UNIVERSITY OF CALIFORNIA, MERCED

Importance of Cultural Tailoring: Identifying a Type 2 Diabetes Prevention Intervention for the San Joaquin Valley Punjabi Population through Qualitative Interviews

A dissertation submitted in partial satisfaction of the requirements

For the degree of Doctor of Philosophy

in

Public Health

by

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2023

Table of Contents

ACKNOWLEDGEMENTS

I want to thank the key informants who took the time to participate in the qualitative interviews and share their valuable stories in their work for the SJV Punjabi community. Also, I would like to thank my dissertation committee for their help and guidance in completing my dissertation. I want to thank my family for their continued support in my academic journey. Mainly, my mom is the most considerable support and influence on my professional goals. Her story and work ethic inspire me.

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Raman P, Lal P, Ali S, **Chauhan H**, Pant I, Lama J, Mukherjea A. Understanding Community Identity Among Diverse South Asian Communities for Health Disparities Research. American Public Health Association Meeting, November 2020, Virtual Conference.

Chauhan H, Gonzalez M. Health Needs Assessment of the Punjabi Sikh Community in the San Joaquin Valley. American Public Health Association Meeting, November 2019, Philadelphia, PA.

McEligot AJ, Behseta S, Cuajungco M, Toga AW, **Chauhan H**. Big Data, Diversity, and Research Education. BD2K All-Hands Meeting, October 2015, Bethesda, MD.

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ABSTRACT

Background: Type 2 diabetes (T2D) is a chronic disease that disproportionately affects Punjabis, a distinct South Asian sub-group, due to unique risk factors. This dissertation will provide an adapted, culturally tailored intervention design modeled after an existing intervention. The updated intervention will be culturally tailored for the rural Punjabi population in the San Joaquin Valley, based on key informant responses. **Methods:** Using qualitative interviews, conducting a literature review, and applying the Delphi method, an adapted T2D intervention was culturally tailored to meet the needs of the SJV Punjabi population. I completed 17 semi-structured interviews with individuals who work closely with the SJV Punjabi community (non-profit organizations, medical professionals, and health departments/agencies). The interview guides were developed using the social-ecological model (SEM). The SEM informed questions about individual, social cultural, and institutional level factors that affect T2D risk factors. The key informant interviews identified cultural assets and essential aspects of an intervention design tailored to SJV Punjabi individuals. **Results:** Key informants encouraged using cultural assets in the culturally tailored T2D intervention. Cultural assets included traditional foods, "sair" (walking), and the Gurdwaras (Sikh Temples). The key informants provided essential considerations that were adapted to the intervention identified in the literature review. **Conclusion:** This dissertation shows the benefits of using key informants and the Delphi method to culturally tailor a health intervention for culturally distinct populations. In addition, this dissertation will inform the implementation of a T2D education intervention for the SJV Punjabi population.

POSITIONALITY STATEMENT

During data collection, I was mindful of the impact this research will have on a community that has been historically silenced due to racism and unjust policies. I tied the data back to the theoretical frameworks in this paper and the intersection of race, ethnicity, language, multiple generations, socioeconomic status, and age. This research is an important story I wrote as a Punjabi woman who grew up in a small agricultural town in the San Joaquin Valley (SJV). Growing up in the SJV, I was exposed to the adverse health outcomes that my aunts/uncles, and grandparents had to face.

After immigrating to the US, my parents worked laborious jobs that were considered unskilled, even though they had college degrees from Punjab. My upbringing had financial hardship and trouble accessing healthcare, but I appreciated my simple life. I did not understand the generalizations that "Indians" are wealthy and faring better than other ethnicities growing up in the SJV. My neighbors and family worked in farms, factories, warehouses, and fast-food locations.

My interest in public health was sparked by watching my maternal grandfather, over 60, working six days a week from 4 a.m. to 6 p.m. as a farm laborer. He rarely had time to visit a doctor because of his work schedule. Shortly after he became sick, he passed away from colon cancer. My paternal grandmother, who I always knew to have T2D, would need to monitor her food intake and medication adherence. I would see her secretly mixing spoonfuls of sugar into homemade yogurt as a snack. This would be eaten with traditional Punjabi food. She knew there was nothing to do but take her medication and pray for the best. She passed away of complications from T2D.

My life experiences influence my positionality. This research is important to me and my community. Talking to individuals from local health departments, non-profits, and hospitals was inspiring. Many people have a common goal of promoting health and helping Punjabis live longer, healthier lives. My integration into the community helped me identify participants and provided comfort and trust to the interviewees. My background, and passion for this work may be a source of bias in the results and interpretation, however, the methodology of this research reduced bias by including committee members with different research expertise and using validated theories and frameworks.

Overall, my research will help inform a tangible intervention addressing risk factors for the Punjabi community, especially the most vulnerable. My research and personal experiences have informed my research questions and analysis to create a culturally tailored T2D intervention.

INTRODUCTION

Diabetes is a global health issue that has affected an estimated 425 million people in 2017.[1] This number is estimated to rise to 629 million people by 2045.[1] Roughly, 90% of diabetes diagnoses are type 2.[1] The World Health Organization (WHO) reported that T2D prevalence is increasing quickly in low and middle-income countries, compared to high-income countries. Internationally, T2D and kidney disease related to T2D caused roughly 2 million deaths in 2019.[2]

In the United States, T2D has become a significant health issue since the rate of individuals with T2D in the US increased by a factor of 4 between 1980 and 2014, and as of 2019, it affects about 29 million people in the United States.[3] These data show T2D is an rising issue in the US.[3]

According to the 2020 Behavioral Risk Factor Surveillance System (BRFSS), those with less than a high school education have the highest prevalence of T2D (CA: 18.7%, US: 19.8%), compared to high school graduates (CA: 11.0%, US: 14.0%), those with some college (CA: 13.1%, US: 13.0%), and college graduates (CA: 5.4%, US: 7.7%).[4] Most T2D diagnoses in California and the United States are after the age of 65, 19.4% (CA) and 22.5% (US). This is followed by ages 45-64 (CA: 14.0%, US: 14.6) and 18-44 (CA: 3.2%, US: 3.2%).[4] Overall, this data shows that less formally educated and older people are more susceptible to T2D.[4]

Income ranges also differ by T2D prevalence in 2020, where those who make less than $25,000 have a 17.8% and 19.0% T2D prevalence in California and the United States, respectively.[4] This is compared to the lowest T2D prevalence of 7.1% and 7.5% in California and the United States a month for those who make $75,000 or more.[4] These data show those with a higher income are less likely to have T2D.[4] These data also show differences in T2D diagnosis by educational attainment, age, and income.[4]

While T2D is an issue of concern in the US, the risk of developing this disease varies by race/ethnicity.[4] In 2020, T2D affected 4.0% of Asians in California and 6.8% nationally.[4] Non-Hispanic Whites were second least affected by T2D (8.6% in California and 10.5% in the US).[4] Roughly 12.9% of Hispanics in California had T2D, compared to 11.6% nationally in 2020.[4] Blacks had the highest prevalence of T2D in both California (16.9%) and the US (15.5%) in 2020.[4] Although the Asian group had the lowest T2D prevalence, the Asian identifier includes a sizeable heterogeneous community in East Asia, Central Asia, South Asia, Southeast Asia, and Western Asia.[4] The average T2D average age-adjusted mortality rate in California between 2018-2020 was 22.3 deaths per 100,000 residents, with Kern County in the SJV having the highest mortality rate in California (43.2 deaths per 100,000 residents).[5] In particular, the prevalence of diagnosed T2D among South Asians was among the highest (21.1%), compared to non-Hispanic Whites (8.0%) reported in a study that analyzed the National Health and Nutritional Examination Surveys (NHANES) from 2011-2016.[6] Yet, South Asian includes several different countries, and does not clearly show which populations are most affected by T2D. There is a need to disaggregate South Asian data to identify communities affected by T2D.[7]

Even though T2D is increasing worldwide, South Asians with T2D have significantly increased over time.[6] The category “South Asian” covers various countries with differing practices, including Bangladesh, India, Pakistan, Nepal, Maldives, Bhutan, and Sri Lanka.[8] It has been estimated that T2D will increase In South Asia to 120.9

million by 2030.[9] These 7 South Asian countries are culturally and linguistically different.[10] The 2011 census in India detailed at least 121 languages, highlighting the cultural and linguistic differences.[10]

The high prevalence of T2D among South Asians should be of great concern because South Asian immigrants, specifically from the Indian subcontinent, became the second largest immigrant group living in the United States in 2010.[11] Asian Indians in the US have the highest T2D prevalence of all ethnic/racial groups in the US.[12] Yet, the term Asian Indian encompasses different cultural regions, religions, and languages.[10] When collecting data for Asian Indians, it assumes that the people from India are homogenous, which masks disparities affecting subgroups.[13] Punjabis have a distinct history in the SJV, thus data should be collected on this population, separate from the large ethnic categories. T2D is increasing among South Asians, even though they may not have some traditional risk factors.[14] For example, South Asians may have high insulin resistance but tend to have a low body mass index (BMI).[14] Also, South Asians have higher abdominal obesity and ectopic fat.[14] Metabolic syndrome also increases the risk of T2D by five among South Asians[15] and South Asians also have a higher genetic predisposition to T2D.[14] Other identified risk factors associated with higher incidence of T2D are body composition, metabolic characteristics, and genetics.[14] addition, behavioral factors such as diet, physical activity, sleep disorders, and sociocultural factors also contribute to T2D.[14] A study from 2019 found an environmental risk factor, exposure to dichlorodiphenyltrichloroethane (DDT), in India may contribute to the increase in T2D among Asian Indian immigrants in the US.[16]

Another risk factor for T2D includes historical racism,[17] which Punjabis have undergone since their arrival in the United States.[18] Punjabis are a distinct group that has faced religious discrimination and displacement in India, which led to their early immigration to the United States in the 1900s.[18] Many Punjabis immigrated to the SJV to work in an agricultural setting.[18] Most Punjabis in the SJV follow the Sikh faith, which has made them more susceptible to discrimination.[18] Upon immigrating to the SJV, Punjabis faced racism, xenophobia, and historical trauma, affecting their chronic illness over generations.[18] In 2018, two teenagers physically abused a 71-year-old Punjabi man on a walk in Turlock,[19] and another Punjabi man was murdered in August 2019 in Stockton.[20] This is understood to be due to their physical appearance and practice of their Sikh faith (wearing turbans and having long beards for men).[20] The literature shows that racism has an impact on health,[21] which is why it is important to note the discrimination that the Punjabi community in the SJV has faced.

Geographically, the SJV is one of the poorer parts of California, with endemic poverty, food deserts, and the worst air quality in the United States.[22] These aspects of the geography affect the SJV population, including Punjabis. To create behavioral changes in this distinctive group, it is essential to develop a culturally tailored intervention to fit the unique needs of the SJV Punjabi population. The context of the disparities that exist in the SJV are important to understand, so the intervention could fit the needs of the Punjabi community. Although and intervention cannot directly address structural issues, the T2D intervention can be tailored linguistically, culturally and with an understanding of the social hardships this community has faced based on their identity.

Cultural tailoring is described as creating strategies for change targeted at a specific group.[23] The change strategies include tailoring health messages based on cultural

beliefs/attitudes and health behaviors based on the cultural background.[23] Culturally tailored health messages have a more significant effect on creating behavior change because they consider the social structures that may impact actions.[23] The goal of culturally tailored interventions is to help the target population understand and comprehend the health message and to address the health issue.[23] This is done by providing knowledge, promoting self-efficacy, and managing risk factors in a culturally tailored manner.[23] Studies have shown that understanding culture is essential in T2D management.[24] Without cultural tailoring, individuals may be unable to understand or address T2D risk factors, navigate T2D care, and practice medication adherence.[23] Culturally tailored interventions help to prevent or decrease the impacts of T2D.[24]

South Asians and Asian Indians are a heterogeneous group with different cultures, languages, and diets that need tailored interventions.[25] However, there is a significant gap in T2D among Punjabis in rural locations. The Punjabi population is a distinct group who live in the San Joaquin Valley.[18] General T2D interventions may not be helpful or successful in creating behavioral change.[23] Specifically, Punjabi T2D intervention literature is very narrow. South Asian interventions have provided some success in addressing the T2D risk factors previously listed.[26,27] Yet, there have not been any studies that focus on T2D interventions for Punjabis in rural locations in the US. Therefore, there is a need to address this gap and design a T2D intervention tailored to the SJV Punjabi community.

Addressing the Gap in the Literature:

In the literature, we have seen T2D interventions for South Asians in more urban locations, but limited interventions for those living in rural settings.[26] Another important factor is that South Asian populations are heterogeneous, and characterizing South Asians as one group would not be appropriate.[28] The group, South Asians, includes multiple countries, cultural practices, languages, and health outcomes.[28] It is important to tailor health interventions to the respective communities to ensure understanding of the material and credibility of the intervention.[29] The Punjabi group is overlooked or grouped under the "South Asian" category, which does not accurately depict the health inequities and risk factors associated with T2D; thus, an intervention is critical to move forward with ways to manage and decrease T2D among the Punjabi community.[18] Furthermore, this qualitative research will be the first to attempt to understand the perceptions of those who serve the SJV Punjabi population and their feedback on a T2D intervention tailored to the Punjabi population in the SJV.

This dissertation will draft a culturally tailored intervention framework for the Punjabi community of the SJV. Overall, culturally tailoring the intervention means that the people conducting the interventions, the language that the intervention is communicated in, the location of the intervention, and the overall messaging must successfully address some risk factors related to T2D.[23] There is a hole in the literature regarding culturally tailored T2D interventions, with most of the literature focusing on Latino interventions. A preliminary search in PubMed identified 102 culturally tailored T2D interventions, with only a few focusing on the South Asian population in urban settings. This dissertation will fill a need in intervention research by providing recommendations for culturally tailored T2D interventions for the SJV Punjabi population.

Culturally tailored T2D interventions targeted at ethnic minorities have successfully seen changes in BMI, HbA1C, and weight.[30] Culturally tailored interventions are usually more culturally congruent, and the health messages are received by an effective and trusted messenger.[30] Without cultural tailoring, the health behavior being addressed in the intervention may not be implemented. Even though South Asian T2D interventions have seen significant changes in their participants, it is essential to culturally tailor the interventions to the unique SJV Punjabi community.

With the input from those who serve the SJV Punjabi population, this research will identify the best way to tailor an effective intervention. The key informants were interviewed because of they already work with the Punjabi population and will be able to share their community experiences. Understanding their perspectives on the need to address T2D and listening to their recommendations on addressing the health issue is essential. Upon completing interviews, the need for expert view will be met by highlighting if there is a demand for a T2D intervention for the Punjabi community, what is currently being done in the SJV, and what cultural tailoring is necessary for an effective intervention. This dissertation uses the Delphi methodology to identify an intervention design that key informants inform. Qualitative data is needed at this stage due to the limited available data/surveys/records on the Punjabi health indicators. The key informants will be able to identify which parts of an intervention would work, be congruent with the Punjabi community, cause discomfort with the participants, violate cultural norms, and willingness of the participants in this community to make behavior changes.

This dissertation fills a gap in the population, geographical location, perspectives, and implications for a culturally tailored intervention. There is a need to engage stakeholders who serve these populations to ensure the intervention is successful and culturally tailored.[31] First, I will identify if a culturally tailored intervention is needed by asking the key informants to answer questions about T2D and interventions to address this health issue. Then, I will identify culturally tailored South Asian culturally tailored T2D interventions through a literature review. Finally, I will present a culturally tailored intervention(s) identified during the literature review to my interviewees, utilizing the Delphi methodology. The responses will inform intervention objectives and the best ways to implement them. The outcome of the projects will show a culturally tailored T2D intervention for the SJV Punjabi population.

Dissertation Research Question: What intervention best addresses T2D risk factors among the SJV Punjabi population?

Study 1: *This study will identify if individuals who serve the Punjabi community believe T2D is a top health issue in the community and identify what intervention characteristics would be most feasible/culturally tailored to change behavior and prevent T2D.*

Study 2: *This study will identify and assess T2D interventions that have been conducted among the United States and Canadian South Asian population*

Study 3: *This study will present the elements/components for a culturally tailored intervention(s) for the SJV Punjabi population to the key informants, which will inform the logic model for the intervention.*

The first project asks key informants about the issue of T2D among SJV Punjabis. The key informants are involved with the SJV Punjabi population as non-profit community leaders, medical professionals, or working in local health departments. The second project identifies an existing intervention through a literature review and feedback from the initial interviews for the second project. The third project focuses on providing an intervention outline and asks key informants their thoughts on the proposal. In addition, they will be asked how these interventions could improve and if they believe the community will respond well to the program. The primary outcome is to showcase a logic model of a culturally tailored T2D intervention for Punjabis in the SJV.

HISTORICAL CONTEXT

To understand the unique group of Punjabis in the United States, it is essential to understand the historical context and immigration patterns. Punjabis are a distinctive subgroup of South Asians who have endured multiple displacements and racism in the early 1900s.[32] Asians originally came to North America as early as the 1600s.[32] The initial wave of Asian immigration mainly included Chinese and Filipinos.[32] The second wave of Asian immigration during the 1830s included Japanese, Koreans, Chinese, and Filipinos arriving to work at sugar plantations in Hawaii.[32] The third pattern of Asian immigration had Sikhs from Punjab in the early 1900s.[32] Punjabi immigration to the United States from Punjab continues to present day, Even though this migration was much smaller, it is crucial in informing the context of Punjabis in the SJV.[32] Most Punjabis residing in the SJV are followers of the Sikh religion.[32] Therefore, religious traditions played a role in the trauma and racism that has affected their health over generations.[32]

Punjab was a fertile farming state in India and was the region that created food for many parts of the country.[33] After the British annexed the Punjab state in 1849, a new tax was imposed on farmers.[33] This British tax's goal was to create roads and railways; however, it negatively affected the farmers.[33] Before British annexation, the total tax collected from Punjab was 820,000 pounds.[33] After annexation, the tax increased to 1.06 million pounds.[33] Since the taxes were required, many farmers mortgaged their property to meet the tax requirements.[33] This made it hard for Punjabis to continue living in Punjab, and they needed to find work elsewhere. This led to the emigration of Punjabi Sikhs.[33]

The majority of Punjabis immigrated to the US in the 1900s from the following districts of Punjab: Amritsar, Hoshiarpur, Jullundur, Ludhiana, Gurdaspur, and Amritsar.[34] An Indian employee of the United States Labor Statistics, Rajani Das, in the 1920s, noted that many of the Punjabis residing on the West Coast had previously served in the British Army.[34] Most British military posts during World War II had Sikh soldiers.[34] Sikh soldiers began building Gurdwaras (Sikh temples) in diverse areas like Hong Kong.[34] These temples served as short-term lodging for other Sikhs, which was helpful during emigration since some individuals waited weeks for their ships. This created a community for social support during the war.[34]

Punjabi Sikhs filled the jobs in steamship companies and railroad builders in North America.[34] Specifically, Canada recruited Indian immigrants from 1904-1907.[34] During these three years, roughly 4,000 Punjabi Sikhs immigrated to Canada, also known as the "turban tide."[34] However, this significant influx of Punjabi Sikhs coming to Canada did not last long because the government implemented new strategies to make it harder to enter the country. In addition, another law stated that immigrants must have a "continuous journey," but no direct ship brought Punjabi Sikhs straight to Canada.[34] Gurdit Singh, a wealthy landowner from Punjab, rented a steamship to sail directly to Canada's Vancouver port with 375 other Sikh Punjabis in May of 1914.[34] However, Canada passed another law requiring immigrants to have 200 dollars to enter Canada, where previously only 25 dollars were necessary.[35]

Because Canada implemented these new policies, Punjabi Sikhs began immigrating to the United States.[35] In 1907, roughly 200 Punjabi Sikhs found jobs working in the Lumber Mills in Bellingham, Washington. The journalists at the time negatively described Punjabi Sikhs as "Hindoos" and described them as unfit to work.[35]

Even though 90% of the South Asians were Sikh, they were called "Hindoos," a slur used by media and State/Federal agencies.[18] They were described as dirty and racially degraded by illustrating the individuals with long hair, long beards, and turbans as unclean.[35] Sikhs were seen as an economic threat, taking away jobs from those who previously lived there.[35] Furthermore, Sikhs did not assimilate and continued to practice their faith and continued to eat traditional food, which was also used against them.[35] Many journalists and writers discussed how Punjabi Sikhs are "strange in appearance and have peculiar habits and customs."[36] This Euro-American racist environment created a hostile situation and eventually drove out the Punjabis.[35] These racially charged experiences led them to California. Between 1907 and 1910, a significant immigration of Punjabi Sikhs came to the United States.[35] Many became farmers since they were familiar with farming in Punjab.[35]

Federally enforced policies negatively affected the Punjabi population.[34] Most Punjabi migrants moved to North America to escape the economic and political issues faced during the British rule in India.[34] When migrants face unwelcoming policies and hostile situations at their workplace and home, there is usually a negative effect on health care services.[34] Many reviews have illustrated the harmful effects of discrimination on health like increased blood pressure and mental health issues.[37] After immigrating to North America, Punjabi Sikhs were seen as "other" and were told to adopt Western culture. Nonetheless, discrimination and exclusion continued.[24]

Most Sikhs who came to the United States lived in the San Joaquin Valley or the Imperial Valley since these areas were agricultural belts.[18] After the Immigration and Naturalization Act of 1965, many Indians who were educated and skilled moved to the United States. Yet, the Punjabis who moved to the United States in the early twentieth century needed more job-training and usually needed formal education.[33] Thus, they continued to sponsor unskilled family members into the United States.[33] They usually had low-wage farming jobs that had provided limited financial mobility.[33]

Punjabi Sikhs tried to gain citizenship by proving Aryan blood.[38] This is showcased in a famous Supreme Court Case: United States v. Bhagat Singh Thind.[38] Thind had served in the United States military during World War I and eventually received U.S. citizenship in 1920.[38] He was passionate about removing British rule from India, and the U.S. used this as an excuse for deportation.[38] The Aryans were considered a branch of the "superior" White race, so Thind wanted to protect his citizenship by stating he was of Aryan blood.[38] The Aryan blood is a racial myth.[38] However, his skin color took precedence, and his citizenship was removed.[34]

In 1917, the United States implemented an Immigration Act, which excluded immigrants living in "Barred Zones."[34] A make-believe line was created that restricted Indian immigrants from coming to the United States.[34] In 1946, some Punjabi Sikhs could enter the country due to the Luce Cellar Bill, which allowed Indians to gain citizenship and sponsor family reunification.[34] Yet, the door opened much more when the Immigration and Naturalization Act of 1965 came into effect.[34] Discrimination informed many policy decisions that ultimately affected the stability and independence of Punjab Sikhs.[34]

Muzamdar argues that skin color discrimination affected everyone who was not considered white.[38] However, Chinese, Japanese, and Koreans were categorized as "yellow" and were categorized closer to Whites.[38] Yet, those darker in complexion, like

Filipinos, Indonesians, and Indians, were considered treatment closer to Blacks.[38] According to the 1980 census, Indians and Filipinos born in the United States showed higher levels of unemployment. The unemployment was 1.5% among Chinese and Japanese, while Asian Indians had an unemployment rate of 7.6%.[38] The U.S. Commission on Civil Rights reported that unemployment was due to discrimination.[38] Economically, racial job discrimination deleteriously affects the economic mobility of Sikhs.[38]

Overall, Punjabis have faced many challenges in immigrating and assimilating to the United States. With many generations of Punjabis living in the United States, we continue to see high rates of T2D. An upstream factor for T2D is structural racism.[39] In the San Joaquin Valley, there continues to be racism and difficulties that the Punjabi community faces. On July 31, 2018, two teenagers physically beat a 71-year-old Punjabi man who was on a walk[19] and the murder of a Punjabi man in August 2019 in Stockton.[20] In addition to the physical stress of their work, distrust in a system that may have portrayed racism can exacerbate T2D rates by preventing access to healthcare.[21]

To implement a T2D intervention in this minority community, the interventions must be culturally tailored to the group's lived experiences. The historical context and the risk factors are important to understand. By collecting information and data from the key informants (public health/health professionals who work with the SJV Punjabi population), important feedback is utilized to identify key intervention characteristics. Cultural tailoring on an intervention is significant for this community because there is a historical trauma, and there may be a lack of trust in the system. Historical trauma can affect a community long-term and may influence the population's health.[40] Therefore, it is essential to research the Punjabi community in the SJV.

