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Elizabeth Fox Date

Factors Influencing Maternal Immunization Among Pregnant Immigrant and Refugee Women

By

Elizabeth Fox
Master of Public Health

Hubert Department of Global Health

Paula Frew, PhD, MA, MPH
Committee Chair

Robert A. Bednarczyk, PhD, MS
Committee Member

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By

Elizabeth Fox

Bachelor of Arts
Arizona State University
2010

Thesis Committee Chair: Paula Frew, PhD, MA, MPH

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Abstract

Factors Influencing Maternal Immunization Among Pregnant Immigrant and Refugee Women

By Elizabeth Fox

Background: During pregnancy women become more susceptible to disease due to suppression of cell-mediated immunity. Immigrant and refugee pregnant women are uniquely vulnerable because they face additional barriers to healthcare. Multiple advisory and professional groups recommend that pregnant women receive the influenza and the tetanus, diphtheria, and acellular pertussis (Tdap) vaccines to protect themselves and their infants from disease. However, vaccination rates remain low. Further, a Group B *Streptococcus* (GBS) vaccine is currently undergoing clinical trials and may soon be available to pregnant women to prevent colonization and intrapartum transmission of GBS to infants. The purpose of this study was to understand factors related to influenza, pertussis, and potential GBS immunization among pregnant refugee and immigrant women to have a better understanding of how to improve health outcomes, increase healthcare access, and reduce influenza, pertussis, and GBS-related morbidity and mortality.

Methods: In-depth interviews were conducted with sixteen pregnant women in metro Atlanta. Interviews were recorded and transcribed. Transcripts were then coded and analyzed using a grounded theory approach. Emergent themes and patterns were constructed into a conceptual framework.

Results: The most prevalent facilitators to vaccination include a provider recommendation, comorbidities, desire to keep baby healthy, and being offered the vaccine during a healthcare visit. Prevalent barriers include not being offered the vaccine, no knowledge of the disease (pertussis and GBS), and a lack of awareness that the vaccine is available for pregnant women.

Conclusions: The strongest theme to emerge was the influence a provider's recommendation has on vaccination status. A provider recommendation had the ability to overcome other barriers. These results suggest that providers can strongly impact vaccination rates in this population. Further research on providers' knowledge and attitudes towards maternal vaccination would be useful in determining why women are not being offered the vaccines and how to implement change. Although a provider recommendation alone has such a strong influence, education and engagement are still crucial components to health education and interventions targeted at this population. A three-pronged approach is recommended 1) Educate women 2) Engage women in adopting vaccination as a staying health strategy 3) Promotion by healthcare providers.

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION AND RATIONALE

During pregnancy, women's bodies go through physical changes that can make them more susceptible to disease. Some of those changes include decreased lung capacity, increased cardio output, increased oxygen consumption, and suppression of cell-mediated immunity [1]. Suppression of cell-mediated immunity occurs to protect the fetus from being rejected by the mother since half of its antigens are of paternal origin [1-3]. The impact of cell-mediated immunity suppression on the mother is a diminished response to infection [1].

Historically, pregnant women have been identified as a target group for influenza vaccinations due to higher morbidity and mortality outcomes from influenza illness [4-7]. The surgeon general first identified pregnant women as a high risk group in 1960 along with elderly and chronically ill populations [8]. Despite coinciding recommendations from the Centers for Disease Control and Prevention (CDC), the American College of Obstetricians and Gynecologists (ACOG), the American College of Nurse Midwives (ACNM), and the American Academy of Family Physicians (AAFP) that all pregnant women receive the flu vaccine, rates remain unsatisfactorily low. During the 2013-14 influenza season only 52.2% of pregnant women were vaccinated [9]. Early reports for the 2014-15 season estimate only 43.5% of pregnant women have been vaccinated [9]. Reported reasons for refusing the influenza vaccine include fears about safety, unsure of vaccine effectiveness, and lack of perceived personal need [10-16].

In recent years, rates of pertussis related morbidity and mortality have increased. The CDC reported 48,277 cases in 2012 and 28,639 cases in 2013 [17]. Children under six months of age are considered to be a high risk group for pertussis as the number of infections is 20 times higher than in the rest of the population and greater than 90% of pertussis related mortality occurs in this age group [18]. Twelve of the thirteen pertussis deaths in 2013 occurred in infants under three months of age [17].

The CDC currently recommends pregnant women receive the tetanus, diphtheria, and pertussis vaccine (Tdap) during their third trimester to provide short term pertussis protection to their infants until they are old enough to be vaccinated themselves [19]. Kharbanda et al. revealed that vaccination rates still remain low among pregnant women with only15-30% of pregnant women receiving the Tdap vaccine annually between 2010 and 2012 in California [20].

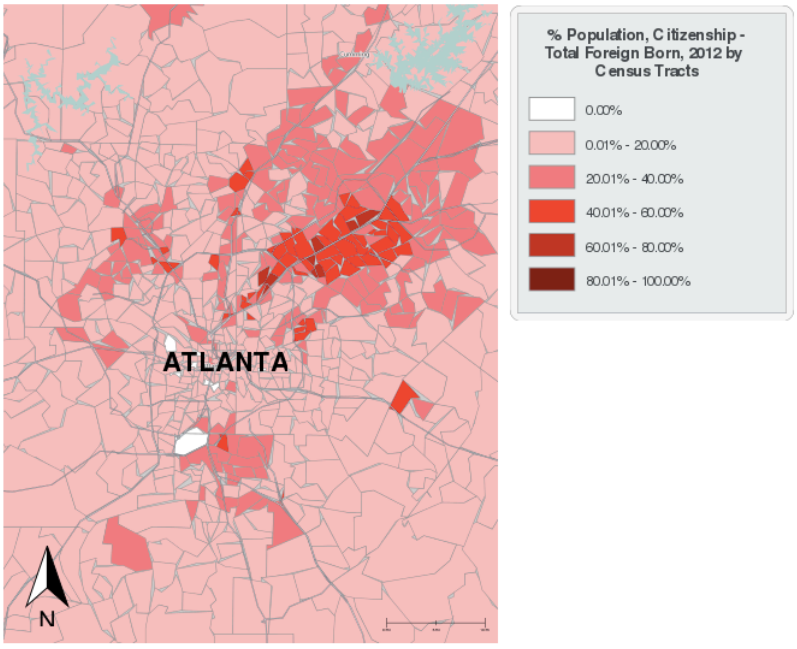
Colonization of Group B *Streptococcus* (GBS) bacteria can be detected in approximately 25% of pregnant women through the use of vaginal and rectal cultures, however, most of these women show no other symptoms of infection [21]. During birth, GBS can be passed on to infants and lead to still birth, sepsis, and meningitis with irreversible brain damage [21, 22]. Currently the only proven method to protect an infant from contracting GBS is to give the mother intravenous antibiotics during labor [21]. Development of a vaccine to be administered to mothers during pregnancy could be another strategy to prevent colonization of GBS bacteria and to prevent infants from contracting this disease during birth. While there are currently no vaccines available there are several that are undergoing phase II and phase III trials and may soon be available to the public [23].

Problem Statement

With the recent statistics documenting low coverage of influenza and Tdap immunization of pregnant women, it is crucial to understand what factors are influencing the actions and decisions of mothers regarding immunization during pregnancy. Furthermore, with the possibility of a GBS vaccine on the horizon it is important to understand what factors will influence this population's acceptance of a new vaccine.

Acceptance of and access to vaccines in different ethnic and racial groups cannot be assumed and should be evaluated in a variety of populations, especially in groups that are historically underserved. The metro Atlanta area is home to an incredibly diverse population and provides a suitable setting to investigate what factors influence vaccination status. The United States Census Bureau reports that between 2009 and 2013, 7.7% of the Atlanta population was foreign born [24]. Figure 1 illustrates the density of foreign-born persons in the metro Atlanta area in 2012.

Figure 1. Percent of Foreign-Born Persons by Census Tract in the Atlanta Metro Area, 2012



Source: Created with SimplyMap 3.0

Clarkston, a city in the metro Atlanta area, was identified several decades ago as a city that would provide a good transition for refugees and other displaced persons. As a result, many resettlement organizations have placed refugees there [25]. To illustrate the diversity, the local high school boasted students from more than fifty different countries in the early 2000s and there are currently over 60 languages spoken within the city's 1.1 square mile area [25]. In 2012, the median annual household income was approximately $37,000 [25]. This income is nearly $10,000 less than Georgia's overall median income ($47,209) and nearly $14,000 less the national median income ($51,371) for the same year [26]. In addition to a large refugee population, there are many other immigrants living in the state of Georgia. The Migration Policy Institute reports that 9.7% of the state population (970, 979 people) were foreign-born residents in 2013 [27]. Of those foreign-born residents, 8.7% were born in Africa, 28.2% were born in Asia, and as many as 51.8% were born in Latin America [27]. In Hall County Georgia the percentage of the population who identify as a minority quadrupled from 9% in 1980 to 36% in 2010 partly attributable to immigration [28]. Minority populations are projected to account for 46% of Hall County residents by 2030 [28]. In 2010 per capita income in Blacks and Latinos was approximately half (Blacks) and one-third (Latinos) the per capita income of Whites in Hall County [28]. Given the diverse cultural climate of the area and a large minority population that has uniquely disparate barriers to healthcare, this population presents a prime opportunity to learn more about what factors are related to influenza, pertussis and potentially GBS vaccination for pregnant refugee and immigrant women.

