Spring 5-2020

Development Of A Culinary Nutrition-Based Training For Dietitians And A Clinic-Based Nutrition Intervention To Improve Health Outcomes Among Low-Income Minority Patients

John Wesley Mcwhorter
UTHealth School of Public Health

DEVELOPMENT OF A CULINARY NUTRITION-BASED TRAINING FOR REGISTERED DIETITIAN NUTRITIONISTS AND A CLINIC-BASED NUTRITION INTERVENTION TO IMPROVE HEALTH OUTCOMES AMONG LOW-INCOME MINORITY PATIENTS

by

JOHN WESLEY MCWHORTER, MS, BS, AS

APPROVED:

CASEY DURAND, PHD, MPH

DEANNA HOELSCHER, PHD, RDN, LD, CNS, FISBNPA

SHREELA V. SHARMA, PHD, RDN, LD

DEAN, THE UNIVERSITY OF TEXAS SCHOOL OF PUBLIC HEALTH

DEDICATION

John “Papa John” Willoughby, Jr.
&
Robert “Boo” McWhorter

DEVELOPMENT OF A CULINARY NUTRITION-BASED TRAINING FOR DIETITIANS AND A CLINIC-BASED NUTRITION INTERVENTION TO IMPROVE HEALTH OUTCOMES AMONG LOW-INCOME MINORITY PATIENTS

by

JOHN WESLEY MCWHORTER
MS, The University of Texas Medical Branch, 2015
BS, Kansas State University, 2014
AS, Florida Culinary Institute, 2007

Presented to the Faculty of The University of Texas

School of Public Health

in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PUBLIC HEALTH

THE UNIVERSITY OF TEXAS
SCHOOL OF PUBLIC HEALTH
Houston, Texas
May 2020

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to Dr. Shreela Sharma for her support, mentorship, and patience throughout my doctoral studies. Thank you to my committee members, Dr. Casey Durand and Dr. Deanna Hoelscher, for your encouragement and challenges. Thank you to Laura Moore and Don Sanders for their vision and generosity in creating a world-class teaching kitchen to challenge the status quo of nutrition education. To my friends and colleagues, Dr. Mazher Mulla, Dr. Margaret Raber, Dr. Jean Gutierrez, Dr. Susie Day, Melisa Danho, Shannon Weston, and Jeanne Piga-Plunkett, thank you for your friendship and encouragement. My sincere gratitude goes to the UTHealth community for the countless conversations, inspirations, and breaking bread with me over the years. I would like to thank my mentor and friend Dr. David Eisenberg and the many *Teaching Kitchen Collaborative* members for their inspiration and comradery. I want to express my gratitude to Dr. Tim Harlan, and the *Health Meets Food* team for expanding the field of culinary medicine. Thank you to the entire team at Harris Health for their collaboration throughout my dissertation studies. To the greatest cohort ever – I would not have completed this dissertation without each of you. To my parents, thank you for your direction, constant love, and support. To my siblings and their families, thank you for the passionate example of your work across the world. To my son, John Atlas, and daughter, Alex Ann, thank you for your relentless joy and love – may you pursue your dreams unabashedly. Most importantly, I would like to express my love and appreciation to my wife, Annah, whose traits are too numerous to label, for her love, encouragement, and support throughout my education.

DEVELOPMENT OF A CULINARY NUTRITION-BASED TRAINING OF DIETITIANS AND A CLINIC-BASED NUTRITION INTERVENTION TO IMPROVE HEALTH OUTCOMES AMONG LOW-INCOME MINORITY PATIENTS

John Wesley McWhorter, DrPH, MS, BS, AS
The University of Texas
School of Public Health, 2020

Dissertation Chair: Shreela V. Sharma, PhD, RDN, LD

Substantial evidence demonstrates the relations between a healthy dietary pattern rich in fruits, vegetables, and whole grains and a lower risk of chronic diseases including type 2 diabetes. Despite well supported studies, programs, and public health campaigns presenting the health benefits of consuming a healthy dietary pattern, most Americans fall far short of the recommendations. Further, the compounding effects of food insecurity and the consumption of energy-dense and nutrient-deficient foods disproportionately affect low income minority populations. Culinary medicine (CM) and food prescription programs are gaining popularity as tools for (1) decreasing food insecurity; (2) increasing personal agency; (3) promoting healthy eating; and (4) reducing the risk of chronic diseases. However, there is a critical gap in the education and training of healthcare professionals including Registered Dietitian Nutritionists (RDN) to deliver CM programs that are specifically designed for low income minority patients with diabetes participating in a food prescription program.

The purpose of this dissertation project was three-fold (1) to perform a formal needs assessment among the target population of low-income, minority patients with diabetes and

practicing RDNs; (2) to utilize concepts of intervention mapping to develop a comprehensive CM curriculum; and (3) to develop a subsequent training curriculum for practicing RDNs to level-set culinary nutrition skills and knowledge.

Intervention Mapping (IM) was utilized to systematically develop a Social Cognitive Theory (SCT)-based framework for a CM curriculum tailored to the needs of a culturally diverse, food insecure, and low-income minority population. Secondarily, a train-the-trainer capacity-building curriculum was developed to fill the identified gaps among practicing RDNs. Our IM process was informed by key informant interviews, six patient focus groups (n=40), and three RDN focus groups (n=17). The qualitative data analysis identified themes and subthemes to understand the (1) diverse dietary habits and barriers and facilitators to healthy eating; and (2) the gaps in education and knowledge in culinary nutrition between practicing RDNs and the needs of their respective patients.

The resulting CM curriculum includes a three step method for each session, (1) *taste* – provides participants the opportunity to consume delicious "healthy food" in order to change negative outcome expectations of "healthy food" tasting bad; (2) *see* – demonstration of recipes (cooking techniques) involves modeling and observational learning of skills; and (3) *do* – provides participants the ability to increase behavioral capacity and self-efficacy through hands-on experiential preparation recipe(s) (cooking techniques). Lastly, holding the series of classes in a group setting with self-efficacy discussions and goal setting promote modeling through peers, group learning, changes in social norms, and continued reinforcement of positive behaviors. The RDN training curriculum consists of level-setting of basic cooking

skills (e.g., knife skills, vegetable roasting), counseling strategies, diversity training, and mock session delivery.

Results from the pilot testing and evaluation of patient curriculum and practitioner training will inform and provide an evidence-based foundation for future culinary nutrition programming among a diverse low-income minority population.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

BACKGROUND

Food Insecurity

Good nutrition is necessary for optimal health including the growth, development, and maintenance of health and well-being across the lifespan (Azetop & Joy, 2013; Zhan et al., 2017). Good nutrition has been defined as a dietary pattern rich in fruits and vegetables (FV), legumes, and whole grains (US Department of Health and Human Services [HHS], 2017). Access to good nutrition is a considered a basic human right, yet in 2017 more than 11.8% (15 million) of households in the United States (U.S.) did not have access to these healthy foods, and suffered from food insecurity (Alisha, Rabbitt, Gregory & Singh, 2017). The United States Department of Agriculture (USDA) defines food insecurity as "a household-level economic and social condition of limited or uncertain access to adequate food", "the inability to provide adequate food for one or more household members due to lack of resources", or more simply, "a lack of access to enough food for an active, healthy lifestyle" (Alisha et al., 2017; Rainer, Hans, Hans, & Hans, 2000). At the national level, rates of food insecurity were higher for households with children or with incomes at or below the federal poverty line, those households headed by single women or men, and among the aging population (Alisha et al., 2017; De Marchis et al., 2019). Further, rates of food insecurity are disproportionately higher for minority households (22% for Hispanic and 26% for African American) (Alisha et al., 2017; Vaccaro & Huffman, 2017).

In Texas, the prevalence of food insecurity is higher than the national average at 14.6%, with 1 in 7 Texans suffering from food insecurity (S. Berkowitz, T. Berkowitz & Wexler, 2017). In the greater Houston area as of 2017, an estimated 724,750 people identified as food insecure (16.6%), which is about two percentage points above the state and five percentage points above

the national rates (11.1%) (Schuler & Koka, 2019). Houston's diverse population represents a range of income levels with more than 18% of the population living in poverty and almost 9% estimated to be of undocumented immigrant status (Schuler & Koka, 2019; Passel & Cohn, 2017). Hunger is simply the tip of the iceberg; food insecure households suffer disproportionately from a host of health disparities (Berkowitz et al., 2017). Efforts to address food insecurity must be long-term, systemic, coordinated, and collaborative across sectors to ensure adequate patient-centered care to adequately address the root causes of food insecurity (Schuler & Koka, 2019).

Health Disparities Among Food Insecure Individuals

While it is true that the majority of food insecurity affects those well below the federal poverty threshold, a significant portion of the broader population, often termed the "working poor", also suffer disproportionately from health disparities (Pruitt et al., 2016). Members from this often-overlooked group typically qualify, but often do not apply for assistance programs, consume poor quality foods, and, when measured, typically screen positive for food insecurity (Wight, Kaushal, Waldfogel & Garfinkel, 2014). Ironically, food insecure individuals are more likely to suffer from poor health statuses related to overconsumption, including chronic diseases such as type 2 diabetes, and obesity (Berkowitz et al., 2017; NCHS, 2016; US Department of Health and Human Services [HHS], 2017; Zhan et al., 2017).

Contributing to the issue of food insecurity is simply living in an area that does not have adequate access to food, and more specifically, access to healthy foods. Low income communities are often located in areas considered to be *food deserts,* or geographical areas with limited access to affordable healthy food such as vegetables, fruits, and whole grains (HHS, 2017). Other communities might have few grocery stores and might contain several options for

unhealthy energy dense and nutrient deficient foods, such as fast food restaurants. Neighborhoods like these are termed *food swamps*, because of the ratio of the availability of unhealthy to healthy foods (Cooksey-Stower, Schwartz & Brownell, 2017). Low income populations living in food deserts and food swamps do not have adequate access to healthy foods to live a healthy and sustainable lifestyle (Cooksey-Stowers et al., 2017).

More than 13% of Houston residents are suffer from diabetes, and two-thirds with overweight and more than one-third with obesity (Alisha et al., 2017; Health of Houston Survey, HHS 2017-18). Consistent with other health disparities, the rates of type 2 diabetes, overweight, and obesity are higher in low income communities where access and financial tradeoffs prevent adequate care (Schuler & Koka, 2019). The combination of the chronic uncertainty of the next meal, eating only when foods are available, and consumption of unhealthy food can further increase the risk of chronic diseases among food insecure households (Sharma, Hernandez, Hoelscher & Yaroch, 2015). Good nutrition is a proven therapy to prevent and treat chronic diseases, but the combination of food insecurity and financial tradeoffs often lead to the converse with higher consumption of energy dense and nutrient deficient foods likely further complicating chronic diseases and increasing healthcare costs (Berkowitz et al., 2017; Alisha et al., 2017; Schuler & Koka, 2019).

Food Insecurity as a Social Determinant of Health

Healthy People 2020 defines social determinants of health (SDOH) as "conditions in the environments in which people live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks." (Healthy People 2020, 2010). Areas of SDOH include (1) economic stability, (2) education, (3) social and community context, (4) health and health care, and (5) neighborhood and the built environment (Healthy People 2020, 2010). Food insecurity is inextricably linked to poverty and often leads to a negative feedback loop where each financial decision creates more problems than it solves (Thornton et al., 2016; Pooler, Hartline-Gafton, DeBor, Sudore & Seligman, 2019). Food insecurity is further complicated by the local environment where education, access to healthcare or healthy food, transportation, built environment, and safety are common SDOH. Furthermore, these SDOH are inter-related such that there are spending trade-offs within households struggling with food insecurity. For example, "Should I buy food or medication?", is a type of decision that individuals at risk of food insecurity often face. However, providing food as a handout does not solve food insecurity – hunger is simply the tip of the iceberg (Gundersen & Ziliak, 2015).

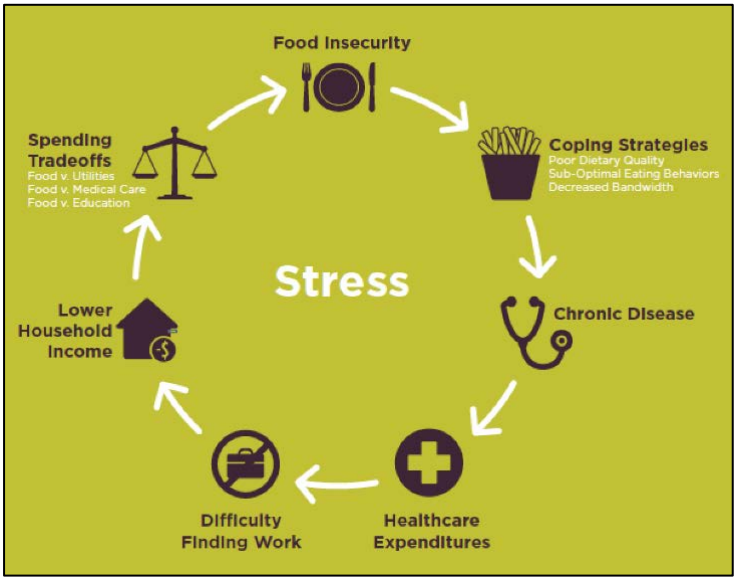


Figure 1: Cycle of Hunger and Health

This food insecurity cycle (figure 1) is a prison for many households across the U.S. and is increasingly difficult to escape without considerable systemic support and resources (Thornton et al., 2016; Feeding America, 2019).

Diet and Chronic Disease

Although substantial evidence indicates that the burden and costs of chronic disease such as type 2 diabetes and obesity can be reduced through modifiable risk factors, each year more than 85% of the nation's $2.7 trillion healthcare costs are dedicated to treating symptoms rather than preventing chronic diseases (Gerteis et al., 2014; W. Raghupathi & V. Raghupathi, 2018). Consuming a healthy diet rich in FV, legumes, and whole grains is a well-supported low-cost prevention and treatment approach for reducing the risk of chronic diseases, including type 2 diabetes and obesity (NCHS, 2016 & Zhan et al., 2017). Despite well supported studies, programs, and public health campaigns presenting the health benefits of consuming FV, fewer than 1 in 10 Americans meets the U.S. Dietary Guidelines for Americans (1.5-2.0 cups of fruit and 2.0-3.0 cups of vegetables per day), with lower consumption rates among adults suffering from food insecurity (CDC, 2016; US Department of Agriculture [USDA], 2015). The compounding effects of poverty, access, chronic disease, and consumption of energy dense and nutrient deficient foods continues to be a major public health problem. Food insecurity and chronic diseases such as obesity and diabetes often co-exist within the same individual because of disordered eating (figure 1) – consuming what is available regardless of whether the foods are healthy or not (Hartline-Grafton & Dean, 2017).

Food Prescription Programs

In an effort to combat food insecurity, increase access to and consumption of healthy foods, and reduce the burden of chronic disease, programs known as food prescription, Food Rx

and food *pharmacies* have emerged across the US (Saxe-Custack, LaChance, Hanna-Attisha & Ceja, 2019; Swartz, 2018). These programs generally enroll food insecure individuals with certain health criteria such as type 2 diabetes and offer a physician-provided "prescription" that can be redeemed for healthy foods, like FV, legumes, and whole grains (Swartz, 2018). Preliminary pilot research suggests positive results with increasing access to healthy foods, improved consumption of healthy foods, and stronger community linkages (Aiyer et al., 2019; Ferrer, Neira, Garcia, Cuellar & Rodriguez 2019). Little is known about the feasibility and scaling of such programs across large healthcare systems, the integration of these programs into electronic medical records, and the partnerships required across sectors are needed to successfully integrate such program into usual patient care (Saxe-Custack et al., 2019; Swartz, 2018). In Houston, Harris County, healthcare organizations are investing in the screening of food insecurity and SDOH for their patients, and then implementing strategies such as food prescription programs or connecting patients to food pantry resources. However, more research is needed to understand the strategies; their feasibility, adoption, uptake; the impact of these programs; and best practices that can be used to scale and sustain for long-term success (Aiyer et al., 2019; Swartz, 2018; Seligman & Berkowitz, 2019).

Addressing Behavioral Barriers to Healthy Eating – Why People Eat the Way They Do?

In the seminal article, "*Why Americans eat what they do"*, Glanz et al (1998), when discussing successful approaches to increase healthy food consumption, argued that "a more promising strategy might be to stress the good taste of healthful food" rather than focus on nutrition as a message (p.1125). Americans are generally knowledgeable about the health benefits of vegetables (Glanz et al., 1998). Further, the overly simplified advice to "eat more fruits and vegetables" ignores the complex social and environmental linkages that often dictate

an individual's choice to consume FV (Glanz, Sallis, Saelens & Frank, 2005). Since not all consumption decisions are derived from free choice, a combination of several social inequalities limit a person's choice to consume healthy foods (Darwin & Drewnowski, 2015). For people living in poverty, these social and environmental factors often lead to lower cost and increased availability of calorically dense, palatable, and low nutritional value processed foods (Popkin & Kenan, 2016). Over the past several decades, significant changes in the U.S. food system and social and eating environments have led to an evolving relationship with FV for adults living in poverty (Smith, Ng, & Popkin, 2013; Schulz et al., 2013). Negative taste perceptions, perceived time, and the overall cost of access (purchasing, transportation, waste, etc.), are strong deterrents of consuming healthy foods (Neumark-Sztainer, Wall, Perry & Story, 2003; Story, Kaphingst, Robinson-O'Brien & Glanz, 2008). Merely distributing healthy foods in low-income communities excludes intrapersonal factors such as flavor, self-efficacy and overall food literacy, as well as the community social support and role modeling needed to increase healthy food consumption (Kuehn, 2019; Story et al., 2008).

A Culinary Nutrition Approach to Address Behavioral Barriers to Healthy Eating

Another emerging strategy and evidence-based approach to increase healthy food consumption is through the utilization of experiential culinary nutrition classes that help expose participants to delicious healthy foods, and offer solutions for cost, preparation, culture and specific health conditions (Kuehn, 2019; Horning, Fulkerson, Friend & Story, 2017; Overcash et al., 2017; Hartmann, Dohle & Siegrist, 2013). Culinary nutrition programming offers hands-on opportunities for class participants to cook healthy foods and overcome personal barriers through experiential learning in a supportive group environment (Eisenberg, Miller, McManus, Burgess & Bernstein, 2013; La Puma, 2016). However, healthcare providers, including Registered

Dietitian Nutritionists (RDNs), those responsible for counseling patients in nutrition, do not typically receive formal training in experiential culinary nutrition (Eisenberg & Burgess, 2015; McWhorter, Raber, Sharma, Moore & Hoelscher, 2019). There is a critical gap in the education of healthcare professionals in practical and useful nutrition information that is tangible and useful for low-income minority populations including cooking skills, culturally relevant foods, language, and messaging. This strategy has a two-pronged approach: training of healthcare providers to improve knowledge and skills in experiential nutrition education; and community-based classes for patients to address barriers to healthy eating and increase healthy food consumption.

Improving Food Insecurity at Harris Health System

Harris Health System (HH) is a fully integrated healthcare system that provides care for all people residing in Harris County, Texas. The system includes two full-service hospitals, multiple mobile health units, eighteen community health centers, five same-day clinics, five school-based clinics, three multi-specialty clinics, a dental facility, and a dialysis center (Harris Health, 2019). As a safety net provider, HH's primary focus is to care for the underserved. HH clinics and hospitals serve the most impoverished geographic areas in Harris County, with residents suffering significantly higher rates of food insecurity, overweight and obesity and type 2 diabetes (Harris Health, 2019; Health of Houston Survey, HHS 2017-18). More than 55% of the patients served by HH live below the poverty line; and the prevalence of overweight and obesity among HH adults aged 18 to 44 were 73.9%, which is significantly higher than the rates for Houston (63.6%) (Harris Health, 2019).

Beginning In 2015, to address health disparities, HH began screening all patients for food insecurity to better understand the scope and scale of the problem within HH. The results of food

insecurity screening inspired HH leadership to create lifestyle interventions and initiatives targeted at reducing food insecurity and chronic diseases such as type 2 diabetes and obesity. In 2017, leadership at HH's Lyndon B. Johnson Hospital (LBJ), in the 5th ward of Houston, raised funding to build a one-acre community farm on site at the hospital as a means to reach out to the community and provide access to fresh fruits and vegetables. In 2018, HH launched an initiative in collaboration with the Houston Food Bank to install food pantries called "food *pharmacies*" and implement a food prescription framework onsite in the HH ambulatory clinics and hospitals. As part of this strategy, patients screened to be positive for food insecurity and have a diagnosed diet-related chronic disease (e.g. diabetes) are given a prescription, they can redeem in the clinic *food pharmacy* for healthy foods such as FV, legumes, and whole grains. These prescriptions allow patients the ability to "shop" in the *food pharmacy,* where they are allocated a weekly distribution of FV, whole grains, and other "healthy" staples (e.g. legumes and lean meats). HH *food pharmacy* provides these healthy foods through a partnership with the Houston Foodbank's *Food for Change* program (described elsewhere). Currently, as of fall 2019, HH has one operational *food pharmacy* in Strawberry Health Center in Pasadena, and one additional *food pharmacy* planned for Spring 2020 onsite at LBJ hospital.

To further operationalize and evaluate the impact of the food prescription programming, HH is now collaborating with UTHealth School of Public Health in a two-year initiative called *A Prescription for Healthy Living* to a) implement a tailored culinary nutrition-based food prescription program for their patient population, specifically pregnant women who are at risk for gestational diabetes, and adults diagnosed with diabetes; and b) conduct a systems-wide training of dietitians in culinary nutrition (details described below). This collaboration between UTHealth and HH is designed as a cost saving measure, since a one-point reduction in a patient

with diabetes HbA1c leads to an estimated cost savings of around $8,300 per year (Harris Health, 2019). The HH initiative has the potential to strengthen the clinic-community linkages and provide resources and interventions to a historically underserved population in tremendous need of increased quality-care and resources to address food insecurity and chronic diseases, such as type 2 diabetes and obesity.

Public Health Significance

Lifestyle interventions and preventive services are not typically available or accessible for low income minority populations (Fiscella & Sanders, 2016; Thorton et al., 2016). These types of services can strengthen the clinic-community linkages and mitigate chronic diseases such as obesity and type 2 diabetes among low-income minority populations, who are at a disproportionately higher risk of these diseases and other factors such as food insecurity (Sharma et al., 2015). Providing innovative solutions to educate healthcare professionals, such as RDNs, in experiential lifestyle interventions such as culinary nutrition and food prescription programs are key strategies for delivering successful programming to increase healthy eating behaviors and to address the upstream causes of chronic diseases. Integrating a community farm, *food pharmacy* (food prescription), and experiential culinary nutrition classes within a healthcare system is a novel systems-level solution that can be integrated into the standard of care at HH, across Texas, and more broadly, the United States.

A Prescription for Healthy Living (PI: Dr. Shreela Sharma)

A Prescription for Healthy Living (APHL) is a two-year initiative between UTHealth SPH and HH to train HH RDNs in culinary nutrition and implement evidence-based programs (described below) among pregnant women and adults diagnosed with diabetes to improve pregnancy and health outcomes respectively while improving lifestyle behaviors. The study,

implemented from 2019-2021, includes three phases: Phase 1 includes a formal needs assessment with key informant interviews; focus groups with patients to understand current dietary habits, cooking behaviors, home environment, and other related behaviors; and focus groups with HH RDNs to understand the gaps in knowledge and skills for teaching a culinary nutrition program. For phase two, data gathered from the formal needs assessment will be used to develop a culinary nutrition curriculum specific to the needs of a diverse HH population, coordinating it with HH *food pharmacy* and food prescription program framework. For phase three, a capacity building train-the-trainer curriculum will be developed to fill the gaps of the HH RDNs' knowledge and skills for delivering the patient culinary nutrition program. Two UTHealth programs, *Nourish* and *Healthy Eating Active Living (HEAL)* provide evidence-based curriculum for undertaking these phases (McWhorter et al., 2019; Sharma et al., 2018). Altogether the study is designed to strengthen the clinic-community linkages and to address the gaps between healthy eating, food insecurity, and chronic diseases such as obesity and type 2 diabetes.

To address the aforementioned gaps of experiential culinary nutrition training and education and gardening skills, the University of Texas Health Science Center at Houston (UTHealth) School of Public Health developed the *Nourish Program*– a nutrition research and education hub consisting of a holistic teaching garden, a culinary teaching kitchen, and a nutrition teaching simulation lab (McWhorter et al., 2019). The three resources provide experiential opportunities to address the linkages between food insecurity, food systems, dietary consumption, health promotion, and chronic disease prevention and treatment. This model provides education for healthcare students, including dietetic, medical and dental students; professional trainees; and healthcare professionals, while integrating experiential learning

opportunities to prepare participants for real-world situations for the treatment and prevention of chronic diseases, including type 2 diabetes and obesity through culinary nutrition programming.

Healthy Eating Active Living (HEAL), is a lifestyle intervention developed by researchers at UTHealth for women who are pregnant or who have an infant and would like to embrace a healthier lifestyle for themselves and their children (Sharma et al., 2018). The program is integrated into the healthcare system and offers support through weekly group classes, which include exercise, nutrition, and cooking instruction in a supportive group environment to promote better health outcomes for mothers and their children. HEAL provides opportunities to strengthen the clinic-community linkages while improving healthy eating behaviors.

Objectives

The specific aims of this dissertation are:

- Aim 1:To understand facilitators and barriers to healthy eating and overall food literacy through focus groups conducted with patients and Registered Dietitian Nutritionists (RDNs) at HH. I will conduct an analysis of the data collected from the focus groups conducted between April-August 2019 among patients receiving care at LBJ and HH clinics, and dietitians employed at HH.
- Aim 2: To develop an APHL patient-centered culinary nutrition curriculum addressing the food literacy gaps identified through a needs assessment with HH patients and RDNs. Data from the focus groups in Aim 1 will be used to develop and finalize the Nourish and HEAL program strategies that will coordinate with the HH food prescription programming to reduce food insecurity, promote healthy habits, and mitigate type 2 diabetes among HH patients.

- Aim 3: To develop an APHL train-the-trainer culinary nutrition curriculum to improve knowledge and skills for RDNs. Data from the focus groups in Aim 1 and Nourish and HEAL curriculum content and strategy will be used to design the train-the-trainer curriculum to build capacity by level setting the culinary nutrition skills for HH RDNs and promoting the HH food prescription program. Lastly, pilot testing and feasibility and evaluation of the curriculum will be conducted.

METHODS

Study Design

This dissertation is part of the larger APHL parent study and includes 1) data analysis of the focus groups to inform the development of a culinary nutrition-based curriculum for HH patients, 2) development of a framework and culinary nutrition curriculum for implementation among HH patients as part of APHL, and 3) development of a capacity building culinary nutrition train-the-trainer curriculum.

