women in California and in Arizona. In doing so, the project investigates whether and how the mechanisms of inadequate prenatal care utilizations would differ by states. The second objective of the project is to assess how Asian American women's individual-level predictors of inadequate prenatal care utilizations differ by states. Findings from addressing two objectives will provide invaluable information for designing place-based state-level policy to reduce the prevalence of inadequate prenatal care utilizations for Asian American women in two states.

In this project, my main role was to construct the population dataset and conduct the analyses for the community-facing research report and paper. I was responsible for three activities. The first activity was data construction. This activity included working on getting access to the NCHS natality data files and data construction by merging multiple years of natality files into one pooled dataset. The second activity involved data analyses. This included coding our variables of interest (and making the corresponding codebook) and selecting my topic of interest to focus the data analysis on. Upon the completion of the data construction and selection of the topic to focus on (i.e., inadequate prenatal care utilization), I conducted extracting descriptive statistics from the dataset, creating generalized linear models, conducting chi-square analysis, and forming and applying survey weights to our data. The last activity was writing the results of my data analysis, as well as recommendations for programs and other interventions relative to my topic of interest, into a concise community-facing report.

The project goal and objectives came together and revised with the feedback from the community organization partner (APCA), and they were appropriate for addressing the health

inequity in inadequate prenatal care utilization for Asian American women in Arizona and overall. One of the key strengths of this project was the use of population data. NCHS natality data is a population data from birth certificates capturing over 99.9% of *all* births occurring in the United States and its territories in a given year.[20] Given the small sample size issue that is prevalent in survey data for Asian Americans, which can lead to systematic erasure of Asian Americans in health equity research, the use of population data provided an important opportunity to investigate the health of Asian American women while minimizing the probability of false positive or false negative findings due to data limitations. Population data did not only allow us to look at within group differences across different ethnic groups but also by different geographic locations – allowing more thoughtful place-based policy recommendations to reduce the inadequate prenatal care utilization for Asian American women.

Challenges and Lessons Learned

One of the first challenges that we came across in this project, which affected the overall timeline for this project, was the lack of a specific research question or health outcome of interest that we would look at (at least, until fairly late until the project timeline). The project I completed for the practicum focused on inadequate prenatal care utilization for Asian American women, but the larger project had multi-prolonged goals looking at various prenatal health status and birth outcomes. For example, the natality datasets contain a wide variety of variables and health outcomes of potential interest, including Hepatitis B infection, Syphilis infection, and number of prenatal care visits. Because the practicum project was situated within the larger project with multiple project goals, the key challenge was not having the specific research question set from the onset for the practicum project. As a result of not having a clearly defined

research question from the start of the project, most of the time over the practicum was used for data exploration and deciding on a specific outcome to focus on.

This change in our timeline was also compounded by challenges in accessing the data sources needed for the project. Although natality datasets are publicly available through the National Center for Health Statistics (NCHS), we started this project with the intention of using the restricted versions of these datasets, which add geographic data in the dataset, including information on the state and county of each recorded birth in the dataset. We sent in an application to request access to the restricted natality datasets in December 2020, prior to the start of the practicum, under the assumption that we would be able to have access to the data within a five- week period after sending in the application. However, due to a period of staff turnover for our contacts with the NCHS, the request was neglected in the process, such that we had to follow up with the organization multiple times in order to check on the status of our request. As result, we were not able to get access to the restricted natality datasets until early-April 2022, a delay of approximately 2 months beyond our expected timeline. While the time spent waiting for access to these restricted datasets was used to further finalize a research topic (and support other related research projects in the process), the extent of what we were able to do for 2 months was quite limited. Along with other minor disruptions to the project timelines, such as myself and my practicum supervisor contracting COVID at separate times during the process, the timeline and workload of this project was not as equally distributed as we initially planned.

The primary lesson learned from these first set of challenges is ensuring that we allow enough flexibility to move deadlines and project milestones around in order to account for these disruptions to our project timelines. Thankfully, in our case, the five-month period for the practicum allowed us enough time to move milestones and deadlines around to account for these

disruptions. In addition, better planning prior to the start of the practicum, including finalizing a topic earlier in the project planning process, can also play a role in ensuring that we have this kind of flexibility throughout the process of doing the practicum.

