COVID-19 Mitigation Behaviors in Hmong Americans

By

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DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

NURSING SCIENCE AND HEALTH CARE LEADERSHIP

in the

OFFICE OF GRADUATE STUDIES

of the

UNIVERSITY OF CALIFORNIA

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2022

Dedication

This dissertation is whole heartedly dedicated to my parents, Tou Yer Moua and Lou Moua. You gave everything so that I can have the opportunity to have a higher education. For your endless love, support, and encouragement, it allowed me to chase not just after my dreams but your dreams as well. This dissertation and resulting doctoral degree are a symbol of your endless love and support.

I would also like to dedicate this work to Kora Vang, my precious daughter. You are my constant source of motivation. This work is a testament of the sacrifices that everyone made, just so that this endeavor could be possible. I hope that this work will be a beacon for your goals and dreams in life. May you never stop learning and always reaching for the stars.

Acknowledgements

Throughout my schooling and the writing of my dissertation, I have received a great deal of support and assistance.

I have been generously funded by the Betty and Gordon Moore Foundation to support my coursework and dissertation research throughout my doctoral studies. I am also greatly appreciative of the financial support from Michael and Carol Corbett, the benefactor of the Michael and Carol Corbett Award scholarship.

I am greatly appreciative and thankful to all the individuals who volunteered their participation in this project and the recruitment partners who helped shared this study.

The completion of my dissertation would not have been possible without the support and nurturing of my research mentor and chair, Dr. Sheryl Catz. I would like to acknowledge and express my deepest appreciation for her many years of thoughtful guidance and ongoing support throughout my doctoral work. Your insightful feedback, expertise, and guidance helped pushed my work to fruition by providing me with the tools and resources to successfully complete my dissertation.

Additionally, I would like to extend my sincere thanks to my committee members, Dr. Dian Baker, Dr. Lorena Garcia, and Dr. Christiana Drake, who advised me through each step of my doctoral journey.

During the beginning phases of my schooling, I was given great insight and support from Dr. Bill Randall, a former PhD scholar at the Betty Irene Moore School of Nursing. You not only lend me your books, but provided invaluable insight and recommendations, that has led me to make academic decisions to be where I am today. Thank you for helping students like me thrive at the school of nursing.

I am extremely thankful for my family and friends, who have never stopped supporting me in my educational and professional endeavors. I would like to specifically thank my sister Jolly Moua. Thank you for helping me achieve this dream by helping mom and dad raise Kora for me. This was the hardest sacrifice I had to make and helping raise Kora as your own allowed me to make this dream come true. Words cannot express how grateful I am to have you as my sister.

Finally, I would like to acknowledge my wonderful husband, Edward Vang and our beautiful daughter, Kora. Thank you for your never-ending support and motivation that pushed me to go back to school. Thank you for always putting up with me unquestioningly and supporting me through every step of my schooling. Lastly, thank you for always being the pillar in my life. You allowed me to explore endless opportunities and never once stopped believing in my capabilities.

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Abstract

Introduction: The unique sociocultural context of Hmong people in United States has historically contributed to health and public health challenges for this community. This study was among the first to investigate contextual and sociocultural factors associated with COVID-19 illness and mitigation behaviors in Hmong Americans. The goals of this study were to: 1) describe COVID-19 health seeking and mitigation behaviors, and related information, motivation, and behavioral skills among Hmong American adults, and 2) to examine contextual and sociocultural factors that may be associated with masking, social distancing, group gatherings, and vaccination uptake in Hmong Americans.

Methods: A cross-sectional web survey was conducted between April 8, 2021, to June 1, 2021, with Hmong Americans aged 18 and over. Descriptive statistics were used to summarize the overall characteristics and COVID-19 related behaviors of Hmong Americans. Chi-square and Fisher's Exact Test were computed to describe COVID-19 mitigation behaviors by gender and generational status (a marker of acculturation).

Results: The sample included 507 participants who completed the survey. Most of the participants reported participating in mitigation interventions to keep themselves safe from COVID-19. Mitigation behavior assessment shows that 88.9% (449 of 505) of the participants masked all the time, 55.3% (270 of 496) maintained 6 feet when leaving home all the time, 68.32% (345 of 505) avoided group gatherings or crowds the last 30 days, 72.3% (366 of 506) avoided public spaces, gatherings or crowds the last 30 days, and 69.17% (350 of 506) received the COVID-19 vaccine. Different patterns of behaviors surfaced for generation and gender. Hmong American women were more likely to avoid family (P=.005) and social gatherings

(*P*=.009) and stay 6 feet from people outside their household (*P*=.005) compared to men. Third generation individuals were more likely to avoid gatherings of 10 or more (*P*=.010) and first-generation individuals were more likely to avoid public spaces, gatherings, or crowds (*P*=.003). Hmong community leaders were social influencers to masking (*P*=.029), social distancing (*P*=.022), group gatherings (*P*=.026), and vaccination (*P*=.037) for Hmong American men. Government officials and healthcare providers were social influencers for Hmong American women for masking and social distancing. Government officials were social influencers on masking behaviors for first generation individuals (*P*<.000), family were social influencers on social distancing for second generation individuals (*P*=.038), and family were social influencers for group gatherings (*P*=.041) and vaccination uptake (*P*=.011) in third generation individuals. Participants and their families trying to stay healthy reported seeking care from a medical doctor. However, when trying to prevent and treat COVID-19, participants reported preferring to use Hmong medicine and traditional approaches.

Conclusion: Social influences play a significant role in COVID-19 mitigation behaviors including masking, social distancing, avoiding group gatherings, and vaccination uptake. Hmong Americans reported using both Western medical and traditional Hmong approaches to manage and treat symptoms of COVID-19. These findings have implications for identifying and implementing culturally appropriate health messages, future public health interventions, policy development, and ongoing research with this population.

CHAPTER ONE

Introduction

In late 2019, an epidemic of a novel coronavirus (n-CoV) was brought to the public's attention after an outbreak in Wuhan, China. This new variant of coronavirus is identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which causes Coronavirus Disease 2019 (COVID-19). SARS-CoV-2 led to a world-wide outbreak which was identified by the World Health Organization (WHO) in March 2020 as a pandemic.[1,2] The spread of SARS-CoV-2 flourished across the world, particularly impacting and devastating communities with social and economic inequities.[1,3] The specific inequities and disparities in different racial and ethnic groups impacted by COVID-19 are limited as disaggregated data on racial and ethnic groups cease to exist further exacerbating an understanding on the acceptance, adoption, and adherence to mitigation efforts to prevent and control the spread of COVID-19.

COVID-19 Mitigation Interventions

Public health experts initiated mitigation efforts to contain and prevent the spread of the virus by enforcing masking, social distancing, avoidance of group gatherings, and vaccination uptake.[4,5] Guidance for masking includes wearing a mask when leaving the house and when in enclosed public spaces. Masks can help reduce the spread of droplets when worn over the mouth and nose.[6] Whereas for social distancing and avoiding group gatherings can help prevent the spread of the virus by reducing physical interactions by maintaining 6 feet apart from individuals outside of their household and reducing the number of people they physically interact with.[7] Mitigation strategies were endorsed to enhance public safety measures, however, compliance varied as reduction of COVID-19 transmission required individual level health behaviors.[8] The United States (US) Department of Health and Human Services highlight multilevel factors that

exist at the personal, organizational, and policy level, which in turn shape health behaviors.[9] When mitigation interventions were initiated, personal level factors were largely ignored to address upstream factors, such as organization and policy levels. As the pandemic progressed, it became clear that it was personal level factors such as contextual and sociocultural factors that impeded adoption, acceptance, and adherence to mitigation behaviors.[3,10]

Furthermore, initial information on COVID-19 were evolving and many sources of information were quickly inundated with misinformation and unreliable methods of prevention and COVID-19 treatment.[11] Identified as an "infodemic," Zarocostas [11] explains that an infodemic occurs when there is an overload of information, containing both true and false information. The abundance of false or unverified information about a problem or major crisis that is often fueled by social media, news outlets or online platforms can instill fear and speculation, making the problem worse.[12] In an effort to address the pandemic infodemic, the World Health Organization [12] aimed to provide interventions and messages that are based on science and evidence; provide translatable knowledge and behavior-changing messages; reaching out to key community leaders to better tailor advice and messages; and form strategic partnership with social media and technology platforms. However, despite these aims and objectives, distrust of government and science, poor health literacy, and continual misinformation prevent individuals from obtaining reliable information.[3]

In understanding ethnicity and its link to COVID-19, ethnic minorities were more prone to underlying health conditions compared to non-Hispanic Whites and have cultural and socioeconomic factors that predispose them to worse health outcomes, susceptibility to infection, hospitalizations, and deaths.[13,14] At the time this research was proposed, people of color

experienced disproportionate burden of COVID-19 cases and deaths.[15] Of those who have died from COVID-19, over half of the dead were ethnic minorities.[16] Cumulative data over time later showed that disparities have narrowed for Blacks and Hispanic people while rising COVID-19 cases, hospitalization, and deaths are occurring in non-Hispanic Whites despite having the highest rates of vaccination.[15,17,18] Furthermore, the of lack of disaggregated data in ethnic minority groups (e.g., Asian American subgroups) prevents public health experts from understanding the vulnerabilities among various groups experience during the COVID-19 pandemic. COVID-19 data on Asian Americans fails to identify the disproportion of disparities among Asian Americans as disparities vary by location and not all Asian American groups are homogenous resulting in difficulty identifying socioeconomically vulnerable groups.[19] COVID-19 cases and deaths for Asian Americans remain relatively low compared to other populations. The data may mask varying underlying disparities as subgroup variation exist at both ends of the socioeconomic scale for Asian Americans.[15,19] Inequities and disparities among different subgroups have a significant role in poorer health outcomes and higher rates of morbidity and mortality.[20] Factors that can contribute to the increased spread of COVID-19 among Asian American groups include individuals who work in precarious industries resulting in low wages and unsafe or limited workplace protection, are less likely educated, live in overcrowded living situations, and have unequal access to healthcare.[16,21] Cultural differences and vulnerabilities exist between different Asian American subgroups, challenging inclusive mitigation efforts to contain the spread of the COVID-19 among groups such as Hmong Americans.

Hmong Americans and COVID-19

Current studies on the impact of COVID-19 in ethnic minority groups are limited, even more so in Hmong Americans. While reducing transmission requires the adoption, acceptance

and adherence to mitigation strategies, behaviors within the contextual and sociocultural factors needed to be understood. Sociocultural factors are forces within cultures and societies that influence an individual's thoughts, feelings, and behaviors.[22] To contain and control virus transmission in marginalized and vulnerable communities that have difficulty in adhering to mitigation guidelines (e.g., masking, social distancing, avoiding gatherings, and vaccination uptake) differences between individual and social structures should be recognized.

The Hmong are refugees who fled to the United States after the Vietnam War, and for decades have experienced poverty, educational inequity, and health disparity.[23,24] While some Hmong Americans have been in the United States for over 40 years, socioeconomic barriers and acculturation to the US mainstream have prevented many Hmong Americans from achieving socioeconomic success. The ability to acculturate to a new or host culture can profoundly affect one's well-being and livelihood. Acculturation is a change process that results from constant interactions between two distinct cultures, resulting in learned values, behaviors, lifestyles and language of the host culture.[25] The literature points out that the inability to acculturate to the host culture has resulted in poor health outcomes for health and other areas of functioning.[25-28] Among Hmong Americans, the major contributors to the high morbidity and mortality are likely because of underutilization and rejection of formal healthcare services, low use of preventative care, delay in seeking critical health services, and low health literacy.[29-32] Hmong American health behaviors include actions that are influenced by sociocultural beliefs and practices. Inherent health beliefs and practices in Hmong Americans include a complex infrastructure of cultural influences on healing practices, use of traditional medicine, religious beliefs, disease perception, social organization, and family roles.[24,29,33,34] In addition, health literacy contributes

to poor health outcomes in Hmong Americans.[35-37] The inability to understand health conditions and illnesses has delayed Hmong Americans from seeking critical healthcare services when ill.[38]

Besides traditional views on health and illness, Hmong Americans may perceive health and illnesses to have natural and supernatural causes. Rooted in the Hmong culture, some Hmong Americans may have animistic beliefs that all objects, places, and creatures have distinct spiritual ties that dominate all aspects of human life, including an individual's health. When spiritual ties become unbalanced, disrupted, or result in the loss of one's soul, the Hmong engages in spiritual ceremonies to restore the imbalance. To prevent one's soul from becoming lost, the Hmong will engage in practices of tying a string to the wrists or limbs to prevent the soul from leaving their body.[39] Other practices include using a shaman to travel to the spirit world to restore one's soul and may sometimes use animal sacrifices as a peace offering to other spirits in the spirit realm with the belief that it can restore one's soul and health.[39-41] Illnesses that are perceived to be caused by spiritual or supernatural causes will often result in the refusal to use Western healthcare services unless all other traditional practices have become futile.[34] Although many Hmong Americans engage in shamanistic rituals to help maintain and restore health, not all Hmong Americans take part in such activities. Some Hmong Americans have diverted away from shamanistic rituals but may keep the belief that health problems may have spiritual causes and will pray for healing in place of shamanistic rituals.[42]

Problem Statement

To better understand the impact of COVID-19 in Hmong Americans, further studies will be needed to focus on COVID-19 prevention related information, motivation, behavioral skills, and health behaviors such as masking, social distancing, group gatherings, and vaccination

intention and use. There is not much data or reports on Hmong American mitigation behaviors during the COVID-19 pandemic. Hmong American attitudes about masking, social distancing, group gatherings, and COVID-19 vaccine is currently unknown. Concerns for COVID-19 mitigation behaviors will require further studies to understand and address the underlying barriers and facilitators during the pandemic. It is unknown if contextual factors such as gender, acculturation (as measured by generation status), and sociocultural structures of Hmong Americans may influence behaviors, values, and beliefs that would prevent them from adopting, accepting, or adhering to mitigation strategies. In addition, the lack of COVID-19 data on Hmong Americans does not allow for an understanding of COVID-19 related disparities, leading to a gap for consistent COVID-19 response policies and interventions aimed at this community. While resources and funding allocation are based on racial and ethnicity data, missing or unavailable data prevent proper resource allocation.[43] Therefore, to design specific and tailored public health and healthcare messaging about COVID-19, more research is required to explain the barriers and facilitators for COVID-19 understanding and prevention among Hmong Americans.

Purpose of the Study

The aim of this study is to describe individual and social COVID-19 mitigation behaviors of Hmong Americans and to assess the contextual and sociocultural factors that may assist or impede mitigation behaviors in Hmong Americans. The Information Motivational Behavioral Skills Model (IMB) will be used to assess the association between masking, social distancing, avoiding group gatherings, and vaccination intention and use among Hmong Americans. The model posits that adherence to masking, social distancing, avoidances of group gatherings, and vaccination uptake is a function of the individual's knowledge of SARS-CoV-2/COVID-19

mitigation related information, motivation to carry out the prevention, and behavioral skills in conducting specific preventative behaviors.[44,45] The model further assumes that information and motivation may have a direct or indirect effect on the individual's behavior based on the behavioral skills.[44,45] There is currently, no theory-based model to assess SARS-CoV-2/ COVID-19 mitigation behaviors among Hmong Americans. Therefore, a behavioral framework such as the IMB model is the best available model to understand mitigation behaviors, knowledge, and attitudes to guide public health interventions or education targeting this population due to its ability to measure explicit relationships among constructs that are determinants of health behaviors. Currently little is known about how specific public health messaging design for the Hmong American community may be optimized. Therefore, theoretical evidence is needed to guide the development of specific culturally sensitive mitigation interventions targeting masking, social distancing, avoiding group gatherings, and vaccination uptake among Hmong Americans. At the time of this study, there are no known studies on Hmong Americans' COVID-19 mitigation behaviors and COVID-19 vaccination uptake during the COVID-19 pandemic. This study will measure Hmong Americans' COVID-19 mitigation behaviors and health seeking behaviors regarding both traditional Hmong and Western health approaches during the COVID-19 pandemic. The central research question to address the problem highlighted above will be as followed: *What are the Hmong Americans SARS-CoV-2/COVID-19 prevention-related information, motivation, behavioral skills, and health behaviors and how are these influenced by culturally relevant socio-contextual factors?*

Specific Aims

To achieve the overall purpose of this proposed study, the following specific aims will be addressed using a web-based survey of Hmong Americans living in the United States ages 18 and older:

Aim 1: Describe COVID-19 mitigation-related information, motivation, behavioral skills, and behaviors among Hmong Americans.

Aim 2: Examine associations among COVID-19 mitigation behaviors and contextual factors and sociocultural factors that would influence masking, social distancing, group gatherings, and vaccination uptake in Hmong Americans.

It is expected that the knowledge gained from this study will increase our understanding of Hmong American COVID-19 mitigation behaviors and the sociocultural and contextual factors that influences such behaviors. The research findings will provide evidence that will increase our understanding of Hmong American COVID-19 mitigation behaviors to help aid public health experts with proper education and interventions towards the prevention and control of COVID-19 in Hmong Americans.

Chapter Two

Literature Review

Novel Coronavirus

The novel coronavirus (n-CoV) is a series of viral diseases that can be transmitted between animals and humans. Known as spillover, Johnson CK et al[46] points out that spillover occurs when zoonotic viruses are transmitted from animals to humans and spread by a secondary transmission between humans. Johnson CK et al[46] argues that spillover unleashes potential pandemic characteristics as these viruses are often associated with high-risk disease transmission, human to human transmissibility and geographic distribution. To date, six known spillover coronaviruses have been identified with the latest known coronavirus transmissions called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), now known as Coronavirus Disease 2019 (COVID-19).[47]

Etiology, Transmissibility and Susceptibility

Known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), experts are investigating bats as a likely reservoir, since Rhinolophus bats were known to have anti-SARS-CoV antibodies and were >96% homologous with the current SARS-CoV-2 virus.[47] However, investigation is still underway to find the source of the viral variant. COVID-19 is a highly contagious respiratory disease that spreads directly or indirectly between people. Sources of transmission can include close contact with infected people through aerosol droplets released from the mouth, nose or contact with contaminated objects or surfaces.[48] According to the World Health Organization [48] transmission can occur with or without symptoms, occur right before someone develops symptoms, or when someone is in close proximity of an infected person for a prolonged period. Using face masks, proper hand hygiene, and physical distancing can limit an

individual's risk for becoming infected with COVID-19. Therefore, mitigation efforts were placed to prevent the spread of the infection through social distancing and masking requirements. However, despite such efforts, reported cases of outbreaks in close settings such as restaurants, bars and places of worship revealed that crowded indoor locations with inadequate ventilation can also increase the risk of getting infected with COVID-19.[48]

In understanding transmissibility and susceptibility in the earlier phases of the outbreak, Shi et al[49] found that individuals who were at higher risk for being severely sick with COVID-19 included individuals who were male, ages 65 and over, and experiencing underlying health condition such as hypertension, diabetes, cardiovascular disease and cancer. Developing data on COVID-19 later revealed similar characteristics that places individuals at higher risk for active COVID-19 infection. These include pre-existing conditions, certain racial and ethnic minority groups, pregnant and breastfeeding women, people with disabilities, developmental and behavioral disorders and individuals with drug use and substance use disorder.[50] Interestingly, children are not in particular risk for severe disease due to the differences in their immune system.

A specific protein in the body was found to allow for the infection of COVID-19. Angiotensin-converting enzyme 2 (ACE2) has been identified as a function receptor for SARS-CoV and SARS-CoV-2.[51,52] ACE2 can be found in various parts of cells and tissues of the lungs, heart, blood vessels, kidney, liver, and gastrointestinal tract. ACE2 is a protein receptor that helps regulate functions in the cell and plays a pivotal role in the blood pressure regulation, inflammation, and wound healing.[51] With spike-like protein on its surfaces, it provides an anchor for the SARS-CoV-2 virus to bind to the ACE2, acting as a receptor for the virus that causes COVID-19.

Symptomology of COVID-19

While there are numerous factors that can impact the spread of COVID-19, the symptomatology of COVID-19 varies. Symptoms for COVID-19 may appear after an incubation period of 5-14 days, however, individuals may be infectious up to 48 hours before the onset of symptoms.[53,54] Therefore, individuals can transmit the infection without knowing they are infectious. A test from saliva or a nasal and throat swab can determine if an individual has been infected with COVID-19 with 93 percent accuracy between silva and oropharyngeal swab in comparison with nasopharyngeal with 97.7 percent accuracy.[55] The time frame between initial symptoms to death from COVID-19 can range anywhere from 6-41 days, with a shorter time span for individuals who are over the ages of >70, and those who are immune compromised.[53] The most common symptoms for COVID-19 included fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea, vomiting, and diarrhea.[54] Less common symptoms include skin changes, eye problems, and gastrointestinal symptoms.[56] However, the virus has been found in urine and fecal products, therefore, the Centers of Disease Control and Prevention (CDC) also recommends that healthcare providers consider testing feces and urine to exclude potential sources of transmission.[57] Since symptomology varies between individuals, the Centers for Disease Control and Prevention [58] advises that individuals who are sick to self-isolate for 10 days, avoid public transportation or gatherings, wear a face covering when going out, and seek medical attention if symptoms of COVID-19 worsen, such as high fever, difficulty breathing, bluish lips, and confusion.

Cases and Fatalities

Since the outbreak of COVID-19, there have been over 500 million reported cases of COVID-19 and 6 million people succumbing to the disease.[59-61] The United States is the leading country with the most COVID-19 cases and deaths. At the time of study, there are over 20 million COVID-19 cases and over 350,000 deaths in the United States as experts grapple with the challenges to suppress the spread of COVID-19 and its increasing death toll.[62] In an analysis of deaths among ethnic minorities, of those who succumbed to COVID-19, over 52% of the deaths are from people of color.[63] Ethnic minorities account for 40% of the US population.[64] The toll on ethnic minorities during the pandemic illustrates the alarming disparities and inequities in ethnic minorities.

Initial data revealed that Black communities experienced significant adversities during the pandemic. However, as more data about COVID-19 related deaths become available, Flagg et al[63] analysis of ethnic minority deaths during the COVID-19 pandemic identified Asian Americans similar to Blacks and Hispanics who have suffered the highest percentage of deaths. Asian American deaths during the pandemic have received little attention due to the small numbers whom have died, however the 35 percent increase in Asian American deaths is comparable to Hispanic Americans who have the second highest.[63] Flagg et al[63] argues that racial disparity plays a significant role in the deaths of ethnic minorities during the COVID-19 pandemic. Significant disparities among different racial groups, in addition to socioeconomic factors and unequal access to healthcare are contributors to poor outcomes.

Mitigation Interventions and COVID-19 Information

In 1918, the influenza pandemic occurred affecting 500 million people world-wide and killing over 50 million people.[65] While this highly infectious disease spread around the world,

the only preventative measures included social isolation, good personal hygiene, and limiting public gatherings as there were no vaccines or antibiotics to treat secondary infections.[65] Since the influenza pandemic, many strides were accomplished to understand the role of mitigation efforts such as social isolation, personal hygiene, and use of face masks to suppress the spread of infection. Regardless of what has been learned from previous outbreaks, there continues to be challenges with mitigation efforts as contextual factors, socioeconomic disadvantages and inequities prevent individuals from effectively adopting preventative interventions.

While information about this virus is revolving, millions of lives are impacted as scientists, experts and researchers scramble to understand this new virus by looking to find reliable testing kits, plausible treatment plans, and a vaccine.[66] The staggering cases of COVID-19, lack of healthcare resources, limited hospital beds, and staffing shortages, led public health experts to initiate mitigation efforts to contain and prevent the spread of COVID-19 globally by enforcing social distancing, masking, and stay at home orders.[4] Economic downturn occurred as millions of people are forced to stay home, cascading a domino effect on financial loss, unemployment, and uncertainty.

To prevent further COVID-19 cases and deaths, preventative interventions such as social and physical distancing, personal hygiene, and use of face masks were initiated globally. Communication and information control was essential to limit negative information and promote public trust when trying to implement public health interventions,[67] especially during public health emergencies such as pandemics that necessitate population level action. Multilevel factors associated with healthcare providers, government systems and researchers revealed that many underserved communities have historically experienced abuse or punitive measures for seeking healthcare or government assistance, resulting in complex distrust issues.[68]

Therefore, when trying to understand inclusive control measures during the COVID-19 pandemic, Berger et al[3] stresses the importance of transparent information, pointing out that confusing information can have detrimental effects as vulnerable and underserved communities will resort to seeking information from unreliable alternative sources. Berger et al[3] highlights the need to provide timely and transparent information is crucial to seizing control of media reports, public discourse, and any rumors associated with events. Congruently, O'Malley et al[67] believe that by providing transparent information, protective behaviors can be adopted in a timely manner, leading to heightened disease surveillance, and mitigation intervention compliance. To suppress the spread of infection, mitigation strategies are crucial to reducing and preventing the spread of COVID-19. Mitigation strategies for the COVID-19 pandemic include promoting healthy hygiene, staying at home when ill, physical and social distancing, and use of cloth face covering.[54]

However, when faced with mixed information and varying mitigation efforts from one geographic location to another, people will most likely ignore or distrust the information. As COVID-19 is an evolving phenomenon and experts are learning new facts every day, this can contribute to mixed information that can lead to information fatigue. Information fatigue can occur when individuals are inundated with information from various sources. Whether these sources are true or not, excess information from the media, internet or at work can result in mental exhaustion and stress.[69] Being overloaded with information can prevent individuals from processing new information which can help impede learning and decision making.[70]

This does not include the need to have equitable and inclusive control measures. Berger et al[3] points out that control measures must be equitable and inclusive when implementing mitigation strategies in communities with COVID-19 transmissions. A commitment to inclusion

needs to occur as vulnerable populations are those who are the most sensitive to containment and mitigation efforts such as the homeless, elderly, those without adequate health insurance, people of color, or low socioeconomic statuses.[3] Since the widespread infection of COVID-19 in the United States, vulnerable populations such as the elderly and underserved ethnic minorities, are those who have been accounted for most of the deaths.[62] While it is known that the most effective strategy to contain and prevent the spread of COVID-19 is social distancing, this intervention remains to be a challenge. The ability to remain at home, maintain safe social distancing, work from home, or telecommute is a privilege that many communities do not have. The racial and socioeconomic inequities among vulnerable and underserved populations places these individuals at significant risk for contracting COVID-19 or increased COVID-19 mortality when social distancing and isolation is difficult to maintain.[3,71]

Furthermore, the use of face masks continues to remain controversial as some Americans refuse to mask while out in public. Initial communication of mask use provided mixed information about the risks and benefits of masking. Commercially manufactured facemasks are high in demand due to insufficient facemask production; therefore, healthcare and government official's initial facemask messaging was to reserve facemask for frontline workers. As the spread of infection increased, the CDC later issued recommendations for face coverings while in public settings. Arguments for the use of facemask were aimed to control the spread of infection. While some states have incorporated masking mandates to reduce the spread of COVID-19, not all states have enforced such executive order. At the time of study, recommendations included the use of a face mask with two or more layers of washable, breathable fabric to reduce the spread of infection by trapping droplets when sneezing or coughing.[54] Overtime, more contagious COVID-19 variants warranted the need for higher levels of protection prompting

health and public health officials to change masking recommendations to use only well-fitting NIOSH-approved masks such as surgical masks, KN95s or N95s masks.[72]

With ongoing changes to recommendations for COVID-19, misinformation, and the lack of cohesive statements from the political and scientific community, many individuals are confused between plausible and false preventative interventions. Goals to develop and successfully deploy medications and vaccines against COVID-19 had researchers across the globe scrambling at the time this study was launched. Particularly with vaccinations, as vaccination development, clinical trials for efficacy, and the United States Food and Drug Administration (FDA) approval for vaccination use is often time-consuming and laborious. The first FDA approved vaccine against COVID-19 was issued under the emergency use authorization on December 11, 2020.[73] Produced by Pfizer-BioNTech, the FDA allowed the Pfizer-BioNTech vaccine against COVID-19 to be distributed in the United States to individuals age 16 and older.[73] Shortly after, on December 18, 2020, a second vaccine against COVID-19 produced by Moderna was also granted emergency use authorization for individuals ages 18 and over in the United States. A third vaccine produced by Johnson and Johnson was later approved for emergency use authorization in individuals 18 years and older on February 21, 2021. Currently FDA has approved the mRNA vaccines against COVID-19 for certain age groups and emergency use approval for younger age groups.

