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Plant-Powered: A Digital Plant-Based Nutrition Intervention for Low-Income Patients with Type II Diabetes

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Plant-Powered: A Digital Plant-Based Nutrition Intervention for
Low-Income Patients with Type II Diabetes

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Abstract

Purpose: This project aimed to measure the acceptability and feasibility of plant-based diets among low-income individuals with type II diabetes at the Samaritan House Food Pharmacy and to create a user-centered pilot program to encourage the adoption of a plant-based diet.

Background: Plant-based diets are effective for preventing, treating, and reversing type II diabetes, but there is not much evidence about the acceptability and feasibility of these diets.

Methods: Focus groups were used to gather qualitative data about the acceptability and feasibility of plant-based diets in the target population. The researcher conducted interviews with Food Pharmacy program leaders to learn about their vision for the program and gather feedback about the proposed digital nutrition education platform. Food Pharmacy clients were asked to engage in usability testing of the pilot plant-based nutrition education website.

Results: An emerging theme in the focus groups was that Food Pharmacy clients were concerned about being able to attend in-person nutrition education meetings due to busy and unpredictable schedules. The leader interviews established several key priorities for the Food Pharmacy: increased sustainability, increased access, and increased convenience of the program. Usability testing with Food Pharmacy clients revealed that the pilot plant-based nutrition education website was highly acceptable.

Conclusion: Plant-based diets are feasible and acceptable among Food Pharmacy clients, and a digital plant-based nutrition education platform is recommended for increasing access.

Keywords: type 2 diabetes, plant-based diet, nutrition education, food pharmacy, digital intervention, online nutrition education, low-income, clinic-based program, chronic disease

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A Digital Plant-Based Nutrition Intervention for
Low-Income Patients with Type II Diabetes

Literature Review

An Introduction to Type II Diabetes

Background. Type II diabetes (T2D) occurs when the body does not properly use insulin. Insulin is released into the body when blood sugar levels are high, such as after a meal, and helps sugar molecules enter cells so that the body can effectively use sugar as energy (ADA, 2015). When somebody has T2D, their body is not as responsive to insulin or does not produce enough insulin, so this process does not work properly. As a result, sugar molecules have trouble entering the cells and providing energy. This insulin resistance leads to high sugar levels in the blood and low sugar levels in the cells. Low sugar content in cells over a long period of time can lead to negative effects on long-term health and well-being. Some of the health consequences of long-term T2D include skin and eye problems, nerve damage, foot complications, dangerously acidic blood, kidney disease, high blood pressure, stroke, heart disease, and poor mental health (ADA, 2018). Additionally, T2D is associated with other chronic diseases, including obesity (Appendix A). There is evidence that managing obesity can slow the progression of pre-diabetes and can help individuals with T2D manage their condition, thus demonstrating the link between these two diseases (Knowler et al., 2002; Tuomilehto et al., 2001).

Increasing prevalence. Not only is T2D a dangerous disease, it is also increasing in the United States (U.S.). Nationally, diabetes rates have continued to rise over the past twenty years despite medical advances and increased attention to this issue. In 1994, all American states had a diabetes prevalence of below 7.4% (CDC, 2017; Appendix A). However, 27 states had a diabetes prevalence of above 9% by 2015, according to the Centers for Disease Control and Prevention

(CDC, 2017). California is facing rising rates of diabetes, reflecting the national situation. According to the American Diabetes Association (ADA), 13.4% of Californian adults have diabetes, which is about 4 million people (ADA, n.d.). Additionally, the ADA estimates that another 1 million adults living in California have pre-diabetes. Pre-diabetes involves higher than normal blood sugar levels, but not quite high enough to receive a diagnosis of T2D (CDC, 2018). The CDC estimates that 90% of people with pre-diabetes do not know that they have the condition. This project focuses on type II diabetes rather than type I diabetes because it is much more common: 90-95% of people with diabetes have type II diabetes (UCSF, 2018).

Prevention and management. There has been substantial research on T2D prevention, management, and reversal in the past few decades. There are two main methods for preventing and managing diabetes: medication and lifestyle changes. Medications for treating T2D typically target blood sugar levels by lowering sugar production and improving the body's sensitivity to insulin to help cells absorb more sugar from the blood (Mayo Clinic, n.d.). Other treatments include lifestyle changes; T2D has been linked to certain lifestyle factors such as high saturated fat intake, lack of exercise, and smoking (Ley et al., 2016; Mayo Clinic, n.d.; Franz et al., 2002). An example of effective diabetes prevention is the evidence-based Diabetes Prevention Program (DPP). The DPP was designed to lower the incidence of T2D through a lifestyle intervention, and researchers found that the program led to a 58% reduction in diabetes incidence (Diabetes Prevention Program Research Group, 2002). A diabetes prevention program that used a medication called metformin led to a 31% reduction in diabetes incidence, showing that lifestyle changes were more effective at preventing T2D than medication (DPP Research Group, 2002).

Type II Diabetes and the Social Determinants of Health

T2D development is influenced by the social determinants of health, which constitute the environment in which a person lives and works, including their food accessibility, housing, relationships, and community (Hill, Nielsen, & Fox, 2013). Researchers have found that risk factors for developing T2D are specifically associated with income, education, race and ethnicity, and environment (Hill, Galloway, et al., 2013). The relationship between social determinants of health and diabetes risk is complex because social determinants affect health-related behaviors, which can in turn affect a person's risk for developing T2D (Figure 1). This section will describe and analyze the social determinants of health that are related to T2D.

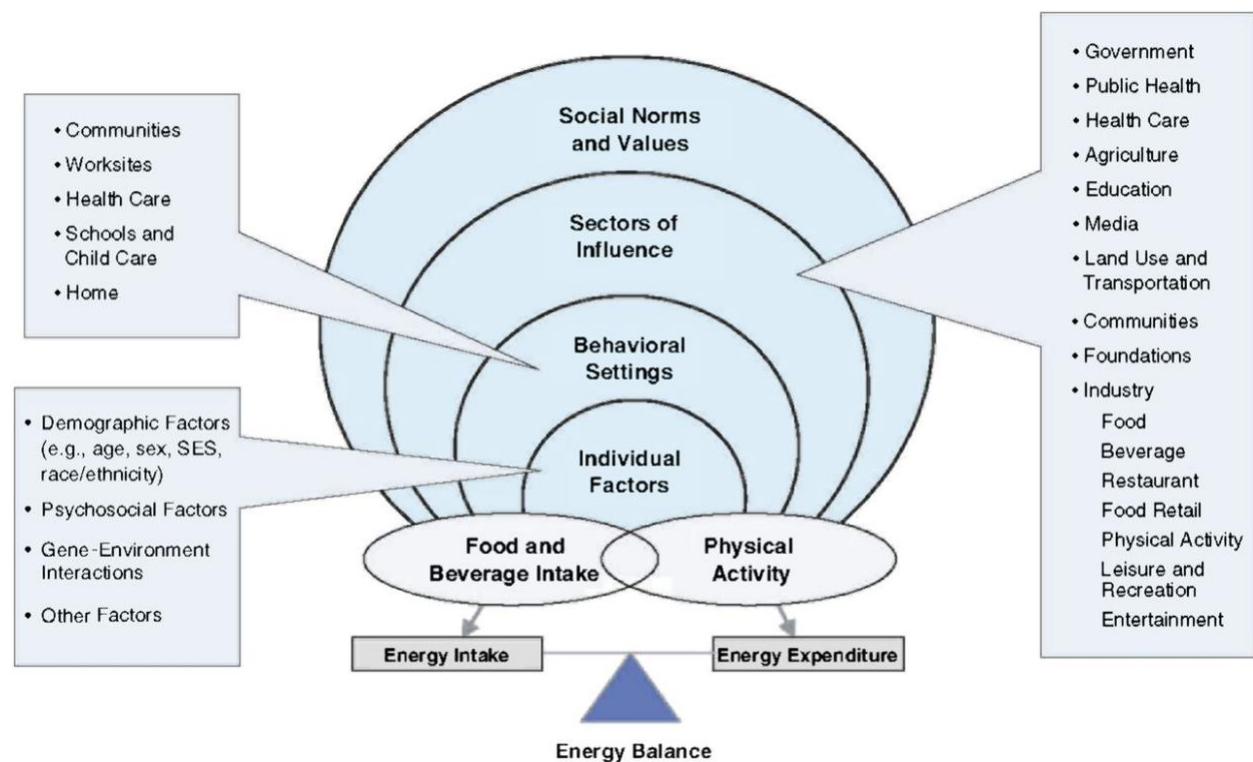


Figure 1. The social determinants of health and T2D (Hill, Galloway, et al., 2013).

Income. Rawshani et al. (2016) found that income level is directly related to all-cause, cardiovascular, and diabetes-related mortality for adults living with T2D. This means that people with low income levels died more often of one of these causes, regardless of access to healthcare,

marital status, or education level. Although this research was not focused on how social determinants of health influence diabetes risk, it exemplifies the strong relationship between T2D complications and the social determinants of health. Another study, done by Hsu et al. (2012), found that T2D rates were correlated with poverty even in places that offer universal healthcare. This research implies that access to healthcare is not necessarily the problem when it comes to T2D risk.

Education. Rawshani et al. (2016) also examined the relationship between education and mortality in people with T2D. They found that education level was associated with mortality for individuals with T2D. Lower education levels were correlated with higher mortality rates. These researchers proposed several possible reasons why education may be associated with T2D deaths, including lower socioeconomic privileges, increased psychosocial stress, lower employment, financial issues, unhealthy behaviors, obstacles to wellness, living in risky areas, and low social support (Rawshani et al., 2016). Another group of researchers found that individuals with low education levels had a higher risk of developing T2D compared to those with high education levels (Sacerdote et al., 2012). These studies show that education has an effect on T2D risk as well as mortality for individuals with T2D.

Race and Ethnicity. In the United States, T2D disproportionately affects racial minority groups. African Americans, Latinx Americans, Native Americans, Native Hawaiians, Pacific Islanders, and Asian Americans all have a higher risk for developing T2D (Chow, Foster, Gonzalez, & McIver, 2012). T2D affects Latinx populations more than white populations: 13% of Hispanic adults in the U.S. have T2D, compared to 7.6% of non-Hispanic white adults (Benavides-Vaello, Brown, & Vandermause, 2017; Smith-Miller, Berry, & Miller, 2017). Additionally, Soltero et al. (2017) predict that 50% of Latinx youth will develop T2D in their

lifetimes. T2D also leads to higher mortality rates among Latinx communities compared to white communities in the U.S. According to Benavides-Vaello et al. (2017), Latinx individuals are 1.5 times more likely to die from T2D compared to non-Latinx white individuals. Benavides-Vaello et al. (2017) suggest that the higher risk of mortality for Latinx people with T2D could stem from low levels of glycemic control due to barriers to proper T2D self-management. These researchers found that many healthcare providers do not fully trust patients to effectively manage their disease, especially for Latinx patients. Additionally, a barrier to self-management is that oftentimes both Latinx patients and their providers believe that the healthcare provider is responsible for T2D management. With around 90% of chronic disease management happening in the patient's social and home environments, self-management skills are of utmost importance to lower the risk of T2D-related complications (Benavides-Vaello et al., 2017).

Environment. The environment includes physical resources in and around an individual's home and workplace. One element of a person's environment is accessibility to nutritious foods. The United States Department of Agriculture (USDA) defines low food security as "reports of reduced quality, variety, or desirability of diet" (USDA, n.d.). Research has found that food insecurity is higher for individuals with T2D compared to those without T2D (Gucciardi, Vahabi, Norris, Del Monte, & Farnum, 2014). These researchers also found that food insecurity leads to higher risk of developing T2D: people in food-insecure households had a 50% higher chance of developing T2D. According to Hill, Galloway, et al. (2013), changing environments may be contributing to lower physical activity and changes in food consumption that increase risk for T2D; these researchers identified urbanization and community environment as factors in T2D risk. For example, urbanization has led to increased access to high-fat, calorie-dense food as well as fewer home-cooked meals. In terms of community environment, lower

income neighborhoods do not have as many spaces for physical activity and recreation, which is associated with decreased exercise and increased overweight (Hill, Galloway, et al., 2013).

These are both risk factors for developing T2D.

Implications related to social determinants of health. The social determinants of health for T2D are complex and intertwined, as shown in Figure 1. There are many lifestyle factors that contribute to the development of T2D, including nutrition and physical activity. Along with lifestyle factors, certain disease states are also risk factors for developing T2D: overweight, obesity, high blood pressure, history of heart disease or stroke, and depression (National Institute of Diabetes and Digestive and Kidney Diseases, 2016). Nutrition is strongly linked to T2D and these other related disease states, and it is also closely related to the social determinants of health. Researchers established a causal link between nutrition and T2D risk (Feldman et al., 2017). Feldman et al. (2017) found significantly less T2D in people who had high fiber intake and significantly more T2D in people who had high fat intake. The following sections will describe the research about how income and race and ethnicity impact nutrition, and therefore T2D risk.

Income and nutrition. Researchers have found that having a low income is associated with unhealthy eating patterns and the development of overweight, obesity, and T2D (Beydoun & Wang, 2010; Woolf et al., 2015; Zarnowiecki, 2017; Pedraza, Popkin, Taillie, & Salgado, 2018). Beydoun and Wang (2010) found that income is linked to obesity risk and proposed a pathway by which low-income groups experience higher obesity levels: people with low income have higher levels of chronic stress, which leads to poor mental health and major depression, which then leads to eating patterns that increase obesity risk. These researchers also pointed out that dietary patterns often vary depending on income because healthier foods are more expensive

and less available to people living in low-income neighborhoods (Beydoun & Wang, 2010). Woolf et al. (2015) found that low-income neighborhoods have fewer produce markets and higher concentrations of fast food restaurants and convenience stores. This lack of access to fresh foods in low-income areas leads to lower consumption of fruits, vegetables, and whole grains (Zarnowiecki, 2017). Zarnowiecki (2017) also found that people with low income consume more processed foods and sugary drinks compared to people who have moderate or high income. These studies show that economic and structural issues lead to higher T2D risk in low-income communities.

Another group of researchers found different shopping patterns based on income level: low-income groups tend to shop more at small, local grocery stores and convenience stores compared to middle- and high-income groups, who shop more at supermarkets (Pedraza et al., 2018). These researchers posit several reasons for this difference, including lack of transportation and less time to spare for shopping for people in lower-income levels, as well as higher prices at supermarkets.