Purpose Statement

This study has two primary aims.

1. To understand the factors related to influenza, pertussis (Tdap), and Group B *Streptococcus* immunization among pregnant refugee or immigrant women to have a better understanding of how to improve health outcomes, increase healthcare access, and reduce influenza, pertussis, and GBS-related morbidity and mortality among pregnant refugee or immigrant women and their infants.
2. To conduct qualitative interviews with a cohort of pregnant self-identified refugee or immigrant women at any stage of vaccination including those who have not yet received the influenza and/or pertussis immunizations and women who have received the influenza immunization, Tdap, or both.

Research Questions

This study sought to address the following questions:

Question 1: What factors influence the influenza vaccination status of pregnant immigrant and refugee women living in the metro Atlanta area?

Question 2: What factors influence the tetanus, diphtheria, and pertussis immunization status of pregnant immigrant and refugee women living in the metro Atlanta area?

Question 3: What potential factors may influence the acceptance of a Group B *Streptococcus* vaccine among pregnant immigrant and refugee women living in the metro Atlanta area?

Significance Statement

This project sought to conduct a qualitative study that aimed to understand the issues related to immunization and healthcare access for pregnant refugee/immigrant women. This knowledge is indispensable to promoting equitable healthcare access, improving health outcomes for a vulnerable population, and reducing disparities in influenza-, pertussis-, and GBS- related morbidity and mortality among pregnant women as well as their infants.

DEFINITION OF TERMS

AAFP	American Academy of Family Physicians
ACIP	Advisory Committee on Immunization Practices
ACOG	American College of Obstetricians and Gynecologists
ACNM	American College of Nurse Midwives
CDC	Centers for Disease Control and Prevention
DTaP	Diptheria, tetanus, and acellular pertussis vaccine
GBS	Group B Streptococcus
PAPM	Precaution Adoption Process Model
Tdap	Tetanus, diphtheria, and acellular pertussis vaccine
TTM	Trans-theoretical Model (also known as “Stages of Change”)

CHAPTER 2: LITERATURE REVIEW

BARRIERS TO HEALTHCARE ACCESS IN IMMIGRANT POPULATIONS

Studies in the United States and other developed countries have found a variety of barriers to healthcare access in immigrant populations. A 2002 review of literature found that there are negative consequences in the Latino community as a result of language barriers including decreased access to care, lower quality of care, and inability to accurately communicate health conditions and treatment plans even with the use of an interpreter [29]. A community study with African refugee and immigrants in Portland and found that healthcare was difficult for the community for a variety of reasons including not knowing how the US health system worked, not knowing where to go for care, cost (even for those with health insurance), and difficulty communicating with healthcare workers [30]. Another study was conducted in Rochester, Minnesota to identify disparities in preventive health services including vaccination in a private primary care practice that serves a large number of Somali refugees. They found that there were significant disparities in completing mammograms, pap smears, colorectal cancer screening and influenza vaccination coverage in the Somali patients compared to non-Somali patients [31]. A qualitative study also conducted in Minnesota identified self-reported barriers to care among Somali refugee women included language, distrust of interpreters, and past experiences of discrimination from healthcare staff [32]. Finally, reported barriers to maternity care among Muslim immigrant women in Newfoundland include lack of cultural and religious sensitivity (most important relative to the gender of physicians) and weak language skills [33].

Current literature has shown that immigrants and refugees face multiple barriers to accessing health care. Because pregnant women are a distinctively vulnerable group within a population that already faces health access challenges, it is important to learn to what extent they encounter these and other barriers.

FACTORS ASSOCIATED WITH VACCINE ACCEPTANCE

Barriers and Facilitators to Acceptance

There has been a large amount of research done on vaccine acceptance in the general population as well as during pregnancy. Reported reasons for refusing the influenza vaccine among different populations include fears about safety, being unsure of vaccine effectiveness, lack of knowledge on vaccination during pregnancy and lack of perceived personal need [10-16, 34]. Some women also report obstacles to getting a vaccine despite their willingness to receive one including lack of health insurance and not being offered the vaccine by their physician [34]. Reported reasons for accepting vaccines include believing that they are effective at preventing disease and trust in the recommendation of the physician or provider [34]. Additional facilitators to vaccine acceptance include counseling and education directly from health care providers, positive message framing (safety and benefits) rather than negative message framing (disease risks, etc.), making vaccination a more routine part of care (consistent provider recommendation and standing orders), onsite administration, and past history of immunization [35, 36].

While there is not currently a GBS vaccine available, some acceptability studies have been conducted. A 2013 review released by the Group B Strep Association (USA) and Group B Strep Support (UK) stated that in the event that a safe and effective GBS vaccine becomes available,

'most' women will want to receive it based on their experience working with the public [22]. In 2013, an electronic survey of 231 pregnant and recently delivered women in Colorado about the acceptability of a hypothetical GBS vaccine was conducted. While 75% of respondents 'strongly agreed' that the vaccine was a good way to protect their child's health, only 68% thought pregnant women should receive it when it becomes available, and 63% were concerned about the safety of giving vaccines during pregnancy [23].

Influence of Providers and Healthcare Workers

Health care workers have a significant amount of interaction with women throughout pregnancy and therefore have the opportunity to positively or negatively influence the decision to be vaccinated. A multi-year study that surveyed 267 obstetric healthcare workers (nurses, nursing assistant, medical assistance, receptionists, and clinical administrators) in Rhode Island and Pennsylvania found that many workers lacked adequate knowledge of the risks and benefits of influenza immunization in pregnant women. Approximately one third of the health care workers did not believe that vaccines were safe and effective for preventing infections. Only slightly more than one third believed that vaccines are safe during pregnancy. And only two-thirds of the workers would receive the vaccine themselves during a pregnancy if recommended by an obstetrician [37].

A study of obstetricians and gynecologists in the United States was conducted in 2010 to evaluate factors influencing seasonal and H1N1 influenza vaccination offers to their pregnant patients. The majority of OB/GYNs reported offering the vaccinations to patients on a regular basis. Reasons given by those who did not offer the vaccines include "inadequate reimbursement," "storage limitations," and "the belief that vaccines should be administered by

another provider."[38] The investigators concluded that one way to improve vaccination coverage in this vulnerable population was to address the logistic and financial factors the physicians discussed [38].

A 2004 study of practicing obstetricians in Nashville, TN found that 89% reportedly offered the seasonal influenza vaccination to their patients during pregnancy, however; only 68% actually had specific guidelines in place to do so at their medical practices. The biggest obstacles they found with administration of the vaccine included patient refusal and lack of adequate reimbursement [39].

During the 2009 H1N1 pandemic, an Obstetric Clinic in Seattle took a multi-faceted approach in an attempt to improve vaccination acceptance among their patients. The clinic serves a diverse population of women including a significant proportion of immigrants who do not speak English. The clinic provided education for staff members on the H1N1 vaccine, invited patients to come to the clinic to receive a vaccination in their primary language, tracked patients' vaccine status using a color coded charting system and electronic reminder system, an educational video was created in nine languages to play in the clinic waiting room, written educational literature was provided, and flu packs (containing mask, thermometer, and antiseptic) were given to patients. The CDC reported national vaccination coverage to be 38%, however, with their multi-pronged approach the Seattle clinic was able to achieve vaccination coverage of 76% [40]. The Kelsey-Seybold Clinic in Houston, Texas was also able to increase vaccination rates over a period of six years from 2.5% to 37.3% through the use of direct encouragement, standing orders for influenza vaccination during pregnancy, and vaccination training for the nurses and obstetricians [41].

Immigrant and Refugee Populations

In immigrant and refugee populations there are unique factors that could potentially influence the acceptance and access to vaccines. In a study conducted in 2009, low acceptance of H1N1 and seasonal influenza immunization was found among minority parents and caregivers of children ≤ 18 years. There were negative attitudes about vaccines in the community and parents reported poor experiences with healthcare providers [42, 43].

A recent study in Michigan found that between 2011 and 2014 Black, Asian, and Arab pregnant women were less likely to be immunized against pertussis compared to Caucasian women. Similarly, the study also found that pregnant Black women were less prone to getting the seasonal influenza vaccine than Caucasian women [44].