FRAMEWORK

Before culturally tailoring a health intervention, it is important to conduct background research by identifying the health need and how it will be addressed.[31] Intervention development studies have shown the importance of engaging experts.[31] Some of the intervention literature included interviews from expert advisors,[31] and providers as key informants to provide a community perspective.[41] Specifically, the providers and expert advisors give concern about health issues and recommend ways to address the problems in the form of a tailored intervention.[41] By interviewing those who serve the SJV Punjabi population, the outcome of the dissertation will provide valuable perspectives due to their imperative role in the implementation of the intervention. The key informants interviewed in this study have worked closely with the Punjabi population through the mediums of community based organizations, health care, and government in the SJV, so their input is very valuable to culturally tailor an intervention. In addition to providing recommendations from the key informants, a literature review about current ongoing interventions, or lack thereof, will be conducted. This information is essential in the formative process of developing interventions. Stakeholder viewpoints are vital in culturally tailoring interventions to unique communities since the intervention literature may not be consistent with rural populations.[42]

Social Ecological Model:

This dissertation uses the social-ecological model because it provides context about the factors that influence health outcomes.[43] This prevention framework highlights the different facets affecting health behaviors and outcomes.[43] The interview questions for Project 1 mainly focus on answering questions about the individual, social cultural, and institutional factors that may impact T2D. The responses are important because they will identify how to best tailor the intervention and which level of the social-ecological model will be addressed.

The social-ecological model (SEM) was developed by Urie Bronfenbrenner in the 1970s to highlight the several systems that affect health.[44] The SEM understands there are broader systems to individual-level factors that influence decision-making, which, in turn, could affect health. This framework understands that individuals are part of larger social systems rather than focusing only on individual-level factors.[45] Overall, the traditional SEM model uses a prevention framework to address four main levels: individual, relationship, community, and societal.[43] The individual level looks at biological, psychological, and self-efficacy factors that might increase the likelihood of a disease.[43] Relationship focuses on the people close to the individual and how they may impact the health outcome.[43] Community looks at the neighborhood-level factors and how they may influence disease development.[43] Societal includes broader elements that highlight inequities at a larger scale. Examples of societal factors include health care, cultural framework, social norms, and economic policies. Some social factors include wages, living in rural areas, and immigration history.

Figure 1 visually showcases the adapted SEM, emphasizing T2D risk factors affecting South Asians. Studies have shown that insulin resistance, bio-mechanisms, and genetic predispositions are essential biological/individual-level risk factors that influence T2D diagnosis.[14] These risk factors, highlighted as the small circle in Figure 1, have the least likelihood of change since individuals are born with the predisposition.[14] Even with

the genetic predisposition to T2D, prolonging a T2D diagnosis to an older age is possible. Therefore, social factors are important to prevent the early onset of T2D.[14]

At the individual level, eating food that is high in sugar and refined grains are risk factors for T2D.[46] South Asian diets is high in saturated fats, however there is consumption of traditional foods like okra and bitter gourd that promotes glycemic control.[47] Fatalistic attitudes also influence the likelihood of doing physical activity or eating a T2D preventative diet.[47]

Previous studies have shown social-cultural factors like living a sedentary lifestyle, eating unhealthy foods, acculturation to American norms, limited social support, targeted discrimination, and cultural norms affect South Asian health.[12] Acculturating to the US includes a more sedentary lifestyle and consuming the American diet.[12] In fact, second and third generation of South Asians tends to skew towards a fast-food American diet rather than a traditional Punjabi diet.[48] Also, immigrating to a new country makes individuals susceptible to limited social support and discrimination.[20] This adds more stressors to an individual's life and affects health outcomes.[24] Higher levels of stress increase cortisol level, which increase the risk for T2D.[49]

Institutional factors like the immigration system, healthcare system, and education system affect health.[34] Historically, anti-immigration policies have made it difficult for Punjabis to settle in America.[34] Key informants discussed financial and societal pressures that SJV Punjabis face upon immigrating to the SJV. In turn, this has also affected access to health resources.[50] Ultimately, this decreases access to T2D preventative care.[51] Although institutional factors are more difficult to change, the intervention aims to address stress management from the resulting institutional stressors.

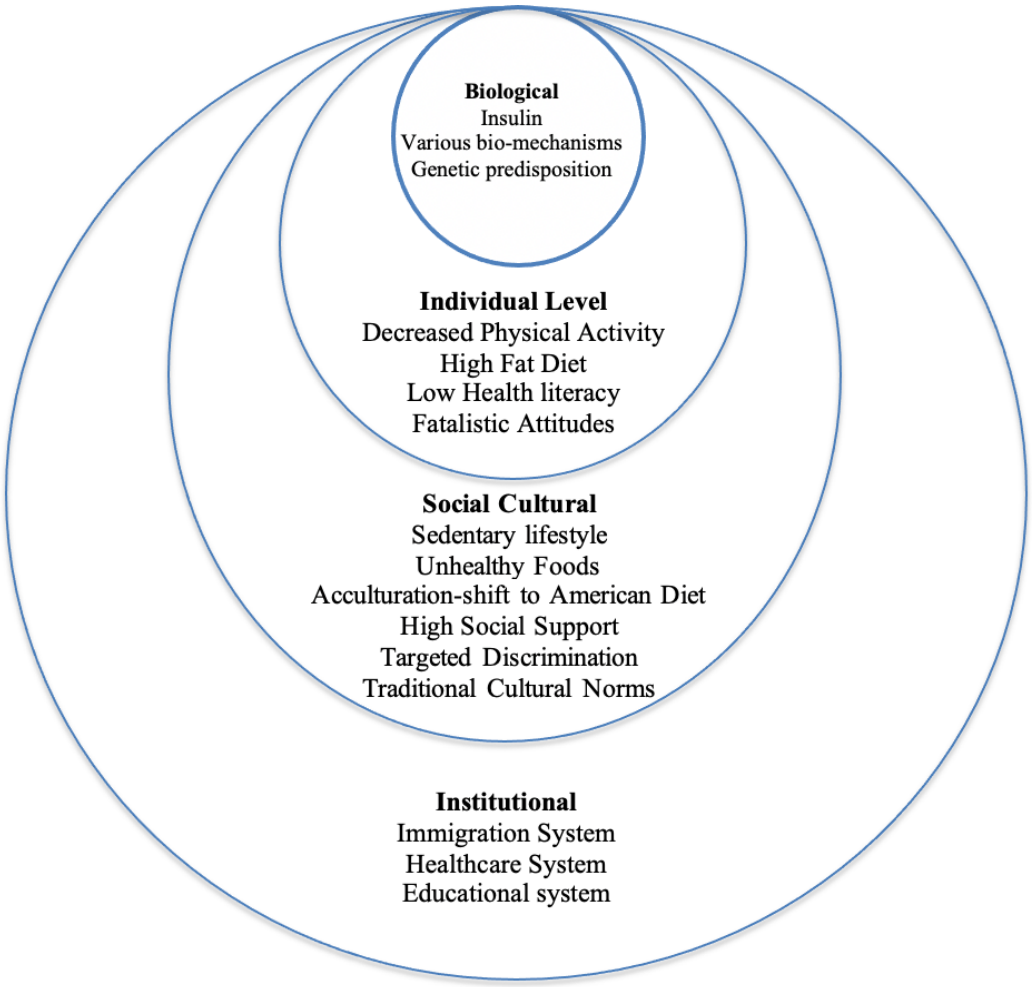
The questions in interview script #1 follow the social-ecological model to understand the more significant factors that may influence the increased risk of T2D among the SJV Punjabi community. In particular, the social-ecological model was adapted to include South Asian risk factors for T2D in the different facets of the framework: biological, individual, social-cultural, and institutional. The T2D intervention design for the SJV Punjabi population mainly addresses risk factors at the individual, however it is important to address the institutional level for long-term sustainable change.[52]

Intervention Mapping:

Intervention mapping is a popular way to help plan interventions using the Social Ecological Model and evidence-based best practices.[53] Intervention mapping allows us to understand interventions because it is a specific guide to help develop the starting points for intervention.[53] This will help with cultural tailoring because it helps to identify the main criteria for change to fit the needs of the SJV Punjabi community. Intervention mapping has six steps: 1) logic model of the problem, 2) identification of intervention outcomes using a logic model of change, 3) program design using the Social Ecological Model, 4) program production, 5) program implementation plan, and 6) evaluation plan.[54] After completing all the interviews, intervention mapping will be a helpful way to visualize the anticipated intervention. Logic models are an important part of intervention planning because they highlight frameworks and theories that help make the intervention effective.[55] Steps 1, 2, and 3 will be covered in this dissertation. Since this dissertation

will be planning for a culturally tailored T2D intervention, steps 3-6 will not be included in this dissertation work.

Figure 1. Adapted Social Ecological Model for South Asians and T2D



STUDY 1

Identifying Cultural Tailoring Needs for a SJV Punjabi T2D Intervention

INTRODUCTION

Public health intervention literature for the Punjabi community is limited, and T2D intervention literature is limited. The few interventions focused on Punjabis and T2D in the US did not publish key informant interviews that informed intervention design.[56] Few studies have focused on the background work of creating an intervention, explicitly understanding the needs of key informants to develop an intervention.[57] Implementing a health intervention is a way to create change in knowledge and behavior successfully.[57] In ethnic and historically disenfranchised populations, including the target population's perspective in the intervention's design is important.[54] Specifically, the intervention's community buy-in and cultural tailoring will help with design, recruitment, and implementation.[54] However, the public health intervention literature has many different methodologies in preparing the study design and it needs to be better described.[57] With the inconsistent intervention literature, there is a gap in highlighting the intervention design process.

Key informant interviews are helpful to attain information on a community's problem from experts in the community.[58] Key informants serve as a liaison of the community's beliefs and behaviors.[58] The one-on-one interviews allow the key respondents to answer questions freely and provide more in-depth conversations.[58] There is a need to understand what key informants think about T2D and ways to address the issue. The key informants interviewed in this study have worked with the Punjabi community. Furthermore, SEM and barriers to T2D prevention among Punjabis. Specifically, the key informants provided us with information about where Punjabi community members may get lost in accessing care or making healthier choices.

The main goal of the interviews was to understand what characteristics are necessary for a culturally tailored intervention for the SJV Punjabi community. The key informants provided a valuable perspective that summarizes the community's needs and includes information on making an intervention culturally congruent for the SJV Punjabis.[58] International studies have shown that T2D is a prominent health issue affecting South Asians because of social, cultural, and genetic factors. This study will design the intervention, so it filled the gap in how key informants talk about T2D in the SJV Punjabi community.

The key informant interviews were conducted from March to May 2022 to fulfill the first project of the dissertation at UC Merced. This project is the first qualitative study that will identify the main health risk factors and issues related to T2D among a specific subset of the population from the lens of the key informants. The research questions focused on T2D as a health concern among the SJV Punjabi community, the interventions that could address the problem of T2D, and how to tailor a T2D. The responses from key informants will inform a culturally tailored T2D intervention for the SJV Punjabi community.

To fill the gap in culturally tailored intervention literature, key informants were interviewed on their experience working with Punjabis with T2D in the SJV and the intervention qualities needed for successful implementation. Understanding the following questions will help me fill the gap by identifying important culturally tailored components to include in a feasible intervention design. This will be done by answering the following questions:

Aim 1: Understand what key informants believe are T2D risk factors for the SJV Punjabi community.

Aim 2: Identify what is being done, and where is the gap.

Aim 3: Identify ways to target the intervention for the SJV Punjabi population.

RESEARCH DESIGN AND METHODS

Delphi Method:

This technique is used to answer a specific research question by gathering opinions from a group of experts over several sequences of data collection.[59] Ultimately, the goal of the Delphi method is to reach a consensus on specific recommendations. There are three primary Delphi methods: conventional Delphi, real-time Delphi, and policy Delphi. Real-time Delphi is a method that combines data collection to be a single, continuous interview.[60] The policy Delphi is usually when an expert or informed group of people provide information and evidence instead of generating a group consensus.[59] Conventional Delphi is when a group of experts are asked to complete a survey or questionnaire and then are followed up with to provide the results of the first encounter.[59] The goal is to come to unanimity.[59] We used the conventional method because it allows time to gather additional information through a literature review. In addition, this allowed the respondents to think about their responses and provide extensive feedback for an intervention. Studies have shown that 10-15 interviews are sufficient in the Delphi method.[61]

The methodology of the dissertation projects adopted the conventional Delphi system to allow sufficient time to analyze the first round of interviews and develop a potential intervention. The three-part dissertation began with interviewing the key informants to understand their opinions on T2D among the SJV Punjabi community. After an analysis of the interviews and a literature review, the key informants were displayed the outcomes of the first two projects. The goal of the final dissertation project was to develop a consensus on an intervention to address T2D among this population. The Delphi method and a deductive approach helped tie together all the projects to provide a culturally tailored T2D intervention framework for SJV Punjabis.

Study Design

This key informant interview qualitative study is the first dissertation project out of three total projects to prepare for a T2D intervention tailored to the SJV Punjabi population. Semi-structured interviews were conducted with a total of 10 participants. This research study was driven mainly by researchers at UC Merced but also collaborated with a CSU East Bay faculty member.

All the interviews were conducted via a secure university Zoom account. These interviews were recorded for transcription and analysis. Zoom has a transcription feature that was utilized. Researchers looked through the transcript and audio for quality checks of the transcripts. There were minimal risks associated with the study. This research received an exemption determination from the Institutional Review Board. The

participants were reassured that they did not need to answer any questions that did not make them feel comfortable.

Using qualitative methods, the research team utilized a semi-structured interview guide. Semi-structured interviewing is commonly used in qualitative research.[62] Although there were targeted questions, interviewees were encouraged to share any important information about Punjabi health and T2D interventions. In addition, the interviewer asked follow-up questions that pertained to the research. Previously, there had not been a qualitative research study that has asked the key informants who work closely with the Punjabi population to understand T2D. This novel study utilized the knowledge and interaction of the key informants in identifying the primary reasons for the increased risk of T2D and highlighting the feasibility of potential interventions.

This project aims to provide a framework for a culturally tailored intervention. Although one intervention is not enough to address chronic disease, we believe this will be a start to understanding how to prevent T2D for current and future generations.

Study Recruitment

The first four participants were recruited using personal contacts of the research team. The team first contacted known connections since the PI is connected to Punjabi organizations throughout the SJV. Then, snowball sampling was utilized when it is hard to reach target populations. Since the Punjabi non-profit organizations and county employees who work with the Punjabi community is small, the connections were limited. This research has never been conducted in the SJV, so snowball sampling was the most appropriate way to proceed for recruitment. Previous interviewees were asked if they knew anyone else who worked closely with the Punjabi community and had a strong pulse on the health needs of the target population. Since these four locations are well connected, we did not anticipate substantial issues with recommendations provided by previous interviewees.

Inclusion Criteria

1. Must be over the age of 18.
2. Speak English.
3. Consent to the qualitative interview and the recording of the interview.
4. The participants must work with or serve the Punjabi community in their respective areas as medical professionals/public health professionals/community based organizers.

Exclusion Criteria

1. Under the age of 18.
2. Do not speak English.
3. Do not consent to the qualitative interview and/or the recording of the interview.
4. Do not work with or serve the Punjabi community in their respective area.

Participants

Those who serve the SJV Punjabi population have a prominent role in understanding the community, cultural assets, and places to improve. The empirical data showed a strong narrative of the impact on the population and ways to address T2D by

implementing an intervention. The unique perspective informed the qualitative data and the following sequence of projects by providing professional views on the health problem. Ten interviews were conducted, which included participants from Bakersfield (2), Fresno (2), Livingston/Turlock (3), and Yuba City/Sacramento (3). These geographic locations were selected because they have the highest proportion of Punjabi residents. Key informants from these areas will provide broad perspectives on the culturally tailored intervention design and feasibility.

Those who serve the Punjabi community with some health background included the following jobs: public health departments, non-profit organizations, and medical professionals. The interviewees were familiar with SJV Punjabi health by working with or for the population. This allowed for some variability in responses from individuals with experience with this segmented population.

The study recruited people from Bakersfield, Fresno, Livingston, and Turlock/Livingston area because these cities have the largest Punjabi populations in California. Key informants from these cities are more likely to interact with our interested population and would highlight issues in rural parts of California, where there are unique structural and social risk factors related to T2D. In addition, the interviewees provided a perspective not included in previous literature. The job titles for the key informants were collapsed into affiliates of a community-based organization, health department/agency, or the medical community for anonymity. Interviews halted when data saturation is achieved.[63] Data saturation was determined when new information was no longer identified.

Geographically, participants worked in Yuba City/Sacramento (n=3, 30%), Turlock/Livingston/Merced (n=4, 40%), Fresno (n=1, 10%), and Bakersfield (n=2, 20%). Roughly half of the 10 participants worked at community-based organizations (n=5, 55%), and the other half worked for government healthcare agencies/public health departments (n=3, 30%) or as medical professionals (n=2, 20%). In addition, most participants were female (n=7, 70%).

Table 1.1 Participant Characteristics

Location	Count (N=10)
Geographic Location	
Yuba City/Sacramento	3 (30%)
Turlock/Livingston/Merced	4 (40%)
Fresno	1 (10%)
Bakersfield	2 (20%)
Job Role	
Community Based Organization	5 (50%)
Health Department/Agency	3 (30%)
Medical Professional	2 (20%)
Gender	
Female	7 (70%)
Male	3 (30%)

Materials and Equipment

The research team had access to a secure Zoom account and phone, the capability to record the interviews and store them in a secure location to ensure anonymity. The interviews were stored on the PI's password-protected computer. Access was limited to only the members of the research team. The interview was de-identified so confidentiality is maintained. Interviewees are told that their identities will not be publicized to ensure they can freely discuss the topics presented to them.

The interview guide has four major themes that will address this project's research questions: (1) T2D affecting the SJV Punjabi population, (2) interventions that are feasible and what interventions are currently present, (3) the best way to implement an intervention, and (4) feasible interventions. These questions aimed to understand what interviewees believe are the major health problems that affect the Punjabi community, know if these problems are consistent with the Punjabi health literature (T2D), and then ask questions specific to T2D. These interviews were roughly 60-90 minutes.

Interview Guide

The interview guide was created using the SEM.[64] In addition, it was developed under the guidance of the dissertation advisor and presented to the dissertation committee. The introductory questions provide information about the interviewee. The main goal of these questions is to understand their general perception of T2D by having the key informants think about why they may believe T2D is an issue. The next set of questions addressed question 1 of this research project: Is T2D a concern for the SJV Punjabi population? Pulling from the Social Ecological Model, the questions go into depth, probing for individual, relationship, community, and societal level factors that may be associated with T2D in the SJV Punjabi population.[64] The proceeding questions target question 2: identifying feasible interventions. Using intervention implementation literature, it is important to identify the target audience and the specific "hows" to make

the intervention feasible. That is why it is essential to understand what is currently being done and what can be added to make it more successful. The final questions ask about ways to culturally tailor an intervention to ensure feasibility and acceptability by the target population. These questions help identify which sections of the SEM need to be addressed for the intervention.

After introductions were completed, the PI asked questions regarding 4 areas: (1) do the key informants of the Punjabi community believe that T2D is a health concern in the Punjabi community, (2a) what interventions do they think will be most feasible way to address T2D in the Punjabi community? (2b) what is being done and where is the gap? and (3) what is the best way to target the intervention for the SJV Punjabi population in a culturally tailored manner? What can make intervention feasible? The main goal of the first questions was to understand their general perception of T2D by having the key informants think about why they may believe T2D is an issue. The second question asks key informants to think about what T2D culturally tailored interventions exist and what needs to be done to address any gaps. The third question asks key informants to share components of the intervention that can be culturally tailored.

Theme Validation

To validate themes, investigator triangulation was used.[65] Triangulation is a technique used in qualitative methods to ensure the interview findings are valid and reliable.[65] Investigator triangulation is when multiple researchers are part of the analysis and discussion of the interviews to reduce bias in the outcomes of the research study.[65] With more than one researcher reviewing the findings, the validity increases.[65] For this dissertation, two researchers from different research backgrounds interpreted the data and conclusions. A limitation of this study was the lack of intercoder reliability, due to funding restrictions.