Despite the availability of vaccines against COVID-19, challenges for vaccination uptake continue to present itself as a growing number of individuals believe that vaccines are either harmful or unnecessary.[74] While many public health officials rely on the high uptake of vaccinations to protect individuals and vulnerable communities from diseases and viruses, challenges exist in the confidence of vaccines, and in the attitudes and beliefs of the efficacy of

vaccines.[74] According to Pew Research Center,[75] public interest in taking these vaccines ranges from intentions to take them immediately, to "wait and see," to hesitance, and outright refusal. In a recent report published by the Kaiser Family Foundation (KFF) on vaccination intention and uptake, overtime, individuals who wanted to "wait and see" obtained the COVID-19 vaccine while those who refused, continued to not obtain the vaccine.[76] The KFF report also found that barriers to vaccination were also factors that prevented vaccination uptake. Data from race and ethnicity reports show that Blacks, Hispanics, and individuals from low-income households had access barriers to vaccination, meanwhile overall, dividing factors to vaccination were related to age, education, political affiliation, geography, and religious affiliation.[76] When looking at political affiliation alone, partisanship played a significant role in the uptake of the COVID-19 vaccination with Democrats being more willing to vaccinate and have higher vaccination rates compared to Republicans.[76] The KFF report found that physicians were found to be the most trusted source of information on vaccinations for many individuals; however, efforts and support from schools and employers were found to be catalysts to vaccination uptake.[76,77] As experts work towards understanding the short- and long-term effects of vaccines against COVID-19, vaccine use and intent needs to be continually assessed to help experts develop strategies to address vaccination uptake in groups refusing or hesitating to get vaccinated. Further studies are also needed to understand consistent masking and social distancing despite the availability of a vaccine. For the current study, it was important for all segments of the US population to continue or to increase consistent masking and social distancing while vaccines were rolled out over a long period of time.

Social Vulnerability and Racial Disparities during COVID-19

As experts grasp a better understanding on how COVID-19 spreads, they encompass upon the inequities many individuals and communities face that predisposes them to health challenges during the pandemic. Factors such as tight living quarters in addition to the inability to properly isolate when sick will predispose individuals to getting infected. As pointed out by the Centers for Disease Control and Prevention [50] people living in overcrowded housing were associated with increased risk for COVID infection rates. The World Health Organization [78] points out that overcrowding living conditions is a marker for poverty and social deprivation that can predispose individuals to environmental and health risks, transmission of infectious diseases, mental health issues and sleep disorders. Other living arrangements with high risks for spreading COVID-19 included people living in rural communities, people experiencing homelessness, newly resettled refugee populations, individuals living in nursing homes and longer-term care facilities, and group homes for people with disabilities.[50] Emerging issues of social vulnerability during the COVID-19 pandemic revealed that socially vulnerable communities were at higher risk for COVID-19 outbreaks.[79]

Social vulnerability not only impacts communities but those who are living within them. These vulnerabilities predispose individuals to significant health challenges as they are ill equipped with resources and access to healthcare, transportation, housing, education, nutrition, employment, and income.[80,81] When limited with access to resources and placed in dire circumstances like natural or human-made disasters, vulnerable communities do not only face higher disease burden, but also experience decreased testing and treatment access that prevents them from being able to respond or recover compared to other communities.[80,82] Known as social vulnerability, it refers to the socioeconomic and contextual factors that prevent community

resilience during disasters that prevents them from preparing for, responding to, and managing a disaster.[83] Nonetheless, this does not include that within socially vulnerable communities racial and ethnic disparities exist that impacts the varied health outcomes of different racial minority groups.

Racial and ethnic health disparities prevent people of color from achieving optimal health outcomes due to the long-standing inequities along racial/ethnic lines. Ethnic minorities suffer from health conditions that are associated with higher risk for severe COVID-19 illnesses such as cardiovascular diseases and diabetes.[13,84] Cultural and socioeconomic factors were key factors to poor health outcomes as education and linguistic barriers prevent individuals from adopting preventative measures. Furthermore, living preferences among ethnic minorities are often confused as crowding, as cultural differences and personal space vary among different groups.[85] According to Evans et al[85] when individuals come from collectivist cultures, they tend to be more tolerant of crowded living situations as they reinforce the needs of the group compared to individualist cultures that fosters independence. These factors not only predispose elderly individuals and those with comorbidities at risk but also make it more challenging for social distancing and self-isolation measures to work.[13]

While there is a lack of reports on racial and ethnic composition of those who are infected with COVID-19, it is important to note that there are substantial concerns that varying ethnic minority groups are suffering from greater disparities than others during the pandemic. Laurencin and McClinton[84] argue that the scarcity of such information prevents experts from understanding the amount of disproportionate burden of disease that different ethnic minorities experience. The social impact is relatively unknown among different ethnic minority groups and will require further research to understand the varying factors that predisposes such groups to

risks of infection. While underlying causes of health disparities among these groups are complex, social and structural determinants of health, racism and discrimination, educational disadvantages, and healthcare quality should be assessed to understand the influence in preventative health behaviors.

Health Disparities among Vulnerable Populations

When individuals from socially disadvantaged groups experience poverty, environmental threats, inadequate access to healthcare or experience educational inequities, health disparities ensue, resulting in poor health outcomes and increased risk for mortality.[86] Defined as preventable differences in disease, injury, violence or opportunities experienced by socially disadvantaged populations, health disparities impact millions of individuals in the United States.[86] However, when coupled with factors such as literacy, language barriers, racial and ethnic disparities, socially disadvantaged individuals are less likely to obtain optimal healthcare services further impairing their ability to obtain good health.[87]

Socially Disadvantaged Groups

Socially disadvantaged groups are individuals who experience differences defined by factors such as race, gender, education, income, disability, geographic location or sexual orientation.[86] These individuals experience differences that prevent them from obtaining resources and opportunities for socioeconomic success and improved health outcomes. When faced with poverty, these individuals are unable to provide for anything other than to minimally secure their livelihood when it comes to food and housing.[88] Poverty, health inequities, and access to healthcare prevent socially disadvantaged populations the ability to obtain resources for promoting safe social and physical environments that creates and promotes optimal health outcomes.

Poverty and Inequities

Poverty has been an ongoing issue for many centuries, impacting policy formation and governmental interventions. The undertaking of managing the labor market, societal classification and deterrence of the poor resulted in the Poor Law Act of 1601 during the time of Elizabeth I.[89] This was one of the most influential policies on poverty that helped shape the future and political framework to help control the lives of the poor. Whether there was a plausible solution to managing those living in poverty, interventions varied as poverty had different meanings and conditions. To some, poverty means living in or near destitution; however, when trying to understand poverty in the United States, Rector and Sheffield[90] found that although over 46 million people lived in poverty, only a very small few actually fit that description. Therefore, while hardship does occur, it is limited by scope and severity from one individual to another.

Characterized and categorizing into different social classes, poverty has far-reaching effects on health, family life, and education.[89] Poverty is a perplex that has political and social characteristics. Politically, poverty has been controversial as it is a systematic classification of the poor based on policies. Various methodological approaches have been developed to classify those in poverty, however relatively few policies have properly addressed the issues of poverty, resulting in contested political concepts.[89] When failed to be addressed, poverty limits access to resources, education, and job opportunities that are linked to health inequities among poverty-stricken groups. Various factors exist that continue to perpetuate the division of class across multiple generations through the political division of communities through redlining, gentrification, and industrialization.[80]

Although illegal and outlawed in 1968, redlining was a practice that was used to mark maps of predominantly minority communities and labeled as poor financial investments.[91] Redlining policies include discriminatory practices in refusing to offer mortgages to certain racial groups. Redlining policies were not only limited to denying mortgages to predominantly minority individuals but also included preventing the development of areas and investments that would provide basic services such as banking institutions, healthcare services, public transportation, and employment opportunities to these communities.[71] Although resources have been placed to recover from these policies and practices, there continues to be a lack of investments in improving neighborhoods, public safety, public transportation, commercial activity, housing, and employment prospects that would improve economic opportunities.[71,91] Long term effects of redlining continue to devastate various communities throughout the United States as disadvantaged communities are unable to defy poverty, inequities, and poor health outcomes.

When social, economic, environmental and structural differences impact the distribution of power and resources among different groups and classes, health inequities occur.[92] Health inequities go beyond healthcare, adding additional strain to the US economy, national security, and public finance. Health inequities steaming from racial inequities in healthcare carry an economic burden and loss of $35 billion in excess healthcare expenditures, 410 billion in illness-related lost productivity and nearly $200 billion in premature deaths.[93] Not to include that the adverse effects stemming from poverty and inequities have an array of risks and adverse factors. These risk factors can include emotional and social challenges, acute and chronic stressors, cognitive lags, and health and safety issues that further contributes to the growing economic costs.[94] One of the most prominent lasting and adverse effects seen in individuals facing

inequities are the inability to obtain educational and career opportunities that would secure income and housing.

Many studies have shown that access to safe and affordable housing helps support physical and mental health. Housing stability has significant impact on healthcare costs, access, and outcomes.[71,95] Bailey [95] argues that violent or unsafe conditions have led to poor health, as it can cause toxic stress, exacerbation of mental health issues or substance use in individuals living in poverty. Stress is negatively associated in both adults and children living in unsafe environments. Prolonged exposure to unsafe and unstable housing environments in children has been associated with poor social development, physical, psychological, behavioral, and mental health.[95]

While the literature shows a strong link between poverty, inequities and health, it is contested that the only way health outcomes can be improved is to reduce poverty.[90,96] However, many Americans have different attitudes towards those living in poverty and have differing opinions on how and when the government should intervene. In poverty toll trends, Howard et al[97] found that Americans were more sympathetic to those who were classified as "poor" compared to individuals who relied on welfare. While many Americans believe that poverty should be addressed in the United States, many Americans and policy makers are weary that individuals rely on welfare and public programs, thereby perpetuating their socioeconomic state, rather than improving it.[97] Regardless of such views and definition of poverty, the role and importance of available public programs plays an essential role towards providing resources, access to healthcare, and improving health and well-being of Americans.

Access to Care

In the United States, 28% of the general population are identified as low-income with 21% being covered by Medicaid.[98] The availability of public health programs such as Medicaid, allow low-income individuals, children, pregnant women, adults, seniors, and individuals with disability healthcare coverage. Medicaid is a state and federal funded program that provides health coverage, including doctor visits, hospital and medication expenses, nursing, and home health care, in addition to long term care cost. Medicare on the other hand is a federal program providing healthcare coverage for individuals aged 65 and older or individuals under 65 with a disability, regardless of income. Public health programs such as Medicaid and Medicare provide individuals access to healthcare; however, there remains to be barriers to accessing care.

Despite availability of publicly funded healthcare coverage programs, individuals experiencing greatest risk for barriers to access include low-income individuals, people in poor health, and ethnic minority groups. Language and low literacy prevent these individuals from system level barriers that prevent access to care. Not to include the other substantial barriers to accessing services, such as long wait time, provider mistrust, and work and family obligations.[99] When such barriers exist, these individuals are less likely to seek preventative healthcare services.

According to the National Academy of Science's health disparities framework, there are three barrier domains that impact access to care: patient-level (work and family barriers), provider-level (provider-level barriers and discrimination), and system-level (cover, cost, or access barriers).[99] When one or any of these domains are impacted, barriers will prevent individuals from accessing care, despite the availability of healthcare coverage. Such as in the case of racial and ethnic health disparities, where ethnic minorities tend to receive poorer quality

of care compared to non-minorities.[100] When individuals are discriminated against or failed to be provided with culturally relevant care, delays in receiving medical care occurs. In understanding barriers to care among the publicly insured, Allen et al[99] discovered that any barrier at the patient, provider or system-level significantly influences individuals to delay seeking healthcare. In order to address such barriers, the Agency for Healthcare Research and Quality [101] identifies a framework in addressing and reducing disparities in healthcare systems by detecting the health disparity, which will allow to understand the determinants of health disparities that will thereby reduce the disparity through interventions and policy change. However, despite availability of such a framework, health disparities research remains challenging as interventions may need to vary between different groups, age, and gender of people. Health prevention work with any group of socially vulnerable people should be grounded in a broad understanding of their history and social context. The next section therefore provides relevant background about the Hmong American community.

The Hmong

When the health of ethnic minorities is not well understood by healthcare professionals, concordant care and public health interventions are not effective. The inability to understand and embrace cultural differences among varying ethnic minorities will create inefficiencies with patient care and health outcomes.[102] The lack of empirical studies in certain ethnic minorities prevents healthcare practitioners to be aware of the patient, provider and system-level barriers and the social structural barriers that lead to poor health outcomes. Hmong Americans specifically, lack empirical studies to inform healthcare providers of the complexity of cultural and language barriers, socioeconomic barriers, literacy, and distrust issues of Western health

system that results in the delay of medical care, preventive screening interventions, and adoption of health behaviors.[24,29-31]

Hmong History

Prior to the Vietnam War, very little was known about the Hmong. Lack of historical documentation allows for identifying the origination and roots of the Hmong.[103] Many researchers believe the inconsistencies of the Hmong's history are partially due to the literacy of the Hmong.[103,104] Historically an oral culture, the Hmong once had a written language that was similar to Chinese.[105] Hmong narratives encapsulates that in the process of escaping the continuous warfare against the expansion of the Manchu dynasty, the alphabet and knowledge of the writing was lost.[106] While the origin and written language of the Hmong remains contested, some scholars believe that the Hmong may have originated from Mesopotamia, Siberia, or Mongolia; meanwhile, others believe that the Hmong's history predates back to ancient central China.[107-109] In a linguistic stratification of the Hmong language, Lemoine [110] found that a significant amount of people spoke the Hmong language in and around China. While language stratification cannot pinpoint the origination of a specific group of people, it does allow for understanding characteristics of the Hmong based on various regions where the language exists. Current literature and facts on the Hmong theorize that they are a nomadic group of pre-literate farmers without a country, living in mountainous areas of Southeast Asia, such as China, Thailand, Laos, and Vietnam.[103,111,112]

Hmong and the Secret War

During the Vietnam War, the Central Intelligence Agency (CIA) of the United States requested help from the Hmong in Laos to help fight against the Communist Pathet Lao forces in its war against the North Vietnamese.[113,114] With promises to ensure resettlement after the war,

the Hmong agreed. The Hmong assisted the US by fighting alongside and teaching US troops about guerilla tactics and warfare. Unfortunately, when President Nixon withdrew US forces from the war in 1972, the Hmong were left behind to fend for themselves, and the communist regime annihilated the Hmong as traitors.[114] Ostracism, harassment, and killings of the Hmong led by the Laos Communist government, caused as many as 300,000 Hmong to flee the country, seeking asylum in Thailand.[103,114] This figure does not include the thousands of Hmong soldiers and individuals who retreated to inaccessible areas of the jungles of Laos in fear of retaliation.

In the mid 1970's the US finally granted the Hmong preferred refugee status and a large number immigrated to the US.[29] Hmong refugees were dispersed to resettle in various areas of the United States such as California, Minnesota, Wisconsin, and North Carolina.[115] Under the direction of President Jimmy Carter, the Refugee Act of 1980 was established to enable and standardize resettlement services for all refugees admitted to the United States to encourage rapid acclimation and economic self-sufficiency.[116,117]

Since their resettlement, the Hmong struggle to acclimate to the US mainstream. Cerhan[107] pointed out that many Hmong struggled living in the United States during the waves of immigration, falling into lower socioeconomic categories and had marital and intergenerational conflicts. Furthermore, literacy and language barriers contributed to poor educational attainment and health outcomes amongst the Hmong. In a two-year study of the Hmong's cultural and educational values, Timm [105] found that the Hmong's values included education to be an important factor for success. However, traditional values highly influenced young Hmong boys to work which resulted in many dropping out of school. Furthermore, young Hmong girls were expected to marry early, preventing them from finishing school, especially if they became pregnant. Cultural expectations to participate in traditional Hmong ceremonies took precedence,

therefore prevented well-paying jobs.[105] Caught in an economical spiral, Hmong men and women often work more than one semi-skilled paying job.

Hmong in the United States

According to the 2010 US census, there are over 300 million people living in the United States, with 19.2 million people identified as Asian Americans.[118] Making up less than one percent of all Asian Americans, the US census identified approximately 281,000 Hmong Americans living in various areas of the United States.[115,119,120] The Hmong National Development [121] argues that the number of Hmong Americans residing in the US is likely underreported due to language barriers, literacy, and mistrust of the US government. Therefore, Leaders from the Hmong National Development and within the Hmong community estimate that there could be more than 300,000 Hmong Americans living in the US.[121]

Generalized and categorized as Asian Americans, many overlook the socioeconomic disadvantages of subgroups such as Hmong Americans. The lack of disaggregating Asian American data may provide a misleading picture of different subgroups. Asian Americans are divided into origin groups. According to Budiman et al,[122] the six largest origin groups of Asian Americans are the Chinese, Indian, Filipino, Vietnamese, Korean, and Japanese. These six Asian origin groups make up approximately 85% of Asian Americans in the United States. The remaining 15% of Asians consists of a variety of subgroups with various cultural differences among them.[122,123] Joo et al[123] argues that the aggregation of Asian Americans lends Asian subgroups to racial stereotypes. Statistically, Asian Americans have higher education attainment, household income and live-in areas with higher median property values when compared to the general population, Hispanic and Black Americans.[122] In addition, aggregated data is not suggestive of the heterogeneity between different groups.

For example, the Center for American Progress [120] reports that 36% of the Hmong have less than a high school education, 27% are living in poverty, and the median household income of Hmong Americans is $52,500. The per capita income of Hmong Americans is $10,949 a year, which falls below any racial group nationwide.[119] In a national report produced by the Asian Pacific American Legal Center and Asian American Justice Center[119], the Hmong remain to be one of the poorest ethnic groups in the United States. However, data suggests that collectively Asian Americans have the highest median household income in the United States when compared to all ethnic minorities at approximately $71,209 a year with only 12.8% living in poverty.[115] Although multiple reports agree that Asian Americans are thriving, they also point out that struggling small ethnic subgroups such as the Hmong, Laotian, Bangladeshi, and Cambodian Americans remain invisible due to aggregated socioeconomic and health data.[115,119] Aggregated data remain to be controversial and one of the biggest challenges for public policy in the United States as huge differences exist between racial categories.[123-125] Edlagan and Vaghul[125] argues that different race and ethnicities are often categorized into monolithic groups such as Asian American and Pacific Islanders, and when that occurs, it places many communities such as Hmong Americans at substantial risks for being underserved by their state and federal governments.

With income as a major indicator of stability, Hmong Americans face multiple socioeconomic adversities. They are more likely than any other racial group to access cash public assistance (13%) and receive some form of public assistance (41%) compared to 2.7% of Asian Americans.[115] The Southeast Asia Resource Action Center [115] points out that Hmong Americans struggle with job stability, resulting in 11% being unemployed, and 32% living in overcrowded housing. Low educational attainment and financial disparities have resulted in

17.1% of Hmong Americans being without any health insurance, and only 47% having some form of private health insurance.[120] When compared to Asian Americans, 15.1% of Asian Americans have no health insurance and 70.1% have some form of private health insurance coverage.[115] While some Hmong Americans have been in the United States for over 40 years, socioeconomic barriers and acculturation to the US mainstream have prevented many Hmong Americans from achieving socioeconomic success.

Acculturation

With the rapid growth of ethnic minorities and varying degrees of migration in the U.S. understanding the acculturative process is crucial to providing culturally appropriate social, academic and health resources and interventions.[27] The acculturative process transpires differently between different groups and individuals. To better understand cultural identity, values, and the process of acclimation in the US, various acculturation instruments have been developed to measure acculturation among various ethnic groups. Despite the availability of various acculturation instruments, no one acculturation instrument has been able to fully capture the acculturative process as acculturation is a complex construct that encompasses socioeconomic, historical, political, and psychodynamic variables.[26-28]

The ability to acculturate to a new or host culture can profoundly impact one's well-being and livelihood. According to Zane and Mak,[25] acculturation is a change process that results from constant interaction between two distinct cultures resulting in learned values, behaviors, lifestyles, and language of the host culture. In contrast, Collier et al[26] points out that the acculturation process occurs in four adaptation phases: assimilation, integration, rejection, and marginalization. During the assimilation phase, individuals will completely replace their native culture with the host culture, whereas in the integration phase, individuals will integrate

language, food, and behaviors into their native culture. The rejection phase occurs when the individual chooses to reject the new culture and the marginalization phase occurs when the individual has no interests in transitioning into the new culture despite losing connection with their native culture.[26] Consequently, Collier et al[26] argues that educators, psychologists, and healthcare providers need to be aware of these different adaptation phases as some of these behaviors may be confused with other behavioral issues.

The psychology literature has been a strong proponent of understanding acculturation and its impact on the psychological well-being of individuals. Psychologically, the literature points out that the inability to acculturate to the host culture has resulted in poor health outcomes, lack of willingness to seek mental health resources or counseling, personality issues, lack of educational achievement, and poor attitudes towards mental health.[25-28] Given the importance to understand acculturation and its impact on ethnic minorities, extensive efforts have been done to assess acculturation levels among different ethnic minority individuals.

However, ethnic minorities-based research in Asian Americans has led researchers to find that acculturation has been linked to various psychological variables that may be overlooked due to the tremendous variation among Asian Americans.[28,126] Asian Americans immigrated from various parts of Asia at different points in time. For example, the arrival of Chinese immigrants in the US took place in 1848, with Japanese following in 1868, Koreans in 1903, Filipinos in 1906, and Asian Indians in 1907, and migratory flow are all still ongoing.[126] Migration of other Asian subgroups was sporadic throughout US history. With Congressional laws sparring and banning Asian immigration into the US, there was a point in history where Asians were not allowed to enter the country. However, with the passing of the Immigration Act of 1965 and the

end of US involvement in the Vietnam War in the 1970s, Asian countries were the leading source of immigration to the United States.[126]

Other factors that may impact the acculturative process for Asian Americans is the amount of time an individual is in the United States and how often they are exposed to the host culture. Such as a fifth or sixth generation Asian American may identify more closely to European Americans compared to a first-generation Asian American who just migrated and is still navigating and trying to understand the American mainstream. With such variations, trying to measure the acculturation process for Asian Americans has been rather difficult. There have been numerous strides and efforts to develop tools and instruments to measure acculturation among different Asian American groups; however, it remains challenging as some subgroups of Asian Americans face greater disparities than others in the United States.[126] According to the Southeast Asia Resource Action Center,[115] Laos, Cambodian, Hmong, and Bangladeshi face the greatest disparities with poverty levels higher than African Americans. With approximately 21 million Asian Americans, disparities from these small subgroups are rendered invisible when their statistics are conformed with Asian Americans who are considered to be thriving, are more educated, and have higher household incomes compared to the national US average.[127]

To measure and understand the different levels of acculturation among different Asian American populations, various acculturation instruments exist. For example, Dr. Richard Suinn developed a 21-item Suinn-Lew Asian Self Identity Acculturation (SL-ASIA) tool that allows researchers the ability to assess acculturation through cognitive, behavioral, and attitudinal components.[128,129] Suinn et al[129] believed that acculturation does not occur in a linear fashion but rather occurs in a multi-dimensional and orthogonal way. The SL-ASIA is a widely used instrument to measure acculturation in Asian Americans however there are other instruments that

may be better at measuring other acculturation components compared to the SL-ASIA.[128] In contrast, other researchers believe that the best way to capture and measure acculturation levels is by assessing and measuring different domains of acculturation such as social and relationship contacts, language, identity, media use, food preference, cultural knowledge and exposure, cultural activities and behaviors, and history and traditions.

In a review of various acculturation instruments, Zhang and Tsai[28] points out that when selecting an instrument to measure acculturation, it is important to determine whether a unidimensional or dimensional instrument best captures the acculturative process for a specific sample. Zhang and Tsai[28] argues that depending on the research, directionality of acculturation may not be important but rather the domains of acculturation, enculturation or cultural orientation that may direct researchers to utilize domain-oriented tools instead of dimensional instruments. In addition, there are many acculturation instruments that may have been translated into another language that may not have already been published which can limit the ability to select the best acculturation instrument.[28]

In contrast, Zane and Mak[25] argue that acculturation instruments that measure domains may vary according to the different acculturation components. Zane and Mak[25] points out that the most common domains used to assess for acculturation are language, the people with whom an individual socializes with and the identification of oneself with a particular culture. Since these domains are the ones that are most often used to assess for acculturation, Zane and Mak[25] points out that other areas of the acculturative process may be overlooked.