Aim 1: To understand facilitators and barriers to healthy eating and overall food literacy through focus groups conducted with patients and RDNs at HH.

Aim 1: Focus Groups

As part of the APHL project, six patient focus groups (were conducted at HH locations among patients receiving care at LBJ hospital and Strawberry Health Clinic in private conference rooms and occurred Monday through Friday in both the morning and afternoon. Patients (n=40) were recruited via flyers posted in patient waiting areas and by program staff at LBJ Hospital and Strawberry Health Clinic. A bilingual trained facilitator led the focus groups, while a secondary

bilingual facilitator took notes using a structured guide. The one-hour English and Spanish focus group sessions were audio recorded and transcribed and translated into English for analysis.

Three RDN focus groups (English language) were conducted at HH locations (described below) in private conference rooms in the afternoons during normal working hours. Participants (n=17) were recruited via email through collaboration with HH administration. A trained facilitator led the one-hour audio recorded focus groups while a second facilitator took notes using a structured guide. The recorded sessions were transcribed for analysis.

Study Setting

Locations of the focus groups included Lyndon B. Johnson Hospital, 5656 Kelley St, Houston TX 77026 (n=4); Strawberry Health Clinic at 927 Shaw Avenue, Pasadena, TX 77056 (n=2); Thomas Street Health Center at 2015 Thomas Street, Houston, TX 77009 (n=1); and Ben Taub Hospital at 1504 Ben Taub Loop, Houston, TX 77030 (n=2).

Study Participants

Patients receiving care at LBJ hospital and HH clinics and RDNs employed at HH in spring and summer 2019 were recruited to participate in the study. Inclusion Criteria included:

- Focus Groups for HH Patients
    - Adult patients (18 to 70 years) receiving care at LBJ hospital and HH Strawberry clinic in June 2019 – August 2019;
    - Women ≥ 18 years, pregnant and receiving prenatal care at LBJ hospital and HH Strawberry clinic in June 2019-August 2019; and
    - English-speaking or Spanish speaking
- Focus Groups for HH RDNs

- Registered and licensed dietitian in the state of Texas employed at HH in April 2019 – August 2019; and
- English-speaking

Printed explanation of the purpose of the study were available for all participants to review prior to their respective focus group session. Trained program staff reviewed the consent and offered an opportunity for participants to ask any questions or express concerns. Informed consent was obtained for all interested participants.

All patient focus group participants received a $25 gift card to Walmart at the time of enrollment for their participation in the study. HH RDNs did not receive any monetary compensation as part of this study for their time. Participation in this study is of minimal risk, and we did not expect our focus group questions to cause emotional distress. Protocols and focus group script and questions (Appendix) were approved by the University of Texas Health Science Center (UTHealth) Institutional Review Board number: HSC-SPH-10-0187.

Focus Group Sample Sizes

- RDN focus groups: The target enrollment was five to ten participants per focus group (n=3) among HH RDNs (n=26) with an actual sample size average of 5.6 per focus group (n=17).
- Patient focus groups: The target enrollment was five to ten participants per focus group (n=6) among HH patients receiving care at Strawberry Clinic or LBJ Hospital, with an actual sample size equaling an average of 6.6 per focus group (n=40).

Data Collection

All focus groups were held in private conference rooms at one of the four locations at HH (Ben Taub Hospital, Thomas Street Health Center, Strawberry Clinic, or LBJ Hospital). A range

of times and days for focus groups were offered to increase enrollment. A short paper survey was created in Qualtrics and administered prior to the patient focus groups to gather information on patient demographics, home kitchen equipment, and their respective home environment. Focus groups were conducted in either English or Spanish for patients and only in English for RDNs utilizing protocols derived from Krueger et al. (Krueger & Casey, 2015). Two trained study staff members participated in each focus group, with one member leading the focus group and the second taking notes and audio recording the approximately one-hour focus group sessions. Patient survey and both patients and RDN focus group scripts are in Appendix A.

Data Management

Participant responses from focus groups transcripts were stored separately from any identifying personal information. Study codes in the form of a unique number were assigned to each participant to label their response. A separate document that links the study code to subjects' identifying information was stored in a locked cabinet at the UTHealth SPH office with access restricted to members of the research team. All digital copies were password protected on UTHealth share drives.

Data Analysis

Descriptive statistics were obtained from the patient paper survey, including demographics and kitchen equipment and home environment considerations. These data were used to understand the home cooking environment including the physical barriers and facilitators to the preparation of healthy food, as well as inform the curricula regarding tailoring of programmatic materials. Program curricula worked within the identified constraints of the patient population to ensure realistic and useable culinary nutrition education.

Each of the nine transcripts was examined by two independent reviewers and blind cataloged and organized into common themes and subthemes utilizing Krueger et al. methodology (Krueger & Casey, 2015) through NVivo qualitative software (QSR International). APHL principal investigator and staff reviewed the themes and subthemes, and a group consensus was reached on themes and subthemes for the respective RDN and patient focus groups. Specific quotes that represented and exemplified relevant themes and subthemes were used as an illustration in the respective analysis.

The data analysis included a review of the themes and subthemes of the patient focus groups to understand dietary habits including culturally specific foods, typical eating patterns, frequency of cooking and barriers and facilitators to cooking. Understanding these key behaviors is vital in developing a patient centered curriculum that fills the gaps, addresses barriers, and emphasizes the most appropriate and realistic behavioral changes in promoting increased healthy food consumption.

Aim 2: Development of Culinary Nutrition Curriculum

Aim 2 of this dissertation was to develop a tailored patient-centered, clinic-based culinary nutrition curriculum aligned with the food prescription programming for HH patients. The culinary nutrition curriculum was developed specifically for the diverse HH population through the analysis of the patient survey and focus group data conducted as part of Aim 1 and will align with the goals of the food prescription program at HH. Patients who were eligible for the HH prescription produce program were invited to participate in the Culinary Nutrition programming. The proposed intervention used a Social Cognitive Theory (SCT) framework, which emphasizes individual (e.g. self-efficacy to prepare healthy foods) and social factors (e.g. social support for healthy eating) on health behaviors (Bandura, 2001). The curriculum utilized MyPlate nutrition

guide – an evidenced-based nutrition education resource developed by the U.S. Department of Agriculture as part of the U.S. Dietary Guidelines for Americans, which are aimed at improving America's health by mitigating chronic diseases like obesity and type 2 diabetes (USDA, 2015). MyPlate (figure 2), is a guide that illustrates a "plate" with representative portions of fruits, vegetables, whole grains, proteins, and dairy food groups. The simple to follow, public facing nutrition education guide was adopted by the Academy of Nutrition and Dietetics, national, state, and locally funded nutrition education programs as well as Food Banks and other non-profits as the framework for nutrition education. By implementing a widely used nutrition guide, the focus will be on overcoming barriers and promoting facilitators to healthy eating. Further, the proposed culinary nutrition curriculum can be readily adopted as an adjunct to existing nutrition programming to further improve patient outcomes. The practical, *How To* skills and hand-on experiential culinary training and self-efficacy building will bolster a strong nutrition education framework. The culinary nutrition education curriculum will focus on addressing the gaps between patient healthy eating behaviors (facilitators and barriers) and MyPlate recommendations identified through the analysis of the patient focus groups and survey. As part of this dissertation, I will use the data from the focus groups and interviews were used to develop the curriculum content and related training materials and further develop the proposed framework to coincide with analyses of the qualitative data.

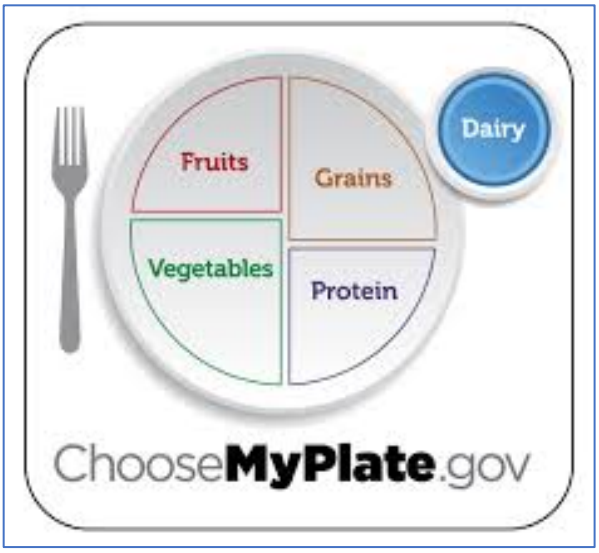


Figure 2: MyPlate - ChooseMyPlate.gov

Social Cognitive Theory and Proposed Framework

Healthy food consumption is a dynamic and complex behavior for adults living in poverty, and the solution is not a simple one size fits all approach. Social Cognitive Theory (SCT), posits a reciprocal and dynamic interaction of personal, behavioral, and environmental interactions impacting behaviors (Kelder, Hoelscher & Perry, 2015; Tougas, Hayden, McGrath, Huguet & Rozario, 2015). By utilizing the SCT as a framework for the culinary medicine curriculum, we intend to increase healthy eating behaviors by building food literacy skills and knowledge through hands-on experiential group classes. Our proposed framework (table 1) includes a three step method for each session, 1) *taste* – provides participants the opportunity to consume delicious "healthy food" in order to change negative outcome expectations of "healthy food" tasting bad; 2) *see* – demonstration of recipes (cooking techniques) involves modeling and observational learning; and 3) *do* – gives participants the ability to increase behavioral capacity and self-efficacy through hands-on experiential preparation recipe(s) (cooking techniques). Finally, holding the series of classes in a group setting with self-efficacy discussions and goal setting promotes modeling through peers, group learning, changes in social norms, and continued reinforcement of positive behaviors.

The proposed curriculum includes five weekly 2-hour sessions with eight participants and one RDN instructor. The proposed format allows RDNs to counsel more patients than typically seen during a 3-hour time period (six patients). RDN individual patient counseling sessions at HH are thirty minutes in length, while in comparison RDNs will see an additional two patients within the 3-hour culinary medicine class (30-minute set-up, 2-hour class and 30-minute clean-up). In order to achieve adequate dosage and saturation, each culinary technique and nutrition topic was covered and reinforced during two separate classes. We estimate the saturation point to

be attendance in four of the six sessions. Further, to work within the constraints of HH clinics without dedicated teaching kitchen space, a portable kitchen cart will be used. This kitchen cart is self-contained, and contains large equipment (oven, microwave, blender, stove top, etc.), small equipment (pots, pans, knives, cutting board, measuring cups and spoons, etc.), space for eight participants and an instructor, a sink, and potable water. All curriculum development including recipes were designed within the scope of the kitchen cart, thereby ensuring proper recreation of recipes and preventing operator bias (Table 1).

Table 1: APHL Culinary Medicine Curriculum Outline		
Five, 2-hour each, hands-on sessions via Kitchen a la Cart		
Common themes for each session: • Patient centered communication (e.g., facilitated discussions) • Culinary skills development (e.g., knife skills, vegetable roasting, etc.) • Self-efficacy building (e.g., tasting and preparing foods, picture challenges) • Utilization of foods from the food pantry • Group discussion and feedback		
Session	Topics Covered	Objectives
Session 1	MyPlate, kitchen safety, vegetable prepping (knife skills), roasting, goal setting, review patients' recipes and building a healthy plate activity	Participants will: (1) Describe their current barriers with healthy eating (2) Identify a healthy plate as ½ fruits and vegetables, ¼ lean protein, and ¼ whole grains (3) Learn to roast flavorful vegetables (4) Learn how to use safe and effective knife skills to prepare a variety of vegetables. (5) Create a short-term goal related to building a healthy plate.
Session 2	Carbohydrate counting, label reading, whole grains, vegetable salads, goal setting, review patients' recipes and label reading activity	Participants will: (1) Be able to describe what foods contain carbohydrates. (2) Learn how to control glucose levels using a MyPlate approach. (3) Learn how to cook whole grain(s). (4) Practice safe and effective knife skills to prepare a variety of vegetables. (5) Refine/ build from goal from session 1
Session 3	Meal planning, grocery shopping, stir-frying & microwaving, goal setting, review patients' recipes and meal planning and grocery shopping activity	Participants will: (1) Discuss their success and challenges with carbohydrate counting. (2) Describe meal planning as a way to help plan the grocery list. (3) Learn how to prepare a flavorful vegetable stir-fry. (4) Learn how microwave flavorful vegetables (5) Refine/ build from goal from session 2
Session 4	Repurposing leftovers, meal planning, vegetable roasting, whole grains, goal setting, review patients' recipes and planning and repurposing activity	Participants will: (1) Discuss their challenges and successes in meal planning and grocery shopping. (2) Identify ways to plan meals in a way that repurposes leftovers. (3) Reinforce whole grain cooking and roasting vegetables (4) Practice safe and effective knife skills to prepare a variety of vegetables. (5) Refine/ build from goal from session 3
Session 5	Eating away from home and snacking, vegetable soups and microwaving, goal setting, review patients' recipes and choosing healthy foods	Participants will: (1) Discuss their challenges and successes in repurposing leftovers. (2) Identify how to eat healthier meals away from the home and while snacking. (3) Learn how to prepare flavorful vegetable soups (4) Reinforce microwave cooking and practice safe and effective knife skills. (5) Refine/ build from goal from session 4

An intervention mapping process was utilized to systematically map the proposed objectives to SCT constructs and the desired outcomes. A proposed logic model framework is described in Table 2. Upon analysis of the formal needs assessment data, further development and mapping of the curriculum was conducted. A draft of the curriculum was sent to experts in health promotion, behavioral science, nutrition, culinary arts, and epidemiology to gauge consensus and perform face validity on the proposed framework and the operationalization of the culinary medicine constructs.

Table 2: A Logic Model of APHL Curriculum Framework

Program Inputs →	Change Agents →	SCT Change Objectives →	Behavioral Outcomes →	Physiological & Psychosocial Outcomes
APHL Training of RDN • Practitioner (train-the-trainer) training (culinary skills, nutrition knowledge, program delivery) • Planning and implementation support **APHL Materials** • Facilities including portable kitchen equipment and cooking materials • Food provisions • Patient curriculum • Implementation manual • Recipe and culinary skills toolbox • Coordination kit • APHL resources for printed materials and handouts • Online resources	**Implementation Team** (APHL staff, clinic dietitians, and misc. staff) • Coordinates patient enrollment with EMR • Plans patient curriculum implementation • Provide pre and post intervention survey **Patient Classes** • Aligns with food received from the food pantry • Provide tasting of recipes prepared in class • Conduct demonstration of cooking techniques • Provide instruction in hands-on preparation of recipes • Conduct class discussions of nutrition topics and recipe preparation • Provide post-session handouts covering nutrition and cooking topics	**Patients** will increase: • Outcome expectations of the taste of healthy foods* • Knowledge of healthy eating (appropriate type, portion size, and to manage disease condition) • Self-efficacy of preparing healthy foods* • Culinary skills for preparing healthy foods* • Perceived social support for healthy foods* • Normative beliefs of healthy foods* **Healthcare Staff** will increase: • Knowledge of culinary techniques • Skills for the preparation of healthy foods • Social support for culturally relevant foods and flavor profiles • Communication with patients about preparation of healthy foods* • Consistent dietary messages	**Patients** will increase: Healthy eating behaviors: • Preparation of healthy foods at home Dietary Intake of: • Vegetables • Fruits • Whole grains • Legumes **Patients** will decrease: Dietary intake of: • Caloric dense and nutrient deficient foods • Sugar sweetened beverages • Processed grains • Overall caloric intake **Environmental Outcomes →** **Patients** will have: • Increased availability of healthy foods* at home • Increased opportunity to practice healthy eating behaviors • Improved home nutrition environment	**Patients** will increase: • Health related quality of life **Patients** will decrease: • Food insecurity • Complications from Diabetes • HbA1c levels • Blood pressure • Triglyceride levels • LDL cholesterol • Body Mass Index • Body weight

*Healthy food is comprised of the components of the MyPlate– which includes fruits, vegetables, legumes, healthy fats, nuts and seeds, lean proteins, whole grains, and dairy products.
**Nutrition related chronic diseases include heart disease, stroke, high blood pressure, diabetes, and some cancers.

Aim 3: Development of Train-the-Trainer Curriculum

Data from the RDN focus groups were analyzed and mapped to the patient culinary medicine curriculum to understand the gaps between the HH RDNs' knowledge and skills to deliver the above proposed patient centered culinary medicine curriculum successfully. These data informed the subsequent training curriculum development, where the identified gaps were addressed to ensure adequate delivery and future capacity building with the implementation of patient-centered curriculum at HH. To level set the skills of all HH dietitians basic cooking skills (e.g., knife skills, vegetable roasting, culinary medicine training, counseling strategies, and mock session delivery will be instituted as part of the training. The train-the-trainer curriculum is outlined in Table 3 below.

Table 3: APHL Train-the-Trainer Curriculum

Six, 3-hour each, hands-on sessions at UTHealth Nourish Teaching Kitchen

Common themes for each session:

- Pre-session readings (electronic)
- Patient centered communication (e.g. motivational interviewing, facilitation vs lecture)
- Culinary skills development (e.g. knife skills, vegetable roasting, etc.)
- Mock session practice (e.g. facilitating experiences)
- Group discussion and feedback

Session	Topics Covered	Objectives
Session 1	Communication/ counseling strategies, culinary nutrition training (knife skills and vegetable roasting), and food choice discussion.	(1) Participants will increase knowledge of counseling strategies. (2) Participants will increase knowledge of food choice. (3) Participants will increase knife and vegetable roasting skills.
Session 2	Motivational interviewing workshop, culinary nutrition training (vegetable roasting and sautéing), and food language discussion	(1) Participants will increase knowledge and skills in motivational interviewing. (2) Participants will increase ability to discuss nutrition in food-first language. (3) Participants will increase vegetable roasting and sautéing skills.
Session 3	Cultural competency workshop and culinary nutrition training	(1) Participants will increase knowledge of cultural competency. (2) Participants will increase ability to discuss nutrition in culturally relevant language.

	(vegetable microwaving and grains)	(3) Participants will increase vegetable microwaving and whole grain skills.
Session 4	Food insecurity workshop and culinary nutrition training (soups & stews & vegetable microwaving)	(1) Participants will increase knowledge of food insecurity. (2) Participants will increase ability to discuss nutrition to a food insecure population. (3) Participants will increase vegetable microwaving and soups and stew skills.
Session 5	Mock group facilitation session, facilitated group practice and cooking demonstration	(1) Participants will increase knowledge of leading facilitated culinary nutrition demonstrations. (2) Participants will increase confidence of leading facilitated culinary nutrition demonstrations.
Session 6	Experiential culinary nutrition practice and facilitated hands-on culinary nutrition practice	(1) Participants will increase knowledge of leading facilitated culinary nutrition workshops. (2) Participants will increase confidence in leading facilitated culinary nutrition workshops.

Evaluation of Train-the-Trainer Curriculum Pilot Training

Training for the HH RDNs was complete in January of 2019, and the subsequent evaluation began shortly thereafter. An online, pre-test survey (Appendix E) was administered to HH RDNs that included demographics and information regarding self-efficacy teaching cooking skills, healthy eating, and related behaviors. Where available, validated survey instruments were used; however, because of the innovative nature of the proposed curriculum development and culinary skill application, some questions did not have extensive validation. In these instances, we will perform face validity for the questions through a consensus of experts in the field. At the end of each respective training session, a paper comment card with questions specific to the session was administered for feedback on reception and usefulness of training (Appendix D). After completion of training, RDNs were sent a post-training survey (Appendix F) as well as a retrospective questionnaire to rate their confidence in the themes identified through the focus group analysis. These included items such as culinary skills, teaching skills, and cultural awareness before training compared to their confidence in the items after the training. The data

collected over the course of the pilot implementation of the train-the-trainer curriculum were used to finalize the APHL implementation strategies to mitigate chronic disease especially type 2 diabetes and promote healthy habits during pregnancy among HH patients.

- Pre-Post training surveys – analysis will include descriptive statistics of demographic data and chi-square test or paired t-tests to analyze differences in pre/post-survey responses.
- Retrospective questionnaire – analysis will include chi-square tests or paired t-tests to analyze differences in post training to retrospective subjective rating of personal culinary and food literacy skills.
- Feasibility testing of training – analysis will include means and standard deviations for Likert scale questions and qualitative analysis of the comment card responses. Specific quotes that identify relevant themes will be used as illustration.

IMPLICATIONS, LIMITATIONS, AND STRENGTHS

Implications

The results of this study have the potential to provide culinary nutrition curricula utilizing an evidence-based theoretical framework. By using the formal needs assessment combined with a systematic intervention mapping process, the curriculum will provide an intervention map to translate the theoretical objectives into practical steps for a representative and diverse population. Further, the development of a train the trainer curriculum offers the opportunity to build capacity by level-setting culinary nutrition skills and knowledge of practicing RDNs and other healthcare providers. The contribution to literature can potentially strengthen efforts of food pharmacies &

food prescription programs by providing practical “HOW to” food literacy skills and knowledge for patients to increase healthy food consumption and promote better health outcomes.

Limitations

Cooking based interventions have an inherent bias due to the novelty effect associated with the excitement of the group cooking environment (Reiks et al., 2017). Measures for cooking self-efficacy are self-reported, which have provided mixed results in previous studies and often lead to social desirability bias (Mills et al., 2016; Reiks et al., 2017). To our knowledge, a validated objective scale has not yet been developed to objectively measure the relations between cooking self-efficacy, cooking skills, and FV consumption. To overcome this barrier, face validity will be assessed through a consensus of experts.

Strengths

The study has several strengths. First, the greater Houston area is one of the most racially, socioeconomically, culturally, and religiously diverse areas in the United States. As a Safety Net provider, HH focus is the care of the underserved. Its clinics are located in some of the poorest areas of Houston with more residents living at or below the federal poverty level. Further, this diversity of the greater Houston area is represented in both the HH patient and practitioner population and provides an opportunity for a representative sample population of the greater Houston area. The formal needs assessment includes multiple viewpoints from both patients and practitioners providing a multifaceted picture of the barriers and facilitators to healthy eating. Lastly, all HH RDNs will participate in the pilot training, which will provide a unique capacity to this healthcare system.

LIST OF JOURNAL ARTICLES

Title of Journal Article 1: A qualitative study of patient and dietitian perspectives to understand barriers and facilitators of implementing a clinic-integrated food prescription program in a low-income food insecure population

Proposed Journal for Submission: Journal of the Academy of Nutrition and Dietetics

Title of Journal Article 2: An Intervention Mapping Approach to Develop a Patient Centered Culinary Medicine Program for Low Income Food Insecure Patients

Proposed Journal for Submission: Journal of Nutrition Education and Behavior

Title of Journal Article 3: Training of Registered Dietitian Nutritionists to Improve Food Literacy Through Culinary Medicine

Proposed Journal for Submission: Journal of the Academy of Nutrition and Dietetics

Title of Journal Article 1: A Qualitative Study of Patient and Dietitian Perspectives to Understand Barriers and Facilitators of Implementing a Clinic-Integrated Food Prescription Program in a Low-Income Food Insecure Population

Target: Journal of the Academy of Nutrition and Dietetics

INTRODUCTION

Consuming a healthy diet is a well-supported low-cost prevention and treatment approach for reducing the risk of chronic diseases, including type 2 diabetes (NCHS, 2016 & Zhan et al., 2017). Despite a continued focus on interventions and public health campaigns presenting the benefits of consuming a healthy diet, most dietary patterns still do not align with the current national guidelines, especially in low-income families (Wilson et al., 2016; CDC, 2016; US Department of Agriculture [USDA], 2015). The overly simplified advice to "eat more fruits and vegetables" ignores complex social inequalities that limit a person's choice to consume healthy foods (Glanz, Sallis, Saelens & Frank, 2005). Strategies for the promotion of healthy eating should focus on increasing food literacy through a combination of solutions to address challenges to healthy eating (Darwin & Drewnowski, 2015; Thompson et al., 2019).

Food Insecurity

Access to healthy food is considered a basic human right, yet in 2018 more than 11.1% (14.3 million) of households in the United States (U.S.) suffered from food insecurity (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2019). Food insecurity and chronic diseases often co-exist within the same individual because of disordered eating – consuming what is available regardless of whether the foods are healthy (Hartline-Grafton & Dean, 2017). The compounding effects of poverty, access, chronic disease, and consumption of energy dense and nutrient deficient foods continues to be a major public health problem (Hartline-Grafton & Dean, 2017). Food insecurity

is even a bigger problem in Houston, where 16.6% of the population experiences food insecurity, which is about 2% and 5% above the state and national rates, respectively (Schuler & Koka, 2019).

Food Prescription Programs

In efforts to combat food insecurity, increase consumption of healthy foods, and reduce the burden of chronic disease, programs are known as "food prescriptions" have emerged across the US (Saxe-Custack, LaChance, Hanna-Attisha & Ceja, 2019; Swartz, 2018). These programs operate as a collaborative effort between healthcare and social services, by screening for and enrolling food insecure patients with certain health criteria such as type 2 diabetes (Swarts, 2018). Patients are offered a "prescription" that can be redeemed for a variety of healthy foods (Swartz, 2018). Preliminary research suggests these programs have positive results with increasing access to healthy foods, improved consumption of healthy foods, and stronger community linkages (Aiyer et al., 2019; Ferrer, Neira, Garcia, Cuellar & Rodriguez 2019). However, some common challenges with success include maintaining redemption rates among participants, and a lack of evidence of the impact of dietary and cooking behaviors and health outcomes (Swarts, 2018).

Culinary Medicine Programs

Another strategy and evidence-based approach to increasing healthy food consumption is through the utilization of culinary medicine classes that expose participants to delicious tasting healthy foods, and offer solutions to common eating barriers such as food preparation skills (Kuehn, 2019; Horning, Fulkerson, Friend & Story, 2017; Overcash et al., 2017; Hartmann, Dohle & Siegrist, 2013). These classes, delivered by a variety of practitioners, provide participants the opportunity to practice preparing healthy foods through experiential learning in a

supportive group environment (Eisenberg, Miller, McManus, Burgess & Bernstein, 2013; La Puma, 2016). Conversely, these programs often focus on food preparation skills in isolation and exclude socio-ecological factors that promote healthy eating such as food access and culturally appropriate foods (Thomas et al., 2019; Vigden et al., 2017).

A Holistic Clinic-Integrated Strategy

The combination of clinic-based food prescription programs to increase access to healthy foods coupled with culinary medicine education has the potential to mitigate food insecurity, increase food literacy, and promote healthy eating. These types of services can strengthen the clinic-community linkages and mitigate chronic diseases such as obesity and type 2 diabetes among low-income minority populations. who are at a disproportionately higher risk of these diseases and other factors such as food insecurity (Sharma et al., 2015). However, clinic-integrated strategies require trained practitioners that can deliver programming to a culturally diverse population. Concomitantly, there is a critical gap in the education and training of Registered Dietitian Nutritionists (RDN) in practical food literacy skills needed for implementing culinary medicine and food prescription programs for low-income minority populations (Barkoukis et al., 2019; McWhorter et al., 2019).