A study was conducted among Hmong immigrants in California whose children had significantly lower immunization rates than the rest of the population in 2008. The researchers found two factors that likely contributed to the low rates including socioeconomic status and engagement in traditional Hmong medical care. Length of time spent in the United States and English language ability were not found to have any significant relationship with vaccination status [45].

While significant research has been done on vaccine acceptability, there is a dearth of literature that focuses on immigrant and refugee pregnant women who constitute a uniquely vulnerable population. Further research would illuminate the distinctive factors affecting vaccine coverage for these women as well as possible factors that could influence GBS vaccine acceptance and thus enable an evidence-based avenue for public health action.

DISEASE RISK AND VACCINE RECCOMENDATIONS

Influenza

An infection with the influenza virus manifests with symptoms of fever, cough, rhinorrhea, sore throat, myalgia, and headache [46]. Historically, pregnant women have been identified as a target group for influenza vaccinations due to higher morbidity and mortality outcomes from influenza [4-7]. During the 2009 H1N1 influenza pandemic, hospitalization rates for pregnant women were approximately seven times higher than the rate of non-pregnant women [34]. A study in Tennessee that looked at 19 years of hospital admissions found that pregnant women were more likely to be admitted to the hospital for a cardiopulmonary related illness compared to women who were not pregnant during seasonal influenza epidemics [34]. A study in Canada found that otherwise healthy pregnant women were 18 times more likely to be hospitalized during the influenza season than other women [34].

In addition to maternal morbidity and mortality, concern is also given for the fetus and newborn infants. Possible complications of influenza for the fetus include miscarriage, still birth, and premature birth [34]. Possible complications for infants under six months who contract influenza include pneumonia, laryngotracheobronchitis, encephalopathy, otitis media, febrile illness, and death [34].

Influenza Vaccine

Prior to 2004, inactivated influenza immunization was recommended only for pregnant women who were at risk of respiratory complications [47]. In 2004, the recommendations were expanded to include immunization of all pregnant women [47]. A review of maternal influenza

immunization studies published in 2009 determined that immunization of pregnant women was safe and effective [1].

Despite recommendations from advisory and professional groups including the American College of Obstetrics and Gynecology (ACOG) and the Advisory Committee on Immunization Practices (ACIP), rates of seasonal influenza vaccination among pregnant women remain low [47]. Between the 2004 recommendations and the 2009 H1N1 epidemic, estimated vaccination rates among pregnant women were under 20% [48]. Rates during the 2008-2009 and 2009-2010 increased to 37% and 39.7% respectively [48]. During the 2013-14 season, rates were at 52.2% and the estimated rate in November for the 2014-15 season was 43.5% (final rates not yet released) [9].

Children under six months of age are a high-risk group for influenza, however, there are currently no vaccines recommended for this age group [47]. One method to protect infants from influenza that models have shown to be 41-91% effective for prevention is immunizing mothers during pregnancy. Mothers will then pass antibodies to the fetus via the placenta and to newborn infants via breast milk thereby establishing passive immunity [34, 47]. A three year study of pregnant Native American women found that maternal influenza vaccination resulted in a 41% decrease in the risk of laboratory-confirmed influenza infection in their infants [34]. A 2004/2005 study in Bangladesh found results that suggest maternal immunization with the influenza virus can positively impact gestational growth when the virus was circulating in the community [49]. The vaccine is also recommended in some women who have other health concerns. For example, a study conducted in South Africa in 2011 and 2012 found use of the

inactivated influenza vaccine to be protective in women with HIV as well as women without HIV [50].

Pertussis

Generally called "whooping cough," pertussis is an infectious respiratory disease caused by the bacterium *Bordetella pertussis* [46, 51]. The disease manifests in three phases: the catarrhal phase consists of a mild cough, malaise, rhinorrhea, and fever lasting from 1-2 weeks; the paroxysmal phase consists of rapid coughing followed by gasping (whoop), possible posttussive emesis, and fatigue lasting from one to six weeks; and the convalescent phase when the cough gradually resolves [46]. The convalescent phase can last a few weeks or up to several months [52].

In recent years, rates of pertussis related morbidity and mortality have increased due to a combination of waning immunity in vaccinated populations and vaccine refusal [46, 53]. In 2010, a California epidemic resulted in the highest pertussis rates seen in over sixty years with 23.4 cases per 100,000 people [18]. A second epidemic was declared in California in June of 2014 with rates of 26.0 cases per 100,000 people [54]. The rate in infants under twelve months was much higher at 174.6 cases per 100,000 [54]. National rates have also been high. In 2012 there were over 41,000 cases and 14 deaths in infants under 12 months and in 2013 there were over 28,000 cases and 12 deaths in infants under 12 months [17, 55].

Children under six months of age are considered to be a high risk group for pertussis as the number of infections is 20 times higher than in the rest of the population and greater than 90% of

pertussis related mortality occurs in this age group [18, 56]. Possible complications in infants under three months include pneumonia, seizures, encephalopathy, hospitalization, and in some cases death [56].

Pertussis Vaccine

To achieve protection from pertussis, infants require a series of 3-4 DTaP (Diptheria, Tetanus, and acellular Pertussis) immunizations that take up to 12 months to complete [56]. The Global Pertussis Initiative (GPI) introduced the concept of "cocooning" in 2005 in an effort to protect infants who are at high risk for the disease. The program recommended that all close contacts of infants, primarily parents and other family members that account for 76-83% of exposures, be immunized against pertussis so that infants would be protected through herd immunity until they had achieved protection through completing the DTaP series [51, 56]. ACIP now includes cocooning as a method of protection in its recommendations [55]. In 2006, ACIP made the recommendation that women receive the Tdap (Tetanus, diphtheria, and acellular pertussis) booster vaccine prior to pregnancy or post-partum, however, subsequent studies have questioned the ability of post-partum vaccination to provide protection to an infant during the first weeks of life [56]. One such study conducted in Houston, Texas found that there was no reduction in pertussis cases for infants under six months of age when mothers were administered Tdap post-partum [51].

A decision analysis model was created by the CDC to compare the effectiveness of the Tdap vaccination given during pregnancy compared to post-partum administration. The model predicted that vaccination during pregnancy could prevent 906 infant cases and 9 deaths

compared to postpartum vaccination which the model predicted would prevent 549 infant cases and 3 deaths [55]. In 2011 ACIP recommended that pregnant women be immunized after 20 weeks if they had not received a prior immunization [55, 56]. The timeframe of immunization after 20 weeks maximizes the amount of passive immunity gained for the fetus through the placenta as well as immunity for the infant through breast milk after birth [56, 57]. If necessary, Tdap can be given at anytime during pregnancy rather than during the target weeks (i.e. during an epidemic) [58].

In 2012 ACIP recommended that all pregnant women receive the Tdap vaccine in each pregnancy, between 27 and 36 weeks gestation, regardless of prior vaccine receipt [55, 56]. This recommendation was based on data showing that Tdap vaccination in a prior pregnancy does not provide a high enough level of antibodies to pass on immunity to their infants [55]. With the updated recommendations in the past decade, adverse reactions to the vaccine could be a concern, however, a review of reports from the Vaccine Adverse Event Reporting System (VAERS) from 2005 to 2010 found that there were no safety risks associated with receiving Tdap during pregnancy [59]. Despite the recommendations, studies estimate that only 2-30% of women received Tdap during their pregnancy in recent years [20, 55].

Group B Streptococcus

Up to a quarter of pregnant women are colonized with Group B *Streptococcus* (GBS) bacteria, often with no adverse symptoms in the women [21]. During birth, GBS can be passed on to infants and lead to still birth, sepsis, and meningitis with irreversible brain damage [21, 22].

Currently, pregnant women are routinely screened for GBS between 35 and 37 weeks by taking cultures from the vagina and rectum [60]. The only proven method, and the method currently recommended by the CDC, to protect an infant from contracting early-onset (within one week of delivery) GBS during delivery is to give the mother intravenous antibiotics during labor [21, 60, 61]. Antibiotic use is recommended for women who test positive for GBS as well as for women who had a positive GBS urine sample at some point during their pregnancy, have a history of a previous child with GBS, have their water break greater than 18 hours before delivery, have a fever during labor, and during preterm labor [21]. Antibiotic treatment reduces the likelihood of transmission of GBS during birth significantly in women who test positive (1/200 reduced to 1/4000). However, this method is not associated with prevention of late-onset (one week to three months from delivery) GBS disease in infants [61].

