

The University of San Francisco

USF Scholarship: a digital repository @ Gleeson Library | Geschke Center

Master's Projects and Capstones

Theses, Dissertations, Capstones and Projects

Summer 8-13-2021

Strategies for Addressing Vaccination Disparities and Rates in the U.S Among Racial/Ethnic Minority Adults

Harpreet Kaur

University of San Francisco, hkaur18@dons.usfca.edu

Follow this and additional works at: <https://repository.usfca.edu/capstone>



Part of the [Community Health and Preventive Medicine Commons](#)

Recommended Citation

Kaur, Harpreet, "Strategies for Addressing Vaccination Disparities and Rates in the U.S Among Racial/Ethnic Minority Adults" (2021). *Master's Projects and Capstones*. 1245.

<https://repository.usfca.edu/capstone/1245>

This Project/Capstone - Global access is brought to you for free and open access by the Theses, Dissertations, Capstones and Projects at USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. It has been accepted for inclusion in Master's Projects and Capstones by an authorized administrator of USF Scholarship: a digital repository @ Gleeson Library | Geschke Center. For more information, please contact repository@usfca.edu.

**Strategies for Addressing Vaccination Disparities and Rates in the U.S Among
Racial/Ethnic Minority Adults**

Harpreet Kaur

University of San Francisco

Master of Public Health – Community Health Practice

August 13, 2021

Table of Contents

Abstract	3
Introduction	4
<i>Table 1.</i>	6
Methods	7
Background and Literature Review	8
<i>Evidence and Data Indicating Vaccine Disparities Among Ethnic/Racial Minorities</i>	8
<i>The Physical and Economic Burden of Avoiding Vaccination</i>	10
<i>Understanding Vaccine Uptake: The Health Belief Model</i>	11
<i>Understanding the Literature: Health Belief Model Theoretical Framework</i>	12
<i>Current Efforts for Addressing Vaccination Disparities</i>	15
<i>Next Steps in Addressing Vaccine Disparities Among Ethnic/Racial Minorities</i>	16
Recommendations	16
<i>The Influence and Role of Healthcare Providers</i>	17
<i>The Health Belief Model: Best Fit for Creating Targeted Interventions</i>	17
<i>The Health Belief Model Constructs</i>	18
<i>Screening to Assess for Health Belief Model Constructs</i>	22
<i>HBM Scoring by Construct</i>	23
<i>Enhancing Awareness and Knowledge of Vaccine-Preventable Health Risks</i>	23
<i>Enhancing Accessibility of Vaccination</i>	24
<i>Continuance of Safeguarding Affordable Vaccines</i>	25
<i>The Influence of Community Leaders and the Role of CBPR</i>	26
<i>Funding Tailored Interventions Based on the Needs of Ethnic/Racial Minorities</i>	28
<i>Figure 1.</i>	29
<i>Figure 2.</i>	29
<i>Figure 3.</i>	30
<i>Table 2.</i>	30
Implications and Discussion	31
Conclusion	34
References	36
Appendix	46
<i>Appendix A – MPH Core Competencies</i>	

Abstract

As new and emerging infectious diseases surface, public health officials are working harder to close the immunization gap. Every year, thousands of adults in the U.S suffer adverse health outcomes and die from vaccine-preventable diseases. The COVID-19 pandemic has reminded us of the power of vaccines as they have been able to eradicate diseases, save lives, and create healthier communities. A literature review was conducted to identify the gaps in research as it relates to vaccine disparities among racial/ethnic adult populations. The literature indicates that ethnic/racial minorities are at disproportionate risk for vaccine-preventable diseases and data has shown increasingly high levels of vaccination disparities among these groups. In order to address the gaps in vaccination disparities among ethnic/racial minority groups, targeted interventions addressing individual and community needs are needed using the Health Belief Model (HBM) framework. Additional interventions are needed to increase strong provider/family/friend recommendation, enhance individual and community vaccine education and knowledge of health risks, eliminate barriers by enhancing accessibility and affordability, and placing great emphasis on the role and influence that community leaders/workers have in vaccination promotion. These practices can contribute to community trust, knowledge, and better health outcomes.

Keywords: vaccination, vaccination disparities, vaccination rates, vaccine inequity, racial/ethnic disparities, vaccine uptake, immunization coverage, racial/ethnic minorities, health disparities, U.S minorities

Introduction

Infectious diseases have long been a main cause of morbidity, mortality, and disability in the U.S. disproportionately affecting health and socioeconomic outcomes across different racial/ethnic groups (Park, 2021). As new and emerging infectious diseases surface, public health officials are working harder to close the immunization gap. Every year, thousands of adults in the U.S suffer adverse health outcomes and die from vaccine-preventable diseases. The COVID-19 pandemic has reminded us of the power of vaccines as they have been able to eradicate diseases, save lives, and create healthier communities. Vaccination is not only the foundation of our healthcare system but the most effective strategy in preventing infectious diseases and death. Despite the local and state efforts to get all Americans vaccinated, there remains a significant gap in who is receiving immunization across the United States.

According to statistics reported by Kaiser Family Foundation, as of July 4, 2021, CDC reported that race/ethnicity was known for 58% of people who had received at least one dose of the vaccine. Among this group, nearly two thirds were White (59%), 9% were Black, 16% were Hispanic, 6% were Asian, 1% were American Indian or Alaska Native, and <1% were Native Hawaiian or Other Pacific Islander (Nambi Ndugga, 2021). Unfortunately, in the United States, vaccination rates vary according to between racial/ethnic groups, geographic areas of residence, income levels, disabilities, and other factors (Martinez & Coles, 2020).

This unequal distribution and discrepancy of vaccination can be defined as vaccination disparity. Vaccine disparities occur in the absence of vaccine equality (similar allocation of vaccine supply proportional to its population across jurisdictions) and vaccine equity (preferential access and administration to those who have been most affected by a disease)

(Melillo, 2021)). Vaccine disparities affect all racial/ethnic minority populations which include Blacks/African Americans, Hispanics/Latinos, Asians and Pacific Islanders, and American Indians and Alaska Natives.

For the purposes of this paper, inclusive terms such as vaccination disparities, rates, and uptake will be used interchangeably. Crocker-Buque and colleagues defined vaccine uptake as the proportion of the eligible population who received a vaccine (Crocker-Buque et al., 2016). The key term here is “proportion”, which refers to a number considered in comparative relation to a whole. This proportion can be referred to as vaccination rates. According to the Measure Evaluation’s website, immunization coverage rates or vaccination rates can be defined as percent of the target population that has received the last recommended dose for each vaccine recommended in the national schedule by vaccine (Measure Evaluation, 2017).

Vaccines play a crucial part in building immunity and healthier communities across the world. However, if they are not equally distributed, especially among vulnerable populations, who are predisposed to poor health outcomes and health disparities, it can lead to higher morbidity and mortality rates. It has become more and more evident that the uptake of vaccines has historically been lower among all minority racial and ethnic groups compared to non-Hispanic white populations (Lu et al., 2015).

The purpose of this paper will be to address vaccine disparities among ethnic and racial minorities by examining vaccine uptake. To address this public health concern, this paper will recommend developing tailored interventions based on the Health Belief Model constructs to address vaccine disparities. Recommendations will focus on helping increase vaccination uptake/rates and encourage healthier ethnic/racial minority communities.

Table 1: Defining Terms and Keywords

Vaccine disparities (Melillio, 2021)	<i>An unequal distribution and discrepancy of vaccination which occur in the absence of vaccine equality and vaccine equity.</i>
Vaccine rates (Measure Evaluation, 2017)	<i>The percent of the target population that has received the recommended dose for each vaccine recommended in the national schedule by vaccine.</i>
Vaccine uptake (Crocker-Buque et al., 2016)	<i>The proportion of the eligible population who received a vaccine.</i>
Vaccine equality (Melillio, 2021)	<i>Similar allocation of vaccine supplies proportional to its population across jurisdictions.</i>
Vaccine equity (Melillio, 2021)	<i>Preferential access and administration to those who have been most affected by a disease.</i>
Morbidity (CDC, 2012)	<i>Morbidity is the departure, subjective or objective, from a state of physiological or psychological well-being which encompasses disease, injury, and disability.</i>
Mortality (CDC, 2012)	<i>A mortality rate is a measure of the frequency of occurrence of death in a defined population during a specified interval.</i>
Racial/Ethnic Minorities (CDC)	<i>Racial and ethnic minority groups include people of color with a wide variety of backgrounds and experiences.</i>

Methods

Research Strategy

A literature review was conducted to identify the gaps in research as it relates to vaccine disparities among racial/ethnic populations. The literature review was conducted using multiple databases to identify relevant scholarship in vaccine rates, disparities, uptake among ethnic/racial communities, and the Health Belief Model. Literature review was also used to produce recommendations and conduct a community-based needs assessment.