The second set of challenges that we came across over the course of the project were challenges in processing the data that we have received from NCHS. One of the first issues that I ran into came during the step of merging datasets. The datasets that we received from NCHS consisted of one dataset for each year of interest, and so, prior to conducting analysis on the datasets, I had to merge three separate datasets into one giant comprehensive dataset. Given that natality datasets captured almost all births that occurred in the United States, each dataset took up approximately 2.5-3.0 GB of data, and when combined, resulted in a dataset approximately 8.5 GB large. I used my personal MacBook Air laptop computer in order to conduct this work, and given the technical limitations of my personal computer, processing this much data resulted in multiple times where my RStudio would either abort the process (usually in the middle of running code), or my computer would completely crash, both of which resulted in losing some of the progress I made in writing code or losing key intermediate datasets I created during the data merging process. In order to work around these technical limitations, I had to figure out how to optimize my workflow in the data merging process to ensure that I am not using too much of my computer's memory at one time. For instance, one step I took to optimize my workflow included slicing the full datasets such that I would only work with datasets that only included Asian American identifying mothers, which helped to ensure that I was working with smaller datasets at one time.

Another data processing challenge that we came across were errors in reading the dataset into our respective data processing systems. About halfway through the practicum project, we

discovered that even though all datasets we imported from the National Bureau of Economic Research (NBER), which we used to access the publicly available NCHS natality datasets, contained the same exact variables, there were inconsistencies in how the datasets were formatted, which we discovered through abnormal results in our data analysis. Upon further investigation, we concluded that these inconsistencies in how the datasets were formatted were due to errors in how the NBER reads in the datasets and uploads them into their public data-hosting platform. Initially, our workflow for reading the datasets from NBER into our respective data processing systems was to write code that would automatically read in these datasets. However, upon discovering these inconsistencies in dataset formatting, we had to read in our datasets manually, in which we had to delete filler columns (which were completely blank) and other similar variables to ensure that all three datasets had the same number of columns. While this step was quite laborious, the end result of reformatting our datasets made dataset merging much easier.

Within these challenges related to data processing, the biggest lesson learned was to ensure that we maintain a sense of flexibility to change our workflows. Oftentimes, the actions of cleaning and processing raw datasets can be accomplished through different approaches, and it is up to us, as individuals dealing with the data from this research, to be able to explore all possible options for changing workflows based on the technical limitations that we need to work around.

Personal Assessment

The practicum experience contributed to my understanding of public health practice in two parts. First, the process of operationalizing the dependent variable (i.e., inadequate prenatal care utilization) contributed to my understanding about the importance of measurement and operationalization in quantitative inquiries. Second, the research process and findings from the

research paper gave me a deeper understanding on the importance of intersectionality, and the importance of geography for Asian American health inequity research. I will first elaborate on two main points I have learned for public health practice, and then elaborate on relevant public health core competencies that this project is related to.

The Big Lesson for Public Health Practice

Conducting this project taught me the importance of measurement and operationalization in quantitative inquiries. For the dependent variable (i.e., inadequate prenatal care utilization) of the project, we first calculated the Kotelchuck Adequacy of Prenatal Care Utilization Index (APCUI).[21,22] APCUI is a standard measure which assesses adequacy of prenatal care utilization and it has been in use for past three decades.[21,22] The APCUI measure is constructed to measure both adequacy of initiation of prenatal care (timing) and adequacy of adherence (received services). *Adequacy of initiation of prenatal care* is calculated based on the month prenatal care began. If women started their prenatal care within the first trimester (before the 4th months), then it meets the criteria for adequate initiation of prenatal care. If women started their prenatal care after the 4th month or no prenatal care, then it is coded as inadequate prenatal care. *Adequacy of adherence of prenatal care* is calculated based on the proportion of the number of total visit until the time of delivery to the number of visits recommended by the American College of Obstetrics and Gynecology. If women received more than 80% of the recommended services, then it is considered adequate adherence.

