January 2013

The Role Of Family Functioning In A Family-Based Diabetes Prevention Program

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The role of family functioning in a family-based diabetes prevention program

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

by
Julia Rose Lubsen
2013

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Abstract

THE ROLE OF FAMILY FUNCTIONING IN A FAMILY-BASED DIABETES PREVENTION PROGRAM

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***Background**:* Family functioning is a family's ability to communicate, solve problems, carry out tasks and support each other. Unhealthy family functioning may be a risk factor for obesity and non-adherence to treatment of chronic diseases. Fair Haven Community Health Center, a federally qualified health center in New Haven serving a patient population with high rates of obesity and diabetes, holds screenings for prediabetes and diabetes to identify patients who are eligible to participate in the family-based Diabetes Prevention Program (DPP) for prediabetic adults and the Bright Bodies (BB) program for overweight children.

Hypotheses: Unhealthy family functioning is associated with obesity and a diagnosis of prediabetes or diabetes at diabetes screenings. Unhealthy family functioning is associated with suboptimal enrollment, attendance, participation and weight loss in the DPP/BB program. The family-based DPP/BB program will improve family functioning.

Methods: We enrolled participants at diabetes screenings in an observational cohort study. To assess family functioning, we administered the General Functioning subscale

of the McMaster Family Assessment Device (FAD-GF). We measured participants' BMI and performed metabolic testing, including 2-hour oral glucose tolerance testing. We followed participants for subsequent enrollment, participation and outcomes in the DPP/BB program.

Results: We enrolled 129 participants ages 13-73 at diabetes screenings. Just over half of participants (53%) had unhealthy family functioning, defined as a baseline FAD-GF score $\geq$ 2.0. Participants with private insurance had healthier family functioning scores than participants with Medicaid ($p = 0.012$). Healthy family functioning was significantly correlated with higher BMI in adult participants, $r\,(102) = -0.257$, $p = 0.009$. There was no association between family functioning and a diagnosis of prediabetes or diabetes. In a small longitudinal sub-sample (n=14), participants with healthy family functioning lost significantly less weight during the program compared to participants with unhealthy family functioning (-0.61 ± 3.83 lbs vs. -5.02 ± 3.21 lbs), $p = 0.042$.

Conclusion: Unexpectedly, healthy family functioning may be a risk factor for adult obesity in this predominantly Latino and African-American population with high rates of obesity, and may be associated with barriers to successful weight loss in a lifestyle intervention program. Further research is necessary to validate our results and determine which factors related to families, food and culture might explain the link between healthy family functioning and obesity.

Acknowledgements

I would like to gratefully acknowledge the many wonderful people who contributed to this work. My thesis advisor and mentor, Dr. Marjorie Rosenthal, has been an incredible source of support and guidance. She empowered me to take ownership of all aspects of this project, from developing research questions to applying for IRB approval, and finally performing the data analysis and writing. This project was my first experience with community-based participatory research, and it has been an amazing learning opportunity. Margi, thank you so much for your encouragement and wisdom.

I also want to thank all of my collaborators at Fair Haven Community Health Center: Dr. Anne Camp, Elizabeth Magenheimer, Mari Montosa, Rebecca Kline, Felix Fernandez, Emillie Swenson and Nancy Dalrymple from the Diabetes Prevention Program, and Mary Savoye and Catalina Guzman from the Bright Bodies Program. Dr. Rosette Chakkalakal and Georgina Lucas from the Robert Wood Johnson Foundation Clinical Scholars Program were also incredibly helpful. This truly was a collaborative effort, and I could not have completed this project without the help of an outstanding team of people.

The John Jones HAVEN Fellowship and the James G. Hirsch, M.D. Endowed Medical Student Research Fellowship supported me during my research year. These fellowships allowed me to do community-based research while directing the HAVEN Free Clinic. I want to thank my generous supporters, especially Mr. John A. Jones, for giving me that incredible opportunity. I also want to thank all of the board members and volunteers at the HAVEN Free Clinic. It was a true pleasure working with all of you.

Mae Geter, Donna Carranzo and John Forrest in the Yale Office of Medical Student

Research were very supportive of my research efforts throughout my time at Yale. I also want to thank Karen Dorsey and Nancy Kim for their feedback as I developed my project. Dr. Laura Ment shared her passion for research with me early on in medical school and has been a wonderful and important mentor.

Finally I want to thank my family – my mom, dad, Kelley and Natalie – for their constant love and support.

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Introduction

The prevalence of obesity and type 2 diabetes is high in the United States, and these epidemics disproportionately affect Latinos, African Americans and people living in poverty. Based on 2009-2010 data, 69% of US adults are overweight or obese and 36% are obese.[1] Among adolescents ages 12-19, 34% are overweight with a body mass index (BMI) $\geq 85^{th}$ percentile.[2] The US ranks 3rd in the world for number of adults with type 2 diabetes (26.8 million), with a 2010 national prevalence of 12.3%.[3] Compared to non-Hispanic whites, the prevalence of diabetes is twice as high in non-Hispanic blacks and Mexican Americans,[4] and low socioeconomic status is associated with an increased risk of both obesity and diabetes.[5, 6]

Fair Haven Community Health Center (FHCHC) serves over 14,000 patients in an impoverished, urban, Latino neighborhood in New Haven. Among FHCHC patients, 68% of adults are obese, 45% of children are overweight or obese and 3,200 adult patients have risk factors for type 2 diabetes. FHCHC holds diabetes screenings three times per month to test at-risk adults and children for prediabetes and diabetes using an oral glucose tolerance test (OGTT). Prediabetes, or impaired glucose tolerance, is defined as a fasting glucose of 100-125 mg/dl or a glucose of 140-199 mg/dl 2 hours after ingesting 75 g of glucose (Table 1). Diabetes is defined as a fasting glucose $\geq$ 126 or a 2-hour glucose $\geq$ 200. People with predibetes are at increased risk of developing diabetes.

Table 1. Criteria for diagnosing prediabetes and diabetes

	Normal	Prediabetes	Diabetes
OGTT fasting glucose (mg/dl)	< 100	100 – 125	≥ 126
OGTT 2-hour glucose (mg/dl)	< 140	140-199	≥ 200

OGTT – oral glucose tolerance test

FHCHC currently offers two evidence-based lifestyle intervention programs[7, 8] to address obesity and prevent type 2 diabetes in the Fair Haven community:

The Diabetes Prevention Program (DPP) enrolls adults with prediabetes and their families in a 12-week intensive lifestyle intervention (ILI) that includes nutrition education and supervised physical activity.

The Bright Bodies (BB) program enrolls children with a BMI > 85th percentile and their parents in a 12-week ILI program developed specifically for overweight children.