While GBS infection can have severe consequences, the overall incidence is low. In 1993 incidence was 0.29 per 1000 live births. For a normal birth cohort of four million there would be approximately 1,160 cases a year. Annual incidence ranged from 0.11 to 0.14 between 1999 and 2005 (approximately 440 to 560 cases) [62]. With continual improvement in detection and treatment, infant mortality as a result of GBS disease has continued to decline. In the 1970s mortality rates of GBS disease were greater than 50%, in the 1980s, rates declined to 15-25%, by the 1990s were less than 10%, and currently are approximately 4% [60]. When breaking down the overall mortality rates the risk of death is greater in premature infants (10-30%) compared to those born at full term (2-3%) [60].

Despite the drastic decline in mortality since the 1970s no recent improvements have been made and GBS still poses a significant threat to morbidity. Furthermore, rates of late-onset GBS have seen no decline [60]. A 2012 study of the long-term effects of GBS Meningitis (both early- and late-onset) found 25% of children who survived were found to have mild to moderate impairment. Additionally, 19% of the survivors were found to have severe impairments as a result of GBS meningitis [61]. These outcomes have not improved since the research team conducted a similar study in 1985 [61].

Group B Streptococcus Vaccine

Given the plateau in mortality rates and lack of prevention methods for late onset GBS, researchers have started investigating the possibility of a GBS vaccine. Candidate vaccines have been developed based on the process of using native polysaccharides, glycoconjugate vaccines, and most recently reverse vaccinology [60]. There are several vaccines that are currently undergoing phase II and phase III trials and may be available to the public in the future [23].

SUMMARY

With ample evidence supporting the safety and efficacy of influenza and Tdap vaccination during pregnancy as well as the possibility of a GBS vaccine, there is a tangible opportunity to reduce the morbidity and mortality of pregnant mothers and their infants as a result of influenza and/or pertussis infections. Despite multiple advisory groups including the CDC, ACIP, and ACOG making recommendations on maternal immunization, coverage rates remain unsatisfactorily low. With an adequate understanding of what factors are associated with vaccine acceptance, progress in improving coverage can be made. While significant research has been

done on vaccine acceptability, there is a dearth of literature that focuses on immigrant and refugee pregnant women who constitute a uniquely vulnerable population. Further research would illuminate the distinctive factors affecting vaccine coverage for these women as well as possible factors that could influence GBS vaccine acceptance and thus enable an evidence-based avenue for public health action.

CHAPTER 3: PROJECT CONTENT

METHODS

Population and sample

The population for this study consisted of pregnant women, aged eighteen years and older, who self – identify as immigrants and/or refugees to the United States coming from any other country. No restriction was placed on the timeframe for arrival in the United States. Women in this study could be in any stage of immunization receipt, including those who have not received the influenza or Tdap immunizations and those who have already received either one or both immunizations. Sixteen women were recruited both in person and through the use of fliers from various venues in the metro Atlanta area including (1) clinics, (2) provider offices, (3) community-based organizations, and (4) other locations serving the target study population.

Procedures

Individuals who were interested in participating were asked to complete a screening questionnaire. Eligible participants were then invited to participate in the in-depth interview lasting 30-45 minutes. The in-depth interview was conducted either immediately following the screening (based on participant availability) or scheduled for another time at the participant's convenience. With the consent of participants all interviews were audio recorded on two devices. Five interviews were conducted in Spanish using a certified Spanish translator. Four interviews were supplemented with the use of Cyracom certified medical translators to allow participants to provide more in-depth answers in their native language than they would be able to convey using only English. All other interviews were conducted solely in English. When the interviews

concluded participants were compensated with $25 in the form of a Walmart gift card. All interviews were conducted from October 2014 – January 2015.

Instruments

A close-ended demographic questionnaire and semi-structured interview guide were developed. The close-ended questionnaire was conducted at the beginning of the interviews covering demographics, influenza and pertussis vaccine uptake, SES, and household information. The semi-structured interview guide included open-ended questions about perceived susceptibility to influenza, pertussis, and group B streptococcus, health knowledge and education, relationship with healthcare providers, and barriers/facilitators to accessing healthcare during pregnancy. The interviewer followed up with probes and further questions to elicit more in-depth, detailed responses from the individual participants.

Data Analysis

Audio recordings were transcribed verbatim using Google's *Transcribe* software (https://transcribe.wreally.com/) and verified through a final comparison of the recording to the written transcript. Interview transcripts were uploaded to MaxQDA11 (VERBI GmbH, Berlin). A grounded theory approach guided the data analysis. The transcripts were reviewed to identify emergent themes. The principal investigator created a detailed codebook based on the emergent themes and refined it as needed through the iterative process of qualitative research. All transcripts were coded by the principal investigator using the established code scheme. A second coder was trained with the codebook and double coded >20% of the transcripts to assess the integrity of the codes. Average inter-coder agreement of 94% was reached. Coding occurred from January 2015 – February 2015.

Codes were compared and analyzed to determine relationships and patterns in the data. Conceptual frameworks were developed based on the emergent patterns. Analysis was completed in February 2015.

Ethical Considerations

This study was reviewed and granted expedited approval by Emory University's Institutional Review Board on September 26, 2014 (IRB00077094).

RESULTS

Demographic Characteristics of Study Cohort

A total of sixteen pregnant women aged 18 – 37 were interviewed. Nine self-identified as refugees, three as documented immigrants, three as undocumented immigrants, and one reported qualifying for Deferred Action for Childhood Arrivals (DACA). All, including the uninsured, had access to obstetric care. Further demographic characteristics can be found in Table 1 below.

Table 1. Demographic Characteristics of Study Cohort (n=16)

Variable	n	%	Variable	n	%
Age			**Length of Pregnancy**		
18-25	7	43.8	1-12 weeks	1	6.3
26-35	8	50.0	13 – 27 weeks	2	12.5
≥36	1	6.3	28 – 40 weeks	13	81.3
Country of Origin			**Legal Status**		
Burma	3	18.9	Refugee	9	56.3
Burundi	1	6.3	Documented Immigrant	3	18.9
Central African Republic	2	12.5	Undocumented Immigrant	3	18.9
Congo	2	12.5	DACA*	1	6.3
El Salvador	1	6.3	**Time in the United States**		
Guatemala	1	6.3	≤ 6 months	3	18.9
Kenya	1	6.3	7 months – 1 year	3	18.9
Mexico	4	25.0	1 – 5 years	5	31.4
Refugee Camp (Thailand)	1	6.3	≥ 5 years	5	31.4
Health Insurance			**Employment Status**		
Yes	11	68.9	Employed	6	37.5
No	5	45.5	Unemployed	10	62.5
Financial Responsibility			**Former Pregnancies**		
Self	4	25.0	0	7	43.8
Spouse/Partner	8	50.0	1 - 2	5	45.5
Other family member	4	25.0	3 - 6	4	25.0
Influenza Vaccine			**Tdap Vaccine**		
Yes	6	37.5	Yes	2	12.5
No	8	50.0	No	11	68.9
Don't know	2	12.5	Don't know	3	18.9

*Deferred Action for Childhood Arrivals

Overall the following factors emerged as significant themes related to vaccination status for each specific vaccination (Table 2).

Table 2. Summary of barriers and facilitators to maternal immunization.

	Influenza	Tdap	Group B *Streptococcus*
Barriers			
Not offered vaccine	X	X	
Unaware that vaccine is available for pregnant women	X	X	
Lack of perceived vaccine efficacy	X		
Lack of perceived disease risk	X	X	
Unaware of disease		X	X
Mistrust of new vaccine			X
Vaccine side effects (baby)			X
Risk of vaccine induced disease			X
Facilitators			
Provider recommendation	X	X	X
Keep Baby Healthy	X	X	
Comorbidities	X		
Offered at healthcare visit	X		
Combination vaccine		X	
Perceive a personal need			X
Desire to prevent disease			X
Desire to cure disease (misconception)			X