In creating this index, we had to carefully consider what to do with women who did not receive any prenatal care. Although some research operationalizes inadequate prenatal care utilization inclusive of no prenatal care, we did not include those who did not receive any prenatal care as their experiences are likely qualitatively distinct – requiring distinct policy

efforts. We conducted the sensitivity analyses where we included women with no prenatal care as inadequate prenatal care, and all findings were substantively and significantly consistent. However, this exercise to compare two different operationalizations taught me the importance of how the variables are operationalized; and how different operationalizations can lead to inaccurate findings.

Relevant public health core competencies that this project is related to are addressed below.

Evidence Based Approaches to Public Health

One of the key features of evidence-based approaches to public health is the ability to use data and information systems systematically in order to disseminate information and results from research, evaluate programs, and make decisions.[23] This project utilized Restricted Natality Datasets from the National Center for Health Statistics (NCHS) between 2018 and 2020, which capture approximately 99.9% of all births that occurred in the United States in a given year.[20] Given this ability to capture almost all births occurring in the United States, these datasets are a valuable and robust source of evidence used in research relating to maternal and child health outcomes.

Furthermore, data construction methodologies for this project not only utilized the variables and outcomes that are already present in these datasets, but were also based off previous research and code. In particular, the construction of the Adequacy of Prenatal Care Utilization Index (APCUI) was fueled by research conducted by Kotelchuck and has been used as a standard method for assessing prenatal care utilization in the United States for over three decades.[21,22] These methods were not only conducted by me using R Version 4.1.3, but were also verified by Aggie Yellow Horse using STATA 17 to ensure consistency in the results that were

found from this study. As a result, the source data used in this project and the methods for manipulating data for this specific project's needs are robust and paint a representative picture of prenatal care utilization for our specific population and geographic locations of interest.

The primary method of data analysis was the use of logistic regression models with inadequate prenatal care utilization acting as our dependent variable. The outcome of these models, which we use to derive insights, are odds ratios that provide insight into which factors are considered a risk factor or protective factor against inadequate prenatal care. Prior to finalizing these models, I ran diagnostic tests to ensure that the covariates used in the models were all valid and that there were no abnormalities with these models. These diagnostics included visualizing the Cook's Distance of all data points used in each model to look out for any outliers and acquiring the generalized variance inflation factor for all covariates to ensure there were no issues with multicollinearity.

These steps throughout the process of this project help us to ensure that we are using the most robust sources of evidence and that we use evidence-based methods to tell the most accurate stories from the data that we have.

Health Equity and Social Justice

The Model Minority Myth for Asian Americans perpetuates the idea of unparalleled success educationally and occupationally,[24] and that the effects of such success trickle down into positive health outcomes for the entire community. However, looking at health outcomes among different Asian ethnic groups reveal striking disparities in health outcomes among ethnic groups,[24,25] including outcomes related to accessing prenatal care. This project not only confirms these inter-ethnic disparities in prenatal care access, but also reveals such disparities across state lines. While the project not only serves to reveal these disparities, we also aim to take action

through our partnership with Asian Pacific Community in Action (APCA), a non-profit, based in Phoenix, AZ, dedicated to serving the health needs of the Asian and Pacific Islander communities in the state. APCA is acting as our medium to disseminate the results of this research and recommendations for reducing disparities in prenatal care access in a community-based report that is accessible to healthcare-based stakeholders, other non-profit organizations that serve the Asian American community, and interested Asian American identifying community members. The community-based research report from this practicum project will be published upon review of APCA and other community partners, the future dissemination of these results will allow relevant organizations and community members to advocate for policies and resources that increase prenatal care access in culturally competent ways. As a result, this project employs a mechanism of using research and other evidence-based practices in order to contribute towards achieving health equity and addressing systems that perpetuate the disparities found in the healthcare system, both within Asian ethnicities and within geographic locations.

Intervention Recommendations

Arizona-Based Intervention Recommendations

The results of the study have important policy implications. Given the heterogeneity in Asian American women's experiences with inadequate prenatal care utilization and different mechanisms, the place-based public policy must meaningfully include the importance of differing contexts.