The FHCHC diabetes prevention team developed the DPP as an ILI for the prevention of diabetes in the clinic's high-risk patient population based on the results of the National Institutes of Health (NIH) DPP study.[7] The NIH DPP ILI consisted of setting weight loss and physical activity goals for individuals at risk for developing diabetes, and providing individualized education about diet, exercise and behavior modification. The ILI was compared to a group receiving metformin and routine lifestyle recommendations and a control group receiving a placebo and routine lifestyle recommendations. Over a 2-5 year follow-up period, the ILI reduced the incidence of type 2 diabetes by 58% compared to the placebo group, and was superior to a 31%

reduction in diabetes incidence in the group receiving metformin. A 10-year follow-up showed sustained reductions in diabetes incidence in the ILI group.[8] Other studies have shown that adults with prediabetes who lose weight and increase physical activity levels can prevent or delay the onset of diabetes.[9-12]

Based on these promising results, FHCHC implemented an enhanced version of the DPP ILI starting in 2007 at the John Martinez School in Fair Haven. The ILI was adapted to take a community and family-based approach to diabetes prevention, including group nutrition and exercise classes. FHCHC utilized its electronic patient registry to identify 1225 Latina women ages 18-55 with diabetes risk factors, including obesity (BMI > 30), hypertension, dyslipidemia, coronary artery disease, history of gestational diabetes, history of having a baby weighing greater than 9 pounds at birth, and family history of diabetes. Of these women, 279 received oral glucose tolerance testing (OGTT), 111 (40%) were identified with prediabetes and another 19 (7%) were diagnosed with diabetes. Women with prediabetes and their children were invited to participate in the DPP ILI. In the pilot study, 30 women and 31 children participated in three 10-12 week cycles of the ILI. Eighty-eight percent of participants lost weight, with an average weight loss of 3.2 kg. All of the participants reported increased exercise to at least 90 minutes per week, with 65% achieving the DPP goal of 150 minutes per week. Further sessions of the ILI are ongoing. Potential DPP participants are identified at the diabetes screenings held at FHCHC. Clinicians refer patients with diabetes risk factors to these screenings, and an OGTT is performed to identify patients with prediabetes eligible for the DPP.

Since the completion of the pilot study demonstrating the effectiveness of the DPP, the FHCHC DPP staff have partnered with the Bright Bodies (BB) program, a weight management program for children that is affiliated with the Yale Pediatric Obesity Clinic. The BB program is an ILI consisting of exercise, nutrition education and behavior modification. A randomized controlled trial comparing the BB program to traditional clinic management demonstrated that the BB program was significantly more effective than clinic management in terms of decreasing BMI, percent body fat, and insulin resistance at 12 months.[13] A follow-up study showed that significant decreases in BMI, percent body fat, and insulin resistance were maintained 12 months after the end of the intervention.[14] Currently, a modified version of the BB program is held simultaneously with the adult DPP classes at the John Martinez School. Children and their parents are eligible to participate in the BB program if the child is > 85th percentile for BMI. Children are identified for this program by their clinician or at the FHCHC diabetes screenings.

While both DPP and BB programs take a family-based approach, the DPP targets prediabetic adults and BB targets overweight and obese children. However, all family members of the participants in these programs are also likely to be at high risk for obesity and diabetes. Starting in March 2011 FHCHC began a quality improvement initiative to make it feasible for all members of the family to participate in an age-appropriate ILI, emphasizing the importance of changing health behaviors in whole families.[15] The programs piloted "family time" activities that engage adults and children together for group food-tastings, games that encourage healthy food choices, and family exercise sessions. These activities also began to identify and address sources of family conflict

over food and exercise. The ultimate goal is to develop a comprehensive family-based program that promotes health behavior change within the context of the family, home and community.

There is evidence for the benefits of this family-based approach compared to traditional approaches that focus on treating individuals. Meta-analyses show that family-based programs are more effective for treating childhood obesity than traditional approaches.[16, 17] Most family-based programs target obese children for treatment and involve parents and caregivers as mediators of the child's behavior. These programs do not usually track health outcomes in parents or caregivers, indicating that their primary focus is on the child rather than the adults.[18] Some innovative lifestyle intervention programs have successfully treated all members of the family simultaneously.[19] In some programs parent BMI change was a significant predictor of child BMI change.[20, 21] The effects of family-based interventions for obesity and diabetes prevention in adults have not been well studied.

There is evidence that family functioning is linked to obesity, and may be an important predictor of success in weight-loss and diabetes prevention programs. Family functioning refers to a family's ability to resolve problems, communicate, support each other, carry out tasks, maintain standards for appropriate behavior and maintain an appropriate level of emotional engagement.[22]

There are two frequently cited models of family functioning, the McMaster Model and the Circumplex Model.[23, 24] Both models were originally developed for the assessment of families presenting for family therapy. The models are based on Family Systems Theory, a theory which views individuals in families as part of a complex

system that interacts with other systems (i.e. extended family, school, community, etc.).[23] The McMaster Model of Family Functioning considers family functioning in multiple dimensions, including problem solving, communication, roles, affective responsiveness, affective involvement and behavior control.[23] Based on this model, the McMaster Family Assessment Device (FAD) is a self-report measure of family functioning.[22] The Circumplex Model of Marital and Family Systems focuses on the dimensions of family cohesion and family adaptability.[24, 25] Family cohesion is the "emotional bonding that family members have toward one another" and ranges from "disengaged" to "enmeshed."[25] Family adaptability is "the ability of a marital or family system to change its power structure, role, relationship, and relationship rules in response to situational and developmental stress" and ranges from "rigid" to "chaotic."[25] The Family Adaptability and Cohesion Evaluation Scale (FACES) is a self-report measure of cohesion and flexibility in families.[26] The FAD and FACES have both been used to evaluate the relationship between family functioning and health-related measures like BMI, lifestyle behaviors and treatment adherence. Other measurement tools such as the Family Environmental Scale, the Family APGAR, and the Family Assessment Measure have also been used to assess family functioning.[27-29]

Most of the literature about the relationship between family functioning and obesity focuses on childhood obesity. Suboptimal family functioning is associated with higher BMI in children in some studies,[30] but others have found no relationship between family functioning and childhood obesity.[31, 32] Family functioning has also been associated with factors that contribute to or protect against obesity. Better family functioning has been associated with healthier overall dietary patterns, higher fruit and

vegetable consumption, lower soda intake, more frequent breakfast consumption, more frequent family meals and less sedentary behavior.[33-38] However, family functioning has been found to contribute to a very low percentage of variance in food choices compared to individual factors.[39]

The relationship between family functioning and adult obesity has not been well studied. Johnson, et al. studied family functioning in a predominantly Caucasian cohort of adults using the FACES instrument, but asked participants to rate the functioning of their family of origin – how their family functioned when they were 15 years old.[40] The study was designed to explore the impact of family functioning in adolescence on adult obesity rather than the relationship between current family functioning and obesity. In men, family cohesion in adolescence was associated with healthier eating attitudes and better control over eating, while higher family adaptability was associated with earlier onset of obesity and more disturbed eating attitudes. There was no association between cohesion or adaptability and body weight in women. Wen, et al. studied the relationship between family functioning and obesity-related behaviors in pregnant women using the General Functioning subscale of the FAD.[41] They found that unhealthy family functioning was associated with a greater number of obesity risk behaviors, but did not examine the relationship between family functioning and BMI.

Healthy family functioning has been associated with better treatment adherence in a variety of settings. Suboptimal family functioning was associated with suboptimal attendance in a pediatric obesity program.[42] Family dysfunction has also been associated with treatment non-adherence in pediatric chronic diseases, including type 1 diabetes,

asthma and spina bifida.[43-48] The influence of family functioning on adult program participation and treatment adherence has not been well studied.