Vaccine Knowledge and Perceptions

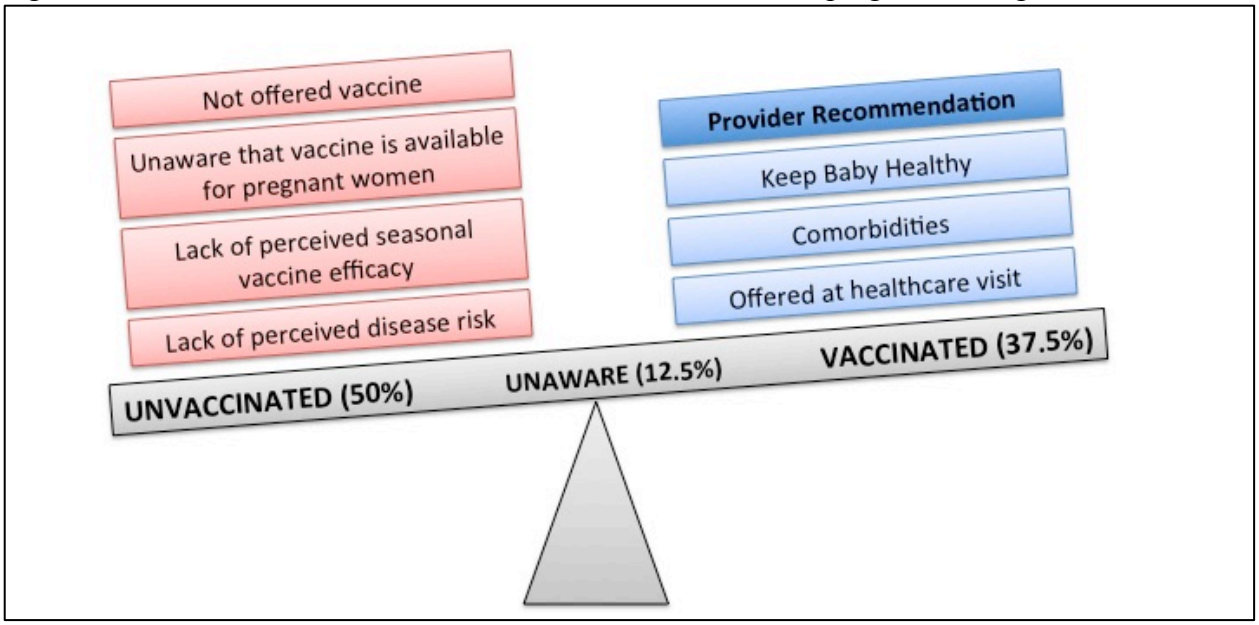
With the exception of one African refugee who perceived vaccines as therapeutic treatment, the women had a basic understanding of vaccination as a protective health measure. When asked, "What do you know about vaccines in general?" responses included, *"They prevent illness like the flu and I suppose one gets one so they don't catch it. Prevention. It's for prevention*" (Mexico, 27) and "*When I get contact with any virus, it is hard for it to get into my body because the vaccine protects me from those virusus"* (Congo, 22).

There was some variation in how vaccinations were viewed with the majority having positive perceptions similar to participant 14, *"I do not have any reason to be against [vaccines]. I like them because I know it is for my wellbeing"* (Mexico, 30). For some individuals, they liked the benefits a vaccine brought but had other negative perceptions related to pain and side effects. Women explained, *"I don't like that they prick you with a needle. It scares me [laughter*]" (Mexico, 27) and *"What I don't like about it is that it hurts and … I feel like I don't feel good and for like almost a week"* (Burma, 22).

Factors Associated with Influenza Vaccination Status

Of the 16 study participants eight reported they had not received the seasonal influenza vaccine while pregnant, 6 reported that they had received the influenza vaccine while pregnant, and two were unaware of their influenza vaccination status. Reasons for not being vaccinated included not being offered the vaccine, being unaware the vaccine was available for pregnant women, perceived lack of vaccine efficacy, and perceived lack of disease risk. Reasons why women did receive the influenza vaccine during pregnancy include it was recommended by a provider, it was offered to them by their physician, they wanted to keep the baby healthy, and they suffered from another disease making influenza vaccination necessary.

Figure 2. Factors associated with influenza vaccination status in pregnant immigrant women.



Influence of Healthcare Providers

The influence of physicians on influenza vaccination status was the strongest theme to emerge. When women who had received the influenza vaccine were asked why, a common response was physician recommendation. Many women who had not received the vaccine stated that they probably would have gotten it if their provider recommended it to them. A physician recommendation had the ability to overcome what would otherwise be a barrier to vaccination. One participant explained her experience overcoming her mistrust of the vaccine, *"My doctor - Every time I'm pregnant I take the flu - He encourages me to take the flu shot… I remember the first time asking about it more because I felt really not comfortable taking it at that time. But he told me that it would really help the symptoms not to be as strong so I took it because of that*" (Kenya, 32).

A strong provider recommendation had the potential to overcome barriers such as lack of perceived risk for disease as well. One participant explained her decision to decline the

influenza vaccine saying, *"Oh she* [my doctor] *talked to me about getting the flu vaccine but since I haven't had flu since I've been in this country I thought it was not necessary so I declined and I still have not gotten the flu… Its like the germs here are not as strong as some other countries I guess"*(Mexico, 29). She further explained what would convince her to accept the vaccine, "*if my OBGYN felt really strong about it. But she didn't feel strong about it either way, so, if she would have insisted I would have gotten it"* (Mexico, 29).

Keeping Baby Healthy

The concept of getting vaccinated to keep their child healthy was also prevalent among the women who were vaccinated with statements such as, *"For protecting me and the baby"* (Congo, 25).

Vaccine Availability for Pregnant Women

There were also several instances where women had very positive views of vaccines, but were still unvaccinated because they did not know they were available for pregnant women. One woman explained, *"Since I was in my country, this was very important and thank goodness I received all of my vaccinations. And up to now, I do not think I have missed even one."* But when asked if she received the influenza vaccine during her current pregnancy she responded, *"No. Not during pregnancy no. They have not told me about that. Can you do that? [surprised]"* (El Salvador, 35).

Perceptions of Vaccine Effectiveness

While vaccine effectiveness was not a common theme, it was brought up by one participant as a reason to decline the seasonal influenza vaccine. She explained, "*usually if its something like for example the flu that evolves and I would have to get one every year and I don't think its worth it. By the time I get it, it has probably evolved into something different"* (Mexico, 29).

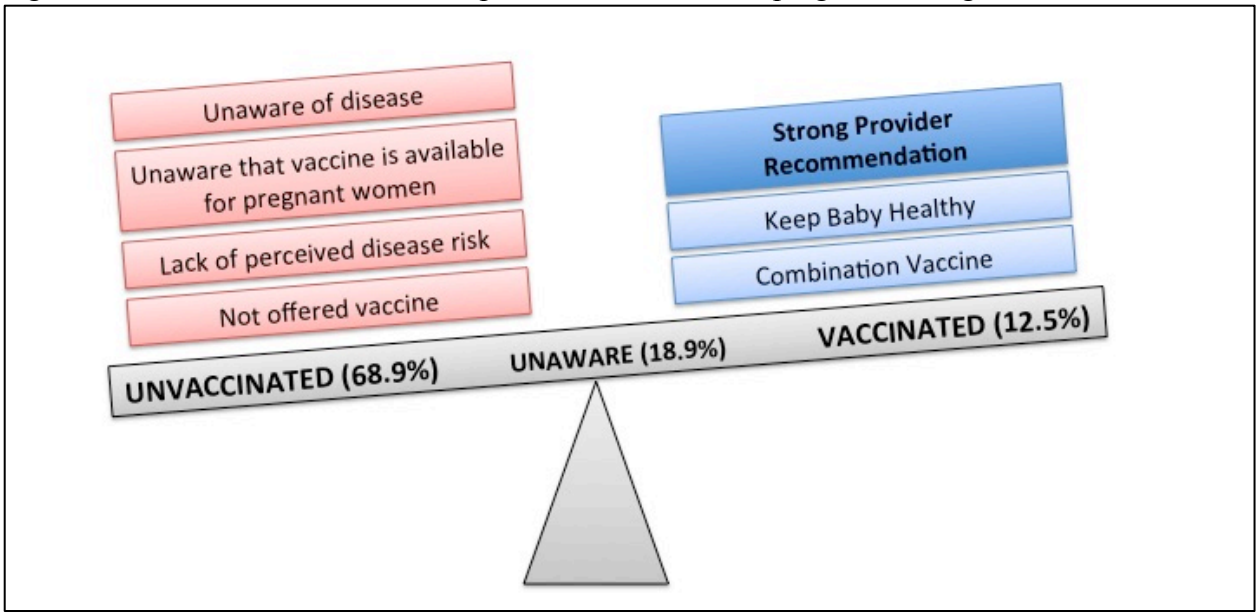
Comorbidities

One mother's asthma condition influenced her decision to get the flu vaccine with her current pregnancy. She explained her choice, *"Because I have asthma. So when I have not gotten the flu vaccine, I have gotten really ill… I have a boy who is 6 years old. And with him I didn't get it and almost every month I was with an asthma attack at the hospital*" (Mexico, 30).

Factors Associated with Pertussis (Tdap) Vaccination Status

Eleven participants reported that they had not received the Tdap vaccine while pregnant; two reported that they had, and three were unaware of their Tdap vaccination status. Factors associated with receiving the vaccine include a strong provider recommendation, wanting to keep the baby healthy, and the fact that Tdap is a combination vaccine. Prominent factors associated with being unvaccinated include being unaware of the disease pertussis, being unaware that the vaccine is available for pregnant women, lack of perceived risk for the disease, and not being offered the vaccine by a health care provider.

Figure 3. Factors associated with Tdap vaccination status in pregnant immigrant women.