Race, ethnicity, and nutrition. Racial and ethnic minority groups within the U.S. are more likely to experience poverty and discrimination compared to the white majority (American Psychological Association, 2019). Poverty and discrimination heighten the risk of developing T2D and other serious chronic health conditions through unhealthy lifestyle behaviors brought on by chronic stress and lack of access to healthy food. Researchers have also found that increased levels of acculturation in Latinx immigrants leads to worse health outcomes and higher levels of chronic disease (Yoshida et al., 2016). Acculturation refers to integration and assimilation with the dominant culture. Unfortunately, unhealthy eating patterns are widespread in dominant U.S. culture. The Standard American Diet (SAD) is a high-calorie, high-fat diet that

does not include the recommended daily intake of fruits, vegetables, or fiber. About 75% of the population eats too few fruits and vegetables, too little fiber, and too much sugar, salt, and saturated fat (U.S. Department of Health and Human Services, 2015). In Yoshida et al.'s (2016) study, the poor health outcomes in Latinx immigrants were the result of increased consumption of sugar and fat and lowered consumption of fruits and vegetables as individuals became integrated into mainstream U.S. culture.

Biomarkers, Lifestyle Behaviors, and Type II Diabetes

The previous section introduced how the social determinants of health impact an individual's risk of developing T2D through lifestyle behaviors, such as nutrition and physical activity. This section will review how these lifestyle behaviors lead to T2D through disease states such as overweight, obesity, and insulin resistance.

Biomarkers. Biomarkers are biological measurements that accurately indicate a person's state of health (Strimbu & Tavel, 2010). Important biomarkers for determining somebody's T2D risk include high body fat percentage, fatty liver, and insulin resistance (Sung et al., 2012). Excess body fat is a strong predictor for T2D onset (Ley et al., 2016). Body fat percentage is also a mediator of the relationship between family history of T2D and the onset of T2D in an individual. This means that some of the genetics attributed to T2D onset can be explained by overweight and obesity, which may or may not be genetic in nature. Fatty liver is closely linked to both obesity and insulin resistance and is associated with T2D risk (Dharmalingam & Yamasandhi, 2018).

Insulin resistance is arguably the most important indicator for measuring T2D risk, and it is closely linked to metabolic syndrome (Taylor, 2012). Metabolic syndrome is a cluster of biomarkers that are all associated with T2D: high blood sugar, high blood pressure, high levels

of fat in the blood, and large waist circumference (Shin et al., 2013). Insulin resistance is the biomarker that causes the other biomarkers of metabolic syndrome. Insulin resistance refers to the reduced ability of body cells to respond to insulin, and the result of this resistance is that less sugar is transported from the blood stream into the cells. This disrupted biological process is what leads to high levels of blood sugar and the T2D diagnosis. Some researchers have proposed that insulin resistance is ultimately caused by excess body fat cells around the abdominal area (Hardy, Czech, & Corvera, 2012). The accumulation of abdominal fat cells is correlated with impaired insulin signaling and leads to heightened inflammation in the body. Inflammation and problems with insulin signaling lead to the development of insulin resistance and T2D.

Lifestyle behaviors. There are several lifestyle behaviors that lead to increased body fat and insulin resistance: physical activity, sleeping, smoking, and nutrition. Researchers have found significant evidence that lifestyle factors affect the onset of T2D.

Physical activity. Researchers have found that physical activity has an effect on T2D risk. Moderate to intense regular physical activity is associated with a lower T2D risk, and low or no physical activity is associated with higher T2D risk (Ley et al., 2016). This relationship is most likely mediated by energy expenditure. When more energy is expended, an individual will not gain as much weight, which will lead to lower total body fat and, in turn, a lower risk of developing T2D.

Sleeping. Sleep quantity and quality are also associated with T2D risk (Ley et al., 2016). Both excessive sleeping (over 9 hours) and lack of sleep (less than 5 hours) are associated with a higher risk of developing T2D. Poor quality of sleep, such as interruptions or snoring, can also increase T2D risk.

Smoking. Both passive and active smoking are associated with a higher risk of developing T2D (Ley et al., 2016). However, current active smokers have the highest risk, and the risk of developing T2D is directly associated with smoking frequency. The more a person smokes, the higher their risk for T2D.

Nutrition. According to researchers, nutrition has the most influence on the development of T2D of all lifestyle behaviors because it is most closely linked to body fat percentage and therefore insulin resistance. In terms of diet components, several nutrients have been tested for diabetes risk: fat, fiber, meat, and vegetables (Ley et al., 2016). Although there is not consistent evidence linking fat intake to T2D risk, there is strong evidence that plant-based fats lead to lower T2D incidence compared to animal-based fats. Additionally, high-fiber diets are associated with lower T2D risk, especially when that fiber comes from whole grains (Feldman et al., 2017; Ley et al., 2016). Vegetables are not correlated with diabetes risk in general, but a higher intake of green leafy vegetables was associated with a lower T2D risk. Researchers have found a strong association between T2D risk and both red and processed meat intake. This means that eating higher levels of red and processed meat leads to higher T2D risk. Processed meat (e.g. bacon) intake has a stronger link to high T2D risk than red meat intake. Researchers have also looked into broader dietary patterns and their effects on T2D risk (Ley et al., 2016). In general, eating more fruits, vegetables, whole grains, and legumes and less meat, processed grains, and sugary beverages is associated with lower T2D risk.

Nutrition and Type II Diabetes

An individual's diet has a significant impact their risk of developing T2D. Researchers have found that certain eating patterns can lead to the primary risk factors of T2D: obesity, fatty liver, and insulin resistance (Sung, Jeong, & Byrne, 2012). These eating patterns are linked to the

social determinants of health and are mediators of the relationship between social determinants and T2D risk. Oftentimes, the pathway from a social determinant to a high risk of developing T2D starts with social circumstances that lead to unhealthy eating patterns, which leads to overweight, obesity, fatty liver, and insulin resistance (Sung et al., 2012). This section will provide an overview of the research on nutrition and T2D, including how food can be used to prevent, manage, and even reverse T2D.

Two macronutrient-based interventions that researchers have looked at for preventing and managing T2D are ketogenic diets and plant-based diets. Some researchers suggest a ketogenic diet that is low-carbohydrate and high-fat is effective for managing blood sugar levels and reducing weight (Boden, Sargrad, Homko, Mozzoli, & Stein, 2005; Brouns, 2018; Athinarayanan et al., 2019). Other nutrition researchers suggest that a plant-based diet that is high-fiber, low-fat may be more effective for preventing, managing, and reversing T2D (Zhao et al., 2018; Bellou, Belbasis, Tzoulaki, & Evangelou, 2018; MacLeod et al., 2017; Barnard et al., 2006; Jenkins et al., 2003).

The ketogenic diet. The standard ketogenic diet includes 75% fat, 20% protein, and 5% carbohydrates (Mawer, 2018). The goal of the ketogenic diet is to create ketosis in the body. Ketosis occurs when the body uses fat for energy rather than its usual fuel of sugar. Boden et al. (2005) found that after 14 days of a strict low-carbohydrate diet, participants experienced weight loss, normalized blood glucose levels, and about a 75% improvement in insulin sensitivity. There have been similar findings according to a review conducted by Brouns (2018); however, there is little evidence that carbohydrate-restricted diets lead to long-term benefits for people with T2D. Brouns (2018) found evidence that ketogenic diets can be helpful in the short-term but did not find any studies exploring the long-term effects. Some researchers have warned that a ketogenic

diet could be detrimental in the long term due to the low fiber and high fat content that leads to high cholesterol and higher mortality rates in those who adhere to it (Brouns, 2018). There is also concern that ketogenic diets are not sustainable in the long term because they are difficult to adhere to (Brouns, 2018).

However, there is preliminary evidence that ketogenic diets could help manage T2D in the long term. A 2-year study found that ketogenic diets led to a reduction in T2D biomarkers such as sugar levels, blood pressure, and weight compared to American Diabetes Association (ADA) guidelines (Athinarayanan et al., 2019). This study seems to suggest that low-carb, high-fat diets may be sustainable and beneficial long-term. However, there are several caveats to consider. The researchers were aiming to use nutritional ketosis to help manage and reverse T2D, but only 14.1% of participants reached the recommended levels of ketosis, meaning that most participants were not eating a true ketogenic diet. The intervention group in this study was also provided with continuous remote care, which involved a web-based application for tracking nutrition and biomarkers, daily feedback from a care team, education and support from providers and health coaches, and telemedicine appointments (Athinarayanan et al., 2019). The control group received usual care from their primary care provider and counseling from a registered dietitian on ADA diet guidelines. Some of the positive changes in T2D that the intervention group experienced could be attributed to the individualized care and support they received. Stone et al. (2010) found that active care management with home telemonitoring significantly improved T2D biomarkers compared to usual care. This evidence suggests that the improvements in Athinarayanan et al.'s (2019) study could have been due, at least in part, to the more active and involved care in the intervention group. Another concerning element of this

study is that the intervention group had increased levels of LDL cholesterol, which can lead to a dangerous buildup of cholesterol in the arteries that is a risk factor for heart disease.

The plant-based diet. Diets high in cholesterol and saturated fats correlate with chronic diseases, such as T2D and heart disease, suggesting that dietary patterns that include many animal products may be leading to increased diabetes risk. Many studies have found that high-carbohydrate, low-fat, plant-based (PB) diets are effective for preventing and treating T2D (Barnard et al., 2006; McMacken & Shah, 2017; Turner-McGrievy, Barnard, Cohen, Jenkins, Gloede, & Green, A., 2008; Kahleova et al., 2011; Goff, Bell, So, Dornhorst, & Frost, 2005). PB diets emphasize the consumption of whole grains, legumes, fruits, vegetables, nuts, and seeds, and discourage the consumption of animal products. Although both PB diets and low-carbohydrate diets have been shown to improve T2D outcomes, there is stronger evidence in favor of PB diets. Researchers have found that PB diets are more feasible in the long term, help prevent, manage, and reverse T2D and other chronic conditions, and do not require restrictive eating patterns.

The foundational randomized clinical trial about PB diets was conducted by Barnard et al. (2006). These researchers found that patients with T2D who were randomized to a low-fat vegan diet had significantly better biometric outcomes compared to patients randomized to the American Diabetes Association (ADA) diet after 22 weeks. The participants in the vegan group were instructed to avoid animal products and added fats, and to eat vegetables, fruits, grains, and legumes with an emphasis on low-glycemic foods such as beans and green vegetables. Their portion sizes, energy intake, and carbohydrate intake were not restricted. The participants in the ADA diet group were prescribed a 500-1000 calorie intake depending on body mass index (BMI), which constitutes an energy deficit. They were not told to avoid any particular foods but

were instructed to limit calories to the prescribed amount. The results of this study showed that participants following a low-fat vegan diet improved significantly more than the participants following the ADA diet in terms of reducing medications, reducing glycated hemoglobin (HbA1c) levels, reducing body weight, and reducing LDL cholesterol (Barnard et al., 2006). HbA1c is a measure of average blood glucose over time. A surprising result of this study was that adherence rates were higher in the vegan group compared to the ADA group: 67% adherence in vegan group versus 44% adherence in the ADA group. Barnard et al. (2006) suggested that this higher adherence level could be due to the simpler instructions and lack of portioning or calorie restriction in the vegan diet.

More recent research has also shown the same pattern – PB diets are effective for the prevention and management of T2D. Zhao et al. (2018) found that that low dietary fiber intake leads to the development of T2D through negative effects on gut microflora. This finding is consistent with other intervention studies that have shown protective diets include increased whole grains and decreased red and processed meat (Bellou et al, 2018; MacLeod et al., 2017). In other words, people who eat more whole grains and less red and processed meat have a lower risk of developing diabetes. These results are similar to Ley et al.’s (2016) findings that processed meats are strongly linked to T2D risk. Yokoyama, Barnard, Levin, and Watanabe (2014) conducted a meta-analysis and found that PB diets were associated with lower blood glucose and HbA1c levels. The elements of a PB diet that led to these positive changes were decreased protein, fat, and cholesterol intake along with increased carbohydrate and fiber intake. Along with improving T2D biomarkers, PB diets also improve cardiovascular health, high blood pressure, weight, and fat levels in the blood (Yokoyama et al., 2014). McMacken and Shah (2017) conducted a literature review and also found that PB diets are effective for preventing and

treating T2D. These researchers further identified that the source of carbohydrates, fats, and protein are critically important for T2D outcomes. They found that unrefined carbohydrates, unsaturated fats, and plant proteins were superior to refined carbohydrates, saturated and trans fats, and animal proteins (McMacken & Shah, 2017).

There is also evidence that PB diets lead to the reversal of T2D as shown by biomarkers and discontinued use of medications (Barnard et al., 2006; Jenkins et al., 2003; Lee, 2016). In Barnard et al.'s (2006) study, 43% of the vegan intervention group reduced diabetes medications, compared to 26% of the non-vegan control group. Additionally, the intervention group reduced their HbA1c levels by 1.23 compared to 0.38 in the control group (Barnard et al., 2006). Jenkins et al. (2003) found that a PB diet led to a 39% reduction in insulin and a 71% reduction in oral blood sugar medications for participants with T2D. All of these researchers found that PB diets decrease T2D biomarkers, such as HbA1c and blood sugar levels (Barnard et al., 2006; Jenkins et al., 2003; Lee, 2016).

Ketogenic diet vs. plant-based diet. Both the ketogenic diet and the PB diet have been shown to improve T2D outcomes. Ketogenic diets seem to do this by allowing the body to use fat as fuel. PB diets improve T2D outcomes through weight loss, reductions in LDL cholesterol, lowered inflammation, and improved insulin sensitivity (Satija et al., 2016; Trapp & Levin, 2012). These factors lead to less insulin resistance and improved T2D biomarkers such as HbA1c and blood sugar levels.

Possible mechanism behind ketogenic diet. There is conflicting evidence within the nutrition literature about the effects of saturated fats on T2D. Some researchers identified high levels of saturated fats as risk factors for developing T2D, but others encourage a ketogenic diet that usually includes high levels of animal fats. Saturated fats are primarily found in animal

products like meat, cheese, and eggs, so PB diets are usually low in saturated fat. A possible mechanism within ketogenic diets is that by allowing the body to burn fat, these diets are eliminating some of the risk factors that accompany high saturated fat intake. As discussed earlier in this review, excess body fat is the most important risk factor for T2D. If a ketogenic diet successfully allows a person with T2D to enter ketosis and burn fat for energy, then it would theoretically help lower the amount of body fat and therefore improve T2D outcomes. However, excess body fat is easily produced by eating excess amounts of fat in the diet (Jéquier & Bray, 2002). If a person is not in ketosis and burning fat, then eating high amounts of saturated fats in a ketogenic could potentially lead to worse T2D outcomes because it will lead to more body fat.

Trade-offs between the diets. Although both PB diets and ketogenic diets improve T2D outcomes, it is important to consider the trade-offs of each.