Analytic Strategy:

Upon completing the interviews, the research assistants and the PI completed memos in their research notes to highlight any significant themes or takeaways from the interview before coding. Initially, this helped with the qualitative coding. The interviews were analyzed using Atlas TI to identify common themes among the interviews. First, the transcripts were read, and the transcriptions were edited. Even though the Zoom transcription feature is beneficial, there were some errors. The research assistants double-checked for errors and anonymized the transcripts. The PI coded and categorized the data by tagging/coding the transcript sections. A codebook was created in Atlas TI. Atlas TI was used to organize the interview transcripts, and the PI did the interpretation and synthesis. Codes were analyzed reported on the frequency of the theme. The interviews averaged 60 minutes.

The interviews were analyzed using thematic analysis.[66] Thematic analysis has six phases, which include getting familiar with the data, creating codes for the data, identifying themes, reviewing the themes, naming the themes, and reporting the analysis.[66] Upon completing the interview, a memo documents were created to write down initial thoughts and how their responses related to the study objectives, before the transcription. Then open coding and descriptive coding was conducted section of the interview with a descriptive code or category name. Inductive coding was used to create

an initial codebook, where the themes described the data that was collected.[67] Themes were named after an iterative process of reviewing the codes and discussing them with the dissertation advisor, to ensure interpretation validity and trustworthiness.[68] The deductive reporting of the themes utilized the Social Cognitive Theory, where the theory helped to organize the data by environmental factors, cognitive factors, and behavioral factors.[69,70]

Table 1.2 Interview Guide:

Introductory Questions

1. How are you?

2. What is your job title?

3. How do you work with SJV Punjabi community?
   Probe: What is your role?
   Probe: How much contact do you have with the Punjabi community?

Question 1: Do the key informants of the Punjabi community believe that T2D is a health concern in the Punjabi community?

4. From your perspective, what are the main health issues affecting Punjabis in the SJV?

5. Do you think T2D is a problem among SJV Punjabis? Why or why not?
   Probe: Have you seen differences in the way T2D is handled by different age groups or generations? Are you seeing T2D being diagnosed at a younger age in the community?

6. What do you think are risk factors for T2D?
   Probe: Individual Level- Exercise, diet?
   Probe: Community Level issues (neighborhood/city/county)- access to care,
   Topic of interest social determinants of health – break down into the different determinants that are risk factors]: diet, exercise, access to care, environment, stress

7. Is there a T2D intervention that you know of that is tailored to the Punjabi population?
   Probe: Is your program/workplace/organization addressing T2D among the SJV Punjabi population?
   Probe: If yes, which one's were successful? Why do you think this was accepted by the community? What was not accepted by the community? Which things that you tried were not successful? Why do you think they didn't work?

8. What factors should be considered to improve T2D prevention in the Punjabi community?
   Probes: What do you see as the barriers and facilitators to addressing T2D in this community?
   Probe: What health changes does the community already do? What do they need to do?

9. What kinds of individual health changes or interventions would help address T2D. What do you think the community would accept?
   Probe: Do you have any potential solutions to this problem?
   Probe: Diet intervention, education, exercise, community intervention?

Q2: And what interventions do they think will be most feasible way to address T2D in the Punjabi community? What is being done and where is the gap?

10. What do you think would work for this community?

11. What do you think people need? (In regard to the previous questions)
    Probe: Interventions? Education? Policy?
    Probe: Which would work best? Individual or group intervention?

12. Are there cultural concerns? What are the cultural strengths?
    Probe: What are your worries/concerns about the SJV Punjabi population?
    Probe: Community mindset?

Q3: *What is the best way to target the intervention for the SJV Punjabi population in a culturally tailored manner? What can make intervention feasible?*

13. Who do you think should be part of these interventions?
    Probe: Generational differences?
    Probe: Age group?

14. Where could the intervention be held?
    Probe: Could interventions run through hospital/clinic, public health department, outreach from temple? Neighborhoods?
    Where is a safe space to meet for the intervention? School? Hospital? Temple? Park? Web based?

15. What source of information is most trustworthy to deliver the intervention? How about to promote?
    Probe: Doctors? Family, priest? Can children influence their parents? Most educated person in the family? Elderly?

16. What incentive could be used to increase attendance?
    Probe: food? Mugs? Gift cards?
    Probe: What days of the week would work best for this population?
    Probe: This population might not have weekends or afternoons off due to their job? Sundays?

Extra

17. Is there anything else you would like to tell me?
18. I will be adding your feedback to develop an intervention using your feedback. Would you be interested in participating in that study where I show you an intervention for your feedback?
19. Do you have any peers that would be able to participate in this interview?

RESULTS

Qualitative Analysis:

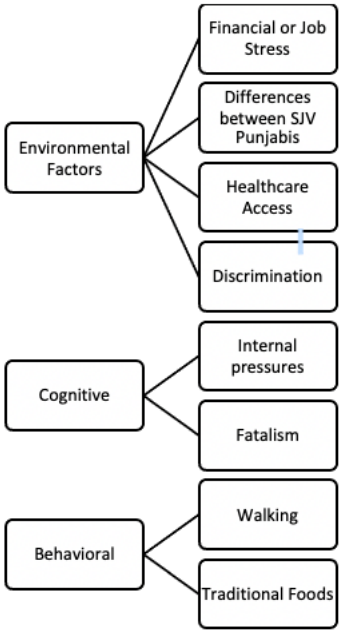
Since males were concentrated in a specific job category, gender will not be used to describe the quotes to maintain privacy. Also, the number for each geographic location was small, so the location will not be attached to the quotation. Instead, the quotes will be identified only by their general job role.

Seven themes were identified from the interviews. There were discussions on why the SJV Punjabi population is more vulnerable to T2D, cultural beliefs that prevent behavior changes, and cultural assets that will strengthen the intervention.
None of the key informants reported knowing that there was a T2D culturally tailored intervention in the SJV. Only intervention I was aware of health clinic and translated information. Therefore, information focused heavily on social cognitive and environmental

Theory

Themes were organized using the Social Cognitive Theory (SCT) as environmental factors, cognitive factors, and behavioral factors.[71] The environmental factors included difficult job environments, generational differences between first, second, and third generations, health care access due to linguistic and systematic barriers, and discrimination. Cognitive themes included internal discrimination and fatalistic perceptions about T2D. Behavioral themes include cultural assets like walking and eating traditional diets to prevent T2D. This theory provides a framework for sociostructural influences that affect health.

Figure 2.1: Theme Organization by SCT



Environmental Factors

Theme 1: Financial/Employment Stressors Affect Health

Six key informants felt that financial pressures were one of the reasons why Punjabis in the SJV may experience stress and may deter them from exercising and sleeping. One key informant discussed the types of jobs that first generation Punjabi immigrants may work. These jobs were described as difficult, but emphasized the need to work for financial security. Financial security is emphasized multiple times. The key informant talked about the types of difficult jobs first generation Punjabis work and that paying bills is priority. Being financially secure is important and may be a source of stress. This quote linked the financial stressors to not eating healthy foods or exercising.

> *I know with primarily first-generation immigrants, there's a lot of financial stress… just stressed to get established to earn money…first off, the jobs that individuals might have, those jobs they might be working long hours, which means they're not sleeping as much and don't have time for exercise. Maybe multiple jobs, so it eliminates the ability to exercise and even eat properly. If you're not eating at some regular intervals at regular times, there's just that ongoing stress of the job hoping to achieve financial security.*
>
> *-Community Based Organization 2*

Another key informant explained that financial stressors also come from the social pressures of upholding societal obligations, like taking care of family in India. This key informant made the link to the stressors that exist upon immigrating to the US. There is a goal to show that they have "made it" by taking care of their families. There is a pressure to keep up with the societal pressures of being a first-generation immigrant in the United States and show they are financially secure. Ultimately, the stressors related to keeping up with the financial pressures and supporting multiple households is related to increased stress. The quote suggests that the health is not prioritized due to the social pressures of appearing financially secure.

> *People just don't care about their health because they're stuck in this sort of having to pay rent, having to send money back to India, having to keep up with the Joneses or Johals.*
>
> *-Community Based Organization 1*

The same key informant explored what it is like to be a newly immigrated Punjabi in the SJV. This key informant emphasizes the hardships that originate in India and continue to follow after immigration to the US. Particularly, the trajectory of the types of jobs and experience they faced as new immigrants to the US. Prior to having a green card, newly immigrated Punjabis worked in the service industry, followed by farm work and factories. Even though there was difficulty in their work, their attitude was to not complain about the difficult working conditions

since they had the opportunity to arrive to the United States. This quote discussed the risk factors and hardships that affect health.

> *They're [Punjabis] are told from the time they land in this country…[they are told to] set up work, whether it's at like restaurants, gas stations, or liquor stores, getting taken advantage of by their employers; then finally getting green cards…then moving on to actual work in factories or farms or whatever, still getting taken advantage of …so it's almost as they've just accepted that this is life because it was so bad in India that even though it's really bad here at least it's not as bad as that. Right?*
>
> *-Community Based Organization 1*

Another key informant described the difficult physical working conditions. Some of the jobs discussed are low paying and physically intensive jobs. Cannery workers can get food ready for canning, which may include cleaning and peeling fruits and vegetables. Meat packing jobs include cutting and cleaning animals for distribution. The key informant described women tend to have Cannery jobs and men work in meat packing factories. These production line workers have a demanding schedule and have repetitive tasks, which attribute to the physical stress endured. The key informant suggests some of the jobs that SJV Punjabis work have low wages and are physically demanding. This also recognized the type of jobs that are unique to the SJV.

> *They're so busy working very, very hard. [They are] working in the cannery, and men are working in the [meat packing factory], and even women are working, and they don't have any time to themselves.*
>
> *-Community Based Organization 6*

Theme 2: Differences in Risk Factors between SJV Punjabis

Seven key informants discussed the many risk factors that affect health. Some key informants mentioned that those who immigrated to the US from Punjab have additional barriers to addressing T2D risk factors compared to those born in the US. The generational differences affect the perceptions of health. This key informant discussed that those who immigrated have different experiences related to health compared to first- and second-generation Punjabis. An intervention for T2D must understand that there are multiple generations, that have different attitudes and perceptions on T2D. The intervention must be tailored accordingly since each generation may have different perceptions and attitudes. This concept needs further research.

> *The attitudes are different, different kids who were born here to parents who grew up here... their attitudes are different from kids who were born here to parents who weren't born here but immigrated here. Those attitudes are different, too… I feel like there are three types of generations, like three types of cultural subsets.*
>
> *-Health Department/Agency 1*

Another key informant also emphasized the differences within the Punjabi community. The Punjabis in the SJV have different risk factors based on several different social factors that affect health. Particularly, socioeconomic factors play a large role in access to health care and ways to prevent T2D. Similar to the quote above, Punjabis have generational differences, which may impact their socioeconomic status.

> *It's important to recognize that the Punjabi community is not a monolith; that within our community, we have different socioeconomic structures that allow some people certain advantages in, like health care or preventative care or whatever the case may be.*
>
> *-Community Based Organization 1*

Another key informant emphasized that those newly immigrated from Punjab may not know how to access care to prevent T2D, compared to those who are not newly immigrated. New immigrants from Punjab may be the most at-risk group for T2D, due to their limited knowledge of resources and access to care. The key informant specifically mentioned having access to resources, including education, health care, etc. This suggests preventative behaviors for T2D may not be well understood by newly immigrated people. Instead, new immigrants may catch their T2D diagnosis too late.

> *I think people that have just immigrated here [are] probably need the most [help] because they would probably not be aware of resources… where to get this information, how to access it, or even how to figure out like wait, "Am I diabetic" like the simplest basic steps like from the get-go, whereas the other folks have probably already kind of figure those things out.*
>
> *-Health Department/Agency 2*

Another key informant continues to provide an example of how generational differences affect diet. Specifically, they talked about how those born in the United States are more "advanced," which highlights the social differences about acceptance and the way American Punjabis are perceived. The key informant suggested an advantage to those who are born in the United States versus Punjab. This quote explained that Punjabis born in American tend to have a healthier diet than those eating traditional diets. This perception of "Indian diets" being less healthy is an important concept to expand upon in a culturally tailored intervention.

> *I see that the kids and the parents who were born here like they tend to be a little bit more forward-thinking, advanced, or they are already like incorporating some healthy elements. Of course they, their diet is different, because they have more Western diet than they have more Indian diet…when you have people who are specifically from India, then their diet is more traditional than it is Western… and even if they have a Western diet, they make that Western diet Indian too. So any intervention that we have I think it would be important to understand the makeup of that community and the dynamic.*
>
> *-Health Department/Agency 1*

Another interesting comment was how pre-diabetes may become more common among the younger population. This key informants discussed catching T2D too late, which doesn't encourage prevention. This key informant talked about the differences between generations. Since this key informant believes pre-diabetes will rise, they are giving hope to the possibility of decreasing T2D diagnosis by having prevention interventions.

> *I think that our generation…we will be more susceptible to T2D. But I believe that because we were living in a country where we have access to medicine, we're going to be able to catch at an early age…now, you won't be a diabetic, now you will hear people who are like, Oh, you're pre-diabetic.*
>
> *-Community Based Organization 2*

Theme 3: Access Barriers to health care

Five key informants described the cultural assets that may be used to implement a culturally tailored health intervention. Specifically, key informants discussed that they know of many Punjabi-speaking nurses and those who work in the medical field. However, this key informant voiced concern about other systems that may hinder Punjabis from receiving access to care. Having Punjabi speaking medical professionals addresses the language barrier, however, it is unclear if the SJV Punjabis have access to these providers. There are still barriers to accessing health insurance and use of the healthcare system. This can make it challenging to get culturally tailored care.

> *The hospital I go to, there are Punjabi nurses, so it's just great again; it comes down to are they [the Punjabi community] going to the hospital. Not a lot of clinics, I would say (have Punjabi-speaking health professionals)… a lot of Punjabi people work in the health field, but again, do they know how things work, how my medical insurance I have, how does that work like, you know, all that kind of stuff.*
>
> *-Community Based Organization 4*

Even though this key informant mentioned there are Punjabi-speaking doctors in the SJV, the health care system is not utilized because of cultural/language barriers about health insurance. Since health insurance, systematically, is not tailored to the Punjabi community by providing information in a culturally tailored way (i.e., language, culturally congruent messaging), many individuals may not be paired with the best kind of care.

> *They have… a lot of Punjabi people working in the health field. But again, it comes down to the beginning part… do they know how things work, how my medical or the insurance I have, how does that work like, you know, all that kind of stuff.*
>
> *-Community Based Organization 4*

Another key informant discussed the large number of Punjabi speaking medical providers in the SJV, but was worried about access to Punjabi- speaking providers. This key informant also described that Punjabi speakers may have a difficult time explaining symptoms and health issues to providers who do not speak Punjabi. Even though there is a perception of Punjabi-speaking doctors and health professionals in the SJV, it may be challenging to have access to these providers. Then, Punjabi speakers may resort to seeking care from a non-Punjabi speaker. The language barriers can affect how medical providers understand patient symptoms. As a result, prevention and proper health care services are negatively affected.

> *I mean, here, I guess for the entire San Joaquin Valley, I can say we have a large number of Punjabi-speaking providers. But everybody who doesn't have access to one of those providers is what I've noticed in the community, and sometimes the way people describe their symptoms in Punjabi can't be translated into English… I think that communication barrier makes them more vulnerable to developing chronic illnesses like T2D because they may be saying I'm experiencing something in my body pretty early on, but if the provider doesn't understand them and doesn't pick up on that as a possible symptom of T2D so, they're not going to be able to help with that prevention.*
>
> *-Health Department/Agency 1*

Another key informant who works with a community-based organization emphasized their work with undocumented Punjabis in the SJV who have difficulty accessing care. Some factors related to limited access to care include technology and transportation barriers.

> *We work a lot with the undocumented [individuals]. We work a lot with folks that don't know English, with the folks that don't know how to use a computer, folks that never actually been to a doctor that wouldn't even know how to even go about that, folks that may not even have a car.*
>
> *-Community Based Organization 1*

Theme 4: Discrimination

Two key informants discussed specific incidents of racism and discrimination in the SJV Punjabi population, however it is important to note the context of the community and how it relates to health and T2D risk factors. The first key informant expanded on specific racist events in the SJV that resulted in violent fatalities. The participant discussed the fear of the community leaving their house, especially when the individuals who commit the fatalities are released without going to trial. The key informant made sure to provide context by stating the victim was walking in a "nice" neighborhood. This comment suggests that the fatal attack was not due to the physical environment in the neighborhood, but it was a personal attack. The key informant suggests that exercising outside may be difficult for Punjabis in the SJV when there are racist and fatal attacks occurring.

> *There have been attacks; there's been deaths of Punjabi Bajurgh (Elderly) as well that are still unsolved to this day in San Joaquin [valley]. Just one recently happened in 2019, where a guy's throat was slit when he was on his evening walk in a nice neighborhood… [the perpetrator] was released without a trial. He didn't go to trial, but the grand jury didn't like do that… the judge released him. So you know, these kinds of things[happen], and we tell people to go exercise, you tell people to do this…you know, if they don't feel safe leaving the house, then where are they going to go? So, you know, problems are endless, but we're addressing them little by little.*
>
> *-Community Based Organization 1*

Another key informant stated they were worried about racism in the community. They discuss discrimination and hate toward Punjabis in the SJV as a concern.

> *I'm worried about incidents of like racism, discrimination and hate that happen externally to our community.*
>
> *- Community Based Organization 5*

Cognitive Factors

Theme 5: Internal Pressures because of Generational Differences

Four key informant described the internal social pressures that is endured within the Punjabi community. This key informant talked about specific social issues that occur within the Punjabi community that have an impact on health. Internal pressures are a unique response, since most of the pressures noted in the interview are external. However, this quote provides examples of gender violence, caste-discrimination, and the discrimination between generational status. This is important to note for context of the social factors that affect SJV Punjabis.

> *I'm also worried about that internally as well… like internal discrimination, whether it's like gender violence, or like caste discrimination, or discriminating between the first-generation immigrants and second-generation immigrants and third-generation Punjabis., so like that sort of discrimination.*
>
> *-Community Based Organization 5*

This community-based organization leader continued to discuss the stress and pressures of the younger Punjabi generation, which include the pressure to have a career, get married, and having a family. The key informant suggested these stressors for the younger generation of Punjabis may lead to substance use and other negative health outcomes. It is important to note the difference in stressors from the first and second generation of Punjabis. Substance use has become a priority issue for the United States and may highlight coping mechanisms that younger Punjabis acculturated from the US.

This key informant highlighted drug and alcohol use as an issue in younger Punjabis, rather than T2D.

> *So I'm concerned about that… But yeah, you can be concerned about the pressure and expectations parents place on their children, like career, marriage, and family. And how children cope with that stress? You know whether they turn to substances, alcohol, or drugs like opioids. This is a growing area of concern. And part of it is that stress or peer pressure.*
>
> *-Community Based Organization 5*

Another key informant discussed the responsibility and expectation of younger generations helping with scheduling doctors' appointments for their parents or grandparents. The "generation" the key informant referred to is the second generation, those with parents who were born outside the United States. The family ties between parents and children are strong and the second generation feel a responsibility to help their parents. Since the vast majority of second-generation immigrants can speak in English, they can address the communication barriers. Supporting the "older" generations is a cultural asset that is highlighted by the key informant.

> *I believe the cultural strength is our generation…just taking the "homeship" of helping our older generation… I'm helping my parents' generation out, and whether or not I like it, I have a relationship with my parent…[I] understand that if I just do a little bit of here and there, it'll be all the more better to be preventable. So what that looks like is having being the bridge between.*
>
> *-Community Based Organization 2*

<u>Theme 6: The concept of fatalism is widely accepted</u>

Five key informants talked about fatalism and how it relates to T2D in the SJV Punjabi population. The quote below explains that there is knowledge and awareness of T2D in the Punjabi community, however, the elderly population anticipates a T2D diagnosis. The key informant suggested that T2D has become normalized and accepted, since it is so common in the community.

> *I think the community, in general, knows that we have a high prevalence of T2D, and maybe because the prevalence is so high, we've kind of accepted that our elders are eventually going to get T2D.*
>
> *-Health Department/Agency 1*

This key informant also discussed that a pre-diabetic diagnosis may not serve as a call to action to prevent T2D from progressing. Instead, it is accepted and normalized as a disease they will eventually have. This fatalistic viewpoint does not encourage making changes to their diet or exercise to delay the onset of T2D.

> *One thing I've heard in the community is once they're pre-diabetic… It's almost like, oh, well, now, I'm just eventually going to have it… "Menu ta sugar ho jani a" (I am going to eventually get the sugar disease), like eventually I'm just going to get there. Eventually, it's just a matter of time. It's not really like this is an opportunity to prevent actually being diabetic.*
>
> *-Health Department/Agency 1*

Another key informant discussed the perception of the limiting factors related to a T2D diagnosis. The example the key informant discussed talks about removing sugar from their tea. They also discussed the acknowledgement of death, and the sacrifice to drink bland tea is not well accepted. Specifically, the behaviors someone at-risk of T2D "can't" do. This mindset makes it more difficult to change health behavior. The key informant explains that those at-risk of T2D affirm fatalism. Rather than preventing T2D, the idea is to enjoy the last few years of life instead of extending it.

> *He can't do this, he can't do that, he can't do this… "No, I'm not drinking fickee cha (bland tea). Are you insane? Who are you? Tell me like I really have a couple of years left. Why are you taking this away from me?" You know, kind of thing, but it's like, no, you don't have a couple years left.*
>
> *- Community-Based Organization 1*

Another example was that T2D is accepted because of the unique genetic predisposition. This key informant recalled an experience with their parents, who stated that both of their grandparents had T2D, which is accepted. Attributing T2D and other diseases to genetics decreases the sense of self-efficacy to make behavioral changes.