The ability to measure acculturation between various ethnic groups will allow researchers, policy makers, and society to be aware of the impact acculturation may have for different ethnic minority groups and their ability to thrive economically. Resources and

interventions are often derived from the information obtained from measures of acculturation; therefore, it is important that when measuring acculturation among various ethnic groups, researchers are aware of the potential limitations of each instrument. Furthermore, barriers towards acculturation should be taken into consideration as varying factors may prevent individuals from becoming accustomed to their new home environment, language, and literacy skills.

Literacy

According to ProLiteracy [130] over 36 million adults in the United States cannot read, write or do basic math beyond the third-grade level; impacting poverty, healthcare costs and sustainable employment. Low literacy impacts over $225 billion in non-productivity workforce costs in the US and an estimated $232 billion a year in healthcare costs due to low adult literacy levels.[131,132] The National Council for Adult Learning [132] reports that 43% of adults living in poverty have the lowest literacy level in the United States. Despite availability of education for children, adults can become functionally illiterate thereby impacting their ability to use reading, writing, and computing to develop themselves.[133]

Literacy, defined as the ability to read and write, impacts the lives of millions of people. Literacy not only impacts the individual but further impacts their family's literacy and their ability to thrive successfully. According to Cascio et al,[134] children whose parents have low literacy have a 72% chance of being at the lowest reading levels themselves. Students who don't read proficiently by the 3rd grade are 4 times more likely to drop out of school.[135] Further studies among children with low literacy reveal that these children tend to have lower grades and display behavior problems, in addition to having higher absentee rates, years repeated in school and/or drop out of high school.[134] In 2017, the National Council for Adult Learning [132] reported that one

in six young adults will drop out of high school every year, impacting more than 2.1 million young adults. In understanding labor market consequences of the effects of inadequate education, Rouse [136] reports that it will cost the nation approximately $260,000 for each dropout over his or her lifetime.

An example of lasting effects of literacy on young adults includes state prison inmates. According to the RAND report in 2013 on correctional education, 75% of state prison inmates did not complete high school, and are classified as low literate.[137] The low literacy level among prisoners hinders them from successfully integrating into local communities after being released from prison. Literacy further impacts their ability to obtain steady post release employment, making it a significant challenge for reintegration, resulting in either homelessness or reentry into the prison system.[137]

One of the first large-scale national assessments of adult literacy conducted in the United States was called the National Assessment of Adult Literacy (NAAL). The NAAL evaluated adult Americans' ability to read, write, comprehend, and apply written language. In the 2003 report, NAAL reported that adults 65 and above had the lowest literacy level when compared to any other age groups; education level of less than or some high school accounted for the largest percentage of low literacy; and race and ethnicity were also a strong factor in low literacy.[138] In the NAAL report, Baer et al[138] pointed out that individuals who spoke another language other than English before starting school or learned to speak English after the age of 20 were also at higher risk for low literacy in addition to individuals living in poverty and those with multiple disabilities.

To measure for literacy, NAAL measures three types of literacy, prose, document, and quantitative. Prose literacy is the ability to read and comprehend the materials in a paragraph in

order to use the information provided.[139] Meanwhile document literacy is the ability to review and use non-continuous texts such as maps, applications and nutrition labels, while quantitative literacy is the ability to use numbers towards everyday tasks.[139] Vágvölgyi et al[133] argues the importance of functional literacy, which is the ability to take reading and writing materials and making sense and use of it, to develop personally, socially, and economically. The term functional literacy was first coined during World War II to describe individuals who were incapable of understanding basic written instructions to carry out military functions.[140] However, since the NAAL report, the Program for the International Assessment of Adult Competencies (PIAAC) is now being used by the Organization for Economic Cooperation and Development (OECD) to collect data on the number of US adults with low literacy levels and compared to over 25 different countries. Because the skills assessment of PIAAC is conducted in English, all US PIAAC literacy results are for English literacy only and is limited to English speaking respondents.

The PIAAC literacy scale has three key components for individuals to thrive in the 21st century: literacy, numeracy, and digital problem solving.[141] These three competencies are assessed to determine 6 different levels and score ranges of literacy. Depending on the score range, respondents' can be at a "Below Level 1" if having scored 0-175; "Level 1" if scored between 176-225; "Level 2" if scored between 226-265; "Level 3" if scored between 276-325; "Level 4" if scored between 326-375; or "Level 5" if scored between 376-500. Individuals considered to have very poor literacy skills are considered to be at Level 1 or below meanwhile a score within the Level 3 range is considered to have the minimum literacy skills required for everyday life activities.[142] While this literacy assessment is done on an international level, there

are limitations that this assessment is for English speaking respondents only and the sample was predominantly limited to White, Black, and Hispanic Americans.

Nevertheless, literacy's link to social and economic development are not the only pivotal developmental factors. The impact of literacy on one's ability to function has been linked to language related deficits and cognitive deficits. Language related deficits include the inability to properly perform phonological tasks when compared to other individuals with the same reading level.[133] In contrast, cognitive deficits such as the ability to copy or recall has been seen to be worse when compared to individuals of the same reading and literacy level.[133] It is important to note that these deficits do not take into consideration cultural differences that may further impact the language and cognitive processing of ethnic minorities and their literacy. The Center for Immigration Studies [143] reports that over 2 million immigrants come to the United States each year, with over 50% lacking a high school education or have English proficient skills. These individuals are at the highest risk for literacy, with Hispanic immigrants struggling the most with English literacy, despite their long-time residence in the United States.[143] According to the Migration Policy Institute,[144] immigrant adults lag behind their native-born peers in literacy, numeracy and problem-solving skills, impacting their income, employment, education opportunities, and their health.

In contrast, Scribner [145] believes that literacy goes beyond social and economic development. Scribner [145] points out that literacy is a form of adaptation and procurement for power in society. As people adapt to their social and economic environment, they are forced to learn English literacy, thereby enabling individuals to explore other functionalities to co-exist with others of the same or similar skills. Scribner further highlights that the strive to give meaning and advance in society is another fundamental factor that embraces individuals and

groups to enhance their literacy.[145] However, when you have groups that fail to have effective participation in the country's economic or education system such as poor, Black, ethnic minority groups, Scribner [145] argues that problems with poverty and political powerlessness prevents adequate access and resources to these groups, only further limiting their progression, and growth.

While multiple significant statistics and reports have been reported on the literacy crisis in the United States, there lacks to be an effective resolution to the literacy problem. The lack of a cohesive educational plan for Americans continues to be a critical issue to educators, economics, and researchers. The need for a comprehensive plan to address literacy in children and adults remains a challenge in the academic system. Decline in federal and state funding the last 10 years has resulted in programs serving only a fraction of adults in need.[130] Currently, two-thirds of adult education programs are struggling with long student waiting lists, with less than 10% of adults in need receiving services.[130] The desire and need to improve literacy among children and adults in the United States is dire. Extenuating circumstances with financial barriers and limited resources prevent vulnerable populations in the United States to thrive; in addition to the need for more resources and funding to address health literacy and poor health outcomes among those with low literacy.

Health Literacy

Over 90 million Americans struggle with understanding health information that is given to them.[146] Low health literacy has been associated with poor health outcomes as it prevents individuals from making informed health decisions to properly care for themselves.[147,148] The Agency for Healthcare Research and Quality [149] defines health literacy as the degree an individual is able to process and understand basic health information and services to make

appropriate health decisions. However, the definition of health literacy varies, and its meaning can be confusing between healthcare providers and patients.[147] Furthermore, various health literacy instruments exist yet there remains to be a comprehensive tool that addresses all the fundamental domains that addresses the complexity of literacy and health literacy.

The wide range of negative health outcomes related to health and literacy has cast a growing awareness to improve patient centered approaches to improve the patient's ability to obtain and understand health information. The Institute of Medicine's 2004 report, *Health Literacy: A Prescription to End Confusion,* reports the immense amount of work done in the United States by developing measuring tools and screening aids for healthcare providers with the use of the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA).[146] However, there remains much skepticism and criticism regarding the REALM and TOFHLA and its ability to fully assess and measure health literacy.[150,151] Considered as the "gold standard," REALM is a 66-item word recognition and pronunciation test, meanwhile TOFHLA is a 50-item test measuring reading fluency. Many may argue that these questionnaires may not be a comprehensive assessment for health literacy but rather an exhaustive measure of reading and word recognition.[150,151] In an attempt to provide a quick health literacy screening tool, the Agency for Healthcare Research and Quality [149] recommends the Short Assessment of Health Literacy-Spanish and English, Rapid Estimate of Adult Literacy in Medicine-Short Form and Short Assessment of Health Literacy for Spanish Adults due to their quick and easy screening for health literacy. Although validity and reliability were tested for all three instruments, there remains criticism of the capability of the instruments to comprehensively measure the individual's needs and the servicing healthcare environment.[150]

In an attempt to assess feasibility in conducting a health literacy screen in the acute care setting, Sand-Jecklin et al[148] found inadequacies between healthcare provider interactions with low health literacy patients, and lacked resources for patients flagged as low literacy patients who were at high risk for readmission. Sand-Jecklin et al[148] also points out that although many healthcare providers felt that the feasibility of the screening tool was acceptable and useful, many individuals worked around the screening tool by deferring the screening. The complexities and feasibility of a health literacy screening tool remains too challenging in the acute care setting as healthcare providers are often bombarded with other tasks at hand.

Furthermore, Baker [150] argues that health literacy is constructed on the basis of the individual's capacity to read. More than 1 in 5 adults read at the 5th grade level;[152] therefore, healthcare institutions gear healthcare reading information at the general reading level rather than the health literacy level resulting in differences in baseline knowledge of health concepts and vocabulary.[150] Baker [150] points out that health literacy is complex, involving not only the knowledge capability of the individual, but rather a complex relationship at the individual level, healthcare provider, healthcare system, and communication capacities between all sources. For health literacy to be adequately addressed, Baker argues that all domains must be assessed.[150]

Nutbeam [151] also points out that there are vast inconsistencies and approaches to addressing health literacy and argues that health literacy is a risk factor to poor health outcomes that is often overlooked in clinical practice. Furthermore, Nutbeam [151] points out that health literacy can be an advantage to patient outcomes by improving health education and communication that can empower patients to make informed health decisions. However, with the lack of a comprehensive health literacy screening tool, the healthcare system remains to struggle with streamlining appropriate health literacy relevant materials into practice.

Health literacy impacts the lives of millions of people. Without proper screening and resources to address health literacy, patients and families are ill-equipped to understand, obtain and make informed health decisions. With differing definitions of health literacy, healthcare providers and organizations need to carefully craft a definition and screening tool that will address the varying domains of health literacy. Furthermore, despite the availability of extensive health literacy screening tools, healthcare providers need to be cautious when selecting a tool to ensure that the best tool is selected to address the domains of interest.

To further investigate available instruments and tools, the Health Literacy Tool Shed [153] identified 198 health literacy instruments that measures various health literacy domains. From general health concepts to conceptual knowledge, comprehension, information seeking, numeracy, pronunciation and understating of health information, measuring different health domains will allow researchers and healthcare providers the ability to understand how patients understand and comprehend health information. However, despite such tools and instruments, Baker [150] argues that it is impractical to comprehensively assess and address health literacy for any healthcare setting due to the lack of feasibility and proper screening tools.

Most health literacy tools do not address health literacy among minorities. In a review assessing validity of health literacy for ethnic minorities, Nguyen et al[154] found that despite the numerous health literacy tools available, many existing health literacy measures have not been properly validated for minority groups. This makes it even more challenging when the literature supports that individuals who speak another language other than English or learned to speak the language after the age of 20 were at higher risk for low literacy.[138]

With the lack of validated health literacy tools for minorities, it has been challenging for researchers to assess minority groups who have strong cultural differences such as Hmong

Americans. Currently there are no tools or instruments that can conceptually measure health literacy impacted by cultural and linguistic differences.[31] As a result, Khuu et al[31] measured health literacy by using two questions: "I am confident to understand health information given by a healthcare professional" and "I have experiences of missing medication because I did not know how to take medication." Although these two questions were not comprehensive measures of health literacy, Khuu et al[31] believed it would serve as a proxy for core concepts within health literacy. Khuu et al[31] findings' suggest that about half of the participants reported that they did not understand health information and a fifth of the sample reported having difficulties with functional aspects of health literacy such as medication management. Therefore, Khuu et al[31] argued that acculturation factors are being overlooked and a strong contributing factor to various aspects of health literacy among Hmong Americans.

Literacy, Health Literacy, and Language Barriers among the Hmong

As an ethnic group without a written system, oral traditions are practiced among the Hmong.[155] Oral traditions is defined as a form of preserving cultural and historical traditions by passing down traditions by word of mouth from one generation to another without any written instructions.[156] These oral traditions can come in the form of poems, chants, songs, and stories that encompasses the concept of receiving, preserving, and transmitting information.[157] With no other way of transpiring knowledge, the Hmong practiced oral traditions to preserve their culture, history, knowledge, and skills.[103,105,158]

Prior to the 1950s, the Hmong have never seen a book nor pencil. Through the colonization of France and the United States in Southeast Asia, linguistic efforts from missionaries were introduced to the Hmong.[106] Although the Hmong did not know how to read and write, they were aware of different writing systems in more politically powerful societies

such as in China, Laos, and Thailand. However, despite learning how to read and write, the Hmong continue to struggle to understand new concepts and terms outside of their worldview. Furthermore, despite coming from an oral culture, the Hmong's vocabulary is limited. Limitations in the Hmong vocabulary prevent the Hmong from understanding new concepts and terms, thereby further impacting their literacy in the United States.

Language barriers, literacy, and historical mistrust of the US government prevented Hmong Americans from participating in government programs and activities such as the US Census. Low literacy among Hmong Americans impacted their ability to thrive economically. In addition to literacy and socioeconomic adversities, the literature identifies linguistic discordance as another major barrier that prevents Hmong Americans from obtaining adequate resources and services to healthcare.[159-161] The United States Census Bureau [162] documents that over ninety-two percent of Hmong Americans speak another language other than English at home, with the majority speaking Hmong. Furthermore, the Hmong lacks established vocabulary for medical terms making medical information difficult to interpret.[160] Sentell and Braun[163] found that when individuals have both low literacy and limited English proficiency, it has been tied to poor health outcomes.

Furthermore, to compile health literacy factors on top of literacy and English proficiency, vulnerable populations struggle with improving their health even when education and other well-established health status factors are controlled.[163,164] With the lack of a written system and limited vocabulary, it prevents Hmong Americans from understanding Western concepts. Concepts of the human body remain challenging for Hmong Americans, especially when there are no words or phrases to describe such phenomena. Many Hmong Americans have never

encountered illness terms such as cancer or diabetes until after their arrival to the United States, therefore these new concepts are difficult to apply to their worldview.

In an interview with Hmong medical interpreters, Krieger et al[160] found that even with professional interpreters, it is challenging to interpret medical concepts when the Hmong have no vocabulary or descriptions for the biomedical model of health. The lack of vocabulary and inconsistencies with medical interpretation has resulted in varying information being provided to patients. Furthermore, the literature suggests that the shortage of effective interpreters has created significant communication barriers for the Hmong.[159,160] To address the growing need for language services, President William "Bill" Clinton signed Executive Order 13166 to examine and provide services to individuals with limited English proficiency on August 11, 2000.[165]

Executive Order 13166 implemented protocols and services for individuals requiring access to medical interpreters. The Certification Commission for Healthcare Interpreters and National Board for Certification of Medical Interpreters are two national organizations providing certification and credentialing to medical interpreters. However, due to the lack of vocabulary and difficulty translating, neither organization credentials Hmong interpreters, therefore agencies employing Hmong interpreters only pass a test targeting the native language.[160] The lack of standardization, training and certification among Hmong interpreters has made it difficult to assess the quality of services and information being provided to individuals with limited English proficiency.[159,160]

In assessing Hepatitis B screening among Hmong Americans, Fang and Stewart[166] found that the lack of readily available and quality Hmong interpreters resulted in Hmong Americans selecting to rely on their family members to interpret for them. Fang and Stewart[166] pointed out that the medical staff and doctor's office most often did not have a readily available medical

interpreter, resulting in family members being used to communicate medical information. While the use of family members should be used with caution, overreliance on family members as interpreters can cause harm. Risks in using family and children to interpret should be considered as it is difficult to check the accuracy of the interpretation.[167] As seen in individuals with low literacy and English proficiency abilities, Lee and Vang[34] highlights the importance of proper translation as it has been tied to low preventative screening rates and lack of medical compliance amongst Hmong Americans.

To better grasp health literacy among Hmong Americans, Khuu et al[31] found that in a small sample of 168 Hmong American participants, more than half of the Hmong did not understand the health information that was being provided to them, resulting in 18.3% of the participants from not taking their medications appropriately. Although not generalizable to all Hmong Americans, much of the literature agrees with Khuu et al that many Hmong Americans did not understand the health information being provided to them.[35-37] Furthermore, Lor et al[38] found that in addition to cultural beliefs and values, the inability to understand health conditions and illnesses delayed individuals from seeking health services when ill.

A study with Hmong women's cervical cancer, Lee and Vang[34] discovered that women who had low English proficiency had increased barriers when seeking preventative health screenings for cancer. These women often did not know how to seek medical attention and were less likely to follow-up if they had abnormal results. Lee and Vang[34] argue that disseminating health information among Hmong Americans remains challenging as the majority do not read or write English well. Similarly, in another study with literacy and health education, Schroepfer et al[168] found that health education materials were often not culturally and linguistically appropriate for Hmong Americans. Education materials translated into Hmong were often ill prepared or

improperly translated for the lay Hmong person to understand. The lack of Hmong vocabulary further complicates appropriate translation of education materials, resulting in Hmong Americans not being aware of health resources and/or how to access them.[160,168] Furthermore, even when resources were available, Schroepfer et al[168] points out that lack of outreach to community leaders, liaisons, and the Hmong community prevents awareness of such resources.

While the link between literacy and poor health outcomes is well documented in the literature there remains a gap in the literature about health literacy in Hmong Americans and its impact on their health. The lack of empirical studies on Hmong Americans prevents researchers and healthcare professionals from being aware of the adversities of health management in the United States. Language barriers, cultural differences, literacy, and limitations in understanding health information prevents Hmong Americans from successfully thriving and assimilating. The need for more culturally and linguistic appropriate interventions and validated literacy assessment tools is warranted to help address the widening gap and disparity of ethnic minorities.

Hmong Family and Clan Structure

Collectivist Culture and Decision Making

The Hmong culture comes from a patriarchal, patrilineal clan-based collectivists hierarchical system. The Hmong have 18 clans that represent each family. The clans include the Chang, Chue, Cheng, Fang, Her, Hang, Khang, Kong, Kue, Lee, Lor, Moua, Pha, Thao, Vang, Vue, Xiong and Yang. Each clan has their own clan leader, with some clan leaders being from the head of the household or the eldest male within a family lineage. Since there are no standard Hmong religious rituals or practices, cultural practices vary by clan or familial groupings. For example, Hmong wedding rituals are usually a two-day process meanwhile a Hmong funeral can extend over a period of 3 to 12 days. All family members including young children are expected

to participate with different roles and responsibilities in both weddings and funerals. Extensive funeral ceremonial rituals are due to the Hmong's belief in reincarnation. Proper ceremonial rituals must be performed so that the deceased can be reincarnated, and any spirits of the deceased and surviving descendants are not offended. It is believed that if proper funeral ceremonial rituals are not performed, the deceased's soul will not be able to reincarnate and harm will come to the family, such as death. Therefore, funeral rituals can be laborious and require around the clock rituals to ensure that the deceased's soul is reincarnated in a series of rituals. Some funeral rituals occur nonstop over a period of three consecutive days at funeral parlors with family and community gatherings. Despite acculturation and acclimation in the United States, Hmong funeral rituals are important to the Hmong and continue to occur. The only change seen in Hmong funeral rituals have been seen among Hmong Americans who have converted to Christianity (e.g. Protestants, Catholics), Jehovah Witnesses, and Mormons, where ceremonial rituals are substituted for prayers and church services and are limited to one to three days.[42]

Therefore, while the role and functions of the clans include social support, legal authority, and economic security during difficult times, it does not undermine the importance of the clan leader. Clan leaders serve in a variety of roles, including acting as a mediating agent, disciplinarian, healer, marriage broker, decision maker, or even as a teacher.[29] The Hmong's collectivist practices allow clan leaders to help maintain peace and support within different families or clans. Collectivists practice the principle that the group has priority over other individuals, therefore, decisions are made within the group and problem solving are often done centrally.[169,170] In understanding collectivists and decision making, Le et al[171] found that collectivists tend to be more dependent on the group and the function of the group is essential to

their world views and decisions. Needs of the group or individuals within the group takes priority, compared to individualistic cultures where independence is fostered.

Since problems are often referred to the head of the household or clan leader, problems are often discussed among the group and a decision will be made for the individual. Decisions are often made based on the benefit of the group, which usually involves preventing discord or shame.[30] As a result, problems like marital discord have been an extremely problematic issue within the Hmong American community. Group expectations prevent individuals to make independent decisions to leave abusive relationships, resulting in individuals staying in violent relationships.[172]

In an analysis of intimate partner violence survivors, top risk factors include patriarchal norms, strict gender roles, women being seen as property after payment of a bride price, and stigma against divorced women that keeps women in abusive relationships or justification for the abuse.[173] Furthermore, marital affairs like all other problems or issues are politically managed outside of the marriage and not between the individuals involved in the relationship. The term "ua sab ntev" is metaphorically used to encourage Hmong women to be patient and stay in violent relationships or situations to prevent shame to their families. The mentality for Hmong women to "ua sab ntev" further impacts the individuals involved in that, when illness arises, healthcare decisions to manage one's health is oftentimes dictated by other family members and not the spouse, who is often the primary caregiver.

Gender Roles

Generational influence, socioeconomic factors, acculturation to the mainstream in the United States, and cultural expectations of men and women, gender roles have deterred many Hmong Americans from successfully completing college.[174] Low literacy, socioeconomic factors

and language barriers have hindered first generation Hmong Americans' experience in American schools; resulting in the inability to guide their children towards academic success.[105] Although education is valued by the Hmong, clan organization is at the core of the family which has molded attitudes about society and one's place in it.[105] In the Hmong culture, educational attainment is preferential for men, whereas women are expected to tend to housekeeping tasks and care for the family.[104,105] Typically, it is unfavorable for Hmong women to seek educational attainment whereas protective factors are in place for Hmong men to succeed in college.[175] While there has been strides in Hmong American men and women advancing academically, cultural expectations and gender differences continue to exist. Younger individuals educated in the United States have a blended worldview between the Hmong and American culture, therefore beliefs and cultural practices vary.

Gender role expectations among the Hmong prevent individualism, as Hmong women are expected to heed to their husband and his family's decisions. This has become problematic in healthcare as seen in Spring et al[33] study, where Hmong men objected to pelvic exams in pregnant Hmong women resulting in limited prenatal visits thereby affecting the health and welfare of the fetus and mother. The Hmong believe that to have another individual examine a Hmong woman, is considered disgraceful and shameful therefore Hmong women should avoid getting physical exams.[33,35,37] In another study focusing on preventative cervical screening, Lor et al[35] found that Hmong men objected to preventative cervical screening exams due to being jealous of their partner exposing themselves. The lack of cervical screening among Hmong American women has resulted in lower cervical cancer survival rates compared to Asian American and Non-Hispanic Whites; however, when compared to all US racial or ethnic groups, Hmong American women continue to have the highest incidence rate for cervical cancer.[37] While

other factors such as lack of congruent care, culturally, and linguistic appropriate education and resources can be contributing factors to the lack of seeking preventative services, it does not go without stating that gender roles and decision-making abilities within the Hmong cultural construct impact the health of Hmong Americans.

Hmong Health, Beliefs, and Behaviors

Hmong Health and Disease Prevalence

The health and disease prevalence of Hmong Americans are invisible in the United States. The limited empirical studies on Hmong Americans and the aggregation of health and disease prevalence data among Asian Americans make it impossible to see disparities between different subgroups. de Hollander et al[176] argue that health and disease prevalence data are oftentimes aggregated to conduct comparative risk evaluation among different ethnic groups, evaluate government and public health policies for efficiency, and characterize health risks. However, Gordon et al[124] argue that when groups are aggregated under a generalized ethnicity such as Asian Americans or Asian, the data cannot be used to conduct meaningful research or reporting purposes. Gordon et al[124] point out that the heterogeneity between Asian American subgroups can hurt and mask differences across different groups when accumulated into one group. As found in Gordon's study on differences in health and health risks among Asian ethnicities, differences in health burden, disease prevalence and smoking significantly differed for different Asian American groups than from those for All-Asian Americans.[124]

Lor [24] argues that to better understand individual subgroups, their disease patterns, and target prevention and interventions strategies, data on Asian Americans need to disaggregate. Disaggregating health and prevalence data will allow for a better understanding of disease burden among different groups. Disease burden is defined as the impact of a health problem that

is measured in terms of cost, mortality, or other indicators.[177] While little is known about the contributing factors to the disproportionate disease burden of Hmong Americans, Hmong Americans are one of the youngest ethnic groups living in the United States.[121,162,178]

The Hmong American population is a relatively young population. The median age of Hmong Americans is 20.4 years old compared to 37.2 years of the general US population and 33.3 years in the Asian American population.[121,162] Life expectancy among Hmong Americans is higher for those who were born in the US compared to those of Hmong immigrants. However, when reviewing the median life expectancy of the Hmong in the United States, the Hmong median age expectancy is 57 years old compared to 77 years among Non-Hispanic White.[178] Short life expectancy and median age of Hmong Americans can be explained by the socioeconomic disadvantages and factors that prevent Hmong Americans from obtaining necessary resources to achieve health equity in the United States.

Common health diseases seen in Hmong Americans include diabetes, hypertension, kidney disease, cancer, and hepatitis B.[34,166,168] In an analysis of mortality patterns among California Hmong Americans from 1988-2002, Yang et al[178] found that the leading cause of deaths among Hmong Americans were caused by circulatory diseases, cancer, and respiratory diseases. Yang et al[178] study was the first of its kind to help provide insight to support the current literature of the Hmong's underutilization of preventative services and its link to poor health outcomes and mortality. To date, there are no other studies evaluating mortality risks or patterns among Hmong Americans.