Target Population

Racial/Ethnic Minority Adults in the United States (aged ≥ 18 years)

Minority groups include Hispanic or Latinx, non-Hispanic Blacks, non-Hispanic American Indians or Alaska Native, and Asian Americans.

Keywords

Search keywords included: vaccination disparities, racial/ethnic disparities, vaccine inequity, vaccine uptake, and immunization coverage. Given the limited research available, local resources were also included. The review compiles both scholarly articles and local resources to examine characteristics, trends, and resources available for the target population.

Databases

Multiple databases were searched including Scopus, Google Scholar, PubMed, and data extracted and analyzed from CDC reports. Results were limited to publications in English from years 2000-2021.

Exclusion and Inclusion Criteria:

Inclusion criteria: Racial/Ethnic Minority Adults (aged ≥ 18 years), Location: U.S, Vaccine-specificity: Influenza, COVID-19, HPV, and Pneumococcal

Exclusion criteria: non-Hispanic White populations, Children (aged < 18 years), Locations outside of the U.S

Background and Analysis of Literature

Evidence and Data indicating Vaccine Disparities Among Ethnic/Racial Minorities

While there are cures such as vaccines, many adults are dying due to old, new, and present emerging diseases. Research has found several data and evidence indicating significant vaccine disparities among ethnic/racial minority populations. In the United States, immunization coverage rates are increasing, yet in many communities these rates do not approach the national goals of *Healthy People 2020*, partially due to persisting disparities experienced by racial/ethnic groups (Willis et al., 2016). Lu & colleagues found that despite the vaccination equity efforts of *Healthy People 2020*, the vaccination uptake of three commonly administered vaccines (influenza, pneumococcal, and herpes zoster) in all race and ethnic minority adults, were well below the respective target levels of 70% for influenza vaccination, 60% for pneumococcal vaccination, 90% for pneumococcal vaccination and 30% for shingles vaccination (Lu et al., 2015). The authors state that annual deaths caused by influenza have ranged from approximately 3,000 to 49,000. By 2012, approximately 32,000 cases of invasive pneumococcal disease (IPD) occurred of which about 90% were adults and more than 95% of IPD related deaths occurred among adults. Furthermore, as many as 8,300 adults die annually from HPV-associated cancers and 1 million cases of shingles occur annually among older adults.

According to the Agency for Healthcare Research and Quality, numerous studies in the U.S. have shown persistent differences in health among racial and ethnic minorities (including Blacks/African Americans, Hispanics/Latinos, Asians and Pacific Islanders, and American Indians and Alaska Natives) across a multitude of important health indicators. Such studies have shown that when compared with the white population, racial and ethnic minorities continue to

lag in access to care, quality of care, timeliness of care, and health outcomes. Of the many health disparities and health outcomes that racial/ethnic minorities encounter, they are also disproportionately affected by vaccine disparities.

Furthermore, during the 2018-2019 flu season, 39% of Blacks, 37% Hispanics, and 38% of Asians adults were vaccinated compared to 49% of White adults (CDC, 2019). Furthermore, another CDC report found National Health Interview Survey (NHIS) estimates that indicated racial and ethnic vaccination differences persisted for all vaccinations and lower coverage for most vaccinations among non-Hispanic black, Hispanic, and non-Hispanic Asian adults compared with white adults (CDC, NHIS, 2016). Additionally, A new CDC analysis showed that during 10 influenza seasons from 2009 to 2019, Blacks, American Indians, and Hispanics had the highest influenza-associated hospitalization rates. The analysis indicates that people from racial and ethnic minority groups are at higher risk for being hospitalized with the flu. This includes non-Hispanic Black, non-Hispanic American Indian or Alaska Native, and Hispanic or Latino people. (CDC, 2021).

Another report found on the CDC website states significant lower rates in flu vaccination rates among racial and ethnic minorities compared to non-Hispanic White persons. This report summarized flu vaccine uptake from 2019-2020 as follows: 38% Hispanic or Latinx, 41% Black persons, 42% American Indian persons, 52% Asian persons, and 53% non-Hispanic White persons (CDC, 2021). These report findings confirmed disparities in vaccine uptake among U.S adults. Data from the CDC shows that the flu vaccination rates generally increased over time but remained below the target level with lower rates of vaccination among Black and Hispanic individuals compared to White individuals (Artiga et al., 2020).

More recently, there have been vaccine disparities reported among ethnic/racial minorities during the COVID-19 pandemic. According to a new report by the AARP, as of June 2021, CDC data shows COVID-19 vaccination rates among all races as follows: 6% Asian, 9% Black, 15% Hispanic, and 60% White persons in the U.S. (Bunis, 2021). Persons affected by disparities experience higher incidences of vaccine-preventable diseases and are more likely to die from those diseases as well (Logan, 2009). Such groups are more likely to experience health disparities and poor health outcomes.

The Physical and Economic Burden of Avoiding Vaccination

Like other health care decisions, it is important to weigh the cost and benefit when choosing to get vaccinated. Vaccines are not only beneficial towards individual and community's health but also towards the economy. There are both physical and economic costs of not getting vaccinated. Avoiding vaccination can result in illness, death, or visit(s) to the E.R which not only burden the individual's finances, but also the hospital, healthcare industry, and the economy. According to a comprehensive analysis from the University of North Carolina at Chapel Hill, people who don't get vaccinated for diseases that can be prevented by vaccines, cost the U.S. economy more than \$7 billion a year (Medenhall, 2020). In another study that examined the actual cost of inpatient and outpatient care, cost of medication and the value of productivity lost from time spent seeking care, it was found that vaccine-preventable diseases in adults cost almost \$9 billion in 2015 alone. While 80% of that cost was due to poor vaccine compliance, 95% accounted for inpatient and outpatient medical care to treat the disease-preventable conditions and lost productivity accounted for another 5% (Ozawa et al., 2016).

The economic impact of adult illness is evident from loss of productivity and pay for the duration of the illness and recovery period - all which could be avoided if individuals get vaccinated (Rodrigues & Plotkin, 2020). Rodrigues & Plotkin included a cost benefit analysis in their study findings, they found that the reduction in morbidity and mortality associated with successful vaccine programs, through a combination of direct and indirect protection, has led to reduced incidence of diseases and their associated treatments and healthcare costs. This potentially leads to economic growth, with less money spent owing to the costs averted through fewer medical tests, procedures, treatments, and less time off work by patients/parents (Rodrigues & Plotkin, 2020).

Understanding Vaccine Uptake with The Health Belief Model

To increase vaccination uptake/rates and reduce social, health, and economic burdens related to vaccine disparities, it's important to understand the reasoning for why these populations are not getting vaccinated. Several factors play a role in racial/ethnic minorities' decision to receive a vaccine. These factors can be understood using the Health Belief Model (HBM). According to Fry et al., vaccine uptake can be influenced by health beliefs and attitudes such as perceived risk, susceptibility, prior negative experiences, and cues to action (Fry et al., 2016).

Per LaMorte, the six HBM constructs that predict health behavior are as defined as follows: *perceived susceptibility* (persons perception of risk of acquiring a disease or illness), *perceived severity* (persons feelings on the seriousness of contracting a disease or illness), *perceived benefits* (persons perception of the effectiveness of different actions/resolutions available to reduce disease or illness), *perceived barriers* (persons feelings on obstacles in the

way in order to perform health action), *cues to action* (acts as a trigger for the decision making process to accept the recommended health action) and *self-efficacy* (persons confidence in ability to perform the health behavior (i.e. vaccination uptake) (LaMorte, 2019)). The author suggests that the HBM model is more descriptive than explanatory and does not suggest a strategy for changing health-related actions.

Understanding the Literature: Health Belief Model Theoretical Framework

In a study conducted by Ma et al., the Health Belief Model (HBM) framework was used to assess five out of the six HBM constructs in human papilloma virus (HPV) screening and vaccination among Vietnamese immigrants. From 359 participants, only 8.8% were screened and 7.3% were vaccinated for HPV. Compared to participants who had been vaccinated, unvaccinated participants were more likely to report feeling healthy and lack the knowledge about where to obtain HPV testing which was interpreted as a perceived barrier. Multivariate logistic regression analyses indicated that perceived barriers were negatively associated with screening behavior as well as vaccination behavior (Ma et al., 2007). The study found that Vietnamese males were 11 times more likely to get liver cancer, a result of HPV infection, as compared to White males.