> *To them (my parents), it seems everything is genetic. Just because my Nana (maternal grandfather) and Nani (maternal grandmother) had it, I will have it either way. So, I feel like they have accepted it as part of their life.*
>
> *- Health Department/Agency 3*

This key informant differs from previous quotes on fatalistic perspectives by stating the community wants to be healthy, but don't have the tools. There needs to be better information that is well understood to make substantial changes. Instead of Punjabis in the SJV accepting T2D as a disease, the key informant stated there is interest to prevent and take care of their health. However, there are limited resources and societal barriers, so accessing tools to improve health is difficult. The key informant talked about the structural issues that contribute to T2D and believe that self-efficacy is present, but there are limited resources to make changes.

> *If they're provided with the skill sets…if they're provided with information, they have the things that they need, and they're able to utilize them and understand it, they'll do it. They're very resilient and wanting to be better,*

> *you know, and I think it's just a matter of them having and knowing how to go about it… They're aware of the fact that they need to take care of their health. It's they just don't know how they tools are not there for them.*
>
> *-Health Department/Agency 2*

Behavioral Factors

Theme 6: Use existing cultural assets in T2D interventions (traditional foods, walking *"sair," and Sikh Gurdwaras)*

One key informant encouraged utilization of traditional food in the intervention rather than discouraging Punjabi foods and providing the intervention/information in Punjabi to reach the vulnerable population, which differs from the previous quote. Utilizing traditional foods was encouraged by a health professional. They urged using Punjabi foods as a positive dietary intervention instead of villainizing the traditional diet with food that is popular in the media, like quinoa. Culturally tailoring an intervention using traditional foods should be a public health program asset.

> *I am seeing a lot of folks going back to like things…like grandma's or great grandmas used to use like all the different "atta" (flour) that they're using; it's not just whole grain. They are getting like "bajra" (flour) and all these other types of atta that are going to be more nutritious, just because you're getting a wider variety… you're getting a variety of nutrient profiles. In all these mixed grains, and I have seen a lot of people opting for more of that mixed atta (flour) for the roti, which we know is a staple part of the Punjabi diet, so seeing people going back to their roots, and not necessarily like switching to quinoa or whatever is like propagated in our popular media, but going back to what their ancestors.*
>
> *-Health Professional 2*

Another key informant suggested substituting some parts of the traditional diet to make it healthier and feasible. Specifically, using less butter in food is better than using abundant butter in meals. The key informant suggests making small dietary behavior changes is the best way to begin a T2D intervention.

> *This is just about education, not knowing you can go whole grain…And you know, lessening using butter for a lot of things that you use, and this is a small change. It's not like We're asking them to like completely to abandon their diet. You can more like, replace your time as small things that can help you.*
>
> *-Community Based Organization 2*

A key informant that works with a community-based organization discusses the location of most walking that occurs in SJV communities. They specifically mentioned the use of parks. The local parks are used to exercise and get out of their homes. This may inform

future health interventions for the SJV Punjabi community. A formal intervention could expand park walking and may be a cultural asset.

> *Here [there is] a collective push towards just taking a walk. I felt like I've seen over the years like I have seen that increase where people in my neighborhood, and just in general in parks…as parks are built, more like people get out.*
>
> *-Community Based Organization 1*

Walking in parks has been explained as a multi-generational form of exercise among SJV Punjabis. A sense of community is achieved when individuals see their peers going for walks. Not only does it serve physical health, but it may improve emotional health through socialization. One key informant said that SJV Punjabis are already walking in the evenings, also known as "sair," around the parks. The parks serve as a place for community exercise. Walking has been historically done in India and continues in the US. This healthy habit is an existing cultural asset in the community.

> *I live near a park, and so a lot of our community members visit the park. People like to walk around the park. And I'll see parents, grandparents were coming to the park, you know, walking around it. And I think this is something within our community like we call like "Sangat" [congregation]. I think that's something that's common within our community, and walking… just trying to be outdoors. I think socializing can be something that brings positive mental and emotional health. It depends on the type of socializing as well. But yeah, I think anytime you can socialize outdoors, like in areas like parks, which I see are utilized.*
>
> *Community-Based Organization 5*

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All key informants mentioned the use of Sikh gurdwaras as the location for the intervention. They suggested using Sikh temples for a T2D intervention since the infrastructure and trust are present. Gurdwaras in the SJV are well attended by both adults and youth. Youth attend gurdwaras because of their Punjabi Sunday school engagement and religious camps. A key informant talked about the potential of a T2D intervention at the gurdwara. They highlighted the community that may attend the intervention and those who need help filling out medical forms or paperwork.

> *Gurudwara is the easy spot because it's already like Ready-made built there. You already have a space; you already have a built-in audience. Not necessarily going to get everyone to show up to that whatever event or intervention, whatever you may do, but at least there's a pool to pick from there…I would love it if each Gurudwara had, like, every Sunday for 1 hour…people go there with any medical questions… any sort of papers they got they need translated.*
>
> *-Community Based Organization 1*

Although newly immigrated individuals could immigrate at younger ages, this key informant discussed that first generation Punjabis be offered culturally tailored T2D interventions, and then teach their families. There was also a recommendation to conduct the intervention at a Sikh Temple, since it is considered a place where people feel safe.

> *You don't have any illness on the outside doesn't mean you're healthy on the inside. We need to educate that and at an early age. And then I mean at a place where everyone will feel comfortable, which would be the gurdwara, I believe…or you can educate the first generation to teach the older generation.*
>
> *-Community Based Organization 5*

Another key informant discussed that the initial T2D intervention should start at the gurdwara since it is a convenient place to engage the community. The key informant also mentioned that we can learn and make future changes upon conducting the intervention at the gurdwara.

> *I think we should start off at Temple because that's where that's the hub of our community. So, I think it should start up there and then from there you could learn, even from that own community, like what would be more convenient for them.*
>
> *-Health Department/Agency 3*

Another key informant discussed the social support as another aspect of having the intervention at the gurdwara. Since a community already exists at the gurdwara, it will be more engaging. Bringing the intervention participants from the temple will strengthen existing social networks and allow new social groups to form.

> *Bringing in that social support and creating that community, probably like using places like the Gudwara as a place where people can meet and like have courses kind of like thinking about the diabetes prevention program and how everyone comes together.*
>
> *-Health Department/Agency 2*

<u>Theme 7: Key subpopulation that needs to be targeted for intervention (young/middle-aged adults)</u>

All of the key informants talked about incorporating the prevention intervention for young to middle aged adults. Even though Punjabis who newly immigrated to the United States were previously identified as the most vulnerable and at-risk, this key informant identified youth for the intervention target population. The rationale for choosing younger individuals is because prevention interventions work better on the younger age group. This differs from previous quotes about newly immigrated Punjabis are most at-risk. From their experience, T2D is likely diagnosed after the age of 40. To argue for a prevention intervention, the key informant stressed the need to start younger.

> *I mean, I think if we're talking about prevention, then it would be younger, from like the 20 to 40 age range. I know that's a large range, but I think like after someone's in their forties, then that's where diagnosis start happening. And then it becomes like, how do I manage it so if we're really talking about prevention, we have to go before that. Yeah, like the 20 to 40 range.*
>
> *-Community Based Organization 5*

The same key informant continued to state the intervention should target the younger Punjabi age group in order for them to educate older Punjabis.

> *"You can educate the first generation to teach the older generation."*
>
> *-Community Based Organization 5*

Another key informant provided an interesting quote about how pre-diabetes may become more common among first generation Punjabi population, instead of T2D. The key informant talked about medical advances that may help to prevent T2D. Instead of behavioral preventative strategies, medicine will be used to prevent progression of the T2D.

> *I think that our generation…we will be more susceptible to T2D. But I believe that because we were living in a country where we have access to medicine, we're going to be able to catch at an early age…now, you won't be a diabetic, now you will hear people who are like, Oh, you're pre-diabetic.*
>
> *-Community Based Organization 2*

DISCUSSION

Principal Findings

This study aimed to understand how T2D affects the SJV Punjabi population and how to tailor a T2D intervention. Overall, the key informants shared that the community is aware of the problem, but several social and structural aspects deter the community from being prevention-focused. This study suggests a need to research further the implications of fatalistic behavior precursors in the SJV Punjabi population. Fatalistic attitudes were discussed several times by different key informants, and more research is necessary to understand fatalism in the Punjabi population. The research findings provide ways to utilize the assets in the community and ways to culturally tailor public health interventions to provide productive health messaging and better health outcomes. Furthermore, future research should understand SJV immigrant Punjabi perceptions to compare to the responses of the key informants interviewed in this study.

T2D risk factors for the SJV Punjabi community

T2D was identified as a priority health problem for the Punjabi population by the key informants. Although it is a priority health problem for many ethnic backgrounds, South Asians have a unique genetic predisposition.[15] In fact, T2D has increased rapidly

around the globe and is expected to increase to 642 million affected people in 2040, compared to 415 million in 2015.[72] T2D is diagnosed 5-10 years earlier among South Asians than the general population.[25] It has been considered normal in the community, however, the community must recognize it as a preventable problem. Literature on the family history of chronic diseases may lead to a sense of fatalism for an individual.[73] If there is the belief that disease is mainly passed on through genetics, it limits the need to change health behaviors.[73] Providing education about T2D before the health behavior intervention may increase self-efficacy and improve intervention success.[73]

Key informants discussed structural and issues with health care access based on cultural and language differences for Punjabis in the SJV. There is literature on linguistic barriers that prevent minority populations from understanding health diagnosis and long-term preventative care,[74] which the key informants also stated. Instead of receiving culturally tailored preventative care, SJV Punjabis may attempt to receive care when it is too late to prevent T2D. There is a need to have interventions that are culturally tailored to the SJV population to show preventative health behaviors that are culturally tailored. Other themes discussed by key informants included lack of access to linguistically congruent health care providers, since Punjabis in the SJV may not be aware of how to access the care. The literature provides examples of culturally tailored interventions conducted in primary care settings for the Bangladeshi community.[75] Setting the intervention in a healthcare setting highlights the bridge between primary care and preventing T2D for ethnic minorities.[75] This may improve the barriers to accessing the healthcare system and provide prevention education.[75] However, participants discussed SJV Punjabis may go to the doctor infrequently, so it is challenging to prevent T2D. More literature is necessary on ways to bridge health care access and communities that require culturally tailored information. This highlights a gap in the literature, and there is a need to focus on T2D access to care and prevention, especially among ethnic minorities like the SJV Punjabi population.

Other risk factors the key informants shared were related to financial security and difficult jobs, which affected health. Key informants discussed some Punjabis work laborious job(s) at locations like meat packing factories or canneries. In addition to the challenging job environments, discrimination exists in the social environment. This demonstrates prevention interventions need to be tailored to the cultural and social context of the community.[76] Key informants emphasized financial hardships, familial pressures, and discrimination as risk factors for negative health outcomes. Social understanding is important in intervention design. A nationally representative study in the United States stated cumulative stressors and major discriminatory experiences among minorities correlated with T2D diagnosis, compared to non-Hispanic Whites.[77] Future interventions must address stressors associated with T2D risk. Also, a study conducted in Vancouver among the South Asian population determined that cultural and psychosocial factors were considered important risk factors for T2D.[78]

Health disparities are exacerbated among racial and ethnic minorities.[79] There is a need to understand the social determinants of health and how they include discrimination in the framework's social/cultural aspect.[79] Healthy People 2010 and Healthy People 2020 stated that there is a need to pay attention to health disparities in racial minorities and that addressing social conditions will impact health.[79] A review highlighted that interventions among racial minorities were most successful when contact with a community health

worker was culturally tailored to the respective population.[80] Similar to the key informant statements, it is vital to have a culturally targeted health intervention that utilizes intervention leaders from their community.

In addition, there is a need to address the fatalism in the SJV Punjabi population, according to the responses from the key informants. Studies showed that religious fatalism is used to cope with immigrant stressors; however, changing health behavior with a fatalistic perception is complex.[81] Specifically, religious fatalism leads to delayed seeking of healthcare services.[81] This suggests that addressing fatalism is necessary to prioritize seeking health care. The key informants discussed how fatalism is linked to the lack of prevention and early diagnosis of T2D.

There are culturally specific fatalistic perspectives for T2D diagnosis similar to other communities, where T2D is perceived as inevitable and fate from a higher being.[82,83] These communities include Mexican-Americans and Arabic-Americans with a similar idea of fatalism related to T2D. In a qualitative study focusing on Mexican-American fatalism, religious fatalism was used to cope with the T2D diagnosis rather than self-efficacy.[82] Religious fatalism helped promote mental well-being when physical well-being was difficult to control.[82] Further research is necessary to understand how to address fatalism in the Punjabi population in the SJV and the need for targeted education campaigns.

Gap in Culturally Tailored Interventions for the SJV Punjabi community

When the key informants were asked about current T2D interventions that are tailored to the SJV Punjabi population, all of them said they were not aware of any. This shows that there is a need for this type of intervention. After searching for interventions targeted at Punjabis for other health issue, a CHW model conducted by a community-based organization was identified. This CHW intervention focused on asthma and mental health issues in the Punjabi community. Other interventions included health clinics that provided health education. Since there weren't interventions that were identified by the key informants, collecting information on the background and context of the SJV Punjabi population will help design the culturally tailored T2D intervention. The key informant interviews were organized by the social cognitive theory to understand the environmental, cognitive, and behavioral factors to promote behavior change.[71]

Components for a Culturally Tailored T2D Intervention for SJV Punjabis

The key informants discussed the components necessary to culturally tailor an intervention for the SJV Punjabi community. Based on their experience working in the community, it was necessary to value the existing cultural assets. Those assets include existing Punjabi-speaking health professionals who serve the community, the tight-knit community and support system, and tailoring current health behaviors. These components will be a critical part of the intervention framework since they were identified multiple times by several key informants.

Punjabi-Speaking Medical Professionals as a Community Asset: Although respondents discussed the fatalistic perspective in the Punjabi population, several assets were discussed in the interviews. Specifically, respondents discussed that many medical professionals, like doctors and nurses in the SJV speak Punjabi. The Punjabi medical professionals should be utilized as an asset for the SJV Punjabi population. Language

barriers in healthcare have been a challenge in many ethnic communities due to the fear of being a burden to providers or experiencing discrimination.[84] Having access to a provider who speaks the language most comfortable to the patient tends to have better health care services and outcomes.[84] Participants shared that many providers in the SJV are Punjabi-speaking in hospital and office settings.

However, there may be limited utilization because of barriers to accessing care through health insurance. The respondents discussed that Punjabi-speaking medical providers are underutilized due to issues with access to care through health insurance or having limited health insurance coverage. This is similar to findings in a study examining Hispanic immigrant access to the health care system in a rural location.[85] Non-eligibility for health care services, limited health insurance coverage, immigration status, and transportation issues were barriers to the health insurance system.[85] The health insurance system can be challenging to decipher and utilize because of the confusion about "in-network" versus "out-of-network" providers.[85] Although access to a Punjabi-speaking provider may not be a substantial issue in the SJV, there are larger structural factors that need to be addressed for preventative care.

Collectivist Intervention to Include Target Populations: There are many community assets to different cultural groups, including the shared idea of collectivism, which is defined as positioning a person's goals to a group of individuals that an individual relates to, like an ethnic group.[86] This shared cultural asset should be applied in intervention design. They were especially providing tools for those most vulnerable, which interview participants identified as newly immigrated.

A popular intervention known as the Diabetes Prevention Program (DDP) has been adapted for many ethnic communities, especially for communities at-risk for T2D.[87] A literature review analyzed the Native Hawaiian translation of a culturally tailored DDP program that utilized collectivism by incorporating community investigators who were recognized as community members.[87] The intervention used the assets of collectivist culture in the Native Hawaiian population, which included family, friends, and local community members in the intervention.[88] and behavior changes.[87] This implies that a culturally tailored DPP should inform an intervention addressing T2D in the SJV Punjabi population. The intervention should utilize a collectivist culture to influence individual health behavior.

The *Promatora* Model utilizes the *promatora de salud* (community health worker) to bridge the Latino population and the health care system to promote health.[88] This model shapes health behavior through collectivism, connections, and culture.[88] Behavior change was successful due to the trust in the program and community support.[88] Some *Promatora* interventions include Latino doctors as guest speakers to discuss the prevention of T2D in the community.[88] This would promote the bridge between the community and healthcare.

Use Traditional Foods as an Asset: Instead of changing diet dramatically, respondents discussed cultural tailoring of Punjabi food should be utilized to include healthier alternatives. A literature review identifying dietary interventions for East Asian Americans showed that dietary recommendations from healthcare providers did not align with their spiritual and cultural beliefs.[89] Some of the main outcomes from the dietary self-management literature review highlighted cultural beliefs about food, maintaining spousal relationship harmony through nutrition, and receiving diet education in their

language.[89] This suggests that a successful T2D dietary intervention will need cultural tailoring. This suggests a culturally tailored diet intervention would benefit from teaching traditional diets that are known to have positive health outcomes.

Use Walking Culture as an Asset: In addition, multiple interview participants discussed walking culture as prominent among the SJV Punjabi population. People walk in the mornings and evenings around their neighborhood or local parks. Respondents stated taking long walks is also known as *sair* and can be done alone, with family, or with friends. Walking is a great exercise to lower risk factors (blood pressure, BMI, stress) for T2D.[90] Walking is a very accepted form of physical activity in the Punjabi population, as stated by the key informants. Similarly, walking is accepted as a physical activity intervention in Latino populations.[91]

Future interventions must be aware of the current assets while designing an intervention focusing on diet and exercise. Cultural assets are great ways of involving immigrant communities in behavior change. A global literature review showed that lifestyle modification interventions had the most significant change with both diet changes, increase in exercise, and counseling.[92] This needs to be incorporated for the SJV Punjabis, utilizing current assets. Research respondents stated that when doing diet education, substitution must carefully consider using ingredients and food the population will be receptive to. Specifically, basmati rice has been identified to have a lower glycemic index (< 55) compared to other rice, which is considered a healthier alternative to short-grain white rice. [93]

Key informants indicated that a T2D intervention aimed at prevention must be administered at a much younger age. Key informants also indicated that new immigrants are at the highest risk for T2D due to language barriers and limited knowledge about access to culturally tailored care. Foreign-born South Asian immigrants in the United States are nearly five times more likely to receive a T2D diagnosis than non-Hispanic Whites.[94] Therefore, it is important to prevent the disease at a younger age (< 45).[95] Although many interventions focus on T2D management, few focus on preventative measures among younger South Asian groups.[96] This is a gap in the literature that should be addressed.

T2D prevention interventions targeted at Hispanic youth are also very limited.[97,98] A systematic review found 15 articles focused on preventative lifestyle interventions that reduce T2D risk factors like body mass index.[97] There is little literature on diet/exercise interventions among young adults; however, it is emerging, indicating that this is a future direction for research. Young adults tend to have health interventions on topics such as smoking cessation,[99] mental health,[100] and substance abuse prevention.[101] Research respondents state a need to focus on T2D prevention. Key informants identified a need to target interventions at a younger age to have healthy behaviors. It is crucial to educate them before the onset of T2D symptoms.

The most successful youth T2D prevention interventions that reduced BMI and improved behavior focused on diet change and physical activity.[97] A research participant talked about how the younger Punjabi generation is more likely to be diagnosed with pre-diabetes than a T2D diagnosis. However, there is a need to target behavioral interventions focusing on diet and physical activity at a younger age to delay or reduce the prevalence of pre-diabetes.

LIMITATIONS

This study has limitations, which include a limited representation of the regions. As many non-profit organizations and healthcare professionals are time-limited, it was difficult to recruit more. However, this study is the first initial study that highlights the perspective of community members who directly work with the SJV Punjabi population. In addition, these interviews were limited to one hour to increase participation in the study. Future studies should use this work to further T2D research, expand on the research questions, and gather responses from community members. Although this study aimed to understand the health needs of those who work directly with the Punjabi population, future studies should focus on gathering community participants.
External validity was addressed by sharing themes and results with the dissertation advisor. However, the results of this research may not be generalized to urban population. Some characteristics of the results may work in urban populations, but the results mainly addressed the needs of the SJV. Using thematic analysis, in which the interpretation of themes were shared and justified with an outside party, was a way of addressing internal validity issues that may arise. Despite the outsider validation, there may still be bias in the code and theme formation, and it is possible another research may discover different themes than the themes formed in this research. A different analysis strategy may also yield different results.

Trustworthiness of the research findings may have been affected by the coding conducted by the researchers.[68] Although triangulation was used with the dissertation advisor, the findings may have been more credible if external researchers confirmed the results. Confirmability was attempted by using theories, frameworks, and scales, yet there may be different outcomes if difference theories, frameworks, and scales were used.

CONCLUSION

Overall, research participants shared T2D as a priority health issue for the SJV Punjabi population and mentioned systematic and cultural issues that impact health outcomes. Participants focused on the need to culturally tailor interventions by providing the intervention in Punjabi at a Sikh Temple and utilizing the community's strengths. Strengths include community resilience, having many Punjabi health professionals in the region, and the overall motivation to be healthy.

STUDY 2

Identifying Best Practices for South Asian T2D Interventions

INTRODUCTION

T2D is a health problem that has a high prevalence among South Asians.[14] Unique risk factors include abdominal obesity, ectopic fat, and increased insulin resistance that stems from a genetic predisposition.[14] The introduction of the dissertation goes into depth on why T2D is a pertinent problem in the South Asian community. The South Asian diaspora includes many countries, cultures, and languages, so it is important to address T2D in the South Asian subgroups in a culturally tailored method.[102]

One of the South Asian subgroups includes Punjabis. Punjabis have a distinctive history of discrimination and migration.[32] As one of the early immigrants to the United States that date back to the early 1900s, and worked jobs in lumber mills and farms.[32] Specifically, the Punjabi population in the SJV of California has a migration history that dates over 100 years, yet they continue to be affected by the high number of T2D.[18] The main drivers for migration to the the SJV for Punjabis were job opportunities related to farming.[18] After interviewing key informants from project one of this dissertation, there is a need for a culturally tailored T2D intervention for the rural SJV.