Each month, FHCHC screens approximately 60 people; 35-40% are identified as having prediabetes or diabetes, and are therefore eligible for the DPP. Of these, about 50% enroll in the program, and even fewer regularly attend. Clearly, a main challenge facing the DPP/BB program includes engaging high-risk families in the program for enrollment, attendance and participation. Family functioning may be an important predictor of enrollment and participation in these programs, and is a potential area for intervention to increase the impact of the DPP/BB program in the Fair Haven community.

In summary, previous studies have shown that suboptimal family functioning may be a risk factor for childhood obesity and obesity-related behaviors, and may decrease participation in lifestyle intervention programs. The relationship between family functioning and adult obesity is not well understood, and has not been studied in racial/ethnically and socioeconomically diverse populations. No studies have examined the relationship between family functioning and the diagnosis of prediabetes or diabetes in a screening population, or the relationship between family functioning and adult participation in a lifestyle intervention program.

Previous studies have shown that family-based lifestyle interventions are effective for treating pediatric obesity, but the DPP/BB program represents a novel lifestyle intervention program targeting both children and adults. Family functioning may be an important factor in the success of family-based programs, but the role of family functioning in lifestyle intervention programs is unknown. If family functioning is a risk factor for obesity and obesity-related diseases like diabetes, it will be important for

lifestyle intervention programs to address family functioning to facilitate behavior change.

Statement of Purpose

FHCHC offers two evidence-based lifestyle intervention programs. The DPP aims to prevent diabetes in adults with prediabetes, and the BB program aims to decrease BMI in overweight and obese children. FHCHC is working to integrate the DPP and BB programs to create a unified family-based lifestyle intervention program. Family functioning may be linked to the health conditions that these programs aim to address, including obesity, prediabetes and diabetes. Furthermore, family functioning may have an impact on enrollment, attendance and successful participation in these programs. Additionally, these family-based lifestyle interventions may have an impact on family functioning. Understanding the role of the family in making lifestyle changes will help to shape the development of these family-based programs.

Hypotheses

1) Suboptimal baseline family functioning is associated with obesity, prediabetes and diabetes.

2) Suboptimal baseline family functioning has a significant negative impact on enrollment in the DPP/BB program, program attendance, program participation and change in BMI.

3) The family-based DPP/BB interventions will improve family functioning.

Specific Aims

1) To assess the association between baseline family functioning and diabetes screening test results at baseline, including BMI and OGTT.
2) Among participants invited to participate in the DPP/BB program: to assess the association between baseline family functioning and program enrollment.
3) Among participants enrolled in the DPP/BB program: to assess the association between baseline family functioning and:
    a. DPP/BB program attendance
    b. Rate of completion of food and exercise diaries
    c. Change in weight and BMI from baseline to 12 weeks
4) Among participants completing the 12-week DPP/BB program: to assess the change in family functioning from baseline to 12 weeks.

Methods

Community-Based Participatory Research

We used Community-Based Participatory Research (CBPR) principles to develop our research questions and study design. CBPR is defined as "a collaborative approach to research that equitably involves, for example, community members, organizational representatives, and researchers in all aspects of the research process. The partners contribute unique strengths and shared responsibilities to enhance understanding of a given phenomenon and the social and cultural dynamics of the community, and integrate the knowledge gained with action to improve the health and well-being of community members."[49] The core principles of CBPR include forming equitable, collaborative partnerships with community members and organizational representatives, sharing ideas, expertise and decision-making power between all partners, building on the community's strengths and disseminating research findings in a way that facilitates action and intervention.[50]

In February 2011, Ms. Lubsen began meeting with members of the FHCHC DPP/BB team as well as members of the Robert Wood Johnson Foundation Clinical Scholars Program; a fellowship program that trains early-career physicians in clinical and health services research and community-based participatory research (CBPR). This group collaboratively explored possible research questions that were of interest to the DPP/BB program. Possible projects included the use of pedometers to study physical activity among DPP/BB program participants, an assessment of food insecurity among participants, an evaluation of the DPP's community gardening program and a study of

family functioning in program participants. Ms. Lubsen conducted background research about each of these proposed projects and evaluated their feasibility.

Through discussions with the DPP/BB team, questions about family functioning emerged as questions of interest to the program and were the most feasible to study given the time and resources available. The DPP/BB team was interested in studying family functioning for two reasons. First, many team members recognized the importance of family support in making lifestyle changes from years of experience working with patients and program participants. Second, the DPP/BB program began a quality improvement project in March 2011 that focused on integrating the DPP program for adults and the BB program for children to make both programs more focused on families rather than individual participants. The team developed "family-time" activities including menu-ordering games, food tastings and group exercise sessions to bring parents and children together during the program. Ms. Lubsen developed a "family-time" activity focused on social support within the family, in which groups of children and groups of parents discuss how their family members can support them in making healthy choices (Appendix A).

Once the team decided that family functioning would be the focus of this project, the next step was to decide how to measure family functioning. Ms. Lubsen evaluated several different instruments for measuring family functioning and presented the benefits and drawbacks of each to the group. Since many FHCHC patients speak only Spanish, and some have low levels of education and literacy, we specifically looked for instruments that were available in Spanish and asked simple questions. We also looked for instruments that could be completed quickly because there was a limited amount of

time available during the diabetes screenings and DPP/BB program for enrolling participants in this study. The team decided to use the General Functioning subscale of the McMaster Family Assessment Device (FAD-GF) because it has been validated in Spanish and is brief and relatively easy to complete. [22, 51, 52]

Consistent with CBPR, throughout the implementation of the project, Ms. Lubsen collaborated with members of the DPP/BB team to make sure that the research project continued to support the goals of the program and that the results of the research could be useful to the DPP/BB team as they continued to refine the intervention.

Study Design

In order to study the role of the family and family functioning in the FHCHC DPP/BB program, we conducted a cross-sectional cohort study and a smaller longitudinal study (Figure 1). Ms. Lubsen enrolled participants into the study at FHCHC diabetes screenings, which occur three times per month at the health center (Figure 1A). FHCHC primary care providers refer patients to the diabetes screenings if they have at least one of the following risk factors for diabetes, including: obesity (BMI > 30), hypertension, dyslipidemia, coronary artery disease, history of gestational diabetes, history of having a baby weighing greater than 9 pounds at birth, and family history of diabetes. Patients are tested for prediabetes and diabetes using an oral glucose tolerance test (OGTT), and also undergo a series of other laboratory tests and body measurements. Patients attending the diabetes screening who were eligible for our study were invited to participate. Study participants were asked to provide demographic information and completed the FAD-GF to measure family functioning.