To address these gaps, the University of Texas Health Science Center at Houston (UTHealth) School of Public Health, in partnership with Harris Health (HH) and the Houston Food Bank, is coordinating the implementation and evaluation of a comprehensive food prescription program for HH patients. As one of the largest safety net providers in the country, HH serves one of the most impoverished geographic areas in Texas, with residents suffering significantly higher rates of food insecurity, obesity, and type 2 diabetes (Harris Health, 2019; Health of Houston Survey, HHS 2017-18). In 2019, more than 55% of the patients served live

below the poverty line, and the prevalence of overweight or obesity among adults aged 18 to 44 was 73.9%, which is significantly higher than the prevalence for the surrounding Houston areas (63.6%) (Harris Health, 2019; Schuler & Koka, 2019).

As of 2017, HH began screening patients system-wide for food insecurity, and subsequently, in 2019, released a strategic plan to co-locate food pantries within their hospital and clinic systems to implement food prescriptions for their food insecure patients. This two-year initiative, *A Prescription for Healthy Living*, includes the co-creation, implementation, and evaluation of a comprehensive food prescription and culinary medicine program for food insecure patients with type 2 diabetes. The purpose of this study is to present the results of a qualitative needs assessment conducted with HH patients and RDNs to inform the development of the program, specifically patient programming and training requirements for dietitians.

METHODS

Study Setting and Participants

The study was conducted at HH clinic facilities in Harris County, Texas. We conducted a cross-sectional qualitative needs assessment consisting of focus groups with HH patients and RDNs. Study protocols, kitchen equipment survey, consent forms, and the focus group scripts and questions were approved by the UTHealth Institutional Review Board, HSC-SPH-10-0187. All study participants completed a consent form prior to the focus groups; all focus group questions, survey questions, and consents were available in both English and Spanish.

Focus Groups

Patient focus groups included 40 patients with diabetes receiving care between June and August 2019 and consisted of three subpopulations: English speaking adult patients (n=2 groups,

n=11 patients), Spanish speaking adult patients (n=2 groups, n=13 patients), and Spanish speaking pregnant patients (n=2 groups, n= 16 patients). Patients were recruited via flyers posted in patient waiting areas and verbally by program staff at two participating clinics. All six one-hour focus groups were conducted at two clinics in private conference rooms between June and August 2019 at a variety of times Monday through Friday. A bilingual UTHealth staff member with expertise in focus group administration led both English and Spanish focus groups, while a secondary bilingual facilitator took notes using a structured guide. All sessions were audio recorded, and participation was incentivized with a $25 gift card.

RDN focus groups included 17 RDNs employed at HH between April and August 2019. All participants were recruited via email through collaboration with the HH administration. Three focus groups were conducted in private conference rooms between April and August 2019 during normal working hours. A UTHealth staff member with expertise in focus group administration led the sessions while a secondary facilitator took notes using a structured guide. All sessions were audio recorded, and participation was incentivized with a meal.

Focus Group Questions

Focus group questions and scripts were developed based on existing focus group literature and methodology (Krueger & Casey, 2015), review of pertinent qualitative literature, and group consensus. Drafts of RDN and patient scripts and relevant questions were circulated for revision and discussion by the project team. Once a consensus was reached, further probing questions were added to elicit dialogue (Krueger & Casey, 2015). Final patient focus group questions and scripts were translated into Spanish.

Kitchen Equipment Survey

The kitchen equipment survey was used to understand the home cooking environment and physical barriers and facilitators to healthy eating by assessing the availability of cooking equipment including knives, pots, pans, oven, microwave, etc. The survey was provided in paper format in English or Spanish to all patient participants of the focus groups (Table 1).

Data Analysis

All focus group sessions were audio recorded and transcribed by a transcription service. Spanish sessions were transcribed in Spanish and then translated into English by two trained bilingual staff before analysis. Each of the nine transcripts was examined by two independent reviewers and blind cataloged and organized into common themes and subthemes utilizing constant comparative methodology (Krueger & Casey, 2015) and NVivo qualitative software (QSR International). Research staff reviewed the themes and subthemes along with session notes, and a group consensus was deductively reached on coding the themes and subthemes for the respective patient and RDN focus groups. Patient themes and subthemes were mapped to RDN themes and subthemes to identify perspectives of each patient group, as well as the gaps in training and knowledge of RDNs.

RESULTS

Patient participant characteristics are outlined in Table 1.

Patient Focus Groups

Five major domains were identified in the patient focus groups: (1) consumption history, (2) barriers to and influencers of healthy eating, (3) cooking practices, (4) food availability and food insecurity, and (5) nutrition information and counseling (Table 2).

Domain 1: Dietary History and Food Consumption Patterns

Importance of Culturally Informed Eating Habits. Patients across all focus groups reported consuming family style meals influenced by culture as the most frequently consumed foods in their dietary patterns. Respondents agreed on the importance of the individual taste and eating habits of their self-identified cultural foods. On average, most meals were prepared at home with eating out viewed as a treat and as a break from the everyday cooking process. Some participants reported their traditional food culture as "unhealthy" or "not good", perceiving "American" foods to be better for their overall health.

Americanized Eating Habits. Patient respondents reported foods eaten as children as still being consumed, with adjustments such as less time for cooking and the utilization of convenience food products to speed up the cooking process. Participants 'out-of-home meals included a range of fast food and buffet meals. Decisions of what to eat were made predominately because of the taste and perceived cost and time savings. A majority of respondents reported enjoying foods from their self-identified food culture combined with "American foods".

Favorite Foods. Patient respondents reported a broad range of favorite foods consisting of childhood and cultural favorites including traditional American (e.g., chicken and vegetable casseroles, fried chicken and French fries), Mexican style foods (rice and beans, enchiladas, tortillas, tortas, etc.), Latin American (*pupusa*, *milanesa*, *envueltos*, etc.), Tex Mex (King Ranch chicken, stews, fajitas, etc.), American Italian (spaghetti, pastas, alfredos, etc.) and a fusion or a combination of cultural and Americanized foods.

Domain 2: Barriers to Healthy Eating

Taste and Craving as a Barrier. A majority of patients described taste and cravings as a major barrier to healthy eating. Healthy food was described as not palatable, expensive, and hard to

prepare. Taste was influenced by childhood, family, and self-identified cultural food experiences. Most participants reported enjoying "American style" foods such as French fries, sugar sweetened beverages, and packaged foods.

Perceived Lack of Time. Patients described perceived time constraints as a key barrier to healthy eating that often led them to purchase processed foods, ready-to-eat items, or to forgo cooking for fast food or restaurant purchases.

High Cost Associated with Healthy Food. Patients across all focus groups described the high cost of healthy foods as a barrier to healthy eating. Some patients indicated marketing and sales of food items influenced them to frequent restaurants or to purchased advertised deals. When purchasing groceries, patients agreed that sale prices influenced where they shopped and what they purchased.

Family Perception and Influence of Healthy Eating. Patients consistently conveyed that family members often acted as a barrier to healthy eating. Participants described differing preferences among family members leading to the preparation of multiple dishes or not following dietary guidelines because of complaints from family members about the taste of "diet food":

> *"I prepare food for me and my children differently….and for them what they like. And for me, well -- even if I wanted them to eat just like me [healthy food], but they don't like it very much."*

Other participants described the social pressure of non-supportive family members leading them to "fall off the wagon" and consume foods outside of a healthy dietary pattern:

Dietary Changes Due to Disease. Changes in the diet because of disease status was identified as a major influencer to healthy eating. Patients rationalized that their "disease" was not serious

enough to influence them to change dietary patterns because those dietary changes were so difficult, not enjoyable or confusing to follow. Differences in food preferences and the knowledge of what can be included in a "healthy diet" for specific health status limited patients from consuming healthier foods.

Domain 3: Cooking Practices

Lack of Knowledge and Skills. Patients across all focus groups described inadequate food literacy skills that prevented them from consuming a healthy diet, including meal planning, perceived difficulty of meal preparation, and lack of healthy cooking skills. Some patients reported some proficiency in cooking, while others reported little to no cooking skills. Most patients agreed that they would like to learn more about meal planning, grocery shopping, vegetable cooking, and making their family (traditional) meals healthier and enjoyable.

Frequency of Cooking. Patient participants across all focus groups described a range of cooking frequency, with most patients preparing one to two meals per day and eating out of the home one to two times per week. Some participants reported meals eaten outside of the home were viewed as a treat and not representative of typical consumption. Other participants described more frequent eating out because of perceived time savings, family pressure, or not liking to cook (convenience).

Types of Food Preparation. Overall, patient participants reported preparing meals that were inexpensive, simple to prepare, and enjoyed by their families. Participants described a range of traditional family-style cooking methods for foods including boiling in water with seasoning and fats; boiling in other flavorful liquid and fats (ham hock, pig feet, etc.); baking in mixed dishes or

casseroles (combined with grains and/or meats); sautéing with fats (rendered bacon, butter, margarine or vegetable oil); and steaming and then sautéing with oil.

Cooking Environment. Results from the cooking equipment survey (Table 1) indicated that most participants have access to traditional kitchen equipment (e.g., oven, stove, microwave, and refrigerator and freezer); however focus group discussions indicated the condition of equipment and the supporting cookware was not consistent. Some participants reported no access to some basic equipment like measuring spoons or bowls and thermometers, while others indicated broken or old equipment. Lastly, some patients described utilizing specialty equipment like pressure cookers and crockpots to simplify and speed up the cooking process.

Domain 4: Food Availability and Food Insecurity

Access to Healthy Foods. Overall, most patient participants described large grocery store chains as the main locations of food purchases, which were all influenced by the cost of the food. Participants indicated that some form of transportation (e.g., personal car, public transit, etc.) was needed to access healthy foods. Some participants utilized food banks and pantries as an alternative source for food staples during times of need.

Food Insecurity. A majority of patients across all focus groups described symptoms of food insecurity including lack of access to food, food costs, transportation issues, time, availability, and lacking the resources to consistently purchase healthy foods for their families. Patients discussed eating what was available rather than what was healthy or what they wanted.

Domain 5: Nutrition Information and Counseling

Patient Perception of Dietetics. Overall, patients across focus groups had a mixed knowledge of the role of the RDN, with half reporting positive feelings and beneficial results from RDN interactions. In contrast, the other half viewed RDN interactions as frustrating or of no real benefit because of unrealistic and culturally inappropriate recommendations. The framing of the physician shaped the perception of the RDN as either negative (e.g., punishment for non-compliance) or positive (e.g., resource to help patients).

Nutrition Knowledge. Patients reported a broad range of accurate and inaccurate nutrition knowledge, which included information about MyPlate, general healthfulness of vegetables and fruit, portion control, and preparation methods. Some participant described "Googling" an answer whenever there was question due to limited availability of following up with a trained professional:

> *"[information from the dietitian] that's where it started. And then if I had any questions, I'd just look it up on Google."*

Mixed Dietary Messages. A majority of patients described confusion and frustration from "mixed dietary messages" they received from different healthcare practitioners. Food companies, the internet, and family and friends also added to the confusion of what to eat. Some participants acknowledged they avoided cultural foods because they were not healthy or allowed on their "diet".

RDN Focus Groups

The four major domains and themes emerging from RDN focus groups included: (1) perception of dietetics, (2) RDN education and training needs, (3) patient care challenges, and (4) food

prescription program challenges. Domains, themes and supporting quotes are presented in Table 3.

Domain 1: Perception of Dietetics

Undervaluation of Dietetics. RDNs reported that patients often perceived RDNs as a lower status practitioner, e.g., "food service worker" or through the lens of a negative stereotype, e.g., "food police" and did not have a clear conception of the RDNs role as part of the healthcare team. Consistent with the viewpoint of patients, RDNs reported that healthcare & non-healthcare staff with whom they regularly engaged viewed RDNs as "nutrition experts" and valued their contributions to the team. However, all RDNs agreed that healthcare professionals and administration do not have a realistic conception of the role of the RDN as part of the healthcare team.

Mixed Dietary Messages. RDNs reported contradictory "mixed dietary messages" from a variety of healthcare providers to patients as a challenge in their respective practices to improving patient outcomes. There was consensus that patients rarely viewed the RDN as the expert in nutrition and often chose to follow the advice of the "authority" figure (physician) or to simply "Google it" when receiving conflicting nutrition messages between providers. Further, RDNs felt that the nutrition interaction with the physician shaped the feelings of the patient either positively or negatively. For example, when the physician framed the RDN visit as punishment for non-compliance, RDNs reported more negative interactions with patients.

Domain 2: RDN Education and Training Needs

Positive Aspects of Training. RDNs consistently agreed that interpersonal skills (e.g., empathy and life experiences), behavioral change theories (e.g., motivational interviewing), and nutrition-

focused physical exam training (NFPE) were the most useful and practical training and education strategies they have received because of the usefulness in counseling patients.

Gaps in Training. RDNs agreed that they lacked skills in behavioral change strategies or could use more training to help encourage their patients. Hands-on and practical training strategies were identified as the most useful and topics and included behavior change theory, culinary nutrition skills, cultural competency, food insecurity, interpersonal skills, and counseling strategies.

Culinary Skills. RDNs reported a range of culinary skills and knowledge from "I have no cooking skills" to proficient, still all participants agreed on the need for more hands-on culinary training for teaching patient classes. Topics and skills identified included basic cooking techniques, cultural competency, flavor profiles, seasonal foods and produce, simple and economical preparations, and adaptations for different kitchen equipment and home environments.

Domain 3: Challenges with Patient Care

Diabetes Patient Barriers. RDNs identified and agreed on multiple perceived barriers to healthy eating for patients with diabetes including "mixed-dietary messages" from providers, the timing and length of RDN appointments, type of kitchen (equipment available), living situation (large family, homelessness, etc.). Further, most participants expressed concern about possible negative outcomes with distributing produce without combining education and training on preparing healthy meals:

> "If they're [patients] not eating vegetables, the first thing I hear, I hate greens, I don't like vegetables."

Gaps in Care. Reducing **“**mixed dietary messages” (conflicting information) was identified as a major gap and barrier in patient care. RDNs described the need to help patients build self-efficacy in aspects of diabetes management, to increase food literacy through hands-on cooking classes and demonstrations, to offer culturally relevant resources, and to increase resources available for food insecure patients. Some described the need to streamline the appointment process to ensure patients can access dietary counseling during other appointments and visits.

Domain 4: Challenges in Developing and Implementing a Food Prescription Program

RDN Challenges. Since a food prescription program and culinary medicine classes are out of the typical scope of practice, all RDNs reported challenges in allocating time or scheduling their time to offer culinary medicine classes. All RDNs expressed concerns about the challenges of developing culturally tailored and practical resources, including cooking tips and recipes. Some participants described issues and concerns with allocating enough resources needed to build a food pantry, including costs, maintenance, and staffing to ensure success. Others described challenges centered around determining eligibility, communication, and utilization of the resources.

Communication. Overwhelmingly, communication about food and dietary information was identified as a major barrier for both the RDN and the patient. Participants described the need for a clear communication strategy directed from administration to overcome several issues including reducing “mixed dietary messages” between providers to patients, proper allocation of resources (staffing, equipment, hours, etc.), and implementation for eligible patients (referrals, EMR).

DISCUSSION

This qualitative study is one of the first to explore both the RDN and patient perspective for implementing food prescription and culinary medicine programs. Four themes emerged from the dietitian focus groups: perception of dietetics, RDN education and training, patient care, and food prescription (Table 3). Similarly, five themes were elicited through the patient focus groups: consumption history, influencers and barriers to healthy eating, cooking practices, food availability and food insecurity, and nutrition information and counseling. Four key takeaways that were consistent through both the RDN and patient perspectives were: (1) perception of the RDN, (2) mixed dietary messages, (3) cultural inclusiveness, and (4) need for additional RDN training.

While the status and perception of the RDN on healthcare teams is improving, the stigma of a lower tiered health professional still exists (Adamski, 2018). Significant literature suggests that interprofessional nutrition education can encourage healthcare providers to recognize the importance of nutrition, increase referrals, and promote the profession of the RDN (Adamski, 2018; Barkoukis et al., 2019; Hark, 2017). In our study, a lack of team inclusion and interprofessional collaboration led to RDNs' feeling "undervalued". From the patient perspective, the negative perception of RDNs was informed through two processes: the manner in which a physician refers patients, and actual patient experiences with an RDN. When physicians refer patients as punishment for "non-compliance", the RDN is viewed as the consequence of the patient's own failures in dietary behavior. Conversely, a positive nutrition message from the physician provides the opportunity for the RDN to support the patient in their dietary changes. Second, when patients experience a negative RDN interaction fueled by unrealistic information, non-tailored and culturally inappropriate advice, patients often choose

not to return for follow-up or seek advice elsewhere. Calls for interprofessional collaboration and education are consistent with these findings, suggesting that RDNs should actively pursue collaboration in the healthcare team and promote the importance and value of nutrition (Baute, 2018; Hark, 2017). Institutions and administration should focus on including the RDN in the patient care process to increase collaboration, positive feelings, and knowledge of the skill-set of the RDN from both providers and patients. (Hark, 2017; Sicker et al., 2019).

Mixed dietary messages were a recurring theme across all focus groups. Although few health professionals outside of RDNs have any formal education in evidence-based nutrition (Hark, 207; Eisenberg et al., 2019), providers offer "armchair" and "anecdotal" nutrition perspectives to patients. These messages, while inaccurate and often harmful, are viewed as powerful coming from the "authority" figure (Karlsen, 2017). As one RDN described, "*The doctor is seen as the gateway [authority] and we're ancillaries. So, what we say [nutrition message] is not as powerful as what the doctors say*.". Physicians should reinforce the role of the RDN as an expert in nutrition to patients (Hark and Deen, 2017). Institutions and administrations should focus on aligning the dietary messages across all practitioners and include the RDN as part of the interprofessional team to ensure adherence to evidence-based nutrition guidelines (Adamski, 2018; Hark & Deen, 2017).

Recent literature suggests that health disparities can be decreased through the adoption and implementation of a patient-centered, culturally competent approach in healthcare (Abrishami, 2019; Kumar, 2019). The significance of cultural inclusiveness intersected throughout all of the focus groups consistent with published literature (Gallegos, 2019; Freeland-Graves, 2013). Patients reported the importance of their food culture and history but also questioned whether they could consume those foods in a healthy diet. Although not purposeful,

stigmatizing patients' traditional food practices can lead to patients erroneously believing they must reject cultural foods in favor of Americanized food items to eat healthy. As one patient described, *"We don't eat it [cultural food] because we know they harm us [people with diabetes]"* or another, *"[In our culture] nothing [we eat is] healthy"*. Practitioners should consider including nutrition recommendations that are inclusive of flavors and foods that are relevant to their patient populations to decrease social stigmas and increase adherence to dietary recommendations (Abrishami, 2019; Kumar, 2019). Institutions and administrations should focus on including diversity and cultural training for all practitioners to increase understanding and empathy with a diverse patient population (Pollard, 2019; DiMaria-Ghlili, 2014).

Several themes for RDN training and education efforts were identified throughout the focus groups. Patients reported frustration that some RDNs did not provide practical advice and skills for cooking healthy, tasty, and simple meals. At the same time, RDNs desire the skills and knowledge to deliver these practical tips. As one RDN described, *"having a chance to do more practical things with the patient rather than just going over a handout."*. RDNs requested hands-on practical training in behavior change theory, culinary nutrition skills, cultural competency, food insecurity, interpersonal skills, and counseling strategies. Institutions and administrations should provide adequate training for their RDN professionals to level-set skills and knowledge before implementing food prescription and culinary medicine programming.

In summary, our study highlights the importance of interprofessional collaboration to promote consistent diet messaging and improve the understanding and importance of nutrition among healthcare providers (Sicker et al., 2019). Indeed, this collaboration is key to successful communication with patients and evidence-based nutrition recommendations (Hark, 2017;). Finally, our study provides a blueprint of support for food prescription and culinary medicine

programs to increase healthy food consumption and promote better health outcomes for patients (Swarts 2018; Barkoukis et al., 2019).

Limitations and Strengths

Although the geographic area of the study is home to one of the most diverse populations in the U.S., convenience sampling and self-selection of patient focus groups limit the generalizability of the results. Further recruitment efforts were limited because the study population of low income, food insecure patients faced several barriers to attending appointments. Despite offering a welcoming and inclusive environment, some opinions and expressions around sensitive subjects (food insecurity, transportation, etc.) may not have been expressed or equally represented in the results. Lastly, the qualitative design of the study was limited to thematic interpretation and did not include a quantitative analysis.

This study also has several strengths. As a safety net provider, the healthcare center's focus is the care of the underserved, and the clinics are located in some of the poorest areas of Texas with more residents living at or below the federal poverty level. Further, this diversity of the surrounding area is represented in both the patient and the RDN practitioner population for this study. The qualitative focus groups included multiple viewpoints from both patients and RDN practitioners, providing a multi-faceted picture of the barriers and facilitators to healthy eating for implementing a food prescription program.

CONCLUSION

Food prescription and culinary medicine programs are strategies to promote healthy eating and improve patient outcomes for food insecure patients. This study describes how RDNs, as part of an interprofessional healthcare team, can help provide consistent dietary messaging and tools and resources for patients to overcome healthy eating barriers. Prior to the implementation of a food

prescription program, efforts should promote the training of RDN staff in key areas, such as culturally relevant foods, practical food literacy, and culinary nutrition skills to increase acceptability and adherence for patients.

TABLES AND FIGURES

Characteristics	Participants	Participants
Gender	n	%
Male	9	22.5
Female	31	77.5
Characteristics	Yes (%)	No (%)
Large Kitchen Equipment		
Freezer	34 (85.0)	6 (15.0)
Kitchen Table	38 (97.4)	1 (2.6)
Microwave	36 (90.0)	4 (10.0)
Oven	30 (75.0)	10 (25.0)
Refrigerator	39 (97.5)	1 (2.5)
Stove/Burners	36 (92.3)	3 (7.7)
Basic Kitchen Equipment		
Baking Pan	18 (54.5)	15 (45.5)
Can Opener	33 (84.6)	6 (15.4)
Food Storage Containers	23 (69.7)	10 (30.3)
Large Pot	27 (84.4)	5 (15.6)
Large Spoon	37 (97.4)	1 (2.6)
Measuring Cups	27 (69.2)	12 (30.8)
Measuring Spoons	22 (57.9)	16 (42.1)
Mixing Bowl	17 (51.5)	16 (48.5)
Saucepan	29 (90.6)	3 (9.4)
Skillet, Frying Pan, or Wok	26 (81.3)	6 (18.8)
Spatula	30 (78.9)	8 (21.1)
Vegetable Peeler	30 (76.9)	9 (23.1)
Specialty Kitchen Equipment		
Blender	36 (94.7)	2 (5.3)
Cooler or Ice Chest	27 (75.0)	9 (25.0)
Crock-pot or Slow Cooker	22 (61.1)	14 (38.9)
Electric Mixer	6 (17.6)	28 (82.4)
Food Processor	4 (12.5)	28 (87.5)
Hot Plate	6 (17.1)	29 (82.9)
Other Specialty Item	6 (19.4)	25 (80.6)
Pressure Cooker	9 (27.3)	24 (72.7)
Toaster	22 (59.5)	15 (40.5)
Toaster Oven	8 (22.2)	28 (77.8)

Table 1: Kitchen equipment checklist for patients participating in food prescription focus groups (n=40)

Category	Quotes by Patients
Domain 1: Food History and Dietary Patterns	
Importance of Cultural Eating Habits	"[I still eat] most foods from my childhood." "We all come from different cultures. At least in Nicaragua, they don't eat tortillas, they eat rice and boiled bananas, or they eat boiled yucca. In the morning, they eat ripe fried bananas with beans and cream." "Here we die from eating too much, not from hunger" "Right now, [fast food restaurants] got those two tacos for a dollar" "Kids like [fast food restaurants]." "I think water is very boring. Because if you go to a restaurant you're not going to ask for water, you're going to order juice or soda" "We would cook at home for lunch but then my husband wants tacos for dinner, and he would go out and get tacos for us" "I eat out on the weekends or when I feel lazy"
Favorite Foods	I mostly like Mexican food, such as soups and mole" "Look, right now I'm eating salads; but I like chicharrons [fried pork skins]." "That's good squash! You sauté it, put some onions and a little black pepper & salt - that's good. Just give me a bowl of that and I'm good." "I love *nopales*; I add it to my smoothies"
Domain 2: Influencers and Barriers to Healthy Eating	
Taste and Craving as a Barrier	"I crave food. I just have a taste. Got to taste food." "I am currently on a diet. I avoid what I like and eat food of my diet" "Whatever I have a taste for at the time. If I don't [like the taste] I guess because I've gotten older, it kind of matters a little bit. Because if that's not what I want, I won't eat." "I, basically, eat anything if it's what I want [like]. "Many restaurants have several foods that one can order that is [healthy]. But I'm not going to say I'm not going to eat [unhealthy food] in a restaurant, because I always do [because it tastes good]."
Perceived Lack of Time	"If you have an appointment it is hard to cook. You don't always have time." "I eat out all week because of work. My children about 3 times per week" "I work full time and it's easier to buy fast food. [fast food that] are the closest to my job. I don't meal prep."
High Cost Associated with Healthy Food	"Whether it's fresh or frozen, the price is what makes it or breaks it." "I buy all three [fresh, frozen, and canned vegetables] depending what's on sale, or clearance, or what I might need to maintain for the entire month"

	"For me, for example, I get the fruit from …. because the oranges and the apples are much cheaper. I think other places sell one pound for $1.29 and at [another store] you can get 4 pounds for $1.00."
	"Who can afford the corner store?"
	"As a little kid, you don't tell them [parents] you don't want to eat. Because they'll put the plate down and they'll look at you [expecting you to eat everything]. But, again, I realize now that I'm maturing, I need to make some dietary changes to what I'm doing".
	"At 12 o'clock at night, my husband will tell me " I want some tacos" and I'll say "well, me too" – but I've already started saying no."
Dietary Changes Due to Disease	"I am on a diet so I can't cook the same for the rest of my family."
	"Now that we are diabetics, we eat cactus and black beans, that's all we can eat."
	"I try to keep everything balanced. But of course, there's those days that I fall off the wagon."
Domain 3: Cooking Practices	
Lack of Knowledge and Skills	"I want to cook something, but I don't know how."
	"There's too many different vegetables that I don't know what to do with [how to cook]."
	"I never learned to cook food that my mom would cook. Traditions wasn't passed down."
	"Sometimes I'll look things up on the internet if I don't know how to make it."
Frequency of Cooking	"Who eats in restaurant morning and night? Nobody, I think. Unless you have a lot of money."
	"I cook, so I don't eat out often about one time per week."
	"Eating out every day is not sufficient and all there is junk food."
	"I go every day to restaurants"
Types of Food Preparation	"I do what's easiest to make, like chicken tenders or salads"
	"I adapted it [cultural food]. Yeah. Just made them healthier."
	"If something's going on that interrupts the schedule, then we either have to come up with something that cooks quicker or we're going to eat later or we're going to go grab something which is not healthy."
	"Salads and mainly boil them [vegetables] with seasoning."
Domain 4: Food Availability and Food Insecurity	
Access to Healthy Foods	"If I don't have money, I need to be smart to get good [healthy] food."
	"[I purchase food from] grocery stores that have sales or specials."
	"I like [Hispanic grocery store] it doesn't have that many cookies, candies. They have more food we need [fruits and vegetables.]"
	"I don't have a car."