Influence of Healthcare Providers

The influence of health care providers in receiving a vaccine was again present. In one instance, the participant did not question the provider recommendation but just agreed, *"Well they told me it could prevent the baby (sic). They just give me a shot and I don't really ask any questions anymore"* (Burma, 19). Another participant who had a low perception of pertussis risk still received the vaccine due to her provider's influence. She explained, "*that one [Tdap] my OB/GYN insisted on it. So the ones that she was very, like, hey this is a good vaccine that you should have, and I believe in it I would get them."*

Combination Vaccine

Participant 11 was also more amenable to the Tdap vaccine "*Because it had other things on it besides whooping cough."* She thought receiving a combination vaccine was 'worth' more than receiving a single vaccine such as seasonal influenza, which she declined.

Lack of Pertussis Knowledge

Lack of awareness of pertussis was common among the study participants. When asked, "Can you tell me what you know about pertussis, which is also commonly called whooping cough? " the most informed answer from a woman with experience in healthcare was, *"It's a coughing disease"* (Kenya, 32). Several of the participants were familiar with the name, but little else stating, *"I have heard the term whooping cough but I have not heard anything about the symptoms or anything*" (Mexico, 39) and *"I know that it was really deadly many years ago but I am not really informed about it"* (Mexico, 30).

Vaccine Availability for Pregnant Women

Two women that received the influenza vaccine did not receive the Tdap vaccine because they were unaware that it was available for pregnant women. They explain, *"I thought that was just for children...I did not know it was available for pregnant women... I don't remember getting it. No, it wasn't offered to me so I didn't take it"* (Kenya, 32) and *"I had heard of it. I just don't know if that is something that they give you during pregnancy. They just gave it to me for the flu, but from what I recall, no"* (Mexico, 39).

Unaware of Vaccine Status

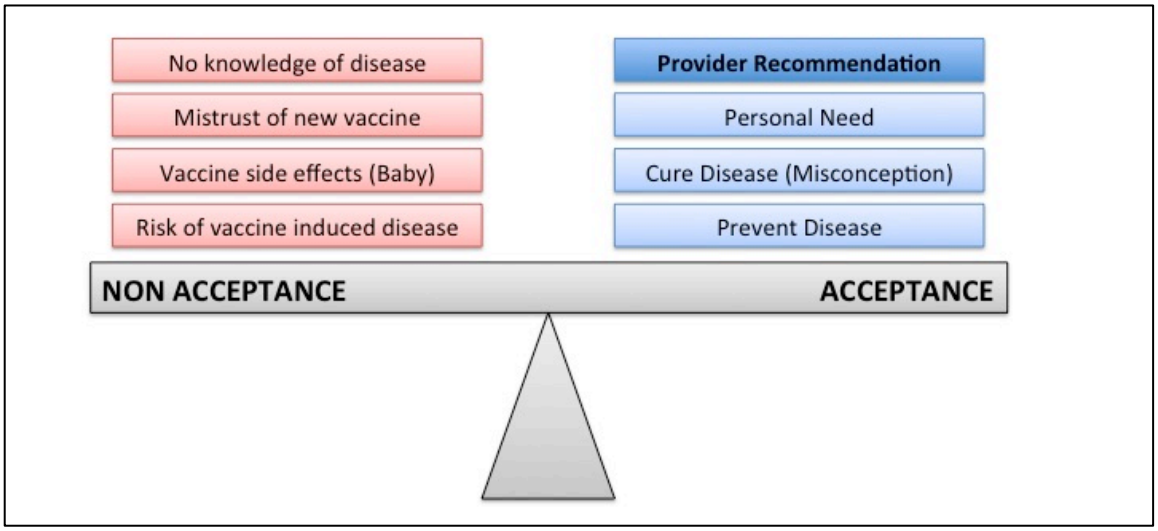
There were three women who were unaware of their vaccine status. Two of these women were refugees and were unaware of both their Influenza and Tdap vaccination status. One woman stated, *"I got some shots but I don't know what are they (sic)"* (Burma, 25). The second woman described her experience in multiple clinics *"Way before I came, I came to clinic so they did the*

medical check-up and they found that I am pregnant but I got two vaccinations. And also when I arrived here they knew that I was pregnant and I got two vaccinations here but I am not sure were they good for me or not. I don't know" (Refugee Camp (Thailand), 24). She was probed with the question, "Do you know the names of the vaccinations you got?" and responded, *"No, I don't know. They told me that I need to get a shot, that's why I get it"* (Refugee Camp (Thailand), 24). Both of these women also described having some difficulty communicating with their healthcare providers including difficulty asking questions based on short interaction time and language constraints. The third participant who was unaware of her Tdap vaccination status was an immigrant who has been in the United States for fifteen years. She simply stated that she did not remember if she had received the Tdap vaccine or not.

Potential factors related to Group B Streptococcus Vaccination

Women were asked for what reasons they may get a GBS vaccine in the future. Reasons included a provider recommendation, a personal need for the vaccine, to cure disease, and to prevent disease. Reasons for not getting a GBS vaccine included no knowledge of disease, mistrust of a new vaccine, possible vaccine side effects, and risk of vaccine-induced disease.

Figure 4. Factors associated with acceptance of a novel Group B Streptococcus vaccine among pregnant immigrant women.



Lack of GBS Knowledge

None of the participants had any specific knowledge about the etiology of Group B Streptococcus. The majority had never heard of the disease responding to the question, "Can you tell me what you know about Group B Strep?" with similar variations of the statement "*Never heard of it*" (Burma, 22). A small number of women who immigrated from Mexico confused GBS with Strep Throat making statements such as, *"Are those also those the ones that affect the amygdala (sic) and the throat?"* (Mexico, 30) and *"Is this the one that is related to the tonsils?"* (Mexico, 27). Two women thought that GBS sounded familiar but did not know anything about the disease. One stated, *"Yeah, I have heard about it but I don't really know about it"* (El Salvador, 35). When asked if she had discussed GBS with her physician Participant 15 responded, "*I feel like maybe during pregnancy umm maybe but I don't remember. I feel like yes but I don't really have an understanding or know what it is about or anything. Just maybe they mentioned it one time. I don't know. I just don't know."* Both of these women had prior

pregnancies, however, interviewers did not assess whether a GBS test was conducted in prior pregnancies.

Vaccine Necessity and Disease Prevention

Despite an overall lack of knowledge and awareness about GBS, most women stated they would get the vaccine if they were told they needed it. Speaking hypothetically about reasons to receive the GBS vaccine, one participant stated, "*Well, I am okay with all vaccines so long as they are necessary. Yes. Even if I don't know what it is exactly, if it is necessary, I will receive it. [laughter]*" (Mexico, 27). Alternatively, because they do not know about the disease, some would ask for more information, "*I would ask first what it is for to get more clarification*" (Congo, 25) and *"If it tries to prevent, well then yes I would get it. But I would need more information. I will have to look it up online"* (El Salvador, 35). Other women stated, *"I would if I needed, anything for baby"* (Burma, 22) and *"I don't think I would want to be sick. And get my baby sick"* (Kenya, 32).

Provider Recommendation

The influence of a provider recommendation was again present with statement such as, "*if it is good and the doctor tells me then I will accept to take"* (Central African Republic, 18).

Cost

Cost was brought up by one participant as a possible barrier to getting the vaccine. She stated the only reason she would not get the GBS vaccine is, "*If it was very expensive [laugh]. And if it*

cost a lot and if there was no money and there was no way of paying for it, well I wouldn't do it then" (Mexico, 39).

Mistrust of New Vaccine

Only one participant expressed that she would most likely refuse the GBS vaccine due to its newness stating, "*Well, if it was in clinical trials and just came off the market I wouldn't take it. I mean I would rather see how other pregnant women do with it first and then decide on it… because usually when they create new vaccines its until three or five years that they see the actual side effects"* (Mexico, 29).

Possible Side Effects or Vaccine-Induced Disease

Other hypothetical reasons women state for not receiving the vaccine included the possibility of disease. When asked, "Is there anything that would make you not get the vaccine" one woman responded with, *"Disease, if the vaccine can bring disease for me and the baby then I would refuse it"* (Congo, 25). Another hypothetical reason for refusing the vaccine was harmful side effects for the baby, *"I don't have any idea of what that is but, if I need it, well then yes. But like I said, if it does not affect the baby and does not do him any harm, then I would do it."* (Mexico, 39).

Other Influential Factors on Vaccination Status

Provider Relationships

There was a variety of patient-physician relationships described by the participants ranging from strong and long lasting to almost non-existent (e.g. seeing a new provider at each health care

visit). Regardless of the quality of provider relationship, the theme of "Doctors Orders" which encompassed the influence of providers on vaccination status persisted. The majority of women explained their trust in physicians based on their education and training as opposed to a fostered relationship. When asked why they trust physicians responses included, *"For me, I don't know anything, but they are doctors… If they told me anything I believe it*" (Refugee Camp (Thailand), 24) and "*Because I believe they can treat me for whatever I want. They went to school for it. It is their profession*" (Congo, 22).