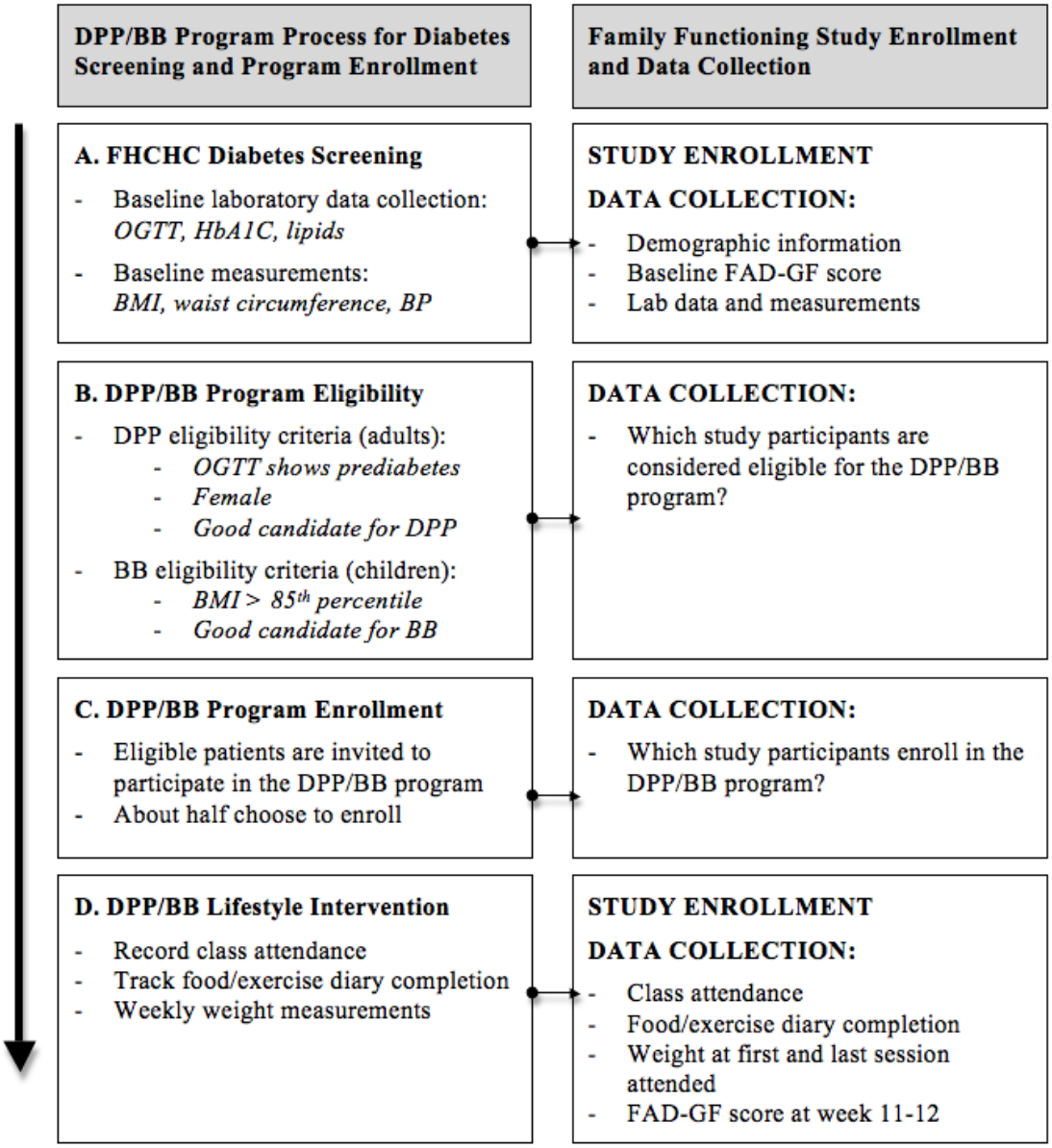


Figure 1: Study overview

- ***A.*** *We enrolled study participants at FHCHC diabetes screenings, where they underwent OGTT and had body measurements taken. Participants also completed the FAD-GF and provided demographic information.*
- ***B.*** *Program staff determined eligibility for the DPP/BB program based on OGTT and BMI.*
- ***C.*** *Eligible participants were invited to participate in the DPP/BB program.*
- ***D.*** *We enrolled additional study participants during the first DPP/BB program class. We collected program attendance and food/exercise diary completion. We also collected pre- and post-program BMI measurements and FAD-GF scores.*

BB – Bright Bodies; BMI - body mass index; DPP – Diabetes Prevention Program; FAD-GF – General Functioning Subscale of the Family Assessment Device; FHCHC – Fair Haven Community Health Center; HbA1C – hemoglobin A1C; LFTs – liver function tests; OGTT – oral glucose tolerance test.

The DPP/BB team uses OGTT results and BMI percentiles from the diabetes screenings to determine whether patients are eligible for the DPP and BB programs respectively (Figure 1B). We recorded whether or not each study participant was considered eligible for the DPP or BB program.

All patients who attend the diabetes screenings are later contacted about the results of their screening tests. At that time eligible patients are invited to participate in the DPP/BB program, and about half decide to enroll in the program (Figure 1C). For our study, we recorded whether study participants who were invited to participate in the lifestyle intervention enrolled in the program.

Only 13 study participants from the diabetes screenings enrolled in the DPP/BB program, so we enrolled an additional 12 study participants during the first class of the DPP/BB program lifestyle intervention (Figure 1D). The DPP/BB program staff kept track of class attendance, food and exercise diary completion and weekly weights for program participants. We collected attendance data, food/exercise diary completion rates and initial and final weights for study participants. We also asked study participants who attended class during the final 2 weeks of the program to complete the FAD-GF a second time.

Participants

Ms. Lubsen recruited study participants at FHCHC diabetes screenings between February 18 and July 13, 2012. She also enrolled 12 participants during the first class of the DPP/BB program. Eligibility criteria for the study included: anyone age 12 or older who was present at a diabetes screening or the DPP/BB program and able to read either

English or Spanish (Tables 2 and 3). We chose 12 or older because the instrument, the FAD-GF, has been validated for children older than 12.[53]

Table 2. Inclusion/exclusion criteria for adults

Inclusion Criteria	Exclusion Criteria
1. Age ≥ 18 2. Able and willing to sign consent 3. Participating in the FHCHC diabetes screening and/or DPP/BB program	1. Unable to understand and read English or Spanish

BB – Bright Bodies; DPP- Diabetes Prevention Program; FHCHC – Fair Haven Community Health Center

Table 3. Inclusion/exclusion criteria for adolescents

Inclusion Criteria	Exclusion Criteria
1. Age ≥ 12 and <18 2. Able and willing to provide written assent 3. Parents able and willing to provide written permission 4. Participating in the FHCHC diabetes screening and/or DPP/BB program	1. Unable to understand and read English or Spanish

BB – Bright Bodies; DPP- Diabetes Prevention Program; FHCHC – Fair Haven Community Health Center

Outcome Measures

Demographic Information

We collected identifying information from each study participant including diabetes screening results, program enrollment and participation data, name, date of birth, and the names of immediate family members participating in the study. We also collected basic demographic information including sex, race/ethnicity, country of origin, family's country of origin, education level, primary language, number of adults and children in the household, and type of insurance (Appendices B and C). Identifying information was used to link demographic information and FAD-GF scores to diabetes

screening results and program enrollment and participation data. We also used identifying information to group participants into families.

In the survey of demographic information, we asked participants "In what country were you born?" and "What country does your family come from?" We did not ask participants to differentiate between Puerto Rico and the USA, but many participants wrote "Puerto Rico" as their country of origin, so these responses were considered separately. Some participants listed "USA/Puerto Rico" as their country of origin, and these responses were classified as Puerto Rico.