Data analysis results for Arizona suggest that inadequate prenatal care is driven by an inability for Asian American mothers to initiate prenatal care. Doing so requires a multifaceted strategy that addresses different factors that prevent the access to prenatal care. One such mechanism to increasing prenatal care access is through the expansion of health insurance,

especially among immigrant mothers. While this expansion was accomplished in Arizona in 2014, which decreased the uninsured rate between 2010 and 2019 by 33%,[26] such expansion of health insurance alone is not enough to counteract other factors that prevent the initiation of prenatal care.

In 2012, Oregon's implementation of the Medicaid program also introduced the model of coordinated care organizations (CCOs), which accomplished multiple objectives. The first was that the model integrated medical, dental, and behavioral health services for members of the state's health plan. The second was the creation of formal partnerships between local public health departments and community representatives to help individuals on the plan with navigating the healthcare system and receive more efficient care. As a result of implementing this model of care, there was a significant increase in the percentage of women who initiated prenatal care in the early stages of pregnancy, from 73.1% during the pre-CCO period (between January 2008 and June 2012) to 77.3% in the post-CCO period (from January to December 2013).[27] These findings suggest that on top of the state's expansion of Medicaid, one way to significantly increase the initiation of prenatal care is to develop partnerships between different stakeholders in a mother's care and to integrate different health services to ensure easier access to prenatal care.

While such a policy is able to utilize mechanisms on an institutional level to increase the ease of accessing and initiating prenatal care, these mechanisms do not address the social and cultural barriers that prevent prenatal care initiation for Asian American mothers in Arizona. In order to address these factors specifically, a community-based intervention may be more appropriate in order to increase the level of health literacy for these mothers. The blueprint for establishing this kind of intervention can be seen in the development of Arizona's Health Start

Program in 1982, which originally served the needs of Hispanic mothers in the state in order to combat the increase in prevalence of low birth weight happening in the state at the time. Aspects of the program include using Community Health Workers (CHWs) to assist expecting mothers in the community throughout the duration of the pregnancy and until the child reaches 2 years of age, which include connecting mothers to appropriate prenatal care, providing application assistance for social support programs (such as WIC), and administering health and developmental screenings for the baby.[28] Hispanic mothers who participated in the program experienced better health outcomes for the birth of their children, especially with such mothers experiencing twice the odds of having a baby with normal birth weight compared to Hispanic mothers who were not in the program.[29] In addition, the program affected Hispanic mothers differently from their White counterparts, which suggest that tailoring the program to the specific needs of the community being served is necessary to increasing the effectiveness of that program. As such, this kind of program should not only be maintained, but also be tailored to the specific cultural needs of Asian American mothers, which can include employing CHWs who identify within an Asian ethnicity and/or are able to communicate to mothers in various Asian languages, translating materials to various Asian languages, and providing nutrition and other health education materials that are tailored to the specific cultural needs of Asian mothers, which can include the introduction of culturally appropriate foods and emphasis on specific cultural values and traditions during pregnancy.

California-Based Intervention Recommendations

Results from California suggest that trends in inadequate prenatal care among Asian American mothers is driven more by inadequate adherence to prenatal care appointments more than inadequate initiation of prenatal care, in that mothers in California are more likely not able

to complete the number of prenatal care visits as recommended by the American College of Obstetrics and Gynecology. In addition to the institutional, social and demographic factors that affect a mother's ability to adhere to her prenatal care appointments (with corresponding recommendations already discussed in the previous section), the mechanism for improving prenatal care adherence is also influenced by the quality of care that the mother receives.

An integrative review by Novick[30] particularly notes the frustrations related to prenatal care experiences among minority women, which can be attributed to a multitude of factors. Discrimination and stereotyping based on race, as well as the presence of language barriers can affect a provider's ability to provide quality of care during a prenatal care appointment. In addition, perceptions of poor treatment and fear of examinations and procedures can deter mothers from continuing to attend their prenatal care appointments. Due to California's increased population of Asian immigrant and Asian American mothers, it is pertinent to ensure that prenatal care providers are trained using culturally sensitive paradigms and principles of diversity and inclusion to ensure that forms of racism and prejudice are not exhibited during the administration of prenatal care.