The five constructs used in this study were perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. Perceived susceptibility was assessed by measuring one's belief of being at risk of acquiring the disease, worry about getting HPV, and getting liver cancer. Perceived severity was measured by using two items concerning the impact of HPV infection on one's life and the belief that people infected with HPV will die from liver cancer. However, for perceived benefits, five items were used such as the belief that early

detection will result from undergoing screening, screening helps prevent transmission to others, vaccination would reduce worry about liver disease, vaccination is the best way to prevent liver cancer, and treatment would not be bad if HBV was detected early. Perceived barriers included language problems, not knowing where to get screened/vaccinated, fear of a positive result, a lack of knowledge, and the belief that screening is not necessary. Lastly, cues to action assessed whether participants had a family member who is an HBV carrier, had received a physician recommendation to undergo HBV screening, or had attended a workshop on HBV (Ma et al., 2007).

While this study used the HBM constructs effectively, there are some limitations. The study highlights the importance of having patient-provider communication in the same language to discuss HBV. However, by not exploring cultural factors, gender disparities and stigma/shame related to HBV, an opportunity to understand why ethnic/racial minorities delay care or avoid seeking treatment for diseases/illnesses is missed. The author explains how screening and vaccination are related to the level of awareness and information given to ethnic/racial minorities.

Fry et al. conducted a cross sectional study to see if socio-demographic variables such as age, gender, and SES were predictors of vaccine uptake among African American participants. The study used the Health Belief (HBM) and Precaution Adoption Process Models (PAPM). The study consisted of 295 African American adults who self-administered the Vaccine Uptake Questionnaire. The authors hypothesized that when HBM and PAPM constructs such as awareness, knowledge, trust in health care providers, perceived health, perceived susceptibility, perceived severity, prior negative experience with vaccines, and health care providers are combined these constructs can positively influence vaccine uptake. The study found that HBM

and PAPM constructs such as awareness, knowledge trust, perceived susceptibility, and provider recommendation play a strong role in pneumococcal vaccine uptake.

Chen and colleagues conducted a study among 2208 congregation members of which 40% identified as White, 8% as African American, 19% Latino, 14% Japanese American, and 10% Filipino American. Race/ethnicity was evaluated as an independent effect on receiving the influenza vaccine and it was found that 71% of Whites had received vaccination as compared to 46% of African Americans and 44% Latinos being the lowest rate of all ethnic/racial groups. More specifically, of the 44% Latino respondents, 13% of Latinos noted the main reason for non-vaccination was access and cost issues as compared to $\leq 2\%$ in other racial/ethnic groups (Chen et al., 2006). The study used the HBM as their framework to analyze flu vaccination uptake predictors. More specifically the study analysis focused on HBM constructs perceived susceptibility, perceived severity, and perceived barriers being the most important predictors of flu vaccination. A significantly greater proportion of African Americans (45%) and Latinos (58%) reported being not at all concerned about getting influenza as compared to their White counterparts (35%). The study examined the main barriers of vaccination revealing that Latinos were more likely to report access and cost barriers, while African Americans were more likely to raise issues of mistrust such as concern that the vaccine causes influenza.

Upon analyzing the literature, it is clear there needs to be different levels of interventions for this matter on a policy, community, and individual levels. Currently, there is a substantial lack in tailored interventions to ethnic/racial minorities addressing the vaccination disparities and low rates. While there are current efforts being made to address vaccination disparities among ethnic/racial minorities, there is considerable deficit in tailored and soluble solutions to address this issue.

Current Efforts for Addressing Vaccination Disparities

While there are various policies and organizations that aim to eliminate ethnic/racial minority health disparities such as HealthyPeople 2030, HHS Office of Minority Health, and Centers for Medicare and Medicaid (CMS) Office of Minority Health, there is an ongoing insufficiency in evidence-based interventions addressed in published literatures aimed toward vaccination disparities specifically among ethnic/racial minorities.

In California, many state departments have reported a disproportionate impact of COVID-19 on Latino and Black due to several factors. Therefore, more recent efforts have been made to target these populations for vaccination uptake. Local and state public health departments have used different approaches to get ethnic/racial minorities vaccination in light of the COVID-19 pandemic. For example, as of March 2021, San Francisco Department of Public Health partnered with Excelsior Strong and Latino Task Force to open new COVID-19 vaccine sites in the Excelsior District neighborhood. Their vaccination strategy goal is to ensure convenient and comfortable access and receipt of vaccination among the district residents. Many residents in the Excelsior District neighborhood have been disproportionately affected by the COVID-19 pandemic and it is home to many ethnic/racial minorities.

Additionally, California's governor, Gavin Newsom recently launched a program to provide a hefty stipend to Californians to get people vaccinated. State officials are launching incentive programs to award Californians with grocery cards, gift cards, and concert and game tickets to encourage people to get vaccinated - especially among ethnic/racial communities with low vaccination rates.

Next Steps in Addressing Vaccine Disparities Among Ethnic/Racial Minorities

Based on the analysis of other literature, there is not a single intervention that will address all the gaps in vaccination rates of ethnic/racial minorities. While there have been recent efforts made to address vaccination gaps in lieu of the COVID-19 pandemic, there are still very few tailored interventions targeted to ethnic/racial minorities based on evidence-based theories such as the HBM. The HBM constructs will be used to address strategies in addressing vaccination disparities and relevant gaps in research. This paper will use different HBM constructs to increase/address/explore vaccine uptake among minorities. Evidence based theory models such as the Health Belief Model have provided a key role in increasing knowledge and literature on more community-informed evidence-based interventions that have had promising results for addressing vaccine disparities among historically underrepresented communities, such as ethnic/racial minority groups. Further investigative research and data should be conducted to elucidate the gaps in the relationship between vaccine disparities, rates, and health outcomes of ethnic/racial minorities.

Recommendations

Services Task Force (CPSTF) has made recommendations for addressing low vaccination rates for the general U.S population by recommending a combination of health care system-based interventions and community-based interventions to increase vaccination rates in targeted populations. Intervention efforts would involve partnerships (external/internal stakeholders) between community organizations, local government, and vaccination providers. While there

were no indications on ethnic/racial minorities vaccination rates, it is suggested that these recommendations may work with specific target populations.

For example, client reminder and recall systems, client-based client education, and manual outreach are some strategies used to engage individuals in vaccine uptake (CPSTF, 2020). Community-based interventions should focus on expanding access in health care settings, reducing the client costs, and increasing home visits. System-based interventions are being directed at providers by sending provider reminders, standing order, and provider assessment and feedback as a way to hold providers accountable for engaging patients in vaccine uptake.

The Influence and Role of Healthcare Providers

For healthcare providers to have a positive influence on communities, it's important that health education campaigns and vaccine programs encourage providers to motivate and influence vaccination uptake in ethnic/racial minority communities on a consistent basis. The influence of provider recommendations has been evident in encouraging vaccination uptake among this population. The literature review indicates the power and influence of physician recommendations as it can serve as a powerful cue to action to get screened and vaccinated (Ma et al., 2007).

The Health Belief Model: Best Fit for Creating Targeted Interventions

While there is not a single intervention that will address all the gaps in vaccination disparities among ethnic/racial minority groups, the Health Belief Model (HBM) has helped increase knowledge and literature on more community-informed evidence-based interventions with promising results for addressing vaccine disparities. In using the HBM model, there are practices that can be implemented and informed by HBM model constructs to reduce vaccination

disparities and ensure vaccination uptake of racial/ethnic minority groups. To create successful tailored interventions, it is essential to understand the needs of our target population. By listening to ethnic/racial minority groups' needs, we can create effective interventions that will work and eliminate any factors that have not worked previously. However, certain constructs of the HBM model are more apt to engage racial/ethnic minorities in vaccine uptake than others

Health Belief Model Constructs

HBM constructs like perceived susceptibility, benefits, severity, barriers, self-efficacy, and cues to action have been the most effective in addressing vaccination gaps and predicting vaccination uptake/rates for diseases like influenza, HPV and HBV (Cheney & John, 2013; Chen et al., 2007; Ma et al., 2007). While there are six HBM constructs, this paper will focus on measuring perceived susceptibility, perceived barriers and cues to action as possible constructs that can explain and predict health-related behaviors, particularly regarding vaccine uptake among racial/ethnic minorities. Janz and Becker conducted a thorough review of the uses and effectiveness of the HBM. After their review of 46 studies that used the HBM, they concluded that the strongest predictor of health behaviors was perceived barriers (Janz & Becker, 1984).