Provider Communication and Knowledge Translation

The primary source of health care and pregnancy related information woman gave was from their physicians and health care facilities. Given the diverse backgrounds of the participants, there was also a diverse range of ability to communicate with their providers. While there were some who felt they had no problems with provider communication, others described some barriers. When one woman was asked if she encountered any barriers in accessing health care while pregnant she responded, *"Where I go, I speak Spanish to the doctor. But here, well, there are many interpreters who speak with me"* (Mexico, 27). The use of a translator was seen as a barrier as opposed to a facilitator.

The short amount of time spent with physicians was also a communication barrier for women. *"I feel some pressure with [my doctor] that I forget the questions that I want to ask. And sometimes I don't get all the answers I really want because I feel like I must do everything fast or something so I will write a list of things I want to ask her so I don't forget. And she answers some - I don't know - it just feels like every time you are with her you bother her"* (Mexico, 29). Time was even

more of a barrier when combined with lower English proficiency. One woman described her typical experience, *"[Ten to fifteen minutes] is usually not enough time for me to talk to the doctor, because of the language barrier, sometimes they just keep on going to another patient, cause when the doctor comes to see me, they just look at me and go and call the nurse and never come back again. So when the nurse comes they just give me another appointment. So they don't have enough time to explain"* (Burundi, 30).

Staying Healthy During Pregnancy

Taking active measures to stay healthy during pregnancy was an emergent theme. Active measures included monitoring nutrition, adding behaviors to their normal routine such as exercise, and cutting out potential risky behaviors. Women determined how to stay healthy through discussion with health care providers and friends or family with pregnancy experience.

Nutrition and Exercise

When asked how they stayed healthy during pregnancy, the most prominent responses were related to nutrition and exercise. One woman explained, *"Well I also try to eat well like I should; fruits, vegetables, milk and also drinking more water. Umm, try to stay active to not gain so much weight"* (Mexico, 30). Discussion of healthy nutrition also included restricting certain foods and beverages, *"I stopped consuming chocolate completely because, um, they told me not to consume caffeine. I also stopped consuming sushi and cold cuts and sprouts. The things that my doctor recommended"* (Mexico, 29). Some women also discussed stopping what they perceived as risky behaviors, *"I quit doing many things like using high heels. I don't go out at*

night alone. Don't go to places where people smoke or there are drugs, drinks. All of that" (Mexico, 27).

Vaccination

While exercise and nutrition were widely discussed methods of staying health, vaccination was only brought up in a minority of cases. One mother's past experience with asthma prompted her to adopt vaccination as a primary means of staying healthy. She responded to the question, "How do you stay healthy while you are pregnant?" with, *"The first thing is to make sure I get the flu vaccine"* (Mexico, 30). Another case was due to multiple pregnancies with consistent provider recommendation.

Access to Healthcare during Pregnancy

All participants had access to obstetric care regardless of their legal status. Women reported having health insurance as a facilitator to access and payment for health services. Lack of insurance made it more difficult to afford care. One woman explained her struggle, *"Well I hardly go because of money. That is the big thing. It's really just that. I don't have the money to pay for it. I do not have the health insurance to even get a set doctor. I don't work either. Before I worked, but the father of my children would get mad and he would hit me. He would hit me when I was in [country] and in the end I had to leave with my daughters to be able to escape and lead a better life. Now I have my second husband and thank God he is helping us get ahead. And you know how it is here. The cost of health is really expensive"* (Mexico, 39).

CHAPTER 4: DISCUSSION AND RECOMMENDATIONS

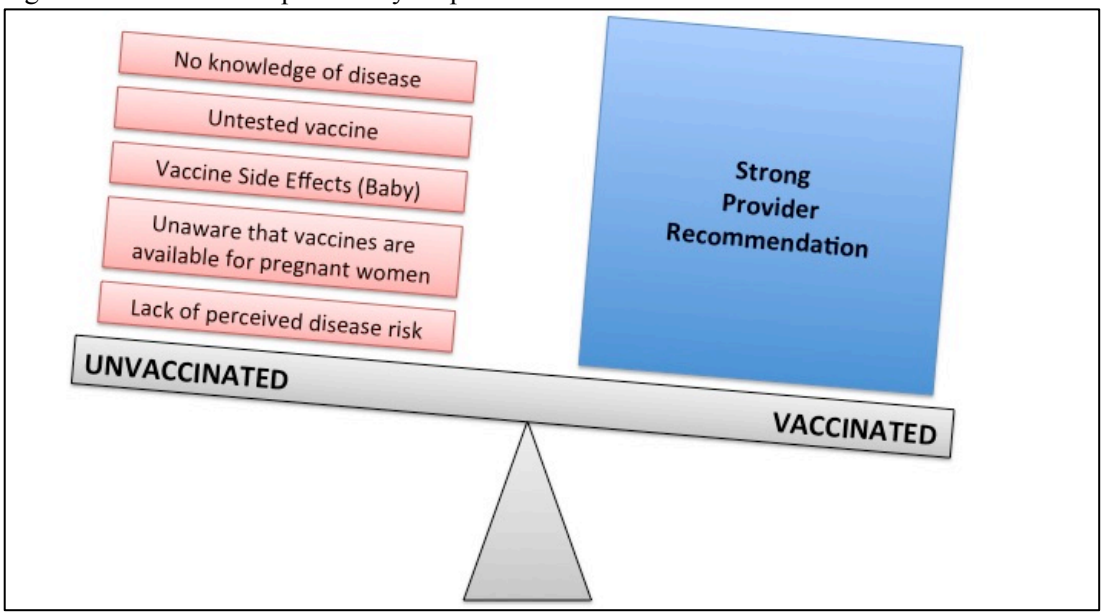
DISCUSSION

The most prominent factor to emerge related to actual or hypothetical vaccination status for women was the recommendation of the provider. A provider recommendation has the ability to overcome other barriers to getting a vaccine including lack of knowledge and lack of perceived risk. This theme stood out even more because it persisted regardless of the quality of the provider-patient relationship or the legal status of the participant. There are mixed results in the literature about provider relationships and trust in immigrant and refugee populations. A study conducted in 2005 found that the majority of political-asylum seekers (83%) in Finland value Western biomedical practices similar to the results of this study [63]. Additionally, during the 2010-2011 influenza season, women who reported receiving a provider recommendation for influenza vaccination were nearly 6 times as likely to report vaccination as those who reported not receiving a provider recommendation (68.8% vs 11.7%) [48].

Conversely, some studies have found that mistrust in providers or Western biomedical practices are a barrier to healthcare for immigrant and refugee populations in the United States [64]. Other barriers that have been discussed in the literature include language barriers, gender, and reliance on traditional medicine [65, 66]. While cultural relevance and sensitivity are still very important for improving patient-provider relationships; it should not be used as a "catch-all" barrier. Understanding the value placed on providers' education and professional recommendations are important in determining why these women are not receiving the recommended vaccinations. In this scenario providers have the opportunity to 'Tip the Scale' in favor of preventive action simply by communicating their professional recommendation. Possible reasons that providers are

not offering vaccinations to their patients include being unfamiliar with the relatively new recommendations and lack of an established process during the care visit for vaccination. Further research on the providers' knowledge and attitudes towards maternal vaccination would be useful in determining why women are not being offered the recommended vaccines during their obstetric healthcare appointments and how to best implement change.

Figure 5. Providers can potentially 'Tip the Scale' in favor of vaccination.



Pregnancy Dialogue

Women are actively engaging in conversations about diet, exercise, and other behaviors (smoking, drinking, etc.) related to staying healthy during pregnancy with their providers as well as with trusted family and friends. Conversely, vaccination was noticeably absent from the dialogue for most women. The few women who did discuss vaccination as a strategy to maintain health during pregnancy did so as a result of their provider's influence. Because many women are already engaged in the dialogue surrounding pregnancy health, there is an opportunity for

providers and health promoters to add vaccination to the 'Staying Healthy' conversation and norm immunization as another prenatal care component.

Agency in Healthcare Decision Making

Another interesting theme that developed out of the data was the lack of agency in making vaccination decisions for some refugee women. Rather than being engaged in and making decisions related to their health, they largely rely on providers to make decisions for them. While trust in healthcare providers is in itself a good thing, lack of knowledge and agency is problematic especially if it results in the patient being unaware of what prevention and treatments they have been given. Factors that may influence this outlook include cultural norms in their country of origin or possibly the healthcare experience in refugee camps prior to coming to the United States where certain medical tests and vaccines are compulsory or only accepted through coercion [64].