Ketogenic diet trade-offs. As discussed, there is preliminary evidence that ketogenic diets are effective for improving T2D outcomes. The research on ketogenic diets has some major limitations. Firstly, there have mostly been short-term studies and only one long-term study. Even the long-term study was only for 2 years. Secondly, the long-term ketogenic study had a relatively weak design which could have led to inaccurate results (Athinarayanan et al., 2019). In addition, ketogenic diets may effectively improve T2D in the short term, but it may lead to other dangerous health issues. One of the results that Athinarayanan et al. (2019) did not expand upon was that the ketogenic diet group experienced heightened LDL cholesterol levels compared to the usual care group. High cholesterol is a risk factor for coronary heart disease, the leading killer in the U.S. (CDC, 2017). Another consideration is the affordability of ketogenic diets. High-fat foods such as meat, dairy products, and eggs, are relatively expensive (Bureau of Labor Statistics, 2019). All meat products are at least \$1.40 per pound and can be as expensive as \$8.1

per pound for high-quality red meat. Dairy products are also expensive, ranging from \$3 to \$4.6 per pound. The ketogenic diet also encourages consumption of non-starchy vegetables, such as peppers, broccoli, and mushrooms. These types of vegetables are more expensive than starchy vegetables like carrots and sweet potatoes (Bureau of Labor Statistics, 2019). The evidence in favor of ketogenic diets is currently inconclusive based on these trade-offs.

Plant-based diet trade-offs. Overall, there is stronger evidence in favor of PB diets for preventing, managing, and reversing T2D. PB diets are also protective against heart disease and other chronic conditions like high blood pressure, cancer, and obesity (Greger, 2015). PB diets are very affordable. The staples of PB diets are legumes and whole grains, which both cost under \$1 per pound (Farmlead, 2018; Statista, 2018). There are no financial or health reasons not to follow a PB diet. However, one of the most common criticisms of PB diets is that they are not feasible for a number of different reasons. Although there is preliminary evidence that PB diets are feasible and acceptable, these eating patterns are still not prescribed very often by primary care providers, and only 5% of the population self-identifies as vegetarian (Searing, 2019).

The Feasibility and Acceptability of Plant-Based Diets

There are several factors that contribute to the lack of mainstream acceptance of PB diets: cultural and societal expectations about food, fear that patients will not adhere, and a lack of research.

Cultural and societal expectations about food. Firstly, there are cultural traditions and biases towards different dietary patterns, and PB diets do not usually fit into these cultural patterns. For example, Neff et al. (2018) performed a national survey study and found that half of the respondents did not increase or reduce their meat intake over the past 3 years. Of these respondents, most of them reported a belief that humans need to eat meat in order to be healthy.

This belief seems to be relatively widespread in the U.S., and it may hinder the progress of PB diet popularity. Another group of researchers defined “meat attachment” as a positive bond towards meat consumption (Graça, Calheiros, & Oliveira, 2015). They found that higher meat attachment was associated with lower willingness to reduce meat consumption and lower willingness to follow a plant-based diet.

Fear that patients will not adhere to PB diets. Secondly, providers fear that patients will not adhere to PB diets, so may not encourage this dietary pattern even though it is the best option for T2D prevention and management. Lee, McKay, & Ardern (2015) analyzed perceptions about and awareness of PB diets for treating and managing T2D in both patients and providers. These researchers found that 66% of patients would be willing to try a PB diet for 3 weeks. However, they found a low rate of providers promoting PB diets, and only 9% of patients currently followed a PBD. Barnard et al. (2006) found a higher adherence rate in their PB diet group compared to their ADA diet group, possibly due to the simplicity of the PB diet recommendations. It seems the fear about lack of adherence may be unfounded, but further research is needed to fully explore this issue.

Lack of research about feasibility and acceptability of PB diets. Thirdly, there is no research that directly explores the adherence, feasibility, and acceptability of PB diets for individuals with T2D in the current literature. Learning more about these factors could help practitioners and public health professionals improve diabetes nutrition education and community-based programs that aim to prevent and manage T2D. The current study aimed to address this gap in the literature by exploring the acceptability and feasibility of PBDs through focus groups in a sample population of patients with T2D in San Mateo County, California.

Agency Profile

Background

History. Samaritan House (SH) is a non-profit organization that was established in 1974 to serve residents of San Mateo County who are in need (Samaritan House, 2019a). Their motto is “neighbor helping neighbor,” and this sentiment is still alive at SH today through the provision of nine different community services aimed at alleviating poverty in the county.

Mission. The mission of SH is the following: “We mobilize the resources of our community to help those among us who are in need. Our dedicated professional staff and volunteers work together to provide food, access to shelter, healthcare, and a broad range of supportive services. We preserve dignity, promote self-sufficiency, and provide hope” (Samaritan House, 2019b).

Staffing. SH relies heavily on volunteer service for day-to-day activities, but they also have a diverse range of professional staff, including physician assistants, medical assistants, cooks, counselors, and members of the executive team. They have approximately 85 paid staff and over 3,500 volunteers.

Funding. According to SH’s 2018 annual report, most support comes from in-kind contributions, followed by monetary funding from government, individuals and bequests, foundations, healthcare districts, business and community groups, and “other” (SH 2018 Annual Report, 2018).

Services and target population

Services and programs. SH provides a broad range of supportive and alleviative services to San Mateo community residents. New clients first meet with a case manager in order to determine their needs. The food service team provides 156,000 hot meals and 40,000 grocery

bags each year, making them the main food distributor in the county. SH also provides a short-term safe harbor shelter for people experiencing homelessness, through which clients can receive services such as job search assistance, financial coaching, and meals. They have two free healthcare clinics that provide dental and medical care for uninsured individuals. SH's worker resource center provides a safe space for workers to obtain fair employment. Additionally, they provide free clothes for children and adolescents through the Kids Closet service. Their housing services help families with emergency rent or utility bills to reduce eviction rates. Finally, the financial empowerment program provides personalized financial coaching to increase financial literacy and establish sound financial habits.

Target population. The services provided by SH are intended to provide support and aid to San Mateo county residents who are living in poverty, experiencing homelessness or housing instability, and those without health insurance.

Food Pharmacy Program

The current study was conducted as part of a Master of Science in Behavioral Health and Master of Public Health fieldwork project with the Food Pharmacy (FP) program at SH San Mateo Free Clinic. In January 2016, SH, in partnership with Second Harvest Food Bank (SHFB), opened the first ever California food pharmacy at their Redwood City clinic (San Francisco Examiner, 2016). This model involves physicians giving patients with T2D a "food prescription", through which they receive weekly healthy groceries and monthly nutrition workshops at the clinic free of charge. Another food pharmacy was opened in September 2016 at the Samaritan House San Mateo free clinic, where the current study was done. Eighty-two percent of the FP clients identify as Latinx, and this program addresses a critical issue for Latinx

residents of San Mateo County. Approximately 24% of Latinx people in San Mateo have diabetes, compared to 4% of white residents (Appendix B).

The researcher conducted focus groups to evaluate the acceptability and feasibility of PB diets for low-income, primarily Latinx patients who have T2D who use the FP program. The researcher also conducted interviews with leaders of SH and SHFB to determine their vision for the FP program and gather feedback about a digital PB nutrition education intervention. The focus groups and interviews informed the development of a pilot PB nutrition education website. The researcher conducted usability testing with FP clients to determine the acceptability and feasibility of the website. This study provides useful information for SH about FP patient perceptions and attitudes towards plant-based foods and digital nutrition education platforms. It also offers transferable, practical recommendations about implementing PB nutrition education for other organizations that serve low-income populations with T2D.

Method

Questions, aims, and purpose

Questions. There are two main research questions that drive the current study.

1. Are plant-based diets (PBDs) feasible and acceptable as a treatment option among individuals with type two diabetes (T2D), especially among those who identify as Hispanic/Latinx?
2. How can organizations like SHSM and SHFB increase uptake of PBDs among FP patients?

Purpose. The primary purpose of this study was to examine the psychological and social factors that impact adherence to PBDs and discover solutions that will lead to more individuals following PBDs, leading to better T2D prevention and management.

Aims. The first aim was to assess barriers and facilitators to eating more PB foods and the acceptability of PBDs. The second aim was to create a client-centered, evidence-based pilot program based on the findings about acceptability, barriers, and facilitators. The third aim was to provide organizations, like SHSM, with evidence-based PBD programming to help increase adherence to PBDs among individuals with T2D.

Study design

Phase 1: Focus groups. The first element of this study was a set of semi-structured focus groups with FP clients to help answer the following questions.

1. What are perceived barriers and facilitators to adopting a PBD in this population?
2. How does this population perceive eating more plant products and fewer animal products? What about labels such as vegetarian, plant-based, vegan, meat-eater, omnivore?
3. Are patients willing to try a PBD?
4. What thoughts and feelings arise with relation to topics about nutrition and diabetes in this population?
5. What emerging information about these topics can help inform the pilot and intervention recommendation?

Phase 2: Leader Interviews. The focus groups uncovered emerging needs such as access to nutrition education and concerns around ability to attend in-person workshops. Participants wanted to learn about PBDs and healthy habits for people with T2D, but they were concerned about being unable to come to the clinic in person due to busy and unpredictable personal schedules. The researcher discovered that a website could be a more accessible platform

for FP patients. Semi-structured interviews were conducted with leaders at Samaritan House (SH) and Second Harvest Food Bank (SHFB) to learn about their views of the FP and gather feedback about the website. These interviews were structured to answer the following questions.

1. What are the goals and priorities for the FP program, according to leadership?
2. What do the leaders view as important next steps for the FP program?
3. Do the leaders see sustainability as a priority?
4. What do the leaders think about implementing a web-based PB nutrition education intervention?
5. How do the leaders see a website fitting into the current FP model?

Phase 3: Usability testing. The leaders from SHFB and SH responded positively to the idea of a website, so the researcher designed a pilot website that aligned with both organizations' visions for the FP. This phase of the study involved a usability test of the pilot website. A talk aloud method and questionnaire were used to gather data from participants in person. It was structured to answer the following questions.

1. Is the pilot website acceptable and usable to FP patients?
2. What modes of communicating information do FP patients prefer?
3. Is an online education intervention feasible for FP patients?

Participants

Focus groups. The target population for the focus groups was patients at Samaritan House Free Clinic in San Mateo who have T2D and are enrolled in the FP program. Most of the FP clients are Latinx and speak Spanish as a first language, and the majority of the sample population for this study was Latinx.

Interviews. The target population for the interviews was leaders at both Samaritan House (SH) and Second Harvest Food Bank (SHFB).

Usability testing. The target population for usability testing was patients at Samaritan House Free Clinic in San Mateo who have T2D and are enrolled in the FP program. An additional inclusion criterion was that the participants had to own and regularly use either a computer or a smartphone. This criterion was implemented in order to ensure a basic understanding of how to navigate a website for the usability testing and to decrease shame if participants did not know how to use a computer or smartphone.

Sampling and recruitment

Focus groups. The FP client list was used as a sampling frame for this study. The FP list consists of 150 clinic patients who have T2D and have been referred to the FP by their physician to receive nutrition education and weekly free healthy groceries. The clients are primarily Latinx and Spanish-speaking (82%), but there are some clients who are English-speaking (18%) and from different cultural and ethnic backgrounds. English-speaking participants were not excluded from the study. If a client was interested in participating, they had the opportunity to do so. The researcher scheduled focus groups based on availability and language to accommodate all participants. For the Spanish focus groups, an interpreter helped the researcher understand what participants were saying, and the group was run in Spanish. For the English focus groups, the researcher did not use an interpreter and the group was run in English.

Potential participants were called using the sampling frame in order to market and recruit for the focus groups. Participants were placed into focus groups based on availability, as the recruitment script explains (Appendix D). Each participant went through verbal informed consent in order to participate in the focus groups (Appendix E). Participants from the focus

groups were told that there would be a pilot study based on what the researcher learned from them during the focus groups. At the end of each focus group, the researcher recorded which participants were interested in the pilot so they could be contacted later. Participants received a \$20 Safeway gift card as an incentive and thank-you gift for their participation in the focus groups.

Leader interviews. The researcher used existing connections with the leaders of the Food Pharmacy (FP) in order to schedule interviews. The interviewees included a medical leader from Samaritan House (SH) and two nutrition education leaders from Second Harvest Food Bank (SHFB). The interviewees were contacted via email in order to schedule the interviews.

Usability testing. Participants for the usability testing portion of the study were recruited from the FP client list. The researcher needed to conduct this portion of the study in person rather than over the phone, so attended the clinic to do on-the-spot usability testing sessions with FP patients. Participants received a \$20 Safeway gift card as an incentive and thank-you gift for their participation in the usability testing. The additional inclusion criterion of regularly using a smartphone or computer was implemented through conversing with potential participants. The researcher started the recruitment process by greeting the potential participant and then asking them if they use a smartphone or computer. If they replied “no,” the researcher thanked them and ended the conversation. If they replied “yes,” the researcher explained the usability testing process and asked if they would like to participate.

Data collection instrument development

Focus group guide. The semi-structured focus group guide was created with the target population in mind and were informed by online courses and tools about how to run focus groups (Community Tool Box, 2018; MethodsMcr, 2014). The Behavior Change Wheel’s capabilities,

opportunities, and motivations behavior system (COM-B) was used as a theoretical framework for developing the goals of the focus group as well as the guide (Michie, van Stralen, & West, 2011).

Behavioral Analysis and COM-B Framework. Michie et al. (2011) developed a behavior change system called the Behavior Change Wheel that is guided by three main constructs: capabilities, opportunities, and motivations for behavior (COM-B). For the purposes of this study, the researcher will call this model the COM-B framework. COM-B includes various capabilities, opportunities, and motivations for behavior change and links them to specific intervention functions (Michie et al., 2011). The main components of COM-B are physical capability, psychological capability, physical opportunity, social opportunity, reflective motivation, and automatic motivation (Table 1). COM-B is also informed by the Theoretical Domains Framework (TDF). The TDF involves 14 domains that influence behavior change, and these domains are linked to COM-B constructs (Figure 2) (Atkins et al., 2017). The researcher analyzed barriers and facilitators of the target behavior change, eating more PB foods, for this population. The Behavior Change Wheel's COM-B framework was used to plan, organize, and perform the behavioral analysis (Appendix C). This analysis informed the development of the focus group guide and preliminary pilot program intervention functions.