Food Insecurity	"Sometimes we want to eat good [healthy] but sometimes we don't have the resources [money] or we don't have the foods at home, so we use what we have." "Sometimes you don't eat what you want, it's what you can get [that is] available." "If there is no money, I need to figure out how to eat better and healthy"
Domain 5: Nutrition Information and Counseling	
Patient Perception of Dietetics	"[a dietitian is someone who] takes you through the right path of healthy eating." "[a dietitian is] a person or persons that teaches other people how to eat better, how to eat healthy." "[a dietitian is someone who] teach you how to cook. With steam and no grease [fat]." "I told her [dietitian] I never wanted to see her again. She told [me] to eat this much food [too little]." "Dietitian give me this [food in the hospital] and they were like [it's healthy]. I say, "Bring me some tacos or something." I had to call somebody. I mean, they give you some chicken and it's dry -it's like wood. What is this? You got to be careful [to not choke]." "[a dietitian is someone who] puts you on a diet where you will die of hunger." "Starchy foods can kill you. I'm telling you. After I eat that plate of French fries, I had that made it [blood sugar] go up to 300." "I know about the healthy plate." "One time I was put on a diet [by a dietitian]. I was on it for 2 weeks, and I lost 18 pounds…I did it verbatim, but I got annoyed and frustrated."
Mixed Dietary Messages	"Yeah. The internet lies to you. I mean, you go on there now, tomorrow, it'll be a better story about how yesterday was no good and today-- this is better" "I don't eat seafood anymore because of all the bacterial poisoning in the water." "I was told a lot of times to eat wheat bread because wheat bread is good for you. But I couldn't find nothing. They got a lot of salt in there too."

Table 2: Domains and supporting quotes from RDN focus groups about the perception of dietetics, needs in RDN education and training, challenges with patient care, and challenges in developing and implementing food prescription programs.

Category	Quotes by Registered Dietitian Nutritionists
Domain 1: Perception of Dietetics	
Undervaluation of Dietetics	"[Patients think] we only tell them what not to eat." "My patients view me as the "supplement lady" or "the breeze deliverer."" "Sometimes seems like we're not providers, sometimes seems like we're not allied health, just kitchen workers." "They [administration] know who we [RDNs] are, but do they care, that's the thing." "I work with a lot of teams, and so I do find the ones that I am in constant contact with or am around with, they do value me as a nutrition expert and part of the team. Ones that I don't have as much contact with, I do find I have to reach out more often in order for my recommendations to be implemented into the patient's plan."
Mixed Dietary Messages	"Unfortunately, I've heard a lot of patients tell me that, for example, their doctor told them they can't eat any fruit ever again" "I think they [administration] do see a big need for us, and I think as a whole, they've been adding more outpatient dietitians to different centers, or expanding the days of the week. So, I definitely think they appreciate us there. I think maybe still mixed [dietary] messages as far as what we do and what exactly the advice we're giving to patients [is a big problem]."
Domain 2: Needs in RDN Education and Training	
Positive Aspects of Training	"Motivational interviewing, when I was in school, we didn't get [any training]. In the past, I remember saying, "Well, you need to work on this. Based on your dietary recall, my assessment, this is what you have to work on." But now, it's just putting it out on the table for them to decide. What are your goals, and what do you want to work on for this next month or this next week, whatever it might be?" "I think Identifying malnutrition is a big positive for inpatient. Like the NFPE, things like diet history, just a criterion that is the biggest thing for us right now I think for inpatients." "Sharing your life experiences helps patients to understand and then they bond with you and listen to you more when you share your personal experience with them."
Gaps in Training	"[Patients] ask me, oh, what about this food that I've never heard of before. They're like, "Is this healthy to eat?" And like I said, I've never heard of this food before, it's a food from their culture, I don't know what's in it, I don't know how it's made, I literally don't know anything about it, so I don't know what to tell them."

	"I definitely think I should've taken more psychology classes. A lot of patients come in and before I can actually get them to understand the diet, it's mentally getting them to understand the importance of making these changes. That means if they understand it, they're more likely to be consistent with it, they're more likely to understand the benefits of it, but some of them just come in and their mind is fixed that you're going to take everything away from me"
	"Having a chance to do more practical things with the patient rather than just going over a handout."
	"As a dietitian, I would prefer that training be hands-on because if I take a cultural class, I read it in a book, but like doing it hands-on is like immersing yourself versus just reading it in black and white."
	"I'd like to be able to have a number of different ways to use different foods, hopefully, at least one of them will resonate with the patient, so they feel more confident that they'll be able to use this stuff and like it."
Culinary Skills	"I have no cooking skills"
	"I still have to even look up when things are in season"
	"The perception that people have is that we [RDNs] know how to cook…Oh man, I just feel like I really lack— how to cook, I can cook, not everything though, just maybe what my mom taught me or a recipe I can get online, or something simple."
	"I feel pretty well versed in the basic, just knowing how to prepare vegetables and whole grains, but as far as going into cultural differences, I think that's where it can get a little wonky for me, as far as like, now let's combine it with spices. I would have to have a little more training, and especially with how wide of a variety of cultures we have…. I think I'd need a little more specific training instead of just the basic cooking preparation methods."
Domain 3: Challenges with Patient Care	
Patient Barriers	"If they're [patients] not eating vegetables, the first thing I hear, I hate greens, I don't like vegetables."
	"I think the biggest thing is patients thinking that they can't have any carbs at all."
	"Many of our patients think that eating a vegetable is really expensive. I always tell them like frozen vegetable is not expensive. So, we give them different options, but like in their mind, they think that vegetables are expensive."
	"Patients are working long, long hours and convenience, again, is a big issue. So, many of them will turn to fast food multiple times a day and part of it is knowing what to get but also the portions, and just limited

	availability when you're on the road and limited capacity, or willingness, or ability to prepare foods and take them with them." "Patients read a lot on the Internet and they think all of that is true. So, they say, oh, I already know what to eat and know what to do." "They [patients] don't really know, or they might not just go out of their comfort zone and try a new non-starchy vegetable. Why am I going to go spend this amount of money and I don't even know how to cook it? I'm going to try to cook it. What if I don't like it? I just spent [money]." "I try to get [patients] in at the same time [as other appointments]. I find that's the best way to get them to come back, if they have another scheduled appointment." "I find that a lot of patients don't have measuring cups and measuring spoons, basic stuff like cutting boards, just basic cooking kitchen, sharp knives. They'll have enough to cook what they normally cook but when you ask them to try new recipes, and stuff like that, that require measuring, that's where I get a lot of pushback." "If the patient, especially old, they're living with their children. So, most times, we end up educating their children or family members because they're actually the ones in charge of what these patients going to eat, especially if they're older or they are ending up eating less, keep them from cooking for themselves."
Gaps in Care	"Unfortunately, I've heard a lot of patients tell me that, for example, their doctor told them "they can't eat any fruit ever again. They can only choose vegetables because fruits are too high in sugar." So, stuff [mixed dietary messages] like that has been something [issues] I've come across frequently." "I remember when I was working at the Centers, they [doctors] were like, "Tell them [patients] no tortillas, and tell them no bread, and no rice." And I'm like, "They can have it."". "Maybe if we were able to have food demos for them to try; how they can incorporate [vegetables], how they can hide it instead of just potato, rice, and cauliflower, mixing it together, it looks the same." "I don't think they really understand the food groups because they'll say, "Well, I don't eat any sugar, I don't eat any carbs," and then they'll say, "Well, I eat fruit." "I think they don't understand how important it's for them and they have a lot of doctor appointments and like normally when they come here, it's like three, four hours of different stuff, ultrasound, seeing doctor, lab. So they just want to leave the hospital and when you try to get them to the nutrition counseling, it's like forcing them, but by the time that they

	come to like office and you talk to them, they're more receptive, but convincing them to do the nutrition, it's hard."
Domain 4: Challenges in Developing and Implementing Food Prescription Programs	
RDN Challenges	"I have a lot of patients that maybe have never seen a beet before, and that's going to be in the food pharmacy, and they're going to go, "Okay, this is great that you're giving this to me but I don't know how to cook it, I don't know what to do with it." So, I am trying to come up with recipes but also, for me, it's like I'm not going to really know until I get that stuff in my food pharmacy what I have to work with." "It's going to be like almost developed recipes and things like on the fly, which might—maybe I might have stuff or have resources for, but maybe it might be something that is a little bit more outside the box and trying to figure out how to fit that item into something that patients are familiar with and are going to actually cook." "I would like to do food demonstrations, but I have no stove, I have no oven. We have a microwave in the staff area, so mainly what I'm going to be able to demo is going to be stuff that I'm going to have to prepare at home the night before or it's going to have to be cold preparation of whatever it is."
Communication	"To be made aware of what patients that might benefit from a program like that since it is a pretty large system. How to specifically narrow it down, whether it's a nurse asking me about food and securities of patients that might benefit from it." "I think delivering the message on nutrition's important across the board like everybody being on the same page." "I found that, besides the culture, it's very important to try to make it [cooking demonstrations] as simple as possible. [Communication] has to be very simple. I know sometimes we can get a little bit of our flare and try to be fancy; it doesn't need to be fancy." "I was going to say depending on interactions, like how much you interact with the teams and the doctors and kind of educate them on what you do?"

Table 3: Domains and supporting quotes from RDN focus groups about the perception of dietetics, needs in RDN education and training, challenges with patient care, and challenges in developing and implementing food prescription program

REFERENCES

About Us // . (2019, February 1). Retrieved November 10, 2019, from https://www.harrishealth.org/about-us/harris-health.

Abrishami, D. (2018). The need for cultural competency in health care. *Radiologic Technology, 89*(5), 441-448.

Adamski, M., Gibson, S., Leech, M., & Truby, H. (2018). Are doctors nutritionists? what is the role of doctors in providing nutrition advice? *Nutrition Bulletin, 43*(2), 147-152.

Aiyer, J. N., Raber, M., Bello, R. S., Brewster, A., Caballero, E., Chennisi, C., . . . Saifuddin, M. (2019). A pilot food prescription program promotes produce intake and decreases food insecurity. *Translational Behavioral Medicine, 9*(5), 922-930.

Alisha, C., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2017). No title. *Household Food Security in the United States in 2016,*

America, F. (2019). No title. *Map the Meal Gap 2018: Food Insecurity in the United States,*

Azétsop, J., & Joy, T. R. (2013). Access to nutritious food, socioeconomic individualism and public health ethics in the USA: A common good approach. *Philosophy, Ethics, and Humanities in Medicine, 8*(1), 16.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1-26.

Baute, V., Sampath-Kumar, R., Nelson, S., & Basil, B. (2018). Nutrition education for the health-care provider improves patient outcomes. *Global Advances in Health and Medicine, 7*, 2164956118795995.

Berkowitz, S. A., Berkowitz, T. S., Meigs, J. B., & Wexler, D. J. (2017). Trends in food insecurity for adults with cardiometabolic disease in the united states: 2005-2012. *PloS One, 12*(6), e0179172.

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2019). Household food security in the united states in 2018. ERR-270. washington (DC): USDA. *Economic Research Service,*

Cooksey-Stowers, K., Schwartz, M., & Brownell, K. (2017). Food swamps predict obesity rates better than food deserts in the united states. *International Journal of Environmental Research and Public Health, 14*(11), 1366.

Cuevas, A. G., O'Brien, K., & Saha, S. (2017). What is the key to culturally competent care: Reducing bias or cultural tailoring? *Psychology & Health, 32*(4), 493-507.

De Marchis, E. H., Torres, J. M., Benesch, T., Fichtenberg, C., Allen, I. E., Whitaker, E. M., & Gottlieb, L. M. (2019). Interventions addressing food insecurity in health care settings: A systematic review. *The Annals of Family Medicine, 17*(5), 436-447.

DiMaria-Ghalili, R. A., Mirtallo, J. M., Tobin, B. W., Hark, L., Van Horn, L., & Palmer, C. A. (2014). Challenges and opportunities for nutrition education and training in the health care professions: Intraprofessional and interprofessional call to action. *The American Journal of Clinical Nutrition, 99*(5), 1184S-1193S.

Early, K. B., & Stanley, K. (2018). Position of the academy of nutrition and dietetics: The role of medical nutrition therapy and registered dietitian nutritionists in the prevention and treatment of prediabetes and type 2 diabetes. *Journal of the Academy of Nutrition and Dietetics, 118*(2), 343-353.

Eisenberg, D. M., & Burgess, J. D. (2015). Nutrition education in an era of global obesity and diabetes: Thinking outside the box. *Academic Medicine, 90*(7), 854-860.

Eisenberg, D. M., Miller, A. M., McManus, K., Burgess, J., & Bernstein, A. M. (2013). Enhancing medical education to address obesity:"See one. taste one. cook one. teach one.". *JAMA Internal Medicine, 173*(6), 470-472.

Ferrer, R. L., Neira, L., De Leon Garcia, Gualberto L, Cuellar, K., & Rodriguez, J. (2019). Primary care and food bank collaboration to address food insecurity: A pilot randomized trial. *Nutrition and Metabolic Insights, 12*, 1178638819866434.

Fiscella, K., & Sanders, M. R. (2016). Racial and ethnic disparities in the quality of health care. *Annual Review of Public Health, 37*, 375-394.

Freeland-Graves, J. H., & Nitzke, S. (2013). Position of the academy of nutrition and dietetics: Total diet approach to healthy eating. *Journal of the Academy of Nutrition and Dietetics, 113*(2), 307-317.

Gallegos, D., & Chilton, M. M. (2019). Re-evaluating expertise: Principles for food and nutrition security research, advocacy and solutions in high-income countries. *International Journal of Environmental Research and Public Health, 16*(4), 561.

Gandy, J. (2008). Mixed messages. *Journal of Human Nutrition and Dietetics: The Official Journal of the British Dietetic Association, 21*(2), 107.

Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., & Basu, J. (2014). Multiple chronic conditions chartbook. *Rockville, MD: Agency for Healthcare Research and Quality, ,* 7-14.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association, 98*(10), 1118-1126.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: Concepts and measures. *American Journal of Health Promotion, 19*(5), 330-333.

Gross, R., Schoeneberger, H., Pfeifer, H., & Preuss, H. (2000). The four dimensions of food and nutrition security: Definitions and concepts. *SCN News, 20*, 20-25.

Guest, G., Namey, E., & McKenna, K. (2017). How many focus groups are enough? building an evidence base for nonprobability sample sizes. *Field Methods, 29*(1), 3-22.

Gundersen, C., & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health Affairs, 34*(11), 1830-1839.

Hartline-Grafton, H., & Dean, O. (2017). The impact of poverty, food insecurity, and poor nutrition on health and well-being. *Washington, DC: Food Research & Action Center,*

Hartmann, C., Dohle, S., & Siegrist, M. (2013). Importance of cooking skills for balanced food choices. *Appetite, 65*, 125-131.

Hess, A., Passaretti, M., & Coolbaugh, S. (2019). No title. *Fresh Food Farmacy,*

Holben, D. H., & Marshall, M. B. (2017). Position of the academy of nutrition and dietetics: Food insecurity in the united states. *Journal of the Academy of Nutrition and Dietetics, 117*(12), 1991-2002.

Horning, M. L., Fulkerson, J. A., Friend, S. E., & Story, M. (2017). Reasons parents buy prepackaged, processed meals: It is more complicated than “I don't have time”. *Journal of Nutrition Education and Behavior, 49*(1), 60-66. e1.

Karlsen, M. C., & Pollard, K. J. (2017). Strategies for practitioners to support patients in plant-based eating. *Journal of Geriatric Cardiology: JGC, 14*(5), 338.

Kelley, T. (2018). Forget the pills. healthy food is the prescription. *Managed Care (Langhorne, Pa.), 27*(8), 18-19.

Kelli, H. M., Kim, J. H., Samman Tahhan, A., Liu, C., Ko, Y., Hammadah, M., . . . Choudhary, F. K. (2019). Living in food deserts and adverse cardiovascular outcomes in patients with cardiovascular disease. *Journal of the American Heart Association, 8*(4), e010694.

Krueger, R. A. (2014). *Focus groups: A practical guide for applied research* Sage publications.

Kumar, R., Bhattacharya, S., Sharma, N., & Thiyagarajan, A. (2019). Cultural competence in family practice and primary care setting. *Journal of Family Medicine and Primary Care, 8*(1), 1.

La Puma, J. (2016). What is culinary medicine and what does it do? *Population Health Management, 19*(1), 1-3.

McWhorter, J. W., Raber, M., Sharma, S. V., Moore, L. S., & Hoelscher, D. M. (2019). The nourish program: An innovative model for cooking, gardening, and clinical care skill enhancement for dietetics students. *Journal of the Academy of Nutrition and Dietetics, 119*(2), 199-201.

Morales, M. E., & Berkowitz, S. A. (2016). The relationship between food insecurity, dietary patterns, and obesity. *Current Nutrition Reports, 5*(1), 54-60.

Neumark-Sztainer, D., Hannan, P. J., Story, M., Croll, J., & Perry, C. (2003). Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. *Journal of the American Dietetic Association, 103*(3), 317-322.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of fruit and vegetable intake among adolescents: Findings from project EAT. *Preventive Medicine, 37*(3), 198-208.

Overcash, F., Ritter, A., Mann, T., Mykerezi, E., Redden, J., Rendahl, A., . . . Reicks, M. (2018). Impacts of a vegetable cooking skills program among low-income parents and children. *Journal of Nutrition Education and Behavior, 50*(8), 795-802.

Passel, J. S., & Cohn, D. (2017). 20 metro areas are home to six-in-ten unauthorized immigrants in US. *Pew Research Center,*

Pollard, C. M., & Booth, S. (2019a). Addressing food and nutrition security in developed countries. *International Journal of Environmental Research and Pubic Health,*

Pollard, C. M., & Booth, S. (2019b). No title. *Addressing Food and Nutrition Security in Developed Countries,*

Pooler, J. A., Hartline-Grafton, H., DeBor, M., Sudore, R. L., & Seligman, H. K. (2019). Food insecurity: A key social determinant of health for older adults. *Journal of the American Geriatrics Society, 67*(3), 421-424.

Pruitt, S. L., Leonard, T., Xuan, L., Amory, R., Higashi, R. T., Nguyen, O. K., . . . Swales, S. (2016). Who is food insecure? implications for targeted recruitment and outreach, national health and nutrition examination survey, 2005-2010. *Preventing Chronic Disease, 13*, E143.

Raghupathi, W., & Raghupathi, V. (2018). An empirical study of chronic diseases in the united states: A visual analytics approach to public health. *International Journal of Environmental Research and Public Health, 15*(3), 431.

Ridberg, R. A., Bell, J. F., Merritt, K. E., Harris, D. M., Young, H. M., & Tancredi, D. J. (2019). Peer reviewed: Effect of a fruit and vegetable prescription program on children's fruit and vegetable consumption. *Preventing Chronic Disease, 16*

Rosen, O., Downes, N. J., Sucher, K. P., & Shifflett, B. (1991). Physicians' perceptions of the role of clinical dietitians are changing. *Journal of the American Dietetic Association, 91*(9), 1074-1077.

Schuler, D. A., & Koka, B. R. (2019). Challenges of social sector systemic collaborations: What's cookin'in Houston's food insecurity space?

Schulz, A. J., Mentz, G., Lachance, L., Zenk, S. N., Johnson, J., Stokes, C., & Mandell, R. (2013). Do observed or perceived characteristics of the neighborhood environment mediate associations between neighborhood poverty and cumulative biological risk? *Health & Place, 24*, 147-156.

Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for, 2020. (2010). Healthy people 2020: An opportunity to address the societal determinants of health in the united states.

Seligman, H. K., & Berkowitz, S. A. (2019). Aligning programs and policies to support food security and public health goals in the united states. *Annual Review of Public Health, 40*, 319-337.

Sharma, S. V., Chuang, R., Byrd-Williams, C., Danho, M., Upadhyaya, M., Berens, P., & Hoelscher, D. M. (2018). Pilot evaluation of HEAL–A natural experiment to promote obesity prevention behaviors among low-income pregnant women. *Preventive Medicine Reports, 10*, 254-262.

Sharma, S. V., Hernandez, D. C., Hoelscher, D. M., & Yaroch, A. L. (2015). Multidisciplinary approaches to address food insecurity and nutrition among youth and their families. *Journal of Applied Research on Children: Informing Policy for Children at Risk, 6*(2), 1.

Sharma, S. V., Upadhyaya, M., Bounds, G., & Markham, C. (2017). Peer reviewed: A public health opportunity found in food waste. *Preventing Chronic Disease, 14*

Shaw, K. M., Theis, K. A., Self-Brown, S., Roblin, D. W., & Barker, L. (2016). Peer reviewed: Chronic disease disparities by county economic status and metropolitan classification, behavioral risk factor surveillance system, 2013. *Preventing Chronic Disease, 13*

Sicker, K., Habash, D., Hamilton, L., Nelson, N. G., Robertson-Boyd, L., & Shaikhkhalil, A. K. (2020). Implementing culinary medicine training: Collaboratively learning the way forward. *Journal of Nutrition Education and Behavior,*

Smith, L. P., Ng, S. W., & Popkin, B. M. (2013). Trends in US home food preparation and consumption: Analysis of national nutrition surveys and time use studies from 1965–1966 to 2007–2008. *Nutrition Journal, 12*(1), 45.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annu.Rev.Public Health, 29*, 253-272.

Swartz, H. (2018). Produce rx programs for diet-based chronic disease prevention. *AMA Journal of Ethics, 20*(10), 960-973.

Thornton, R. L., Glover, C. M., Cené, C. W., Glik, D. C., Henderson, J. A., & Williams, D. R. (2016). Evaluating strategies for reducing health disparities by addressing the social determinants of health. *Health Affairs, 35*(8), 1416-1423.

Tougas, M. E., Hayden, J. A., McGrath, P. J., Huguet, A., & Rozario, S. (2015). A systematic review exploring the social cognitive theory of self-regulation as a framework for chronic health condition interventions. *PLoS One, 10*(8), e0134977.

US Department of Health and Human Services. (2017). *Dietary guidelines for americans 2015-2020* Skyhorse Publishing Inc.

Vaccaro, J. A., & Huffman, F. G. (2017). Sex and race/ethnic disparities in food security and chronic diseases in US older adults. *Gerontology and Geriatric Medicine, 3*, 2333721417718344.

Wight, V., Kaushal, N., Waldfogel, J., & Garfinkel, I. (2014). Understanding the link between poverty and food insecurity among children: Does the definition of poverty matter? *Journal of Children and Poverty, 20*(1), 1-20.

Zhan, J., Liu, Y., Cai, L., Xu, F., Xie, T., & He, Q. (2017). Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. *Critical Reviews in Food Science and Nutrition, 57*(8), 1650-1663.

Title of Journal Article 2: An Intervention Mapping Approach to Develop a Patient Centered Culinary Medicine Program for Low Income Food Insecure Patients

Target: Journal of Nutrition Education and Behavior

INTRODUCTION

In 2018, 13% of all adults in the United States (US) suffered from type 2 diabetes, with rates climbing over 26% among adults aged 65 years or older (CDC, 2018). Consequently, adults with diabetes carry a 50% higher risk of mortality and spend more than $9500 yearly on medical costs than their counterparts in addition to increased risk of complications and co-morbidities (CDC, 2018; Rowley, 2017). Alarmingly, the prevalence of diabetes is forecast to increase by more than 50% over the next decade (Rowley, 2017). Substantial evidence demonstrates the relations between a healthy dietary pattern rich in fruits, vegetables, and whole grains and a lower risk of chronic diseases including type 2 diabetes (Hu et al., 2020). Despite well supported studies, programs, and public health campaigns presenting the health benefits of consuming a healthy dietary pattern, most Americans fall far short of the recommendations (Zhan et al., 2017). Americans' knowledge of nutrition is estimated to be at an all-time high (Funk & Kennedy, 2016), yet evidence indicates that knowledge alone has only minor effects on dietary behaviors (Mozaffarian, 2017). Further, food insecurity and diabetes often co-exist within the same individual because of disordered eating – consuming when and what is available regardless of whether the foods are healthy (Hartline-Grafton & Dean, 2017). The compounding effects of poverty, food insecurity, chronic disease, and consumption of energy dense and nutrient deficient foods continue to negatively affect public health (Raghupathi & V. Raghupathi, 2018).

Over the past several decades, significant changes in the US food system have increased social inequalities in food access by promoting cheap and poor nutritional value processed foods

over fruits, vegetables, and whole grains (Popkin & Kenan, 2016; Smith, Ng, & Popkin, 2013; Schulz et al., 2013). One approach to assist patients suffering from food insecurity is through "food prescription" programs that operate collaboratively between healthcare and social services (Saxe-Custack, LaChance, Hanna-Attisha & Ceja, 2019; Swartz, 2018). These programs screen for and enroll patients with certain health criteria such as type 2 diabetes and provide a prescription that can be redeemed for a variety of healthy foods (Swarts, 2018). However, the common reductionist philosophy to "eat more fruits and vegetables" ignores the complex social and environmental factors that often dictate an individual's choice to consume a healthy dietary pattern (Darwin & Drewnowski, 2015; Mozaffarian, 2017). Additionally, barriers such as negative taste perceptions, perceived lack of time, and the overall cost of access (purchasing, transportation, waste, etc.), are strong deterrents of consuming a healthy dietary pattern (Neumark-Sztainer, Wall, Perry & Story, 2003; Story, Kaphingst, Robinson-O'Brien & Glanz, 2008). Thus, merely distributing healthy foods to food insecure patients in low-income communities ignores social inequalities and intrapersonal factors such as taste, self-efficacy for food preparation, and food literacy, as well as the community social support and role modeling and may not be sufficient to increase healthy food consumption (Kuehn, 2019; Story et al., 2008).