The limited availability and current research on Hmong Americans have prevented many Western healthcare providers from being informed about traditional health practices, socioeconomic disadvantages, and poor health outcomes.[29,34,116] The lack of culturally relevant

healthcare services to the Hmong has led to significant health issues when compared to their Asian American counterparts and Non-Hispanic Whites.[166,168] For example, in an interview with Hmong community leaders, Schroepfer et al[168] found that resources and information provided to Hmong Americans about cancer awareness was not culturally relevant and not properly translated for the lay Hmong person to understand. Hmong community leaders expressed concerns over the lack of outreach to the Hmong community about health management and preventative screening.[168] Schroepfer et al[168] argues that concepts of preventative medicine were difficult for the Hmong to understand and involving the community and community leaders is essential to addressing these issues. These results mirror Lee and Vang[34] systematic review of cancer screening barriers in Hmong Americans, where high mortality appears to be correlated with the underutilization of cancer screening. Interestingly, Fang and Stewart[166] disagree and argue that poor social constructs, discrimination, lack of transportation, literacy, linguistic barriers, and poor quality of care are responsible for mortality risks among Hmong Americans.

Furthermore, limited studies on immunization uptake among Hmong Americans make it difficult to understand the underutilization of childhood immunizations in Hmong American children, and the perceived barriers to obtaining seasonal vaccines in Hmong American adults. The only study conducted on immunization among Hmong Americans by Baker et al[179] found that cultural values, health beliefs, and behaviors are strong predictors to immunization uptake. Hmong American perception and importance of immunization is blurred as the source of health care varies among Hmong American individuals.[179] The use of traditional health approaches in conjunction to or without conventional medicine can either hinder or facilitate immunization uptake. While healthcare sources may be multifaceted in many cultures, Western

healthcare providers continue to struggle to understand Hmong American health practices, beliefs, and values.[29,30,105]

Traditional Hmong Health Beliefs and Practices

The Hmong believe that health and illness are intertwined with natural and supernatural phenomena. Therefore, treatments are dependent on the type of cause, which can result in the services of either an herbalist, shaman, or Western provider. Seeking services from Western providers only take place when other alternative interventions have failed, most often resulting in complicated healthcare management, high mortality, late-stage diagnosis and/or poor health outcomes.[29,116] Hmong's concept of health and illness is complex and determining the appropriate type of alternative treatment can be complicated when there are multifactorial issues involved.

Approaches to Health Management

Complementary and Alternative Medicine (CAM) use continues to grow in the United States, requiring healthcare providers to be alert of such use and prevalence. According to the National Health Interview Survey in 2012 (NHIS), the growing popularity of complementary and alternative medicinal use in the United States identified that 59 million Americans, ages 4 or older had at least one out of pocket expenses with complementary health therapies.[180] Twelve months prior to the survey, NHIS reported that an approximate $30.2 billion were spent on complementary health approaches with $28.3 billion for adults and $1.9 billion for children.[181] Described as a diverse group of medical and health therapies that is not part of the conventional medical model, complementary and alternative medicine and its use is growing in the United States.[182]

Complementary and Alternative Medicine

CAM includes a variety of modalities and therapies that is often not recognized by the healthcare mainstream in the United States. Pain, restlessness, stress, minor ailments, musculoskeletal issues, head or chest cold are just a few health conditions of individuals who seek CAM therapies.[183] The Institute of Medicine [184] reports that the variety of complementary approaches to address certain health conditions and diseases can be complex making it difficult to have a consistent definition for CAM. Different approaches have been done to classify CAM therapies by grouping certain CAM modalities, however these efforts remain challenging as some modalities coincide with others. With no clear definition, the National Center for Complementary and Alternative Medicine (NCCAM) structured and classified CAM therapies into five distinct categories: 1) alternative whole medical systems (homeopathic and naturopathic, Chinese and Ayurvedic medicine); 2) mind-body interventions (meditation, prayer, mental healing, art, music, and dance therapy); 3) biologically based therapies (herbs, foods, vitamins and other dietary supplements, including natural products such as rhino horn); 4) manipulation and body-based methods (chiropractic and osteopathic manipulation, massage); and 5) energy therapies (qi gong, Reiki, therapeutic touch and electromagnetic field exposure).[184]

Alternative medicine has been around for many centuries and its use and practices are seen around the world. Compared to conventional medicine that are based on scientific approaches, alternative medicine use is based on non-mainstream practices that may be used in place or in conjunction with conventional medicine. Alternative medicine was introduced to Westerners in the United States with the arrival of the Chinese and other ethnic minorities in the early to mid-19th centuries.[185] Alternative practitioners emphasized that alternative approaches and practices were natural therapies, therefore it was considered safe.[182] Since then, the

widespread popularity of alternative medicine and dietary supplements has increased dramatically in the United States.

The lack of understanding alternative approaches between Western healthcare providers and different ethnic minority groups have resulted in legal conflict. For example, coining, a common folk remedy, can discolor the skin or leave a purple streaking on the body of children. Practices such as coining if unknown to the practitioner may look like abuse, resulting in the referral to Child Protective Services. Furthermore, the lack of cultural awareness creates conflicts between Western healthcare professionals and ethnic minority groups, making health management even more challenging as patients are less likely to be compliant with their medication regimen.

Asian Americans in particular, makeup 5.6% of the US population and are less likely to be insured.[186] Therefore, CAM use is common amongst Asian Americans and various important ethnic variations exist.[187] Traditional folk remedies and medications may vary between different Asian American groups; however, all alternative approaches regardless of ethnic variability are all considered and categorized as CAM in the United States. Therefore, it is essential to assess and understand ethnic variation in alternative medicine to provide socially and culturally relevant care.[188,189]

The Hmong and CAM Use

The Hmong for example, have strongly rooted health beliefs with the use of shamans, traditional folk remedies, and medications. While the use of alternative health practices among Hmong Americans is prevalent, its use has resulted in the delay of medical care. Delay of medical care among Hmong Americans include lack of preventative screenings, ongoing health maintenance and medical compliance that has led to poor health outcomes and increased

mortality risks.[29,30,37] The efficacy of these alternative health practices is subjective and the lack of current empirical studies on alternative approaches among Hmong Americans prevents healthcare providers to properly care for this population.

Furthermore, the popularity of CAM in the United States among differing ethnic groups remains to have deficient knowledge of its efficiency, safety, and interaction with prescription drugs.[182] The lack of empirical and evidence-based research prevents healthcare providers to properly counsel patients using alternative approaches. The National Institute of Cancer [190] points out that just because alternative therapies are natural it does not necessarily mean it is safe to use. Certain herbal supplements may be harmful when taken alone or in conjunction with other prescription medications. Other "natural" products can also affect the efficiency of prescription drugs such as anticancer treatment drugs when used in conjunction with St. John's wort, which is often used to treat depression.[181,184,190] Therefore, while it is impossible to understand all alternative approaches and uses among varying ethnic groups, it is important to assess for alternative use. Limited understanding on Hmong Americans and their use of alternative therapies remains problematic as many continue to seek non-prescription medication or traditional remedies in replacement or in conjunction with their prescription medication.[188,191,192]

In essence, the lack of standardized CAM assessment tools makes it rather difficult for healthcare practitioners to assess for CAM use globally. The National Research Center in Complementary and Alternative Medicine (NAFKAM) of the University of Tromsø, Norway, brought CAM researchers and practitioners together to design an international CAM questionnaire (I-CAM-Q). The I-CAM-Q was an attempt for practitioners to collect comparable data among different populations.[193] Quandt et al[193] believed that by having comparable data, it

would increase knowledge on CAM use and provide a foundation for evidence-based comparisons at the international level. However, despite its efforts, there has not been a consensus in utilizing I-CAM-Q as a standardized tool to measure CAM use in the United States nor in other countries. While other CAM assessment tools and instruments exist; not all CAM tools are known to healthcare providers since conventional medicine is often practiced in silo. The lack of cohesive integration of healthcare practices between conventional and alternative medicine has been challenging for healthcare practitioners to properly assess for CAM use, placing patients at significant risks for adverse reactions to prescription medications and poor health outcomes.

Lack of disclosure of alternative use remains to be problematic as such use is dependent on trust and the relationship patients have with their provider. The lack of disclosure of CAM use to healthcare providers predisposes patients at significant risks for adverse reactions when taken in conjunction with conventional medicine. A study on perceptions on complementary therapies reveals that 79% of the participants believed that CAM use in conjunction with conventional medication was superior to either one alone.[194] Furthermore, 63% to 72% of the participants revealed that they will not disclose CAM use to their provider and as many as 61% of the participants felt it was not important for their healthcare provider to know about the alternative therapies they seek, despite their health beliefs.[194]

To better understand Hmong Americans' experiences with the Western healthcare system, Johnson [30] revealed that Hmong Americans feared that they were being studied and that the treatments they received were for the benefit of the doctor. Word of mouth, stories of fear and apprehension of conventional medicine were found to prevent Hmong Americans from seeking conventional services.[30] Stories of people dying shortly after being hospitalized or

having ill side effects from procedures deterred Hmong Americans from going to the hospital or seeking preventative care. Fear and misunderstandings have led to noncompliance with prescribed medications and lack of follow-up care with healthcare providers. Compiled with rooted health beliefs, mistrust of conventional medicine has led Hmong Americans to not fear seeking alternative approaches to care such as the use of imported and unregulated medication.

Health and safety concerns regarding the acquisition of folk remedies and medications exists when it can either be grown, purchased, or obtained from a family, friend or even stranger online.[188,191] In understanding herbal remedy use in Hmong Americans, Lor et al[191] found that over 52% of the participants obtained their herbal remedies from someone else or overseas. The lack of regulation with folk and imported remedies and non-prescription medications poses potentially significant safety risks. However, despite its potential ill effects, folk and imported remedies, and non-prescription medications remain prevalent and a strong health management motivator in the Hmong American community.

While many Hmong Americans will fail to disclose alternative practices to their practitioners, some will continue to utilize both approaches simultaneously. The lack of disclosure of CAM use to healthcare providers predisposes patients at significant risks for adverse reactions when taken in conjunction with conventional medicine. In a general study conducted by Eisenberg et al[194] 79% of the participants believed that CAM use in conjunction with conventional medication was superior to either one alone. Eisenberg et al[194] point out that 63% to 72% of the participants will not disclose CAM use to their provider and found that as many as 61% of the participants felt it was not important for their healthcare provider to know about the alternative therapies they seek despite their health beliefs.

There are limited studies on prevalence and use of alternative approaches, traditional, folk remedies, non-prescription, and imported medication use among Hmong Americans. Since Spring's 1989 study, few empirical studies on alternative therapies in Hmong Americans prevent an understanding of current health approaches Hmong Americans are utilizing for their health management. Different circumstances and factors may influence how individuals perceive safety when utilizing alternative approaches to manage their health, such as traditional approaches, folk remedies, and non-prescription medications. Safety awareness and risk taking are often generalized from individual experiences and with rooted health beliefs, it can drive health behaviors despite educational interventions. The gaps to understanding safety and efficacy of traditional folk remedies further prevents awareness of risk taking and safety awareness among Hmong Americans.

In a 2016 study on Hmong American perceptions and use of herbal remedies, Lor et al[191] found that a majority of the participants believed that traditional herbal remedies treated the body as a whole. Use of herbal remedies in Hmong Americans was higher than any other ethnic groups when compared to the National Health Interview Survey of Alternative Medicine Supplement Database.[181,191] Lor et al[191] found that 28.6% of the participants were more confident in using herbal medicine compared to conventional medicine with 20.8% believing that herbal medicine was more effective. However, despite these findings, Lor et al[191] pointed out that the majority of the Hmong believe that herbal medicine was considered to be the same as conventional medicine and is less costly and easier to obtain. Thereby, herbal remedies were preferred compared to conventional medicine. Although this study is not a representative study of Hmong Americans and had a small sample size of 77 participants, it provides significant insight to health beliefs and practices of Hmong Americans.

Concepts of Health and Traditional Practices

Health and illnesses are perceived differently by many people and cultures. The literature on the Hmong suggests that illnesses are perceived to be caused by losing one's soul due to supernatural or spiritual causes including magical causes, natural causes or the expiration of one's "life visa."[40] The Hmong's religious and traditional views are rooted in animistic beliefs that all objects, places, and creatures have distinct spiritual ties. The Hmong believe that every individual possesses multiple souls. When an individual's soul wanders away or is lost, it can cause the individual to become ill. The literature points out that the Hmong believe that a number of things can cause an individual's soul to become lost or wander away, such as malicious or angry spirits or body spirits wanting an animal sacrifice.[39] To prevent a soul from wondering or getting lost, the Hmong must engage in spiritual ceremonies and practices of tying a string to their wrist or limbs to prevent their soul from leaving their body. The concept of illness as the loss of an individual's soul encourages the Hmong to use shamanistic rituals to restore one's health.

Although many Hmong people often use shamanist rituals to help maintain and restore health, not all Hmong practice shamanism. In Capps [42] seminal study on Christianity in Hmong history, the Hmong were introduced to Christianity as early as the 1600s in China. By the 1900s, approximately 250 Hmong villages were interested in Christian biblical studies with as many as 4,000 Hmong converting to Christianity.[42] With many Hmong fleeing from war, domestic animals for sacrifices and shamanistic rituals were oftentimes not feasible deterring many Hmong from practicing shamanism. Furthermore, many missionaries required that Hmong Christians abandon shamanistic practices and destroy any spiritual emblems.[42] With these religious views, Hmong Christians diverted away from shamanistic rituals, and animistic views.

However, some Hmong Christians may still retain the beliefs that health problems may have spiritual causes and will pray for healing in place of these alternative rituals.[42,195]

Shamans

The Hmong have different types of spiritual healers, including sorcerer-magician (*khawv koob*), fortune-teller (*saib yaig*), herbalists (*kws tshuaj*), and shamans (txiv neeg). These different spiritual healers are considered a form of complementary and integrated medicine and its use is determined based on what is causing the illness.[180,182,196] Most clans and families have their own spiritual healers. Spiritual healers can either be a man or woman.

To better understand the role of shamans in the health management of Hmong Americans, Helsel et al[39] found that shamans are typically chosen by the spirits but can also be someone who was inherited into the role. Helsel et al[39] discovered that shamans heal their patients by covering their face with a black cloth and go into a trance to communicate with the spirit world. Animal sacrifices are often done to appease the angry spirits who may be causing one to become ill. Once the shamanistic rituals are completed, shamans are often paid for their services and are given a portion of the meat from the sacrificed animal to take home.[39,196] Despite shamanistic rituals and practices, the use of a spiritual healer for health and illness management is oftentimes complicated and difficult for many people to grasp its concepts. Traditional Hmong beliefs include multiple sources of illnesses; therefore, multiple methods of interventions can be utilized by the Hmong for health management such as herbal remedies in conjunction to spiritual ceremonies, or the use of conventional medicine when all else has failed.[29,34,116]

Herbalist

The Hmong also believe that some illnesses can result from natural causes. Illnesses resulting from natural causes will steer the Hmong to seek services from an herbalist for herbal remedies. Herbal remedies can include medications, culinary herbal supplements and topical application grown locally or obtained from Thailand, Laos or China.[191] Herbal remedies are often used to treat common colds, fertility, stamina, and malaise. To become an herbalist, one acquires and learns about herbal and medicinal plants from a skilled herbalist. Herbalists are often Hmong women who have acquired the skills and knowledge from other herbalists, which are oftentimes family members. Unlike shamans and spiritual healers, herbalists practice from personal choice. Anyone can choose to become an herbalist; however, they cannot choose to become a shaman or spiritual healer.

As an oral and collectivist culture, it has been difficult for the Hmong to document the types of plants and herbs used. Therefore, many herbalists do not know names and species of plants, rather acquire skills and knowledge from their predecessors about different plant species and implication for its use. To better understand herbal use among Hmong Americans, Spring [192] conducted an ethnopharmacological analysis of medicinal plants used by Hmong herbalists living in Minnesota and identified over 106 different botanical species that are used to treat health ailments. Although this study identified different plants and herbs the Hmong commonly use to manage one's health, there are limitations. The winter seasons in Minnesota prevented herbalists and the Hmong from growing and obtaining plants and herbs that typically grow in warm tropical weather. Therefore, the inability to access plants and herbs during the cold winter months have resulted in the Hmong to either exchange or borrow herbs and plants or seek imported plants and herbs from overseas.[188]

Although significant work has been done on assessing and understanding CAM use in the United States, there lacks continual efforts in understanding CAM use and its impact in Hmong Americans. Suggestions include more empirical studies of CAM use in ethnic minority populations in the United States and to include a more diverse population when conducting the National Health Interview Survey on CAM.

Western Healthcare Services and Medications

Although much of the literature identifies various barriers that exist with Hmong Americans achieving health equity in the United States, the literature also points out that mistrust of the Western system is a barrier for Hmong American adults.[30] Lee and Vang[34] found that the Hmong felt betrayed after the Vietnam War, resulting in skepticism of the Western system and a huge contributor to being unable to acclimate to the US mainstream. Studying Hmong American experiences with the Western healthcare system, Johnson [30] found that many Hmong Americans fear and distrust Western approaches to health care. Surgical interventions and lab draws were found to be unacceptable in addition to believing that surgical interventions will distort the body therefore affecting reincarnation in the next life.[197] The belief of the body and soul reincarnation is strongly rooted in the Hmong's belief of life and life after death that it has resulted in Hmong Americans from refusing lifesaving surgical interventions to prevent any missing body parts to occur in the current life. The Hmong believe that if a body part or organ is to go missing, when a person dies and reincarnates, they too will have missing body parts or organs in the new life. Therefore, surgical interventions altering body parts and organ donations are often denied among Hmong Americans.

Furthermore, the Hmong's inability to understand the human anatomy and pathophysiology, has led the Hmong to believe that drawing multiple vials of blood will deplete

their blood reserves and therefore will die from blood loss.[188] As a result, blood draws are often refused or not followed through for preventive management on chronic health issues. Furthermore, word of mouth and stories of fear and apprehension of conventional medicine has also prevented the Hmong from seeking Western healthcare services. Stories of people dying shortly after being hospitalized and/or procedures having adverse effects have deterred Hmong Americans from going to the hospital or seeking preventative care services. Fear and misunderstanding of the Western healthcare system have led Hmong Americans to be noncompliant with prescribed medications, fail to follow-up care with healthcare providers, and seek early healthcare services when ill.[32,34,38]

Gaps in the Literature and the Present Study

While the literature reveals multiple barriers for Hmong Americans, it is crucial to understand that many people are not aware of the health beliefs, practices, and adversities that they endure. A small proportion of qualitative studies provide a broad knowledge about Hmong Americans; however, the lack of comprehensive studies prevents researchers to understand the barriers Hmong Americans endure when managing their health, access to care, disparity, and quality of care. Common literature themes with Hmong Americans include health beliefs, literacy, linguistic discordance, and quality of care. Health beliefs are strongly rooted among Hmong Americans and having a firm understanding of such beliefs is critical to providing culturally competent care. Although economic and educational advances have been made among some Hmong American individuals, many of Hmong Americans continue to experience adverse health outcomes due to being deeply rooted in their cultural health beliefs and practices. Younger individuals educated in the United States have a blended worldview between the Hmong and American culture. Therefore, to better grasp personal and cultural practices, individuals should

be assessed at the individual and social level to have a better understanding of their beliefs and practices.

Literacy, health literacy, and literature on Hmong Americans reveals some insightful facts that is important to highlight the significance and limitations of each. Literacy is often measured by using the gold standard tools such as the REALM and TOFHLA. However, despite the validation of these tools, these tools are not appropriate to use in minority populations such as Hmong Americans. A limitation to using tools that are conceptualized on vocabulary and reading comprehension is administering it to a group that lacks vocabulary and terms such as the Hmong. The lack of vocabulary and terms would make it difficult to translate for administration, furthermore it would be difficult to validate. It is significant to point out Nguyen et al[154] findings that the lack of a validated tool in minorities make it difficult to assess for literacy among minority groups; however, it should not be disregarded as many of these groups are already experiencing vulnerabilities when it comes to social and economic development.

While most health education interventions are developed at the general reading level, the lack of cohesiveness between literacy and health literacy prevents healthcare providers to be aware of the differences between the two, resulting in inadequate health education materials. This limitation compounds a cascade of barriers as patients and health clinicians are limited with proper education materials. While most healthcare providers are unaware of the discrepancy between reading levels and comprehension of health information, further research efforts and interventions are needed to strengthen the relationship between health education materials and health literacy comprehension.

The lack of cultural and linguistic appropriate resources prevents Hmong Americans from making informed health decisions or being aware of health resources. The scarcity and

availability of professional Hmong medical interpreters predisposes patients to being misinformed about their health conditions/disease, medication management and plan of care. Furthermore, although the efficacy and safety of traditional approaches, folk remedy, and non-prescription medication use among the Hmong Americans remains questionable, Spring [192] points out that efficacy varies depending on the perception of its use. Perceptions of efficacy had desirable effects for Hmong Americans, therefore Spring believed it gave meaning to continue its use to prevent disruption and stress when one is ill.[192] However, since Spring's 1989 study, there remains to be limited or current empirical studies on traditional approaches, folk remedy, or the use of non-prescription medication in Hmong Americans. Most qualitative and very few quantitative studies were done on Hmong health beliefs and practices among Hmong refugees or first-generation Hmong Americans. There are little or no known studies on 2nd generation or subsequent Hmong American generations and their health beliefs and practices in the United States.

In addition to the lack of empirical studies on Hmong health attitudes and behaviors, the lack of proper and consistent CAM screening tools in the United States prevent healthcare practitioners to be aware of such use among Hmong Americans. When ethnic minorities and groups have differing health beliefs and practices, it is essential for practitioners to be aware of these differences and have standardized tools for assessing alternative approaches to be able to provide culturally competent care. While additional studies will be needed to assess, evaluate, and address healthcare phenomena of Hmong Americans and the gaps as stated above, the need for additional empirical studies is crucial to addressing the barriers reported. The literature presented above provides a foundation for further inquiry to address the health behaviors of Hmong Americans during the COVID-19 pandemic.

It remains unknown what the long-term effect of COVID-19 will have on different populations and generations. With three FDA-approved mRNA vaccines against COVID-19, it is still unknown how many people will obtain the vaccine and if access to the vaccine is available to the populations that need it the most. Current COVID-19 clinical management continues to revolve around supportive symptom management with conditions such as pneumonia, hypoxemia respiratory failure (ARDS), sepsis, septic shock, cardiomyopathy, arrhythmia, acute kidney injury and complications from prolonged hospitalizations.[54] Viral testing continues to be a challenge, as many counties and states lack access to testing kits in addition to limited access and testing for vulnerable and underserved communities. Furthermore, there remains to be a testing gap among underserved and vulnerable populations. Distrust and misinformation have made it difficult for vulnerable and underserved populations to accept, obtain and access COVID-19 testing, further dividing the gap in understanding the impact COVID-19 has on vulnerable and underserved populations.[198] The need to assess the effectiveness of COVID-19 mitigation interventions in underserved and vulnerable populations lies in understanding the information and motivation factors, behavioral skills, and health behaviors. The lack of disaggregation of Asian American data prevents health disparities to be seen by policy makers, researchers, and funders in subgroups like Hmong Americans. Therefore, the need to study sub-Asian American groups such as the Hmong Americans and their health behaviors during the COVID-19 pandemic will allow experts to understand the barriers and facilitators to masking, social distancing, avoiding group gatherings adherence, and vaccination uptake during the pandemic. At the time of this study, there are no known studies on Hmong Americans' COVID-19 mitigation behaviors during the COVID-19 pandemic.

In an informatic era, information is available at anyone's fingertips. In this context, misinformation is in abundance and obtaining valuable and accurate information about COVID-19 can be challenging, especially when literacy and access to accurate information is a barrier. To better understand how vulnerable and underserved populations like Hmong Americans understand the ramifications of mitigation policies, COVID-19 precautions, and signs and symptoms to seek care, further inquiry and studies will be needed to identify the pathways that trigger certain health behaviors. Studies will have to be done from a traditional and Western perspective to fully grasp the varying factors that can impact different attitudes, beliefs, and behaviors. Thus, expanding existing behavioral models of health behavior to include such culturally relevant socio contextual factors that may impact Hmong Americans may be advantageous for fully understanding how to improve their preventive health behaviors.

Theoretical Framework

Information Motivation Behavioral Skills Model

Health behavior models are designed to understand the cause-and-effect relationship of health-related behaviors.[199] Understanding health related behaviors will allow experts to predict the occurrence of health-related behaviors, develop meaningful interventions to change behaviors and guide health behavior research.[199] While there are no comprehensive theoretical framework or model, it is important to be aware that different frameworks and models exist and more than one may be used to help understand the different influences that can impact one's behavior.[199] An innovation of the proposed study is applying a theoretical approach to understanding Hmong Americans' health promotion behaviors and adherence to COVID-19 mitigation interventions based on COVID-19 mitigation related information, motivation, and behavioral skills. While any health behavioral model is useful in this assessment, it is imperative

that the health behavior model selected is appropriate to identify and assess the different pathways that may influence the individual's health related behavior. The conceptual model that will be used for this study will be the Information Motivational Behavioral Skills Model (IMB).

The IMB theorizes that well informed individuals are more motivated to act upon health-related behaviors and have the required behavioral skills to influence their health promotion behavior.[200] The IMB utilizes a social psychological approach to understand and promote health behaviors.[200] The IMB was proposed by Fisher and Fisher[44] to understand AIDS risk behavior in 1992. The model conceptualizes three fundamental determinants that impact health related behavior and risk-reduction (Figure 1). The three determinants of the IMB are information, motivation, and behavioral skills. Information constructs include information regarding the health condition and specific preventative interventions to reduce risks, meanwhile motivation assesses for the personal and social motivation that influences change.[44] Behavioral skills, on the other hand, includes the performance of specific preventative acts.[44] Furthermore, the IBM conceptualizes that psychological determinants can either impair or improve one's health status.[200] Psychological determinants include individual characteristics such as motivation, perception, attitudes, beliefs, and learning.[201] With varying influences, contextual factors can influence different constructs of the IMB thereby impacting the preventative health behavior outcome.[202] The version of the model that will be used for this study will include an expanded IMB model to include contextual and personal characteristics with the following constructs: 1) health behavior information, 2) health behavior motivation, 3) health behavioral skills, 4) health behaviors, and 5) contextual/personal characteristics (Figure 2).