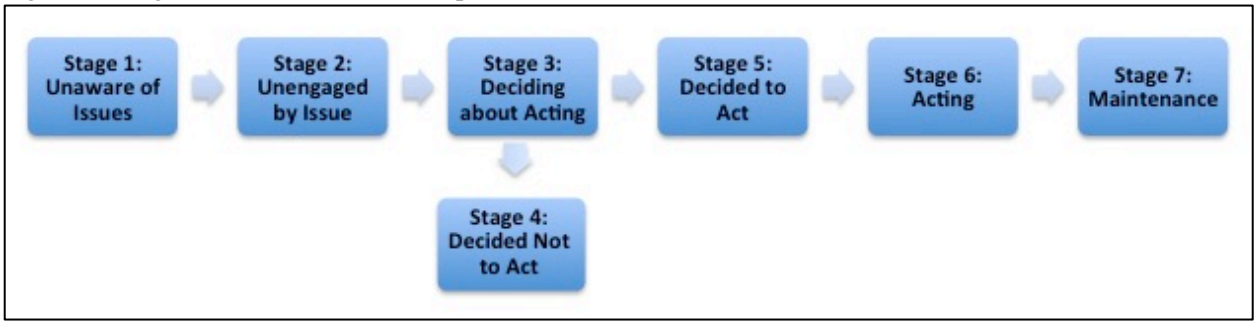
Anthropologists Toffelson and Mortland suggest that cultural orientations conducted in refugee camps intended to ease adjustment to life in the United States may have some negative consequences calling it a "strategy to instruct refugees in subservient behavior in order to prepare them for limited occupational categories in the American labor market" and that it "reinforced the powerlessness of the refugees and their structural dependence on American patrons for their daily needs, movements, and behavior" [67]. There is a dearth of current literature on agency in healthcare decision-making within these populations and on the effects of cultural orientations on agency in the United States. Further research on the driving factors

behind developing agency in these populations would be very beneficial to understanding how to foster knowledge acquisition and agency regarding personal health.

Applications to the Precaution Adoption Process Model

Barriers and facilitators to vaccination status among the participants are not identical for all women. The Precaution Adoption Process Model (PAPM) is a useful framework to further understand some of the variation not explained by other variables in the data. The PAPM, introduced by psychologist Neil Weinstein, is based on the concept that individuals pass through different stages as they move towards a preventive action (in this case vaccination) [68]. The seven stages of are outlined in Figure 6 below.

Figure 6: Stages of the Precaution Adoption Process Model [69]



The PAPM emphasizes the idea that one cannot move from the first stage, lack of awareness, to the latter stages of action and maintenance without first going through the other stages in the model. Women who were unaware of influenza, pertussis and Group B *Streptococcus* were at stage one of the process (unaware of issues). The women who were aware of influenza, pertussis, and GBS but did not have any perception of personal risk or relevance were in stage two, unengaged by issues. In this cohort, none of the women were currently at stage 3, deciding about acting, however some had moved beyond this stage in the process to either stage 4, decided not to act, or stage 5, decided to act. The participant who declined the influenza vaccine

is an example of deciding not to act. Stage five consists of deciding to receive the vaccine and stage six, acting, applies to those women who have already been vaccinated. Those women who had habitual vaccine behavior through multiple pregnancies are at the last stage in the continuum, maintenance. Conceptualizing barriers and facilitators to vaccination in a continuum as this model does is particularly useful when designing interventions to improve vaccination rates. Women who are at different stages have different barriers and information needs, thus interventions should be tailored accordingly in order to have any impact [69]. For example, someone who is unaware that the flu vaccine is available for pregnant women faces different barriers than women who declined the vaccine. Further, as women progress through the process, different interventions may be necessary in order to continue to propel them towards preventive action instead of stall somewhere in the middle of the continuum.

Potential Applications to the Transtheoretical Model

The Transtheoretical Model (TTM), also called the Stages of Change Model is also a useful model when looking at individual behaviors such as vaccination. Contrasting TTM to PAPM provides valuable insight on the benefits of reinforcing messages throughout the primagravida stage, but also in possible future pregnancies. The model consists of five stages of change that progress in a circular pattern indicating that individuals can relapse to earlier stages or need to begin the process again. The five stages of change include pre-contemplation, contemplation, preparation, action, and maintenance [69]. Similar to the PAPM, individuals who are at different stages in the model have different informational needs and thus interventions need to be tailored to each stage. A strength of this model is that it addresses the possibility of moving backwards or needing to restart the process of change again. A weakness in this model is that it begins with

pre-contemplation of behavior change, indicating that there is some knowledge or understanding of the issue by the individual. In cases where there is a complete lack of awareness, such as the women in this study who were completely unaware of pertussis or GBS, this model does not provide an adequate framework.

Study Limitations

All participants interviewed in the study had access to obstetric care as a result of the recruitment venues used, however, additional relevant factors associated with maternal immunization status may be present in the population unique to women without access to care that were not found in this study. Additionally, the lack of native English and native Spanish language proficiency in some of the study participants may have influenced the depth of data interviewers were able to collect during interviews. An additional factor that could impact the data quality is the studies use of self-reported vaccination status. Vaccination status was not verified through review of vaccination or health records. Finally, by nature of qualitative research (non-random sample and small sample size), study findings are not generalizable to the general population. Despite these limitations, the results of this study can contribute to a better understanding of factors associated with maternal immunization in immigrant and refugee populations.

PUBLIC HEALTH IMPLICATIONS AND RECOMMENDATIONS

Understanding the factors associated with vaccination status and where they fit along the continuum in the PAPM will be beneficial to any health communication and promotion efforts as they prioritize possible interventions to increase vaccination uptake. Despite the impact that a provider can have it is crucial that any public interventions does not ignore earlier stages in the

process (i.e. acquiring knowledge and engagement) to maximize the agency in the target population. A three-pronged approach of 1) Educate, 2) Engage, and 3) Promote is recommended to increase seasonal influenza, Tdap, and possibly GBS immunization in pregnant immigrant women.

Educate

Education initiatives should be the first step taken towards increasing vaccination rates. As seen in the PAPM model, awareness is a necessary first step towards preventive actions. Education should focus on both disease risks for pregnant women as well as the availability of vaccinations for pregnant women. As the most trusted source of health information, healthcare facilities have the opportunity to play a role in educational outreach. This can occur through sponsored health promotion campaigns, one-on-one education during clinic visits (by trained nurses or other office staff), the use of culturally and linguistically appropriate educational materials (pamphlets, posters, information videos, etc.).

In 2009, an obstetric clinic in Seattle, Washington serving an ethnically diverse population was able to achieve a 76% acceptance rate of the H1N1 vaccination rate in their clinic, partly attributable to their education efforts[40]. Their educational intervention included playing an educational video in the lobby that ran in nine different languages and providing written information literature to patients about the symptoms and prevention measures available for H1N1 influenza [40]. Other clinics serving similar populations could benefit using this type of educational outreach.

Recent research has shown that in some cases education actually decreases reported likelihood of vaccination. The study found that while education was successful in correcting misperceptions about the influenza vaccine (i.e. the vaccine can cause the flu) it also significantly decreased reported likelihood to get the vaccine in people with high side effect concerns [70]. While these results may at first seem to indicate that education is counter-productive in improving vaccine acceptance and behaviors, education still remains a crucial component. This evidence supports the concepts presented in the Precaution Adoption Process and Transtheoretical Health Behavior Models that education alone is insufficient to change behaviors. Rather it is a crucial stepping-stone along the way. It is essential that educational messaging is framed and presented to women according to their current phase in either of the models. Failure to do so would likely results in an unsuccessful educational campaign because women are not receptive to the type of information being provided. Further, even if educational efforts do not result in the desired change, not providing knowledge to patients violates the third principal of biomedical ethics, respect for autonomy and should therefore not be purposefully withheld [71].

Engage

Engaging women to understand their own risks for disease during pregnancy and the vaccinations available is the second step. There are many NGOs and religious organizations that support immigrant and refugee populations in the Atlanta metro area as well as in the greater United States. Using these outlets to add vaccination to the conversation would be ideal. Women already discuss pregnancy and ways to stay healthy with each other and actively modify their diet, exercise habits, and other behaviors to maximize the health of both themselves and

their infant. Utilizing venues where women are already engaged in this issue is one way to add vaccination to the dialogue surrounding pregnancy.

Education and engagement are critical in this vulnerable population, especially in those who lack agency. By empowering women to understand and care about their own health, they are more likely to ask their physician questions or request vaccinations themselves in the event that providers do not offer them outright.

Promote

Finally, given the authority placed on provider recommendations in this population, providers are in a position to create a noticeable impact on vaccination rates through vaccine promotion during obstetric visits. Other health care staff at hospitals and clinics should also be educated and trained to unify messaging during the visit.

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