Table 1

COM-B components, definitions, and examples (Michie et al., 2011).

| COM-B model component Definition | Example |
|--|--|
| Physical capability Physical skill, strength or stamina | <i>Having the skill to take a blood sample</i> |
| Psychological capability Knowledge or psychological skills, strength or stamina to engage in the necessary mental processes | <i>Understanding the impact of CO2 on the environment</i> |
| Physical opportunity Opportunity afforded by the environment involving time, resources, locations, cues, physical 'affordance' | <i>Being able to go running because one owns appropriate shoes</i> |
| Social opportunity Opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way that we think about things, e.g. the words and concepts that make up our language | <i>Being able to smoke in the house of someone who smokes but not in the middle of a boardroom meeting</i> |
| Reflective motivation Reflective processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad) | <i>Intending to stop smoking</i> |
| Automatic motivation Automatic processes involving emotional reactions, desires (wants and needs), impulses, inhibitions, drive states and reflex responses | <i>Feeling anticipated pleasure at the prospect of eating a piece of chocolate cake</i> |

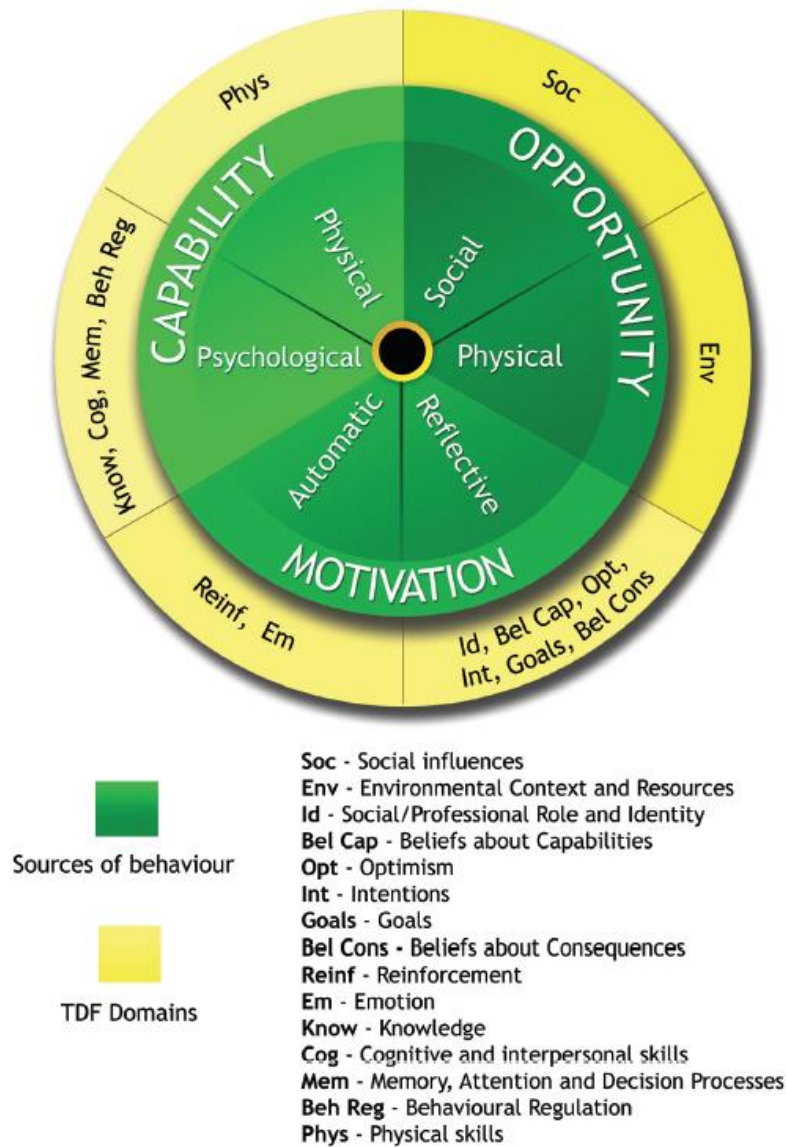


Figure 2. Linking COM-B and TDF components. COM-B is the green portion of the wheel. TDF is the yellow portion of the wheel (Michie et al., 2011).

Leader interview guide. The leader interview guide was developed in conjunction with literature about building sustainable community health programs in order to evoke these topics throughout the conversations (Ament et al., 2017; Ceptureanu, Ceptureanu, Luchian, & Luchian, 2018). The leader interview guide is available in Appendix F.

Usability testing. The Health Information Technology Usability Evaluation Scale was modified and used to measure the usability of the FP pilot website (Schnall, Cho, & Liu, 2018). A talk aloud method was also used to gather insight into participants' opinions and needs in a user-centered design process (Lyles et al., 2016). The pilot website was created using Weebly, a free website developing platform. The usability questionnaire is available in Appendix G.

Data collection procedures

Focus groups. Focus group sessions were audio recorded. For Spanish-speaking groups, both the original Spanish and the English translation were recorded. The clinical interpreter spoke an English translation directly into the recording device as participants were speaking in order to facilitate more efficient transcription. The researcher transcribed the focus groups directly from the audio recordings. No names were used in the transcriptions to protect patient privacy. The clinic interpreter and the researcher were the only people who heard the contents of the focus group. The researcher was the only person who had access to the audio recording, which was stored on a password-protected computer.

The focus group procedures did not happen exactly according to plan. The researcher had scheduled 4 focus groups with a total of 18 participants, but the attrition rate was very high. One group had 3 attendees. Two groups had 1 attendee each, and one group had 2 attendees. The total number of participants by the end of the initial focus groups was 7, and the researcher was aiming for around 15. Another focus group was scheduled at the same time as the monthly nutrition workshop at the clinic, and 6 additional participants attended. The recruitment procedure of calling and scheduling focus groups for non-established times did not work very well for participant turnout.

Interviews. The interview with the SHSM leader was audio recorded, and the group interview with the SHFB leaders was documented with detailed notes. The researcher was the only other person in the room with the interviewees during both interview sessions. The researcher used the audio recording to create a transcription of the SHSM interview. The detailed notes included themes and quotes from the interview with SHFB, which was used to create a semi-transcription of this interview.

Usability testing. Participants talked to the researcher as they explored the sample FP website on either their own smartphone or the researcher's smartphone or computer. The researcher recorded notes of what participants said as they used the website. The researcher then went through a questionnaire with participants to gather both qualitative and quantitative data. The questionnaire was hosted on Qualtrics. The researcher read questions aloud and entered answers for the participants if requested in order to accommodate different literacy levels and avoid creating a shameful experience.

Data analysis procedures

Focus groups. Dedoose was used to perform a thematic analysis of the transcribed focus group conversations. The purpose of this analysis was to identify the barriers and facilitators to PBDs and other emerging themes that are relevant to the study.

Interviews. Dedoose was used to perform a thematic analysis of the transcribed interviews.

Usability testing. The data were exported to Excel from Qualtrics for quantitative and qualitative analysis. Excel was used to perform descriptive analyses on the survey questions. Qualitative data from the questionnaire were inputted into Excel and organized based on themes. The qualitative excerpts were short, so Dedoose was not used for this third phase of the study.

Results

Focus Groups

In order to identify the barriers, facilitators, and motivations that clients associate with plant-based eating and type II diabetes, the researcher conducted focus groups and interviews with FP clients at SHSM free clinic. The three focus groups were conducted in Spanish and the two interviews were conducted in English. The representative quotations reported in this section are English translations given by a certified clinical interpreter (Table 2). There was participant attrition between recruitment and focus groups, as represented in the CONSORT diagram (Figure 3).

Participant demographics. The focus groups were conducted with 13 Food Pharmacy clients who have type II diabetes. Twelve of the 13 participants are Spanish-speaking and consider themselves to be of Latinx or South American heritage. Home countries include Mexico, El Salvador, and Peru. One participant is from the Philippines and speaks English as a second language. The gender distribution of participants was relatively equivalent, with 6 men and 7 women. All of the participants were middle-aged, between 45-65 years old.

Themes. This section includes an account of the major themes that emerged during the focus groups, ordered from highest to lowest number of occurrences throughout the conversations: positive towards PB diet (148), food, eating, and cooking (109), interactions among participants (90), nutrition topics (31), perception of what is healthy (18), asking questions (16), anxious about timing and scheduling (15), perception of PB diet contents (15), and mention of heritage, culture, or nationality (15). Table 2 includes all of the focus group themes along with representative quotes and the number of times the themes were mentioned during conversations. The focus group conversations centered on food, nutrition, and health,

which is probably why these themes were mentioned more frequently. However, emerging themes such as anxiety about timing and scheduling and heritage, culture, or nationality were important to note in the results as well. The themes were analyzed according to the COM-B framework, as discussed in the method section, and were linked to COM-B categories during analysis (Table 3).

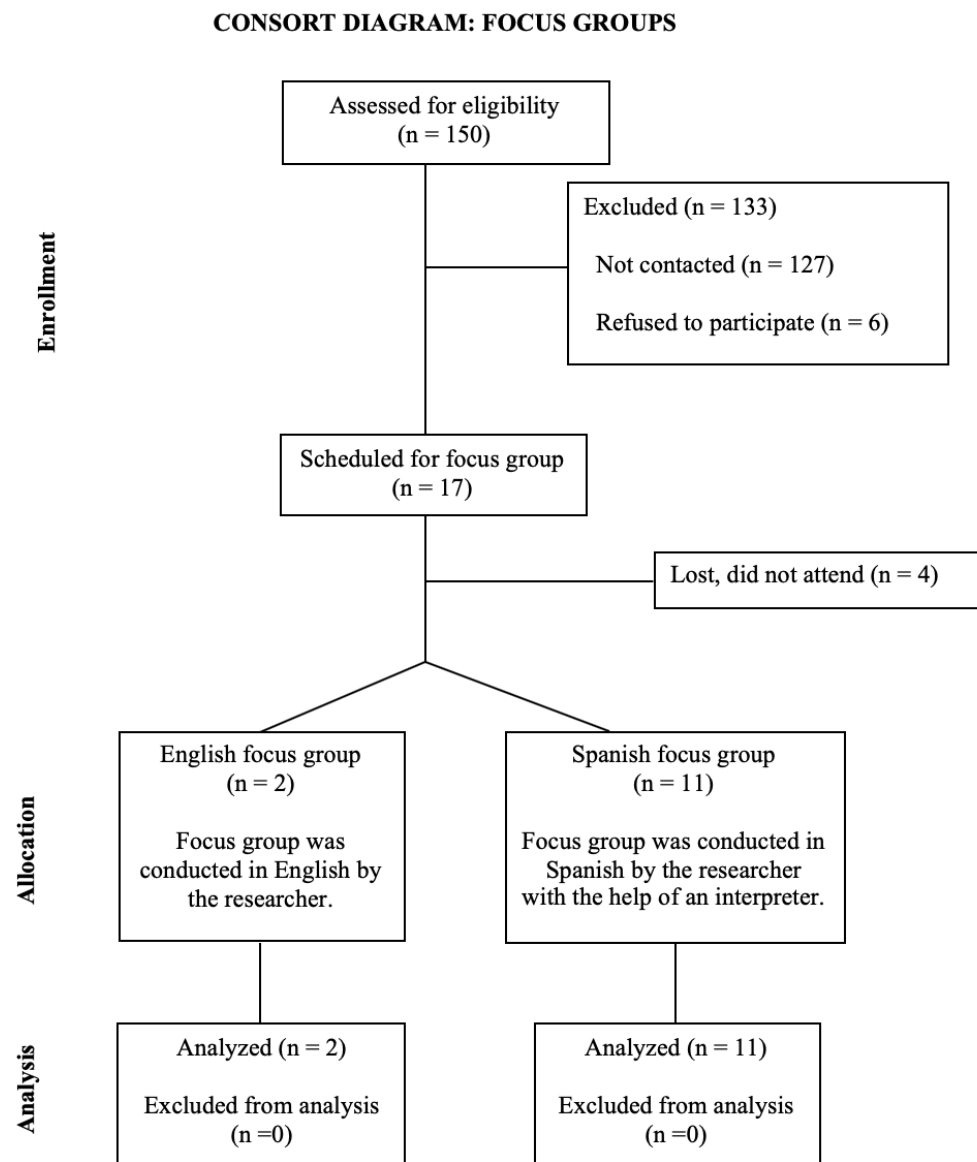


Figure 3. Focus group recruitment and analysis.

Positive towards PBD. This theme emerged throughout the focus groups and interviews in many different ways. Participants were overwhelmingly positive towards PBDs, both in response to structured questions from the focus group guide and in unprompted conversations with the researcher and other participants. Examples of sub-themes include the following: think that PBDs are healthy for people with diabetes, intend to eat more PB food, want to learn more about PBDs, would try PB meat alternatives, and positive affect towards people who eat PBD. All of the participants expressed interest in eating more PB foods and learning more about PBD. Everybody thought that eating PB foods was healthy for people with diabetes and healthy for people in general.

Food, eating, and cooking. The second most popular topic of conversation centered around food, eating, and cooking. The focus group guide included questions about eating habits, but there were many emerging themes around cooking, cultural and family dishes, sharing recipes, and passion for food and cooking. All of the participants expressed that they love to cook, and many conversations among participants involved what they like to eat for their meals, sharing ideas about healthy substitutions, and excitement around learning more about cooking. Through these conversations, we all discovered that most people were already eating an abundance of PB foods and did not realize it. This theme is connected to the “perception of PBD contents” theme as well because most participants assumed that PB foods did not include bread, rice, and beans. Many people pointed to their salads as the main source of PB foods in their diets, but further lines of questioning led to the discovery that rice, beans, and tortillas are also PB foods.

Interactions among participants. The primary topic of conversation among participants was food and eating habits. Everybody seemed excited to share what they like to eat and support

each other to pursue healthier habits. The main topics within this theme other than food and eating habits were the following: giving each other advice about nutrition, providing ideas about healthy substitutions, supporting each other, and talking about nutrition. A connected theme is “following or giving unofficial nutrition advice.” Every participant had a slightly different perspective about nutrition and what is the best way to eat, so there were various ideas floating around about nutrition. None of them were from official nutrition sources. For instance, one participant said that she heard from a friend that eating beef is bad for digestion and makes you feel tired, so she avoids eating beef now.

Nutrition topics. All of the participants thought that health and nutrition are connected. Some participants also mentioned that they enjoy cooking recipes that they learned during the nutrition workshops at SHSM. Many participants mentioned that they wanted to learn more about nutrition and what the healthiest foods are for people with diabetes. There was an overall need for more information and guidance with healthy food choices.

Perception of what is healthy. Participants had various perceptions about what it means to be healthy. Many people talked about nutrition. Other sub-topics included: low stress, healthy heart, not being overweight, and security.

Asking questions. Participants were encouraged to ask questions and have an open dialogue throughout the focus groups and interviews. Most questions were about PBDs, others were about where to buy certain food products, and others were about what foods are healthy or unhealthy. Participants asked and answered questions amongst one another and also asked questions of the researcher.

Concerned about timing of the pilot intervention. An emerging theme of the focus groups was anxiety about being able to attend in-person nutrition workshops due to scheduling

issues. When the researcher asked patients if they would be interested in participating in a pilot program, there was hesitation and worry around scheduling. For instance, some participants said they would be very interested in the pilot program, but they don't have a regular schedule so do not know if they will be able to attend all of the meetings. One participant said: "call me because I don't know my schedule." These anxieties that participants brought up around timing and being able to attend in-person meetings is an emerging theme that will be explored further in the discussion section.

Perception of PBD contents. Most participants perceived PBDs as just containing vegetables and fruits. There was some confusion around other carbohydrates like bread, rice, and beans. I explained the definition of PBDs during the focus groups and interviews, but this misperception persisted throughout for most of the participants.

Mention heritage, culture, or nationality. Several participants mentioned their heritage, culture, or nationality during conversations without being prompted about this topic. It naturally emerged throughout the interviews and focus groups as part of the ongoing conversation about food and cooking. Some participants labeled themselves as belonging to a certain culture and then proceeded to identify how they are different from many other people in their cultural community. For example, one participant said that "Latin people" like to eat three meals a day and like to eat large portions at those meals, but she prefers to eat smaller meals throughout the day instead.