Figure 1. Information Motivation Behavioral Skills Model

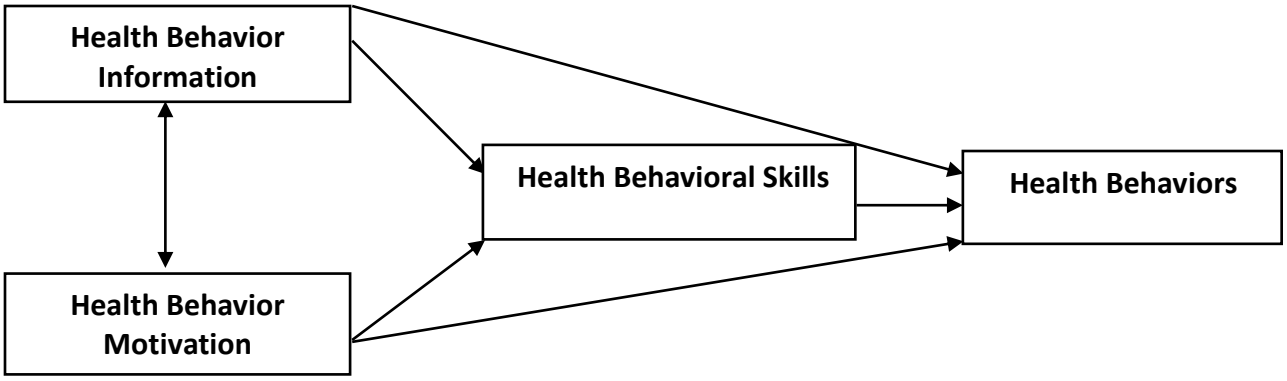
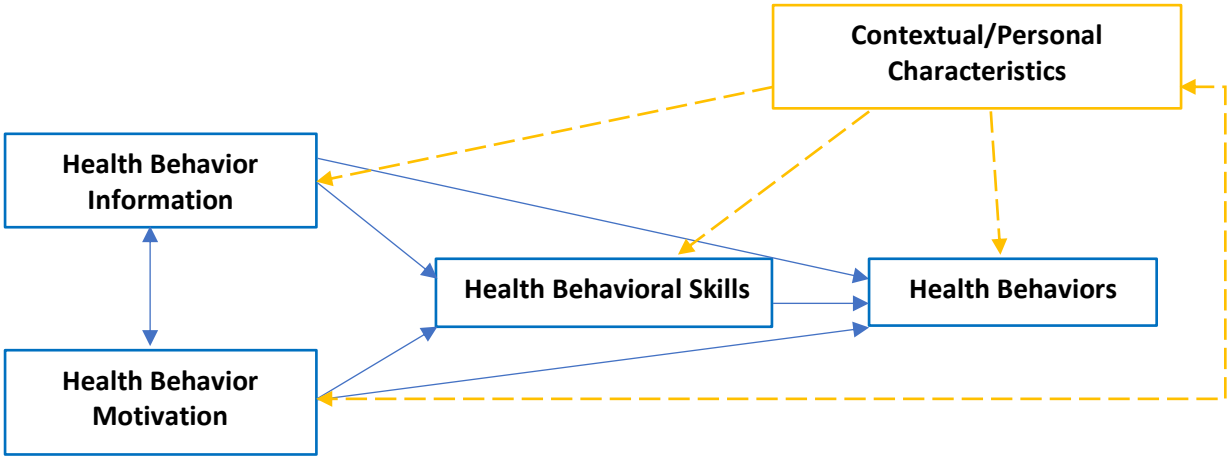
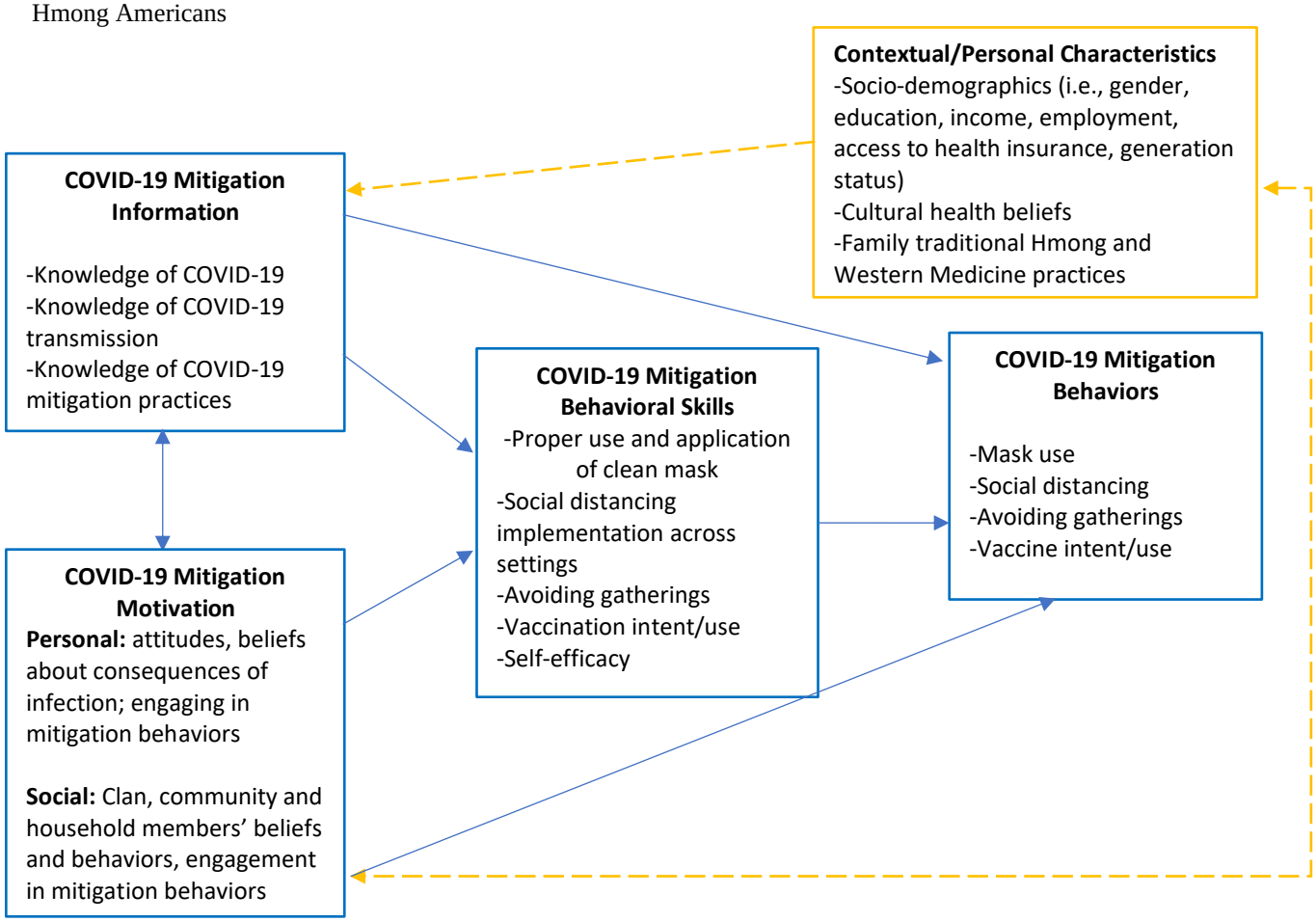


Figure 2. Expanded Information Motivational Behavioral Skills Model



As shown in Figure 2, the expanded IMB model is organized according to the different constructs and its impact on the health behavior. According to the model, health behavior information and motivation has a direct effect on all the constructs. Meanwhile health behavior skills are a direct predictor to the adoption and adherence to health behaviors. Contextual and personal characteristics directly impact all the dimensions in the IMB model. The original IMB model is represented with solid lines and the contextual and personal characteristics added to the study are represented by the dotted lines. A more detailed proposed IBM model of COVID-19 prevention information, motivation, behavior skills and health behaviors among Hmong Americans is summarized in Figure 2.

Figure 3. Expanded Information Motivational Behavioral Skills Model for COVID-19 Mitigation Behaviors in Hmong Americans



As shown in Figure 3, the expanded IMB model is organized according to the different constructs and its impact on COVID-19 mitigation behaviors. The first construct in the model is the COVID-19 information to include assessment of COVID-19 knowledge, transmission of COVID-19, and mitigation practices. The importance of assessing for COVID-19 information among Hmong Americans will allow a better understanding of the relationship between COVID-19 information comprehension and its impact on COVID-19 mitigation behaviors. The abundance of information on news outlets, social media, online platforms, in addition to word-of-mouth information from family and friends, can have negative connotations toward mitigation

behaviors as not all information are factual. The IMB asserts that information is directly relevant to the health performance.[200] Information can include knowledge or facts about COVID-19, interventions towards prevention of infection, resources for COVID-19 testing and healthcare services, and heuristics about acute versus chronic health conditions. Heuristics is the decision-making process that often includes taking shortcuts to obtain a timely solution.[203,204] Many individuals rely on heuristics to make simple and faster decisions. While simple and faster decisions may lead to inaccuracies, individuals would rather trade off costs and time to save effort. Gigerenzer and Gaissmaier[203] believes that individuals who choose to use heuristics to make decisions do not necessarily feel that the decisions are important. Therefore, loss in accuracy is acceptable compared to the higher costs and time in one's effort.

The second construct of the IMB model is the COVID-19 preventative motivation construct. Fisher et al[200] points out that during the motivation stage, it can include personal and social cues that can help promote or delay health behavior skills, such as familial beliefs and support. Personal motivation cues can include attitudes, beliefs, and perceptions in engaging in preventative health behaviors. Meanwhile, the social motivation among one's family or clan can result in differing health practices, beliefs, and attitudes from the personal motivation cues. Among Hmong Americans, familial and cultural beliefs are deeply rooted in how individuals manage their health. Variation in such health practices can either hinder individuals from seeking preventative healthcare services or prevent individuals from participating in preventative health interventions despite their personal motivation cues. According to the IBM model, an individual's behavior can be inferred from psychological characteristics.[200] Hartley [201] argues that psychological characteristics are the product of a group and characteristics such as attitudes and beliefs arises in the group that individual belongs to. The inherent beliefs and attitudes among the

group becomes standardized for individuals within the group. Therefore, when studying and understanding health behaviors, Hartley [201] argues that health information should not only be directed at the individual but also include an assessment of the group.

COVID-19 mitigation behavioral skills are the third construct of the IBM model. Fisher et al[200] argues that when individuals are well informed and have the personal and social motivation cues, they are more likely to possess the behavioral skills to initiate and maintain the health behavior. Mitigation efforts to suppress the spread of COVID-19 include recommendations to use face masks, social distance, and avoid group gatherings when out in public areas.[58] Improper use and application of face masks predisposes individuals to the virus, as the virus spreads via aerosol droplets. According to the Centers for Disease Control and Prevention [205] face coverings should have two or more layers of washable, breathable fabric, should completely cover over the nose and mouth and fit snugly against the sides of the face. Masks should be washed regularly, and hand hygiene should occur immediately after handling used masks. To further prevent the spread of infection, social distancing practices include increasing the space between individuals to decrease the frequency of contact with people. Social distancing recommendations require that individuals maintain at least 6 feet between all individuals.[58] While masking, social distancing, and avoiding group gatherings are some of the mitigation interventions towards suppressing the spread of infection, vaccine uptake can also help with the prevention of disease. With three available mRNA vaccines, mitigation behavioral skills assessing for the vaccination intent and uptake is critical to understanding vaccine hesitancy and allow for a better understanding of the barriers that prevents vaccine uptake. Lastly, self-efficacy is measured in the preventative behavior skills construct. Self-efficacy is a strong predictor to health behaviors. Self-efficacy reflects the confidence in one's ability to

effectively perform preventative health behavioral skills. Different sources can contribute to one's self-efficacy, such as personal mastery experience and observation of other people. Other sources of self-efficacy can include personal and physiological motivation that either instills feelings or hands-on confidence in performing certain tasks.[206]

The fourth component of the IMB model is the COVID-19 mitigation behavior. The IMB assumes that health promotion information and motivation work through health behavior skills to influence the health promotion behavior.[200] Health behaviors are strong predictors of morbidity and mortality. According to Conner and Norman,[206] the leading cause of death are caused by the behaviors of the individual. Although health behaviors are modifiable, interventions should be matched to the needs of the individual. Therefore, it is important to understand the driving forces and barriers towards changing health behaviors by understanding individual contextual and personal characteristics. Contextual and personal characteristics are the fifth construct of the IMB model.

Contextual and personal characteristics are factors that have been identified to have an influence on the information, motivation, and behavioral skills most relevant to the engagement of health-related behaviors and risk reduction.[200,202,207] Contextual factors include a range of elements that influences the health, safety, and wellbeing of individuals. These factors include family interactions, socio-cultural factors and characteristics that are unique to a particular group or community.[200,202] While contextual factors exist, their impact varies among different groups. Cultural health beliefs can be a contextual factor in preventing Hmong Americans from adhering to mitigation interventions such as the use of masks, social distancing, avoiding group gatherings, and vaccination uptake. Collectivist practices among Hmong Americans in addition

to cultural expectations further impact behavioral skills when masking, social distancing, avoiding group gatherings, and obtaining the COVID-19 vaccine.

Chapter Three

Research Design and Methodology

Significance and Innovation

In an informatic era, information is easily accessible via online platforms and news media outlets. There is an abundance of misinformation and obtaining accurate information about COVID-19 can be challenging, especially when literacy and access to accurate information is a barrier. To better understand how vulnerable and underserved populations such as Hmong Americans understand the ramifications of not following mitigation policies and vaccination uptake requires further inquiry and studies to identify the pathways that trigger certain health behaviors. Studies will have to be done from a traditional and Western perspective to fully grasp the varying factors that can impact different attitudes, beliefs, and behaviors.

Currently there are no studies investigating COVID-19 mitigation behaviors and COVID-19 vaccination intention and uptake in Hmong Americans. Furthermore, current COVID-19 studies lack conceptual and theoretical frameworks to guide and understand individual health behaviors among Hmong Americans. While various conceptual models exist, there are few models that would allow researchers to look at the contextual factors that impact Hmong Americans and their health behaviors such as the cultural and family structures that drive behaviors among Hmong Americans. Therefore, an expanded Information Motivational Behavioral Skills model will be used to assess for COVID-19 mitigation related information, motivational cues, and behavioral skills during the COVID-19 pandemic. The purpose of this study is to examine Hmong American mitigation knowledge, attitudes, beliefs, and health behaviors with COVID-19. This study will be assessed in the context of both traditional Hmong and Western views.

Study Design

The purpose of this study is to examine Hmong American mitigation knowledge, attitudes, beliefs, and health behaviors with COVID-19. The study design was a cross-sectional quantitative web-based survey.

Data Collection

Setting and Sampling

A cross-sectional web survey was conducted between April 8, 2021, to June 1, 2021. A link to the survey was available on HmongCOVID.com and shared using recruitment partners. An explanation of the study was provided, in addition to the goals and objectives of the study. Individuals interested in participating in the study were directed to the University of California Davis Qualtrics software for an electronic consent form prior to taking the survey (Appendix 1).

The targeted sample for this study was a minimum of 270 people. Due to the inability to easily identify the entire Hmong American population in the United States, true random sampling was not possible. As a result, non-probability sampling methods were used in this study. The two types of sampling methods used were convenience and snowball sampling. This study draws on Hmong Americans online with the use of recruitment partners; therefore, convenience and snowball sampling were reasonable methods for the purpose of this study. Community leaders, activists, and non-profit organizations from across the United States known to the researcher were contacted and asked to complete the survey and serve as a recruitment partner by encouraging their communities to complete the survey. Digital fliers and information about the study were provided to recruitment partners to share and post on their social media or web-based platform, the community they serve, or by email.

Dillman et al[208] best practices for web survey implementation were followed. An announcement in the form of a flyer, email, and pre-recorded video of the study were posted by the researcher and recruitment partners several days before the intended start date of the study. According to Dillman et al[208] personalization of all contacts in web surveys is crucial to drawing out respondents from the target population. In a study understanding Hmong Americans' perspective on insider and outsider researchers, Lor and Bowers[209] found that 53% of the respondents reported that they would participate in a research study if the researcher was Hmong. Understanding trust issues among Hmong Americans with the US government, healthcare system, science, and research, it is essential to personalize the study as much as possible with the use of a pre-recorded recruitment video from the researcher. A pre-recorded recruitment video clip of the researcher explaining the study and need for participants was posted online and shared with the recruitment partners in addition to flyers and information about the study.

Subsequent postings online via social media, email or fliers were posted to recruit participants, and as needed until the minimum sample is obtained. Virtual flyers including the link to the survey and website explaining the survey were available. The recruitment partners were informed of the study and were asked to schedule social media posts, or other electronic announcements once or more during the recruitment period. Sample emails and social media posts were provided to the recruitment partners; however, it is possible that the final text used by recruitment partners were altered before sharing. Individuals interested in the study were directed to HmongCOVID.com or provided a link to the survey. Flyers posted on web-based platforms included the website and direct link to the survey. Physical flyers posted by recruitment partners

involved detailed information about the study and researcher conducting the study, in addition to the link and QR code to the survey.

Inclusion and Exclusion Criteria

The study sample was drawn from a population of Hmong American men and women living in the United States. Restrictions were limited to those that were 18 years or older, able to read and write English, and provide consent. Study samples were drawn from Hmong American individuals who have online access and/or social media accounts where recruitment partners have posted the survey. With differences in mitigation efforts from country to country, in addition to differences in healthcare access and resources, all participants must be living in the United States at the time of the study. The limited Hmong vocabulary and words for certain conditions prevent the researcher from having a survey in Hmong. Therefore, the study was limited to those who could read and write English.

Survey Instrument Development

Our two-step approach to developing a culturally appropriate survey assessing Hmong Americans was, first to identify existing validated tools for measuring COVID-19 mitigation information, motivation, and health behaviors skills, and then to use cognitive interviewing. Second, cognitive interviewing was conducted with a small group of Hmong Americans from varying age groups and socioeconomic demographic backgrounds to make sure the survey content was clear to study participants and to determine the amount of time it would take participants to complete the survey online. Cognitive interviewing informed our final decision on response anchors to avoid complex rating scales when possible and to use Yes/No options

instead of True/False statements, because True/False statements lacked clarity for this population.

The strategy to develop an optimal survey questionnaire was focused on looking at existing validated tools for assessing for COVID-19 mitigation information, motivation, and health behaviors skills, adapting as needed to be appropriate for Hmong American sample. Surveys used to develop the questionnaire included the International COVID-19 Awareness, and Response Evaluation Survey, Social Psychological Survey of COVID-19, USC Center for Economic and Social Research on Understanding America Study on Coronavirus tracking survey, behavioral insight studies related to COVID-19 from the World Health Organization European Region, Consumers and COVID-19: Survey Results on Mask-Wearing Behaviors and Beliefs, CDC COVID-19 Community Survey Question Bank, and the Knowledge, Attitudes, and Practices toward COVID-19 among Chinese questionnaire.[210-216] Vaccination intent or use questions were measured by items adapted from a battery of items used to validate COVID-19 vaccinations intention and use from the Kaiser Family Foundation (KFF) COVID-19 survey.[217]

While the surveys were not used in their entirety to minimize participant burden, the questionnaire designs were developed to include questions measuring the constructs of interest for the proposed research. The constructs included COVID-19 mitigation information, motivation, behavioral skills, and health behaviors. The constructs were assessed from both traditional Hmong and Western healthcare views. Hmong Americans experience low literacy and historical distrust with the Western healthcare system and US government.[30,197] Therefore, when designing a questionnaire, questions were developed at the 5th grade reading level, had open ended questions, and were easy to answer.[164] Answer options were simple enough that a fifth

grader would be able to understand how to answer numerical point labels, yes or no, or true and false options. No survey was collected without confirming the written informed consent of the participant. All data were anonymous and maintained in a secured database and only available to the researcher.

Survey Measures

The final survey battery included items related to the participants' social demographics, contextual factors such as cultural health beliefs and practices, and COVID-19 mitigation information, motivation, behavioral skills, and health behaviors on masking, social distancing, group gatherings, and vaccination intent/use (Appendix 2).

Sociodemographic

Thirteen sociodemographic questions were adapted from similar survey questions. Sociodemographic characteristics included gender (male; female; other), age (18-24 years; 25-34 years; 35-44 years; 45-54 years; 55-64 years; or 65 or older), education (Less than high school; High school graduate, diploma, or equivalent; Trade/technical/vocational training; College degree), employment status (Full-time; Part-time; Student; Retired; Unemployed), combined yearly household income (less than $30,000; $30,000-$70,000; $71,000-$100,000; over $100,000), and healthcare coverage (yes; no). Place of birth (Laos; Thailand; United States; Other) and parental birthplace were used to determine generational status as a broad marker of acculturation. Chronic health conditions are conditions that increase the risk for severe illness from COVID-19. Assessment of such conditions were inquired with answer options such as asthma, lung disease, heart disease, diabetes, kidney disease, and cancer. Individuals younger than 18 and over 65 years old were at highest risk for COVID-19 when living in overcrowded

households. We assessed for three age groups of people living in the same household (<18, 18-64, and ≥ 65).

Traditional verses Conventional Health Practices

To assess for contextual and personal characteristics, personal and family/clan health beliefs and practices were assessed. Participants were asked to reflect upon their health beliefs, family/cultural norms, and type of health condition that would affect their health behaviors. Nine questions assessed personal and social health practices regarding use of traditional and conventional methods when ill. Six questions assessed personal health practices and three questions assessed social health practices. An example of personal health practices during the pandemic was measured using the question, "During the pandemic, have you used Hmong medicine or other traditional approaches to: (select all that apply)." Respondents answered using the following options: 1=To stay healthy, 2=Prevent COVID-19, 3=Treat COVID-19 illness, and 4=Never used. Subsequent questions were used to measure use of a shaman and seeing a medical doctor during the pandemic with the same 1-4 answer options.

We measured social health practices with the following question: "During the pandemic, have your family members used Hmong medicine or other traditional approaches to: (select all that apply)." Respondents answered using the following options: 1=To stay healthy, 2=Prevent COVID-19, 3=Treat COVID-19 illness, and 4=Never used. Subsequent questions queried family use of a shaman and medical doctor with same 1-4 answer options.

The last three health practice questions assessed personal use of traditional approaches, a shaman or medical doctor if sick with COVID-19. For example, use of traditional approaches if sick with COVID-19 were measured with the question "If sick with COVID-19, how likely

would you use Hmong medicine or other traditional approaches?" Respondents answered using the following answer options: 1=Very likely, 2=Somewhat likely, 3=Neither likely nor unlikely, 4=Somewhat unlikely, and 5=Very unlikely.

COVID-19 Information, Motivation, and Behavior Skills

Twelve questions were used to assess COVID-19 mitigation related information. Questions on COVID-19 related information included sources of information, trust of COVID-19 information, information related to COVID-19 disease and symptoms, masking, social distancing, group gatherings and COVID-19 vaccines. Respondents answered with the following answer options: 1=Yes, 2=No, and 3=I don't know. One question assessed sources of information participants used to stay informed on COVID-19. Respondents answered by selecting all that applied: 1=Television, 2=Conversations with family and friends, 3=Websites or online pages, 4=Social media (e.g., Facebook, Twitter, YouTube, WhatsApp, etc.), 5=Radio Stations, 6=Official government, 7=Medical institutions, 8=Hmong community leaders, and 9=Other. To understand trust in the sources providing COVID-19 information, respondents were asked if they trusted the following sources: Television, Conversations with family and friends, Websites or online pages, Social media (e.g., Facebook, Twitter, YouTube, WhatsApp, etc.), Radio stations, Official government, medical institutions, and Hmong community leaders. Respondents answered each source with the following answer options: 1= A lot of trust, 2= Some trust, 3=Neither little or some trust, 4=Little Trust, and 5=Very little trust.

The COVID-19 preventative motivation questions assessed two constructs of motivation: personal motivation and social motivation. Twelve personal and eleven social motivation behavior questions measured attitudes, beliefs about consequences of infection, and engaging in

preventative behaviors, such as masking, social distancing, group gatherings, and vaccination use/intent.

The COVID-19 preventative behavioral skills and behavior questions assessed the proper use, application, and removal of face mask, knowing how to and maintaining 6 feet from people outside their household, avoiding group gatherings and large crowds, and vaccine use/intent (see Appendix A). Questions on the likelihood of engaging in behaviors were rated on a 5-point Likert scale from Very Likely to Very Unlikely. Questions on behavioral skills and the presence or absence of protective behaviors in the last 30 days were responded with Yes/No options. Questions on the frequency of behaviors were rated with a 4-point Likert scale from All the time to Never.

Data Analysis

All data are stored in Qualtrics XM database provided by the University of California Davis and then imported into STATA (version 15.1) for statistical analysis. Categorical data was reported by one-way frequency and percentages. Descriptive statistics were used to summarize the overall characteristics of the sample. Chi-squared analyses were used for bivariate analyses between health behaviors with gender and generation status. Fisher's Exact Test (FET) was used in analyses when the expected value in a cell fell below 5. FET were used for generational status by health behaviors. Missing data were carefully assessed. Variables with 60-70% of missing data were dropped from the analyses. Outliers were assessed and addressed if it appeared that the value was in error. A p-value of $<.05$ was considered to indicate a statistically significant difference.

Aim 1: To describe SARS-CoV-2/ COVID-19 mitigation related information, motivation, behavioral skills, and health behaviors among Hmong Americans.

AIM 1 includes all Hmong Americans who met the inclusion criteria. Characteristics of the sample was described with descriptive statistics. Descriptive statistics, specifically frequency, central tendency and measures of variability are reported for Hmong Americans. Descriptive statistics and frequency distribution were calculated for all baseline predictors and for each measure of the expanded IMB model. Frequency distribution of mitigation behaviors were calculated. A sub analysis of individuals who identified as being sick with COVID-19 was also done to assess for health seeking behaviors with use of traditional or Western health approaches.

Aim 2: Examine associations among COVID-19 mitigation behaviors and contextual factors and sociocultural factors that would influence masking, social distancing, group gatherings, and vaccination uptake in Hmong Americans.

The association between SARS-CoV-2/ COVID-19 prevention-related information, motivation, and behavioral skills factors, contextual factors and personal characteristics, adherence to masking and social distancing, and vaccine intent or use were evaluated using chi-square or Fisher's Exact Test analysis. Four outcomes representing specific preventative health behaviors such as masking, social distancing, group gatherings, and vaccination intent/use were examined.