Culinary Medicine (CM) is emerging as a strategy to help participants overcome barriers and improve adherence to healthy dietary patterns through the utilization of experiential culinary nutrition education (Kuehn, 2019; Sicker et al., 2019). This new scientific field blends the art of cooking with the science of medicine to empower patients to improve their health through the power of healthy food (Eisenberg, Miller, McManus, Burgess & Bernstein, 2013; La Puma, 2016). CM adds to current nutrition education and interventions by incorporating both the

practical hands-on preparation and pleasure of food and the scientific knowledge of how nutrition and dietary patterns affect health (Evert, 2019; Sicker et al., 2019). While several CM programs exist with varying adaptations, we are unaware of any programs specifically designed for low income minority patients with diabetes participating in a food prescription program (Barkoukis et al., 2019; Sicker et al., 2019).

The purpose of this study was to develop a patient-centered, clinic-based CM curriculum for low-income minority patients with type 2 diabetes participating in a food prescription program (called *A Prescription for Healthy Living, APHL*). As part of this study, we utilized the Intervention Mapping (IM) methodology to describe the APHL theoretical framework, intervention components, and evaluation constructs (Fernandez et al., 2019). These steps can provide researchers and practitioners the ability a model decision-making process to translate theory into practice in public health programs.

METHODS

APHL is a clinic-based food prescription program developed for patients with type 2 diabetes and who are food insecure. This program consists of two primary components: (1) food provision where participating patients receive a six-month prescription for thirty pounds of fresh produce and other healthy items such as whole grains, lean meats, and legumes, and (2) a six session CM based bi-weekly experiential nutrition education. We used an IM framework to develop the curriculum design and components.

IM consists of a six-step iterative process: (1) needs assessment, (2) program outcomes, (3) program design, (4) program production, (5) implementation plan, and (6) evaluation plan. Each step contains several smaller tasks to create a thoroughly designed intervention with rigorous implementation and evaluation measures (Fernandez et al., 2019). Consistent with other

published literature (Kok et al., 2017), where possible, we utilized complete IM methods and steps to help facilitate curriculum design.

Step 1: Needs Assessment

As one of the largest safety net providers in the country, Harris Health serves an extremely impoverished geographic area in Texas, with residents suffering significantly higher rates of food insecurity, obesity, and type 2 diabetes (Harris Health, 2019; Health of Houston Survey, HHS 2017-18). In 2019, more than 55% of the patients served live below the poverty line, and the prevalence of overweight or obesity among adults aged 18 to 44 was 73.9%, which is significantly higher than the prevalence for the surrounding Houston areas (63.6%) (Harris Health, 2019; Schuler & Koka, 2019). In a prior study, we conducted a total of 6 patient (n= 40) and 3 RDN (n=17) focus groups to understand both the barriers and facilitators for healthy eating among this low-income, diverse population with diabetes and the gaps in knowledge and training for Registered Dietitian Nutritionists (RDN) to address patient barriers when implementing a food prescription and CM program in a healthcare setting (McWhorter et al., 2020*). Results from the qualitative analysis revealed four key takeaways that were consistent through both the RDN and patient perspectives: (1) negative perception of the RDN (including nutrition and healthy foods), (2) mixed dietary messages, (3) cultural inclusiveness in food and nutrition

recommendations, and (4) the need for additional RDN training in CM to facilitate programming for patients. A logic model of the determinants is illustrated in Figure 1.

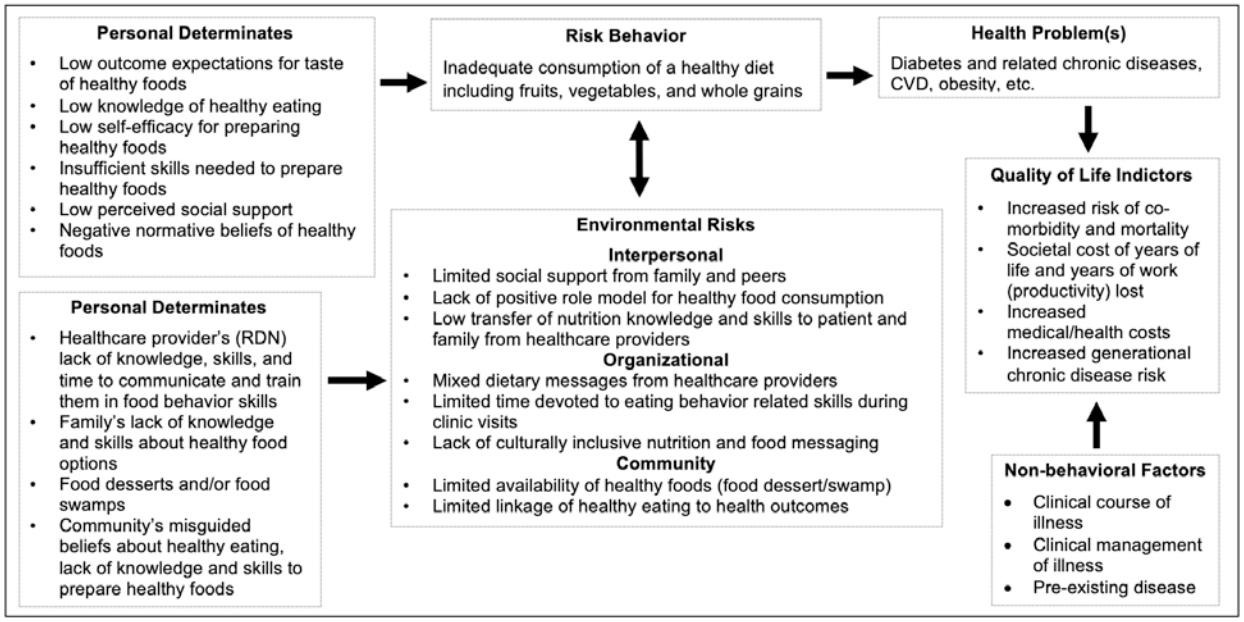


Figure 3: Logic model for patients and RDNs participating in food prescription focus groups

Step 2: Program Outcomes and Change Objectives

The program outcomes and change objectives were developed in response to the needs assessment outlined in Step 1. In addition to focus groups, discussions and planning with key Harris Health personnel helped to elucidate major factors and issues for program outcomes and the subsequent change objectives. Importantly, different change objectives were indicated for healthcare providers and patients with diabetes. A train-the-trainer curriculum was identified as a needed resource to accompany the patient curriculum in order to level-set the culinary skills of practicing RDNs for teaching patient curriculum (McWhorter et al., 2020*).

Table 1 outlines the logic model of the APHL curriculum framework which targets training, skill building, communication, and practice that will affect healthcare practitioners and patients: (1) outcome expectations that healthy food tastes good and is affordable, simple to

prepare, and relevant to all cultures; (2) knowledge and awareness about healthy eating including the common strategies to overcome common barriers of cost, time, flavor, and skills; (3) self-efficacy for engaging in healthy eating; (4) skills to prepare healthy and flavorful foods; (4) subjective norms that healthy eating is the norm for other representative patients; (6) social support to shop, prepare, and consume healthy foods (vegetables, fruits, whole grains, legumes) and to make each plate representative of the MyPlate; (7) change in behavior that results in improved consumption of healthy foods and each plate consumed representing MyPlate ratios; and (8) outcomes related to healthy eating including improved quality of life, better blood sugar control, and related biomarkers including triglycerides, LDL cholesterol, blood pressure, and body mass index.

Program Inputs →	Change Agents →	SCT Change Objectives →	Behavioral Outcomes →	Physiological & Psychosocial Outcomes
APHL Training of RDN • Practitioner (train-the-trainer) training (culinary skills, nutrition knowledge, program delivery) • Planning and implementation support • HH time for RDN training **APHL Materials** • Facilities including portable kitchen equipment and cooking materials • Food provisions • Patient curriculum • Implementation manual • Recipe and culinary skills toolbox • Coordination kit • APHL resources for printed materials and handouts • Online resources • Funding from SMITH Foundation	**Implementation Team** (APHL staff, clinic dietitians, and misc. staff) • Coordinates patient enrollment with EMR • Plans patient curriculum implementation • Provide pre and post intervention survey **Patient Classes** • Aligns with food received from the food pantry • Provide tasting of recipes prepared in class • Conduct demonstration of cooking techniques • Provide instruction in hands-on preparation of recipes • Conduct class discussions of nutrition topics and recipe preparation • Provide post-session handouts covering nutrition and cooking topics	**Patients** will increase: • Outcome expectations of the taste of healthy foods* • Knowledge of healthy eating (appropriate type, portion size, and to manage disease condition) • Self-efficacy of preparing healthy foods* • Culinary skills for preparing healthy foods* • Perceived social support for healthy foods* • Normative beliefs of healthy foods* **Healthcare Staff** will increase: • Knowledge of culinary techniques • Skills for the preparation of healthy foods • Social support for culturally relevant foods and flavor profiles • Communication with patients about preparation of healthy foods* • Consistent dietary messages	**Patients** will increase: Healthy eating behaviors: • Preparation of healthy foods at home Dietary Intake of: • Vegetables • Fruits • Whole grains • Legumes **Patients** will decrease: Dietary intake of: • Caloric dense and nutrient deficient foods • Sugar sweetened beverages • Processed grains • Overall caloric intake **Environmental Outcomes →** **Patients** will have: • Increased availability of healthy foods* at home • Increased opportunity to practice healthy eating behaviors • Improved home nutrition environment	**Patients** will increase: • Health related quality of life **Patients** will decrease: • Food insecurity • Complications from Diabetes • HbA1c levels • Blood pressure • Triglyceride levels • LDL cholesterol • Body Mass Index (BMI) • Body weight
*Healthy food is comprised of the components of the MyPlate– which includes fruits, vegetables, legumes, healthy fats, nuts and seeds, lean proteins, whole grains, and dairy products. **Nutrition related chronic diseases include heart disease, stroke, high blood pressure, diabetes, and some cancers.				

Table 2: A Logic Model of APHL Curriculum Framework

Step 3: Program Design

Food consumption is a complex behavior for adults living in poverty, and the pathway to healthy eating is not a simple one size fits all approach (Emanuel et al., 2012; Guillaumie, et al., 2010). Behavioral theories can help explain the barriers and facilitators to behaviors like healthy eating and provide insight into developing successful environments for public health programs (Kelder et al., 2015). Social Cognitive Theory (SCT) is one such theory and posits a reciprocal and dynamic interaction of personal, behavioral, and environmental interactions impacting behaviors (Kelder, Hoelscher & Perry, 2015; Tougas, Hayden, McGrath, Huguet & Rozario, 2015). SCT has been cited as an effective model to explore the constructs of healthy eating and has been widely used in health promotion and nutrition intervention interventions to successfully improve related behaviors (Kelder et al., 2015).

By utilizing principles of SCT as a model for the framework for our CM curriculum, we intend to increase healthy eating behaviors by building food literacy skills and knowledge through hands-on experiential group classes. Our framework includes a three step method for each session, (1) *taste* – provides participants the opportunity to consume delicious "healthy food" in order to change negative outcome expectations of "healthy food" tasting bad; (2) *see* – demonstration of recipes (cooking techniques) involves modeling and observational learning of skills; and (3) *do* – provides participants the ability to increase behavioral capacity and self-efficacy through hands-on experiential preparation recipe(s) (cooking techniques). Lastly, holding the series of classes in a group setting with self-efficacy discussions and goal setting promotes modeling through peers, group learning, changes in social norms, and continued reinforcement of positive behaviors.

Step 4: Program Production

For program production, we coalesced information from the first three steps to operationalize the theoretical framework and develop practical program curricula to achieve the change objectives. Throughout the planning and development stages, with input from stakeholders, we centered the curriculum around Harris Health's food prescription program, staffing, clinic space, and patient population to ensure successful implementation and long-term success. The team input allowed us to develop the program components and mutually decide on the scope and sequence of programming.

While literature surrounding CM and teaching kitchens is increasing, most healthcare clinics do not necessarily have access to a built-in dedicated teaching kitchen for providing hands-on cooking classes (Stauber et al., 2019; Nicosia et al., 2019). Thus, we are utilizing portable kitchen carts (Kitchen a La Carte) that include basic kitchen cooking equipment (oven, microwave, sink, stove, etc.) and accessories blender, pots, pans, knives, etc.) to deliver the classes across clinic sites. These carts have space for eight to ten participants, allow the flexibility for a class to be offered in a clinic without a built-in teaching kitchen, and have a small storage footprint when not in use.

The APHL curriculum consists of five, 2-hour hands-on CM group classes led by one RDN and one community health worker for eight patients with diabetes participating in the food prescription program. Culinary techniques are designed around foods typically found in the food prescriptions, and recipes are prepared from foods available in the food pantry. Each session provides an opportunity to taste culturally relevant healthy food, practice culinary skills, and learn about nutrition in a group setting. The APHL patient curriculum is outlined in table 2.

A Prescription for Healthy Eating Culinary Medicine Curriculum Outline		
Five, 2-hour each, hands-on sessions via Kitchen a la Cart		
Common themes for each session: • Patient centered communication (e.g., facilitated discussions) • Culinary skills development (e.g., knife skills, vegetable roasting, etc.) • Self-efficacy building (e.g., tasting and preparing foods, picture challenges) • Utilization of foods from the food pantry • Group discussion and feedback		
Session	Topics Covered	Objectives
Session 1	MyPlate, kitchen safety, vegetable prepping (knife skills), roasting, goal setting, review patients' recipes and building a healthy plate activity	Participants will: (1) Describe their current barriers with healthy eating (2) Identify a healthy plate as ½ fruits and vegetables, ¼ lean protein, and ¼ whole grains (3) Learn to roast flavorful vegetables (4) Learn how to use safe and effective knife skills to prepare a variety of vegetables. (5) Create a short-term goal related to building a healthy plate.
Session 2	Carbohydrate counting, label reading, whole grains, vegetable salads, goal setting, review patients' recipes and label reading activity	Participants will: (1) Be able to describe what foods contain carbohydrates. (2) Learn how to control glucose levels using a MyPlate approach. (3) Learn how to cook whole grain(s). (4) Practice safe and effective knife skills to prepare a variety of vegetables. (5) Refine/ build from goal from session 1
Session 3	Meal planning, grocery shopping, stir-frying & microwaving, goal setting, review patients' recipes and meal planning and grocery shopping activity	Participants will: (1) Discuss their success and challenges with carbohydrate counting. (2) Describe meal planning as a way to help plan the grocery list. (3) Learn how to prepare a flavorful vegetable stir-fry. (4) Learn how microwave flavorful vegetables (5) Refine/ build from goal from session 2
Session 4	Repurposing leftovers, meal planning, vegetable roasting, whole grains, goal setting, review patients' recipes and planning and repurposing activity	Participants will: (1) Discuss their challenges and successes in meal planning and grocery shopping. (2) Identify ways to plan meals in a way that repurposes leftovers. (3) Reinforce whole grain cooking and roasting vegetables (4) Practice safe and effective knife skills to prepare a variety of vegetables. (5) Refine/ build from goal from session 3
Session 5	Eating away from home and snacking, vegetable soups and microwaving, goal setting, review patients' recipes and choosing healthy foods	Participants will: (1) Discuss their challenges and successes in repurposing leftovers. (2) Identify how to eat healthier meals away from the home and while snacking. (3) Learn how to prepare flavorful vegetable soups (4) Reinforce microwave cooking and practice safe and effective knife skills. (5) Refine/ build from goal from session 4

Table 3: APHL Culinary Medicine Curriculum Outline

Step 5: Program Implementation

The implementation plan is centered around a capacity building strategy to ensure successful adoption and long-term implementation of the program after the pilot implementation. Thus, the capabilities of Harris Health both in staffing and facilities and the patient population needs were discussed in detail through a series of meeting with stakeholders. This process identified barriers and facilitators for adoption and implementation ,which were described in length under step 1.

For the planned pilot study, we identified two Harris Health clinic locations with planned food prescription programs to implement the APHL curriculum. All classes will be held on site utilizing a portable kitchen cart to facilitate hands-on cooking. Participants are eligible to participate if they (1) speak English or Spanish (2) screen positive for food insecurity, (3) participate in the food prescription program, (4) diagnosed with type 2 diabetes, and have an HbA1c > 7. Trained Harris Health Community Health Workers will approach and recruit participants and invite them to participate in the program. Consent will be obtained during the first-class session.

We will conduct a total of 6 cohorts (3 at each clinic) of five biweekly 2-hour class sessions. APHL staff will lead the first cohorts with assistance from Harris Health RDNs, Harris Health RDNs will lead the second cohorts with support from APHL team, and Harris Health RDNs will lead the third cohorts with coaching and auditing by APHL staff.. The built-in capacity building during pilot implementation is designed to help cement adoption and long-term implementation.

Step 6: Evaluation Plan

The main objectives highlighted in the logic model (table 1) in step 2 correspond to the outcome variables and measurement for the evaluation plan. We will track several of the clinical outcome measures via electronic medical records, including HbA1c levels, lipid panel, blood pressure,

and weight measurements at two timepoints – inclusion (within 90 days of start) and completion (within 90 days of completion). Clinical outcomes will be compared to subjects at control clinics. We will conduct a pre- post-survey to gather demographic data and to determine the changes in dietary behaviors, nutrition knowledge, and culinary skills of participants. Our pre-post analysis will utilize paired t-test, chi-square test, and Analysis of Covariance to determine changes in biometric and behavioral measures pre to post APHL program participation. Survey items are described in detail in the measurement in table 3.

APHL Curriculum Survey Constructs and Source Citations		
Constructs	**Items and Sample Questions**	**Source citation**
Perceived Health	1 item E.g. Overall, how would you rate your health in the past four weeks? Response options (1-6) – Excellent to Very Poor	Bowling, A; Just one question: If one question works, why ask several?; Journal of Epidemiology & Community Health (2005); 59:342-345.
Vegetable consumption	1 item E.g. How many servings of VEGETABLES do you eat or drink each day? Response options (0 to 5): None to 4+ servings per day	Yaroch AL, et al. Evaluation of Three Short Dietary Instruments to Assess Fruit and Vegetable Intake: The National Cancer Institute's Food Attitudes and Behaviors Survey. J Acad Nutr Diet. 2012 Oct;112(10):1570-7.(Link: http://www.ncbi.nlm.nih.gov/pubmed/23017567)
Fruit consumption	1 item E.g. How many servings of FRUIT do you eat or drink each day? Response options (0 to 5): None to 4+ servings per day	Yaroch AL, et al. Evaluation of Three Short Dietary Instruments to Assess Fruit and Vegetable Intake: The National Cancer Institute's Food Attitudes and Behaviors Survey. J Acad Nutr Diet. 2012 Oct;112(10):1570-7.(Link: http://www.ncbi.nlm.nih.gov/pubmed/23017567
Whole grain consumption	1 item E.g. How many servings of Whole Grains do you eat each day? Response options (0 to 5): None to 4+ servings per day	Adapted from: Yaroch AL, et al. Evaluation of Three Short Dietary Instruments to Assess Fruit and Vegetable Intake: The National Cancer Institute's Food Attitudes and Behaviors Survey. J Acad Nutr Diet. 2012 Oct;112(10):1570-7.(Link: http://www.ncbi.nlm.nih.gov/pubmed/23017567
Typical food consumption behaviors	7 items: E.g. How often do you typically eat a green salad?	Pinard, Courtney A., et al. "Development and testing of a revised cooking matters for adults

	Response options (0-4): Not at all to More than once a day	survey." American journal of health behavior 39.6 (2015): 866-873.
Perceived Barriers of Eating Fruits and Vegetables	13 items E.g. I don't eat fruits and vegetables as much as I like to because they cost too much Response options (0-4): Strongly agree to strongly disagree	Pinard, Courtney A., et al. "Development and testing of a revised cooking matters for adults survey." American journal of health behavior 39.6 (2015): 866-873.
Eating/cooking/using nutrition labels	10 items E.g. How often do you compare prices before you buy food? Response options (1-5): Never to Always	Pinard, Courtney A., et al. "Development and testing of a revised cooking matters for adults survey." American journal of health behavior 39.6 (2015): 866-873.
Nutrition knowledge	1 item E.g. When thinking about preparing a plate of food, how much of your plate should be filled with fruits and vegetables?	Not previously validated
Barriers to Healthy Eating	4 items E.g. Cooking healthy food is difficult Response options (1-5): Strongly agree to strongly disagree	Not Previously validated
Self-efficacy in cooking food and meal planning	5 items E.g. Before this program how sure were you that you could use basic cooking techniques (e.g. microwaving, sautéing, roasting). Response options (0-4): Not at all sure to Extremely Sure	Condrasky, M.D., Williams, J.E., Catalano, P.M., & Griffin, S.F. (2011). Development of psychosocial scales for evaluating the impact of a culinary nutrition education program on cooking and healthful eating. Journal of Nutrition Education and Behavior, 43, 511-516.

Table 4: Description of APHL Survey Items

Process evaluation data on session dosage, reach, fidelity, and acceptability will be conducted using attendance logs and individual session comment cards. Instructors will complete a post session teaching surveys to gauge fit and further refine and improve the program curriculum. Additionally, an independent auditor will conduct individual session audits to provide data on session homogeneity, participant engagement, and teaching quality. Lastly, we

will conduct interviews with stakeholders (Harris Health staff and select participants) to elucidate qualitative feedback on enhancers and barriers for APHL curriculum before further implementation.

DISCUSSION

This paper describes the systematic theoretically-driven developmental process of a holistic CM-based, food prescription program designed to be implemented in a clinic setting for food insecure, diverse patients with type 2 diabetes. The use of a methodical IM protocol for the needs assessment, planning, development, and future implementation and evaluation increases the likelihood of program adoption and capacity building and program effectiveness (Godin et al., 2007; Kok et al., 2017). The proposed CM framework will be further refined through the results of RDN training and subsequent pilot implementation.

In the development of public health programs such as food prescriptions and CM, it is vital to understand how the theoretical framework can used to address the needs of the target population (Fernandez et al., 2019; Spahn et al., 2010). Intervention Mapping (IM) is a systematic planning process for the development of public health and health promotion programs and has been used extensively across a range of programs including nutrition interventions (Hoelscher, Evans, Parcel, & Kelder, 2002; Brug et al., 2005; Kok et al., 2017). IM is not a theoretical approach but consists of a detailed series of logical steps to ensure proper and adequate input during the planning, development, and implementation stages (Fernandez et al., 2019). These steps provide the researcher with the ability to produce a coherent decision-making process to translate theory into practice in public health programs.

With the rise of CM initiatives (Nicosia, Lanzoni, & Eisenberg, 2019; Stauber, et al., 2019) and food prescription programs (Swarts, 2018) instituted in healthcare systems, it is vital to promote interprofessional collaboration to encourage consistent dietary messages and improve the understanding and importance of nutrition among healthcare providers (Hark, 2017; Sicker et al., 2019). Further, recent literature suggests healthcare practitioners, including RDNs, need additional education and practice to develop the necessary confidence and culinary skills to deliver CM programming (Barkoukis et al., 2019; Eisenberg et al., 2015). The integrated approach of our framework provides training for practitioners to level set the needed skills and knowledge and adequately address patient concerns.

Recent literature indicates health disparities can be reduced through the addition of culturally inclusive language and recommendations (Abrishami, 2019; Kumar, 2019). Our needs assessment further highlighted the significance of cultural inclusivity in food and nutrition interactions consistent with published literature (Gallegos, 2019; Freeland-Graves, 2013). Yet, many nutrition programs provide only one flavor profile and one way of consuming healthy foods, thereby stigmatizing and excluding many minority groups and people of color (Goody et al., 2009). Further, the labeling of cultural food practices as bad (Southern, Chinese, Mexican, etc.) or good (French, Italian, Mediterranean, etc.) can lead to the rejection of cultural foods in favor of “Americanized foods” to eat healthy (Burt, 2019; McWhorter et al., 2020*). Our framework is designed to promote healthy dietary patterns for all by empowering participants to navigate healthy eating through the lens of their own food and cultural experiences. By emphasizing culinary techniques over recipes, we can inspire adaptability of culturally familiar flavors and ingredients for a diverse range of ethnicities, abilities, and cooking equipment.

MyPlate is utilized as a tool to provide context to meal components and portion sizes, while the open discussion gives voice to the diversity and expertise represented in each class.

One of the challenges of the program is the lack of validated instruments for some of the related culinary constructs, and we have attempted to overcome this through face validity among our research team. Although the geographic area of the study is home to one of the most diverse populations in the U.S., the convenience sampling and self-selection of patient focus groups for the needs assessment limit generalizability of the results. We integrated programming within the current food prescription appointment structure to help alleviate the transportation and time burden for participants and staff. While we attempted to overcome identified barriers, we will assess additional sustainable opportunities during pilot implementation to assist participants through other barriers such as childcare.

This study also has several strengths. By utilizing a systematic IM process, we created a tailored and holistic curriculum for our target population that complements the current food prescription programming. The curriculum can be used in isolation or jointly with other food-access based programming. Further, the curriculum follows the USDA MyPlate nutrition guide – an evidence-based nutrition education resource - and provides practical “how to” instruction on healthy cooking and eating (USDA, 2020). In addition to RDN training, the utilization of portable kitchen carts promotes long-term capacity building and adoption and implementation efforts across clinic sites. As a safety net provider, Harris Health’s focus is the care of the underserved, and the clinics are located in some of the poorest areas of Texas with more residents living at or below the federal poverty level. Further, this diversity of the surrounding area is represented in both the patient and RDN practitioner population for this study. Lastly, the

curriculum incorporated the significance of flavor and promotes the importance of inclusion of culture in healthy dietary patterns for all.

CONCLUSION

This paper describes a systematic IM process to create a framework for the CM curriculum for low income, diverse patients with diabetes. An evaluation study is currently testing the APHL curriculum, and the subsequent results and evaluations will help further refine curriculum to best suit the needs of practicing RDNs and diverse patient populations to promote healthy eating and improve health outcomes.

REFERENCES

Barkoukis, H., Swain, J., Rogers, C., & Harris, S. R. (2019). Culinary medicine and the registered dietitian nutritionist: Time for a leadership role. *Journal of the Academy of Nutrition and Dietetics, 119*(10), 1607-1611.

Berkowitz, S. A., Delahanty, L. M., Terranova, J., Steiner, B., Ruazol, M. P., Singh, R., . . . Wexler, D. J. (2019). Medically tailored meal delivery for diabetes patients with food insecurity: A randomized cross-over trial. *Journal of General Internal Medicine, 34*(3), 396-404.

Berkowitz, S. A., Terranova, J., Hill, C., Ajayi, T., Linsky, T., Tishler, L. W., & DeWalt, D. A. (2018). Meal delivery programs reduce the use of costly health care in dually eligible medicare and medicaid beneficiaries. *Health Affairs, 37*(4), 535-542.