An effective way of counteracting these forms of racism and prejudice lies in the way in which we train providers to administer prenatal care. One such method is by employing a group prenatal care-based curriculum when training medical residents. Rather than relying on didactic teachings and the use of books, and articles as the main focus of the training, group prenatal care-based curriculum puts medical residents into teams, in which residents provide prenatal care to a mother in a group setting while being supervised and facilitated by a trained faculty physician.[31] This pedagogy allows residents to not only center the needs of the mother in their training, but also provides opportunities for residents to review facilitation and counseling

techniques that are used during the visit. While the training by itself is significantly associated with reductions in low birth weight, preterm births, and cesarean sections,[31] these training also provide opportunities for residents to combat their own preconceived stereotypes, among other forms of racism, as this form of training forces residents to not only directly interact with the mother, but also review ways to improve that interaction. In short, forcing residents to interact and learn from their mistakes during care provides them strong lessons in ensuring that they are able to administer care in an anti-racist and culturally sensitive manner.

While employing methods for combating racism and prejudice during care ensure that Asian American and Asian immigrant mothers feel a sense of safety during their prenatal care visits, such training is unable to counteract the accessibility-related factors that prevent mothers from ensuring that they can adhere to their prenatal care appointments. With the rise in adoption of telehealth in the healthcare system, especially in light of the COVID-19 pandemic,[32] implementing the use of remote technology can allow providers to develop models of care that can reduce the different burdens on mothers (and their families) that come with attending prenatal care appointments. OB Nest, for instance, is a model of prenatal care administered among low-risk women that incorporates technology to allow for providers to not only remotely monitor the health of the mother and her baby, but also, reduce the number of physical appointments the mother would have to attend. As a result of this technological implementation, mothers who undertook this model of prenatal care experienced higher satisfaction with care and experienced lower stress from their care.[33] Other forms of technological implementation can be more simple, including the use of phone calls and video visits, which are not only associated with greater satisfaction of care, but also mitigate disparities in prenatal care, especially among mothers based in rural regions.[34] As the Asian American population continues to diversify,

implementing technology and telehealth methods provides a viable way of ensuring accessibility to all mothers, regardless of their location, and as a result, help to improve adherence to prenatal care appointments, especially in California. Furthermore, we must also recognize that greater investment in this sphere is needed in order to ensure equitable access to prenatal care, especially among geographic lines.

Conclusion

This project demonstrates the importance of just representation of Asian Americans in health data and the need for quality data for disaggregation along multiple domains. While the NCHS Natality Data Sets used in this project offer an incredibly robust census of birth data among Asian American mothers, in general, studies that specifically look at Asian American health outcomes, including studies that look at inadequate initiation and access to prenatal care among this population, are incredibly lacking. A huge part of this phenomenon is driven by the fact that data, outside of what we used in this project, is severely lacking, and as such, in order to accurately look at other health outcomes for Asian Americans, more robust data collection among Asian Americans is needed.

Furthermore, as the population of Asian Americans continues to grow and experience geographic diversification, the specific health and cultural needs of this population are becoming increasingly more important, including the prenatal care needs of Asian American mothers and their babies. The experiences of Asian American mothers have historically not been included in discourse around accessing prenatal care, and so, future inclusion of this population facilitates the mitigation of disparities that we see in prenatal care initiation and prenatal care adherence. In addition, given the heterogeneity in Asian American women's experiences with inadequate prenatal care utilization and the different mechanisms that drive this phenomenon, place-based

public policy and interventions must be constructed to take the intersectionality of these experiences into account. The experience of an Asian American mother in California may not correlate with the experience of an Asian American mother in Arizona, and as such, the policies that support mothers in these states need to be different and take into account differences in racial makeup and other institutional factors that we observe between the two states.

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Appendix

Table 1. Demographic statistics for Asian Americans in the United States, California, and Arizona