Protection of Human Subjects

This study was approved by the University of California Davis Institutional Review Board as an exempt study (Approval no. 1731265-1, April 6, 2021). Written informed consent was posted on the web-based questionnaire, and all participants had to log into the web-based

questionnaire and answer a yes or no question to voluntarily confirm their willingness to participate before the data was collected. Only subjects who consented according to the IRB approved protocol were included in this study. There were minimal risks for participants in this study. All data were confidential, and anonymous.

Chapter 4

RESULTS

A total of 609 participants assessed the link to the web survey. Only 507 (83%) participants completed the survey in its entirety and were used for the analyses. The characteristics and demographics of the samples are summarized in Table 1. As expected, the sample was younger, more likely to have achieved higher educational attainment, employed, have a higher annual household income, and some form of health insurance. Analysis of the sample revealed that 378 (78%) were female and 106 (22%) were male. Of the 507 participants, 65 (13.5%) were born in Laos, 4 (.8%) identified as being born outside of the United States, while 102 (21.2%) identified as being born in Thailand, and 311 (64.5%) were born in the United States. When assessing parental birthplace to determine generation status, 464 (96.5%) participants have a parent who was born outside of the United States with 17 (3.5%) whose parents were born in the United States. This analysis revealed that 196 (38.66%) participants identified as first-generation Hmong American, 299 (59%) participants identified as second-generation Hmong American, and 12 (2.4%) identified as third generation Hmong American.

Table 1. Sample Characteristics

Characteristics		**n (%)**
Gender		
	Male	100 (20.75)
	Female	376 (78.01)
	Prefer not to say	6 (1.24)
Age		
	18-24 years	48 (9.96)
	25-34 years	205 (42.53)
	35-44 years	182 (37.76)
	45-54 years	41 (8.51)

55-64 years	5 (1.04)
65-74 years	1 (0.21)
Generation Status	
First generation	196 (38.66)
Second generation	299 (58.97)
Third generation	12 (2.37)
Education Level	
Less than High School education	4 (0.83)
High School graduate, diploma, or equivalent	63 (13.07)
Trade Degree	28 (5.81)
College Degree	387 (80.29)
Employment Status	
Employed	386 (80.09)
Unemployed	48 (9.96)
Student	46 (9.54)
Retired	2 (0.41)
Annual Income	
Less than $30,000	39 (8.11)
$30,000-$70,000	123 (25.57)
$71,000-$100,000	103 (21.41)
Over $100,000	178 (37.01)
Prefer not to say	38 (7.90)
Healthcare Coverage/Insurance	
Yes	448 (92.95)
No	34 (7.05)
Types of Healthcare Insurance	
Medicaid/Medicare	72 (15.19)
I get my health insurance through my work	338 (71.31)
I buy my own health insurance	22 (4.64)
Veterans Affair/Military Insurance	7 (1.48)
Other	35 (7.38)
Chronic Health Conditions	
Lung Disease/Asthma	
Yes	26 (5.60)

No	438 (94.4)
Heart Disease/High Blood Pressure	
Yes	57 (12.15)
No	412 (87.85)
Diabetes	
Yes	35 (7.51)
No	431 (92.49)
Kidney Disease	
Yes	5 (1.08)
No	459 (98.92)
Cancer	
Yes	5 (1.08)
No	459 (98.92)
Obesity	
Yes	129 (27.51)
No	340 (72.49)
Diagnosed or sick with COVID-10	
Yes	86 (17)
No	420 (83)
Knew someone with COVID-19	
Immediate family member	
Yes	273 (56.06)
No	214 (43.94)
Relative	
Yes	366 (75.15)
No	121 (24.85)
Friend	
Yes	315 (64.68)
No	172 (35.32)
Someone other than family, relative or friend	
Yes	97 (19.92)
No	390 (80.08)

Household assessment is summarized in Table 2. Household assessment by age groups show that (67.25%) participants reported having at least one child under the age of 18 and 96 (22.57%) participants reported having at least one individual over the of 65 years old living in their household.

Table 2. Ages in Household

	Children Under 18 yrs. (n=440)	**18 to 64 yrs.** (n=470)	**>65 yrs. old** (n=425)
None	144 (32.75)	12 (2.54)	329 (77.43)
One	77 (17.50)	22 (4.68)	58 (13.65)
Two	86 (19.55)	181 (38.51)	31 (7.29)
Three	61 (13.86)	81 (17.23)	4 (0.94)
Four	50 (11.36)	69 (14.68)	0 (0)
Five and more	22 (4.98)	105 (22.34)	3 (0.71)

COVID-19 Information

COVID-19 information assessment shows that majority of the participants are aware of COVID-19 symptoms (Table 3). Information on COVID-19 assessment shows that 30.8% of the participants reported that there are medications that can treat COVID-19 while 8% reported there are Hmong medications that can treat COVID-19. Few participants (19 of 506, 3.8%) reported there is a cure for COVID-19, while 96.1% (486 of 506) of the participants reported that the COVID-19 virus spreads through close contact with infected individuals, 97.4% (492 of 505) reported that to prevent COVID-19 individuals should avoid going to public spaces, 97.4% (492 of 506) reported that COVID-19 can get them sick, and 10.9% (55of 506) reported that they are more likely to catch COVID-19 from a stranger than a family member (Table 3).

Table 3. Information about COVID-19

	Yes n (%)	**No** n (%)
Symptoms of COVID-19		
Fevers and Chills	502 (99.6)	2 (0.40)
Cough	457 (90.67)	47 (9.33)
Shortness of Breath	496 (98.41)	8 (1.59)
Sore Throat	391 (77.58)	113 (22.42)
Runny Nose	336 (66.67)	168 (33.33)
Muscle Ache	473 (93.85)	31 (6.15)
Headache	430 (85.32)	74 (14.68)
Fatigue	457 (90.67)	47 (9.33)
Diarrhea	385 (76.39)	119 (23.61)
Loss of Taste and Smell	494 (98.02)	10 (1.98)
Information About COVID-19		
There are medications that can treat COVID-19	155 (30.75)	349 (69.25)
There are Hmong medication that can treat COVID-19	40 (7.91)	466 (92.1)
There is a cure for COVID-19	19 (3.75)	487 (96.25)
The COVID-19 virus spreads through close contact with infected individuals	486 (96.05)	20 (3.95)
The COVID-19 virus can spread without showing symptoms	499 (98.62)	7 (1.38)
To prevent getting COVID-19, individuals should avoid going to crowded public spaces	492 (97.43)	13 (2.57)
COVID-19 can get me sick	492 (97.43)	14 (2.57)
You are more likely to catch COVID-19 from a stranger than a family member	55 (10.87)	451 (89.13)

Sources of Information

Survey responses about sources of information used to obtain COVID-19 information showed that 78.5% (397 of 506) of the participants sought COVID-19 information from websites or online pages, 73% (369 of 506) sought information from social media, 62.3% (315 of 506) sought information from conversations with friends and family, 61% (308 of 506) sought information from government officials, 54.7% (277 of 506) sought information from medical institutions, 51.8% (262 of 506) sought information from television shows, 16.8% (85 of 506) sought information from radio stations, and 6% (30 of 506) sought information from Hmong

community leaders. Assessing trust in sources of information, 92.2% (458 of 497) of the participants reported that they trusted medical institution as a source of information for COVID-19, 80.7% (401 of 497) trusted government officials, 74% (371 of 502) trusted website or online pages, 54.7% (271 of 495) trusted television, 44.7% (224 of 501) trusted conversations with friends and family, 38.6% (194 of 503) trusted social media, 37.8% (185 of 489) trusted radio stations, and 16% (78 of 488) trusted Hmong community leaders. When assessing if participants found sources of misinformation, 50.6% (255 of 504) reported having found information on COVID-19 where it was hard to decide whether it was right or wrong (Table 4).

Table 4. COVID-19 Sources of Information, Trust, and Misinformation

Sources of Information	**Yes** n (%)	**No** n (%)	**Trust** n (%)	**Don't Trust** n (%)
Television	262 (51.78)	244 (48.22)	271 (54.74)	226 (45.26)
Conversations with Friends and Family	315 (62.25)	191 (37.75)	224 (44.71)	257 (55.29)
Website or Online Pages	397 (78.46)	109 (21.54)	371 (73.9)	131 (26.1)
Social Media	369 (72.92)	137 (27.08)	194 (38.57)	309 (61.43)
Radio Stations	85 (16.80)	421 (83.20)	185 (37.84)	304 (62.16)
Government Official	308 (60.87)	198 (39.13)	401 (80.68)	96 (19.32)
Medical Institution	277 (54.74)	229 (45.26)	458 (92.16)	39 (7.84)
Hmong Community Leaders	30 (5.93)	476 (94.07)	78 (15.98)	410 (84.02)
Found Sources of Misinformation	255 (50.60)	249 (49.4)		

Masking, Social Distancing, Group Gathering, and Vaccination Behaviors

Masking

Survey responses about masking beliefs and attitudes showed that 26.8% (135 of 503) of the participants' felt masks do not keep people from spreading COVID-19 to others. When questioned about the safety and effectiveness of masking, 73.1% (370 of 506) of the participants felt that masks kept them safe and 80.5% (401 of 498) felt masks were effective in keeping them

safe from COVID-19. For masking behavioral skills, we found that 93.9% (474 of 505) of the participants felt that wearing a mask was not too much trouble, 91.9% (465 of 506) reported they knew how to put on a mask so that it fits well, and 98% (496 of 506) endorsed that their mask always covered their nose, mouth, and chin. Most of the participants (424 of 505, 84%) endorsed that they will mask the whole time when attending gatherings. Assessment of masking behaviors showed that 59.9% (303 of 506) of the participants wore a mask every day and, when inquired about masking when leaving home, 88.9% (449 of 505) stated that they wore a mask all the time. In the past 30 days, 99% (500 of 505) of the participants reported they wore a mask to keep themselves safe from COVID-19 (Table 5). When assessing masking behaviors in family, 96.9% (466 of 481) of the participants reported their family members wore a mask in the last 30 days, 86% (413 of 528) reported their family masked all the time when leaving their home, 89% (428 of 482) felt masking can keep them safe from COVID-19, and 8% (35/482) felt wearing a mask is too much trouble (Table 5). Family (329 of 506, 65%), government officials (315 of 506, 62.3%), and healthcare providers (409 of 506, 80.8%) had the largest influence on masking compared to Hmong community leaders (34 of 506, 6.7%), shaman (17 of 506, 3.4%), and religious leaders (28 of 506, 5.5%) had the least influence (Table 6).

Table 5. Individual and Social Motivation on COVID-19 Mitigation Behaviors

	Yes n (%)	**No** n (%)
Masking		
Masks do not spread COVID	135 (26.84)	368 (73.16)
Masks keep me safe	370 (73.12)	136 (26.88)
Wearing Masks is too much trouble	31 (6.14)	474 (93.86)
I know how to wear a mask	465 (91.90)	41 (8.10)
Masks always overs my nose, mouth, and chin	496 (98.02)	10 (1.98)
I wear a new mask every day	303 (59.88)	203 (40.12)

Willing to mask the whole time at gatherings	424 (83.96)	81 (16.04)
Last 30 days worn a mask	500 (99.01)	5 (0.99)
Masking is effective prevention against COVID-19	401 (80.52)	117 (19.48)
Mask all the time when leaving home	449 (88.91)	56 (10.09)
My family thinks mask can keep them safe from COVID-19	428 (88.80)	54 (11.20)
Wearing a mask is too much trouble for my family	35 (7.26)	447 (92.74)
My family masks all the time when leaving home	413 (85.68)	69 (14.32)
My family worn a mask the last 30 days	466 (96.88)	15 (3.12)
Social Distancing		
I know how far 6 feet is form other people	485 (95.85)	21 (4.15)
I know how to keep people from walking or standing too close to me	433 (85.57)	73 (14.43)
Wiling to stay 6 feet apart from people outside the household	454 (89.90)	51 (10.1)
Last 30 days stayed 6 feet from people outside the household	446 (88.32)	59 (11.68)
Staying 6 feet apart is effective prevention against COVID-19	388 (77.45)	74 (22.55)
Maintain 6 feet when leaving home all the time	270 (55.25)	226 (44.75)
My family maintained 6 feet all the time when leaving home	275 (57.05)	207 (42.95)
My family knows how far 6 feet is from other people	409 (85.03)	72 (14.97)
My family stayed 6 feet from people outside the household the last 30 days	418 (86.72)	64 (13.28)
Group Gatherings		
I know how to say no to group gatherings	462 (91.30)	44 (8.7)
Willing to avoid family gatherings	385 (76.09)	121 (23.91)
Willing to avoid social gatherings	422 (83.56)	83 (16.44)
Last 30 days avoided gatherings of 10 or more	345 (68.32)	160 (31.68)
Last 30 days avoid public spaces, gatherings, or crowds	366 (72.33)	140 (27.67)
Avoiding public space, group gatherings and crowds is effective prevention against COVID-19	431 (85.35)	74 (14.65)
My family avoided gatherings of 10 or more the last 30 days	343 (71.46)	137 (28.54)
My family avoided public spaces, gatherings or crowds the last 30 days	351 (72.82)	131 (27.18)
Vaccination		
COVID vaccines are available for free	471 (93.08)	35 (6.92)
I trust authorities who say COVID vaccines are safe	312 (61.66)	194 (38.34)
Trusted leaders say everyone should get the COVID vaccine as soon as possible	340 (67.19)	166 (32.81)
I know where to get the vaccine	478 (94.47)	28 (5.53)
I know when it is my turn to get the vaccine	465 (91.9)	41 (8.1)
Vaccination is effective prevention against COVID-19	378 (76.36)	117 (23.64)
Willing to get the vaccine as soon as possible	354 (69.96)	152 (30.04)
Wait to see how the vaccine is working for other people	100 (19.76)	406 (80.24)
Only get the vaccine if it is required	23 (4.54)	483 (95.46)
Definitely not get the vaccine	29 (5.73)	477 (94.26)

Received the vaccine	350 (69.17)	156 (30.83)
Very likely to mask after getting vaccine	422 (83.73)	82 (16.27)
Very likely to social distance after getting vaccine	357 (71.12)	145 (28.88)
Very likely to attend gatherings after getting vaccine	91 (18.06)	413 (81.94)
Some people in my family don't trust authorities who say COVID-19 vaccines are safe	217 (45.11)	264 (54.89)
Some of my family members received the COVID-19 vaccine	423 (87.76)	59 (12.24)

Table 6. Social Influences on COVID-19 Mitigation Behaviors

	Hmong Community Leader n (%)	**Family** n (%)	**Shaman** n (%)	**Religious Leader** n (%)	**Government Official** n (%)	**Healthcare Provider** n (%)
Influences on Masking Behaviors						
Yes	34 (6.72)	329 (65.02)	17 (3.36)	28 (5.53)	315 (62.25)	409 (80.83)
No	472 (93.28)	177 (34.98)	489 (96.64)	478 (94.47)	191 (37.75)	97 (19.17)
Influences on Social Distancing						
Yes	33 (6.52)	297 (58.70)	17 (3.36)	23 (4.55)	321 (63.44)	403 (79.64)
No	473 (93.48)	209 (41.30)	489 (96.64)	483 (95.45)	185 (36.56)	103 (20.36)
Influences on Group Gatherings						
Yes	70 (13.83)	313 (61.86)	17 (3.36)	19 (3.75)	34 (6.72)	40 (7.91)
No	436 (86.17)	193 (38.14)	489 (96.64)	487 (96.25)	472 (93.28)	466 (92.09)
Influences on Vaccination						
Yes	36 (7.11)	288 (56.92)	15 (2.96)	17 (3.36)	276 (54.55)	351 (69.37)
No	470 (92.89)	218 (43.08)	491 (97.04)	489 (96.64)	230 (45.45)	155 (30.63)

There were no differences in masking behaviors reported by men and women when leaving home and masking at gatherings (Table 7). Differences in social influences by gender showed that men and women reported that Hmong community leaders (*P*=.029, FET), government officials (*P*=<.000, FET), and healthcare providers (*P*=<.001, FET) were influencers to masking. Hmong American men were more likely influenced by Hmong community leaders to mask compared to Hmong American women. Whereas Hmong American women are more likely influenced to mask by government officials and healthcare providers than Hmong American men (Table 8). Masking by generational status showed that there were no differences in masking behaviors reported by first, second, or third generation individuals (Table 7). Social influences on masking by generation showed that there was a difference between generation status and

government officials as influencers to masking (*P*=<.000, FET). First generation individuals were more likely influenced by government officials compared to second and third generation (Table 8).

Table 7. COVID-19 Mitigation Behaviors by Gender and Generation Status

	Gender						Generation Status			
	Male (n=106)	**Female** (n=376)	**chi²**	**df**	**p-value**	**FET**	**First Generation** (n=195)	**Second Generation** (n=299)	**Third Generation** (n=12)	**FET**
Willing to Mask the whole time at gatherings			1.293	1	0.255					0.341
Yes	85 (80.19)	318 (83.78)					164 (84.54)	248 (83.96)	12 (100)	
No	21 (19.81)	57 (15.20)					30 (15.46)	51 (17.06)	0 (0)	
Masking all the time when leaving home			2.845	1	0.092					0.378
Yes	89 (83.96)	337 (89.87)					176 (90.26)	261 (87.58)	12 (100)	
No	17 (16.04)	38 (10.13)					19 (9.74)	37 (12.42)	0 (0)	
Last 30 days worn a mask						0.074				0.257
Yes	103 (97.17)	373 (99.47)					195 (100)	293 (98.32)	12 (100)	
No	3 (2.83)	2 (0.53)					0 (0)	5 (1.68)	0 (0)	
Willing to stay 6 feet from people outside the household			8.016	1	*0.005**					0.549
Yes	88 (83.02)	346 (90.23)					177 (90.77)	265 (88.93)	12 (100)	
No	18 (16.98)	29 (7.73)					18 (9.23)	33 (11.07)	0 (0)	
Maintaining 6 feet all the time when leaving home			0.081	1	0.777					0.051
Yes	60 (56.60)	207 (55.05)					120 (61.86)	152 (50.84)	7 (58.33)	
No	46 (43.40)	169 (44.95)					74 (38.14)	147 (49.16)	5 (41.67)	
Last 30 days stay 6 feet from people outside the household			0.006	1	0.938					0.22
Yes	93 (88.57)	332 (88.30)					177 (91.24)	258 (86.29)	11 (91.67)	
No	12 (11.43)	44 (11.70)					17 (8.76)	41 (13.71)	1 (8.33)	
Willing to Avoid Family Gatherings			8.022	1	*0.005**					0.956
Yes	71 (66.98)	301 (80.05)					147 (75.38)	229 (76.59)	9 (75)	
No	35 (33.02)	75 (19.95)					48 (24.63)	70 (23.41)	3 (25)	
Willing to Avoid Social Gatherings			6.914	1	*0.009**					0.629
Yes	80 (75.47)	323 (86.13)					166 (85.13)	245 (82.21)	11 (91.67)	
No	26 (24.53)	52 (13.87)					29 (14.87)	53 (17.79)	1 (8.33)	
Last 30 days avoided gatherings of 10 or more			0.809	1	0.369					*0.010**
Yes	69 (65.09)	262 (68.68)					146 (75.26)	189 (63.21)	10 (83.33)	

No	37 (34.91)	114 (30.32)					48 (24.74)	146 (75.26)	2 (16.67)	
Last 30 days avoided public spaces, gatherings, or crowds			0.034	1	0.853					*0.003**
Yes	76 (71.70)	273 (72.41)					157 (80.51)	200 (66.89)	9 (75)	
No	30 (28.30)	103 (27.39)					38 (19.49)	99 (33.11)	3 (25)	
Will vaccinate, when COVID-19 vaccine is available			0.347	1	0.556					0.053
Yes	77 (72.64)	262 (69.68)					147 (75.38)	197 (65.89)	10 (83.33)	
No	29 (27.38)	114 (30.32)					49 (24.62)	102 (34.11)	2 (16.67)	
Received the COVID-19 vaccine			0.479	1	0.489					0.067
Yes	71 (66.98)	265 (70.48)					146 (74.87)	195 (65.22)	9 (75)	
No	35 (33.02)	111 (29.52)					49 (25.13)	104 (34.78)	3 (25)	
After getting vaccine, likely to mask						0.153				0.092
Yes	99 (93.40)	362 (96.79)					191 (98.45)	282 (94.63)	12 (100)	
No	7 (6.60)	12 (3.21)					3 (1.55)	16 (5.37)	0 (0)	
After getting vaccine, likely to maintain 6 feet			0.003	1	0.959					0.069
Yes	97 (91.51)	9 (8.49)					182 (94.79)	266 (89.26)	11 (91.67)	
No	341 (91.67)	31 (8.33)					10 (5.21)	32 (10.74)	1 (8.33)	
After getting vaccine, likely to attend gatherings			1.308	1	0.253					0.242
Yes	65 (61.32)	206 (55.08)					107 (55.15)	172 (57.72)	4 (33.33)	
No	41 (38.68)	168 (44.92)					87 (44.85)	126 (42.28)	8 (66.67)	

**p-value< .05 denotes statistical significance*

Social Distancing

Findings about social distancing beliefs and attitudes showed that 77.5% (388 of 505) of the participants felt that social distancing was effective in keeping them safe from COVID-19. Social distancing behavioral skills showed that 95.9% (485 of 506) of the participants knew how far 6 feet is from other people, and 85.6% (433 of 506) knew how to keep people from being too close to them. When assessing if one is willing to social distance, 89.9% (454 of 505) reported that they will maintain 6 feet from people outside of their household. When leaving home, only 55.3% (279 of 505) of the participants endorsed they would stay 6 feet from people outside of their household all the time. When assessing past 30-day social distancing behaviors, 88.3% (446 of 505) of the participants reported they kept 6 feet away from people outside of their household

to keep themselves safe from COVID-19 (Table 5). When assessing social distancing behaviors in family, 86.6% (418 of 428) participants reported their family stayed 6 feet from people who do not live with them in the last 30 days, 85% (409 of 481) knew how far 6 feet is from other people, and 57% (275 of 482) maintained 6 feet from other people when leaving home (Table 5). Family (297 of 506, 58.7%), official government (321 of 506, 63.4%), and healthcare providers (403 of 506, 79.6%) had the largest influence on social distancing compared to Hmong community leaders (33 of 506, 6.5%), shaman (17 of 506, 3.4%), and religious leaders (23 of 506, 4.6%) had the least influence (Table 6).

There were differences between social distancing behaviors and Hmong American men and women (Table 7). Hmong American women were more willing to stay 6 feet from people outside the household compared to Hmong American men (x^2=8.01, *P*=.005). Social distancing behaviors in the last 30 days did not show any significant difference between Hmong American men and women. Differences between gender and social influences on social distancing behaviors show that Hmong community leaders (*P*=.022, FET), government officials (*P*=<.000, FET), and healthcare providers (*P*=<.000, FET) were influencers to social distancing. Hmong American men were more likely to be influenced by Hmong community leaders to social distancing compared to Hmong American women, whereas Hmong American women were more likely to be influenced by government officials and healthcare providers (Table 8). Generation status and social distancing behaviors showed no differences in social distancing behaviors by generation (Table 7). Social influences on social distancing by generation status showed that family were more likely to influence second generation individuals to social distancing, compared to first and third generation individuals (*P*=.038, FET) (Table 8).

Table 8. Social Influences on COVID-19 Mitigation Behaviors by Gender and Generation Status

	Gender			Generation Status			
	Male (n=106)	**Female** (n=376)	**FET**	**First Generation** (n=195)	**Second Generation** (n=299)	**Third Generation** (n=12)	**FET**
Social Influences on Masking							
Hmong Community Leader	12 (11.32)	20 (5.32)	*0.029**	14 (7.18)	19 (6.35)	1 (8.33)	0.663
Family	64 (60.38)	245 (65.16)	0.214	117 (60)	205 (68.56)	7 (58.33)	0.119
Shaman	5 (4.72)	11 (2.93)	0.262	4 (2.05)	12 (4.01)	1 (8.33)	0.194
Religious leader	7 (6.60)	20 (5.32)	0.38	8 (4.10)	20 (6.69)	0 (0.000)	0.41
Government Official	51 (48.11)	250 (66.49)	*0.000**	127 (65.13)	187 (62.54)	1 (8.33)	*0.000**
Healthcare Provider	74 (69.81)	317 (84.31)	*0.001**	152 (77.95)	245 (81.94)	12 (100)	0.127
Social Influences on Social Distancing							
Hmong Community Leader	12 (11.32)	19 (5.05)	*0.022**	13 (6.67)	19 (6.35)	1 (8.33)	0.815
Family	60 (56.60)	220 (58.51)	0.404	101 (51.79)	189 (63.21)	7 (58.33)	*0.038**
Shaman	5 (4.72)	11 (2.93)	0.262	5 (2.56)	11 (3.68)	1 (8.33)	0.314
Religious leader	6 (5.66)	16 (4.26)	0.349	7 (3.59)	16 (5.35)	0 (0.000)	0.655
Government Official	49 (46.23)	257 (68.35)	*0.000**	126 (64.62)	191 (63.88)	4 (33.33)	0.102
Healthcare Provider	71 (66.98)	313 (82.24)	*0.000**	152 (77.95)	240 (80.27)	11 (91.67)	0.563
Social influences on Group Gatherings							
Hmong Community Leader	22 (20.75)	47 (12.50)	*0.026**	28 (14.36)	41 (13.71)	1 (8.33)	0.966
Family	64 (60.38)	233 (61.97)	0.425	109 (55.90)	194 (64.88)	10 (83.33)	*0.041**
Shaman	6 (5.66)	10 (2.66)	0.115	8 (4.10)	9 (3.01)	0 (0.000)	0.746
Religious leader	5 (4.72)	13 (3.46)	0.36	8 (4.10)	11 (3.68)	0 (0.000)	0.884
Government Official	4 (3.77)	29 (7.71)	0.111	17 (8.72)	17 (5.69)	0 (0.000)	0.3553
Healthcare Provider	7 (6.60)	32 (8.51)	0.342	21 (10.77)	19 (6.35)	0 (0.000)	0.17
Social Influences on Vaccinations							
Hmong Community Leader	12 (11.32)	21 (5.59)	*0.037**	14 (7.18)	20 (6.69)	2 (16.67)	0.33
Family	63 (59.43)	212 (56.38)	0.327	95 (48.72)	185 (61.87)	8 (66.67)	*0.011**
Shaman	6 (5.66)	8 (2.13)	0.063	3 (1.54)	11 (3.68)	1 (8.33)	0.154
Religious leader	3 (2.83)	13 (3.46)	0.518	6 (3.08)	11 (3.68)	0 (0.000)	0.871
Government Official	53 (50)	210 (55.85)	0.169	110 (59.41)	163 (54.52)	3 (25)	0.106
Healthcare Provider	69 (65.09)	267 (71.01)	0.147	133 (68.21)	210 (59.83)	8 (66.67)	0.836

**p-value< .05 denotes statistical significance*

Group Gathering

Survey responses on group gathering beliefs and attitudes showed that 85.4% (431 of 505) of the participants believed that avoiding public spaces, group gatherings and crowds was effective in keeping them safe from COVID-19. Regarding group gathering behavioral skills, 91.3% (462 of 506) of the participants knew how to say "no" when invited to big gatherings. Responses about willingness to avoid gatherings showed that 76.1% (385 of 506) of the participants will avoid family gatherings such as birthday parties, funerals, weddings, ceremonial, or cultural celebrations, while 83.6% (422 of 505) of the participants will avoid social gatherings. When asked about group gathering behaviors in the past 30 days, 68.3% (345 of 505) reported avoided gatherings with 10 or more people and 72.3% (366 of 506) reported avoiding public spaces, gatherings, and crowds to keep themselves safe from COVID-19 (Table 5). When assessing group gathering behaviors in family, participants reported 71.5% (343 of 480) of their family members avoided family gatherings with more than 10 people and 72.8% (351 of 482) avoided public spaces, gatherings, and crowds in the last 30 days (Table 5). Family (313 of 506, 61.9%) had the largest influence on group gatherings compared to Hmong community leaders (70 of 506, 13.8%), shaman (17 of 506, 3.4%), religious leaders (19 of 506, 3.8%), government officials (34 of 506, 6.7%), and healthcare providers (40 of 506, 7.9%) had the least influence (Table 6).