We also asked participants "What is your native / preferred language?" and many participants checked both "English" and "Spanish." These responses were recorded separately as "English and Spanish."

The questions about household size asked, "How many adults live in your household?" and "How many children live in your household?" We expected the person completing the survey to include him/herself in these numbers, however some adults wrote "0" for the number of adults living in their household. We recorded these responses as written because participants who indicated that one or more adults live in their household may have made the same error.

Measuring Family Functioning

We chose the McMaster Family Assessment Device (FAD)[22] to assess for associations between family functioning and relevant outcome variables. The FAD is based on the McMaster Model of Family Functioning, which includes six dimensions of family functioning: problem solving, communication, establishing roles, affective responsiveness, affective involvement and behavior control.[22] The full 60-item FAD

includes subscales for each of these dimensions as well as a 12-item General Functioning subscale (FAD-GF) that assesses the overall level of family functioning across multiple dimensions. We used only the 12-item FAD-GF because it is relatively quick to administer, and has been used alone in previous studies examining the role of family functioning in obesity (Appendices B and C).[41] The statements included in the FAD-GF are shown in Figure 2.

Figure 2. Statements included in the FAD-GF

1. Planning family activities is difficult because we misunderstand each other.
2. In time of crisis we can turn to each other for support.
3. We cannot talk to each other about sadness we feel.
4. Individuals are accepted for what they are.
5. We avoid discussing our fears and concerns.
6. We can express feelings to each other.
7. There are lots of bad feelings in the family.
8. We feel accepted for what we are.
9. Making decisions is a problem for our family.
10. We are able to make decisions about how to solve problems.
11. We don't get along well together.
12. We confide in each other.

FAD-GF – General Functioning Subscale of the Family Assessment Device

In the FAD-GF participants are asked to rate their level of agreement with each statement on a 4 point Likert-type scale (Strongly Agree, Agree, Disagree, Strongly Disagree). Each item is scored 1-4, with 1 reflecting healthy family functioning and 4 reflecting unhealthy family functioning.

The FAD-GF was available in both English and Spanish. Barroilhet, et al. (2009) developed a Spanish version of the FAD and demonstrated that the reliability of the FAD-GF is comparable to previous studies of the English version.[52]

In the 2003 National Assessment of Adult Literacy, 36% of Hispanic adults and 24% of black adults had less than a basic level of document literacy, and low household

income was associated with lower literacy levels.[54] Given concerns about low levels of literacy in the FHCHC population, we adapted the Likert-like scale shown in Figure 3 to make it easier for participants to read and understand by eliminating abbreviations and adding a graphical representation of the answer choices (Figure 4). Adding picture to text can improve comprehension,[55] and others have used this strategy to covey health information to patients with low literacy levels.[56-58]

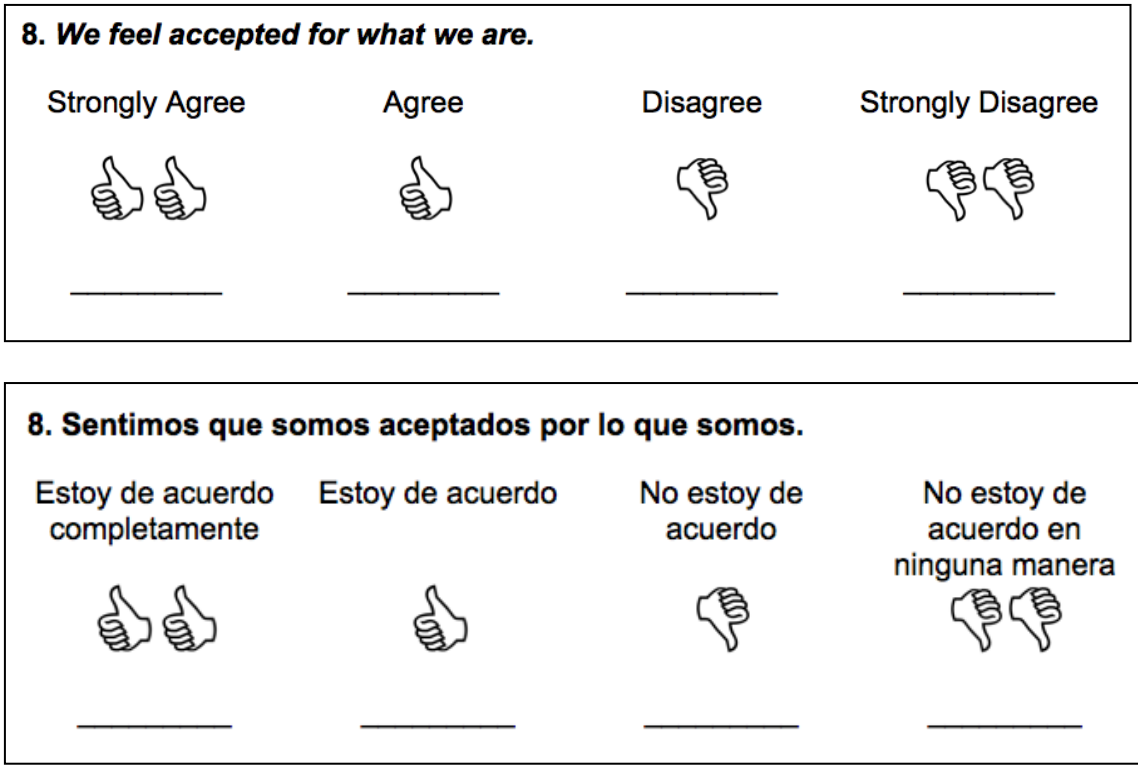
Figure 3. Original English version of the FAD-GF

36. We feel accepted for what we are.

____SA ____ A ____ D _____SD

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

Figure 4. Adapted English and Spanish version of the FAD-GF



Spanish Translation

We used a Spanish version of the FAD-GF that was translated and validated by Barroulhet et al.[52] The Yale Center for Clinical Investigation has formed a community partnership with JUNTA for Progressive Action to provide Spanish translation services to Yale investigators. We used those services to translate our other study materials, including informed consent documents and the questions about demographic information (Appendix C).

Diabetes Screening Outcomes

Diabetes screening at FHCHC includes the metabolic tests and body measurements listed in Figure 5.

Figure 5. Tests included in a FHCHC diabetes screening

1. Oral glucose tolerance test (OGTT) – blood glucose is measured once after a 12-hour fast and again 2 hours after ingesting a 75 gram oral glucose load
2. Hemoglobin A1C (HbA1C)
3. Fasting insulin (in children < 18)
4. Fasting lipids (total cholesterol, HDL, LDL, triglycerides)
5. Liver function enzymes (AST, ALT)
6. Weight
7. Height
8. Calculated BMI (weight (lb) / [height (in)]^2 x 703)
9. Waist circumference
10. Blood pressure

We used OGTT results to determine whether or not participants met criteria for a diagnosis of prediabetes or diabetes (Table 1). Participants were diagnosed with prediabetes or diabetes, respectively, if they met criteria based on either fasting glucose or 2-hour glucose as measured during the OGTT.