Perceived Barriers (PB)

PB are a person's feelings on the obstacles to perform the health behavior. Examples of barriers include concerns about vaccine safety and efficacy, medical mistrust, lack of reliable vaccine information, financial costs, and access to reliable transportation. Research has shown that the lack of information and knowledge about vaccination, accessibility, costs, and perceptions around the safety and efficacy of vaccines serve as barriers to vaccine uptake (Dabla-Norris et al., 2021). Eliminating these barriers can allow for easier access to vaccines.

Concerns about vaccine safety and effectiveness closely tie into issues stemming from medical mistrust. If communities have a history of broken trust and do not trust healthcare entities, then it is without doubt they will have concerns about what is being offered to them. For example, the Tuskegee trials was a significant turning point in history that led to substantial mistrust amongst Black communities. Such historical events have led Black communities to question medical authorities. Cerise and colleagues explain the importance of building community trust, they found, Black Americans report significantly more trust than those who are White in informal information sources for health care information, including family or friends and church or religious leaders and are two times more likely to trust health messages from other Black people compared to White counterparts (Cerise et al., 2021). If communities don't feel that they can trust the information provided to them (caused by historical marginalization, medical mistrust, past unethical research practices, or current and past issues of racism and injustice), they may not feel obligated to be as receptive to vaccine-related information. Mistrust of government and lack of accurate, in language, culturally sensitive information are key barriers to equitable vaccine distribution (Los Angeles DPH, 2021).

The lack of knowledge and information on vaccines and their benefits as well as a lack of awareness for the need of vaccination can also serve as a significant barrier. Understanding where to get vaccinated and the different vaccinations and its potential benefits can be overwhelming to individuals. This can be particularly true for ethnic/racial minorities who don't speak English or have access to online information. Thus, more reliable information should be distributed to these communities on a consistent and timely basis in various methods such as in newspaper articles, in-person workshops and church and community-led events.

The socioeconomic factors that affect racial/ethnic minority groups also contribute as barriers to vaccination. These barriers include the lack of access to reliable transportation, inability to take time-off from work, or financial burden due to a lack of healthcare insurance or inability to pay for vaccine-associated costs. Therefore, to improve vaccination uptake in these communities, interventions like mobile vaccine clinics, onsite or in-home vaccine visits and financial incentives should be provided more frequently as they have been found to improve vaccination rates (McLaughlin et al., 2019).

Perceived Susceptibility (PS)

PS is a person's perception in contracting the disease and is a key predictor in prevention of health behaviors. It is important to understand racial/ethnic minority groups' perception of risk to create tailored strategies and, thus, get them vaccinated. By targeting PS, interventions will increase vaccination uptake and ultimately increase rates. Research has shown that when someone perceives themselves susceptible to a disease or illness, they are more likely to engage in preventive behavior, like vaccination (Scarinci et al., 2021). On the other hand, research has revealed that individuals who see their risk and symptoms of infection as low and not severe, worry less about the disease and feel no urgency or importance in getting vaccinated (Walker et al., 2021). This low perception of risk can consequently cause individuals to opt out of vaccination resulting in a high death toll as individuals die from vaccine-preventable diseases. *Figure 2* shows the predicted number of deaths from COVID-19 from 2020 to 2021. From the numbers in this graph, a low perceived risk to disease can have devastating effects, roughly costing 18,000 lives (Dabla-Norris et al., 2021). *Figure 3* shows the impact of individuals' concerns about COVID-19 on their probability of vaccination intent leading to uptake on the left

graph while the right graph shows the same effects, but it focuses on individuals' trust in the healthcare systems. The more likely people perceive themselves to be at risk for COVID-19 and trust healthcare systems, the more likely they are to get vaccinated.

Perhaps continuing to make data related to COVID-19 deaths available to the public could change their perception of risk. Additionally, testimonials that speak on personal experiences of contracting COVID-19 (or any other disease) or testimonials sharing the death of a loved one could help shape risk perceptions.

Cues to Action (CA)

CA are cues needed to engage in the behavior, they can be internal or external prompts. Some of these include seeing community leaders, family members, and other trusted messengers engage in social norms around vaccines. There is research showing that when community messengers engage in a healthy behavior it helps facilitate the process of engaging in that healthy behavior in racial/ethnic minorities groups. Per Dabla-Norris and colleagues, "If a person's vaccination decision is positively influenced by his or her peers' vaccination behavior, interventions to promote vaccine take-up among selected individuals not only directly encourage their own take-up but also indirectly encourage take-up among peer" (Dabla-Norris et al., 2021). These cues can help people's readiness to seek vaccinations.

Trusted community leaders and family members can serve as influencers in motivating individuals to get vaccinated. If mistrust is not an outlying issue between the target population and healthcare staff, then physician recommendations can also have a huge impact on a community's motivation to get vaccinated. Ma and colleagues evidently state, healthcare provider recommendations can serve as a powerful cue to action to get vaccinated (Ma et al.,

2007). However, if there is evident mistrust between certain communities and healthcare staff, then an individual's social circle (family or friends) would serve as a source of an effective cue to action because individuals are more likely to listen to the recommendations of those who they trust the most (Cheney & John, 2013).

Vaccine recommendations from healthcare workers and family/friends are significant motivators for vaccination. Remarkably, some studies have found rather than working directly on the actual vaccine uptake, the recommendations from healthcare workers and family/friends improved perceptions of disease susceptibility and benefits of vaccination to raise the vaccination coverage rate of the target population (Ye et al., 2021). Black Americans report significantly more trust in informal information sources for health care information, including family or friends and church or religious leaders and Hispanic populations demonstrate higher trust in information presented via television or radio compared to non-Hispanic white populations (Cerise et al., 2021). Thus, we can state with certainty that, along with PB, CA is also one of the most important HBM constructs that can shape effective tailoring of interventions because it directly triggers the need to take action.

Screening to Assess for Health Belief Model Constructs

Establishing an individual/patient assessment that can capture three HBM constructs can ultimately help create tailored interventions addressing gaps in vaccination disparities and encourage vaccination uptake. A vaccine assessment form, or instrument, can be provided during doctor visits, mobile clinic visits, or community events to get a clear understanding of individuals' perceived susceptibility, perceived barriers, and any presence of cues to action influencing vaccination (see *figure 1* for HBM Assessment/Evaluation Tool). It is crucial to

develop a culturally relevant assessment based on the individual or communities' preferred language and cultural understanding to eliminate language barriers.

HBM Scoring by Construct

The vaccine form, or instrument, would consist of a section consisting of close-ended items that include factors such as demographics, race/ethnicity, education level, age, and gender. The second section of the instrument would include questions measuring health behavior such as PS, PB, and CA to vaccination. PS can be examined by two items: measuring the person's belief in being high risk and their worry about contracting a vaccine-preventable disease. PB can be assessed by measuring four items; language problems, lack of information on where to get vaccinated, lack of vaccine knowledge, cost, and accessibility problems. CA could be assessed by measuring three items with binary variables (Yes, No); whether the person received a physician recommendation, referral or recommendation by a community leader, community health worker, or someone within their social circle.

Then, statistical analyses would be conducted to determine the total for each construct measurement. Items for each construct would be combined into a scale in which higher scores would indicate which construct was more evident in the assessment form. Statistical results are significant if the p-value is less than alpha 0.05. This significance will indicate which health belief construct must be addressed in each tailored intervention. The results can also present any recurring health belief differences and similarities among people within the same ethnic/racial group. Such results would help target the root of the problem and create specific interventions that will work for a particular group.

Enhancing Awareness and Knowledge of Vaccine-Preventable Health Risks

Strengthening individual and ethnic/racial minority groups' knowledge is critical to reducing the deficit in vaccine uptake (Fry et al., 2016). If the patient assessment form indicates a low perceived susceptibility, it is recommended to enhance/increase awareness and knowledge of health risks associated with vaccine-preventable diseases. This can be guided through language and culturally appropriate health education campaigns conducted through community engagement and outreach. While addressing PS, one can simultaneously work on PB influencing factors by answering any pending questions about vaccines and addressing vaccination safety and efficacy on a one-on-one basis/case-by-case.