Table 2

Focus group themes and representative quotes.

| Theme | # of Excerpts | Quotes |
|---------------------------------------|---------------|--|
| Positive towards PBD | 148 | <p>“And plant-based foods are much better and healthier”</p> <p>“Plants are something marvelous”</p> |
| Food, eating, and cooking | 109 | <p>“I really like making salads at home”</p> <p>“I eat chicken, beef, and fish sometimes. Usually about one or two times a week”</p> |
| Participant interactions | 90 | <p>“You could combine Greek yogurt with fruits that are sweet like grapes, blueberries, and it tastes so good!”</p> |
| Nutrition topics | 31 | <p>“Yes, I think health and nutrition are connected. Before, no, but now I’m a believer because each time I eat something unhealthy I feel bad.”</p> |
| Perception of what is healthy | 18 | <p>“Eating well”</p> <p>“Not being overweight”</p> <p>“Security”</p> |
| Asking questions | 16 | <p>“To eliminate stress as much as you can”</p> <p>“What do vegetarian people eat for breakfast?”</p> <p>“Do they sell plant-based hamburgers?”</p> |
| Concerned about timing and scheduling | 15 | <p>“Which days will it be?”</p> <p>“It’ll depend on the time. So call me because I don’t know my schedule”</p> |
| Perception of PBD contents | 15 | <p>“Vegetables, fruits, soy, sprouts”</p> <p>“Vegetables, everything that’s vegetables, and fruit”</p> |

| | | |
|---------------------------------|----|--|
| Heritage, culture, nationality | 15 | <p>“In the Philippines, there’s a lot of tofu, we love tofu”</p> <p>“Mostly Latin people eat three big meals a day, but I like small dishes more times during the day eating a little bit”</p> |
| Diabetes topics | 13 | <p>“I have been trying to eat better so the diabetes sugar doesn’t go up”</p> <p>“It’s hard for me to have diabetes. Because I have to work every day what food is good for me and what is not good”</p> |
| Perception of what is unhealthy | 12 | <p>“Bad nutrition. Not eating well. To not have a balanced diet, and a diet with lots of fats and sugar in it.”</p> <p>“Tobacco, alcohol, that make you feel bad”</p> |
| Would eat fully PBD | 12 | <p>“Yes. It would be worth it to try it just to see the change in oneself”</p> <p>“I would be able to do it as long as I needed to”</p> <p>“I would just need to get used to it”</p> |
| Negative towards PBD | 9 | <p>“No, I wouldn’t [want to spend time with someone who eats a PBD]. Because I hosted my niece who is a vegetarian, and I couldn’t eat what I wanted to eat.”</p> |
| Physical appearance | 7 | <p>“I would like to lose weight”</p> <p>“Very small and thin. My niece is vegetarian, but when there’s wind I think she’ll fall over!”</p> |
| Open to online program | 5 | <p>“Yes, but I don’t know much about how to use computers”</p> <p>“Videos are great”</p> |

| | | |
|-------------------------|---|--|
| Addiction | 4 | <p>“It’s very hard to let go of sugar.”</p> <p>“So, when I have my sandwich and they don’t put sauce, sometimes it feels wrong, it’s like an addiction. An addiction.”</p> |
| Would not eat fully PBD | 2 | <p>“I think I could eat 50% of the time this way. But 100% maybe not. Because then I’d lose too much weight and then I’d get scared”</p> |

Table 3

COM-B categories mapped onto focus group themes and sub-themes

| COM-B Component | What needs to happen for the target behavior to occur? | Themes |
|--------------------------|---|---|
| Psychological capability | Know benefits of PBD for T2D | <i>Positive</i> Positive towards PBDs |
| | Know what products/meals are plant-based healthy | Perception of what is healthy Would eat fully PBD |
| | Know how to prepare delicious, familiar plant-based meals | <i>Negative</i> Perception of PBD contents |
| | Know how to navigate the grocery store | Questions about where to buy PB products |
| Physical opportunity | Have transportation to get to grocery store and cooking/nutrition classes | <i>Positive</i> No mention of physical barriers to eating healthy food |
| | Have access to fresh produce and other plant-based, healthy foods | FP program offers access to free, healthy foods |
| | Have a kitchen in which to prepare food | <i>Negative</i> None |
| Social opportunity | Acceptability of PBD among family and friends | <i>Positive</i> Positive towards PBD: know friends/family who eat PBDs |
| | Acceptability and encouragement of PBD at clinic from doctors and educators | Positive family support for healthy eating |

| | | |
|-----------------------|--|---|
| | Acceptability of PBD among co-workers | <i>Negative</i> Physical barrier: work and home environments |
| Automatic motivation | Establish habit/routine of eating more plant-based meals | <i>Positive</i> Positive towards PBD: intend to eat more PB foods |
| | Establish healthy snacking habits | Food and eating: eating healthier now than in the past |
| | | <i>Negative</i> Perception of PBD contents Negative towards PBDs |
| Reflective motivation | Have belief that eating PBD will improve health | <i>Positive</i> Positive towards PBDs: belief that PBD is healthy for diabetes, intend to eat more PB food |
| | Intend to prioritize eating more plant-based foods in diet | |
| | | <i>Negative</i> None |

Leader Interviews

This section includes the results from interviewing leaders of Samaritan House (SH) and Second Harvest Food Bank (SHFB) about their vision for the FP program and the potential for an online nutrition resource for clients. Three leaders were interviewed, two from SHFB and one from SH. These results helped the researcher design a pilot digital PB nutrition platform for FP clients that is sustainable and has buy-in and feedback from leaders of both organizations. Table 4 provides an overview of their priorities and goals for the FP program as well as potential barriers to achieving them. Table 5 includes feedback and ideas about the online PB nutrition platform.

Goals and priorities for the FP program. There were several common goals and priorities that leaders at SH and SHFB shared for the FP program: increasing sustainability,

increasing access to nutrition education, and serving clients in a way that is convenient and beneficial to them (Table 4). Sustainability refers to the ability of the FP program to continue long-term. All of the leaders emphasized that having a staff member who is dedicated to the FP and to implementing the digital nutrition education intervention is important for sustainability. In terms of access to nutrition education, all of the leaders were enthusiastic about increasing the reach of the FP program to include more clients. The leaders at SHFB prioritize “meeting clients where they are at” in order to increase engagement and make a larger positive impact. The interviewee from SH was also passionate about increasing the number of patients who are using the FP program. Finally, both organizations want to make the FP program convenient for clients in terms of scheduling and content. One of the main priorities for the interviewee from SH is to conduct an in-reach of current FP patients to identify ways that SH can better serve them.

Potential barriers to achieving FP goals. Both organizations had similar barriers to achieving the FP goals and priorities (Table 4). Common barriers include staffing and funding. The SHFB leaders emphasized that the organization has many large projects and a small nutrition staff, so they cannot currently dedicate a lot of time to managing the FP program. The SH leader mentioned that the FP would need a dedicated staff member if it continues to expand. Leaders from both organizations highlighted that funding is often a limiting factor in achieving goals for the FP because both of these non-profits are large and have many other important programs as well.

Response to the online nutrition education platform. All of the leaders were enthusiastic and excited about the possibility of a website for FP clients. The main concern about the online platform is that it may exclude clients who are not as skilled with technology or do not own a smartphone or computer. However, the leaders had many ideas for how to effectively

implement the website and what content may be useful to include on it (Table 5). Both the SH and SHFB leaders mentioned that the website could serve as an online resource page that provides links to other web-based resources for clients that the organizations trust and recommend. In this way, the website could serve as a trusted page that allows clients to search for information related to nutrition and diabetes from reliable, accurate sources. Another idea that SHFB leaders brought up was creating a Facebook page to further engage clients and build a remote community for those who cannot regularly attend the in-person nutrition programming.

Table 4

Priorities, structural limitations, and themes around the Food Pharmacy (FP)

| Organization | Priorities and goals for the FP | Potential Barriers to achieving the leader's FP vision |
|---------------------|--|---|
| Samaritan House | Learning what patients need and how we can better serve them | Funding |
| | Access | Staffing |
| | Expanding FP service to other diseases | Partner organizations |
| | More personalized behavioral health services | Patient beliefs |
| | Sustainability | Logistics Physical space |

| | | |
|--------------------------|--|--|
| | Trauma-informed nutrition education | |
| | Root causes of health behavior and incorporate that into nutrition education program | Other large projects take priority now |
| Second Harvest Food Bank | Sustainability | Funding |
| | Increased access to nutrition education | Nutrition staffing |
| | Working with client schedule to meet them where they are | |

Table 5
Response to online platform and ideas for its application

| Organization | Response to online platform | Ideas and needs for online platform |
|--------------------------|---|---|
| | | Sharing nutrition videos |
| | Positive response overall | |
| | Some hesitation at first because past efforts weren't successful, and some clients may not have the digital literacy or resources to access a website | Serve as a trusted resource for other useful websites outside of SHFB that clients would benefit from, such as eatfresh.org |
| Second Harvest Food Bank | Enthusiasm once they saw the sample website page and were able to voice ideas about how it should be applied | Anonymous forum for answering client questions |
| | | Nutrition education lessons |
| | | Important information for clients, such as recipes, nutrition information, links to other SHFB resource pages |
| | Positive response overall | |
| | Concern about lack of access for patients who do not have smartphones or computers, but we discussed potential solutions to this (library | Increase access to nutrition education |
| Samaritan House | | Create a hub for reputable online resources about nutrition and diabetes |

| | |
|--|---|
| partnership for access to computers and trainings) | General diabetes education information along with nutrition information |
| Enthusiasm about the online platform because it has the potential to reach many more clients and allow us to meet clinic patients where they are | Easy way for patients to answer their questions about self-care |

Digital Platform Usability Testing

In order to answer the research questions for phase 3 of this study and to create a user-centered digital platform for the FP program, the researcher conducted usability testing with a group of 5 participants. The protocol included a brief think aloud session in which participants explored the pilot website and talked about their impressions of the website and the steps they were taking to navigate the page. This talk aloud was followed by a questionnaire that gathered information about (1) demographics, (2) acceptability of the website, and (3) preferred digital modes of communication.

Demographics. The average age of this group was 56, and 100% identified as Hispanic or Latinx. The educational level varied among participants, with 25% split evenly across the following categories: high school, some college, 4-year college degree, and master's degree. In terms of employment status, all participants were part of the work force, with 75% of participants employed full-time and 25% employed part-time.

Acceptability of the website. The website was highly acceptable overall. The Health-ITUES scale was used to measure impact, perceived usefulness, perceived ease of use, and user control for the website, and the overall Health-ITUES score was 4.76 out of 5 (Table 6). While all of the sub-scales within the Health-ITUES metric had scores of 4.6 or higher, the highest was for perceived usefulness (Table 6). The higher the score on each scale between 1-5, the more participants perceived the website to be impactful, useful, easy to use, and controllable.

Table 6

Health-ITUES scores across the four different scales and overall. The scales each ranged from 1-5, with 1 being strongly disagree and 5 being strongly agree

| Scale | Mean | SD |
|----------------------------|-------------|-----------|
| Impact | 4.6 | 0.55 |
| Perceived Usefulness | 4.85 | 0.37 |
| Perceived Ease of Use | 4.8 | 0.37 |
| User Control | 4.8 | 0.42 |
| Overall Health-ITUES Score | 4.76 | 0.43 |

Participants were also asked direct yes or no questions in order to learn more about their experience with the pilot website. The website was perceived positively by all participants.

When asked if they liked the website, 100% of participants responded “yes”. All participants said that they would like to use the website to learn more about nutrition and diabetes, and that they feel comfortable using the website from their phones.

The qualitative information gathered about the website included general impressions about the website and reasons why participants wanted to use it to learn more about nutrition and diabetes.

General impressions. All participants expressed enthusiasm and a positive attitude towards the website. The most consistent feedback from participants was that they really liked the information provided on the website: “Terrific. Very useful information.” Another common theme was that it was easy and quick to find the information that they wanted to find. One participant mentioned that they thought the website would “help people who have health problems.” Another participant mentioned that she thought the website was very educational, but we “need to educate people how to use it.”

Reasons for wanting to use the website to learn more. The most common reason for wanting to use the website to learn more about nutrition and diabetes was to know which foods are healthy for people with diabetes. Most participants expressed that they wanted to be healthy and improve their health. One participant mentioned that they would like to learn more about new treatments and discoveries about diabetes. Another said that “I want to find out more about diabetes and what is best because I want to eat food, not medicine.”

Preferred modes of digital communication. Digital platforms allow for various modes of communicating information, and the researcher asked participants to rate their preference for the following on a scale from 1-5: video, writing, photo, and audio. On this scale, 1 means “don’t like at all” and 5 means “really like”. The mode of communication with the highest average score was photo (5), followed by video (4.8), with a tie between writing and audio (4.6) (Table 7).

Table 7

Preferences for digital modes of communication on a scale from 1-5, with 1 being “don’t like at all” and 5 being “really like”

| Mode of communication | Mean | SD |
|-----------------------|------|------|
| Video | 4.8 | 0.45 |
| Writing | 4.6 | 0.55 |
| Photo | 5 | 0 |
| Audio | 4.6 | 0.55 |

Participants were also asked questions about their digital technology use. Of the participants in the usability trial, 60% of them use a computer. Of the 8 FP patients who were approached about participating in the usability testing, 5 of them own and regularly use either a computer or smartphone, while the other 3 do not own or regularly use a computer or

smartphone. The 3 patients who did not own or regularly use a computer or smartphone were not asked to participate in the website usability testing.

Although the pilot website is not affiliated with Facebook, the Second Harvest Food Bank (SHFB) leaders were interested in creating a Facebook group in the future as a way to create a digital FP community. The researcher asked participants if they use Facebook and if they use Facebook groups in order to understand more about how FP patients use this platform (Table 8).

Table 8
Facebook use

| Question | Yes | No |
|-----------------------------|-----|-----|
| Do you use Facebook? | 80% | 20% |
| Do you use Facebook groups? | 75% | 25% |

Discussion

As discussed in the literature review section, type II diabetes (T2D) is a complex condition that is becoming more prevalent every year (ADA, 2018; CDC, 2017). The social determinants of health are intimately connected to the development and progression of T2D through their influence on health behaviors such as nutrition and physical activity (Zarnowiecki, 2017; Pedraza et al., 2018; American Psychological Association, n.d.; Beydoun & Wang, 2010). There is substantial support in the literature for a pattern of eating that includes primarily plant-based foods as a way to prevent, manage, and sometimes reverse T2D (Zhao et al., 2018; Bellou et al., 2018; MacLeod et al., 2017; Barnard et al., 2006; Jenkins et al., 2003). Despite the evidence in favor of plant-based diets (PBD) for treating and preventing diabetes, it is still not a common recommendation given to patients by healthcare providers (Lee et al., 2015). There are many possible explanations as to why PBDs are not being recommended, but a common fear

among providers is that patients will not be able to adhere to a PBD or do not want to eat this way (Lee et al., 2015).