For our study, using FHCHC's chronic disease management database, Patient Electronic Care System (PECS), we determined if participants had been diagnosed with prediabetes or diabetes prior to the OGTT test. Prior diagnoses were determined based on either previous OGTT results or a diagnosis of prediabetes or diabetes documented in PECS.

Program Eligibility and Enrollment

Based on the diabetes screening results, a subset of the study participants were determined to be eligible for the DPP/BB program. Adult women age 18 and older were eligible for the DPP if they met criteria for prediabetes on an OGTT done within 3 months of the program start date and were considered good candidates for the lifestyle intervention (Figure 1B). Since the DPP targets women and families, men are only invited to participate if they have a spouse or partner participating in the program. Children of DPP participants are usually invited to participate in the BB program, but none of our study participants were children of DPP participants. Children younger than 18 were eligible for the BB program if they had a BMI > 85^{th} percentile and were considered good candidates for the lifestyle intervention. Parents of BB participants are encouraged to attend the BB program with their children. Among the subset of participants who were invited to participate in the DPP or BB program we determined who enrolled in the program and who declined to participate.

Program Participation and Longitudinal Outcomes

Among the cohort of study participants who enrolled in the DPP/BB program, we recorded several measures of program participation and outcomes. The measures of program participation included the percentage of nutrition and exercise classes attended,

the number of food and exercise diaries returned. The change in BMI from the first session attended to the last session attended was a longitudinal outcome. We asked study participants enrolled in the program to repeat the FAD-GF at the conclusion of the program (during the 11th or 12th session) so that we could examine the change in FAD-GF score from baseline to after the intervention.

Data Collection

Participants provided demographic information and answered the FAD-GF questions on a paper questionnaire. DPP/BB program staff obtained laboratory specimens and measured height, weight, waist circumference and blood pressure at the diabetes screenings. Laboratory data, height, weight, blood pressure, insurance status and diagnosed conditions were obtained from PECS. DPP/BB program staff tracked program attendance, completion of food and exercise diaries and weekly weights. Ms. Lubsen abstracted data from those records related to the study participants, including attendance data, food/exercise diary completion rates and weights from the first and last sessions attended. Ms. Lubsen abstracted and entered all data into a Microsoft® Access® database that she designed for this project.

Data Analysis

Previous studies have analyzed FAD-GF scores as both a continuous and a categorical variable.[41, 59] As a continuous variable, FAD-GF scores range from 1-4, with lower scores indicating healthier family functioning. Scores can also be sorted into categories, with scores < 2.0 being classified as healthy family functioning, and scores $\geq$ 2.0 being classified as unhealthy family functioning. Miller et al. established the cutoff score of 2.0 for the FAD-GF,[51] and this cutoff has been used in previous studies.[41]

We examined the associations between family functioning and three categories of data: 1) demographic information, 2) laboratory data and body measurements and 3) DPP/BB program enrollment, attendance, participation and outcomes. In all cases we first analyzed FAD-GF score as a categorical variable; we compared the group of participants with healthy family functioning scores to the group with unhealthy family functioning scores. For continuous variables like age and household size, we compared the means in each group using t-tests. For categorical variables like ethnicity and OGTT results, we compared proportions using Pearson's χ^2-tests.

We further investigated three demographic factors that showed trends towards an association with family functioning – insurance status, education level and number of children in the household – by considering FAD-GF as a continuous variable. In the case of insurance status we used a one-way ANOVA and Tukey HSD post-hoc analysis to examine the variance in mean family functioning score by insurance type, and compared mean family functioning scores among participants with Medicaid vs. private insurance using a t-test. We compared mean FAD-GF score in participants with low v. high education levels using a t-test. We also tested for a correlation between number of children in the household and FAD-GF score.

We considered BMI as both a categorical and a continuous variable, comparing the proportions of participants who were normal weight, overweight and obese in the healthy and unhealthy FAD-GF score groups and also comparing the mean BMI between groups. Since there was a significant difference between mean BMI between the groups, we further evaluated the relationship between BMI and family functioning by testing for a correlation between BMI and FAD-GF score.

While this study was primarily cross-sectional it had a small longitudinal component. We asked participants to complete a second FAD-GF during the 11th or 12th week of the program. We analyzed this longitudinal data using paired-samples t-tests to compare mean FAD-GF scores at baseline to scores at 11-12 weeks. We also collected initial and final weights from program participants. Among participants who had initial and final weight recorded $\geq$ 5 weeks apart, we compared mean weight change in participants with healthy vs. unhealthy family functioning using a t-test.

Statistical analysis was performed by Ms. Lubsen using IBM® SPSS® Statistics version 21.

Contribution

Ms. Lubsen developed the research questions and study design in collaboration with Dr. Camp, Dr. Rosenthal and the FHCHC DPP/BB team. Ms. Lubsen wrote an HIC proposal, which was approved by Dr. Rosenthal and Dr. Camp. Ms. Lubsen was primarily responsible for recruiting participants for the study, obtaining informed consent from all participants and administering the FAD-GF. Measurements, laboratory data and program attendance and participation data were collected by Ms. Montosa and other members of the DPP/BB team for all people participating in the diabetes screenings and/or the DPP/BB program. Ms. Lubsen created a database and completed all data entry for the study participants. Ms. Lubsen completed all data analysis in consultation with Dr. Rosenthal and Dr. Camp. Ms. Lubsen presented a poster reporting preliminary data at the North American Primary Care Research Group 2012 Annual Meeting.

Results

Study Enrollment

Ms. Lubsen enrolled participants at 13 Diabetes Screenings that took place at FHCHC between February and July 2012. Based on attendance records, there were 178 eligible participants present at these screenings; 153 adults, and 25 adolescents ages 12-17 (Figures 6 and 7). At the diabetes screenings the rate of enrollment was 66%; 117 participants (107 adults and 10 adolescents) consented to participate in the study and completed the FAD-GF and 108 participants (98 adults and 10 adolescents) underwent OGTT and other laboratory testing. The nine participants who were not tested were most likely friends and family members of participants being screened.

Adult Program Eligibility and Enrollment

Among the 98 adults who underwent OGTT, 29 had previously been diagnosed with prediabetes (n=28) or diabetes (n=1) (Figure 6A). In the prediabetic group, 17 continued to have OGTT results showing prediabetes, while 2 progressed to diabetes. Of the 69 adults who had not been previously diagnosed with prediabetes or diabetes, 26 met criteria for prediabetes and 1 met criteria for diabetes. In order to be eligible for the DPP, adults must have had an OGTT showing prediabetes within the previous 3 months; 43 adults met OGTT criteria for enrollment in the DPP. Fifteen of these prediabetic adults were deemed ineligible for the program; 9 males were not eligible for the female-only intervention, 5 women were not considered good candidates for the lifestyle intervention by the DPP/BB program and 1 was unreachable by telephone. Two adults who did not

meet OGTT criteria for DPP enrollment were considered eligible for other reasons; 1 had previously participated in the DPP (past participants are always invited to come back to the program) and 1 had a spouse who was invited to participate.