According to the Los Angeles Department of Public Health Equity report, there is an immediate need to engage with trusted providers and community members in messaging, in recognition of historical barriers and discrimination as well as account for immigration status and other anxieties, in anticipation of vaccine criteria expansion (Los Angeles DPH, 2021). Also, a lack of vaccine knowledge and information can create opportunity for misinformation from peers and social circles, therefore, it's crucial that health care providers, media, public health officials and any other health authorities should accurately and repeatedly inform minority communities about the evidence on the safety of vaccines and address community and individual concerns. The report also recommends implementation of targeted communications campaigns to address barriers by engaging in community and faith-based organizations as well as trusted providers to work with communities to develop and disseminate information to overcome persistent inaccuracies.

Enhancing Accessibility of Vaccination

Suppose the assessment form indicates there are accessibility issues. The Healthcare provider should then bring in a caseworker or nurse that can assist the patient with any transportation issues. Also, case workers or nurses can also print or text them locations near their home or place of employment. Providing vaccines at places of employment can help people easily access them without having to deal with other barriers. Mobile vaccine clinics and on-site locations are desperately needed. McLaughlin and colleagues suggest increasing mobile vaccine clinics and on-site vaccinations in non-traditional settings like the workplace, churches, stores, or pharmacies to help improve vaccination uptake in these communities. It would be important to make such mobile clinics easy to access and free of cost to eliminate financial, physical, and structural barriers.

Continuance of Safeguarding Affordable Vaccines

If in the screening/assessment form, patients report not having money or insurance to cover the cost of vaccines, then innovative approaches must be taken to alleviate the financial burden of vaccine costs. To help reduce cost barriers, incentives and cost-free vaccinations should be provided to communities heavily populated with ethnic/racial minorities. This will not only alleviate the financial burden but also increase motivation through incentives. State officials are launching incentive programs to award individuals with grocery cards, gift cards, and concert and game tickets to encourage people to get vaccinated - especially among ethnic/racial communities with low vaccination rates.

In light of the recent pandemic vaccination efforts, employers are providing financial incentives to get vaccinated. Such incentives include cash rewards, gift cards, additional healthcare spending, or providing extra paid time off so employees don't have to use existing

vacation or sick days to get vaccinated (Miller, 2021). Therefore, if affordability is indicted to be an issue expressed in the assessment form, then it would be prudent for tailored interventions to communicate with various employers to set up a policy or formal agreement to incentivize its' employees by substituting a day's pay through additional PTO allocation or equivalent financial incentive to make up for the time lost at work.

The Influence of Community Leaders and the Role of CBPR

Community-Based Participatory Research (CBPR) is effective in improving health outcomes among minorities (De las Nueces et al., 2012). According to Health Outreach Partners, "Community-Based Participatory Research is a research methodology which includes the participation of those who are affected by the issue or problem being studied for the dual purpose of creating knowledge and social change" (Health Outreach Partners, 2011). This paper focuses on the creation of targeted interventions, and it should be noted that CBPR is research based not intervention based. For the purposes of this paper, CBPR will only be used to help understand why ethnic/racial minority groups do not get vaccinated. Thus, helping the development of future vaccination campaigns. Furthermore, it should be noted that CBPR work relies heavily on working with Community Health Workers (CHWs) to go into the community and implement interventions on individual and community levels.

Historically, CHWs have been a key component of comprehensive efforts to minimize transmission of communicable diseases worldwide through community engagement, awareness and promotion of preventive practices and have been instrumental in increasing uptake of immunizations (Rahman et al., 2021). CHWs are not only trusted messengers but also reliable and having them execute interventions is cost-effective, thus many community-based

organizations use them to educate minority communities. While they are an integral part of the community they serve, they can help individuals navigate the healthcare system, educate the community, and provide social support. CHWs understand their community's health needs, health beliefs, and culture, and can both reach out to fellow community members about health issues and bring community insights to the healthcare system (Huang et al, 2018).

Targeted interventions can focus on solving community-identified problems while using CHWs as messengers of health-related information. It will be important to identify influential community partners/leaders/workers that do not reinforce power structures. CHWs should be leveraged to model healthy behaviors and assist in reducing any vaccine barriers/concerns and help frame vaccination as a potential benefit to community health in order to enhance vaccination uptake. These CHWs can assist ethnic/racial minorities in completing an individual assessment form and answering any questions about vaccines. Bringing in CHWs that speak the same language or have other ethnic similarities could help build strong community trust. Vaccine forms and relevant vaccine education should be tailored to their preferred language and community leaders and CHWs should be trained to assess and respond to questions in a timely manner addressing concerns and clarifying needs. Using community leaders and CHWs as messengers and educators can provide a sense of community empowerment to get vaccinated. Furthermore, using community leaders and CHWs as messengers can help eliminate overbearing medical lingo and power structures so community members can create dialogue about the benefits of the vaccine. Through this dialogue, bidirectional learning and trust can be established among community leaders and its members, thus increasing PS, and serving as a cue to spread the word about getting vaccinated.

Funding Tailored Interventions Based on the Needs of Ethnic/Racial Minorities

Funding is needed to assess the individual and community needs of the target population. An assessment will help ensure that the community is engaged and feeling heard. For example, if the community indicates a low level of susceptibility, funding should focus on vaccine education and outreach targeting ethnic/minority populations. Suppose the assessment form indicates barriers to vaccine access, then funding should focus on creating opportunities to distribute vaccines in the most affected areas/zones through vaccine pop-up community clinics, mobile clinics, after-work hour (5pm) clinics.

Funding must take into consideration a multifaceted approach. A similar practice that is already in place to understand COVID-19 vaccination disparities is leveraging grant awards from organizations like The Clinical and Translational Science Institute (CTSI). Furthermore, The Centers for Disease Control (CDC) can also provide funding towards vaccination disparities by expanding vaccine programs at state and local levels. Recently, the CDC provided \$3 billion to expand COVID-19 vaccine programs. The CDC emphasized that this funding can be used for innovative partnerships with community-based organizations to increase vaccine uptake, including in underserved populations (CDC, 2021). It is crucial that funding adopts a multifaceted approach.

Figure 1: Health Belief Model Evaluation Tool (Alobaidi, 2021)

Variable	OR (Confidence Interval)	Wald	df	p
Constant	—	39.62	1	<0.001
Perceived susceptibility of contracting COVID-19				
My chance of getting COVID-19 in the next few months is great	1.43(0.549–3.741)	0.54	1	0.463
I am worried about the likelihood of getting COVID-19	3.82(1.635–8.942)	9.57	1	0.002
Getting COVID-19 is currently a possibility for me	1.47(0.540–4.093)	0.59	1	0.443
Perceived Severity				
Complications from COVID-19 are serious	2.50(0.682–9.171)	1.91	1	0.167
I will be very sick if I get COVID-19	1.05(0.449–2.466)	0.014	1	0.907
I am afraid of getting COVID-19	1.55(0.617–3.872)	0.866	1	0.352
Perceived benefits of COVID-19 vaccination				
Vaccination is a good idea because I feel less worried about catching COVID-19	7.59(1.651–34.863)	6.78	1	0.009
Vaccination decreases my chance of getting COVID-19 or its complications	1.42(0.221–9.081)	0.136	1	0.712
Perceived barriers of COVID-19 vaccination				
Worry that possible side-effects of COVID-19 vaccination would interfere with my usual activities	0.31(0.132–0.746)	6.88	1	0.009
I am concerned about the efficacy of the COVID-19 vaccination	0.65(0.272–1.566)	0.92	1	0.339
I am concerned about the safety of the COVID-19 vaccination	0.06(0.025–0.152)	36.66	1	<0.001
I am concerned of the faulty/fake COVID-19 vaccine	0.60(0.286–1.269)	1.78	1	0.182
Cues to action				
I will only take the COVID-19 vaccine if I was given adequate information about it	1.27(0.376–4.302)	0.15	1	0.698
I will only take the COVID-19 vaccine if the vaccine is taken by many in the public	0.32(0.130–0.768)	6.47	1	0.011

Note: Significant p values (p<0.05) are mentioned in bold letters.