The current project aimed to gather rich qualitative data about how patients with T2D at Samaritan House view nutrition, health, diabetes, and PBDs through focus groups. Another aim of this project was to create a pilot program based on the focus group data to help patients include more plant-based foods in their diets. The initial vision for the pilot program, before running the focus groups, was to test an in-person nutrition education intervention program and determine whether comprehensive or simple nutrition information was preferable for increasing consumption of plant-based foods. After analyzing the focus group data, however, more urgent research questions and needs emerged for this patient population.

The results from the focus groups made it clear that an in-person intervention would not be suitable because every participant expressed anxiety about fitting an in-person workshop into their schedules, so this method would exclude individuals who cannot come to the clinic at specified times. Currently, the existing in-person, monthly nutrition education workshops hosted at Samaritan House clinic include about 5-12 people each time, out of the 150 patients enrolled in the Food Pharmacy program. Another key result from the focus groups was that all participants expressed interest in PBDs and willingness to try eating more plant-based foods. Additionally, all participants perceived plant-based foods as healthy for diabetes. The direction of this project changed after the focus groups based on these results, with a new concentration on increasing access to nutrition education through a texting and website-based intervention. This section includes an interpretation of this project's results, implications and recommendations for practice, and limitations of the project.

Interpretation of Findings

Focus groups. The focus groups were helpful for elucidating the beliefs, perceptions, needs, and motivations of the participants. This section will discuss the results within the COM-B framework and delve into the following topics that emerged throughout the focus groups: motivations, plant-based diets, unofficial nutrition advice, and enthusiasm for cooking.

COM-B Framework. The focus group structure was developed using COM-B and the Behavior Change Wheel as a theoretical foundation, as discussed in the methods section. This theoretical framework is described in Michie, Atkins, and West's (2014) "The Behaviour Change Wheel: A Guide to Designing Interventions." The researcher used this model to identify the target behavior (eating PBD), what needs to change, intervention functions, behavior change techniques, and mode of delivery for the intervention. The focus group guide was built around several key COM-B components that were identified as important to the target behavior: psychological capability, physical opportunity, social opportunity, automatic motivation, and reflective motivation. The focus group themes fit well within this COM-B framework, supporting this theory-based methodology (Table 3).

Psychological capability. For psychological capability, participants had some knowledge about PBDs and generally knew what is healthy for diabetes, but they struggled with knowledge of where to buy healthy items and what exactly is included or excluded from PBDs.

Physical opportunity. There was not much discussion during the focus groups about physical opportunities because this did not seem to be a barrier to eating plant-based foods for most patients. The main barrier was not having enough time to prepare healthy, home-cooked meals at home.

Social opportunity. In terms of social opportunity, participants were generally very positive towards PBDs and know a friend or family member who follows this eating pattern, facilitating this COM-B component. However, there was discussion around cultural norms for eating and how many patients struggle with eating small portions as a person with T2D at family gatherings because they are different.

Automatic motivation. The automatic motivation component focuses on habits, and these participants intend to eat more plant-based foods, are eating healthier than they used to, but were sometimes unaware of the contents of a PBD. A common misperception about PBDs was that you can only eat vegetables. Throughout the focus groups, this pattern of thought persisted despite the researcher explaining the definition of PBDs multiple times during the conversation. This kind of behavior is in line with the psychological concept of belief perseverance, which is when an individual continues to believe what they initially did about a topic despite new, conflicting information about it (Anderson & Kellam, 1992). Newer research has also found that beliefs can persist even when they are corrected on the spot, as the researcher did in the current study (Thorson, 2016).

Motivations. The focus groups provided very helpful information about what Food Pharmacy patients are interested in and what their motivations are for participating in conversations about nutrition. Every participant expressed that they want to be healthy and find a way to manage their diabetes using nutrition. Another emerging theme was weight loss. One participant expressed that he wanted to lose weight and wished that there was a method for doing that. Most of the participants said that they just want to know what is healthy and what is unhealthy for them to eat for their diabetes. Every participant truly wants to eat healthier, so the intention to eat PBDs is present. A common interest was finding inexpensive, fresh foods. At one

point, participants had a lively conversation with each other about where the cheapest produce is and if fresh vegetables and frozen vegetables are equivalent in terms of quality. Some participants brought up that there are cheap vegetables available at many stores and supermarkets, and that “we don’t take advantage of it because we don’t.” This implies that there is something preventing participants from buying affordable, fresh produce besides cost and convenience. Perhaps some of the barriers to social opportunity or automatic motivation, such as cultural norms and personal habits, need to be overcome before this purchasing behavior change occurs. However, this was just the opinion of a couple individuals and may not represent the experience of other participants.

Plant-based diet. One of the aims of the current study was to determine the feasibility and acceptability of PBDs for people with T2D who are primarily Latinx. The rich qualitative data gathered from the focus groups answered the acceptability question. PBDs were universally acceptable and attractive to participants. Although some participants expressed hesitation with trying a fully PBD, these were mostly due to fears based on misinformation. For example, some participants, mostly male, expressed that they were afraid they would lose too much weight by eating just a PBD. The researcher asked follow-up questions to uncover the underlying beliefs and motivations and discovered that almost all participants thought that PBDs just included vegetables and nothing else. Once the researcher described that PBDs can include rice, beans, vegetables, fruits, grains, nuts, and seeds, all of the participants expressed positivity and enthusiasm towards PBDs. These results were consistent with Lee et al.’s (2015) finding that 66% of patients would be willing to try a PB diet. These researchers found that 9% of patients were actually following a PB diet, so the next step is to help close the gap between the willingness to try a PB diet and the decision to adhere to a PB diet.

Unofficial nutrition advice. The focus group participants were very engaged in the conversation, both with the researcher and with each other. They would frequently ask questions about PBD contents, where to buy products, and what is healthy to eat. Occasionally, participants would give each other nutrition advice and say that they heard it from a friend or other source of information. Participants also expressed to the researcher that they did not think certain foods were healthy because they heard from friends that it was bad for digestion or bad for diabetes. There were also side conversations about certain vegetables that were supposed to help specifically manage and treat diabetes. The focus groups revealed that there is a lot of nutrition misinformation in this patient population. The participants are not at fault for having these kinds of perceptions and beliefs about nutrition. Online news outlets and social media sites are continually publishing articles about nutrition that contain buzzwords, eye-catching claims, and misinformation. The clinic is only reaching patients one hour per month for nutrition education, so most of their nutrition knowledge is probably coming from elsewhere.

Enthusiasm for cooking. The focus groups revealed that almost all of the participants have a passion for cooking. In most responses to questions, participants mentioned their favorite recipes and what they love to cook for their families without being prompted by the researcher. In fact, cooking was not a topic on the focus group guide at all, but it emerged naturally during every focus group. Talking about cooking created a positive, communal environment during the focus groups that led to increased participant engagement and conversations with each other.

Anxiety around scheduling. All of the focus group participants expressed concern about their ability to access the health and nutrition information they want to learn. When the researcher explained the pilot program and asked participants if they would be interested, the first response was always along the lines of: “yes, but I need to check my schedule and may not

be able to come during the workshop time.” The focus group participants were eager to learn more about PB nutrition and how to become healthier, but they seemed to have concern and even anxiety around fitting the pilot program into their schedules. The monthly in-person nutrition workshop and cooking demonstration receives between 5 and 10 attendees depending on the month, which is less than 1% of the FP program clients. These workshops include 3 to 4 “regulars” who are there every month, and the other attendees fluctuate. The researcher used these observations and focus group results to design a more accessible pilot program.

After performing the behavioral analysis using the COM-B framework, the researcher had identified several promising intervention functions: education, enablement, and training (Appendix C). These intervention functions can be delivered face-to-face or at a distance, depending on the needs of the target population (Michie et al., 2011). The researcher originally planned on an in-person pilot test because the FP already has an existing in-person workshop every month and this seems to work well for clients who attend. However, after conducting the focus groups, a remote pilot program emerged as a better option for the needs of FP clients and leaders. The pilot website was designed to increase access to important nutrition information that FP clients want to learn.

Interviews. The leader interviews were useful for understanding the perspectives and goals of leaders within Samaritan House (SH) and Second Harvest Food Bank (SHFB). Table 4 outlines the priorities and goals each organization has for the Food Pharmacy, as well as barriers that may prevent reaching these goals. These organizations have some common goals: increasing access to services, providing more personalized services, and sustainability. Common barriers for both organizations include funding and staffing. Leaders from both organizations were enthusiastic about the possibility of an online platform for nutrition education as well. Given the

commonalities between SH and SHFB leaders, it would be beneficial for these organizations to work more closely with each other to develop a shared vision for the FP program.

Website usability testing. The aim of this phase of the study was to create and test a pilot Food Pharmacy (FP) website. A usability testing protocol was employed to determine the acceptability and feasibility of the website among FP patients. The website was highly acceptable and should be a feasible addition to the existing FP program. The high level of acceptability was determined from the high scores on the Health-ITUES scales of impact, perceived usefulness, perceived ease of use, and user control. Additionally, 100% of participants reported that they liked the website, would like to use it to learn more about nutrition and diabetes, and would feel comfortable using the website from their phones. The website is also feasible because it is free to create, easy to manage, and most participants reported using either a smartphone or computer.

Granted, several participants did not own or regularly use a smartphone or computer, so the website would not be accessible to all FP patients. All participants that did not own a computer or smartphone reported that they use a cellphone that can send and receive text messages. During the usability testing, one participant mentioned that it would be important to teach people how to navigate the website. This participant said that the website was a very useful tool for learning about nutrition and diabetes, but that some people may not know how to use websites as well as others. This observation should not be ignored because 16% of the United States (U.S.) population is not digitally literate, or do not feel comfortable using a computer (Mamedova & Pawlowski, 2018). In the FP sample, 37.5% do not own or regularly use a computer or smartphone. Although this is simply a proxy measurement for digital literacy, the rate at the FP is more than double the nationwide percentage for people who are not digitally

literate. This could be an indication that FP patients are less likely to be comfortable with computers than the general population, on average.

The Second Harvest Food Bank (SHFB) leaders mentioned that creating a Facebook group for FP patients could be a good way to build online community. In order to determine how useful and accessible a Facebook group would be for FP clients, the researcher asked about Facebook use during the usability testing phase of this study. The majority of participants use Facebook (80%), and 75% of the participants who use Facebook also use Facebook groups. These results are promising for the possibility of a FP Facebook group in the future.

Implications for Practice & Recommendations

This section provides an overview of the key implications for practice and recommendations for the Food Pharmacy (FP) program. Because the FP program is a partnership between Samaritan House (SH) and Second Harvest Food Bank (SHFB), these recommendations should be jointly reviewed and operationalized by both organizations. The researcher recommends quarterly meetings between leaders at both organizations to create a shared vision and mission for the FP program and to ensure that goals are being met.

Overcome belief perseverance. Combatting belief perseverance in FP clients by providing a consistent source of trustworthy nutrition information. This would be particularly useful for misinformed beliefs around nutrition, such as the focus group finding that most participants believed vegetarians only eat vegetables. There is not much research about how to overcome belief perseverance, but a preliminary idea that could help counteract misinformed beliefs is creating new beliefs over time with repeated exposure. This method could be employed in person, online, or both.

Recommend plant-based diets to patients. Start recommending PB diets to patients who have T2D and pre-diabetes. There is substantial evidence that eating more PB foods is beneficial for preventing, managing, and reversing T2D. Furthermore, the current study showed that PB diets are attractive to FP clients. It is important to note that, although fully PB diets are the most beneficial, encouraging clients to start including more PB foods in their diets little by little could be a good way to start.

Provide easy access to useful, trustworthy nutrition information. Provide patients with reputable sources of nutrition information to dispel myths about food and T2D. This could come in the form of a website page that serves as a trusted source of information for patients. Both SHFB and SH leaders suggested this as a possible function for the FP website. Focus group participants also mentioned that they value having access to quality information about nutrition and T2D but often cannot find this information outside of the clinic environment.

Focus on cooking. Center nutrition education around cooking to increase engagement, support, and interest in nutrition. The most significant emerging theme of the focus groups was that FP clients love cooking. Every participant mentioned cooking and were excited to share their favorite family recipes and cooking tips. Participants were the most engaged with the researcher and with each other when they were talking about cooking. Using cooking as a foundational theme of nutrition education at the FP could help increase client engagement and improve adherence to nutritional guidelines.

Website. The usability testing uncovered two important considerations for the FP website: there are still many FP clients who do not use smartphones or computers, and clients prefer learning information via photos and videos.

Partner with libraries. The SH leader mentioned that library partnerships could be useful for providing access to computers and trainings on how to use them. Leveraging these partnerships could help increase access to online resources for FP clients who do not own smartphones or computers and need digital skills training to use these technologies. However, even if SH chooses to partner with libraries, the website still may not work for all FP clients. The FP program should offer both in-person and online nutrition education in order to increase access as much as possible.

Use photos and videos. Participants rated all digital modes of communication highly, but photos and videos received the highest scores. Using photos and videos to portray recipes, nutrition topics, and diabetes topics on the website is highly recommended based on the results of this study.

Limitations

The current study has several limitations. Firstly, only one researcher conducted the focus groups, interviews, and usability testing sessions, which may lead to more biased qualitative results. Ideally, two or more researchers would all analyze the focus group transcripts individually and then collaborate and come to a mutual agreement about the results. With only one researcher, there is a higher possibility for bias in the results. Secondly, the researcher does not speak fluent Spanish, and most of the participants spoke Spanish. Language differences in focus groups may have led to some words being lost in translation. Even though an interpreter helped the researcher understand what the focus group participants were saying, this language barrier could have led to slightly biased results. The focus group recruitment did not proceed as planned. Many participants did not show up to their focus group meetings and the researcher had to improvise and conduct interviews with two groups because only one person showed up. The

different group sizes could lead to different results in each group. Finally, one of the leader interviews was audio recorded and the other was recorded through detailed notes. This led to a greater level of detail in one interview and not the other, which could have impacted the results.

Conclusion

This project found that plant-based (PB) diets are acceptable and feasible among a sample population of Latinx individuals with type II diabetes (T2D). These results were collected through a series of focus groups with patients from the Samaritan House Free Clinic Food Pharmacy (FP) program. The focus groups uncovered access to nutrition education as a crucial need among FP clients, so the researcher interviewed FP leaders to further evaluate overall needs and goals for the program. The focus groups and interviews provided important information about barriers and facilitators to eating PB diets for FP clients, and the researcher designed an online PB nutrition education resource page to increase access for clients. This website was tested for usability and acceptability among FP clients during usability testing sessions at the clinic, and the researcher found that the online resource page was highly acceptable and usable.