Although interventions have been published targeting South Asian populations, they have only been conducted in large and urban locations.[26] Also, fewer interventions have solely targeted the Punjabi community. This project aims to bridge that gap and provide an intervention framework to prevent T2D among Punjabis who live in the SJV. Identifying what interventions already exist is important by conducting a systematic literature review (SLR).[103] A SLR requires researching existing studies and illustrating the search findings to address a specific research question.[103]

Conducting an SLR guides how to rate the quality of the research based on methodological rigor and outcomes.[103] Quality assessment is integral to conducting an SLR because it highlights the study design, results interpretation, and the methods' overall rigor.[103] For intervention quality assessment, it is important to note the sample size, methods for evaluation, and outcomes.[103] The strongest-rated interventions tend to have the highest likelihood of replicability and the least bias.[104]

Based on the South Asian T2D intervention literature, a systematic literature review will be able to identify a successful intervention that fits the criteria of the key informants to replicate in the SJV. The strongest intervention will be replicated and adapted for the Punjabi population in the SJV. A systematic literature review of T2D interventions (T2D) among South Asians in the US will be performed. Upon completing the systematic literature review, a logic model will be constructed. The systematic review will be conducted to fulfill the second dissertation project at UC Merced. The literature review was conducted between May 2022- October 2022.

The literature review aims to answer two research questions:

Aim 1: To identify T2D prevention interventions that have been conducted among the United States and Canada's South Asian population.

Aim 2: Create a logic model draft based on a T2D prevention intervention and key informant responses.

Choosing to examine interventions that have been done among South Asian may include interventions tailored to Middle Easterners, Bangladeshi, Bhutanese, Indian, Nepalese, Pakistani, Sri Lankan, and Maldivian populations in the United States, however, it will provide some background to what has been successful or unsuccessful in addressing T2D in related populations. Limiting the search to only interventions done among Indian or Punjabi populations was highly restrictive and yielded few articles.

RESEARCH DESIGN AND METHODS

Systematic Literature Review

A systematic literature review (SLR) was conducted to identify T2D prevention interventions targeting the South Asians in the United States. An SLR has specific guidelines requiring searching for articles in different databases and removing articles not part of the inclusion criteria.[105] The SLR was conducted from September 2022 to December 2022.

Search strategy and selection of studies:

A search of South Asian T2D interventions in the United States and Canada was conducted in September 2022. Upon meeting with the UC Merced librarians, a search was conducted in five databases: PubMed, Cochrane, Ethnic News Watch, Web of Science, and Science Direct. The PubMed advanced search terms identified 29 articles: "type 2 diabetes" AND ("south asian" OR "other countries) AND (intervention OR program) AND ("united states" OR US or canada). The Cochrane search terms identified eight articles: Type 2 diabetes AND south asian AND (intervention OR program) AND ("united states" OR canada). The Ethnic News Watch search terms identified 319 articles: Diabetes type 2 and South Asia* and (intervention* or program*). The Web of Science search identified 173 articles: Type 2 diabetes AND south Asian* AND (intervention* or program*) AND (united states*). After the articles were identified in the four databases, they were added to EndNote X8 for organization and screening. The remaining articles were read to include the full text for the literature review.

A second literature search was conducted to show the findings for the "Asian Indian," "Punjabi," "Pakistani," and "Bangladeshi" category, to locate interventions specific to some of the disaggregated South Asian subgroup categories. There is a difference in T2D diagnosis in the literature between the subgroups,[13] so the additional search will identify other T2D interventions. The summarized search strategy is shown in figure 2.2. The PubMed advanced search terms identified 13 articles: "type 2 diabetes" AND ("Asian Indian" OR "Punjabi" OR "Pakistani" OR "Bangladeshi") AND (intervention OR program) AND ("united states" OR US or canada). The Cochrane search terms identified 11 results: "type 2 diabetes" AND ("Asian Indian" OR "Punjabi" OR "Pakistani" OR "Bangladeshi") AND (intervention OR program) AND ("united states" OR US or canada). *The Ethnic News Watch search terms identified 70 articles:* "type 2 diabetes" AND ("Asian Indian" OR "Punjabi" OR "Pakistani" OR "Bangladeshi") AND (intervention OR program) AND ("united states" OR US or canada). The Web of Science identified 34 articles: "type 2 diabetes" AND ("Asian Indian" OR "Punjabi" OR "Pakistani" OR "Bangladeshi") AND (intervention OR program) AND ("united states" OR US or canada). Finally, Ethnic Newswatch identified

zero articles. After the articles were identified in the four databases, they were added to EndNote X8 for organization and screening. The remaining articles were read to include the full text for the literature review. Upon reading the full text articles, zero articles matched the inclusion criteria.

Inclusion criteria:

The articles were limited to peer-reviewed journal papers and were published after 2000. The articles described South Asian T2D prevention interventions in the United States and Canada. Additionally, the studies had preventative T2D interventions as the indicator. Preventative interventions were defined as the intervention group not having T2D and one of the aims of the study being T2D prevention. Since there was a small number of articles from the United States, interventions conducted in Canada were included. Punjabis started to immigrate to Canada as early as 1904 to work for steamship companies and railroad builders.[34] This was also noted as the "turban tide." [34] This According to the Canadian census, Sikhs in Canada have doubled from 2001 (0.9% of the total Canadian population) to 2021 (2.10%).[106] Although the healthcare landscape differs from the United States, Canada has a comparable Punjabi population with similar immigration patterns and health issues.

Exclusion criteria:

Exclusion criteria consisted of the following: the study was not peer-reviewed, the target population was located outside of the United States and Canada, the study was a genetic study, the study focused on anthropometric measures without any mention of T2D as an outcome, the study was not relevant to T2D, the study did not include South Asian populations, the study was a systematic review, and the study was not preventative for T2D.

Figure 2.1 First Summarized Search Strategy (PRISMA flowchart)

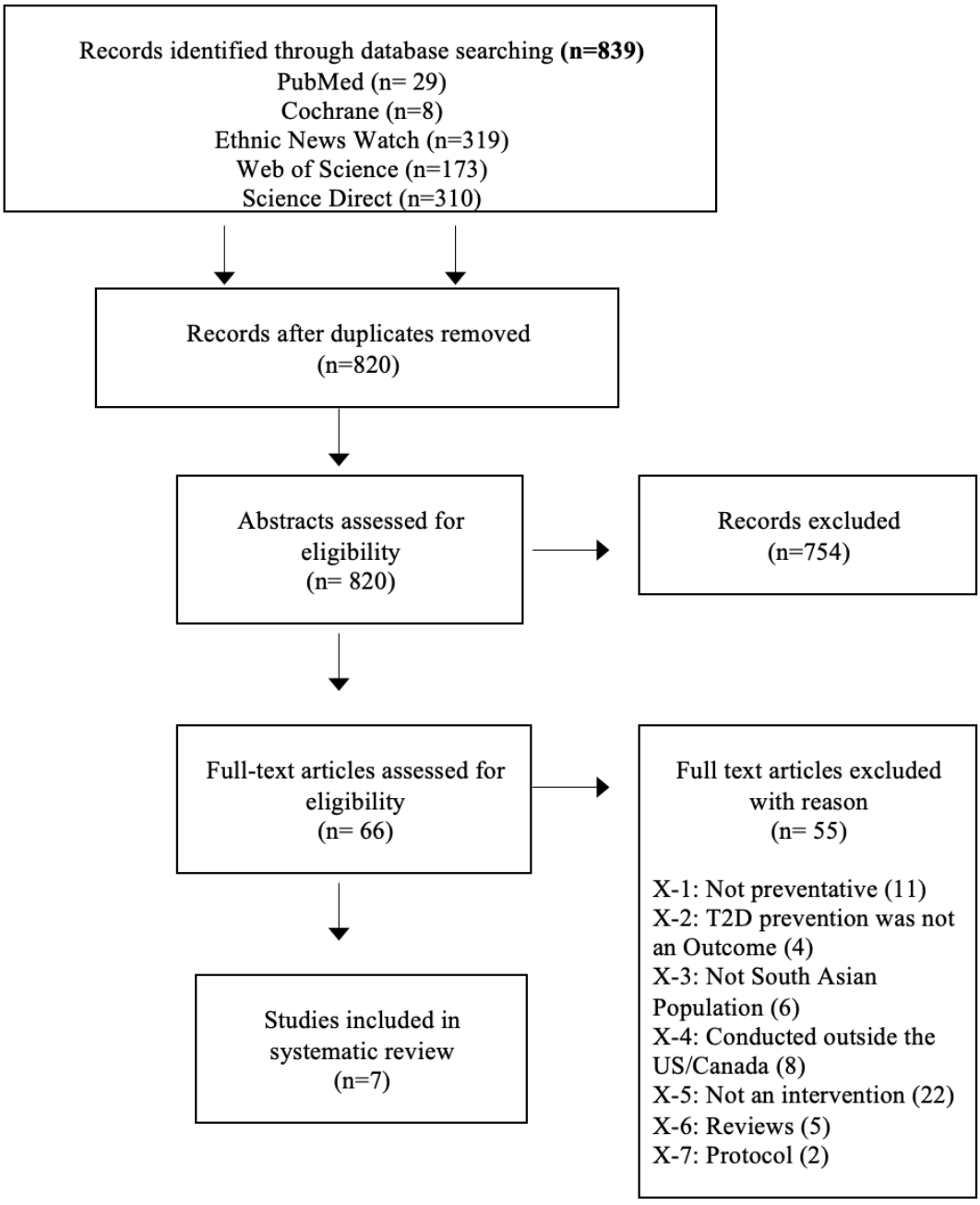
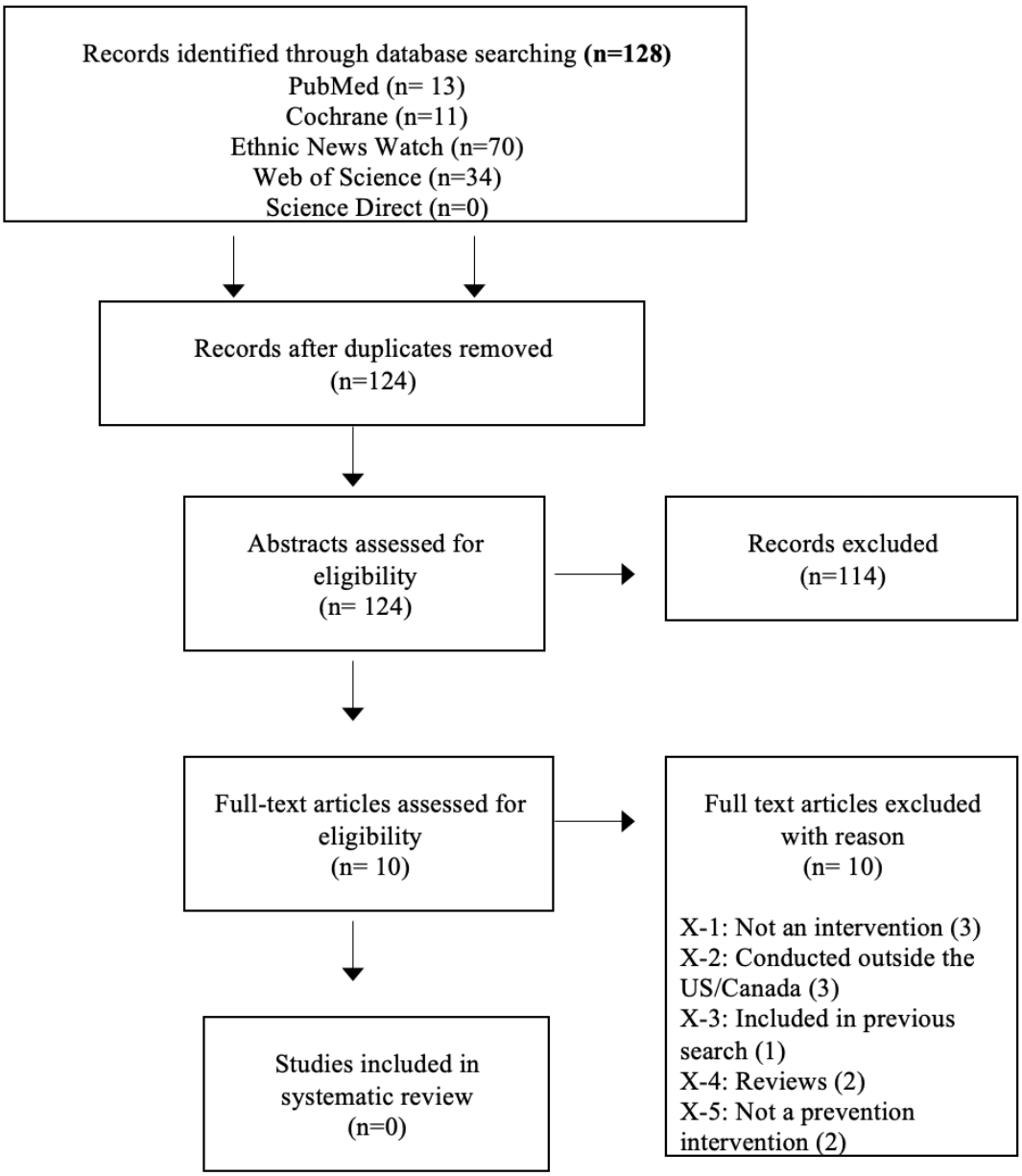


Figure 2.2. Second Summarized Search Strategy (PRISMA flowchart)



Study Quality Assessment:

A scale validated by the National Institutes of Health, as shown in table 2.2, was utilized to rate the quality of the intervention articles.[104] These questions will be able to provide a rating of the interventions that are reviewed for Project 2. If the answer to the question is "yes," then the intervention will be given one point. The goal of using this scale is to reduce the bias and identify the intervention to be adapted for Project 3, which will culturally tailor the intervention design. The principal investigator rated the articles and were discussed with the dissertation advisor.

Two questions from the NIH Quality Assessment of Control Intervention Studies scale were excluded since the South Asian intervention papers were not clinical trials. Therefore, they could not be blinded and the adapted scale excluded questions 4 and 5. An additional question was added to the scale the assessed the description of cultural tailoring of the intervention. The questions excluded and the one question added are shown in table 2.1. The adapted scale is shown in Table 2.2.

Logic Model Design:

One intervention identified as good quality was modified based on the feedback received from key informant interviews from Study 1. Study 1 themes informed modification of the intervention design for the Punjabi population in the SJV through a logic model. After the modifications to the intervention, the key items were displayed in a logic model to show the key informants. The analysis completed in Study 1 helped identify the main criteria for culturally adapting an intervention.

Table 2.1: Modification of NIH Quality Assessment of Control Intervention Studies

Answer the scale questions with Yes, no, or N/A to rate the article as good, fair, or poor.
1. Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT?
2. Was the method of randomization adequate (i.e., use of randomly generated assignment)?
3. Was the treatment allocation concealed (so that assignments could not be predicted)?
4. Were study participants and providers blinded to treatment group assignment? (May not apply- cannot apply this question to exercise or diet interventions)
5. Were the people assessing the outcomes blinded to the participants' group assignments? (May not apply- difficult to do with exercise and diet interventions)
6. Were the groups similar at baseline on important characteristics that could affect outcomes (e.g., demographics, risk factors, co-morbid conditions)?
7. Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment?
8. Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower?
9. Was there high adherence to the intervention protocols for each treatment group?
10. Were other interventions avoided or similar in the groups (e.g., similar background treatments)?
11. Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?
12. Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?
13. Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)
14. Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?
*15. Adaptions for cultural relevance were described in sufficient detail.

Table 2.2: Adapted NIH Quality Assessment of Control Intervention Scale

Answer the scale questions with Yes, no, or N/A to rate the article as good, fair, or poor.
1. Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT?
2. Was the method of randomization adequate (i.e., use of randomly generated assignment)?
3. Was the treatment allocation concealed (so that assignments could not be predicted)?
4. Were the groups similar at baseline on important characteristics that could affect outcomes (e.g., demographics, risk factors, co-morbid conditions)?
5. Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment?
6. Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower?
7. Was there high adherence to the intervention protocols for each treatment group?
8. Were other interventions avoided or similar in the groups (e.g., similar background treatments)?
9. Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?
10. Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?
11. Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)
12. Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?
*13. Adaptions for cultural relevance were described in sufficient detail.

RESULTS

The literature review identified 839 articles that fit the search criteria, as shown in Figure 2.1. Of the articles identified, 19 were duplicates and were removed from the reference management tool. Then, titles and abstracts were read of 820 articles, of which 754 were excluded. Finally, 66 full-text articles were assessed, and 54 were excluded. The excluded full-text articles were either not preventative T2D interventions, T2D was not a predictor, the study population was not South Asian, the setting was outside the United States/Canada, not an intervention, or were other literature reviews.
Seven studies were included in the literature review, which are described in table 2.4. These were four pre/post-experimental designs,[107-110] one quasi-experimental two-arm design,[56] and two mixed methods studies.[111,112]

Intervention Characteristics

All the studies targeted the interventions to the South Asian population. Five articles were for the general South Asian population,[108,109,112-115] and two were faith-based Sikh[56] and Muslim.[107] One was targeted at Gujarati Asian Americans, [110] and one was targeted towards Bangladeshi Americans.[111]. Three interventions targeted women, specifically Canadian Muslim women,[107] and Canadian South Asian women.[112] One intervention was tailored to South Asian adolescents aged 13-17.[108] The study details are organized in table 2.4.

Health Education Canada Interventions (Diet and Exercise)

The first intervention in Candara focused on diet and physical activity education and goal setting. A Canadian study targeted at South Asian adolescents (13-17 years old) used a pre-post experimental design (n=69), which measured change in T2D knowledge, T2D risk perception, and health bahaviors.[107] The intervention was adapted for the DPP, which included exercise and cooking demonstrations. Additional intervention components included games, discussion on the social environments, and future goal setting.[107] There was an increase in physical activity (73.2%), reduction in sweets and junk food consumption (80.5%), and an increase in encouraging other family members to eat healthier foods (80.5%).[107]

A study conducted in Toronto focused on changes in self-efficacy by using a South Asian Diabetes Prevention Program.[109] The model has up to four interactions with the intervention participants.[109] The first encounter consisted of a risk assessment for T2D and cardiovascular disease.[109] The second encounter was a workshop focused on preventing T2D through healthy eating, exercise, and mental health education.[109] The third encounter was offered to high-risk participants to create a work plan to address physical activity and diet.[109] The fourth encounter was extended to the high-risk individuals to ensure they had proper access to health care or social work.[109] Overall, participants reported changes to their eating (86%) and increased physical activity (86%).[109]

Health Education United States Interventions (Diet and Exercise)

Three of the seven studies focused on educating participants on diet and exercise to prevent T2D from occurring in the United States. One of those interventions were located in New York City.[56] The 2014 publication was a quasi-experimental two-arm

design that utilized six community health worker group sessions focused on T2D prevention education, stress, and information about health care access.[56] This was done by providing culturally appropriate images to the Sikh Asian Indians showing how to eat healthier and do physical activity.[56] Of the 108 participants, roughly 92% completed all the sessions, and about 89% of participants continued physical activity six months after the intervention, compared to about 4% before the start of the intervention.[56] There was an 88% satisfaction rate.[56]

Another intervention was conducted in the Houston metropolitan area, targeting the Gujarati Asian American population.[110] The goal of this intervention was to evaluate the effectiveness of a lifestyle intervention to prevent T2D.[110] The intervention was located at a local Hindu temple, and the 12-week intervention was altered from the Diabetes Prevention Program.[110] The 12-week lifestyle intervention was titled *Power to Prevent: A Family Lifestyle Approach to Diabetes Program*.[110] Based on a follow-up at 24 weeks after the start of the intervention, roughly 76% of participants lost at least 5% of their body weight.[110] Also, there was a significant change in dietary habits, not explicitly reported in the paper, at 24 weeks of follow-up compared to the control group.[110]

An Atlanta intervention targeted at the Bangladeshi community used a mixed method, single-arm feasibility study to understand the feasibility of diet and exercise education interventions.[111] Recruitment was through electronic health records and referrals (n=50).[111] Feasibility was measured by the number of sessions the participants attended and the level of satisfaction by the participants.[111] Eight sessions discussed mindfulness and exercise to prevent T2D and eight focused on diet and exercise.[111] Overall, participants were satisfied with the intervention, and roughly 50% participated in the sessions.[111] There was a reduction in mean weight, systolic/diastolic blood pressure, and triglycerides.[111]

Physical Activity Interventions

Three studies had physical activity as the primary component of the intervention.[107,112,113] A Canadian intervention provided a one-hour group circuit exercise for South Asian Muslim women three evenings a week (n=62).[107] The intervention was located in the Sisters prayer area. The intervention included walking, resistance training, relaxation, and chair exercises.[107] In addition, the intervention was delivered by two kinesiologists.[107] Intervention evaluation (pre/post survey) was completed by 19 participants, of which readiness, importance, and confidence scores increased.

Quality Assessment

Some questions from the NIH Quality Assessment of Control Intervention Studies scale were modified since the South Asian intervention papers were not clinical trials. Therefore, they could not be blinded and excluded questions 4, 5, from Table 2.1. The modifications are shown in Table 2.2.

The included studies were analyzed using the adapted NIH Quality Assess of Control Intervention scale in Table 4. If the intervention had the component from the scale, they were marked “yes,” and if they did not have the component from the scale, it was marked “no” For studies that did not have the scale component has part of their study, they were marked as “N/A.” Each component of the scale that was marked “yes”

was given one point. The intervention with the highest number of points was determined the intervention design to present to the key informants. The scale helped to determine which intervention design would be used to culturally tailor to the SJV Punjabi population. Two studies included most of the requirements of the adapted scale.[56,110] The Houston intervention had good follow-up with participants after the completion of the intervention but had a small sample size of 36.[110] In addition to being rated as "good" according to the scale, the study conducted in New York City was a six-month intervention, showed more follow-up, and was scored the highest.[56] The New York intervention also utilized the community health worker model to test if this model was feasible in the Sikh Asian Indian community.[56]

Overall, the effectiveness of the Islam et al. study was shown in the results: feasibility, efficacy, and acceptability.[56] Roughly 92% completed the entirety of the intervention.[56] In addition, 85% had the majority follow-up over the phone with the CHWs.[56] After the intervention, there was a significant change in glucose, weight, and BMI among participants.[56] There was also an increase in physical activity (88.7%) compared to the baseline data (3.8%).[56] There was also an increase in portion control and T2D knowledge.[56] Participants felt accepted by the CHWs and could discuss things with them more than their doctor (72.9%).[56]

The New York City intervention matched several intervention aspects to what the key informants stated. [56] Specifically, providing the intervention in Punjabi.[56] Key informants said that it is important to have the intervention in Punjabi. The New York study utilized CHWs to recruit and execute the intervention. [56] The CHWs were from the community and recruited participants at Sikh temples. [56] Key informants also stressed the importance of using traditional Punjabi foods as an asset in the intervention. Similarly, the New York City intervention created healthy Punjabi recipes and translated them into Punjabi. [56] Because of the NIH Quality Assessment of Control Intervention Studies scale and rigor of this intervention and matching the criteria of the key informants from study 1, I developed a tailored logic model to fit the SJV environment.