Figure 2: Deaths related to COVID-19 (Dabla-Norris et al., 2021)

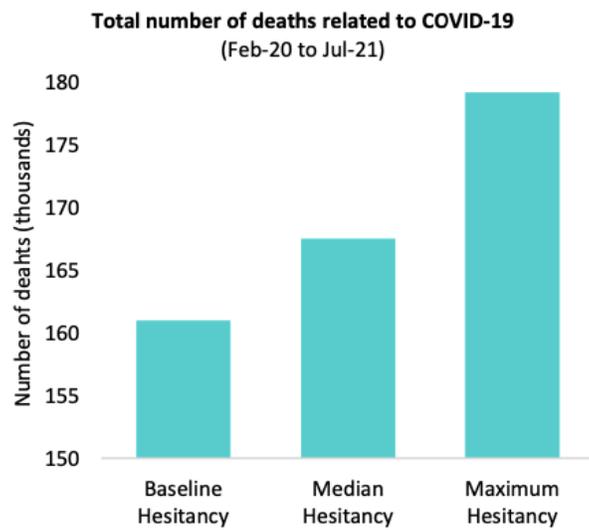


Figure 3: Probability of vaccination and perceptions of COVID-19 (Dabla-Norris et al., 2021)

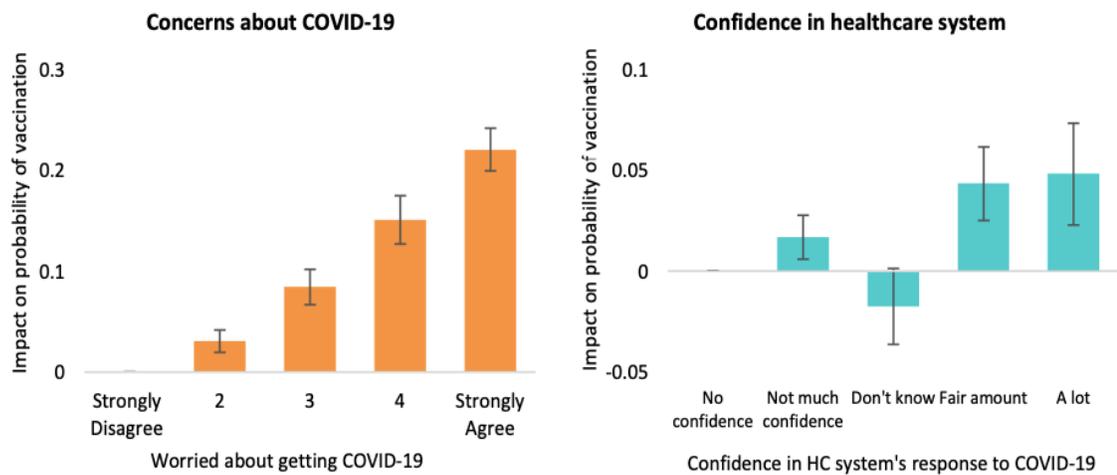


Table 2: Recommendations by Study

<i>Best Practices and Recommendations by Study</i>		
<i>Chen et al., 2006</i>	<i>Ma et al., 2007</i>	<i>Fry et al., 2016</i>

<i>Interventions to increase vaccination rates should increase the general effort to increase the public's awareness of the seriousness of contracting the disease.</i>	<i>Public health efforts should consider the role that perceived susceptibility plays in motivating preventive behavior and should aim to promote a heightened sense of awareness.</i>	<i>Need for development of focused interventions addressing knowledge, awareness, and deficits in provider recommendation to promote PPSV23 uptake in similar populations.</i>
<i>Need for ethnic specific strategies to address vaccination concerns.</i>	<i>Since barriers have been identified as reducing screening and vaccination rates, future interventions to increase screening/vaccination rates among Vietnamese should determine if any barriers are precluding screening/vaccination.</i>	<i>Beyond the clinical setting, strengthening individual and community (particularly minority community) knowledge is critical to reducing the deficit in vaccine uptake.</i>
<i>Develop linguistically appropriate community outreach to provide information on ways to obtain free or low-cost flu vaccination.</i>	<i>Physician recommendations can serve as a powerful cue to action to get screened and vaccinated.</i>	<i>Recommended for the need for alternative sources (social networks, faith-based organizations, and grassroots efforts) for intervention in minority communities</i>
<i>Future interventions for disease prevention will need to be specifically designed to meet the unique barriers to vaccination found in different racial/ethnic populations.</i>		<i>Key stakeholders such as community leaders, parish nurses, and pastors to disseminate information on the importance of PPSV23 vaccination.</i>

Implications and Discussion

The literature has profound implications for the prospect of improving vaccination uptake/rates among ethnic/racial minority adults in the United States. Strengthening individual and minority community knowledge is critical to reducing deficits in vaccine uptake within this

population and future efforts to increase vaccine uptake should enlist key stakeholders such as community leaders and CHWs to disseminate information on the importance of vaccination. This approach may help mitigate perceptions of fear or mistrust. Educational interventions will also need to be contextually and linguistically tailored to increase awareness of perceived risk.

These strategies will help improve vaccine programs and improve vaccine equity by creating healthier communities and lowering disease transmission rates in racial/ethnic minority communities. Furthermore, by creating interventions which are tailored to the specific needs of each individual and minority community, it will help policy makers and other government administrators better understand the needs of the target population. This in return can help create soluble interventions that aim to increase vaccine uptake. By listening to ethnic/racial minority groups' needs, it will allow opportunities for creating sustainable and rigorous interventions to promote vaccine equity.

However, there are several limitations and considerations when exploring vaccination disparities and creating tailored interventions using the HBM model. The first significant limitation to using the HBM model is taking into consideration the use of applying this model as an independent framework for tailored interventions. The HBM model is not a proximate predictor of behavior and behavioral intentions are not included in the HBM model constructs. HBM constructs serve as antecedent of intentions rather than direct predictors of behaviors. Since this model does not predict behavior but rather influences behavior, it is best to combine it with another theory that predicts behavior. Secondly, there are limitations to exclusion criteria and interventions are specific to ethnic/racial minority populations. The findings of this literature were limited to only U.S ethnic/racial minority adult (18+) groups and did not include children or

White populations. Thus, the findings cannot be generalized to all U.S populations. In addition, there are limitations within ethnic/racial minority populations - interventions and solutions that work for one minority group may not work for another (i.e., Hispanic groups v. Asian Americans).

Third, the HBM does not take into consideration cultural/religious barriers and differences that influence vaccine uptake. In particular, religious beliefs may facilitate stigmatizing beliefs. For example, some religious groups strongly oppose vaccination. This can result in the group to have lower vaccination rates as compared to other groups. Fourth, since community-centered interventions are heavily reliant on community involvement of leaders, workers, and members, this can serve as a limitation within itself. While the use of community leaders and workers will produce efficient results in increasing vaccine rates within the community, professionals from outside the community would have much less success. It will be important to place great emphasis on the significance of community leaders/workers promoting vaccine uptake and education through individual and community needs assessments.

From the perspective of the HBM, public health advisors, vaccine programs, and community influencers may wish to focus on increasing PS within the minority groups as a way to increase intention and actual vaccine uptake, thereby decreasing the disparity across all racial/ethnic minority groups. Several approaches may be effective in doing so such as focusing on improving social acceptability of vaccination by emphasizing vaccine education and knowledge sharing. Secondly, by seizing opportunities to reach racial/ethnic minority populations through community events, church gatherings, and trusted venues, with messages that encourage conversations among social circles about the importance, safety, and

effectiveness of vaccinations. This would serve as an important CA and in return shifting vaccine perception and trust. However, for one aspect of the HBM to be effective, all the important constructs must work and be implemented when creating targeted and equitable interventions.

Additionally, for such equitable interventions to work, all aspects should be taken into consideration, including funding. In order to ensure success and sustainability, funding must take a multifaceted approach. Success of interventions is conditional upon funding. Funding will also allow for continuance of engagement and outreach. In order to address vaccine disparities and increase rates, it is important to be consistent with outreach efforts. Lack of funding will likely cause a lack of consistent outreach and, ultimately, lead to demotivation to get vaccinated within the target communities.

More data is needed that captures pre and post intervention information to make better interventions. To ensure evidence-based data is collected, it will be necessary to consistently collect data before and after data with the target population. The data found can potentially help address vaccine disparities among racial/ethnic minority groups. It would also alleviate the economy by promoting better economic output and causing less burden of healthcare costs because of hospital readmissions and emergency visits. Moving forward we need to have strong and sustainable bidirectional trust developed between communities, healthcare providers, and policy makers. By actively listening to the needs of the communities - those suffering from vaccine disparities, it will not only ensure trust-building, but also improved community and vaccine education outreach, better state, local, employer, and community-level policies to create vaccine adherence and prospering communities.