This project aimed to evaluate the barriers and facilitators to eating PB diets among FP clients and create a client-centered, evidence-based program based on findings, and these aims were achieved. The FP program was designed to help alleviate T2D among San Mateo County residents in need, and this is especially relevant for Latinx community members; rates of T2D are much higher in Latinx individuals compared to white individuals in San Mateo. T2D is a growing problem across the U.S. as a whole, particularly for minority populations, reflecting the local issues within San Mateo. Although the results of this project apply to a primarily Latinx population with T2D within San Mateo, the methods could be adapted to assess needs and create client-centered nutrition education programming in diverse groups across the country. The

bottom line is that nutritional research supports adherence to a primarily PB diet regardless of race, ethnicity, income, or location. If more clinics, workplaces, community centers, and food banks across the U.S. begin implementing PB nutrition education and provide people with access to affordable PB food, there is a chance that T2D will become part of this country's history rather than its future.

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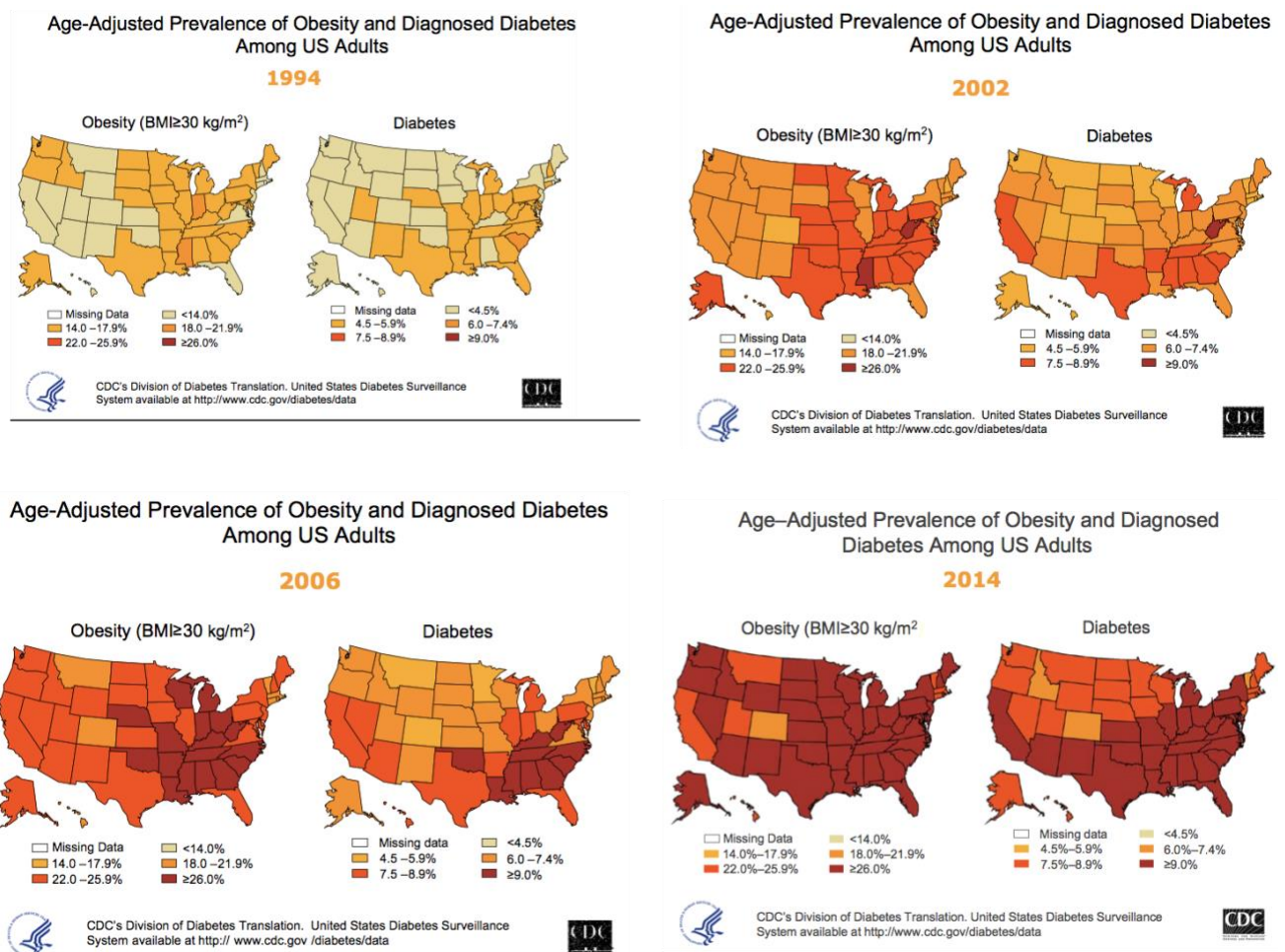
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Appendix A

Maps of Trends in Diagnosed Diabetes and Obesity

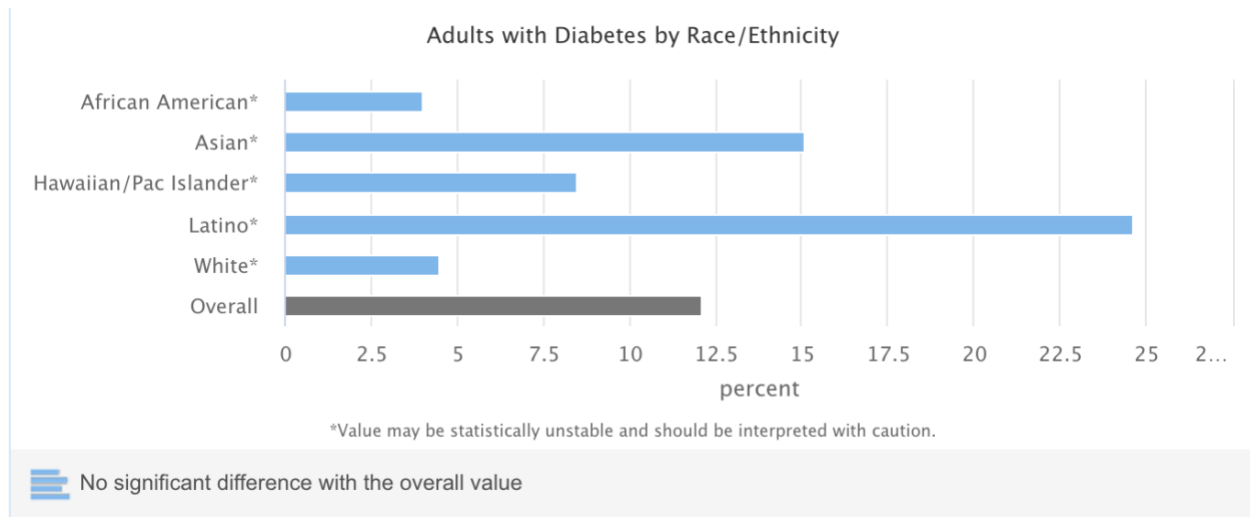
Selected maps displaying obesity and diabetes prevalence from the CDC, with darker red representing higher prevalence (“Maps of Trends in Diagnosed Diabetes and Obesity”, 2017)



Appendix B

Diabetes in San Mateo County

Latinx adults within San Mateo County have a much higher diabetes prevalence compared to other racial/ethnic groups (SMC All Together Better, 2018).



Appendix C

Behavioral Analysis using COM-B Framework

COM-B steps and behavioral analysis

- **Step 1: Define the problem in behavioral terms**
 - Who is involved in the behavior and what is it?
 - Problem: many people with T2D are not eating enough plant-based foods and are eating too many animal-based foods for optimal health and disease management
- **Step 2: Select the target behavior**
 - Identify all behaviors that could prevent the poor outcome that results from the behavioral “problem”
 - Small set of target behaviors selected for intensive intervention, considering:
 - Impact of changing the behavior on preventing bad outcome
 - Ease with which behavior could be changed
 - Extent to which behavior can be easily measured
 - Target behaviors:
 - Eating more plant-based foods
 - Eating fewer animal-based foods
- **Step 3: Specify the target behavior**
 - Describe in as much detail as possible according to who, what, where, when, how often, and with whom they are to be performed
 - Who: people with T2D and are enrolled in the Food Pharmacy
 - What: eat more plant-based foods and eat fewer animal-based foods
 - Where: at home, at work, traveling, out to eat with friends and family
 - When: at mealtimes and snack times
 - How often: as often as possible, close to fully PBD as possible, but will depend on the person and their barriers/facilitators; aim for at least 1 plant-based meal per day on average
 - With whom: with friends, family, co-workers, and fellow patients who attend Food Pharmacy workshops and events
- **Step 4: Identify what needs to change**
 - Behavioral analysis using COM-B model used to determine what needs to happen for each target behavior to occur and what, in terms of C, O, and M, needs to shift in the current context

Target behavior: Eating more plant-based foods and fewer animal-based foods

| COM-B Components | What needs to happen for the target behavior to occur? | Is there a need for change? |
|--------------------------|--|-----------------------------|
| Psychological capability | -Know benefits of PBD for T2D -Know what products/meals are plant-based healthy -Know how to prepare delicious, familiar plant-based meals | Yes |

| | | |
|-----------------------|--|-------|
| | -Know how to navigate the grocery store | |
| Physical opportunity | -Have transportation to get to grocery store and cooking/nutrition classes -Have access to fresh produce and other plant-based, healthy foods -Have a kitchen in which to prepare food | Maybe |
| Social opportunity | -Acceptability of PBD among family and friends -Acceptability and encouragement of PBD at clinic from doctors and educators -Acceptability of PBD among co-workers | Yes |
| Automatic motivation | -Establish habit/routine of eating more plant-based meals -Establish healthy snacking habits | Yes |
| Reflective motivation | -Have belief that eating PBD will improve health -Intend to prioritize eating more plant-based foods in diet | Yes |

- **Step 5: Identify intervention functions**
 - Select according to practical criteria of relevance, affordability, acceptability, practicability, and likely impact

| Candidate Intervention Functions | Is it relevant, affordable, acceptable, practicable, and likely to have an impact? |
|---|---|
| Education | Yes |
| Modeling | Maybe – depends on context of study |
| Enablement | Yes |
| Persuasion | Yes |
| Training | Yes |
| Environmental restructuring | No – not enough resources or influence now |
| Incentivization | No – not enough resources |
| Coercion | No – not acceptable or practicable |
| Restriction | No – not acceptable or practicable |

- **Step 6: Identify policy categories**
 - Determine which policy “levers” are available to the programmers
 - Not relevant to the current study
- **Step 7: Identify behavior change techniques (BCTs) – Appendix 4**
 - Use BCTs that are linked to the relevant intervention functions
 - Select ones that are relevant to the local context to make final intervention

| Intervention Function | Frequently-used BCTs |
|-----------------------|---|
| Education | -Info about social/environmental consequences -Info about health consequences -Feedback on behavior -Feedback on outcome(s) of behavior -Prompts and cues -Self-monitoring of behavior |
| Modeling | -Demonstration of the behavior |
| Enablement | -Social support (practical and unspecified) -Goal setting (behavior and outcome) -Adding objects to the environment -Problem solving -Action planning -Self-monitoring of the behavior -Restructuring the physical environment -Review behavior goal(s) -Review outcome goal(s) |
| Persuasion | -Credible source -Information about social and environmental consequences -Information about health consequences -Feedback on behavior -Feedback on outcome(s) of behavior |
| Training | -Instruction on how to perform behavior -Feedback on behavior -Feedback on outcome(s) of behavior -Self-monitoring of behavior -Behavioral practice and rehearsal |

- **Step 8: Identify mode of delivery**
 - Consider all options and choose most appropriate for the target behavior, population group, and setting
 - Consider: affordability, practicability, effectiveness, cost-effectiveness, acceptability, side effects/safety, and equity
 - Face-to-face
 - Individual
 - Group
 - Distance
 - Population-level
 - Broadcast media (TV & radio)
 - Outdoor media (billboards and posters)
 - Print media (newspaper, leaflet)
 - Digital media (Internet, phone)
 - Individual-level
 - Phone (phone helpline, texts)
 - Individually-accessed computer program

Appendix D

Focus groups recruitment script

Spanish Version

Buenos días / buenas tardes, esta es Ellen llamando de Samaritan House Clinic, estoy hablando con [NAME]?

- ¿[NAME] está disponible?
- *If not available*: No se preocupe, se devolveré la llamada en otro momento. ¡Gracias!

Hola [NAME], otra vez, me llamo Ellen y llamo desde la farmacia de alimentos de Samaritan House Clinic. Llamo para informarle sobre la oportunidad de participar en un estudio que estamos realizando para mejorar la Farmacia de Alimentos. ¿Tienes unos minutos para hablar?

If no → No te preocupes, gracias! Tenga un buen día. **[END]**

If yes → Muchas gracias! Soy voluntario en Samaritan House, pero también soy estudiante de salud pública y salud del comportamiento en la Universidad de San Francisco. Estoy haciendo un proyecto con Food Pharmacy para mejorar nuestra educación sobre nutrición para la diabetes y aprender cómo los clientes de Food Pharmacy, como usted, ven la nutrición y la alimentación saludable. Estaremos organizando pequeños grupos de conversación de clientes de farmacias de alimentos en abril y mayo para hablar sobre nutrición, dietas a base de plantas y diabetes. En junio, utilizando lo que aprendemos de estas conversaciones en grupos pequeños, probaremos una nueva estructura de programas de nutrición para ver si a los pacientes de Food Pharmacy les gusta.

¿Es esto algo en lo que puede estar interesado en participar?

If no → Muchísimas gracias por su tiempo. Mientras estamos haciendo los grupos pequeños y el nuevo programa, todavía podrá acceder a los mismos recursos en la Farmacia de Alimentos que suele hacer, como recoger comestibles cada semana y talleres de nutrición el primer miércoles de cada mes. ¿Tiene usted alguna pregunta? Gracias. ¡Que tengas un gran día! **[END]**

If yes → ¡Genial! Te daré más información sobre los grupos de conversación para que tengas una idea de cómo será. Será un grupo pequeño, de aproximadamente 4 personas, y nos reuniremos en la clínica de San Mateo. Durará aproximadamente 90 minutos y hablaremos sobre lo que piensan los clientes de Food Pharmacy sobre las dietas a base de plantas y sus pensamientos sobre nutrición y diabetes. Recibirás un regalo de agradecimiento por participar al final. Estaremos ejecutando los grupos de conversación los días de semana desde finales de abril hasta finales de mayo. Solo necesitas participar en uno. ¿Qué día de la semana podrías asistir al grupo? [write answer] ¿Preferiría venir a un grupo focal en la mañana, tarde o noche? [write answer]

Muchas gracias. ¿Te sientes cómodo al enviarte más información sobre la programación por correo electrónico y texto? ¿Cuál es un buen número de teléfono para enviarle un mensaje de texto? [write answer] ¿Tiene una dirección de correo electrónico que verifica regularmente y que podría usar para enviarle información? [write answer]

Muchísimas gracias por su tiempo. Espero poder hablar más contigo durante el grupo de conversación. Le enviaré un correo electrónico muy pronto para informarle el día y la hora en que debe ingresar a la clínica para su grupo. El nuevo programa se ejecutará a lo largo de junio y también puede participar en él si está interesado. Le proporcionaré más información sobre el nuevo programa después de nuestros grupos de conversación y podrá decidir si desea participar en eso más adelante. ¿Tienes alguna pregunta para mí ahora? Muchas gracias. ¡Que tengas un gran día!