Blickenderfer, Z. (2016). Vegetable prescription programs: A new take on holistic health.

Buyuktuncer, Z., Kearney, M., Ryan, C. L., Thurston, M., & Ellahi, B. (2014). Fruit and vegetables on prescription: A brief intervention in primary care. *Journal of Human Nutrition and Dietetics, 27,* 186-193.

Caines, L., Asiedu, Y., Dugdale, T., & Wu, H. (2018). An interprofessional approach to teaching nutrition counseling to medical students. *MedEdPORTAL: The Journal of Teaching and Learning Resources, 14*

Cavanagh, M., Jurkowski, J., Bozlak, C., Hastings, J., & Klein, A. (2017). Veggie rx: An outcome evaluation of a healthy food incentive programme. *Public Health Nutrition, 20*(14), 2636-2641.

Darmon, N., & Drewnowski, A. (2015). Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: A systematic review and analysis. *Nutrition Reviews, 73*(10), 643-660.

Eldredge, L. K. B., Markham, C. M., Ruiter, R. A., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: An intervention mapping approach* John Wiley & Sons.

Evert, A., Fleming, A., Gaudiani, L. M., Guggenmos, K. J., Kaufer, D. I., McGill, J. B., . . . Martinez, J. (2019). Culinary medicine: Advancing a framework for healthier eating to improve chronic disease management and prevention. *Clinical Therapeutics, 41*(10), 2184-2198.

Fernandez, M. E., Ruiter, R. A., Markham, C. M., & Kok, G. (2019). Theory-and evidence-based health promotion program planning: Intervention mapping. *Frontiers in Public Health, 7*, 209.

Forbes, J. M., Forbes, C. R., Lehman, E., & George, D. R. (2019). "Prevention produce": Integrating medical student mentorship into a fruit and vegetable prescription program for at-risk patients. *The Permanente Journal, 23*

Friedman, D. B., Freedman, D. A., Choi, S. K., Anadu, E. C., Brandt, H. M., Carvalho, N., . . . Hebert, J. R. (2014). Provider communication and role modeling related to patients' perceptions and use of a federally qualified health center–based farmers' market. *Health Promotion Practice, 15*(2), 288-297.

Funk, C., & Kennedy, B. (2016). The new food fights: US public divides over food science. Pew Research Center,

Gilboy, M. B., Heinerichs, S., & Pazzaglia, G. (2015). Enhancing student engagement using the flipped classroom. *Journal of Nutrition Education and Behavior, 47*(1), 109-114.

Goddu, A. P., Roberson, T. S., Raffel, K. E., Chin, M. H., & Peek, M. E. (2015b). Food rx: A community–university partnership to prescribe healthy eating on the south side of chicago. *Journal of Prevention & Intervention in the Community, 43*(2), 148-162.

Hess, A., Passaretti, M., & Coolbaugh, S. (2019). No title. *Fresh Food Farmacy,*

Hu, E. A., Steffen, L. M., Coresh, J., Appel, L. J., & Rebholz, C. M. (2020). Adherence to the healthy eating Index–2015 and other dietary patterns may reduce risk of cardiovascular disease, cardiovascular mortality, and all-cause mortality. *The Journal of Nutrition, 150*(2), 312-321.

Jacob Cohen. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed. ed.). Florence: Routledge Ltd. Retrieved from https://ebookcentral.proquest.com/lib/[SITE_ID]/detail.action?docID=1192162

Joshi, K., Smith, S., Bolen, S. D., Osborne, A., Benko, M., & Trapl, E. S. (2019). Implementing a produce prescription program for hypertensive patients in safety net clinics. *Health Promotion Practice, 20*(1), 94-104.

Kelley, T. (2018). Forget the pills. healthy food is the prescription. *Managed Care (Langhorne, Pa.), 27*(8), 18-19.

Kris-Etherton, P. M., Akabas, S. R., Bales, C. W., Bistrian, B., Braun, L., Edwards, M. S., . . . Palmer, C. A. (2014). The need to advance nutrition education in the training of health care

professionals and recommended research to evaluate implementation and effectiveness. *The American Journal of Clinical Nutrition, 99*(5), 1153S-1166S.

Kuehn, B. M. (2019). Heritage diets and culturally appropriate dietary advice may help combat chronic diseases. *Jama,*

Lavelle, F., McGowan, L., Hollywood, L., Surgenor, D., McCloat, A., Mooney, E., . . . Dean, M. (2017). The development and validation of measures to assess cooking skills and food skills. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 118.

Marcinkevage, J., Auvinen, A., & Nambuthiri, S. (2019). Washington state's fruit and vegetable prescription program: Improving affordability of healthy foods for low-income patients. *Preventing Chronic Disease, 16*

Monlezun, D. J., Leong, B., Joo, E., Birkhead, A. G., Sarris, L., & Harlan, T. S. (2015). Novel longitudinal and propensity score matched analysis of hands-on cooking and nutrition education versus traditional clinical education among 627 medical students. *Advances in Preventive Medicine, 2015*

Office of Disease Prevention and Health Promotion. (2015). No title. *Social Determinants of Health.Healthy People 2020,*

Paxton, A. E., Strycker, L. A., Toobert, D. J., Ammerman, A. S., & Glasgow, R. E. (2011). Starting the conversation: Performance of a brief dietary assessment and intervention tool for health professionals. *American Journal of Preventive Medicine, 40*(1), 67-71.

Pinard, C. A., Uvena, L. M., Quam, J. B., Smith, T. M., & Yaroch, A. L. (2015). Development and testing of a revised cooking matters for adults survey. *American Journal of Health Behavior, 39*(6), 866-873.

Pitts, S. B. J., Hinkley, J., Wu, Q., McGuirt, J. T., Lyonnais, M. J., Rafferty, A. P., . . . Phillips, L. (2017). A possible dose–response association between distance to farmers' markets and roadside produce stands, frequency of shopping, fruit and vegetable consumption, and body mass index among customers in the southern united states. *BMC Public Health, 17*(1), 65.

Polak, R., Phillips, E. M., Nordgren, J., La Puma, J., La Barba, J., Cucuzzella, M., . . . Eisenberg, D. (2016). Health-related culinary education: A summary of representative emerging programs for health professionals and patients. *Global Advances in Health and Medicine, 5*(1), 61-68.

Popkin, B. M., & Kenan Jr, W. R. (2016). Preventing type 2 diabetes: Changing the food industry. *Best Practice & Research Clinical Endocrinology & Metabolism, 30*(3), 373-383.

Raghupathi, W., & Raghupathi, V. (2018). An empirical study of chronic diseases in the united states: A visual analytics approach to public health. *International Journal of Environmental Research and Public Health, 15*(3), 431.

Reichler, G., & Dalton, S. (1995). Chef''s nutrition knowledge, food preparation practices, and attitudes toward nutrition related to the dietary guidelines. *Journal of the American Dietetic Association, 95*(9), A17.

Rowley, W. R., Bezold, C., Arikan, Y., Byrne, E., & Krohe, S. (2017). Diabetes 2030: Insights from yesterday, today, and future trends. *Population Health Management, 20*(1), 6-12.

Saxe-Custack, A., LaChance, J., Hanna-Attisha, M., & Ceja, T. (2019a). Fruit and vegetable prescriptions for pediatric patients living in flint, michigan: A cross-sectional study of food security and dietary patterns at baseline. *Nutrients, 11*(6), 1423.

Schlosser, A. V., Joshi, K., Smith, S., Thornton, A., Bolen, S. D., & Trapl, E. S. (2019). "The coupons and stuff just made it possible": Economic constraints and patient experiences of a produce prescription program. *Translational Behavioral Medicine, 9*(5), 875-883.

Schlosser, A. V., Smith, S., Joshi, K., Thornton, A., Trapl, E. S., & Bolen, S. (2019). "You guys really care about me…": A qualitative exploration of a produce prescription program in safety net clinics. *Journal of General Internal Medicine, 34*(11), 2567-2574.

Shah, K., Hunter, M. L., Fairchild, R. M., & Morgan, M. Z. (2011). A comparison of the nutritional knowledge of dental, dietetic and nutrition students. *British Dental Journal, 210*(1), 33.

Sicker, K., Habash, D., Hamilton, L., Nelson, N. G., Robertson-Boyd, L., & Shaikhkhalil, A. K. (2020). Implementing culinary medicine training: Collaboratively learning the way forward. *Journal of Nutrition Education and Behavior,*

Singleton, C. R., Fouché, S., Deshpande, R., Odoms-Young, A., Chatman, C., & Spreen, C. (2018). Barriers to fruit and vegetable consumption among farmers' market incentive programme users in illinois, USA. *Public Health Nutrition, 21*(7), 1345-1349.

Stauber, Z., Razavi, A. C., Sarris, L., Harlan, T. S., & Monlezun, D. J. (2019). Multisite medical Student–Led community culinary medicine classes improve patients' diets: Machine Learning–Augmented propensity Score–Adjusted fixed effects cohort analysis of 1381 subjects. *American Journal of Lifestyle Medicine, ,* 1559827619893602.

Surgenor, D., Hollywood, L., Furey, S., Lavelle, F., McGowan, L., Spence, M., . . . Caraher, M. (2017). The impact of video technology on learning: A cooking skills experiment. *Appetite, 114*, 306-312.

Thompson, F. E., Midthune, D., Kahle, L., & Dodd, K. W. (2017). Development and evaluation of the national cancer institute's dietary screener questionnaire scoring algorithms. *The Journal of Nutrition, 147*(6), 1226. doi:10.3945/jn.116.246058

Tougas, M. E., Hayden, J. A., McGrath, P. J., Huguet, A., & Rozario, S. (2015). A systematic review exploring the social cognitive theory of self-regulation as a framework for chronic health condition interventions. *PLoS One, 10*(8), e0134977.

Trapl, E. S., Joshi, K., Taggart, M., Patrick, A., Meschkat, E., & Freedman, D. A. (2017). Mixed methods evaluation of a produce prescription program for pregnant women. *Journal of Hunger & Environmental Nutrition, 12*(4), 529-543.

Trapl, E. S., Smith, S., Joshi, K., Osborne, A., Benko, M., Matos, A. T., & Bolen, S. (2018). Peer reviewed: Dietary impact of produce prescriptions for patients with hypertension. *Preventing Chronic Disease, 15*

US Department of Health and Human Services. (2017). *Dietary guidelines for americans 2015-2020* Skyhorse Publishing Inc

Title of Journal Article 3: Training of Registered Dietitian Nutritionists to Improve Food Literacy Through Culinary Medicine

Target: Journal of the Academy of Nutrition and Dietetics

INTRODUCTION

Strong evidence shows a protective effect between a healthy dietary pattern rich in fruits, vegetables, and whole grains, and a lower risk of chronic diseases, including type 2 diabetes (Zhan et al., 2017). Despite well-supported studies and public health campaigns promoting healthy eating, the average American falls well short of dietary recommendations (Hu et al., 2020; Zhan et al., 2017). Low levels of food literacy coupled with poor dietary consumption behaviors among the United States (US) population warrant the need for innovation in dietary education and intervention approaches (Kris-Etherton et al., 2014; Van Horn et al., 2019). Culinary Medicine (CM) is emerging as an approach to improve adherence to healthy dietary patterns and combat chronic diseases through improved culinary skills and hands-on nutrition education (Sicker et al., 2019). This new scientific field adds to current nutrition education and interventions by incorporating both the practical hands-on preparation and pleasure of food and the scientific knowledge of how nutrition and dietary patterns affect health (Evert, 2019; Sicker et al., 2019).

Currently, multiple varieties of CM programs and definitions (Eisenberg et al., 2013; La Puma, 2016) exist, but all center on the importance of practical hands-on nutrition education (Kuehn, 2019). CM programs operate in medical, public health, dental, and nursing schools to train healthcare providers, using a food first model, in addressing diet-related chronic diseases (Polak et al., 2016). Furthermore, CM pilot programs are also being implemented with patient populations struggling with these chronic conditions in locations across the US (Barkoukis et al.,

2019; Sicker et al., 2019). Preliminary data from a variety of CM studies report positive changes in consumption behaviors among both providers and patients (Eisenberg et al., 2019; Stauber et al., 2019).

The Nourish program at the University of Texas Health Science Center at Houston (UTHealth) School of Public Health is a nutrition research and education hub consisting of a holistic teaching garden, a culinary teaching kitchen, and a nutrition teaching simulation lab (McWhorter et al., 2019). The three resources provide experiential opportunities to address the linkages between food insecurity, food systems, dietary consumption, health promotion, and chronic disease prevention and treatment. This program provides experiential CM education and training for healthcare students, including dietetic, medical, and dental students, professional trainees; and healthcare professionals, and provides hands-on culinary skills and techniques for diet-related chronic diseases to prepare participants for effective treatment and prevention of these chronic diseases.

As part of an ongoing project (called *A Prescription for Healthy Living, APHL*) with Harris Health hospital system, we developed and tested a comprehensive CM training program among the hospital dietitians (McWhorter et al., 2020*). The overarching goal of APHL is to implement and evaluate the impact of a food prescription and CM program on diabetes and pregnancy outcomes among low-income patients The purpose of this paper is to present the theoretical framework and the results of an initial feasibility, acceptability, and impact evaluation of the *APHL trainer curriculum* on improving the food literacy and culinary knowledge and skills among RDN participants.

METHODS

APHL CM training program theoretical framework and description

Intervention Mapping (IM) was utilized to systematically develop a Social Cognitive Theory (SCT) based framework (Kelder, Hoelscher & Perry, 2015) for the APHL patient curriculum tailored to the needs of a culturally diverse, food insecure, and low-income minority patient population receiving care at the county safety net hospital in Houston, Texas (McWhorter et al., 2020*). This curriculum includes a three step method for each session, 1) *taste* – provides participants the opportunity to consume delicious "healthy food" in order to change negative outcome expectations of "healthy food" tasting bad; 2) *see* – demonstration of recipes (cooking techniques) involves modeling and observational learning; and 3) *do* – gives participants the ability to increase behavioral capacity and self-efficacy through hands-on experiential preparation recipe(s) (cooking techniques). Finally, holding the series of classes in a group setting with open group discussion and goal setting promotes group learning, changes in social norms, and continued reinforcement of positive behaviors. The accompanying *APHL trainer curriculum* is a six-session 18 continuing education credit series (1 hour online and 3 hours in person, per session) developed by UTHealth investigators with the primary goal of filling the gaps in knowledge and skills for RDNs delivering the patient curriculum. Program components include hands-on culinary education and training in food insecurity, cultural inclusion, group facilitation, counseling, and communication strategies.

In order to promote learning and reduce the classroom time burden, the six sessions use a flipped classroom format through the inclusion of readings and video instruction prior to session attendance (Gilboy et al., 2015; Surgenor et al., 2017). All 3-hour sessions revolve around four common themes: (1) patient centered communication, (2) culinary skill development, (3) mock session practice, and (4) group discussion and feedback. Each session includes a combination of

experiential and didactic learning rooted in motivational interviewing to provide an opportunity for learning and practical application (Table 1).

Table 1: APHL Train-the-Trainer Curriculum		
Six, 3-hour each, hands-on sessions at UTHealth Nourish Teaching Kitchen		
Common themes for each session: • Pre-session readings (electronic) • Patient centered communication (e.g., motivational interviewing, facilitation vs lecture) • Culinary skills development (e.g., knife skills, vegetable roasting, etc.) • Mock session practice (e.g., facilitating experiences) • Group discussion and feedback		
Session	Topics Covered	Objectives
Session 1	Communication/ counseling strategies, culinary nutrition training (knife skills and vegetable roasting), and food choice discussion.	(1) Participants will increase knowledge of counseling strategies. (2) Participants will increase knowledge of food choice. (3) Participants will increase knife and vegetable roasting skills.
Session 2	Motivational interviewing workshop, culinary nutrition training (vegetable roasting and sautéing), and food language discussion	(1) Participants will increase knowledge and skills in motivational interviewing. (2) Participants will increase ability to discuss nutrition in food-first language. (3) Participants will increase vegetable roasting and sautéing skills.
Session 3	Cultural competency workshop and culinary nutrition training (vegetable microwaving and grains)	(1) Participants will increase knowledge of cultural competency. (2) Participants will increase ability to discuss nutrition in culturally relevant language. (3) Participants will increase vegetable microwaving and whole grain skills.
Session 4	Food insecurity workshop and culinary nutrition training (soups & stews & vegetable microwaving)	(1) Participants will increase knowledge of food insecurity. (2) Participants will increase ability to discuss nutrition to a food insecure population. (3) Participants will increase vegetable microwaving and soups and stew skills.
Session 5	Mock group facilitation session, facilitated group practice and cooking demonstration	(1) Participants will increase knowledge of leading facilitated culinary nutrition demonstrations. (2) Participants will increase confidence of leading facilitated culinary nutrition demonstrations.
Session 6	Experiential culinary nutrition practice and facilitated hands-on culinary nutrition practice	(1) Participants will increase knowledge of leading facilitated culinary nutrition workshops. (2) Participants will increase confidence in leading facilitated culinary nutrition workshops.

Study Design

We present data from the pilot testing and evaluation of the *APHL train-the-trainer culinary nutrition curriculum* in a diverse RDN population from September 2019 to January 2020. A pre-post study design was used for evaluation purposes. The University's Institutional Review Board approved the study and was labeled exempt as a quality improvement activity for RDNs.

Study Setting and Participants

This training was conducted as part of the larger collaborative APHL project between UTHealth and Harris Health hospital systems. Harris Health is one of the largest safety net providers in the country, serving one of the most diverse and impoverished geographic areas in Texas. While the overarching goal of APHL is to implement a comprehensive food prescription plus CM program to improve health outcomes in their patients with diabetes and pregnant women at risk of developing diabetes, the first step was to train the Harris Health RDNs system-wide in a CM approach so that they may implement these strategies as part of their patient care. This training took place across fall 2019 and spring 2020 at the UTHealth School of Public Health teaching kitchen. The training was undertaken with the entire RDN staff (n=29) employed across two hospitals and eighteen community health centers within the Harris Health system between September 2019 and January 2020. All RDNs were registered and licensed RDNs in the state of Texas. RDNs were split into two cohorts (cohort 1, n=14 RDNs; and cohort 2, n=15 RDNs) based on the Harris Health employment structure and attended the sessions as part of their employment. If participants missed a session, they were eligible to attend the equivalent session with the other cohort, when possible. A total of six, three-hour training sessions were held on weekdays during regular business hours. RDNs were released from work requirements and

participated as part of their employment receiving three continuing professional education units (CPEU) for attending each session (18 CEUs total). No other compensation was provided.

Data Collection Measures

Pre and post-training survey data were collected using electronic surveys administered using Qualtrics by UTHealth project staff. Surveys were administered in English and took approximately 10 minutes to complete. Process evaluation measures, including attendance and feedback on each session; these data were collected using our tracking database and comment cards at each workshop session.

Socio-demographic factors

Self-reported socio-demographic information included age, gender, race/ethnicity, languages spoken fluently, position, length in position, prior culinary skills training, and prior prenatal nutrition training.

Culinary nutrition skills

This self-report survey consisted of non-validated questions on the various culinary nutrition skills (6 items: knife skills, roasting, sautéing, microwaving, recipe building, and group facilitation) covered during training. Responses ranged from 1 = no skill to 5 = highly skilled. A summative scale consisted of the addition of all culinary nutrition skill scores (scores range from 6-30).

Confidence in teaching food literacy skills

This self-report survey consisted of non-validated questions regarding self-efficacy in teaching patients various food literacy related to skills (8 items: why to eat healthy, how to eat healthy, how to cook healthy, how to make grocery list, how to cook with leftovers, how to cook from scratch, how to meal plan, and how to eat for prenatal care) covered during training. Responses

ranged from 1 = not confident to 5 = extremely confident. A summative scale consisted of the addition of all confidence in teaching food literacy skills scores (scores range from 8-40).

Communication

This self-report survey consisted of non-validated questions assessing the ease of communication with providers and patients about the role of food and nutrition in health. Responses ranged from 1 = not at all easy to 5 = extremely easy. The frequency of talking with providers was also assessed, scores ranged from 1 = never to 5 = always.

Process evaluation measures

All participants signed in at the beginning of each session to track attendance for continuing education credits. At the end of each session, participants completed a process evaluation survey to provide input on the usefulness of workshop information. All responses ranged from 1 = not at all useful to 5 = extremely useful. An option for open comments was provided on each card. Relevant comments are provided as descriptive illustrations for participant feedback.

Statistical Analysis

Data analyses were conducted using Stata 14.2 (Stata Corporation, College Station, TX). Descriptive statistics including means, standard deviation, count, and frequencies were computed to describe demographic factors of participants and perceived usefulness of training. Paired T-tests were conducted to evaluate the changes between pre- and post-training sessions. P-values of < 0.05 were considered statistically significant.

RESULTS

Twenty-nine RDNs participated in the training from September 2019 through January 2020, with 93% attending 5 or more sessions ($5.6 \pm .74$). Twenty-five of the 29 RDNs completed pre-post

surveys (86% survey completion rate; 2 were no longer employed at the time of post-survey). The RDNs were predominantly under 30 years of age (60%), female (96%), white (40%), Hispanic (28%), and African American (20%). Most RDNs were employed in their current position for 5 years or less (86%), and an even distribution of outpatient and inpatient RDNs were represented. Forty percent of RDNs reported speaking more than one language (Spanish 36% & Tagalog 4%) and 80% had no prior culinary skills training (data not in tables).

Pre-post survey

At baseline, on a scale of 1-5, average scores for each culinary nutrition skill ranged from 2.72 to 3.16, indicating a moderate self-perception of culinary nutrition skills including knife skills, roasting, sautéing, microwaving, recipe building, and group facilitation. Results of the pre-post analysis demonstrate a significant increase in the summative scale scores for the culinary nutrition skills (Mean difference: +6.72; p=0.000). There was a significant increase in scores across all individual measures of culinary nutrition skills as well, with the greatest reported increase in scores for knife skills and roasting (Table 2).

At baseline, on a scale of 1-5, average scores for each self-efficacy in teaching ranged from 3.20 to 4.72 indicating high self-reported confidence in teaching food literacy skills and behaviors including how to cook a healthy meal, how make a grocery list, how to cook healthy with leftovers, how to cook meals from scratch, and how to eat healthy for prenatal care. Results of the pre-post analysis demonstrate a significant increase in the summative scale scores for the confidence in teaching food literacy skills and behaviors (Mean difference: +3.92; p=0.000) There was a significant increase in 5 of the 8 food literacy factors with the greatest reported increase in scores for how to cook healthy with leftovers (Table 2).

Table 2. Mean Changes in Pre and Post Training Survey for A Prescription for Healthy Living Registered Dietitian Nutritionist Training (n=25)					
Variable	Scoring Range	Pre-APHL Mean (±SD)	Post-APHL Mean (±SD)	Mean Difference (±SD)	P-Value
Culinary Nutrition Skills	6-30	17.44 (±5.11)	24.16 (±4.06)	+6.72 (±4.41)	0.000*
Knife Skills	1-5	2.72 (±1.17)	4.08 (±0.64)	+1.36 (±0.95)	0.000*
Roasting	1-5	2.76 (±1.23)	4.24 (±0.88)	+1.48 (±1.26)	0.000*
Sautéing	1-5	3.16 (±1.18)	3.96 (±0.84)	+0.80 (±0.76)	0.000*
Microwaving	1-5	2.96 (±1.21)	4.32 (±0.69)	+1.36 (±1.11)	0.000*
Recipe Building	1-5	2.76 (±1.05)	3.68 (±0.90)	+0.92 (±0.76)	0.000*
Group Facilitation	1-5	3.08 (±0.97)	3.88 (±1.00)	+0.80 (±1.12)	0.001*
Confidence in Teaching	8-40	30.76 (±5.64)	34.68 (±4.50)	+3.92 (±5.11)	0.000*
Why to eat healthy food	1-5	4.72 (±0.54)	4.76 (±0.44)	+0.04 (±0.79)	0.802
How to eat healthy food	1-5	4.40 (±0.65)	4.72 (±0.54)	+0.32 (±0.90)	0.088
How to cook healthy food	1-5	3.36 (±1.15)	4.08 (±0.91)	+0.72 (±1.33)	0.012*
How to make a grocery list	1-5	3.88 (±0.97)	4.36 (±0.70)	+0.48 (±1.05)	0.030*
How to cook healthy with leftovers	1-5	3.20 (±1.26)	3.96 (±0.93)	+0.76 (±1.27)	0.006*
How to cook meals from scratch	1-5	3.36 (±1.04)	3.96 (±0.84)	+0.60 (±0.96)	0.004*
How to use MyPlate for meal planning	1-5	4.44 (±0.71)	4.80 (±0.50)	+0.36 (±0.95)	0.071
How to eat healthy for prenatal care	1-5	3.40 (±1.22)	4.04 (±1.24)	+0.64 (±1.25)	0.017*
Communication					
Ease of talking with patients	1-5	3.72 (±0.84)	4.08 (±0.81)	+0.36 (±1.08)	0.107
Ease of talking with providers	1-5	3.24 (±0.17)	3.40 (±0.76)	+0.16 (±0.99)	0.425
Frequency of talking to providers	1-5	2.88 (±0.20)	2.92 (±0.20)	+0.04 (±0.98)	0.839

*P<.05 significant. n=29 total for training, 2 participants did not complete surveys and 2 are no longer employed. [(a)] Data listed as mean score ± standard deviation. [(b)] Mean Differences calculated as post-APHL –pre-APHL. [(c)] Culinary nutrition skills scored from: (1) no skills, (2) slight skills (3) some skills, (4) skills (5) highly skilled. [(d)]Confidence scored from: (1) not at all confident, (2) slightly confident, (3) somewhat confident, (4) confident, (5) extremely confident. [(e)] Ease of communication scored from: (1) not at all easy, (2) slightly easy, (3) somewhat easy, (4) easy, (5) extremely easy. [(f)] Frequency of communication scored from: (1) never, (2) rarely (3) sometimes, (4) often, (5) always.

Process Evaluation Surveys

Results from the process evaluation of APHL training show that over 65% of all participants attended all six sessions, and over 93% completed ≥ 5 sessions. On average, RDNs rated the APHL training as extremely useful to their practice (4.42 ± 0.26), with session 6 receiving the lowest and session 2 receiving the highest overall usefulness rating (Table 3).