Conclusion

The development of tailored interventions that capture community and individual-centered needs assessment based on strong HBM constructs, can help address vaccine disparities and increase vaccine uptake in ethnic/racial minority communities. Increasing strong provider/family/friend recommendation, enhancing vaccine education and knowledge of perceived health risks, eliminating vaccination barriers, and placing great emphasis on the role and influence community leaders/workers can help address and alleviate vaccine inequity. Listening to the needs of racial/ethnic minority communities will not only ensure strong bidirectional trust between communities and the medical community, but also improve community outreach and create better state, local, employer, and community-level policies to promote vaccine adherence. In the long term, these practices can contribute to community trust, knowledge, and improve the health outcomes of racial/ethnic minority groups with more evidence-based targeted interventions that are community-informed to the needs of racial/ethnic minority populations. These practices will require continuum of community engagement and consistent collaboration between community members, healthcare providers, public health messengers, and policy makers. Overall, Public health and medical communities need to intensify efforts to effectively work across the vaccine uptake continuum to shift individuals' and ethnic/racial minority community attitudes, beliefs, and their decision-making toward vaccine uptake. By drawing on social and behavioral science theories such as the HBM, the public health and medical community may be better equipped to shift individual and community risk assessment more effectively for this population.

References

- Adjei Boakye, E., Tobo, B. B., Rojek, R. P., Mohammed, K. A., Geneus, C. J., & Osazuwa-Peters, N. (2017, November 2). *Approaching a decade since HPV vaccine licensure: Racial and gender disparities in knowledge and awareness of HPV and HPV vaccine*. *Human vaccines & immunotherapeutics*. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5703403/>.
- Alobaidi, S. (2021, May 18). *Predictors of Intent to Receive the COVID-19 Vaccination: JMDH*. *Journal of Multidisciplinary Healthcare*. <https://www.dovepress.com/predictors-of-intent-to-receive-the-covid-19-vaccination-among-the-pop-peer-reviewed-fulltext-article-JMDH>.
- Applying Principles of Community-Based Participatory Research to Your Program*. Health Outreach Partners. (2015, September 30). <https://outreach-partners.org/2011/10/01/applying-principles-of-community-based-participatory-research-to-your-program/>.

- Artiga, S., Michaud, J., Kates, J., & Orgera, K. (2020, September 15). *Racial disparities in flu vaccination: Implications for covid-19 vaccination efforts*. KFF.
<https://www.kff.org/policy-watch/racial-disparities-flu-vaccination-implications-covid-19-vaccination-efforts/>.
- authors, A., & McLaughlin, J. M. (2019, February 22). *Disparities in uptake of 13-valent pneumococcal conjugate vaccine among older adults in the United States*. Taylor & Francis. <https://www.tandfonline.com/doi/full/10.1080/21645515.2018.1564434>.
- authors, A., & Park, J. H. (2021, January 22). *Who is hardest hit by a pandemic? Racial disparities in COVID-19 hardship in the U.S.* Taylor & Francis.
<https://www.tandfonline.com/doi/full/10.1080/12265934.2021.1877566#>.
- Bunis, D. (2021, July 1). *Gap Narrowing for Minority COVID-19 Vaccination Rates*. AARP.
<https://www.aarp.org/health/conditions-treatments/info-2021/minority-vaccination-rates.html>.
- Centers for Disease Control and Prevention. (2012, May 18). *Principles of Epidemiology*. Centers for Disease Control and Prevention.
https://www.cdc.gov/csels/dsepd/ss1978/Lesson3/Section2.html#_ref4.
- Centers for Disease Control and Prevention. (2012, May 18). *Principles of Epidemiology*. Centers for Disease Control and Prevention.
<https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html>.

Centers for Disease Control and Prevention. (2018, February 8). *Vaccination Coverage Among US Adults, NHIS, 2016*. Centers for Disease Control and Prevention.

<https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/NHIS-2016.html>.

Centers for Disease Control and Prevention. (2019, September 26). *Flu Vaccination Coverage, United States, 2018–19 Influenza Season*. Centers for Disease Control and Prevention.

<https://www.cdc.gov/flu/fluview/coverage-1819estimates.htm>.

Centers for Disease Control and Prevention. (2021, April 7). *CDC Awards \$3 Billion to Expand COVID-19 Vaccine Programs*. Centers for Disease Control and Prevention.

<https://www.cdc.gov/media/releases/2021/p0407-covid-19-vaccine-programs.html>.

Centers for Disease Control and Prevention. (2021, May 21). *Flu Disparities Among Racial and Ethnic Minority Groups*. Centers for Disease Control and Prevention.

<https://www.cdc.gov/flu/highrisk/disparities-racial-ethnic-minority-groups.html>.

Centers for Disease Control and Prevention. (n.d.). *Health Equity Considerations and Racial and Ethnic Minority Groups*. Centers for Disease Control and Prevention.

<https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html>.

Chen, J. Y., Fox, S. A., Cantrell, C. H., Stockdale, S. E., & Kagawa-Singer, M. (2006, September 27). *Health Disparities and Prevention: Racial/ethnic Barriers to Flu Vaccinations*.

Journal of Community Health. <https://link.springer.com/article/10.1007%2Fs10900-006-9031-7#citeas>.

- Cheney, M. K., & John, R. (2013). Underutilization of Influenza Vaccine. *SAGE Open*, 3(2), 215824401348473. <https://doi.org/10.1177/2158244013484732>
- COVID-19 Pilot Grant Program Awardees*. Pitt CTSI. (n.d.). <https://ctsi.pitt.edu/funding/funding-opportunities/covid-19-pilot-grant-program/covid-19-pilot-grant-program-awardees/>.
- Crocker-Buque, T., Edelstein, M., & Mounier-Jack, S. (2017, January). *Interventions to reduce inequalities in vaccine uptake in children and adolescents aged <19 years: a systematic review*. *Journal of epidemiology and community health*.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5256276/>.
- Dabla-Norris, E., Khan, H., Lima, F., & Sollaci, A. (2021, May). *Who doesn't want to be vaccinated? Determinants of vaccine hesitancy during covid-19*. IMF.
<https://www.imf.org/en/Publications/WP/Issues/2021/05/06/Who-Doesnt-Want-to-be-Vaccinated-Determinants-of-Vaccine-Hesitancy-During-COVID-19-50244>.
- De las Nueces, D., Hacker, K., DiGirolamo, A., & Hicks, L. R. S. (2012, June). *A systematic review of community-based participatory research to enhance clinical trials in racial and ethnic minority groups*. *Health services research*.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3418827/>.
- Frederick P. Cerise, M. D., Brett Moran, M. D., & Kavita Bhavan, M. D. (2021, January 8). *Delivering Covid-19 Vaccines by Building Community Trust*. *NEJM Catalyst Innovations in Care Delivery*. <https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0692>.

Fry, C. A., Silverman, E. P., & Miller, S. (2016, April 22). *Addressing Pneumococcal Vaccine Uptake Disparities among African American Adults in the United States*. Wiley Online Library. https://onlinelibrary.wiley.com/doi/full/10.1111/phn.12257?saml_referrer.

Huang, J. J., Francesconi, M., Cooper, M. H., Covello, A., Guo, M., & Gharib, S. D. (2018, April 19). *Community health workers on a college campus: Effects on influenza vaccination*. Taylor & Francis. <https://www.tandfonline.com/doi/full/10.1080/07448481.2018.1440582?needAccess=true>.

Immunization and Infectious Diseases. Immunization and Infectious Diseases | Healthy People 2020. (n.d.). <https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives>.

Immunization coverage rate by vaccine for each vaccine in the national schedule. Immunization coverage rate by vaccine for each vaccine in the national schedule - MEASURE Evaluation. (2017, June 9). <https://measureevaluation.org/rbf/indicator-collections/service-use-and-coverage-indicators/dpt3-immunization-coverage.html>.

LaMorte, W. W. (2019, September 9). *The Health Belief Model*. Behavioral Change Models. <https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories2.html>.

Logan, J. (n.d.). *Disparities in influenza immunization among US adults*. Journal of the National Medical Association. <https://pubmed.ncbi.nlm.nih.gov/19378634/>.

Los Angeles County Department of Public Health. (2021, February). COVID-19 Vaccine Equity Committee Assessment and Recommendations Report (internal use report).