A greater proportion of Hmong American women than men reported they will avoid family (x^2=8.02, *P*=.005) and social gatherings (x^2=6.91, *P*=.009). There were no differences in group gathering behaviors in the last 30 days between men and women (Table 7). Hmong American men and women reported that Hmong community leaders influenced their decisions

on group gathering behaviors (Table 8). Hmong American men were more likely to be influenced by Hmong community leaders to attend group gatherings than women (*P*=.026, FET). Compared to generation status, group gathering behaviors in the last 30 days show differences between first, second and third generation individuals (Table 7). Third generation individuals were more likely to avoid gatherings of 10 or more in the last 30 days compared to first- and second-generation individuals (*P*=.010, FET). Whereas first generation individuals were more likely to avoid public spaces, gatherings or crowds in the last 30 days compared to second and third generation individuals (*P*=.003, FET). There were no differences between generation status and willingness to avoid family and social gatherings. Social influences by generation status show that family were social influencers to group gatherings (Table 8). Third generation individuals were more likely to be influenced by family to attend large group gatherings compared to first-and-second generation individuals (*P*=.041, FET).

Vaccine Intent and Use

Findings about COVID-19 vaccine beliefs and attitudes showed that 76.4% (378 of 495) of the participants endorsed that COVID-19 vaccines are effective for keeping them safe. Survey responses about COVID-19 vaccine information and behavioral skills showed that 93.1% (471 of 506) of the participants knew vaccines are available for free, 94.5% (478 of 506) knew where to get the vaccine, and 91.9% (465 of 506) knew when it was their turn to get the vaccine. The majority, 62.7% (312 of 506) of the participants reported they trusted authorities who say COVID-19 vaccine is safe, and 67.1% (340 of 506) reported trusting leaders in their communities when directed to get the COVID-19 vaccine as soon as possible. Assessment of vaccination intention showed that 70% (354 of 506) of the participants responded they would get

the vaccine as soon as possible, 19.8% (100 of 506) will wait and see how it is working for other people first, 4.6% (23 of 506) will only get the vaccine if it is required, 4% (20 of 506) will definitely not get the vaccine, and 1.8% (9 of 506) do not know. When asked about current vaccine uptake, 69.2% (350 of 506) of the participants reported receiving the COVID-19 vaccine. When evaluating willingness to engage in protective behaviors after getting vaccinated, 96.2% (485 of 504) of the participants intended to continue wearing a mask, 91.4% (459 of 502) intended to stay 6 feet away from people outside their household, and 56.2% (283 of 504) intended to attend gatherings with big groups of people (Table 5). When assessing vaccine behaviors in family, 45.1% (217 of 481) of the participants reported some people in their family did not trust authorities who say COVID-19 vaccines are safe, and 87.8% (423 of 482) reported someone in their family received the COVID-19 vaccine (Table 5). Family (288 of 506, 56.9%), government officials (276 of 506, 54.6%), and healthcare providers (351 of 506, 69.4%) had the largest influence on vaccinations compared to Hmong community leaders (36 of 506, 7.1%), shaman (15 of 506, 3%), and religious leaders (17 of 506, 3.4%) had the least influence (Table 6).

There was no statistical difference between gender and vaccination intent or uptake behaviors (Table 7). Social influencers to vaccination by gender showed that Hmong community leaders were social influencers to vaccination (Table 8). Hmong American men were more likely to be influenced by Hmong community leaders to vaccinate compared to women (P=.037, FET). There were few differences between generational status and vaccination behaviors (Table 7). Social influences on vaccination by generation status show that family were social influencers to vaccination (Table 8). Third generation individuals were more likely to be influenced by family to vaccinate compared to first-and-second generation individuals (P=.011, FET).

Health-Seeking Behaviors During the Pandemic

Survey questions about health-seeking behaviors during the pandemic, used questions assessing use of traditional approaches, shamanism, or use of medical doctors. Health seeking behaviors to stay healthy, prevent COVID-19, and treat COVID-19 are summarized in Table 9. To stay healthy during the pandemic, 15.6% (79 of 506) of the participants reported using Hmong medicine/traditional approaches, 9.9% (50 of 506) used shamanism, and 45.9% (232 of 506) saw a medical doctor. To prevent getting COVID-19, 13.4% (68 of 506) participants reported using Hmong medicine/traditional approaches, 5.9% (30 of 506) used shamanism, and 7.13% (36 of 506) saw a medical doctor (Table 9).

Survey questions about knowing someone sick with COVID-19 showed that 56.1% of the participants knew an immediate family member, 75.2% knew of a relative, and 64.7% knew of a friend who had COVID-19 (Table 1). Survey questions on family health behaviors during the pandemic showed that to stay healthy, 35.5% (170 of 506) of participants reported their family used Hmong medicine/traditional approaches, 18.4% (88 of 506) used shamanism, and 59.2% (283 of 506) saw a medical doctor. When preventing COVID-19, 31.5% of the participants reported their family members used Hmong medicine/traditional approaches, 9.6% (46 of 506) used shamanism, and 12.6% (60 of 506) saw a medical doctor. To treat family member's COVID-19 illness, 26.7% (128 of 506) of the participants reported their family members used Hmong medicine/traditional approaches, 4.6% (22 of 506) used shamanism, and 19.8% (95 of 506) saw a medical doctor (Table 9).

Table 9. Health Seeking Behaviors During the Pandemic

	To Stay Healthy n (%)	**Prevent COVID-19** n (%)	**Treat COVID-19** n (%)
Personal Health Seeking Behaviors			
Use of Hmong medicine/traditional Approaches			
Yes	79 (15.61)	68 (13.44)	60 (11.86)
No	427 (84.39)	438 (86.56)	446 (88.14)
Used Shamanism			
Yes	50 (9.88)	30 (5.93)	6 (1.19)
No	456 (90.12)	476 (94.07)	500 (98.81)
Seen Medical Doctor			
Yes	232 (45.94)	36 (7.13)	31 (6.14)
No	273 (54.06)	469 (92.87)	474 (93.86)
Family Health Seeking Behaviors			
Use of Hmong medicine/traditional Approaches			
Yes	170 (35.49)	151 (31.52)	128 (26.72)
No	309 (64.51)	328 (68.48)	351 (73.28)
Used Shamanism			
Yes	88 (18.37)	46 (9.60)	22 (4.59)
No	391 (81.63)	433 (90.40)	457 (95.41)
Seen Medical Doctor			
Yes	283 (59.21)	60 (12.55)	95 (19.87)
No	195 (40.79)	418 (87.45)	383 (80.13)

Behaviors when Sick with COVID-19

Survey responses pertaining to health behaviors when sick or diagnosed with COVID-19 showed that 17% (86 of 506) of the participants had identified as either being sick or diagnosed with COVID-19 (Table 1). Behaviors and social influences of those sick with COVID-19 are summarized in Table 9. Of those sick with COVID-19, vaccination behaviors showed that 58.1%

(50 of 86) of the participants got their COVID-19 vaccination. Health-seeking behaviors among those sick with COVID-19 showed that 51.2% (44 of 86) of the participants reported using traditional approaches or medicine for treating COVID-19, 3.5% (3 of 86) reported using a shaman, and 33.7% (29 of 86) sought care from a Western healthcare provider for treating COVID-19.

Social influences on mitigation behaviors by COVID-19 illness status showed that Hmong community leaders were social influencers to social distancing (*P*=.016, FET) and vaccination uptake (*P*=.036) among those sick with COVID-19. Meanwhile, those who were not sick with COVID-19, Hmong community leaders were social influencers to group gatherings (*P*=.016, FET). Religious leaders were also found to be social influencers to those sick with COVID-19 with vaccination uptake (*P*=.003, FET) (Table 10).

Table 10. Behaviors and Social Influences of those Sick with COVID-19

	Sick with COVID-19 (n=86)	**Not sick with COVID-19 (n=420)**	**FET**
Received COVID-19 vaccine			*0.021**
Yes	50 (58.14)	300 (71.43)	
No	36 (41.86)	120 (28.57)	
Used Hmong Medicine for treating COVID-19			*0.000**
Yes	44 (51.16)	16 (3.81)	
No	42 (48.84)	404 (96.19)	
Used Shaman for treating COVID-19			0.064
Yes	3 (3.49)	3 (0.71)	
No	83 (96.51)	417 (99.29)	
Used Western Medicine for treating COVID-19			*0.000**
Yes	29 (33.72)	2 (0.48)	
No	57 (66.28)	417 (99.52)	
Social Influences on Masking			
Hmong Community Leader	10 (11.63)	24 (5.71)	0.057
Family	61 (70.93)	268 (63.81)	0.217

Shaman	5 (5.81)	12 (2.86)	0.185
Religious leader	7 (8.14)	21 (5)	0.296
Government Official	53 (61.63)	262 (62.38)	0.903
Healthcare Provider	72 (83.72)	337 (80.24)	0.548
Social Influences on Social Distancing			
Hmong Community Leader	11 (12.79)	22 (5.24)	*0.016**
Family	52 (58.70)	245 (58.33)	0.81
Shaman	4 (4.65)	13 (3.10)	0.508
Religious leader	7 (8.14)	16 (3.81)	0.089
Government Official	59 (68.60)	262 (63.38)	0.326
Healthcare Provider	73 (84.88)	330 (78.57)	0.239
Social influences on Group Gatherings			
Hmong Community Leader	5 (5.81)	65 (15.48)	*0.016**
Family	57 (66.28)	256 (60.95)	0.395
Shaman	0 (0)	17 (4.05)	0.091
Religious leader	1 (1.16)	18 (4.29)	0.222
Government Official	4 (4.65)	30 (7.14)	0.487
Healthcare Provider	5 (5.81)	35 (8.33)	0.517
Social Influences on Vaccinations			
Hmong Community Leader	11 (12.79)	25 (5.95)	*0.036**
Family	56 (65.12)	232 (55.24)	0.096
Shaman	5 (5.81)	10 (2.38)	0.151
Religious leader	8 (9.30)	9 (2.14)	*0.003**
Government Official	49 (56.98)	227 (54.05)	0.636
Healthcare Provider	64 (74.42)	287 (68.33)	0.305

*p-value< .05 denotes statistical significance

Chapter Five

Discussion

The main aim in this study was to address the lack of research on COVID-19 mitigation behaviors in Hmong Americans. This was addressed by assessing COVID-19 mitigation information, motivation, behavioral skills and health behaviors with masking, social distancing, group gatherings, and vaccination uptake in Hmong Americans. To our knowledge, this is the first investigation of Hmong American mitigation behaviors during the COVID-19 pandemic. We conducted this study when masking mandates were being lifted in various states. COVID-19 vaccination rollout, availability, and requirements included criteria such as age and underlying medical conditions. Individuals not meeting the stated criteria at the time had to wait their turn to get the vaccine. Vaccine availability varied at the state and county level. Our goal was to provide insight on COVID-19 mitigation behaviors of Hmong Americans. We investigated gender, generation status, and sociocultural differences on mitigation behaviors, such as masking, social distancing, group gatherings, and vaccination uptake to describe Hmong American behaviors.

The first major contribution of the present research is that it provides much needed empirical data on health behaviors of Hmong Americans during the pandemic. This information is important given that this is the first investigation of Hmong Americans COVID-19 mitigation and health behaviors during the pandemic. These findings have several implications for both assessing and implementation of culturally appropriate health messaging, future public health interventions, policy development, and ongoing research with this population.

Healthcare clinicians, public health agencies, and policy makers new to Hmong Americans understandably question the need to assess Asian American subgroups such as Hmong Americans. Labeled as Asian Americans, many fail to see the disproportionate burden of

preventable diseases, death, and disability of Hmong Americans compared to other Asian American groups.[115,119,120] The findings from this research confirm previous assertions regarding Hmong American health beliefs and sociocultural and contextual factors that impact their health decisions and outcomes.[31,37,166,168,218]

Masking, Social Distancing, and Group Gathering Knowledge and Behaviors

In this study, nearly all Hmong Americans showed that they were knowledgeable about COVID-19 and participated in the recommended mitigation interventions for COVID-19 such as masking, social distancing, avoiding group gatherings, and getting the COVID-19 vaccine. COVID-19 mitigation behaviors in Hmong Americans in our study were shown to be much higher compared to other studies on health prevention behaviors in the Hmong.[37,166,179,219] Knowledge on COVID-19 in Hmong Americans showed to be higher compared to other studies assessing knowledge on illnesses such as cancer, diabetes, and hypertension.[37,219-221] Literature on assessing health knowledge, attitudes, and behaviors has showed that knowledge directly influences behaviors. In studies assessing COVID-19 knowledge and behaviors, respondents knowledgeable about COVID-19 had good mitigation practices compared to those who were not.[211,222-225] In contrast to a previous study assessing COVID-19 knowledge and behaviors, we observed that socioeconomic disparities and contextual factors such as age, gender, race and ethnicity were significantly associated with differences in COVID-19 knowledge and behavior in Hmong Americans.[226] Other research could extend our approach to understanding the impact health and disease knowledge has on health behaviors of Hmong Americans, especially when contextual and sociocultural factors highly influence behaviors seen in this population. Our study focused on understanding Hmong Americans' knowledge on COVID-19 and the influence that contextual and social cultural factors have on health behaviors. This is fundamental to being able

to interpret the health behavior decision making process in this population. Future research could extend this work and examine the decision-making process with health behaviors in Hmong Americans in the presence of health literacy and social cultural influences.

Behaviors by gender are important as gender roles and expectations in Hmong Americans could have contributed to the differences as hierarchical and patriarchy practices continue to be prevalent. We found that Hmong American's willingness to avoid family and social gatherings varied by gender with men being less willing to avoid than women. Attending family and social gatherings are expectations of Hmong men, as their roles may be involved in performing rituals of ancestor worship, weddings, christenings, and family feasts.[105,227] When these roles can no longer be fulfilled by the head of the household, younger male household members are expected to assume the roles which could be another contributing factor to the differences between gender participation in group gatherings.[113,228] We did not find significant effects between gender and masking when attending gatherings or leaving the house, showing that male and female participants are equally likely to mask at gatherings or wear a mask when leaving the house. Like masking, social distancing had no significant effects between gender. In contrast to generational status, we also found no significant difference between generational status with masking and social distancing, showing that respondents were equally likely to mask and social distance from people outside their household. Compared to avoiding gatherings, third generation respondents were more likely to avoid gatherings of 10 or more compared to first- and second-generation respondents. Group gatherings with 10 or more, such as family gatherings, weddings, birthdays, funerals, or traditional ceremonial gatherings, are usually attended by first- and second-generation respondents. First and second-generation respondents were more likely to participate in cultural practices, traditions, and fulfill gender role expectations, compared to third generation

respondents who may have acclimated or relate more closely to the US mainstream. Whereas for avoiding public spaces, social gatherings, or crowds, first generation respondents were more likely to avoid public spaces, gatherings or crowds compared to second and third generation respondents. Several factors attributing to these findings is, first, first-generation respondents are older compared to second and third generation respondents and may be more aware of the seriousness of public gatherings during the pandemic. Two, younger people take more risks than any other age groups,[229] and may not sense the seriousness or need to avoid public spaces, social gatherings and crowds. These findings are consistent with the literature's report of COVID-19 mitigation behaviors by age group, indicating that younger individuals had lower engagement in mitigation behaviors resulting to higher cases of COVID-19 in younger individuals.[230] Last, younger individuals who are healthy may not view themselves to be vulnerable to COVID-19 compared to older individuals. The need to prioritize clear and targeted behavior modification in young adults is essential to encourage mitigation uptake and the prevention of spreading COVID-19.

During the pandemic, various social influences exist affecting the mitigation attitudes, beliefs, or behaviors. "Social influence is the process where an individual's attitude, belief, or behaviors are modified from the presence or action of another person, entity, or organization."[231] Social influences had significant effects on Hmong American men's and women's mitigation behaviors. Hmong community leaders were social influencers for men with masking, social distancing, group gatherings, and vaccination uptake. These findings could be related to the gender role expectations and social influences from community leaders for Hmong American men. Modeling best practices for public health interventions should include, but not limited to relevance, community participation, stakeholder collaboration, ethical soundness, replicability

effectiveness, efficiency, and sustainability as suggested by Ng and de Colombani.[232] For instance, community participation and stakeholder collaboration in Hmong Americans are especially important when implementing new public health interventions as their influence can highly impact behavior choices in this population and improve their chances of understanding, acceptance, adoption, and adherence. Implementation of public health or health interventions should highlight the importance of these individuals in the Hmong American community and should consult them with future interventions.

For Hmong American women, healthcare providers were social influencers with masking, whereas healthcare providers and government officials were social influencers for social distancing behaviors. Studies have shown that women are more likely to access healthcare services compared to men.[233] This may be attributed to gender differences in health and health services, with women having more health needs requiring greater use of healthcare services.[234] With increase health needs being addressed by healthcare providers, women are more likely to be influenced by healthcare providers on masking and social distancing behaviors compared to men. While our findings are in an agreement with the literature on social influences and its impact on health behaviors, there are limited studies examining the relationship between social influences and attitudes about COVID-19 mitigation behaviors such as masking, social distancing, and group gatherings in marginalized communities. A unique contribution of this study is that it explores the relationships between social influences and actual behaviors regarding masking, social distancing, and group gatherings directly. Future study could extend on this work and continue to examine these relationships in non-English speaking and older adult Hmong Americans who are at the greatest risks for COVID-19 and failing to understand, accept, adopt, or adhere to masking, social distancing, and group gatherings.

Mitigation behaviors by generation status show that individuals who influence mitigation behaviors are also particularly important. In our study, family members were the strongest proponents of social distancing, group gatherings, and vaccination uptake. During the pandemic, families were the most available source of social interaction, connections, and support towards maintaining protective measures against COVID-19. Support from family could play a crucial role in coping mechanisms and norms during the pandemic and may directly influence mitigation behaviors and coping strategies [235]. Whereas for masking, differences were found with government officials who influenced masking between first, second, and third generation. First generation individuals were more likely to be influenced by government officials to mask compared to second and third-generation respondents. Masking mandates at the time of this study had various recommendations, as some states and county were lifting masking mandates because of the availability of vaccines. Government official's influence on masking plays a large role in masking behaviors, as states with masking mandates have higher masking behaviors.[236] With the ongoing changes to mitigation recommendations in the wake of different variants of COVID-19, additional studies are needed to evaluate the social influences that impact mitigation behaviors to enhance behavior compliance.

COVID-19 Vaccine Knowledge, Intention, and Uptake

Hmong American men's and women's knowledge on COVID-19 vaccination, intention, and uptake showed that majority of the participants were aware of the efficiency, safety, and availability of vaccines. At the time of the study, vaccination rollout recommendations were available to individuals with underlying medical conditions with increased risks to death and serious diseases and to individuals in certain age categories. While each state and county had their own plan on who would be vaccinated first, most of the participants in this study knew

when it was their turn and where to obtain the vaccine. Vaccination rates in this study sample were much higher compared to other studies with vaccination uptake in the Hmong.[219,220,237,238] A possible explanation for the high vaccination rate could be because participants were required to be vaccinated for school or employment, although it also possible that the use of a web survey in English, yielded a relatively higher educated sample compared to the general Hmong American community. While the results show that majority of the participants obtained the vaccine, there are still gaps in vaccination uptake and hesitancy as a good proportion of individuals wanted to wait and see how it is working for other people and others are only willing to get the vaccine when it is required. Previous studies involving vaccinations among the Hmong Americans has shown that low vaccination or hesitancy were due to low vaccine awareness, lack of desire to learn about vaccines, traumatic experiences from vaccines and vaccine research, lack of linguistically and culturally relevant educational programs for Hmong Americans to address barriers or promotion of vaccine uptake, use of traditional health approaches, and access to healthcare.[179,220,239] Also, awareness of the COVID-19 vaccination is relatively higher for this community compared to other diseases requiring vaccinations. This is likely due to the urgency and need to confront the spread of COVID-19. Public awareness about COVID-19 vaccine is paramount to preventing the spread of COVID-19, therefore increase public awareness and campaigns were utilized at a national and international level.[240-242] Considering our participants were younger, have higher household income, health insurance, and higher educational attainment, more studies involving Hmong Americans 55 years and older involving COVID-19 vaccine uptake and hesitancy are needed.

Health Seeking Behaviors

Health seeking behaviors during the pandemic to maintain health, prevent illness, and treat COVID-19 illness varied at the personal and social level. Many of the participants in this study saw a medical provider to stay healthy compared to the few who used Hmong medicine or traditional approaches, and a shaman. The participants in this study were relatively younger, had higher education, and financial income, therefore would have been more inclined to seek care from a medical doctor to maintain their health. The literature suggests that older Hmong Americans may be more inclined to use traditional approaches and a shaman to maintain their health status.[30,39,188]

Interestingly, with regards to preventing COVID-19, some participants in this study were more inclined to use Hmong medicine or traditional approaches compared to shamanism and seeking care from a medical doctor. This could be indicative that the participants in this study may not classify COVID-19 as a spiritual illness. Prior research on Hmong Americans' health decisions has shown that Hmong Americans seek traditional or Western healthcare based on the disease type.[38] The Hmong are less likely to pursue treatment from a medical doctor or obtain preventive health care management.[29,30] Our findings of utilization of medical doctors in the prevention and treatment of illnesses such as COVID-19 is low overall and is consistent in the Hmong American literature on health practices and behaviors.[29,237] Hmong Americans only seek care from Western healthcare providers when all other traditional approaches fail to show improvement in their condition, delaying or preventing them from seeking care from a Western healthcare provider.[38,178]

Among the participants reported being sick with COVID-19, health seeking behaviors in these individuals showed that slightly more than half used Hmong medicine, 4% reported using a shaman, and a third sought care from a medical doctor to treat COVID-19. The low utilization of seeking care from a medical doctor could be attributed to the Hmong's health beliefs and practices and perception that their illness may not be severe enough to be seen by a provider.[188] While public health messages encourage individuals sick with COVID-19 to seek the care from a medical provider if they are experiencing medical emergency with trouble breathing, persistent pain or pressure in the chest, confusion, inability to stay awake or pale or blue-colored skin, health literacy and the inability to understand Western medicine and the health care system can hinder some Hmong from seeking healthcare services.[243] Also, public health messaging could mislead individuals to not seek care if they do not perceive their symptoms to be a medical emergency.

Health seeking behaviors of family members can positively or negatively impact personal health decisions and influence the management and outcomes of chronic health diseases.[244] Health seeking behaviors from participant's family in our study shown that to stay healthy, over half saw a medical doctor, a third used Hmong medicine or traditional approaches and 18% used a shaman. To prevent COVID-19, over a third used Hmong medicine or traditional approaches, 10% used a shaman meanwhile 13% saw a medical doctor. Of those respondents whose family reported being sick, over a quarter used Hmong medicine or traditional approaches, 5% used a shaman and 20% saw a medical doctor. The higher use of Hmong medicine or traditional approaches to prevent and treat illnesses shows that Hmong Americans continue to view Hmong medicine or traditional approaches to be more effective compared to Western medicine. This finding is consistent in the literature with healthcare use and health management in the

Hmong.[34,38,245] Health seeking behaviors of family members can influence health and health decisions of individuals, thereby understanding family and social dynamics in Hmong Americans is crucial when developing public health interventions, policies, and health education materials. While the findings from this study are consistent with the literature, ongoing research is needed to have a better understanding of health seeking behaviors in Hmong Americans with acute and chronic health conditions.

Limitations

Finally, some limitations of the current study should be acknowledged. First, the cross-sectional design of the current study may not provide information about the cause-and-effect relationship. Cross-sectional data are limited to their ability to show causal inferences since the exposure and outcome are simultaneously assessed and temporal ambiguity is difficult to eliminate. Second, although the data were collected anonymously, social approval may still have influenced the responses of the participants, especially with Hmong Americans, where collectivism is emphasized. Third, mitigation behaviors and attitudes were measured using self-reported measures. It is under the assumption that respondents will answer the researcher's questions honestly, can assess themselves accurately prior to answering questions, understand what is being asked and do not have a set response, however there are still threats to reliability, validity, and bias.

Studies involving primary data collection are limited by time and cost constraints of data collection. Responses received may be inaccurate because of inherent bias by the respondents. Participants concerned about the stigma associated with research and surveys may underreport their status and behaviors.[246] Also, participants asked to report behaviors in the past may be subjected to recall bias. Respondents are more likely to fail to report information about an event,

behavior or feeling rather than fabricate it.[247] Sensitive information such as reporting health conditions can cause respondents to withhold sensitive information or recalling information may result in inaccurate or incomplete recollection of events impacting participants' reporting.