Table 3: Comment Card Ratings for A Prescription for Healthy Living Registered Dietitian Nutritionist Training (n=29)

Variable	Scoring Range	Cohort 1 Mean (±SD)	Cohort 2 Mean (±SD)	Total Mean (±SD)
Overall Training Usefulness	1-5	4.29 (± 0.22)	4.53 (± 0.14)	4.42 (± 0.26)
Session 1: Overview of Culinary Nutrition, Knife Skills, and Roasting Vegetables		n=15	n=14	n=29
Overall Usefulness	1-5	4.38 (± 0.96)	4.67 (± 0.41)	4.52 (± 0.75)
Overview of Culinary Nutrition	1-5	4.27 (± 1.03)	4.64 (± 0.50)	4.45 (± 0.50)
Knife Skills Instruction	1-5	4.33 (± 0.96)	4.64 (± 0.50)	4.48 (± 0.83)
Roasting Instruction	1-5	4.53 (± 1.06)	4.71(± 0.47)	4.62 (± 0.82)
Session 2: Motivational Interviewing, Roasting Vegetables and Sautéing Vegetables		n=13	n=16	n=29
Overall Usefulness	1-5	4.48 (± 0.65)	4.69 (± 0.46)	4.59 (± 0.55)
Motivational Interviewing	1-5	4.46 (± 0.66)	4.75 (± 0.45)	4.62 (± 0.56)
Cooking Instruction	1-5	4.38 (± 1.12)	4.63 (± 0.62)	4.52 (± 0.87)
Food Tasting	1-5	4.61 (± 0.51)	4.69 (± 0.61)	4.66 (± 0.55)
Session 3: Cultural Diversity, Whole Grain Cookery and Sautéing Vegetables		n=12	n=16	n=28
Overall Usefulness	1-5	4.47 (± 0.66)	4.48 (± 0.61)	4.48 (± 0.62)
Cultural Competency	1-5	4.42 (± 0.67)	4.50 (± 0.73)	4.46 (± 0.69)
Cooking Instruction	1-5	4.50 (± 0.67)	4.50 (± 0.63)	4.50 (± 0.64)
Food Tasting	1-5	4.50 (± 0.67)	4.44 (± 0.63)	4.46 (± 0.64)
Session 4: Food literacy, Food Insecurity, Soups and Stews, and Microwaving Vegetables		n=12	n=16	n=28
Overall Usefulness	1-5	4.25 (± 0.66)	4.47 (± 0.53)	4.38 (± 0.59)
Food Insecurity	1-5	4.00 (± 1.28)	4.25 (± 0.77)	4.14 (± 1.01)
Cooking Instruction	1-5	4.58 (± 0.51)	4.69 (± 0.48)	4.64 (± 0.49)
Food Tasting	1-5	4.50 (± 0.52)	4.75 (± 0.45)	4.64 (± 0.49)
Meal Planning	1-5	3.92 (± 1.24)	4.19 (± 0.91)	4.07 (± 1.05)
Session 5: Group Facilitation and Leading Mock Cooking Session		n=12	n=16	n=28
Overall Usefulness	1-5	4.25 (± 0.81)	4.31 (± 0.89)	4.29 (± 0.84)
Group Facilitation	1-5	4.17 (± 0.94)	4.31 (± 0.79)	4.25 (± 0.84)

Leading Food Demonstration	1-5	4.33 (± 0.78)	4.31 (± 1.01)	4.32 (± 0.90)
Session 6: Leading Culinary Nutrition Classes		n=14	n=14	n=28
Overall Usefulness	1-5	3.88 (± 1.08)	4.60 (± 0.48)	4.24 (± 0.90)
Hands-on Cooking Class Discussion	1-5	3.57 (± 1.40)	4.36 (± 0.84)	3.96 (± 1.20)
Food Demonstration Coaching	1-5	4.07 (± 1.14)	4.64 (± 0.50)	4.36 (± 0.91)
Leading Food Demonstration	1-5	4.00 (± 1.11)	4.79 (± 0.43)	4.39 (± 0.92)

[a] Variation in population due to incomplete/ missing comment cards

[b] Scores on all items ranged from: (1) not at all useful, (2) slightly useful, (3) somewhat useful, (4) useful, and (5) extremely useful.

Comment Card Feedback

Comment card feedback centered around four major topic areas: (1) positive attributes of training, (2) areas for improvement, (3) application to practice, and (4) enjoyment of cooking (specific to sessions with hands-on cooking component). Select quotes representing the major areas of training session feedback are presented in Table 4.

Enjoyment of Cooking: RDNs frequently described the enjoyment and practicality of learning/ improving cooking skills, the exposure to new/ different flavors and foods, and the deliciousness and simplicity of the dishes prepared in class sessions as reasons for enjoying the sessions. Further, several comments requested additional time in the hands-on culinary portion of the class, especially in comparison to didactic education.

Positive Attributes: RDNs overwhelmingly reported the culinary skills and practical hands-on cooking as the most enjoyable portion of the training. Further, experiential activities and discussions were valued over traditional didactic lectures.

Areas for Improvement: A consistent comment across sessions was that more time should be allocated for the hands-on cooking to improve culinary knowledge and skills. Others voiced concerns with the time commitment required for completing scientific readings and lectures prior to attending sessions.

Application to Practice: Overall, RDNs reported satisfaction with the practical application of the training for their respective practice. Some RDNs described feelings of anxiety and stress when practicing cooking demonstrations, but on average, reported satisfaction in the perceived benefits for their patients.

Table 4: Comment Card Quotes for A Prescription for Healthy Living Registered Dietitian Nutritionist Training (n=29)	
Topic Area	RDN Quotes
Session 1: Overview of Culinary Nutrition, Knife Skills, and Roasting Vegetables	
Enjoyment of Cooking	"Thank you for your patience, especially in the demonstration of cooking."
	"Great job! We want recipes!"
	"Really enjoyed active learning/ knife skills"
Positive Attributes	"I liked how sessions were split into 20-30 min intervals"
	"The class was great, good information, practical skills"
	"Great mix of classroom and hands-on information. Very practical!"
Areas for Improvement	"Incorporate prep [required pre-readings] articles more"
	"More time in the kitchen"
	"I enjoyed the entire session, no critique"
Application to Practice	"I am very grateful for being able to participate in this training; majority of patients know what are healthy foods but they do not eat them because they don't enjoy them due to not using herbs, spices, variety or not knowing how to cook, so more tips, ideas in this training will help me give direction to my patients. "
	"Everything was really fun! Can't wait to help my patients with this info!"
Session 2: Motivational Interviewing, Roasting Vegetables and Sautéing Vegetables	
Enjoyment of Cooking	"I love the foods we're making and can't wait to get all of the recipes."
	"Learning to enjoy new food; has been really helpful."
	"Really good salads, the one with almonds was my favorite!"
Positive Attributes	"All of it was helpful, thanks! Loved the activity/skill building with not as much lecture since I'm a tactile learner."
	"The lecture sessions were very good, detailed and interactive."
	"The session was great. I definitely needed the MI refresher; all speakers were easy to listen to."
Areas for Improvement	"I felt really anxious in the kitchen and my anxiety only slightly let up during food tasting."
	“Would've liked more instruction on how to prep herbs, info on dry-to fresh ratios, etc. similar to the explanation of salt/osmosis [in roasting vegetables]."
	"Labeling the dishes, we are trying would be helpful so we know what dishes we're eating and can better provide feedback."
Application to Practice	"I learn new skills every time I come. The educational part [lectures] also helps me see things from different perspective. You are great at making us feel welcomed."

	"Great session! The motivational [interviewing] section was great and something I can work on."
	"Very good class, I really find it helpful in my practice."
Session 3: Cultural Diversity, Whole Grain Cookery and Sautéing Vegetables	
Enjoyment of Cooking	"Great job. Recipes are easy to follow. Cultural session very informative."
	"I specifically wanted to learn to make fried rice and that's what my group prepared today. Thanks for the simple and yummy recipe."
	"Enjoyed cooking the different grains and learning how to celebrate different cultures."
Positive Attributes	"Love hands on, love activities, love instructors."
	"Great job. Recipes are easy to follow. Cultural session very informative."
	"Excellent class. Interesting information. Practical advice."
Areas for Improvement	"Wish we had longer for the whole thing to dig more into food and culture."
	"More time in the kitchen (with food science principles) and less time doing speed interviewing [cultural activity]. I think 7 min increments would suffice."
Application to Practice	"I thought that the comment about "the RD being the one who should get uncomfortable and not the patient" was great. It was a very meaningful lecture. Happy that racial/cultural bias was addressed.
	"Very important topics. Enjoy talking about culture/racism in food and MNT."
	"Excellent learning experience on the group sessions; learned great adjustments to make to patient educations to increase their comfort level and bring common ground to the table."
Session 4: Food literacy, food insecurity, soups and stews, and microwaving vegetables	
Enjoyment of Cooking	"Love the recipes, love the activities, enjoy teamwork."
	"Can't wait for the recipes!"
	"Really liked learning how to make flavorful veggies in the microwave."
Positive Attributes	"Enjoyed food literacy workshop activity and new recipes-felt like there was more variety."
	"I think this class should stay the way it is. Very fun and educational."
	"Great class! Glad I got to learn how to use a pressure cooker. Food insecurity lecture was very informative."
Areas for Improvement	"Wish I was learning more new information, mostly just a refresher."
	"It would help if with the information provided for us you can give us some typical foods that is eaten in the different parts of the world."
	"The presentation portion was too long, not very useful."
Application to Practice	"Very useful information and meal planning case study. Also, thanks for a proper pressure-cooking demo."
	"Meal planning activity already something we do, but we got more of a picture of tools/items patient has available so I can learn to ask tools/kitchen equipment patient has [in practice]."
	"Excellent practical information."
Session 5: Group Facilitation and Leading Mock Cooking Session	
Positive Attributes	"Great class! Happy for the practice."
	"Enjoyed session. Would love more impromptu video practice."
	"Great exercises."

Areas for Improvement	"Maybe better if we can choose topics or have more time to review (difficult with full schedules)." "A lot of more reading material to prep but not much time to review." "It was good practice today, overall I think it was hard to prepare for the level of critique we had with working a full-time job."
Application to Practice	"This was uncomfortable but a good learning experience." "It was an interesting experience, took me out of my comfort zone, learned a lot." "It was nerve-wrecking doing an on-the-spot presentation, but it was really good practice."
Session 6: Leading Culinary Nutrition Classes	
Positive Attributes	"It was helpful to practice doing a culinary demo with others doing the chopping with you." "Good feedback after practice session + prep [food presentation] lecture; good practice." “Job well done; I am more confident in my knife skills."
Areas for Improvement	"This [cooking demonstration] is anxiety inducting. I think this is useful in some departments but may not apply to me in particular." "Would like more info on different spices especially the mixed spices that are from different cultures." "For future trainings make sure that they know ahead of time the amount of time expected to prepare for upcoming classes; some articles were extremely long. [Possibly] pick out pages to focus on instead of 32 pages.”
Application to Practice	"Overall enjoyed learning new cooking methods/recipes. Gave me more confidence with instructing patients/giving patients new ideas. Thank you for your time!" “I enjoyed the entire program; while I'm not a fan of public speaking, the cooking demo was very useful for having to teach patients different techniques. Thanks for the info and skills." "Extremely useful. I will definitely apply the skills."

DISCUSSION

This training is one of the first to present results of a CM-based train-the-trainer curriculum for RDNs. Data from program evaluation indicates strong acceptability and feasibility of program curricula and positive improvements in culinary nutrition skills and food literacy knowledge and skills. These preliminary results demonstrate a framework of training for institutions, researchers, and RDNs planning or currently undertaking CM initiatives.

These CM initiatives are rapidly increasing with the work of the Teaching Kitchen Collaborative – a joint and shared effort of over thirty-five organizations across the US (Nicosia, Lanzoni, & Eisenberg, 2019; TKC), the Goldring Center for Culinary Medicine's Health Meets Food programming (Birkhead et al., 2014; HMF), and several individual programs in Universities, hospitals, and community locations across the U.S. (Stauber et al., 2019). While some related CM programs and certifications exist (FCP; HMF), the authors are unaware of any curricula designed specifically to increase RDN culinary skills and confidence in teaching CM curricula with food prescription and other food access-related programs in a diverse low-income population. This programming has the potential to support and further advance CM initiatives by empowering RDNs with the needed knowledge, skills, and self-efficacy to promote behavior change.

Recent literature suggests healthcare students and trainees, including dietetics students and interns, need additional practice to continue developing the required confidence and culinary skills to deliver culinary medicine programming (Barkoukis et al., 2019; Sicker et al., 2019). Considering this, many newly credentialed and long-practicing RDNs also require education and practice to fully develop these same skills (Eisenberg et al., 2015; Hark & Deen, 2017). Thus, continuing education and training strategies are needed to successfully level-set these practical skills and position RDNs as leaders of the CM interdisciplinary team (Hark & Deen, 2017).

While some online training curricula exist, one cannot simply watch and then repeat; in other words, demonstration does not equal application (FCP, 2020; HMF, 2020; Polak, et al., 2016). It is imperative, therefore, to have a blend of experiential and didactic opportunities that allow for the practice of knowledge and development of skills. We echo the call for RDNs to seek out educational and training opportunities to position themselves as collaborative and

skilled leaders in the field of CM; otherwise, another profession will fill the void (Hark & Deen, 2017; Barkoukis et al., 2019; Van Horn et al., 2019).

Limitations

One of the challenges of the program was delivering a range of identified culinary skills and knowledge in a limited time frame. We did not evaluate whether RDNs completed pre-class readings and online activities. Another limitation of our study was the utilization of self-reported data, which can result in social desirability bias. Lack of a control or comparison group limits the attribution of outcomes seen to the training itself. Future studies should assess the impact of such training programs on RDN practice in the field and on patient outcomes.

Strengths

The RDN training curriculum aims to improve culinary skills to promote healthy eating in the patient population struggling with diet-related chronic conditions and encourages focusing on cultural considerations, and communication and implementation skills to successfully conduct these strategies in their respective settings. The study population consisted of RDNs from Harris Health, an extensive county hospital system in Houston, TX, thus representing a diverse patient population served. Most importantly, all Harris Health RDNs were required to participate in the training as part of their system-wide strategy to train their dietitians in culinary medicine. Finally, the availability of continuing education credits offers a strong incentive for participation in the program, as seen from our study, where we had very high retention across the six sessions.

CONCLUSION

This study provides an example of how continuing education strategies can be used to improve the culinary nutrition and counseling skills of practicing RDNs to promote the successful

interprofessional implementation of CM initiatives. Additionally, the training provides skills that RDNs need to advance in today's food culture including social media and the media in general. Future research warrants more rigorous assessments of outcome measures and long-term evaluation of RDNs' culinary nutrition skills.

REFERENCES

Azétsop, J., & Joy, T. R. (2013). Access to nutritious food, socioeconomic individualism and public health ethics in the USA: A common good approach. *Philosophy, Ethics, and Humanities in Medicine, 8*(1), 16.

Barkoukis, H., Swain, J., Rogers, C., & Harris, S. R. (2019). Culinary medicine and the registered dietitian nutritionist: Time for a leadership role. *Journal of the Academy of Nutrition and Dietetics, 119*(10), 1607-1611.

Birkhead, A. G., Foote, S., Monlezun, D. J., Loyd, J., Joo, E., Leong, B., . . . Harlan, T. S. (2014). Medical Student–Led community cooking classes: A novel preventive medicine model that's easy to swallow. *American Journal of Preventive Medicine, 46*(3), e41-e42.

Caines, L., Asiedu, Y., Dugdale, T., & Wu, H. (2018). An interprofessional approach to teaching nutrition counseling to medical students. *MedEdPORTAL: The Journal of Teaching and Learning Resources, 14*

De Marchis, E. H., Torres, J. M., Benesch, T., Fichtenberg, C., Allen, I. E., Whitaker, E. M., & Gottlieb, L. M. (2019). Interventions addressing food insecurity in health care settings: A systematic review. *The Annals of Family Medicine, 17*(5), 436-447.

Eisenberg, D. M. (2018). Teaching kitchen collaborative research day February 7, 2018. *The Journal of Alternative and Complementary Medicine, 24*(7), 615-618.

Eisenberg, D. M., & Burgess, J. D. (2015). Nutrition education in an era of global obesity and diabetes: Thinking outside the box. *Academic Medicine, 90*(7), 854-860.

Eisenberg, D. M., Miller, A. M., McManus, K., Burgess, J., & Bernstein, A. M. (2013). Enhancing medical education to address obesity:“See one. taste one. cook one. teach one.”. *JAMA Internal Medicine, 173*(6), 470-472.

Eisenberg, D. M., Righter, A. C., Matthews, B., Zhang, W., Willett, W. C., & Massa, J. (2019). Feasibility pilot study of a teaching kitchen and self-care curriculum in a workplace setting. *American Journal of Lifestyle Medicine, 13*(3), 319-330.

Food and culinary professionals , culinary certificate of training. Retrieved from https://www.foodculinaryprofs.org/page/culinary-certificate-of-training

Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., & Basu, J. (2014). Multiple chronic conditions chartbook. *Rockville, MD: Agency for Healthcare Research and Quality*, , 7-14.

Hark, L. A., & Deen, D. (2017). Position of the academy of nutrition and dietetics: Interprofessional education in nutrition as an essential component of medical education. *Journal of the Academy of Nutrition and Dietetics*, *117*(7), 1104-1113.

Hartline-Grafton, H., & Dean, O. (2017). The impact of poverty, food insecurity, and poor nutrition on health and well-being. *Washington, DC: Food Research & Action Center*,

Health meets food, culinary medicine specialist certification. Retrieved from https://culinarymedicine.org/continuing-medical-education-culinary-medicine/become-a-certified-culinary-nutrition-specialist/

Kelder, S. H., Hoelscher, D., & Perry, C. L. (2015). How individuals, environments, and health behaviors interact. *Health Behavior: Theory, Research, and Practice, 159*

Lawrence, J. C., Knol, L. L., Clem, J., Henson, C. S., & Streiffer, R. H. (2019). Integration of interprofessional education (IPE) core competencies into health care education: IPE meets culinary medicine. *Journal of Nutrition Education and Behavior, 51*(4), 510-512.

Monlezun, D. J., Kasprowicz, E., Tosh, K. W., Nix, J., Urday, P., Tice, D., . . . Harlan, T. S. (2015). Medical school-based teaching kitchen improves HbA1c, blood pressure, and cholesterol for patients with type 2 diabetes: Results from a novel randomized controlled trial. *Diabetes Research and Clinical Practice, 109*(2), 420-426.

Nicosia, R., Lanzoni, G., & Eisenberg, D. (2017). “Teaching kitchens”: From nutrition and lifestyle coaching to culinary medicine. *CellR4, 5*, e2236.

Notaras, S., Mak, M., & Wilson, N. (2018). Advancing practice in dietitians’ communication and nutrition counselling skills: A workplace education program. *Journal of Human Nutrition and Dietetics, 31*(6), 725-733.

Polak, R., Phillips, E. M., Nordgren, J., La Puma, J., La Barba, J., Cucuzzella, M., . . . Eisenberg, D. (2016). Health-related culinary education: A summary of representative emerging programs for health professionals and patients. *Global Advances in Health and Medicine, 5*(1), 61-68.

Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for, 2020. (2010). Healthy people 2020: An opportunity to address the societal determinants of health in the united states.

Seligman, H. K., & Berkowitz, S. A. (2019). Aligning programs and policies to support food security and public health goals in the united states. *Annual Review of Public Health, 40*, 319-337.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annu.Rev.Public Health, 29*, 253-272.

Swartz, H. (2018). Produce rx programs for diet-based chronic disease prevention. *AMA Journal of Ethics, 20*(10), 960-973.

The teaching kitchen collaborative. Retrieved from https://www.tkcollaborative.org/

US Department of Health and Human Services. (2017). *Dietary guidelines for americans 2015-2020* Skyhorse Publishing Inc.

Van Horn, L., Lenders, C. M., Pratt, C. A., Beech, B., Carney, P. A., Dietz, W., . . . Kohlmeier, M. (2019). Advancing nutrition education, training, and research for medical students, residents, fellows, attending physicians, and other clinicians: Building competencies and interdisciplinary coordination. *Advances in Nutrition, 10*(6), 1181-1200.

Wang, X., Ouyang, Y., Liu, J., Zhu, M., Zhao, G., Bao, W., & Hu, F. B. (2014). Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: Systematic review and dose-response meta-analysis of prospective cohort studies. *Bmj, 349*, g4490.

Zhan, J., Liu, Y., Cai, L., Xu, F., Xie, T., & He, Q. (2017). Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. *Critical Reviews in Food Science and Nutrition, 57*(8), 1650-1663.

CONCLUSION

Food prescription and CM programs are strategies to promote healthy eating and improve diet-related health outcomes for food-insecure patients with diabetes. This study provides a holistic approach for the planning, development, training, and implementation of CM programming. By utilizing a methodical IM process, we created a tailored and comprehensive curriculum for our target population that builds on current food prescription programming. Results from the qualitative analysis identified themes and subthemes to understand the (1) diverse dietary habits and barriers and facilitators to healthy eating; and (2) the gaps in education and knowledge in culinary nutrition between practicing RDNs and the needs of their respective patients. Study data revealed the importance of implementing training of RDN staff in key areas, such as culturally relevant foods, practical food literacy, and culinary nutrition skills to increase acceptability and adherence for a diverse patient population. Further, this study describes how trained RDNs, as part of an interprofessional healthcare team, can help provide consistent dietary messaging and tools and resources for patients to overcome healthy eating barriers. The results of pilot training offer an example of how continuing education strategies can be used to improve the culinary nutrition and counseling skills of practicing RDNs to promote the successful interprofessional implementation of CM initiatives.

Future research warrants more rigorous assessments of outcome measures and long-term evaluation of RDNs' culinary nutrition skills. Lastly, a pilot study is currently testing the CM patient curriculum, and the subsequent results and evaluations will help to refine the curriculum to best suit the needs of practicing RDNs and diverse patient populations to promote healthy eating and improve health outcomes. We plan to expand the CM patient curriculum to our community partners, healthcare institutions, and other universities. In light of recent events

around COVID-19, we are in the process of developing the infrastructure to provide additional web-based resources – including video conferencing CM classes and how-to instructional videos for dissemination.

APPENDICES

Appendix A: Dietitian Focus Group Script

Focus Group Script: Harris Health Study **February 2019**

Hello everyone. My name is (facilitator) and this is (co-facilitator). We are from the University of Texas School of Public Health (UTHealth). Today we are here to discuss food and how it relates to your patients' culture, family and health. The information you provide today will help us inform nutrition and cooking education courses for patients and staff at Harris Health Clinics. Today's focus group should last about an hour. We are going to use an audio-recorder and take hand written notes during this session, we will not link what you say to your identity.

There is no right or wrong answer to any of our questions, only differing points of view. Please share your point of view with us, even if it is different from what other participants have said. We are just as interested in negative comments as positive comments, and at times negative comments are the most helpful. In order to protect your confidentiality, instead of names, we have provided you with a unique number, which will be used to refer you. Before we start, we would like to get acquainted with each other, so please tell us your number and your favorite meal.

Domains	Questions	Probes
Perception of Dietetics	1. What do your patients think a dietitian does?	• How do you think dietitians are perceived at Harris Health by patients? Staff? And administration? • Do you think most people at Harris Health have an adequate conception of your profession?
Regular roles	2. What are the typical diet instructions that you complete? What diets are you educating on?	• Inpatient/Outpatient? • Diabetic? Heart healthy? Other?
Training Positives	3. What are some tools/training that have helped you be successful in counseling patients as a dietitian? 4. What tools are unavailable or could be improved upon and be beneficial for your diet instructions for your populations?	• What helps you get your point across to your patients? • What resources have been beneficial in aiding your recommendations?
Prescription for Produce	5. What are some of the challenges you anticipate in implementing food prescriptions from the "farm"? 6. In your opinion, how may some of these challenges be alleviated?	• Administration buy-in? Nurse/Provider buy in? Patient buy-in? EMR? • Communication issues? • Do you think your patients will actually eat/consume the produce? If not, why? What are some of the barriers of consuming the produce you think your patients might face?

UTHealth The University of Texas

IRB NUMBER: HSC-SPH-19-0187
IRB APPROVAL DATE: 04/16/2019

Culinary Training	7. What are some gaps in your cooking/culinary training that prevent you from making food recommendations. 8. What types of culturally-specifically preparation techniques would you suggest for okra? Sweet potatoes? Or Eggplant?	• Do your patients describe or consumed foods that are unfamiliar to you? Do you offer alternate healthy and culturally relevant cooking recommendations to meet their therapeutic diet recommendations? (e.g. offering spice substitutions for low sodium diet) • Could you use more help/resources in recommending healthier, culturally appropriate and tasty substitutes or alternatives?
Diabetes	9. What are some barriers of healthy eating for your patients with Diabetes? Diagnosis - During Treatment? and post-treatment?	• What suggestions do you make to manage those barriers? • Do you change your recommendations? • Or your counseling style?
Pregnancy	10. Can you share with us your experience with nutrition counseling for pregnant women?	• When do you see typically see patients? • What type of diagnoses? • Do your patients make any common requests?
Gaps in Training	11. What are some of the challenges for patients to implement your recommended diet plans? 12. What are some other gaps in your dietetics training that you would like to improve upon, to help you do your job better, and to help your patient population?	• What can improve the diet instruction experience with your patients? • What do you think would help you to be a more effective dietitian?

Appendix B: Patient Focus Group, English

Focus Group Script: LBJ Study **February 2019**

Hello everyone. My name is (facilitator) and this is (co-facilitator). We are from the University of Texas School of Public Health (UTHealth). Today we are here to discuss food and how it relates to your culture, family and health. The information you provide today will help us inform nutrition and cooking education courses for patients and staff at Harris Health Clinics. Today's focus group should last about an hour. We are going to use an audio-recorder and take hand written notes during this session, we will not link what you say to your identity.

There is no right or wrong answer to any of our questions, only differing points of view. Please share your point of view with us, even if it is different from what other participants have said. We are just as interested in negative comments as positive comments, and at times negative comments are the most helpful.

In order to protect your confidentiality, instead of names, we have provided you with a unique number, which will be used to refer you. Before we start, we would like to get acquainted with each other, so please tell us your number and your favorite meal.

Today we will be talking about the food, specifically, what flavors, dishes, and cooking you do for yourself and your family.

Domains	Questions	Probes
Opening Question	**Thank you all for your participation in this Focus Group. We want to talk about what you enjoy eating** 1. What is your favorite meal?	• What is your favorite meal to cook? • What is your favorite meal to eat at a restaurant? • What are your family member's favorite things to eat?
Meal Choice	2. What factors affect your meal choice(s)?	• What are the most important factors (taste, time, budget, health, etc.) when you are choosing to cook or eat a meal?
Availability & Security	3. Where do you get your food?	• On average, where do you purchase your groceries? • How often do you purchase groceries? (weekly? The first 15 days of the month?) • How do you get to the store to purchase items? • Do you typically purchase canned, dried, fresh or frozen? • How often do you eat a meal outside of the home? • What type of restaurants do you frequent? • Do you feel like you have sufficient access to foods you want to eat? Or foods you want to cook?