Lu, P.-J., Rodriguez-Lainz, A., O'Halloran, A., Greby, S., & Williams, W. W. (2014, December). *Adult vaccination disparities among foreign-born populations in the U.S., 2012*. American journal of preventive medicine. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5822444/>.

Lu, P.-Jun, O'Halloran, A., Williams, W. W., Lindley, M. C., Farrall, S., & Bridges, C. B. (2015, December). *Racial and Ethnic Disparities in Vaccination Coverage Among Adult Populations in the U.S.* American journal of preventive medicine. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5824643/>.

Ma, G. X., Fang, C. Y., Shive, S. E., Toubbeh, J., Tan, Y., & Siu, P. (2007, January 30). *Risk Perceptions and Barriers to Hepatitis B Screening and Vaccination among Vietnamese Immigrants*. Journal of Immigrant and Minority Health. <https://link.springer.com/article/10.1007%2Fs10903-006-9028-4>.

Martinez, M. L., & Coles, S. (2020, May 26). *Addressing immunization health disparities*. Primary Care: Clinics in Office Practice. <https://www.sciencedirect.com/science/article/abs/pii/S0095454320300336>.

Medenhall, G. (2020, August 25). *Unvaccinated adults cost the U.S. more than \$7 billion a year*. UNC Eshelman School of Pharmacy. <https://pharmacy.unc.edu/2016/10/unvaccinated-adults-cost-u-s-7-billion-year/>.

- Melillo, G. (2021, April 1). *Disparities in COVID-19 Vaccine Rates Tarnish Swift US Rollout*. AJMC. <https://www.ajmc.com/view/disparities-in-covid-19-vaccine-rates-tarnish-swift-us-rollout>.
- Nambi Ndugga Follow @nambinjn on Twitter, O. P. (2021, July 8). *Latest Data on COVID-19 Vaccinations by Race/Ethnicity*. KFF. <https://www.kff.org/coronavirus-covid-19/issue-brief/latest-data-on-covid-19-vaccinations-race-ethnicity/>.
- Nambi Ndugga Follow @nambinjn on Twitter, O. P. (2021, June 9). *Latest Data on COVID-19 Vaccinations Race/Ethnicity*. KFF. <https://www.kff.org/coronavirus-covid-19/issue-brief/latest-data-on-covid-19-vaccinations-race-ethnicity/>.
- Nancy K. Janz, M. H. B. (1984, March 1). *The health Belief model: A decade later - Nancy K. Janz, Marshall H. BECKER, 1984*. SAGE Journals. <https://journals.sagepub.com/doi/pdf/10.1177/109019818401100101>.
- Office of Minority Health*. Offices of Minority Health at HHS - The Office of Minority Health. (n.d.). <https://www.minorityhealth.hhs.gov/omh/browse.aspx?lvl=2&lvlid=7>.
- Ozawa, S., MV, M., NA, M., Al., E., D, W., SS, H., MR, G., DR, F., MR, M., M, K., TA, H., MR, H., TA, C., JK, H., LA, R., PH, R., WK, V., A, B., WW, W., ... J, H. (2016, November 1). *Modeling The Economic Burden of Adult Vaccine-Preventable Diseases in The United States: Health Affairs Journal*. Health Affairs. https://www.healthaffairs.org/doi/10.1377/hlthaff.2016.0462?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%2B%2B0pubmed.

Racial Disparities in Flu Vaccination: Implications for COVID-19 Vaccination Efforts. KFF.

(2020, September 15). <https://www.kff.org/policy-watch/racial-disparities-flu-vaccination-implications-covid-19-vaccination-efforts/>.

Rahman, R., Ross, A., & Pinto, R. (2021, February 11). *The critical importance of community health workers as first responders to COVID-19 in USA.* Health promotion international.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7928891/>.

Rangel, M. C., Shoenbach, V. J., Weigle, K. A., Hogan, V. K., Strauss, R. P., & Bangdiwala, S. I. (2005, May). *Racial and ethnic disparities in influenza vaccination among elderly adults.*

Journal of general internal medicine.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1490119/>.

Rodrigues, C. M. C., & Plotkin, S. A. (2020, July 14). *Impact of Vaccines; Health, Economic and Social Perspectives.* Frontiers in microbiology.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7371956/>.

San Francisco Department of Public Health.

https://www.sfdph.org/dph/alerts/files/04.15.21_COVID-19_Vaccine_Site_Mission.pdf.

(n.d.). <https://www.sfdph.org/dph/default.asp>.

Scarinci, I. C., Pandya, V. N., Kim, Y.-I., Bae, S., Peral, S., Tipre, M., Hardy, C., Hansen, B., & Baskin, M. L. (2021, March 22). *Factors Associated with Perceived Susceptibility to COVID-19 Among Urban and Rural Adults in Alabama.* Journal of community health.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7983968/>.

Simmons, A., Chappel, A., Kolbe, A., Bush, L., & Sommers, B. (2021, March 16). *Health Disparities by Race and Ethnicity during the COVID-19 Pandemic: Current Evidence and Policy Approaches*. ASPE. <https://aspe.hhs.gov/pdf-report/health-disparities-during-covid-19>.

Stephen Miller, C. E. B. S. (2021, July 7). *Employers Step Up Efforts to Raise Workers' Vaccination Rates*. SHRM. <https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/employers-step-up-efforts-to-raise-worker-vaccination-rates.aspx>.

Topic: Racial / ethnic minorities. (n.d.). <https://www.ahrq.gov/topics/racial-ethnic-minorities.html>.

Vaccination Programs: Community-Based Interventions Implemented in Combination. The Guide to Community Preventive Services (The Community Guide). (2020, September 30). <https://www.thecommunityguide.org/findings/vaccination-programs-community-based-interventions-implemented-combination>.

Vaccination Programs: Community-Based Interventions Implemented in Combination. The Guide to Community Preventive Services (The Community Guide). (2020, September 30). <https://www.thecommunityguide.org/findings/vaccination-programs-community-based-interventions-implemented-combination>.

Vaccination Programs: Health Care System-Based Interventions Implemented in Combination. The Guide to Community Preventive Services (The Community Guide). (2020, September 30). <https://www.thecommunityguide.org/findings/vaccination-programs-health-care-system-based-interventions-implemented-combination>.

- Walker, A. T., Kolasa, M., & Smith, P. J. (2014, April 18). *Reduction of Racial/Ethnic Disparities in Vaccination Coverage, 1995–2011*. Centers for Disease Control and Prevention. <https://www.cdc.gov/mmwr/preview/mmwrhtml/su6301a3.htm>.
- Willis, E., Sabnis, S., Hamilton, C., Xiong, F., Coleman, K., Dellinger, M., Watts, M., Cox, R., Harrell, J., Smith, D., Nugent, M., & Simpson, P. (2016). *Improving Immunization Rates Through Community-Based Participatory Research: Community Health Improvement for Milwaukee's Children Program*. Progress in community health partnerships: research, education, and action. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4869973/>.
- Ye, L., Fang, T., Cui, J., Zhu, G., Ma, R., Sun, Y., Li, P., Li, H., Dong, H., & Xu, G. (2021, January 2). *The intentions to get vaccinated against influenza and actual vaccine uptake among diabetic patients in Ningbo, China: identifying motivators and barriers*. Human vaccines & immunotherapeutics. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7877400/>.

Appendix

Competency	Capstone
Communication	
20. Describe the importance of cultural competence in communicating public health content	Identify priorities for academic partners seeking to engage ethnic/racial minority communities in a culturally competent and identifying strategies and approaches to establish trust.
	Communicated ILEX topic on written paper; Vaccination disparities among racial/ethnic minorities and provided an oral presentation.
Evidence-based Approaches to Public Health	
	Conducting literature reviews, using multiple databases to identify relevant scholarship for the topic.
Public Health & Health Care Systems	
	Addressing social inequities and gaps in health inequity in minority communities as it relates to vaccination.
Planning & Management to Promote Health	

	<p>Assessing the needs of minority populations through individual and community needs based assessment using a Theoretical Framework Model. Suggested development of tailored interventions to address vaccination disparities and health outcomes of minority communities.</p>
<p>CPHP Competency</p>	
	<p>Analyzed racial/ethnic disparities and incorporating Community-based Participatory Research principles to create culturally appropriate solutions. Highlighting specific needs for racial/ethnic minority populations to be implemented.</p>