The use of a survey has limitations as well. Properly designing a survey can have its challenges therefore ensuring that the survey is simple to understand, and answer is crucial to obtaining accurate responses. Alternatives to using a survey is conducting a qualitative interview to capture the phenomenon of the COVID-19 outbreak pandemic among individuals with literacy and language barriers. The limitation of conducting qualitative interviews in place of a quantitative survey is its inability to be statistically representative and difficult to investigate causality.[248]

The coronavirus COVID-19 outbreak pandemic is continuously evolving, and its impact varies from one group to another. It is still unknown what the long-term effects COVID-19 will have on different communities; however, the importance of understanding how individuals comprehend the virus transmission and mitigation interventions is crucial to public health research and policy interventions. Effects of COVID-19 on different racial and ethnic groups is limited in the literature and with limited studies on Hmong Americans, it will be hard to determine the visibility of such factors when trying to understand the impact of COVID-19 on small sub-racial groups like Hmong Americans. If significant health behavior performances are found in this study, future studies should be extended to mixed methods or qualitative studies to include Hmong Americans over the age of 18 without restrictions to those who can or cannot read or write English, in addition to other Southeast Asian subgroups with similar social vulnerabilities. Furthermore, the limitation of having a web-based survey limits the sample selection pool. Not every Hmong American has access to a computer, internet, have a social

media account or know how to use a computer. Therefore, this study is not representative of all Hmong Americans due to the use of a web-based survey and the snowball sampling method used with the help of recruitment partners. Older or elderly Hmong Americans may not know how to navigate a web-based survey and therefore it will limit their ability to participate. Additionally, the survey was only available in English and not representative of non-English speaking Hmong Americans who may be at higher risk for COVID-19. The lack of vocabulary and terms in the Hmong language limits the researcher's ability to accurately interpret the survey, which can potentially lead to inaccuracies or missing data. However, by excluding a translated Hmong survey, the sample will be limited to individuals who only speak, read, and write English. This limitation prevents the researcher's ability to fully grasp different influencers of behaviors when assessing pathways between culture and family structures among different generations. Strong family ties and cultural values have a huge impact on behavior and attitudes. Therefore, it is recognized that the limitation of Hmong vocabulary can greatly impact the outcomes of the research intention and would require that the study be adjusted to reflect the sample of English-speaking individuals only. Future recommendations to address this gap would include conducting in-person or phone interviews in Hmong or use of translators to help non-English speaking individuals complete survey questionnaires.

Last, while the sample for this study was younger Hmong Americans, a larger group of individuals ages 55 and over are missing from this study. Individuals ages 55 and older have higher vulnerabilities and risk for COVID-19 and more likely to have multilevel factors that are influencing their health behaviors, such as language barriers, health literacy, socioeconomic inequities, and sociocultural factors. Future studies are needed to examine COVID-19 mitigation

health behaviors in non-English speaking Hmong Americans and individuals in age categories over 55.

Conclusion

To date, there are over 500 million reported cases of COVID-19 worldwide, with over 81 million cases from the United States.[59-61] While cases of COVID-19 continue to flourish in the wake of new coronavirus variants, ongoing education, and health messaging on protective measures and vaccination uptake is needed to keep Hmong Americans safe. The lack of disaggregated COVID-19 data prevents a full understanding of those affected by COVID-19; however, in a report from the Coalition of Asian American Leaders (CAAL) and Hmong Public Health Association (HPHA),[249] 49% of COVID-19 related deaths were from Hmong Americans in Minnesota. This data signifies that disparities and multifactorial factors are affecting Hmong Americans during the wake of the COVID-19 pandemic. Therefore, our research results suggest an urgent need to improve educational and interventional messages to include the use of Hmong community stakeholders and leaders to enhance protective measures and vaccination uptake. In particular, family-based interventions and messaging that targets the different genders and age groups to help with the acceptance, adoption, and adherence of mitigation behaviors. Further studies are needed to develop and evaluate the effectiveness of culturally relevant health messages and interventions. Additional studies are needed in non-English speaking Hmong American and individuals ages 55 and over to grasp a better understanding of their COVID-19 preventative health behaviors.

Despite the limitations of the study and methodological approach using a cross-sectional web-based survey, this study will expand the understanding of the barriers and facilitators to

COVID-19 prevention-related interventions such as masking, social distancing, group gatherings, and vaccination use/intent among Hmong Americans. Limited studies on Hmong Americans during the COVID-19 pandemic warrants further studies to understand vulnerability during a pandemic. Insights from this study can be used to help inform policies, public health interventions, clinical care, and education interventions, so that it can better serve vulnerable populations experiencing disparities and cultural differences.

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Appendix

Appendix 1. Informed Consent

Informed Consent for: COVID-19 Preventative Health Behaviors in Hmong Americans

Thank you for your interest in this research study. I am seeking Hmong American participants who will be able to provide answers that are relevant to the Hmong American experiences and attitudes with COVID-19 preventative health behaviors. This research study will allow for a better understanding of preventative health behaviors during the COVID-19 pandemic such as masking, social distancing, and vaccine use/intent among Hmong Americans.

As a member of the Hmong American community, I am inviting you to participate in this research study by taking an online survey. Kao Kang Kue "Kaykay" Vang, a Registered Nurse and graduate student from the University of California Davis, Betty Irene Moore School of Nursing is conducting this study. Please read this form and ask any questions that you have before agreeing to be in the study.

SURVEY

If you agree to participate in this study, please click the button labeled "I agree to participate" at the bottom of this screen. Once you agree to participate, you will be asked to answer a set of questions online. You will be asked a few questions about your background. You will then be asked about the things you and your family do to stay healthy. You will be asked what you know about how to treat and prevent COVID-19 with masking, social distancing, and vaccine use/intent.

SURVEY LENGTH

The survey will take about 10 minutes to complete.

BACKGROUND INFORMATION

The goal of this study is to improve our understanding of Hmong American's health behaviors during the COVID-19 pandemic. I plan to use this information to describe the needs of Hmong Americans during the COVID-19 pandemic.

RISKS AND BENEFITS

The risks to participating in the study are low. If you experience discomfort, you may refuse to answer any question at any time. If you need assistance because of discomfort resulting from your participation in this study, you should alert the researcher for assistance. There is no direct benefit from participating in this study. There is no monetary compensation for participating in this study.

CONFIDENTIALITY

The information you provide will be kept anonymous. No names will be asked during this survey. Research records will be kept in a secured database through the University of California Davis; only the researcher will have access to the records. They will be used only for the purpose of dissertation and manuscript development. They will remain confidential in the possession of the researcher for five years after the completion of the study.

VOLUNTARY NATURE OF THE STUDY

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of California Davis, Betty Irene Moore School of Nursing. If you decide to participate, you are free to withdraw at any time without affecting those relationships.

CONTACT AND QUESTIONS

This research has been approved by the Betty Irene Moore School of Nursing at the University of California, Davis. The researcher conducting this study is Kao Kang Kue

"Kaykay" Vang. She may be contacted by phone at (714) 944-0891 or at kkmvang@ucdavis.edu. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, please contact The Institutional Review Board at the University of California Davis at (916) 703-9158 or send an email inquiry to hs-irbeducation@ucdavis.edu.

STATEMENT OF CONSENT

I have read the above information, or someone has read it to me. Any questions I have, have been answered. I agree to participate in the study.

Please click the button "*I agree to participate"* if you agree to participate in the study. If you do not agree to participate your browser will be rerouted. Thank you.

Appendix 2. Survey

COVID-19 Preventative Health Behaviors in Hmong Americans

Start of Block: CONSENT

Q80 **Informed Consent for: COVID-19 Preventative Health Behaviors in Hmong Americans** Thank you for your interest in this research study. I am seeking Hmong American participants who will be able to provide answers that are relevant to the Hmong American experiences and attitudes with COVID-19 preventative health behaviors. This research study will allow for a better understanding of preventative health behaviors during the COVID-19 pandemic such as masking, social distancing and vaccine use/intent among Hmong Americans. As a member of the Hmong American community, I am inviting you to participate in this research study by taking an online survey. Kao Kang Kue "Kaykay" Vang, a Registered Nurse and graduate student from the University of California Davis, Betty Irene Moore School of Nursing is conducting this study. Please read this form and ask any questions that you have before agreeing to be in the study.

SURVEY If you agree to participate in this study, please click the button labeled "I agree to participate" at the bottom of this screen. Once you agree to participate, you will be asked to answer a set of questions online. You will be asked a few questions about your background. You will then be asked about the things you and your family do to stay healthy. You will be asked what you know about how to treat and prevent COVID-19 with masking, social distancing and vaccine use/intent.

SURVEY LENGTH The survey will take about 10 minutes to complete.

BACKGROUND INFORMATION The goal of this study is to improve our understanding of Hmong American's health behaviors during the COVID-19 pandemic. I plan to use this information to describe the needs of Hmong Americans during the COVID-19 pandemic.

RISKS AND BENEFITS The risks to participating in the study are low. If you experience discomfort, you may refuse to answer any question at any time. If you need assistance because of discomfort resulting from your participation in this study, you should alert the researcher for assistance. There is no direct benefit from participating in this study. There is no monetary compensation for participating in this study.

CONFIDENTIALITY The information you provide will be kept anonymous. No names will be asked during this survey. Research records will be kept in a secured database through the University of California Davis; only the researcher will have access to the records. They will be used only for the purpose of dissertation and manuscript development. They will remain confidential in the possession of the researcher for five years after the completion of the study.

VOLUNTARY NATURE OF THE STUDY Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of California Davis, Betty Irene Moore School of Nursing. If you decide to participate, you are free to withdraw at any time without affecting those relationships.

CONTACT AND QUESTIONS This research has been approved by the Betty Irene Moore

School of Nursing at the University of California, Davis. The researcher conducting this study is Kao Kang Kue "Kaykay" Vang. She may be contacted by phone at (714) 944-0891 or at kkmvang@ucdavis.edu. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, please contact The Institutional Review Board at the University of California Davis at (916) 703-9158 or send an email inquiry to hs-irbeducation@ucdavis.edu.

STATEMENT OF CONSENT I have read the above information, or someone has read it to me. Any questions I have, have been answered. I agree to participate in the study.

Please click the button "*I agree to participate"* if you agree to participate in the study. If you do not agree to participate your browser will be rerouted. Thank you.

- ○ I agree to participate (4)
- ○ I do not agree to participate (5)

Skip To: End of Survey If Informed Consent for: COVID-19 Preventative Health Behaviors in Hmong Americans Thank you for you... = I do not agree to participate

End of Block: CONSENT

Start of Block: Screening Questions

Q65 Is your ethnicity Hmong?

- ○ Yes (1)
- ○ No (3)

Skip To: End of Survey If Is your ethnicity Hmong? = No

Q66 Are you 18 years old and older **AND** living in the United States?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If Are you 18 years old and older AND living in the United States? = No

End of Block: Screening Questions

Start of Block: COVID-19 Attitude, Beliefs and Experiences

Q2
The following questions ask about your attitude, beliefs and experiences with COVID-19. Please answer to the best of your ability.

Q3 Which of the following sources of information do you use to stay informed about COVID-19? (Select all that apply)

- ☐ Television (1)
- ☐ Conversations with family and friends (3)
- ☐ Websites or online pages (4)
- ☐ Social media (e.g. Facebook, Twitter, YouTube, WhatsApp, etc.) (5)
- ☐ Radio Stations (6)
- ☐ Official government (7)
- ☐ Medical institution (8)
- ☐ Hmong community leaders (9)
- ☐ Other (10) _____

Q4 How much do you trust the following sources of information in their reporting of COVID-19?

	A lot of trust (1)	Some trust (2)	Neither little or some trust (3)	Little trust (4)	Very little trust (5)
Television (1)	○	○	○	○	○
Conversations with family and friends (3)	○	○	○	○	○
Websites or online pages (4)	○	○	○	○	○
Social media (e.g. Facebook, Twitter, YouTube, WhatsApp, etc.) (5)	○	○	○	○	○
Radio Stations (6)	○	○	○	○	○
Official government (7)	○	○	○	○	○
Medical institution (8)	○	○	○	○	○
Hmong community leaders (9)	○	○	○	○	○

Q5 Have you found information on COVID-19 where it was hard to decide whether it was right or wrong? For example, information about ways to prevent or recover from the disease.

- ○ Yes (1)
- ○ No (2)
- ○ I don't know (3)

Q6 Which of the following can be symptoms of COVID-19? (select all that apply)

- ☐ Fever / Chills (1)
- ☐ Cough (2)
- ☐ Shortness of breath (3)
- ☐ Sore throat (4)
- ☐ Runny or stuffy nose (5)
- ☐ Muscle / Body aches (6)
- ☐ Headaches (7)
- ☐ Fatigue (8)
- ☐ Diarrhea (9)
- ☐ Loss of taste and smell (10)

Q7 There are medications that can treat COVID-19.

- Yes (1)
- No (2)
- I don't know (3)

Q8 There are Hmong medicines that can treat COVID-19.

- Yes (1)
- No (4)
- I don't know (3)

Q9 There is a cure for COVID-19.

- Yes (1)
- No (2)
- I don't know (3)

Q10 The COVID-19 virus spreads through close contact with infected individuals.

- Yes (1)
- No (2)
- I don't know (3)

Q11 The COVID-19 virus can spread without showing symptoms.

- Yes (1)
- No (4)
- I don't know (3)

Q12 To prevent getting COVID-19, individuals should avoid going to crowded public places.

- Yes (1)
- No (2)
- I don't know (3)

Q13 COVID-19 can get me sick.

- Yes (1)
- No (2)
- I don't know (3)

Q14 You are more likely to catch COVID-19 from a stranger than a family member.

- Yes (1)
- No (2)
- I don't know (3)

Q15 Masks do not keep people from spreading COVID-19 to others.

- Yes (1)
- No (2)
- I don't know (3)

Q16 Masks keeps me safe from getting COVID-19.

- Yes (1)
- No (2)
- I don't know (3)

Q17 Wearing a mask is too much trouble.

- Yes (1)
- No (2)
- I don't know (3)

Q18 I know how to put on a mask so that it fits well.

- Yes (1)
- No (2)
- I don't know (3)

Q19 My mask always covers my nose, mouth and chin.

- Yes (1)
- No (2)
- I don't know (3)

Q20 I wear a new mask every day.

- Yes (1)
- No (2)
- I don't know (3)

Q21 I know how far 6 feet is from other people.

- Yes (1)
- No (2)
- I don't know (3)

Q22 I know how to keep people from walking or standing too close to me.

- Yes (1)
- No (2)
- I don't know (3)

Q23 I know how to say "no" when I am invited to a big gathering.

- Yes (1)
- No (2)
- I don't know (3)

Q24 COVID-19 vaccines are available for free.

- Yes (1)
- No (2)
- I don't know (3)

Q25 I trust authorities who say COVID-19 vaccines are safe.

- Yes (1)
- No (2)
- I don't know (3)

Q26 Trusted leaders in my community says everyone should get the COVID-19 vaccine as soon as they can.

- Yes (1)
- No (2)
- I don't know (3)

Q27 I know where to get the COVID-19 vaccine if I want one.

- ○ Yes (1)
- ○ No (2)
- ○ I don't know (3)

Q28 I know how to find out when it is my turn to get the COVID-19 vaccine.

- ○ Yes (1)
- ○ No (2)
- ○ I don't know (3)

Q29 Who influences you to wear a mask when leaving the house? *(select all that apply)*

- ☐ Hmong community leader / clan leader (1)
- ☐ Family / Friends (2)
- ☐ Shaman (3)
- ☐ Pastor / Religious leader (4)
- ☐ Official government leader (5)
- ☐ Healthcare provider (6)
- ☐ None of the above (7)

Q30 Who influences you to stay 6 feet away from other people outside of your household? *(select all that apply)*

- ☐ Hmong community leader / clan leader (1)
- ☐ Family / Friends (2)
- ☐ Shaman (3)
- ☐ Pastor / Religious leader (4)
- ☐ Official government leader (5)
- ☐ Healthcare provider (6)
- ☐ None of the above (7)

Q31 Who influences you to attend large group gatherings such as family events, funerals, weddings or birthdays? *(select all that apply)*

- ☐ Hmong community leader / clan leader (1)
- ☐ Family / Friends (2)
- ☐ Shaman (3)
- ☐ Pastor / Religious leader (4)
- ☐ Official government leader (5)
- ☐ Healthcare provider (6)
- ☐ None of the above (7)

Q32 Who influences you to get the COVID-19 vaccine? *(select all that apply)*

- ☐ Hmong community leader / clan leader (1)
- ☐ Family / Friends (2)
- ☐ Shaman (3)
- ☐ Pastor / Religious leader (4)
- ☐ Official government leader (5)
- ☐ Healthcare provider (6)
- ☐ None of the above (7)

Q33 How effective are the following actions for keeping you safe from COVID-19?

	Extremely effective (1)	Very effective (2)	Moderately effective (3)	Slightly effective (4)	Not effective at all (5)
Avoiding public spaces, gatherings or crowds (1)	○	○	○	○	○
Wearing a mask (2)	○	○	○	○	○
Keeping a minimum of 6 feet between you and other people outside of your household (3)	○	○	○	○	○
Vaccines (4)	○	○	○	○	○

Q34 Would you be willing to do the following?

	Yes (1)	No (2)	I don't know (3)
Avoid going to family gatherings like birthday parties, funerals, weddings, ceremonial or cultural celebrations (1)	○	○	○
Avoid going to social gatherings (2)	○	○	○
Wear a mask the whole time at a family or social gatherings (3)	○	○	○
Stay 6 feet away from people who do not live with you (4)	○	○	○

Q35 Which of the following have you done in the last 30 days to keep yourself safe from COVID-19?

	Yes (1)	No (2)	I don't know (3)
Avoided gatherings with more than 10 people (e.g. reunion, wedding, funeral, birthday party, concert, or religious service) (2)	○	○	○
Avoided public spaces, gatherings, or crowds (1)	○	○	○
Worn a mask (3)	○	○	○
Stay 6 feet away from people who do not live with you (4)	○	○	○

Q36 When leaving home, how often do you wear a mask?

- All the time (1)
- Sometimes (2)
- Occasionally (3)
- Never (4)
- I don't know (6)

Q37 When leaving home, how often do you stay at least 6 feet away from other people?

- All the time (1)
- Sometimes (2)
- Occasionally (3)
- Never (4)
- I don't know (6)

Q38 When a vaccine for COVID-19 is available to you, will you…?

- Get the vaccine as soon as you can (1)
- Wait to see how it is working for other people (2)
- Only get the vaccine if it is required (3)
- Definitely not get the vaccine (4)
- I don't know (5)

Q39 Have you received the COVID-19 vaccine?

- Yes (1)
- No (2)
- I don't know (3)

Q40 After getting the COVID-19 vaccine, how likely would you wear a mask?

- Very likely (1)
- Somewhat likely (2)
- Neither likely nor unlikely (3)
- Somewhat unlikely (4)
- Very unlikely (5)

Q41 After getting the COVID-19 vaccine, how likely are you to stay 6 feet away from people outside of your household?

- Very likely (1)
- Somewhat likely (2)
- Neither likely nor unlikely (3)
- Somewhat unlikely (4)
- Very unlikely (5)

Q42 After getting the COVID-19 vaccine, how likely are you to attend gatherings with big groups of people?

- ○ Very likely (1)
- ○ Somewhat likely (2)
- ○ Neither likely nor unlikely (3)
- ○ Somewhat unlikely (4)
- ○ Very unlikely (5)

Q43 Have you been diagnosed or sick with COVID-19?

- ○ Yes, tested and the result was positive (1)
- ○ Yes, suspected, but not confirmed by a test (2)
- ○ No, tested but the result was negative (3)
- ○ No (4)
- ○ I don't know (5)

Q44 Do you know anyone who has had COVID-19? (select all that apply)

- ☐ Immediate family member (1)
- ☐ Relative (2)
- ☐ Friend (3)
- ☐ Other (4) _____

Q45 During the pandemic, have you used Hmong medicine or other traditional approaches (Thai or imported medicines, herbs, or non-prescription drugs) to: (select all that apply)

- [ ] To stay healthy (1)
- [ ] Prevent COVID-19 (2)
- [ ] Treat COVID-19 illness (3)
- [ ] Never used (4)

Q46 During the pandemic, have you used shamanism to: (select all that apply)

- [ ] To stay healthy (1)
- [ ] Prevent COVID-19 (2)
- [ ] Treat COVID-19 illness (3)
- [ ] Never used (4)

Q47 During the pandemic, have you seen a medical doctor to: (select all that apply)

- [ ] To stay healthy (1)
- [ ] Prevent COVID-19 (2)
- [ ] Treat COVID-19 illness (3)
- [ ] Never used (4)

Q48 If sick with COVID-19, how likely would you use Hmong medicine or other traditional approaches (Thai or imported medicines, herbs, or non-prescription drugs)?

- Very likely (1)
- Somewhat likely (2)
- Neither likely nor unlikely (3)
- Somewhat unlikely (4)
- Very unlikely (5)

Q49 If sick with COVID-19, how likely would you seek a shaman for healing?

- Very likely (1)
- Somewhat likely (2)
- Neither likely nor unlikely (3)
- Somewhat unlikely (4)
- Very unlikely (5)

Q50 If sick with COVID-19, how likely would you seek care from a medical doctor?

- Very likely (1)
- Somewhat likely (2)
- Neither likely nor unlikely (3)
- Somewhat unlikely (4)
- Very unlikely (5)

End of Block: COVID-19 Attitude, Beliefs and Experiences

Start of Block: Family Attitudes, Beliefs and Experiences with COVID-19

Q67
The following questions are about your family's attitudes, beliefs and experiences with COVID-19. Please complete to the best of your ability.

Q68 Which of the following has someone in your household done in the last 30 days to keep themselves safe from COVID-19?

	Yes (1)	No (2)	I don't know (3)
Avoided gatherings with more than 10 people (e.g. reunion, wedding, funeral, birthday party, concert, or religious service) (2)	○	○	○
Avoided public spaces, gatherings or crowds (1)	○	○	○
Worn a mask (3)	○	○	○
Stay 6 feet away from people who do not live with them (4)	○	○	○

Q69 When leaving home, how often are your family members wearing a mask or face covering?

- ○ All the time (1)
- ○ Sometimes (2)
- ○ Occasionally (3)
- ○ Never (4)
- ○ Don't know (6)

Q70 When leaving home, how often are your family members staying 6 feet away from other people?

- ○ All the time (1)
- ○ Sometimes (2)
- ○ Occasionally (3)
- ○ Never (4)
- ○ Don't know (6)

Q71 My family thinks masks can keep them safe from COVID-19.

- ○ Yes (1)
- ○ No (2)
- ○ I don't know (3)

Q72 Wearing a mask is too much trouble for my family.

- ○ Yes (1)
- ○ No (2)
- ○ I don't know (3)

Q73 My family knows how far 6 feet is from other people.

- Yes (1)
- No (2)
- I don't know (3)

Q74 Some people in my family don't trust authorities who say COVID-19 vaccines are safe.

- Yes (1)
- No (2)
- I don't know (3)

Q75 Has anyone in your family received the COVID-19 vaccine?

- Yes (1)
- No (2)
- I don't know (3)

Q76 During the pandemic, have your family members used Hmong medicine or other traditional approaches (Thai or imported medicines, herbs, or non-prescription drugs) to: *(select all that apply)*

- ☐ To stay healthy (1)
- ☐ Prevent COVID-19 (2)
- ☐ Treat COVID-19 illness (3)
- ☐ Never used (4)

Q77 During the pandemic, have your family used shamanism to: *(select all that apply)*

- ☐ To stay healthy (1)
- ☐ Prevent COVID-19 (2)
- ☐ Treat COVID-19 illness (3)
- ☐ Never used (4)

Q78 During the pandemic, have your family members seen a medical doctor to: *(select all that apply)*

- ☐ To stay healthy (1)
- ☐ Prevent COVID-19 (2)
- ☐ Treat COVID-19 illness (3)
- ☐ Never used (4)

End of Block: Family Attitudes, Beliefs and Experiences with COVID-19

Start of Block: Demographics

Q51
The following questions allows us to know you better. Please note that all personal information will be kept completely confidential.

Q52 What is your gender?

- Male (1)
- Female (2)
- Other (3)
- Prefer not to say (4)

Q53 What is your age range?

- 18-24 years (1)
- 25-34 years (2)
- 35-44 years (3)
- 45-55 years (4)
- 55-64 years (5)
- 65-74 years (6)
- 75 and above (7)

Q54 Where were you born?

- United States (1)
- Thailand (2)
- Laos (3)
- Other (4)

Q55 Were either of your parents born outside of the United States?

- Yes (1)
- No (2)
- I don't know (3)

Q56 What is your highest education level?

- Less than high school (1)
- High school graduate, diploma or equivalent (2)
- Trade / technical / vocational training (9)
- College degree (10)

Q57 How would you describe your current employment status?

- Full-time (1)
- Part-time (2)
- Student (4)
- Retired (6)
- Unemployed (8)

Q58 What is the combined yearly income for all family members that live in your house?

- Less than $30,000 (1)
- $30,000-$70,000 (2)
- $71,000-$100,000 (3)
- Over $100,000 (4)
- Prefer not to say (5)

Q59 Do you currently have health insurance?

- Yes (1)
- No (2)
- Prefer not to answer (3)

Skip To: Q60 If Do you currently have health insurance? = Yes

Q60 What type of health insurance do you have?

- ○ Medicaid / Medicare (1)
- ○ I get my health insurance through my work (2)
- ○ I buy my own health insurance (3)
- ○ Veterans Affair / Military Insurance (4)
- ○ Other, specify (5) _____

Q61 How many children under the age of 18 are living in your house?
(indicate number of people below)

- ○ Children under 18 years old (1)

_____

Q62 Including yourself, how many people between 18 to 64 years old are living in your house?
(indicate number of people below)

- ○ Adults 18 to 64 years old (1) _____

Q63 Including yourself, how many people 65 years and older are living in your house?
(indicate number of people below)

- ○ Adults 65 and older (1) _____

Q64 Do you have any of the following health conditions? (select all that apply)

	Yes (1)	No (2)	I don't know (3)
Lung Disease / Asthma (1)	○	○	○
Heart Disease / High blood pressure (2)	○	○	○
Diabetes (3)	○	○	○
Kidney Disease (4)	○	○	○
Cancer (5)	○	○	○
Obesity (6)	○	○	○

End of Block: Demographics