English Version

Good morning/Good afternoon, this is Ellen calling from Samaritan House, am I speaking with [NAME]?

- Is [NAME] available?
- *If not available*: No worries, I'll call back another time. Thank you!

Hi [NAME] my name is Ellen and I'm calling from the Samaritan House Clinic Food Pharmacy. I am calling to tell you about an opportunity to participate in a study that we are doing to improve the Food Pharmacy. Do you have a few minutes to talk?

If no → No worries, thank you! Take care. **[END]**

If yes → Thank you so much! I am a volunteer with Samaritan House, but I am also a student studying public health and behavioral health at the University of San Francisco. I am doing a project with the Food Pharmacy to improve our diabetes nutrition education and learn about how Food Pharmacy clients, like you, view nutrition and healthy eating. We will be hosting small conversation groups of Food Pharmacy clients in April and May to talk about nutrition and healthy eating. In June, using what we learn from these small group conversations, we will be trying a new nutrition program structure to see if Food Pharmacy patients like it.

Is this something you may be interested in participating in?

If no → Thank you so much for your time. While we are doing the small groups and new program, you will still be able to access the same resources at the Food Pharmacy as you usually do, including picking up groceries every week and nutrition workshops on the first Wednesday of every month. Do you have any questions? Thank you. Have a great day! **[END]**

If yes → Great! I'll give you some more information about the conversation groups so you have an idea of what it will be like. It will be a small group, about 4 people, and we will meet at the San Mateo clinic. It will last for about 90 minutes and we will be talking about what Food Pharmacy clients think about plant-based diets and your thoughts about nutrition and diabetes.

You will receive a thank-you gift for participating at the end. We will be running the conversation groups on weekdays from late April to late May. You only need to participate in one. What day of the week would you be able to attend the group? [write answer] Would you prefer to come to a focus group in the morning, afternoon, or evening? [write answer]

Thank you very much. Are you comfortable with me sending you more information about scheduling via email and text? What is a good phone number to text you at? [write answer] Do you have an email address that you check regularly that I could use to send you information? [write answer]

Thank you so much for your time. I'm looking forward to talking to you more during the conversation group. I'll email you very soon to let you know what day and time to come into the clinic for your group. The new program will run throughout June and you can also participate in that if you are interested. I'll provide more information about the new program after our conversation groups and you can decide if you would like to participate in that later. Do you have any questions for me now? Thank you so much. Have a great day!

Appendix E

Informed Consent for Focus Groups, in English and Spanish

Informed consent form: Conversation groups at Samaritan House

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Below is a description of the research procedures and an explanation of your rights as a research participant. You should read this information carefully. If you agree to participate, you will verbally consent after we're finished going through this document to indicate that you have heard and understand the information on this consent form.

You have been asked to participate in a research study conducted by Ellen Pelos, a graduate student in the Department of Behavioral Health and Public Health at the University of San Francisco. This faculty supervisor for this study is Dr. Kelly McDermott, a professor in the Department of Behavioral Health and Public Health at the University of San Francisco.

WHAT THE STUDY IS ABOUT:

The purpose of this research study is to learn more about how Samaritan House Food Pharmacy clients view plant-based diets so we can create better nutrition education and create a pilot program to try out this summer. You are being asked to participate in this study because you are part of the Food Pharmacy program at Samaritan House.

WHAT WE WILL ASK YOU TO DO:

During this study, the following will happen. If you agree to be a participant in this study, you will participate in a small focus group in which we will discuss topics such as things that help you or prevent you from eating plant-based foods and your opinions and feelings about nutrition and diabetes.

DURATION AND LOCATION OF THE STUDY:

Your participation in this study will involve attending one focus group for approximately 1 hour at Samaritan House clinic in San Mateo

POTENTIAL RISKS AND DISCOMFORTS:

We do not anticipate any risks or discomforts to you from participating in this research. If you wish, you may choose to withdraw your consent and discontinue your participation at any time during the study without penalty.

BENEFITS:

There are no direct benefits to you for participating in this study, but you will be helping us to better understand how to deliver high quality nutrition education for the Food Pharmacy program going forward. Once the study is complete, I will be following up with you to tell you what we discovered so you fully understand your contribution.

PRIVACY/CONFIDENTIALITY:

Any data you provide in this study will be kept confidential unless disclosure is required by law. In any report we publish, we will not include information that will make it possible to identify you or any individual participant. We will be using a voice recording device to record the focus groups so the researcher can be fully engaged with participants throughout the conversation and to ensure that important feedback from participants is not missed. The focus group will be recorded and then the recording will be transferred to writing, but your name will not be recorded in the transcript. We will use names such as “participant 1, participant 2...” to indicate different speakers in the focus group transcript. The researcher and an interpreter from the clinic will be the only people who hear the focus group recording in order to translate and transcribe it into writing. The recording will be deleted immediately after the transcript has been written to ensure you cannot be identified in any of the study’s data or results.

COMPENSATION/PAYMENT FOR PARTICIPATION:

You will receive a \$20 Safeway gift card for your participation in this study. If you choose to withdraw before completing the focus group, you will receive usual Food Pharmacy services without any changes to your care.

VOLUNTARY NATURE OF THE STUDY:

Your participation is voluntary and you may refuse to participate without penalty or loss of benefits. Furthermore, you may skip any questions or tasks that make you uncomfortable and may discontinue your participation at any time without penalty or loss of benefits. If you choose to withdraw before completing the focus group, you will receive usual Food Pharmacy services without any changes to your care. In addition, the researcher has the right to withdraw you from participation in the study at any time.

OFFER TO ANSWER QUESTIONS:

Please ask any questions you have now. If you have questions later, you should contact the principal investigator: Ellen Pelos at (952) 451-9885 or (espelos@dons.usfca.edu). If you have questions or concerns about your rights as a participant in this study, you may contact the University of San Francisco Institutional Review Board at IRBPHS@usfca.edu.

Please say that you consent to these terms if you wish to participate in the focus group.

Formulario de consentimiento informado: Grupos de conversación en la Casa Samaritana**CONSENTIMIENTO PARA PARTICIPAR EN UN ESTUDIO DE INVESTIGACIÓN**

Este grupo de conversación es parte de un estudio que estoy haciendo con la Universidad de San Francisco y Samaritan House. Les voy a informar sobre el estudio y sus derechos como participante. Al final, le pediré a cada uno de ustedes un "sí" verbal para indicar que comprenden lo que he hablado y aceptan participar en el grupo de conversación.

DE QUÉ SE TRATA EL ESTUDIO

El propósito de este estudio de investigación es aprender más sobre cómo los clientes de la Farmacia de Alimentos de Samaritan House ven las dietas basadas en plantas para que podamos crear una mejor educación en nutrición y crear un programa piloto para probar este verano. Se les pide que participen en este estudio porque es parte del programa de Farmacia de Alimentos en Samaritan House.

LO QUE HAREMOS:

Si aceptan participar en este estudio, participarán en un pequeño grupo de conversación en el que hablaremos de temas como el consumo de alimentos de origen vegetal y sus opiniones y sentimientos sobre la nutrición y la diabetes. La conversación durará aproximadamente 1 hora.

RIESGOS POTENCIALES Y DIFERENCIAS:

No anticipamos ningún riesgo o incomodidad para ustedes al participar en esta investigación. Si lo desean, pueden optar por dejar de participar en cualquier momento durante el estudio sin consecuencias.

BENEFICIOS:

No hay beneficios directos para ustedes por participar en este estudio, pero nos ayudará a comprender mejor cómo ofrecer educación nutricional de alta calidad para el programa de Farmacia de Alimentos en el futuro. Una vez que se complete el estudio, haré un seguimiento con ustedes para decirles lo que descubrimos para que entiendan por completo su contribución.

PRIVACIDAD / CONFIDENCIALIDAD:

Todo lo que digan durante nuestra conversación se mantendrá confidencial. Usaremos un dispositivo de grabación de voz para grabar la conversación para asegurarnos de que no se pierda la retroalimentación importante de usted. Socorro / Camila y yo seremos las únicas personas que escucharán la grabación para poder traducirla y transcribirla por escrito. La grabación se borrará inmediatamente después de que se haya escrito la transcripción para garantizar que su identidad esté protegida. La transcripción no incluirá sus nombres ni ninguna información que los identifique.

COMPENSACIÓN POR PARTICIPACIÓN:

Recibirá una tarjeta de regalo de Safeway de \$20 por su participación en este estudio. Si elige no participar, recibirá los servicios habituales de la Farmacia de Alimentos y servicios clínicos sin ningún cambio en su atención.

NATURALEZA VOLUNTARIA DEL ESTUDIO:

Su participación es voluntaria y puede negarse a participar sin penalización o pérdida de beneficios. Puede declinar contestar cualquier pregunta que les haga sentir incómodos y pueden interrumpir su participación en cualquier momento sin penalización o pérdida de beneficios.

OFERTA PARA RESPONDER PREGUNTAS:

Por favor hagan cualquier pregunta que tenga ahora. Si tienen preguntas más adelante, deben comunicarse con la investigadora principal: Ellen Pelos al (952) 451-9885 o (espelos@dons.usfca.edu). Si tiene preguntas o inquietudes sobre sus derechos como participante en este estudio, puede comunicarse con la Junta de Revisión Institucional de la Universidad de San Francisco en IRBPHS@usfca.edu. ¿Alguien tiene alguna pregunta?

Si desean participar en el grupo de conversación, digan "sí".

Appendix F

Leader Interview Guide

Goals for our conversation

- Get a sense of your perspective and input on the FP program and learn from your expertise in this field to create the best product I can for your organization at the end of this project
- Open conversation, so feel free to share your thoughts freely
- I will be recording our conversation to help me take notes later. The recording will be deleted at the end of this project.
- Your identity will remain anonymous in my paper
- Would you like to move forward? (Can always just do notes instead of recording)

Questions

1. Tell me about the FP program as if I'm a new employee who is unfamiliar with it.
 - a. Guiding questions
 - i. What is the FP?
 - ii. Who does it serve?
 - iii. What is the purpose?
 - iv. Does it work?
 - v. Who funds it?
2. What is your vision for the future of the FP, ignoring any barriers like funding or staffing?
 - a. In broad strokes, how do you think we can we get to this future state?
 - b. What, if anything, would prevent this future state?
3. What are your priorities for the Food Pharmacy?
 - a. Is accessibility of the program something that you are focused on?
 - i. For example, about 10 out of 150 FP clients attend the nutrition education workshop in San Mateo every month, so accessibility is relatively low for the nutrition education piece of the program.
 - ii. Is that something that we should be working on, from your point of view, getting more engagement for nutrition education? (No right answer!)

4. What do you think makes for a good community health program?
5. What are your views about creating sustainable programs? Do you think it is important for programs to be sustainable over the long-term?
 - a. How do you think the FP is doing in terms of its sustainability?
 - b. How do you build sustainable nutrition education programs?
6. What are your thoughts and experiences around online programs? For instance, an online resource page that includes nutrition education for people with T2D.
 - a. Barriers and facilitators?
 - b. Benefits?
 - c. Drawbacks?
7. I am thinking of creating an online resource page for distributing nutrition education to our FP clients so we can reach more people. The format I am thinking of is a landing page that greets patients and then a menu with English and Spanish options for them to click on, based on language preference. Within the main section of the website, there will be different diabetes nutrition modules, just like we have for the in-person workshops, and each page is a different lesson. Focus group feedback was very positive for this kind of website that they can access it whenever it works for them. To remind patients to check the website and to provide an easy access link to their phones, we can use CareMessage to text FP patients on a regular schedule, like we currently do for reminding them to pick up food and attend the nutrition workshops.
 - a. What are your thoughts about this kind of program service?
 - b. Do you have suggestions and feedback?
 - c. What are concerns that you have?
 - d. How do you see this fitting into the current FP program?
8. Is there anything else you think is relevant to the FP or this project that you'd like to talk about?

Thank you so much!

Appendix G

Usability Questionnaire

Usability Questionnaire

Health Information Technology Usability Evaluation Scale (Schnall, Cho, & Liu, 2018)

I'm going to provide statements about the website, and after each statement, please tell me how much you agree with the statement on a scale of one to five, with one being strongly disagree and five being strongly agree. If you strongly disagree with the statement, you will reply with the number one, if you strongly agree with the statement, you will reply with the number 5. If your answer is between the numbers one and five, please select the number that most accurately represents your opinion. Does this make sense?

Impact

1. I think the website would be a positive addition for people with diabetes

Strongly disagree 1 2 3 4 5 Strongly agree

2. I think the website would improve the quality of life of people with diabetes

Strongly disagree 1 2 3 4 5 Strongly agree

3. The website is an important part of meeting my information needs related to self-management of diabetes

Strongly disagree 1 2 3 4 5 Strongly agree

Perceived usefulness

4. Using this website would make it easier to manage diabetes symptoms

Strongly disagree 1 2 3 4 5 Strongly agree

5. Using this website would enable me to self-manage my diabetes symptoms more quickly

Strongly disagree 1 2 3 4 5 Strongly agree

6. Using this website would make it more likely that I can self-manage my diabetes

Strongly disagree 1 2 3 4 5 Strongly agree

7. Using this website would be useful for self-managing diabetes related symptoms

Strongly disagree 1 2 3 4 5 Strongly agree

Perceived ease of use

8. I am comfortable with my ability to use this website

Strongly disagree 1 2 3 4 5 Strongly agree

9. Learning to use this website is easy for me

Strongly disagree 1 2 3 4 5 Strongly agree

10. It would be easy for me to become skillful at using this website

Strongly disagree 1 2 3 4 5 Strongly agree

11. I find the website easy to use

Strongly disagree 1 2 3 4 5 Strongly agree

User control

12. When I make a mistake on the website, I recover easily and quickly

Strongly disagree 1 2 3 4 5 Strongly agree

13. The information provided on the website is clear

Strongly disagree 1 2 3 4 5 Strongly agree

What is your impression of the website? What do you think about it?

Do you like the website?

Yes

No

Would you like using this website to learn about nutrition and diabetes?

Yes

No

What about the website makes you want to use it more?

How much do you like these different ways of learning information, on a scale of one to five, with one being you don't like them at all, and five being you love using them?

1. Watching videos

Not at all 1 2 3 4 5 Love them

2. Reading

Not at all 1 2 3 4 5 Love them

3. Looking at photos

Not at all 1 2 3 4 5 Love them

4. Listening to the radio or podcasts

Not at all 1 2 3 4 5 Love them

Would you feel comfortable using this website from your phone to learn about nutrition?

Yes

No

What do you usually use your phone for?

Do you use a computer?

Yes

No

Do you use Facebook?

Yes

No

If yes → What do you use Facebook for?

If yes → What is the easiest way to get in touch on Facebook?

If yes → Do you use Facebook groups?

Yes

No