Of the 30 adults who met eligibility criteria for the DPP, 17 enrolled in the program (Figure 6B). The rate of enrollment was 58%. Of the 17 enrolled in the program, six were enrolled in the delayed arm of a separate randomized controlled trial studying the effectiveness of the DPP and were scheduled to attend the lifestyle intervention in one year. The remaining 11 participants were enrolled in the first available session of the DPP.

One adult had previously participated in the BB program as the parent of a child in BB, and was therefore eligible for the BB program. She chose to enroll in the BB program again with her daughter.

Additional study participants were enrolled at the first class of the DPP/BB program – 5 from the DPP class and 4 from the BB class – to reach a total of 16 adults enrolled in the DPP and 5 adults enrolled in the BB program. Of the 5 adults who enrolled in the study at the DPP class, 4 were past participants in the DPP program and were invited to come back to the program, and 1 attended a diabetes screening when we were not enrolling for the study. The 4 adults who enrolled in the study at the BB class were all parents of children in the BB program, and therefore did not go through the diabetes screening protocol.

Figure 6A: Adult eligibility, study enrollment and program enrollment

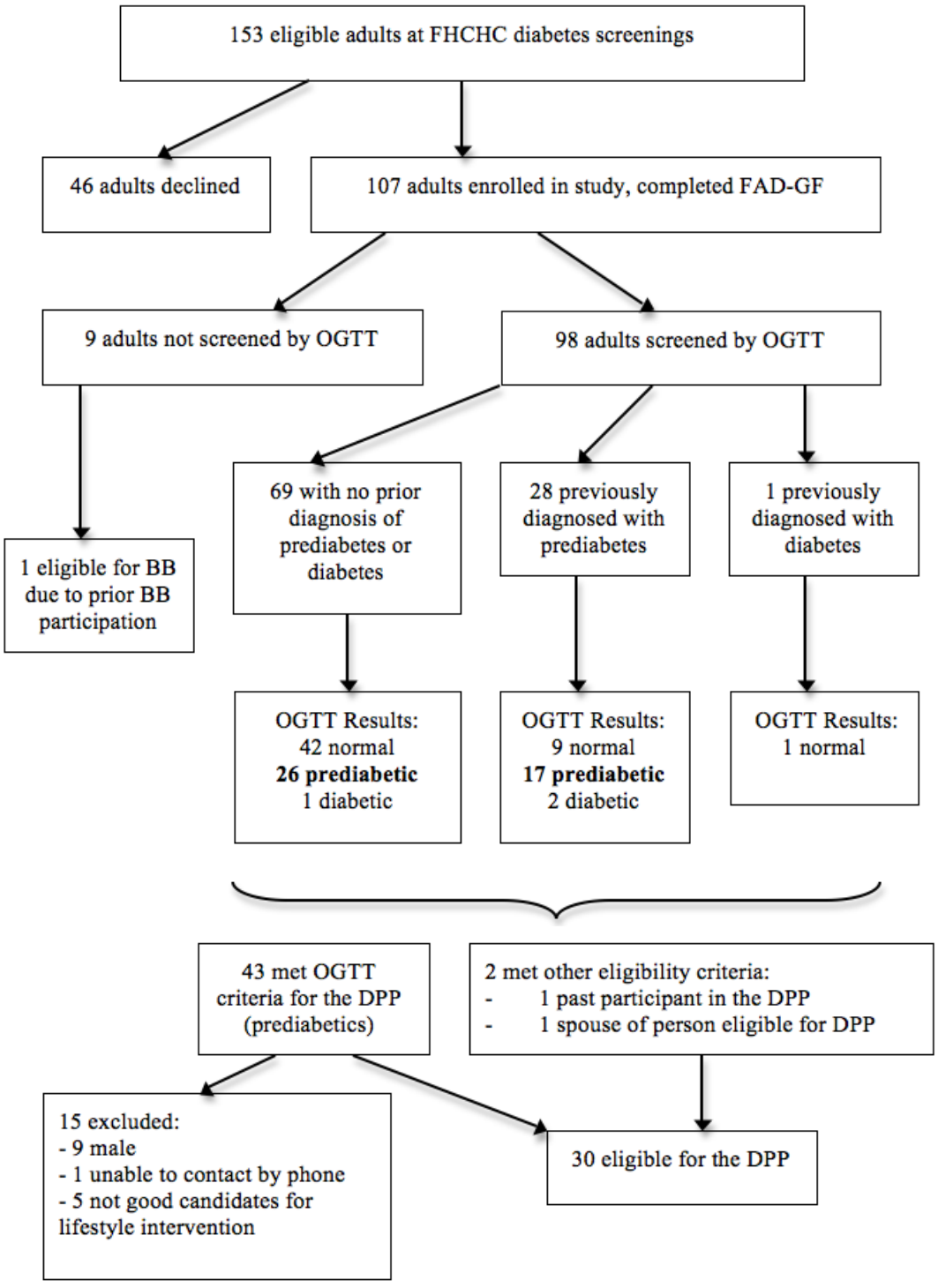


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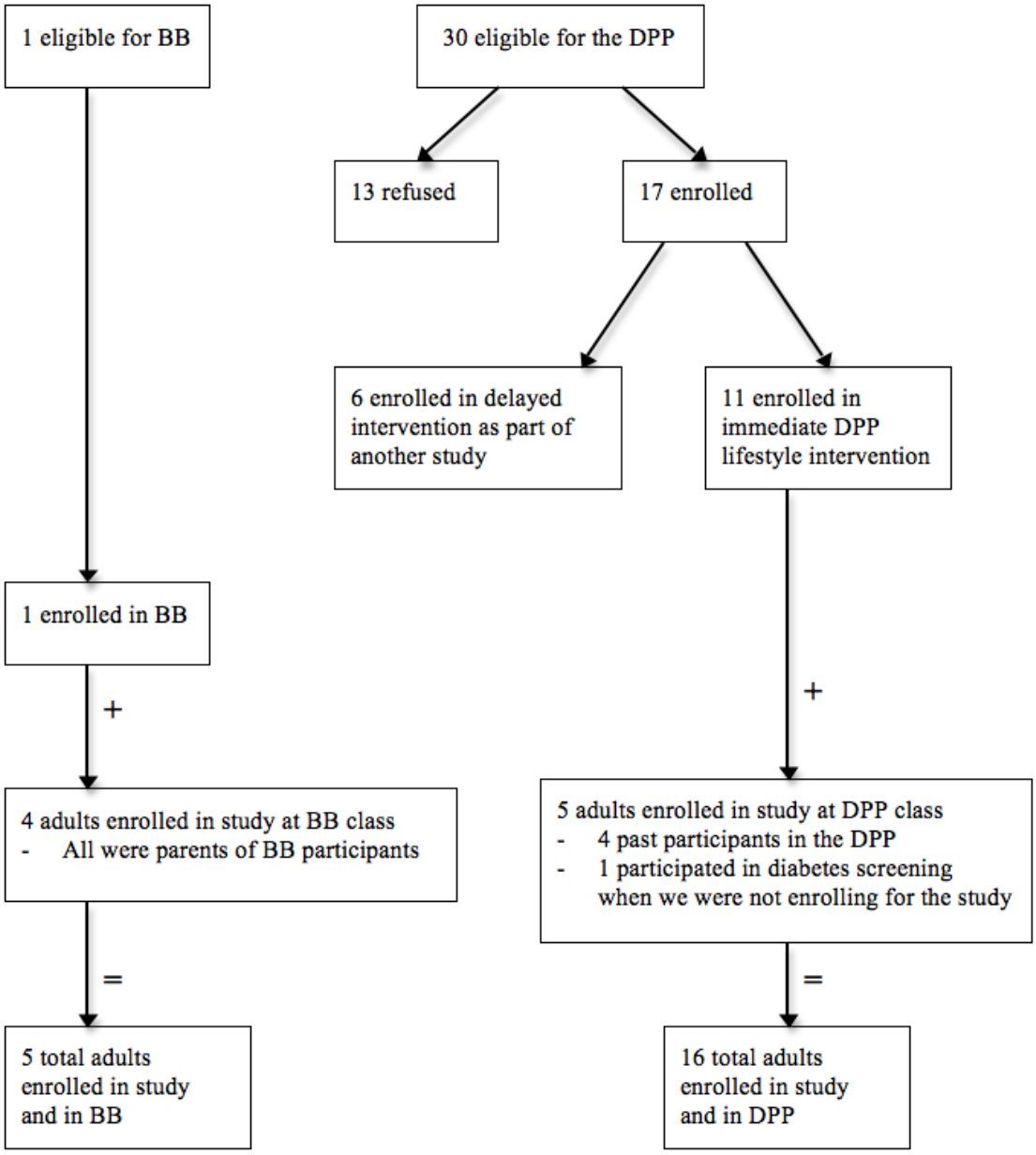
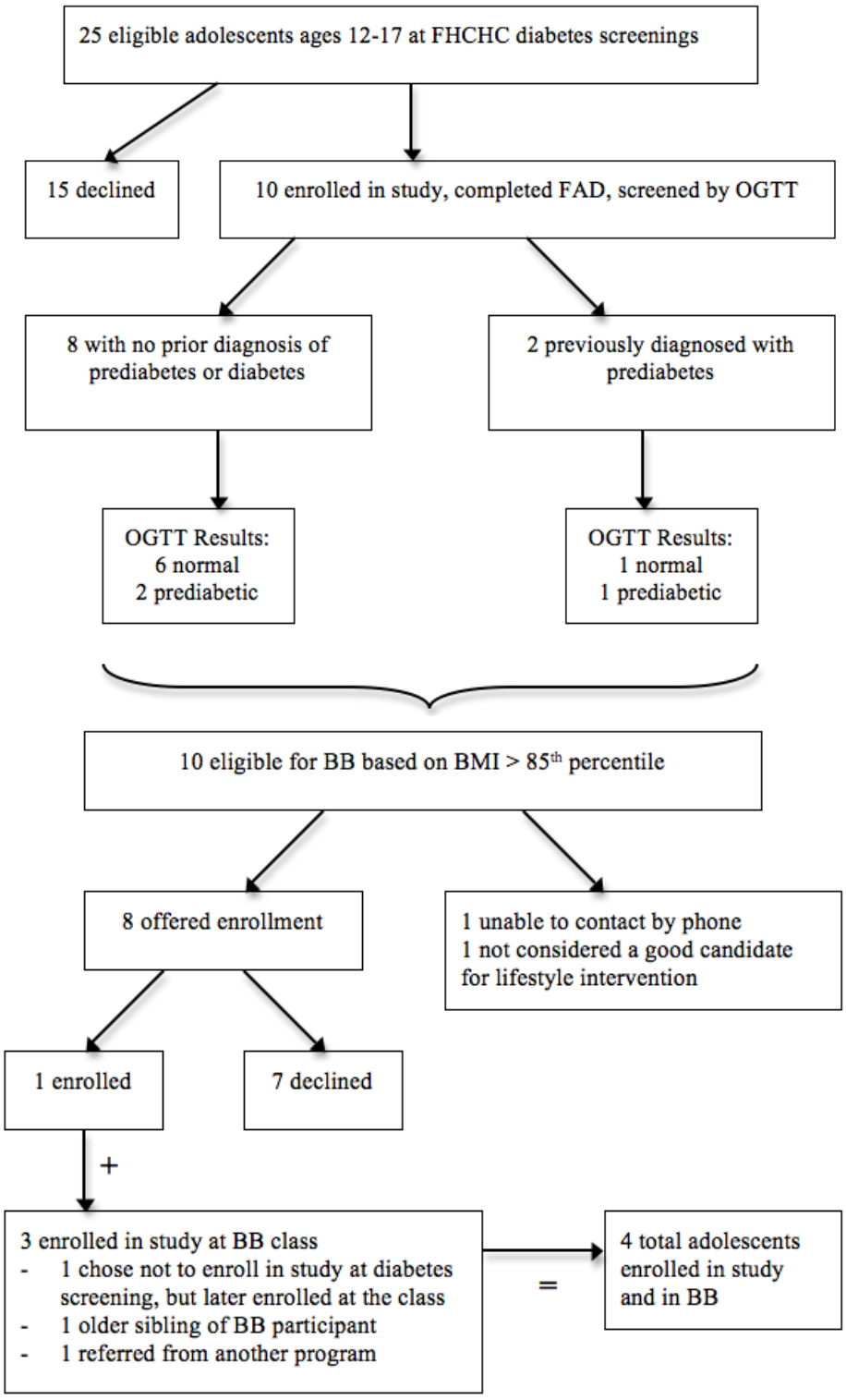
Figure 6B: Adult eligibility, study enrollment and program enrollment (continued)



Adolescent Program Eligibility and Enrollment