	US		CA		AZ	
	%	Std	%	Std	%	Std
Prenatal Care						
No Prenatal Care	4.1%	0.20	1.8%	0.13	3.2%	0.17
Inadequate Prenatal Care	17.8%	0.38	16.8%	0.37	19.2%	0.39
Inadequate Initiation	9.1%	0.29	5.8%	0.23	12.1%	0.33
Inadequate Adherence	10.3%	0.30	12.0%	0.33	9.0%	0.29
Adequate Prenatal Care	78.0%	0.41	81.4%	0.39	77.6%	0.42
Ethnicity						
Asian Indian	29.7%	0.46	17.7%	0.38	35.2%	0.48
Chinese	21.1%	0.41	29.8%	0.46	14.3%	0.35
Filipinx	11.6%	0.32	15.1%	0.36	17.0%	0.38
Japanese	2.3%	0.15	2.3%	0.15	2.0%	0.14
Korean	5.4%	0.23	5.3%	0.22	4.9%	0.22
Vietnamese	8.1%	0.27	8.6%	0.28	11.8%	0.32
Other Asian	19.0%	0.39	14.0%	0.35	14.0%	0.35
Multiracial Asian	2.7%	0.16	7.2%	0.26	0.9%	0.10
Nativity						
Foreign Born	79.0%	0.41	71.6%	0.45	83.6%	0.37
Age						
Advanced Age	30.3%	0.46	35.7%	0.48	28.6%	0.45
Parity						
First Birth	37.7%	0.48	40.4%	0.49	38.0%	0.49
Education						
Less than High School	6.1%	0.24	2.0%	0.14	6.2%	0.24
High School Graduate	12.0%	0.33	10.2%	0.30	10.2%	0.30
Any College	16.3%	0.37	17.9%	0.38	15.7%	0.36
Bachelors and Beyond	65.6%	0.48	69.9%	0.46	67.9%	0.47
Received WIC	18.6%	0.39	16.2%	0.37	12.3%	0.33
Insurance						
Medicaid	23.7%	0.43	18.2%	0.39	19.8%	0.40
Private Insurance	68.4%	0.46	68.0%	0.47	72.2%	0.45
Self-Pay	4.9%	0.22	10.2%	0.30	4.2%	0.20
Other	3.0%	0.17	3.7%	0.19	3.7%	0.19
N	719,454		209,582		8,426	

Table 2. Output from 3 logistic regression models: Inadequate Prenatal Care (APCUI), Inadequate Initiation of Prenatal Care, and Inadequate Adherence of Prenatal Care

	Inadequate Prenatal Care (APCUI)				**Inadequate Initiation of Prenatal Care**				**Inadequate Adherence of Prenatal Care**			
	CA		AZ		CA		AZ		CA		AZ	
	OR	Sig	OR	Sig	OR	Sig	OR	Sig	OR	Sig	OR	Sig
Ethnicity (ref: Asian Indian)												
Chinese	1.07	***	1.32	**	0.91	*	1.57	***	1.13	***	1.01	
Filipinx	1.34	***	1.30	**	1.39	***	1.43	***	1.31	***	1.19	
Japanese	0.89	*	1.45		1.05		1.70	*	0.83	***	1.20	
Korean	1.13	***	1.23		1.27	***	1.18		1.09	*	1.21	
Vietnamese	1.12	***	1.06		0.89	*	1.28		1.19	***	0.79	
Other Asian	1.26	***	1.44	***	1.47	***	1.67	***	1.19	***	1.06	
Multiracial Asian	1.42	***	1.44		1.53	***	1.57		1.41	***	1.88	
Nativity												
Foreign Born	1.09	***	1.08		1.38	***	1.11		1.00		1.05	
Age												
Advanced Age	0.88	***	0.78	***	0.92	***	0.80	**	0.88	***	0.82	*
Parity												
First Birth	0.83	***	1.04		1.16	***	1.27	***	0.72	***	0.82	*
Education (ref: Less than High School)												
High School Graduate	0.86	***	0.85		0.79	***	0.78		0.92		1.06	
Any College	0.79	***	0.78	*	0.68	***	0.72	*	0.86	**	0.86	
Bachelors and Beyond	0.65	***	0.69	**	0.51	***	0.64	***	0.74	***	0.74	
Received WIC	0.92	***	1.18		0.97		1.20		0.89		1.11	
Insurance (ref: Private Insurance)												
Medicaid	1.12	***	1.63	***	3.06	***	2.01	***	0.70	***	1.11	
Self-Pay	2.17	***	2.20	***	8.73	***	2.70	***	0.89	***	1.39	
Other	0.99		1.29		0.99		1.50	*	0.99		1.13	

* $p < .05$, ** $p < .01$, *** $p < .001$