Overview of New York T2D Intervention Design

The New York intervention adapted the Diabetes Prevention Program (DPP) from the Centers for Disease Control (CDC), which was initially created in 2010.[116] This study conducted by the CDC aimed to look at if the DPP or intake of Metformin would impact T2D diagnosis.[116] The results of the study showed that participants who were part of the DPP, they had a 58% decreased chance of T2D, while Metformin intake reduced T2D risk by 31%.[116] The New York intervention design was selected based on the intervention quality assessment rating and it matched closely to the key informant recommendations.[56] The inclusion criteria for the intervention participants were they had to identify as Asian Indian, part of the Sikh faith, and be at risk for T2D between the ages of 18-75 years of age.[56] "At risk" was determined by an American Diabetes Association Risk Assessment tool that provided a risk score for T2D.[56] The questions of the risk score ask about age, sex, family history of T2D, high blood pressure, exercise, race, weight, and height.[117] The risk test determines that a score of 5 or more (out of 10) is considered high risk for T2D because multiple risk factors are present and may indicate the presence of prediabetes.[117] Those with a T2D diagnosis or a terminal illness should be excluded from the study.

The six T2D prevention session content focused on educating on diet, physical activity, T2D complications, stress and family support, and access to health care services.[56] All sessions were linguistically and culturally tailored to the Punjabi Sikh community.[56] The session content was tailored to the Sikh community of Richmond Hill in New York City by tying the social-cultural idea of discipline to Sikh principles, which focused on the idea of "Saint Solider."[56] Another part of the first session addressed the social-cultural concept of fatalism and the misconceptions about T2D prevention.[56] Finally, there is a conversation about the increased prevalence of T2D among South Asians and Sikhs.[56]

The second session was about nutrition, and it was culturally tailored by creating a visual food plate with Punjabi foods to illustrate portion sizes and healthy traditional foods.[56] Punjabi recipes incorporating healthier options are also shared with the intervention participants.[56] There is also discussion about the "langar" (community meal) options at the gurdwara and engaging women to cook more nutritious food for the family.[56] This session culturally tailored the individual factors, like diet, but also discussed the social cultural factors related to the community gathering at gurdwaras.

The third session emphasizes the importance of physical activity by showing participants ways to exercise at home.[56] This session was culturally tailored by comparing the discipline required for prayer to the discipline needed to exercise.[56] It also details ways to balance caloric intake, overcoming barriers related to physical activity, and injury prevention.[56] This session addresses the individual level factor of exercise through cultural and religious norms.

The fourth session discusses co-morbidities related to T2D, like heart disease and stroke.[56] Since T2D risk factors are like other chronic diseases; the session aims to educate on cholesterol and blood pressure.[56] This session is culturally tailored by going over specific food in the Punjabi diet that needs adaptation by decreasing the incorporations of fats and salt.[56]

The fifth session discussed the importance of stress and family support to prevent T2D.[56] This was done by talking about anger management and ways to cope with depression.[56] The cultural tailoring aspect of this intervention brought in the Sikh religion to encourage meditation (*Naam Simran)* and the stigma behind mental health issues.[56] Participants were educated on muscle relaxation to address stress.[56] This session focused more on the social cultural factors in order to make changes to influence their health behaviors.[56]

The final session provided information on health care access.[56] Specifically, how to get access to health care services like the Affordable Care Act coverage and the patient bill of rights.[56] In addition, the intervention shared how to prepare for a visit and communicate with a medical provider.[56] The intervention participants were provided with a list of providers who speak Punjabi in their local area.[56] Overall, these sessions are a strong base for an intervention tailored to the Punjabi population. Based on the key informant's interviews, this intervention will be tailored to meet the needs of the SJV Punjabi community. This session addresses structural factors through education on the insurance system and connecting to providers who can clearly communicate with the Punjabi community.

It provided nutrition information for at-risk T2D participants using a culturally adapted plate image of traditional Punjabi foods.[56] The session on nutrition explained

healthy traditional food options, limiting fried foods and sweets, and working with women on their cooking for the household.[56] This educational session was important to provide basic education on ensuring that traditional recipes are adapted with healthier ingredients.[56] Similarly, the physical activity material focused on educating participants on home-based exercise and using religious discipline to encourage exercise.[56]
The New York intervention focused mostly on addressing the individual and social cultural levels of the SEM. In addition, the intervention provided education on the biological mechanisms of T2D and the institutional factors that affect access to health care.[56] The New York intervention addressed all aspects of the SEM and will be included in the logic model for the culturally tailored intervention logic model for the SJV Punjabi community.

Exercise outcomes were facilitated by goal-setting and showing ways to exercise at home.[56] Exercise was measured by self-reported physical activity.[56] In addition, weight, blood glucose, body mass index, and blood pressure, and total cholesterol were measured at the start of the intervention.[56] Follow up measurements were taken at 3 and 6 months, after the baseline measurement.[56]

Other Successful Intervention Components

The other interventions had components for a successful intervention. Specifically, the Canadian intervention targeting women at a mosque incorporated a collective circuit training exercise program.[108] This intervention was targeted at women and was conducted in the sister's prayer area three times a week for seven months.[108] This intervention had trained kinesiologists show participants how to exercise and the participants built social network.[108] Another intervention was that was specific to Women was conducted in the Toronto area of Canada.[112] South Asian women took part in a 6-week Bollywood dance intervention at an athletic center or dance studio.[112] The intervention was delivered by a South Asian dance instructor that showed the dances and allowed participants to dance.[112]

A second Canadian study a T2D prevention pilot intervention targeted at adolescents with a family history of T2D. Similar to the New York Study,[56] this intervention was a adaptation of the Diabetes Prevention Program.[107] This was an educational intervention that aimed to increase T2D prevention knowledge.[107] An interesting aspect of this intervention was that participants had access to dietician and kinesiologist to assist with diet and exercise.[107] This intervention also included aerobic exercise and cooking sessions.[107] Another Canadian intervention in Toronto had a three encounter intervention, in which included screening, a prevention workshop on eating, exercise, and mental health, and an additional encounter for only the highest risk participants.[109] The Houston intervention was a 12-week education intervention targeted for South Asians who attend "mandir" (Hindu Temple).[110] They included individuals over the age of 18 who had a high diabetes risk score according to the Madras Diabetes Research Foundation Indian Diabetes Risk Score.[110] The Atlanta Georgia Bangladeshi intervention that focused on diet, weight loss, and exercise to prevent T2D.[111] This intervention was provided by a medical doctor and focused on education and goal setting.[111]

Overall, all these interventions were conducted in urban settings and aimed to address individual level factors, primarily on diet and exercise. Future interventions could

incorporate components from the other interventions identified in the literature review. One component is to conduct separate interventions for men and women. Another aspect of intervention design to consider is to allow for aerobic exercise and live cooking during the interventions. This may include traditional dancing and ways to incorporate healthy traditional diets. Although these intervention components were not explicitly included in the intervention design for Punjabis in the SJV, these characteristics should also be considered for future intervention modifications or design.

Logic Model

A logic model was conceived to show the sequence of program planning by providing a map of the program's 1) resources/inputs, 2) activities, 3) outputs, 4) outcomes, and 5) impact.[118] The outcomes, which are the intended results, are divided into short-term outcomes, mid-term outcomes, and long-term outcomes. Short-term outcomes tend to be more immediate, like changes in knowledge and attitudes. Mid-term outcomes tend to be changes in the environment or personal behavior. Long-term outcomes make changes in health outcomes and quality of life. The visual model will also aid in evaluating the effectiveness of the program. The logic model also identifies sources of data to measure the program's effectiveness and improve future programs.

The T2D prevention intervention logic model shown in table 2.3 was modeled after the New York T2D intervention.[56] The dissertation aims to have a culturally tailored T2D intervention for high-risk Punjabis in the SJV by increasing knowledge of diet and exercise. The inputs would include monetary funds through grants or health departments, collaboration with CBOs (i.e., Sikh temples), CHWs, data analysts, culturally tailor existing education material in Punjabi, and utilizing Sikh temples as the location of the intervention. CHWs in the New York study were trained over a five month period on competency and curriculum training.[56] The training was provided by a CHW association, researchers, and healthcare professionals.[56] The activities would include CHW training, recruitment of participants from the Sikh temple and local festivals, implementation of the six courses for T2D prevention curriculum, and data collection. The six-course topics would include T2D prevention, nutrition, physical activity, T2D complications/co-morbidities, stress/family support, and access to healthcare. The output would be a pilot intervention with 50 experimental and 50 control group participants. The intervention treatment and control size was determined 50 to match the results of the New York Study.[94] Similarly, the time frame of the intervention was informed by the New York study.[94] The intervention outcomes would be disseminated to the stakeholders and challenges would be addressed for the next intervention cohort, to improve the intervention design. The outcomes will be disseminated as a report and presentation.

The outcomes are divided into short-term, medium-term, and long-term. The short-term outcomes are weight, BMI, blood pressure, glucose, access to care, physical activity knowledge, and healthy diet knowledge. The New York study measured knowledge of diet and exercise using the Bandura Self-Efficacy Scale.[56] The medium-term outcomes are going to be assessed at a six-month follow-up. Weight, BMI, blood pressure, glucose, cholesterol, and overall behavior change are medium-term outcomes. Long-term outcomes are prevention of T2D diagnosis among intervention participants and the implementation of the intervention in the future. The evaluation would occur at 3

and 6 months. Table 2.3 visually represents the logic model adapted to the SJV Punjabi population.

Figure 2.2: Intervention Overview[56]

Intervention Stage	*Stage Overview*
Community Engagement	-Engagement with local Sikh temples (religious leaders) -Collaboration with local CBOs -Health Care Providers -Health Departments
Recruitment	-Target audience: 20–40-year-old Punjabis -CHWs recruit at Sikh organizations and temples -Word of mouth recruitment -Online recruitment (WhatsApp, Facebook) -Recruitment by same gender
Location	-Intervention will be at Sikh temple
Intervention	-Education material adapted from NY study - T2D prevention (address fatalism) - Nutrition - Physical activity - T2D complications - Stress and family support (discuss internal and external discrimination, job environments) - Access to healthcare
Evaluation	-Quantitative data analysis - Descriptive statistics of baseline compared to 3 & 6 months of intervention - Between group differences (control vs experimental) -Qualitative data analysis - Interviews and focus groups analyzed for feasibility, acceptability, and satisfaction

Table 2.3: T2D Prevention Intervention Logic Model[56]

Overall Goal	**Inputs**	**Activities**	**Outputs**	**Outcomes**		
				Short Term	*Medium Term*	*Long Term*
T2D Prevention Intervention tailored to Punjabis in the SJV to increase knowledge of diet and exercise, and positively change health indicators	Grant submission/secure funding Identify community-based organizations to collaborate (i.e., temples) CHWs Data Analysts T2D culturally tailored education material (in Punjabi language) Location of intervention- Sikh temples	**Training** CHW training **Recruitment** Recruit participants (experimental and control) from Sikh temples and festivals **Implementation** 6 culturally tailored education curriculum provide: T2D prevention, Nutrition, Physical Activity, T2D complications/co-morbidities, stress/family support, access to healthcare **Data Collection** Baseline health information	Pilot intervention of 50 control and 50 experimental participants Dissemination of outcomes to community, stakeholders, and media Record challenges and lessons learned	**At completion of intervention** Weight BMI Blood Pressure Glucose Access to care Physical activity knowledge Healthy diet knowledge	**3 & 6 month follow up** Weight BMI Blood pressure Glucose Cholesterol Overall change in behavior	Continue sustainable intervention in the future Prevent T2D diagnosis among intervention participants
	Evaluation: 3 & 6 month follow up Qualitative data analysis: focus groups, interviews on feasibility of the intervention Quantitative data analysis: change in BMI, blood pressure, weight, glucose					

DISCUSSION

The literature on T2D among South Asians is validates that it is a health issue; however, the culturally tailored intervention literature is limited. The Punjabi sub-group has minimal T2D intervention literature, so this systematic literature review (SLR) aims to highlight South Asian T2D intervention literature in the United States and Canada. Although the South Asian group is very heterogeneous, this literature review highlights the limited T2D prevention intervention research. This review indicates intervention research related to South Asian T2D, and the analysis determines which is the strongest and most feasible to replicate for the Punjabi population in the SJV.

Education Interventions Are the Best Place to Start

In the literature, a majority of the interventions had an educational component.[56] In fact, seven out of the ten interventions mentioned in the review primarily focused on educating the participants on T2D prevention.[56] This shows what is currently published and available in the literature.[56] Research shows that interventions that include both physical activity and dietary change prevent the risk of T2D, especially among those at-risk for T2D.[119] Providing education on making culturally tailored changes to diet and physical activity can create behavior changes.[120]

The New York City intervention adapted to the SJV was primarily educational.[56] These intervention characteristics were consistent with the key informant interviews from Project 1. Specifically, key informants discussed using traditional foods and *sair* (walking) as an asset to encourage behavior change.

Limited T2D Interventions for Punjabis

The purpose of this literature review was to identify South Asian T2D interventions and identify one intervention to create a logic model and intervention design, that is culturally tailored ot the SJV Punjabi community. The literature review showed the limited intervention papers focusing on T2D among Punjabi Sikhs. Two peer-reviewed intervention papers addressed T2D among the Punjabi Sikh population.[56,115] Of these two interventions, none were conducted in a rural area or California. There is a significant gap in the T2D intervention literature, which would be filled by designing and implementing culturally relevant T2D interventions for the SJV Punjabi Sikh community.

In addition, there needs to be more literature matching interventions and logic models to key informant responses. No literature shows the design of a culturally tailored intervention based on theoretical frameworks, historical context, and key informant interviews. The rigorous Delphi methodology has not been utilized to design culturally tailored T2D interventions for Punjabi Sikhs. Since this is a novel project, it was essential to incorporate the thoughts of the local community leaders and current literature.

LIMITATIONS

The limitations of this study included the number of journals that were utilized. After strategizing with multiple university librarians, the key journals were part of this literature review. However, there may have been other journals that could have provided additional interventions. Also, only ten articles were included in this review. Since this review was limited to the United States and Canada, it removed interventions that occurred in other countries. Another limitation is that the review only included

interventions targeted at South Asians. The identifier "South Asians" is a large umbrella term for a heterogeneous community, so it is important to create interventions for South Asian subgroups. This literature review shows the need for more T2D prevention research and interventions in the future.

There was effort to ensure trustworthiness in the systematic review by working with librarians and having previous work in South Asian diabetes work. Yet, some limitations include meeting with other experts in the field of T2D, to ensure the methodology was appropriate in finding South Asian T2D intervention literature. Internal validity was established by using the NIH Quality Assessment of Control Intervention Studies scale to assess the quality of the publications. However, there may be additional scales that are appropriate to use in this research. Utilization of different scales may yield different results. In addition, the literature review was limited to 5 journals and including more journals may increase generalizability and trustworthiness. External validity was attempted by including university librarians in the decision making of journals to include and the search terms for two literature searches, but the librarians were not experts in the topic of T2D interventions.

CONCLUSION

The literature review identified T2D interventions tailored for South Asians in the United States and Canada. Limited interventions were focused on Punjabi Sikhs, and none were tailored to rural communities. This highlights an important gap in the literature and the community. Culturally tailored interventions are critical in creating behavior change in historically marginalized populations. The overall goal of Project 2 is to identify an intervention and modify it based on the feedback from the key informant interviews. It is vital to explore ways to effectively reach Punjabi Sikhs in rural communities and communicate prevention methods that are linguistically and culturally tailored. The following steps include finalizing the intervention design logic model and intervention summary, which local health departments or CBOs could use as a tool.

Table 2.4: Article Summaries

Reference	Sample Size	Demographics	Study Design	Location/Date of Field Work	Outcome Measure	Findings
1. Banerjee, A. T., et al. (2017)[107]	N=62	South Asian Muslim Women, mostly over age 50	Pre-Post Experimental Design	Ontario, Canada June 2014-Dec 2014	Acceptability and effectiveness of intervention	• Two Kinesiologists delivered the group circuit exercise intervention. This was provided 3 evenings a week in the sisters prayer area for 1 hour (walking, resistance training, relaxation, and chair exercises) • 31 women agreed to the research evaluation. 28 provided baseline data and 19 completed the post survey. • Increase in scores in post survey for readiness, importance, and confidence. • Change in inactivity from 42% to 10%. • Change in exceeding Canadian Physical Activity Guidelines from 5% to 37%.
2. Banerjee, A. T., et al. (2022)[106]	N=68	South Asian Adolescent (13-17 years)	Pre-Post Experimental Design	Ontario, Canada Oct 2018-Dec 2018	T2D knowledge, risk perception, and health behaviors	• CBPR culturally and age appropriate T2D education intervention. • Recruited through South Asian adults who seek services for T2D at local diabetes clinic. • 10-week clinic administered by registered dieticians and registered kinesiologists. • Interventions included cooking demonstrations, games, T2D discussion, and goal setting. • 73.2% increased physical activity, 70.7% encouraged physical activity to their family, 80.5% reduced sweet/junk food intake, and 85.4% decreased take-out food consumption. 80.5% also encouraged family to consume healthier food.
3. Islam, N. S., et al. (2014)[55]	N= 126	Sikh Asian Indians	Quasi-experimental two-arm design	New York City March 2012-Oct 2013	Weight, BMI, waist circumference, blood pressure, glucose, cholesterol, changes in physical activity, food behaviors, and diabetes knowledge	• CBPR intervention for those at risk for T2D. • A coalition with community partners/leaders, health care providers, and media were part of the adaption of the Diabetes Prevention Program. • Community Health Workers (CHWs) recruited from local Sikh temples and delivered the intervention. • Intervention has 6 CHW group sessions that focused on prevention of T2D, nutrition, PA, complications from T2D, stress, and health care access. • Provided culturally appropriate images for diet and physical activity. • 92% completed all 6 sessions. Treatment group (88.7%) did physical activity after 6 months, compared to the beginning of the intervention (3.8%). • Significant increase in portion control and knowledge. • 88% were satisfied by intervention
4. Patel, R. M., et al. (2017)[109]	N=34	Gujrati Asian Americans	Pre/Post experimental design	Houston metropolitan area	Evaluate effectiveness of lifestyle intervention to reduce T2D through physical activity	• Indicators were reduction in weight and HBA1c. • Weight loss and increased physical activity was seen in both control and experimental group, but HBA1c and waist circumference was reduced. • Intervention was implemented at a Hindu temple; this is where subjects were selected. • Intervention was 12 weeks that adapted the *Power to Prevent: A family Lifestyle Approach to Diabetes program* (altered DPP). • Participants used SMART goals. Outcomes were measured three times (baseline, 12 weeks, and 24 week)

Reference	Sample Size	Demographics	Study Design	Location/Date of Field Work	Outcome Measure	Findings
5. Shah, M. K., et al. (2022)[110]	N=14	Bangladeshi adults	Mixed Methods single arm feasibility study	Atlanta, Georgia	Feasibility of a diet, exercise, and weight loss intervention	• Intervention began with focus groups to identify cultural norms and behaviors. • Recruited through a single-family clinic using EHR and referrals. • Intervention provided by doctor and lifestyle coach. • Feasibility was measured by sessions attended and satisfaction of the intervention. • Group visit model: 90 min group session with individual care plan. Setting was at a clinic classroom in Atlanta • 8 in person sessions that were adapted (mindfulness, home exercise (while doing chores, diet substitution) • Participants were satisfied by intervention and the clinic-based group model is feasible for vulnerable populations
6. Vahabi, M. and C. Damba (2015)[111]	N=27	South Asian Women	Community based mixed methods	Greater Toronto, Ontario ``	Self-efficacy to dance twice a week	• Bollywood dance intervention that was 6 weeks (twice a week), given by a female instructor. Participants were given free water and a CD with songs used in the class. • Classes were given at an athletic center and a dance studio. • 85% participation rate. • Improvement in stress and social health. Physical measurements did not significantly improve. • Bollywood dance seems like a feasible intervention for South Asian women since it is culturally tailored and has low financial cost.