UTHealth The University of Texas
IRB NUMBER: HSC-SPH-19-0187
IRB APPROVAL DATE: 04/16/2019

Family Food History	4. What types of meals or foods did you eat growing up? 5. What types of meals or foods from your childhood do you still eat? 6. What about meals or foods that you do not eat any more?	• What are the types of food you eat on a regular basis? • What food(s) could you not live without? • Do you have beans or rice with every meal? • What about vegetables? What kind? How are they prepared?
Cooking Practices	7. How frequently do you prepare meals in a typical week? 8. Who taught you how to cook?	• Describe the most recent meal you cooked • What types of ingredients did you use (fresh, frozen, canned)? • Do you use recipes? • Do you prepare the meals yourself? With others?
Facilitators to Cooking	9. What makes it easier to prepare meals?	• What types of cooking equipment do you have available in your home? • What types of equipment do you use most often when cooking?
Barriers to Cooking	10. What are the main reasons or challenges that may prevent you from cooking at home? 11. How might you overcome challenges? 12. Which foods or food groups are more difficult to cook?	• Personal level (time, resource, affordability, emotional) • Family level (family acceptability; new flavors, foods; family prefers eating out?) • Neighborhood level (community, grocery stores) • Please elaborate with examples
Healthy Eating Conceptualization	13. What is a dietitian? 14. What comes to mind when you think of eating healthy? 15. Where do you get most of this information?	• What makes a food healthy or unhealthy? • Do most members of your family eat a healthy or unhealthy diet? Are they interested in eating healthier?
Visits with Dietitian	16. Have you ever visited with a dietitian? 17. If yes, how many visits and how often? 18. If yes, what did you learn? 19. If no, what questions do you have for a dietitian? 20. If no, would you like to visit with a dietitian?	• To understand the RD/patient interaction. To understand how many patients have seen a dietitian and if so, what they remember from their visit. If they have not seen a dietitian are they interested in meeting with one.

Appendix C: Patient Focus Group, Spanish

Guión de grupo focal - LBJ **Febrero 2019**

Hola a todos. Mi nombre es (facilitador) y este es (co-facilitador). Somos de la Escuela de Salud Pública de la Universidad de Texas (UTHealth). Hoy estamos aquí para hablar sobre la comida y cómo se relaciona con su cultura, su familia y su salud. La información que proporcione hoy nos ayudará a informar sobre cursos de nutrición y cocina para los pacientes y el personal de las clínicas de Harris Health. El grupo de focal de hoy debería durar alrededor de una hora. Vamos a utilizar una grabadora de audio y tomaremos notas escritas a mano durante esta sesión, no vincularemos lo que usted dice con su identidad.

No hay una respuesta correcta o incorrecta a ninguna de nuestras preguntas, solo puntos de vista diferentes. Comparta su punto de vista con nosotros, incluso si es diferente de lo que otros participantes han dicho. Estamos tan interesados en los comentarios negativos como en los comentarios positivos, y en ocasiones los comentarios negativos son los más útiles.

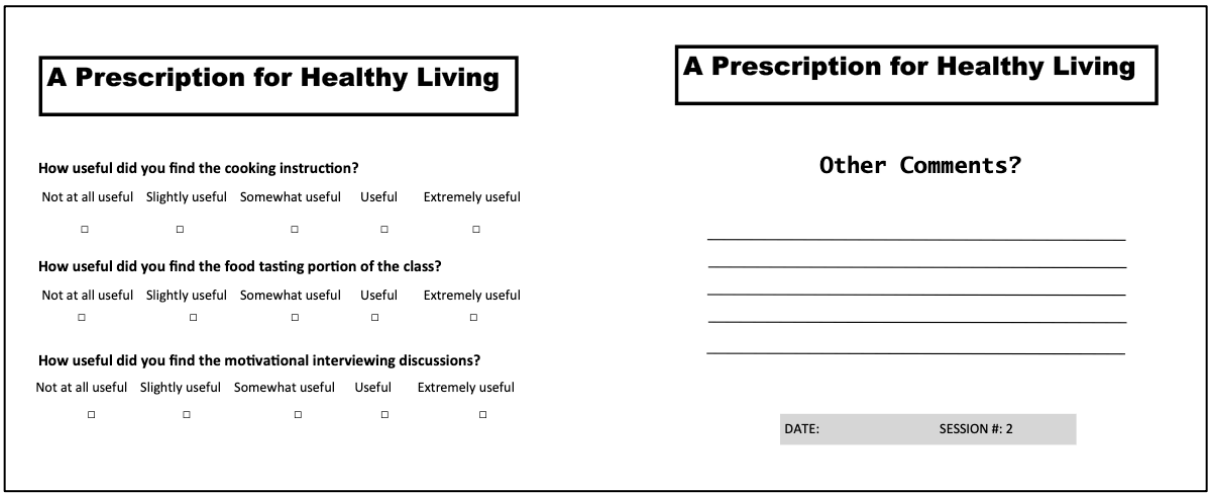
Para proteger su confidencialidad, en lugar de nombres, le proporcionamos un número único, que se utilizará para referirlo. Antes de comenzar, nos gustaría que nos conozcamos mutuamente, así que díganos por favor su número y su comida favorita.

Hoy hablaremos sobre la comida, específicamente, qué sabores, platillos y cocina prepara para usted y su familia.

Áreas	Preguntas	Análisis
Pregunta Inicial	**Gracias a todos por su participación en este Grupo Focal. Queremos hablar de lo que le gusta comer.** 1. ¿Cuál es su comida favorita?	• ¿Cuál es su comida favorita para cocinar? • ¿Cuál es su comida favorita para comer en un restaurante? ¿Cuáles son las cosas favoritas de su familia para comer?
Elección de comida	2. ¿Qué factor(es) afecta(n) su(s) elección(es) de comida?	• ¿Cuáles son los factores más importantes (gusto, tiempo, presupuesto, salud, etc.) cuando elige cocinar o ingerir una comida?
Disponibilidad & seguridad	3. ¿De dónde obtiene su comida?	• En promedio, ¿dónde compra sus alimentos? • ¿Con qué frecuencia compra alimentos? • (¿Semanalmente? ¿Los primeros 15 días del mes?) • ¿Cómo llega a la tienda para comprar artículos? • ¿Normalmente compra enlatados, secos, frescos o congelados? • ¿Con qué frecuencia consume una comida fuera de la casa? • ¿Qué tipo de restaurantes frecuenta?

		• ¿Siente que tiene suficiente acceso a los alimentos que quiere comer? ¿O los alimentos que quiere cocinar?
Historia de la familia sobre la comida	4. ¿Con qué tipo de comidas o alimentos creció? 5. ¿Qué tipo de comidas o alimentos de su infancia todavía come? 6. ¿Qué pasa con las comidas o alimentos que ya no come?	• ¿Cuáles son los tipos de alimentos que usted come regularmente? • ¿Con qué alimentos no podría vivir? • ¿Consume frijoles o arroz con cada comida? • ¿Consume verduras? ¿Qué tipo? ¿Cómo las prepara?
Prácticas de cocina	7. ¿En una semana típica con qué frecuencia cocina? 8. ¿Quién le enseñó a cocinar?	• Describa la comida más reciente que cocinó • ¿Qué tipo de ingredientes usó (fresco, congelado, enlatado)? • ¿Usó recetas? • ¿Se prepara las comidas usted misma? ¿O con otras personas?
Facilitadores de la cocina.	9. ¿Qué facilita la preparación de las comidas?	• ¿Qué tipo de equipo de cocina tiene disponible en su hogar? • ¿Qué tipo de equipo usa con más frecuencia cuando cocina?
Barreras para cocinar	10. ¿Cuáles son los principales motivos o desafíos que pueden impedirle cocinar en casa? 11. ¿Cómo podría superar los desafíos? 12. ¿Qué alimentos o grupos de alimentos son más difíciles de cocinar?	• Nivel personal (tiempo, recursos, dinero para comprar, emocional) • Nivel familiar (aceptabilidad familiar; nuevos sabores, alimentos; ¿la familia prefiere comer afuera?) • Nivel de barrio (comunidad, tiendas de comestibles) • Por favor, elabore con ejemplos.
Conceptualización de la alimentación saludable	13. ¿Qué es una dietista? 14. ¿Qué le viene a la mente cuando piensa en comer sano? 15. ¿Dónde obtiene la mayor parte de esta información?	• ¿Qué hace que un alimento sea saludable o no saludable? • ¿La mayoría de los miembros de su familia comen una dieta saludable o no saludable? ¿Están interesados en comer más sano?
Visitas con una dietista	16. ¿Has visto a una dietista? 17. En caso afirmativo, ¿Cuántas visitas y con qué frecuencia? 18. En caso afirmativo, ¿qué aprendió?	• Comprender la interacción entre la dietista y paciente. Para entender cuántos pacientes han visto a una dietista y, de ser así, qué recuerdan de su visita. Si no han visto a una dietista, ¿están interesados en visitar a una?

Appendix D: RDN Training Comment Card Example



A Prescription for Healthy Living

How useful did you find the cooking instruction?

Not at all useful	Slightly useful	Somewhat useful	Useful	Extremely useful
□	□	□	□	□

How useful did you find the food tasting portion of the class?

Not at all useful	Slightly useful	Somewhat useful	Useful	Extremely useful
□	□	□	□	□

How useful did you find the motivational interviewing discussions?

Not at all useful	Slightly useful	Somewhat useful	Useful	Extremely useful
□	□	□	□	□

A Prescription for Healthy Living

Other Comments?

_____

_____

_____

_____

_____

DATE: SESSION #: 2

Appendix E: RDN Training Pre-Survey

Default Question Block

Hi ${m://FirstName}!

Thank you for taking part in the Prescription for Healthy Living Training Program. We would like to ask you to answer a few questions in this short survey, which should take about 3-5 minutes.

- The survey asks questions about your training and counseling experience.
- There are no right or wrong answers. Please answer to the best of your ability.
- It is your choice to take part in this survey. Your choice to take part will not affect your care in any way.
- Only a number will be used to identify you. No identifiable information will be shared with your employer.
- The information collected is private and will only be available to the program staff.
- There are no known risks involved in filling out the survey.

What is your current position with your employer:

- ○ Inpatient clinical dietitian
- ○ Outpatient clinical dietitian
- ○ Clinical nutrition manager
- ○ Other, please specify: _____

How many years have you been in this position?

_____

What is your gender identity?

- ◯ Male
- ◯ Female
- ◯ Other (specification optional)

What is your age group?

- ◯ 18 - 24
- ◯ 25 - 29
- ◯ 30 - 34
- ◯ 35 - 39
- ◯ 40 - 44
- ◯ 45 - 49
- ◯ 50 - 54
- ◯ 55 - 59
- ◯ 60-64
- ◯ 65 or older

Please choose your race/ethnicity:

- ◯ Black/African American
- ◯ Mexican-American, Latino or Hispanic
- ◯ White, Caucasian, or Anglo
- ◯ Asian (Chinese, Indian, or another Asian country)
- ◯ Native Hawaiian or Other Pacific Islander
- ◯ Native American or Alaska Native
- ◯ Other, please specify:

Languages spoken fluently (check as many as applicable):

- ☐ English
- ☐ Spanish
- ☐ Other, please specify:

Have you participated in a training related to culinary skills and programming before?

- ○ Yes
- ○ No

Have you participated in a training related to prenatal nutrition programming before?

- ○ Yes
- ○ No

On a scale of 1 to 5 with 1 being not confident and 5 being extremely confident:

How confident are you that you can...

	1 (Not confident)	2	3	4	5 (Extremely Confident)
a. Explain to your patients why they need to eat more healthy food	○	○	○	○	○
b. Teach your patients how to eat more fruits and vegetables as part of their regular diet	○	○	○	○	○
c. Teach your patients how to cook using healthy cooking techniques	○	○	○	○	○
d. Teach your patients to make a grocery list for healthy shopping	○	○	○	○	○
e. Teach your patients to make a healthy and tasty meal from scratch without using convenience food ingredients	○	○	○	○	○
f. Teach your patients to cook a healthy meal using leftovers	○	○	○	○	○

	1 (Not confident)	2	3	4	5 (Extremely Confident)
g. Teach your patients how to use the USDA MyPlate for meal planning	○	○	○	○	○
h. Teach healthy eating and cooking behaviors as part of prenatal care to pregnant women	○	○	○	○	○

How easy is it to talk to your patients about how healthy their eating habits are?

- ○ Not easy at all
- ○ Not very easy
- ○ Somewhat easy
- ○ Easy
- ○ Very Easy

How easy is it to talk to your clinic providers (physicians) about the role of food and nutrition in health?

- ○ Not easy at all
- ○ Not very easy
- ○ Somewhat easy
- ○ Easy
- ○ Very easy

How often do you talk to your clinic providers (physicians) about the role of food and nutrition in health?

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often

Appendix F: RDN Training Post-Survey

Default Question Block

Hi ${m://FirstName}!

Thank you for taking part in the Prescription for Healthy Living Training Program. Now that you have completed the training, we would like to ask you to answer a few questions in this short survey, which should take about 2-5 minutes.

- The survey asks questions about your training and counseling experience.
- There are no right or wrong answers. Please answer to the best of your ability.
- It is your choice to take part in this survey. Your choice to take part will not affect your care in any way.
- Only a number will be used to identify you. No identifiable information will be shared with your employer.
- The information collected is private and will only be available to the program staff.
- There are no known risks involved in filling out the survey.

On a scale of 1 to 5 with 1 being not confident and 5 being extremely confident:

How confident are you that you can...

	1 (Not confident)	2	3	4	5 (Extremely Confident)
a. Explain to your patients why they need to eat more healthy food	○	○	○	○	○
b. Teach your patients how to eat more fruits and vegetables as part of their regular diet	○	○	○	○	○

	1 (Not confident)	2	3	4	5 (Extremely Confident)
c. Teach your patients how to cook using healthy cooking techniques	○	○	○	○	○
d. Teach your patients to make a grocery list for healthy shopping	○	○	○	○	○
e. Teach your patients to make a healthy and tasty meal from scratch without using convenience food ingredients	○	○	○	○	○
f. Teach your patients to cook a healthy meal using leftovers	○	○	○	○	○
g. Teach your patients how to use the USDA MyPlate for meal planning	○	○	○	○	○
h. Teach healthy eating and cooking behaviors as part of prenatal care to pregnant women	○	○	○	○	○

How easy is it to talk to your patients about how healthy their eating habits are?

- ○ Not easy at all
- ○ Not very easy
- ○ Somewhat easy
- ○ Easy
- ○ Very Easy

How easy is it to talk to your clinic providers (physicians) about the role of food and nutrition in health?

- ○ Not easy at all
- ○ Not very easy

- ○ Somewhat easy
- ○ Easy
- ○ Very easy

How often do you talk to your clinic providers (physicians) about the role of food and nutrition in health?

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Always

On a scale of 1 to 5, 1 being no skills and 5 being highly skilled, (specifically for vegetables) how would you rate your:

	Before training	After training
Knife skills	▼	▼
Roasting skills	▼	▼
Sauteing skills	▼	▼
Microwaving skills	▼	▼
Recipe building skills	▼	▼
Group education presentation skills	▼	▼

REFERENCES

About Us // . (2019, February 1). Retrieved November 10, 2019, from https://www.harrishealth.org/about-us/harris-health.

Aiyer, J. N., Raber, M., Bello, R. S., Brewster, A., Caballero, E., Chennisi, C., . . . Saifuddin, M. (2019). A pilot food prescription program promotes produce intake and decreases food insecurity. *Translational Behavioral Medicine, 9*(5), 922-930.

Alisha, C., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2017). No title. *Household Food Security in the United States in 2016,*

America, F. (2019). No title. *Map the Meal Gap 2018: Food Insecurity in the United States,*

Azétsop, J., & Joy, T. R. (2013). Access to nutritious food, socioeconomic individualism and public health ethics in the USA: A common good approach. *Philosophy, Ethics, and Humanities in Medicine, 8*(1), 16.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1-26.

Berkowitz, S. A., Berkowitz, T. S., Meigs, J. B., & Wexler, D. J. (2017). Trends in food insecurity for adults with cardiometabolic disease in the united states: 2005-2012. *PloS One, 12*(6), e0179172.

Cooksey-Stowers, K., Schwartz, M., & Brownell, K. (2017). Food swamps predict obesity rates better than food deserts in the united states. *International Journal of Environmental Research and Public Health, 14*(11), 1366.

Darmon, N., & Drewnowski, A. (2015). Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. Nutrition reviews, 73(10), 643-660.

De Marchis, E. H., Torres, J. M., Benesch, T., Fichtenberg, C., Allen, I. E., Whitaker, E. M., & Gottlieb, L. M. (2019). Interventions addressing food insecurity in health care settings: A systematic review. *The Annals of Family Medicine, 17*(5), 436-447.

Eisenberg, D. M., & Burgess, J. D. (2015). Nutrition education in an era of global obesity and diabetes: Thinking outside the box. *Academic Medicine, 90*(7), 854-860.

Eisenberg, D. M., Miller, A. M., McManus, K., Burgess, J., & Bernstein, A. M. (2013). Enhancing medical education to address obesity:"See one. taste one. cook one. teach one.". *JAMA Internal Medicine, 173*(6), 470-472.

Ferrer, R. L., Neira, L., De Leon Garcia, Gualberto L, Cuellar, K., & Rodriguez, J. (2019). Primary care and food bank collaboration to address food insecurity: A pilot randomized trial. *Nutrition and Metabolic Insights, 12*, 1178638819866434.

Fiscella, K., & Sanders, M. R. (2016). Racial and ethnic disparities in the quality of health care. *Annual Review of Public Health, 37*, 375-394.

Gandy, J. (2008). Mixed messages. *Journal of Human Nutrition and Dietetics: The Official Journal of the British Dietetic Association, 21*(2), 107.

Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., & Basu, J. (2014). Multiple chronic conditions chartbook. *Rockville, MD: Agency for Healthcare Research and Quality*, , 7-14.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association, 98*(10), 1118-1126.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: Concepts and measures. *American Journal of Health Promotion, 19*(5), 330-333.

Gross, R., Schoeneberger, H., Pfeifer, H., & Preuss, H. (2000). The four dimensions of food and nutrition security: Definitions and concepts. *SCN News, 20*, 20-25.

Guest, G., Namey, E., & McKenna, K. (2017). How many focus groups are enough? building an evidence base for nonprobability sample sizes. *Field Methods, 29*(1), 3-22.

Gundersen, C., & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health Affairs, 34*(11), 1830-1839.

Hartline-Grafton, H., & Dean, O. (2017). The impact of poverty, food insecurity, and poor nutrition on health and well-being. *Washington, DC: Food Research & Action Center,*

Hartmann, C., Dohle, S., & Siegrist, M. (2013). Importance of cooking skills for balanced food choices. *Appetite, 65*, 125-131.

Health of Houston Survey, HHS 2017-18 A Brief Summary, Houston, TX: Institute for Health Policy, UTHealth School of Public Health, 2019. Copyright © 2019 Health of Houston Survey, Institute for Health Policy, UTHealth School of Public Health.

Hess, A., Passaretti, M., & Coolbaugh, S. (2019). No title. *Fresh Food Farmacy,*

Holben, D. H., & Marshall, M. B. (2017). Position of the academy of nutrition and dietetics: Food insecurity in the united states. *Journal of the Academy of Nutrition and Dietetics, 117*(12), 1991-2002.

Horning, M. L., Fulkerson, J. A., Friend, S. E., & Story, M. (2017). Reasons parents buy prepackaged, processed meals: It is more complicated than “I don't have time”. *Journal of Nutrition Education and Behavior, 49*(1), 6-66. e1.

Kelder, S. H., Hoelscher, D., & Perry, C. L. (2015). How individuals, environments, and health behaviors interact. Health behavior: Theory, research, and practice, 159.

Kelley, T. (2018). Forget the pills. healthy food is the prescription. *Managed Care (Langhorne, Pa.), 27*(8), 18-19.

Kelli, H. M., Kim, J. H., Samman Tahhan, A., Liu, C., Ko, Y., Hammadah, M., . . . Choudhary, F. K. (2019). Living in food deserts and adverse cardiovascular outcomes in patients with cardiovascular disease. *Journal of the American Heart Association, 8*(4), e010694.

Krueger, R. A. (2014). *Focus groups: A practical guide for applied research* Sage publications.

Kuehn, B. M. (2019). Heritage diets and culturally appropriate dietary advice may help combat chronic diseases. Jama

La Puma, J. (2016). What is culinary medicine and what does it do? *Population Health Management, 19*(1), 1-3.

McWhorter, J. W., Raber, M., Sharma, S. V., Moore, L. S., & Hoelscher, D. M. (2019). The nourish program: An innovative model for cooking, gardening, and clinical care skill

enhancement for dietetics students. *Journal of the Academy of Nutrition and Dietetics, 119*(2), 199-201.

Morales, M. E., & Berkowitz, S. A. (2016). The relationship between food insecurity, dietary patterns, and obesity. *Current Nutrition Reports, 5*(1), 54-60.

Neumark-Sztainer, D., Hannan, P. J., Story, M., Croll, J., & Perry, C. (2003). Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. *Journal of the American Dietetic Association, 103*(3), 317-322.

Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of fruit and vegetable intake among adolescents: Findings from project EAT. *Preventive Medicine, 37*(3), 198-208.

Overcash, F., Ritter, A., Mann, T., Mykerezi, E., Redden, J., Rendahl, A., . . . Reicks, M. (2018). Impacts of a vegetable cooking skills program among low-income parents and children. *Journal of Nutrition Education and Behavior, 50*(8), 795-802.

Passel, J. S., & Cohn, D. (2017). 20 metro areas are home to six-in-ten unauthorized immigrants in US. *Pew Research Center,*

Pooler, J. A., Hartline-Grafton, H., DeBor, M., Sudore, R. L., & Seligman, H. K. (2019). Food insecurity: A key social determinant of health for older adults. *Journal of the American Geriatrics Society, 67*(3), 421-424.

Popkin, B. M., & Kenan Jr, W. R. (2016). Preventing type 2 diabetes: Changing the food industry. *Best Practice & Research Clinical Endocrinology & Metabolism*, 30(3), 373-383.

Pruitt, S. L., Leonard, T., Xuan, L., Amory, R., Higashi, R. T., Nguyen, O. K., . . . Swales, S. (2016). Who is food insecure? implications for targeted recruitment and outreach, national health and nutrition examination survey, 2005-2010. *Preventing Chronic Disease, 13*, E143.

Raghupathi, W., & Raghupathi, V. (2018). An empirical study of chronic diseases in the united states: A visual analytics approach to public health. *International Journal of Environmental Research and Public Health, 15*(3), 431.

Ridberg, R. A., Bell, J. F., Merritt, K. E., Harris, D. M., Young, H. M., & Tancredi, D. J. (2019). Peer reviewed: Effect of a fruit and vegetable prescription program on children's fruit and vegetable consumption. *Preventing Chronic Disease, 16*

Saxe-Custack, A., LaChance, J., Hanna-Attisha, M., & Ceja, T. (2019). Fruit and Vegetable Prescriptions for Pediatric Patients Living in Flint, Michigan: A Cross-Sectional Study of Food Security and Dietary Patterns at Baseline. Nutrients, 11(6), 1423.

Schuler, D. A., & Koka, B. R. (2019). Challenges of social sector systemic collaborations: What's cookin'in houston's food insecurity space?

Schulz, A. J., Mentz, G., Lachance, L., Zenk, S. N., Johnson, J., Stokes, C., & Mandell, R. (2013). Do observed or perceived characteristics of the neighborhood environment mediate associations between neighborhood poverty and cumulative biological risk? *Health & Place, 24*, 147-156.

Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for, 2020. (2010). Healthy people 2020: An opportunity to address the societal determinants of health in the united states.

Seligman, H. K., & Berkowitz, S. A. (2019). Aligning programs and policies to support food security and public health goals in the united states. *Annual Review of Public Health, 40*, 319-337.

Sharma, S. V., Chuang, R., Byrd-Williams, C., Danho, M., Upadhyaya, M., Berens, P., & Hoelscher, D. M. (2018). Pilot evaluation of HEAL–A natural experiment to promote obesity prevention behaviors among low-income pregnant women. *Preventive Medicine Reports, 10*, 254-262.

Sharma, S. V., Hernandez, D. C., Hoelscher, D. M., & Yaroch, A. L. (2015). Multidisciplinary approaches to address food insecurity and nutrition among youth and their families. *Journal of Applied Research on Children: Informing Policy for Children at Risk, 6*(2), 1.

Sharma, S. V., Upadhyaya, M., Bounds, G., & Markham, C. (2017). Peer reviewed: A public health opportunity found in food waste. *Preventing Chronic Disease, 14*

Shaw, K. M., Theis, K. A., Self-Brown, S., Roblin, D. W., & Barker, L. (2016). Peer reviewed: Chronic disease disparities by county economic status and metropolitan classification, behavioral risk factor surveillance system, 2013. *Preventing Chronic Disease, 13*

Smith, L. P., Ng, S. W., & Popkin, B. M. (2013). Trends in US home food preparation and consumption: Analysis of national nutrition surveys and time use studies from 1965–1966 to 2007–2008. *Nutrition Journal, 12*(1), 45.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annu.Rev.Public Health, 29*, 253-272.

Swartz, H. (2018). Produce rx programs for diet-based chronic disease prevention. *AMA Journal of Ethics, 20*(10), 960-973.

Thornton, R. L., Glover, C. M., Cené, C. W., Glik, D. C., Henderson, J. A., & Williams, D. R. (2016). Evaluating strategies for reducing health disparities by addressing the social determinants of health. *Health Affairs, 35*(8), 1416-1423.

Tougas, M. E., Hayden, J. A., McGrath, P. J., Huguet, A., & Rozario, S. (2015). A systematic review exploring the social cognitive theory of self-regulation as a framework for chronic health condition interventions. *PLoS One, 10*(8), e0134977.

US Department of Health and Human Services. (2017). *Dietary guidelines for americans 2015-2020* Skyhorse Publishing Inc.

Vaccaro, J. A., & Huffman, F. G. (2017). Sex and race/ethnic disparities in food security and chronic diseases in US older adults. *Gerontology and Geriatric Medicine, 3*, 2333721417718344.

Wight, V., Kaushal, N., Waldfogel, J., & Garfinkel, I. (2014). Understanding the link between poverty and food insecurity among children: Does the definition of poverty matter? *Journal of Children and Poverty, 20*(1), 1-20.

Zhan, J., Liu, Y., Cai, L., Xu, F., Xie, T., & He, Q. (2017). Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. *Critical Reviews in Food Science and Nutrition, 57*(8), 1650-1663