Reference	Sample Size	Demographics	Study Design	Location/Date of Field Work	Outcome Measure	Findings
7. van Draanen, J., et al. (2014)[108]	N=685	South Asians	Pre/Post experimental design	Toronto, Ontario	Change in self efficacy (diet, exercise) Intervention evaluation	• South Asian Diabetes Prevention Program (SADPP.) This model includes 3 encounters with the participants. • Recruited through community leaders and volunteers, also had information sessions • 1st encounter: risk assessment, physical activity, anthropometrics, and risk for CVD and T2D • 2nd encounter: workshop of preventing T2D (healthy eating, exercise, and mental health). • 3rd encounter: only high-risk participants are invited to create a plan • 4th extended encounter: to ensure participants are connected to health care (PCP, social worker, etc.) • 86% said they made changes to their eating, 86% reported increased physical activity,

Table 2.5: NIH Quality Assessment of Control Intervention Studies scale

Intervention	*Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT?*	*Was randomization adequate?*	*Was treatment group concealed?*	*Were groups similar in baseline? (Demographics, risk factors, etc.)*	*Was dropout rate less than 20% for treatment group?*	*Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower?*	*Was there high adherence to the intervention in the treatment group?*	*Were other interventions avoided or similar in the groups?*	*Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?*	*Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?*	*Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)*	*Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?*	*Adaptions for cultural relevance were described in sufficient detail.*	*Score*
1. Banerjee, A. T., et al. (2017)	No	Yes	N/A	N/A	N/A	N/A	Yes	N/A	Yes	No	No	N/A	No	3
2. Banerjee, A. T., et al. (2022)	No	Yes	N/A	N/A	N/A	N/A	Yes	N/A	Yes	No	No	N/A	No	3
3. Islam, N. S., et al. (2014).	No	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	No	No	N/A	No	6
4. Kandula, N. R., et al. (2022).	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	No	No	N/A	No	4
5. Patel, R. M., et al. (2017).	No	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	No	No	N/A	No	6
6. Shah, M. K., et al. (2022)	No	N/A	N/A	N/A	No	N/A	No	N/A	Yes	No	No	N/A	No	1
7. Vahabi, M. and C. Damba, (2015).	No	N/A	N/A	N/A	Yes	N/A	Yes	N/A	Yes	No	No	N/A	No	3
8. van Draanen, J., et al. (2014).	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No	N/A	No	1

STUDY 3

Understanding How the Key Informants Respond to a Modified Intervention

INTRODUCTION

Cultural tailoring is an important tool for interventions geared towards ethnic minorities.[121] By culturally tailoring interventions, health equity is upheld. Health equity ensures that individuals with different backgrounds have equitable access to live healthy lives, regardless of language barriers, socioeconomic status, and geographic location.[122] One definition of cultural tailoring is to adapt an existing intervention design to match the cultural needs of the target population.[121] There is a gap in the literature that does not have defined guidelines on how to tailor to specific populations, especially ethnic minorities, culturally.[121] Another noted area for improvement in culturally tailored interventions is the low retention rates.[121] A literature review conducted in 2020 found issues in recruitment and attendance in culturally tailored interventions.[121] This dissertation aims to provide a culturally tailored T2D intervention design for the Punjabi population in the SJV. This tailored intervention design addresses some gaps in the culturally tailored intervention literature. To create an evidence-based intervention, the Delphi method is used.

The Delphi method is used widely in several sectors, including health science.[123] It is considered a scientific process to provide evidence-based recommendations.[61] One key part of the Delphi method is the iterative feedback from expert individuals.[61] The research project used the Delphi methodology, where an expert panel provides feedback on an intervention design. Then, the updated intervention design is presented to form a consensus among the key informants. The key informants offer expert information and opinions on the cultural tailor of the T2D prevention intervention for the SJV Punjabi population. Key informants who work with the SJV Punjabi population (i.e., community-based organizations, medical professionals, and health departments/governments) were recruited and interviewed to assess the intervention design and ensure cultural tailoring.

There is limited literature on the Delphi method used to inform T2D prevention intervention, and no studies use the Delphi method to assess a T2D prevention intervention design for Punjabis. This is a significant gap that this study will fill. Key informants will be interviewed to analyze their responses to the adapted intervention, and this feedback will guide how to make the intervention more successful. This final qualitative study will identify a specific T2D intervention adapted based on the key informant responses. Using the intervention mapping framework, a logic model will be provided as an output of the overall dissertation of the proposed T2D prevention culturally tailored intervention. The additional details of the intervention will be summarized and referenced back to the original study conducted in New York. The final qualitative study aims to answer the following three questions:

Aim 1: Identify what intervention components presented would need to be kept relevant to the SJV Punjabi population.

Aim 2: Identify what parts of the intervention need to be tailored to the location, community, language, etc.

Aim 3: Identify if this intervention feasible for successful implementation and sustainability. Where are the gaps?

RESEARCH DESIGN AND METHODS

The Delphi method was used because this study was a way to improve on the culturally tailored intervention. The Delphi method aims for expert consensus on a specific topic and provides evidence-based recommendations based on the expert response.[61] In Study 3, The adapted intervention was presented to seven key informants previously recruited and interviewed for Study 1. These seven key informants were asked which components of the intervention were relevant, which parts needed further cultural tailoring, and their expert opinion on the intervention's feasibility. The interview responses informed other changes to the adapted T2D prevention intervention design to serve the SJV Punjabi community better.

Study Design

This study incorporated the Delphi method, which aims to gain consensus from an expert group on a particular topic.[61] Through an iterative process of interviews, there is consensus on the expert discussion.[61] An important aspect of the Delphi method is anonymity, allowing the expert participants to share thoughts freely.[61] This method results in an evidence-based design that can be used in public health. The final study of the dissertation is the second consecutive interview conducted with the expert key informants to inform a T2D prevention intervention for the SJV Punjabi population. They reviewed the intervention design and logic model that was created in study 2, the literature review.

Study Participants:

The same key informants from Project 1 were asked to be interviewed again. This modified interview recruitment strategy is consistent with the Delphi methodology. All ten interviewees from Study 1 were messaged via email or text message to participate in the follow-up interview. Seven of the ten key informants completed the follow-up interviews, while three needed help to follow-up. These interviews were scheduled after the key informants agreed to the follow-up interviews. Two of the three lost to follow-up had very demanding schedules and did not avail themselves to the interview. These key informants were interested in completing the follow-up interview; however, after a week of text messaging, they stated they could not participate in the follow-up interviews. The third key informant lost to follow up and did not respond after three email messages.

For the interviews, there were seven key informants interviewed. Geographically, participants worked in Yuba City/Sacramento (n=3, 43%), Turlock/Livingston/Merced (n=2, 29%), Fresno (n=1, 14%), and Bakersfield (n=1, 14%). Roughly half of the 7 participants worked at community-based organizations (n=4, 57%), and the other half worked for government healthcare agencies/public health departments (n=2, 29%) or as medical professionals (n=1, 14%). In addition, most participants were female (n=5, 71%).

Table 3.1. Participant Characteristics

Location	Count (N=7)
Geographic Location	
Yuba City/Sacramento	3 (43%)
Turlock/Livingston/Merced	2 (29%)
Fresno	1 (14%)
Bakersfield	1 (14%)
Job Role	
Community Based Organization	4 (57%)
Health Department/Agency	2 (29%)
Medical Professional	1 (14%)
Gender	
Female	5 (71%)
Male	2 (29%)

Interview Protocol:

In Table 3.2 of this dissertation, the intervention design was presented to the key informants at the start of the interview. Each component of the intervention design was explained in detail verbally and was screenshared over Zoom. After completing the intervention presentation, the interview was guided by questions about each section of the intervention and, their perceptions of the cultural tailoring, and what needed to be further changed. The key informant was given time to think and speak on the questions and asked, "Is there anything more you would like to add about this section?" before proceeding to ask questions about the intervention component. The semi-structured interviews allowed for flexibility of key informant responses.

The first part of the interview focused on asking key informants what parts of the intervention design are relevant to the SJV population. The key informants were given time to respond to each intervention component in the logic model and discuss aspects of the intervention. This part of the interview focused on the parts of the intervention and logic model that would work well for the SJV Punjabi population.

The second part of the interview focused on areas that must be better tailored to the SJV Punjabi population. The key informants responded to the second interview questions, and following an extended pause, key informants were asked if they had anything additional to add. After answering, probing questions were asked. The probing questions asked whether the community engagement, intervention recruitment, educational material, and evaluation were culturally tailored.

The final part of the interview asked about intervention feasibility. Key informants stated if they believed the intervention was feasible in the SJV. The semi-structured nature of the interview allowed the key informants to expand on their comments. After key informants completed their responses, probing questions were asked

about the sustainability of the intervention over time and feasibility gaps. Overall, the interview guide helped key informants think about the intervention design and logic model and develop their answers on what needs further change to the intervention.

Table 3.2 Interview Guide:

Upon providing an overview of the intervention and logic model, the following questions will be asked: ***Question 1: Identify what intervention components presented would need to be kept in relevance to the SJV Punjabi population.*** *Probe: Do you think the components for community engagement are relevant to the SJV Punjabi population?* *Probe: Do you think the intervention stage for recruitment is relevant to the SJV Punjabi population?* *Probe: Do you think the intervention location is relevant to the SJV Punjabi population?* *Probe: Are the education topics relevant to the SJV Punjabi population?* *Probe: Is the evaluation good for this intervention?* ***Question 2: Identify what parts of the intervention delivery need to be tailored to the location, community, language, etc.*** 1. Is there anything that needs to be culturally tailored to include in the intervention? *Probe: Community engagement? Recruitment? Location? Intervention education? Evaluation?* ***Question 3: Do you think this intervention is feasible for successful implementation and sustainability? Where are the gaps?*** 1. Is this a feasible study design? Why or why not? *Probe: Do you think this intervention could be sustained for long periods?* *Probe: Where are the gaps in this intervention?*

Analytic Strategy:

The interviews were recorded and transcribed using the record and caption feature in Zoom. Transcriptions were checked for any errors from the Zoom transcriptions. Research assistants listened to each interview and matched it to the transcriptions. Although the interviews were conducted in English, key informants sometimes stated concepts or ideas in Punjabi. A Punjabi research assistant reviewed these words or sentences and remained in the transcribed interviews, in addition to the English translation. Once transcriptions were checked for accuracy, the interviews were analyzed using a qualitative analysis software, Atlas T.I.

Trustworthiness of the themes from the key informant interviews were established by using the six phases of thematic analysis: becoming familiar with the data, creating codes, creating themes, review themes with other researchers, defining the themes, and reporting the data.[68] A codebook was created as interviews were conducted, based on the codes that arose after each interview. After codes were created for all the interviews, they were clustered according to themes that were identified. Additionally, the analysis also looked at the frequency with which the theme appeared across the key informant responses; however, concepts of importance were highlighted regardless of the frequency in which they appeared. The grouped themes were carefully analyzed and reported in the results section of the study paper. Specifically, the codes and themes were reviewed by

the dissertation advisor, as part of triangulation.[68] In addition, the themes were validated through the frequency of the codes in the results. Negative cases were also included to show how they diverged from the common responses.[124]

RESULTS

Qualitative Analysis

Follow-up interviews with the key informants identified six major themes when they critiqued the intervention: there was a need to decrease the number of intervention participants, reduce the length of the intervention, health education sessions, feasibility, recruitment, and location. The themes will go into depth on what the key informants discussed.

Theme 1: Decrease the number of intervention participants and shorten the time frame for the intervention

Four key informants recommended to begin with a smaller number of intervention enrollees. The initial intervention participants presented to the key informants was 50, which matched the New York pilot intervention; however, several key informants cautioned against this number for different reasons. Instead, they suggested starting smaller and increasing the sample size over time. One key informant noted that large-scale interventions are labor-intensive when asked to identify relevant aspects of the intervention that need to be tailored. The key informant recommended piloting the intervention in one location, before expanding the intervention to other locations.

> *I think on a small scale. Yeah, but on a big scale, I don't know how that looks like when you say San Joaquin, that area, like, yeah, you can do that on a small scale. And if you have success with the one singular [intervention], then you can be like, okay, seeing it large scale. The large scale requires a lot of people to help. It's gonna be very labor-intensive when it comes to time.*
>
> *-Community Based Organization 1*

Another key informant was surprised at the intervention participant size that was recommended. They stated that since the intervention would be physically located at a gurdwara, those interested in attending would be limited to those who attend the Gurdwara. The key informant suggested that those who would be interested in participating in the intervention are those who regularly attend services, which is a smaller pool.

> *I mean, honestly, 50 is a lot, to be honest. I thought you were gonna say, like 5 to 10 at first, and I saw the number 50, and I was like, "damn, alright!" I think 50 in one area is a tough ask, to be honest, because if you're doing this at the Gurudwara, you're already kind of limiting your pool to people who just come to the Gurudwara, right?*
>
> *-Community Based Organization 2*

Another key informant recommended a shorter time frame for the intervention. The key informant recalled an intervention they worked on where respondents had higher attendance rates and more engagement when the intervention was shorter. Based on their experience, 2-month interventions were received better than year-long interventions. In the key informant's experience, classes that extend 2 months decreased participant motivation.

> *I've helped develop a health intervention. There have been year-long classes, there have been shorter, like two-month classes and one-part classes. People really seem to like the two-month classes because they feel like, "Okay, I'm learning, I'm doing something right," and building that consistency, but it's not such a long commitment that they lose that motivation. So, I think it's a great way to get the ball rolling. Give them information when they're feeling motivated and open to receiving information, but not so long and so much information that they feel overwhelmed.*
>
> *-Medical Professional 1*

Another key informant discussed the time constraints that affect the Punjabi community in the SJV. They had experienced intervention participants decreasing attendance over time. They discussed the importance of clearly outlining the time commitment during the recruitment to warrant a successful intervention.

> *So the only thing with our community is the time commitment… we deal with participants dropping out of the study. So the only thing is making sure what the time commitment looks like for that. And do they really know what they are getting themselves into?*
>
> *-Community Based Organization 3*

Theme 2: Clarify audience and program details

There was a request from four key informants to see the program design in more detail than what was presented during their follow-up interview. Since the key informants were presented with the intervention overview and logic model, one of them stated they needed to view the educational materials that would be presented to participants before deciding if the intervention would work. Specifically, going over the educational material and how items will be explained. This key informant discussed that educational materials presented to the community should specify the physical pathophysiology of T2D with participants and ensure that participants understand the role of carbohydrates.

> *I would be interested in kind of seeing like more deeply what each education piece entails….I would assume that the Pathophysiology of diabetes is explained. Just so people can see. Oh, this is how carbs digest…. and this is how sugars are used in my body, so they have an understanding that our body needs carbs. It's the quality carbs which*

might go under the nutrition section, but I feel like this is really comprehensive.

-Medical Professional 1

While they desired to see specific curriculum contents, which were not presented, they trusted the material was available. They also stated the curriculum could be tailored to the SJV Punjabi community, if they were able to see the material.

I think, like the biggest area I would be thinking about is the actual education material. But again, it sounds like you already kind of have those resources, and you'll be able to tailor them to this population.

-Medical Professional 1

While the previously presented key informant noted the need to view the curriculum, another key informant requested more information. Still, on a different aspect of the intervention, in the intervention guide, the target population was listed as "those at-risk of T2D." The key informant noted that more specificity regarding the target population was needed to be successful.

Be clear and clarify, like who the specific population is.

-Health Department/ Agency 1

Theme 3: Conflicting opinions on including stress and family support session for the T2D intervention

The first key informant I interviewed that worked at a community-based organization hesitated to include stress and family support as part of a T2D intervention. They suggested that stress and family support is a lot of information to unpack, and one session would not do it justice. They warned that working on this session may take substantial time and work. In addition, they stated to try the intervention session on stress and family support but know that it will be difficult to discuss this topic thoroughly. The key informant also suggested designing a separate intervention on stress and family support, instead of including it with the T2D intervention. Then I asked the rest of the key respondents on their thoughts on specifically including the stress and family support in the T2D intervention.

I don't know, like, like the stress and family support…how are you gonna be able to educate that? That's like it's on the division of labor, you know… access to healthcare that makes sense, diabetes complications makes sense, physical activity, nutrition… but the stress and family support. I don't know how that can translate into like being able to help….so maybe that would be its own intervention, essentially, or like it, own kind of….because I think that's like when you get into the mental health services and things. I mean, if you're gonna do it, I say, go for it. But then just know what your bandwidth is, and with the bandwidth of the model could be.

-Community Based Organization 1

The rest of the six key informants stated that the stress and family support session should be included in the intervention design. Specifically, a key informant who works with a community-based organization discussed the importance of including a session on stress and family support since they have worked with individuals in the SJV who are ensuring stress. They also mentioned the linkage between stress and T2D.

> *Also, people going through a lot of family stress. And then there is some kind of stress problem. Especially if they start drinking, the things like this can bring the sugar level high.*
>
> *-Community Based Organization 4*

Another key informant also wanted to include the stress and family support session in the T2D intervention because they mentioned limited information on mental health in the Punjabi community. The key informant talks about the cycle of mental health, where trauma is passed on generationally. The expanded to say that it is hard to address something, if people don't know about it. So a session on stress and family support will provide a space for discussion. The key informant talked about how trauma can become cyclical and be passed on to the younger generations. Furthermore, the key informant commented on how individuals can thrive in other aspects of their life after addressing the stress and mental health issues.

> *I would include it in this because I think in our community, we just can't talk about that enough because people don't even know what they don't know, right? It's just a thing about like hurt people hurting other people. Like putting their trauma on to their kids that, you know, they don't even know why they're doing it, right? I would definitely include that in here for sure. But I would make sure that its own kind of like topic of intervention because once your mind is cleared up, certain things once you're able to look at life in a way where it's like without judgment of yourself, especially, I think like you're able to make better decisions….basically my whole like thing with this is how do you get people out of like survival mode and to think through that I want to thrive in my life, right?*
>
> *-Community Based Organization 2*

Theme 4: Conflicting opinions on using gurdwaras for the intervention

Although all of the key informants from the first interview recommended the use of the Gurdwara for the intervention, there was some dissonance in the second round of interviews. Some key informants discussed not having the intervention at the Gurdwaras since the Gurdwaras have an older audience in attendance. One key informant wanted an intervention for the youth somewhere other than the Gurdwara. They suggested the youth are less likely to participate in the intervention if it was located at a Gurdwara.

> *If you are looking at youth, then maybe not at the Sikh temple because they're probably more likely to be engaged or meet elsewhere.*
>
> *-Health Department/Agency 1*

Another key informant said the gurdwaras are a convenient location for the interventions. Generally, the gurdwara is understood to be a safe space for the community to come together. Since the Gurdwara is considered convenient and may serve as a good place for a pilot study, the location's effectiveness can be re-evaluated after the pilot study.

> *To implement this, right? Yeah, I would think so, as like a lot of people come there. It's fast, it's convenient access. So I think, for convenience purposes, this [gurdwara] location sounds good.*
>
> *-Community Based Organization 3*

Another key informant went in depth about the best times to have the intervention at the gurdwara. In particular, weekends were said to be the best time. However, those who work on the weekends would not have the opportunity to participate in the intervention.

> *I would say the Gurudwara is the best bet, and the best time is usually like 1:30 to 2-ish, on like Sundays…after people eat lunch… other than that, weeknights are gonna be really tough for that. Saturdays could work.*
>
> *-Community Based Organization 2*

Theme 5: Expand on recruitment

Three key informants recommended expanding on the recruitment section that was originally showed to them. The first key informant said the Punjabi radio station is widely listened to by the SJV Punjabi population, especially those who are Punjabi speakers. The radio provides information about community events and can serve as a good place to advertise a T2D intervention. One key informant explained the ads would engage the community in the intervention. Another location to recruit individuals was parks. This was mentioned as a community asset in study 1 of the dissertation. Since the act of "sair" (walking) is a community asset, it is a good place to recruit. The community is visible at the parks and may be more likely to join a T2D prevention intervention.

> *This might go along with the word-of-mouth recruitment, but the population that I think you're trying to recruit also is pretty engaged with the local Punjabi radio…they could have announcements on the local Punjabi radio, which runs on the weekends… Another thing is, well, there's an elderly population that tends to gather at local parks, right…you could also visit like neighborhood parks. Especially some of the big ones like Khalra Park in Fresno, like in an evening when people have gathered there.*
>
> *Health Department/Agency 2*

Another key informants talked about an existing intervention that recruited individuals from a prominent Punjabi low-income housing complex. They met the intervention participants at their homes and continued health education. This was done in collaboration with medical school students interested in providing health education. The initial visits were to build trust, followed by the health material.

> *We identified this one low-income housing apartment complex, where it's like 90% Punjabi people, and we are gonna be going there; we're gonna do like about 5, 6 visits. And the first couple of visits is just kind of getting to know them. You know, like "cha chu pini" (drink tea) blah blah blah, that kind of stuff, and then afterwards we were gonna be doing this like ADA Survey.*
>
> *-Community Based Organization 2*

The key informant continued to share that sports groups for young adults may be a good place to recruit individuals for the intervention. Although individuals who exercise tend to have a lower risk for T2D, the key informant identified them as an at-risk group.

> *Maybe younger people are like at-risk for diabetes…there's like sports club and stuff, too, but I still haven't figured out a way to reach out to the population yet, but there's always somebody playing volleyball…you know, these dudes in the evenings. I don't know if you've seen, there's like on Saturday, Sundays... they're playing like cricket sports, or something…I would imagine like those people are at-risk for diabetes if they do not already have it.*
>
> *-Community Based Organization 2*

Theme 6: Importance of the simplicity of intervention materials

Three key informants encouraged simple design of the intervention information, even though they did not see the specific intervention materials. This key informant appreciated the simplicity of the intervention design because they had difficulty simplifying the intervention materials they worked with in the past. They specifically mentioned jargon makes interventions more complicated, and simple and straightforward interventions are more understood.

> *I was going for simplicity because I feel like sometimes, we complicate things too much with jargon, and there are too many things going on. So I was like, I'm gonna try to make this as simple as possible, which was actually kind of difficult.*
>
> *-Medical Professional 1*

Another key informant mentioned that interventions that are difficult to understand are less feasible because the participants will not understand the material. When intervention participants need help understanding the material or the complicated language, they are less likely to learn and change behavior. The language used in the intervention material

and presentations must be simple so more individuals understand the concepts and continue engaging in the intervention.

> *If we leave a little bit simple, and then maybe more people will come, you know. If we make it difficult, and then they go and say "Oh, we didn't learn anything." We did this and used simple language, and they come more and more people.*
>
> *-Community Based Organization 4*

Furthermore, a key informant discussed the negative impacts of over-information in health interventions. Focusing on a couple of important topics in each session will make it easier for the intervention participants to follow and implement in their lives. The key informant also discussed that more places to improve will be identified upon implementing the pilot intervention. Over time, the intervention material and information will be tuned for the target population.

> *But sometimes that over information backfires, so convincing ourselves that okay, sticking to these 2 or 3 pieces of key information and trusting that people will pursue more information as they need it, they'll ask us for it like with a 6-part program. Like you'll be able to adjust it. Fine, tune it for that specific group of people, and that's gonna look different for each cohort. So simplicity allows for that fine-tuning, that flexibility.*
>
> *-Medical Professional 1*

Updated Explanation of Intervention Design

The key informants recommended the sample size decrease. The experimental and control were decreased to 10 in the updated intervention design instead of the initial 50. The New York study had 50 participants in the experimental group and 50 in the control group.[56] Key informants voiced concern over 50 participants, and the recommendations was to significantly reduce the intervention participant number to 10 for the pilot study. The literature shows that pilot study sample sizes that are at least 10 and will provide reliable estimates of the study variance and will not negatively affect the power.[125] However, other authors who have researched intervention pilot sample sizes have recommended 12, 15, or 32 as the minimum sample size for experimental and control groups.[126] In order to prevent the overestimation of pilot studies, rigorous randomization is recommended in smaller sample sizes.[126] This will allow the pilot intervention to inform a stronger T2D prevention intervention by making changes to improve the outcomes. Another consideration is to make the control group optional, since implementation may occur local governments, health departments, or community based organizations. In addition, the key informants recommended reducing the time of the intervention. Because of their input, the educational sessions will run for six weeks, and follow-up will be at the exit of the intervention (six weeks) and three months. Even though this will reduce the information needed for robust evaluation, key informants shared undesirable outcomes due to extended and lengthy interventions and follow-ups. Most examples shared issues with recruitment, and participants lost to follow-up.

The updated study design also includes more specific information on the target audience. Since the intervention is a T2D prevention intervention, those recruited for the intervention must not have T2D and be a Punjabi living in the SJV. Key informants recommended the intervention focus on those between the ages of 20-40 to ensure T2D prevention, which differs from the Islam et al., study that included anyone from 18-74 years of age. The key informants discussed expanding on the initial intervention recruitment presented to include the Punjabi radio, which is widely listened to by SJV Punjabis, the local parks, and housing complexes.

Key informants also requested more detailed information on the six educational components. These components are highlighted clearly in the Islam et al. paper in Figure 3.1.[56] The sessions were developed and culturally tailored by researchers at New York University and United Sikhs. Although key informants did not see the education material related to the six session, they spoke about simplicity of the intervention education content. The key informants have worked closely with the Punjabi population and wanted to note the importance of simple education material. There was interest from key informants to view the culturally tailored education material developed my the New York intervention, so they wanted to discuss aspects of the actual intervention content. Since they did not know, they provided feedback based on their experiences working with the Punjabi population in the SJV. There was also one conflicting opinion on including the intervention session on stress and family support (highlighted in the New York paper).[56] Ultimately, the consensus of the follow up key informant interviews was to include them in the intervention. However, key informant responses encouraged creating a separate intervention to focus on mental health and stress related to T2D. These responses will inform future intervention designs for T2D risk factors.

The goal of this intervention is to increase T2D knowledge, promotion of T2D prevention by increasing self-efficacy and health maintenance of T2D prevention, increasing awareness of healthcare access, and educating on fatalism.[56] These components were presented in the New York intervention and by key informants to implement a T2D prevention intervention for Punjabis in the SJV to address individual level risk factors. This outcomes will be measured by scales that were used by the New York intervention, listed in Figure 3.1.[56] T2D knowledge will be assessed using the Michigan Diabetes Knowledge Scale[127] and the Risk Assessment Survey from the American Diabetes Association.[128] Success will be measured as increased knowledge of T2D. To measure whether or not self-efficacy regarding diet and exercise maintenance increases, the Bandura Self Efficacy Scale[129] and measurement of weight, BMI, blood pressure, and cholesterol will be recorded. Because this intervention includes individuals that are at higher risk for T2D or are prediabetic, a successful intervention will mean that anthropometric measures either stay the same or decrease from the baseline data. Fatalistic attitudes are inversely correlated with self-efficacy and diabetes fatalism has been shown to be linked to a lack of self-care related to T2D.[73] To see if fatalism decreases, fatalism will be measured using the Religious Health Fatalism Tool, which was originally designed for the African American faith community.[130] This scale will need to be modified for the SJV Punjabi population. Key informants stated that a Lack of access to health care is associated with poor diabetes prevention. Access to healthcare will be measured using questions from the BRFSS.

Generally, the key informants agreed with most components of the New York City T2D prevention intervention tailored for Punjabis. The main change recommendations were due to the rural geography and culture compared to urban New York City. The key informant interviews informed the modification of the intervention to fit the needs of the SJV Punjabi population. Key informants discussed challenges that were at the institutional level (access to health care and challenges as a new immigrant) that will not be directly addressed by the T2D prevention intervention. This intervention primarily targets individual level factors, which is one component of the socioecological model. While it is important to also address institutional level risk factors for sustained change, institutional level risk factors require different interventions.[52] While this intervention cannot address institutional level factors, it does provide resources and tools to help participants deal with either accessing institutional resources or the stress caused by institutional factors.

Figure 3.1 Updated Intervention Overview[56]

Intervention Stage	*Stage Overview*
Community Engagement	-Engagement with local Sikh temples (religious leaders) -Collaboration with local CBOs -Health Care Providers -Health Departments
Recruitment	-Target audience: 20–40-year-old Punjabis, non-diabetic -CHWs recruit at Sikh organizations and temples -Word of mouth recruitment -Online recruitment (WhatsApp, Facebook) -Punjabi Radio -Recruitment by same gender
Location	-Sikh temple
Intervention	-Education material adapted from NY study - T2D prevention, information, myths (address fatalism) - Nutrition (traditional Punjabi foods) - Physical activity (physical environment, "sair" walking) - T2D complications - Stress and family support (discuss internal pressures and discrimination, job environments, financial pressors) - Access to healthcare (health insurance, Punjabi providers)
Outcome Measures	Increase in knowledge (T2D)- Self reported -Michigan Diabetes Knowledge Scale[126] -Risk Assessment from American Diabetes Association[127] -Increase in self-efficacy regarding diet maintenance/ Increase in self-efficacy to maintain physical activity routine -Bandura Self-Efficacy Scale[128] -Weight, BMI, Blood Pressure, total cholesterol -Access to healthcare- Self reported -Modification of BRFSS[131] Measure fatalism - Religious Health Fatalism Tool[129]
Evaluation	-Quantitative data analysis - Descriptive statistics of baseline compared to 3 months - Between group differences (control vs experimental) -Qualitative data analysis - Interviews and focus groups analyzed for acceptability, and satisfaction

Table 3.4: Updated T2D Prevention Intervention Logic Model[56]

Overall Goal: T2D Prevention Intervention modified to Punjabis in the SJV to address T2D risk factors						
Inputs	**Activities**	**Outputs**	**Short Term Outcomes**	**Intermediate Outcomes**	**Long Term Outcomes**	**Impact**
Grant submission/secure funding Health Departments Community based organizations to collaborate (i.e., Gurdwaras, CBOs) CHWs Data Analysts Previously created T2D culturally tailored education material (in Punjabi language) Location of intervention- Sikh temples Evaluation tools	**Training** CHW training **Recruitment** Recruit participants (experimental and control) from Sikh temples, Punjabi grocery stores, Punjabi apartment complexes, social media, Punjabi radio, word of mouth, medical professionals **Implementation** 6 previously culturally tailored education curriculum provide: 1) T2D prevention, 2) Nutrition, 3) Physical Activity including home based exercises, 4) T2D complications/co-morbidities, 5) stress/family support, 6) Access to healthcare Routine contact with each intervention participants to individualize strategies and action plans to implement and maintain diet and physical activity into daily life **Data Collection** Baseline health information Use validated instruments to measure fatalism and self-efficacy 3 & 6 month follow up	Trained CHWs Pilot intervention of 10 participants, 10 control Dissemination of outcomes to community, stakeholders, and media Record challenges and lessons learned Increase in awareness of: •Importance of nutrition and routine physical activity •Strategies for effectively incorporating healthy eating and physical activity into daily routine	**At completion of intervention** Improvement in self efficacy regarding maintaining: •Healthy eating •Routine physical activity Change in fatalistic beliefs Maintenance or reduction of levels of one or more of the following: •Weight •BMI •Blood pressure •Glucose •Cholesterol Increased education on access to care Intent to change	**3 month follow up** Maintenance or reduction of levels of one or more of the following: •Weight •BMI •Blood pressure •Glucose •Cholesterol Improvement in self-efficacy regarding maintaining healthy eating and physical activity	Continue sustainable intervention in the future Decrease in T2D prevalence among SJV Punjabi population	Maintenance or reduction of one or more of the following: •Weight •BMI •Blood pressure •Glucose •Cholesterol Impact of CHWs Progress satisfaction Engagement with program Program satisfaction Increased understanding of T2D risk factors and preventative measures
Assumptions: Trained CHWs available to provide intervention, Participation from SJV Punjabis			**External Factors:** Funding, community buy-in, recruitment issues			

DISCUSSION

Principal Findings

The goal of the final dissertation study was to ensure the intervention was culturally tailored to the SJV Punjabi population. In addition, this study evaluated the strengths and weaknesses of the adapted intervention. The Delphi methodology aided in revising the intervention to meet the community's needs. The key informants appreciated the simplicity of the intervention design; however, they requested more detailed information about the education sessions. There also needed to be more clarity about the length of the study, with recommendations to shorten the length of the intervention. There were also mixed opinions on the feasibility of the intervention and the inclusion of stress and family support. This study finalizes the intervention design and logic model with the concluding feedback from the key informants. This culturally tailored and adapted T2D intervention design will be shared with community stakeholders, non-profit organizations, and health departments to implement. The following steps include community buy-in and implementation.

Benefits of a Pilot Study with Less Participants

Several key informants hesitated with the initial sample size of 50 participants in the intervention. Instead, they recommended decreasing the intervention sample size for the pilot study. Pilot studies are an integral part of research and interventions.[131] Generally, a pilot study is a smaller study or project to test the intervention design and tools for effectiveness.[131] Some other benefits of a pilot study are to test the feasibility, recruitment, and evaluation.[131] In some intervention studies, researchers agree to recruit roughly 20 individuals.[131] Ultimately, the pilot study highlights the places to improve the invention design before investing in a large-scale intervention.[131]

Having a pilot study can trial the intervention to ensure a large-scale intervention is feasible and appropriate for the target population.[132] Some of the weaknesses of having a pilot study with a smaller sample size is that the evaluation and analyses may need to be more representative of the intervention.[132] One of the major issues in research is recruitment based on the set target sample size.[132] One key informant stated that 10 participants at one Gurdwara would be a good place to start and cautioned that 50 experimental and 50 control (total 100) would be challenging to execute. The final intervention design will decrease the intervention sample size.

Community Partners to Promote Intervention Feasibility

To maintain an intervention feasibility, appropriate community partnerships are necessary.[133] Some examples of partnerships include health organizations, public health departments, hospitals, community-based organizations, and faith-based organizations.[134] Key informants discussed that buy-in from local partners would improve the implementation and feasibility of the intervention. It is recognized that some health issues are identified at faith-based institutions.[134] Faith-based institutions usually include volunteers who care for their community, which helps to mobilize and advocate for change.[134] There is a great history of public health interventions that partner with faith-based interventions, specifically for dental care, drug addictions, and acute and chronic diseases.[134]

Some other community partners are hospitals and health systems that can collaborate to execute the intervention.[134] Hospitals in the United States have understood the importance of promoting health equity work that provides a framework to improve health for underserved communities.[134] Some of this work includes required community health needs assessments. Having buy-in from local hospitals to implement and provide additional resources to maintain feasibility.[134]

Key informants also discussed partnerships with the public health departments.[134] There are prominent public health departments in all the counties where key informants were interviewed.[134] Health departments usually have a health equity agenda, which warrants public health investment toward high-risk populations.[134] They also have access to unique data sets that explore the health needs in their community.[134] Yet, they may not have access to disaggregated data on Punjabis, which is consistent with what the key informants who worked in a health department or for the government stated. Another key informant described the need for more consistent involvement of health departments related to Punjabi health issues. This may be due to the lack of information and disaggregated data. Overall, participation from community partners will improve the intervention's feasibility.[133] Key informants talked about the involvement of Gurdwaras, hospitals, community-based organizations, and health departments in implementing the intervention.[134]

Stress and T2D Interventions

Although some literature points to stress contributing to T2D, the etiology is still being researched.[135] In fact, chronic stress is a risk factor for T2D.[136] Chronic stress is commonly seen in racial minorities who may experience racial discrimination and/or low socioeconomic status.[137] Key informants in Study 1 discussed the racial, financial, and social stressors that may inhibit T2D prevention. Stressors were identified as one of the issues that Punjabis in the SJV experience. These stressors may also be risk factors for T2D.

There was some discussion from key informants about separating stress from the existing T2D intervention design. Instead, they suggested a separate intervention focusing on family support and stress. The key informants agreed to include the stress and family support session as part of the T2D intervention. Some examples of stress discussed by key informants were generational trauma and drinking alcohol. Even though stress is a complex topic to unpack in one session of the overall intervention, it will be important to introduce stress and its effects on health. The pilot study may inform a more in-depth intervention solely on mental health. However, the current T2D intervention would benefit from the preliminary discussion of T2D.

Contradictions on Location of Intervention

A notable finding from the key informant interviews were the differing opinions about the location of the intervention. Most key informants identified the Gurdwara as an ideal location for the intervention in the first interviews, however, there was a difference of opinion in the second interviews. One key informant said having the intervention at the Gurdwara would limit the intervention to those who attend religious services.

Religious institutions, like churches, are also important to Black and Latino communities by providing socialization and bringing many generations of families

together.[138] A study conducted in South Los Angeles with Black and Latino churches noted some challenges in conducting health interventions at religious institutions.[138] First, the churches weren't sure how to implement a health intervention or they felt like there were already too many events happening.[138] Smaller churches had more difficulty with implementing health interventions than larger churches.[138] Although there are limitations stated by the South Los Angeles study[138] and by some key informants, most key informants agreed the Gurdwara would be a good place to have the pilot T2D prevention intervention.

Ways to Recruit Younger/Older Individuals for T2D

The DPP is a well-known intervention designed to prevent T2D in many communities.[139] It is the largest randomized control trial to prevent T2D and has been adapted to serve different populations.[139] The Prevention of Diabetes and Obesity in South Asians (PODOSA) in the United Kingdom recruited for their intervention through the National Health Service and referrals from health care providers.[140] Other strategies were referrals from friends and family to enroll in the intervention, partnering with local South Asian organizations, and media recruitment.[140] This example is consistent with what key informants stated and what the New York City study did to recruit for their intervention.[56] These strategies may work well for those who are older.

Younger age groups may be harder to recruit for T2D prevention, especially because T2D interventions among youth are limited.[141] A study conducted in East Harlem in 2011 recommended a partner-led approach to recruit primarily Latino, Black, and low-income youth.[141] The partner-led approach encompasses a local community partner who leads most of the recruitment efforts.[141] Key informants who worked for community-based organizations had unique recruitment methods for younger intervention participants, like recruiting at predominantly Punjabi housing complexes, grocery stores, and volleyball teams.

LIMITATIONS

The final study's limitations were that three key informants were lost to follow-up; however, some lost to follow-up were anticipated. This is one of the limitations of executing the Delphi methodology but following up with the key informants allows for a stronger intervention design. These follow up interviews were shorter than study one of the dissertation since they were focused on the intervention design. Future studies should focus on conducting focus groups with potential community participants and the effectiveness of the intervention upon implementation of the pilot intervention.

Additionally, this intervention design primarily targets individual level factors for T2D prevention. Although this is a good start to introduce T2D prevention to the SJV Punjabi population, it is not as effective as interventions that target multiple levels of the SEM.[52] Future interventions should be informed by this intervention and target additional parts of the SEM.

Internal validity was addressed by using thematic analysis guidelines and external validity was addressed by sharing themes with the dissertation advisor, however, there may have been bias in the code development and analysis. Conducting a different analysis than thematic analysis could have produced different results. These results may not be generalizable to urban areas or communities that are not Punjabi, but some

components could be replicated. Trustworthiness may have challenged since the coding and analysis was mainly conducted by one research.[68]

CONCLUSION

In summary, the key informants helped identify strengths and weaknesses in the adapted T2D intervention for the SJV Punjabi population. The strengths included the simplicity of the intervention and overall intervention location. However, there were suggestions to shorten the length of the intervention, clarify program details, and expand on the recruitment. Also, it is important to receive buy-in from local community-based organizations or health departments to implement the pilot intervention. The adapted logic model and intervention overview are presented to be shared. The intervention designed by NYU was very successful for the New York City Punjabi community and has been adapted to fit the needs of the rural SJV Punjabi community.

CONCLUSION

This dissertation fills a gap in the intervention literature by providing an example of using the Delphi method to modify an existing T2D intervention executed in an urban location (New York City) and culturally tailoring it for the SJV rural Punjabi population. The modification of an intervention based on key informants is a novel study that guides the design of the T2D intervention. The sequential nature of the Delphi method key informant interviews was important to improve the culturally tailored intervention design. The first study identified items necessary to culturally tailor an intervention for SJV Punjabis. The second study identified existing T2D interventions that were culturally tailored for the South Asian community, in which one was culturally tailored based on what key respondents stated. The final study displayed the culturally tailored intervention to the key respondents for further feedback. This ultimately resulted in an adapted culturally tailored T2D intervention for the SJV population that key informants reviewed. Their valuable feedback helped improve the intervention design to adapt to a rural Punjabi community.

A valuable outcome of this research was the collaboration with non-profit organizations, public health departments, and medical professionals. These dissertation projects were able to connect academia to the community leaders, by initiating conversation about the issue of T2D in the SJV Punjabi community and discussing ways to prevent the disease. The methodology of incorporating feedback from those who work directly with the community ensure buy-in from the community entities. The Delphi methodology is encouraged to be used when establishing new interventions, which will increase feasibility. This methodology can be replicated to encourage the design of interventions and buy in for intervention implementation in rural populations.

Furthermore, this dissertation outlines a logic model for a culturally tailored T2D intervention designed for Punjabis in the SJV, informed by best practices in academic literature. The logic model may be utilized by health departments and CBOs to implement a T2D intervention. The logic model provides important components of a culturally tailored intervention, which was informed by key informants throughout the SJV. This will help county health departments and CBOs, by providing the starting steps for intervention design. The logic model will provide the starting frameworks, with opportunities to tailor it to their community. Although the counties in the SJV have many similarities, it must be acknowledged that each county is different. The counties differ in access to resources, expertise, and support. Therefore, the intervention design may be altered to meet the needs of respective counties. The logic model and intervention design provide the basis of a culturally tailored intervention and will serve as a tool for intervention implementation.

Additionally, the dissertation design will also be an asset in other interventions designs. The methodology not only helped with designing the intervention, but there was investment from those that were interviewed. Having the key informants be part of the design process brought about interest and passion to implement a T2D intervention. This methodology can be replicated for interventions addressing other diseases with different target populations.

Stakeholder that would have benefited from being part of the key informant interviews are decision makers at each county health department and CBOs. Talking with the Health and Human Services directors and health officers would have provided a

different perspective to implementation and feasibility. Key informants discussed not having support from leadership, so follow up studies should ask local decision makers what is affecting the implementation of culturally tailored interventions.

Another stakeholder that would have benefited from involvement in this project is the California Department of Public Health. The state provides grant funding to health departments that describe the programming that is required for the grant funding. Health departments are required to meet grant requirements, and sometimes have limited room for change. Including the state leadership, especially those who decide the funding for public health interventions, could lead to valuable T2D interventions for the SJV Punjabi community. The Department of Healthcare services added CHWs as a Medi-Cal benefit in 2022. By reaching out to the state with this framework for the Punjabi community in the SJV, they will be able to disseminate it to the local health jurisdictions as a sample for starting a robust CHW program tailored to the rural Punjabi community. There must be encouragement from the state to permit funding to be spent on a culturally tailored intervention for Punjabi communities in rural areas.

Policy Implications

A common theme in this dissertation is the need for more data and information on the Punjabi population. Instead, most demographic data is grouped under the South Asian and Asian categories, which include heterogeneous communities with different histories, cultures, and health outcomes. Punjabi is the third most spoken language between Kern County and Sutter County in California. There is a need to collect data that disaggregates by the Punjabi population to understand further health disparities. Even limiting demographic data collection to "Indian" is not enough to understand the issues the SJV Punjabi population faces. The Punjabi population is a distinct group, thus needing its ethnic category, especially in California, where the Punjabi community is prevalent. This disaggregated data will inform the future funding designation to address T2D and other health issues in the Punjabi population.

Research Implications

There is a need for additional research using key informants to finalize an intervention design, specifically cultural tailoring for rural populations. There is a need to fund future research on collecting data on the SJV Punjabi community and informing future interventions to address those needs. This dissertation can influence intervention design for other communities that live in rural areas, like the Hmong and Latino populations. Replicating the dissertation study to different target populations can improve the intervention literature.

Another proposed study design can focus on intervention recruitment issues with the SJV Punjabi population. Key informants discussed challenges that are faced by SJV Punjabis, like working multiple jobs, financial obligations, societal pressures, and fatalistic attitudes that may impact recruitment for the pilot intervention. This would be an opportunity to research and understand the factors that affect the participation of SJV Punjabis in a T2D prevention intervention.

Future research is needed to study the collaboration between researchers and an advisory committee and how they can effectively work together to push forward their program goals. When an intervention is being designed, conducting qualitative research

to strengthen the design is recommended to increase community involvement and partner buy-in and strengthen the intervention design.

Health Department/Non-Profit Organization Implications

The adapted intervention design, previously implemented in New York City, was modified for the SJV Punjabi community. The intervention logic model and design were adapted based on a rural California location's need. Health departments and non-profit organizations may utilize this intervention design since key informant interviews have tested the design. The next step is to secure funding and test through a pilot study.

Testing the intervention design using key informants or an advisory group is a practice that health departments/non-profit organizations can utilize to ensure their intervention meets the community's needs. The California Department of Public Health (CDPH) created an Advancing Community Equity (ACE) branch and the Community Development and Engagement Section in 2021 where funding was provided to local health departments. This funding encourages local health departments to implement equity-first strategies, specifically for communities that are historically underserved. With this new, ongoing funding for health departments to promote health equity, there needs to be a focus on health issues affecting the SJV Punjabi community. This is a call to action for local health departments to provide interventions culturally tailored to this new vision coming from CDPH's Office of Health Equity.

Future Steps

Moving forward, the recommendation is to implement a pilot intervention to ensure that it effectively meets intervention goals. To do this, buy-in from a health department or an organization is required. In addition, intervention funding is needed to begin funding personnel, supplies, and other costs. The culturally tailored intervention literature needs more research on disaggregated communities that face health disparities. Also, there is a need for more research on how culturally tailored designs are chosen and tested. This dissertation suggests that we better understand the effective use of key informants or advisory committees in culturally tailored intervention design.

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