There were 25 adolescents ages 12-17 present at the diabetes screenings; 10 (40%) enrolled in the study, underwent OGTT and other laboratory testing and completed the FAD-GF (Figure 7). Two adolescents had been previously diagnosed with prediabetes and the rest were undergoing primary screening. The OGTT results showed that three adolescents (rate = 33%) met criteria for prediabetes and none for diabetes. Eligibility for the BB program is based on having a BMI > 85th percentile for age and gender; all 10 adolescents had a BMI > 85th percentile, so all 10 were eligible for the BB program. One adolescent was not considered a good candidate for the lifestyle intervention by the DPP/BB program staff and one was unreachable by telephone. Eight adolescents were invited to participate in BB, but only one enrolled in the program. Three additional adolescents enrolled in the study at the first session of the BB program. The first participant was present at a diabetes screening when we were enrolling subjects. She chose not to enroll in the study at that time, but later chose to enroll during the first BB class. The second participant was the older sibling of a child participating in the BB program. The third was referred to the BB program from the Fruit and Vegetable Prescription Program, another FHCHC program that gives farmer's market vouchers for fruit and vegetables to overweight and obese children.

Figure 7: Adolescents eligibility, study enrollment and program enrollment



Participant Characteristics

The demographic data presented in Table 4 represents all 129 participants who completed the FAD-GF. The cohort is predominantly female (84%), and the majority of participants are Hispanic (70%) or African American (19%). Many participants were born in Puerto Rico (25%) or in countries other than the US (28%). Approximately equal numbers of participants preferred English (42%) and Spanish (47%), with 11% listing both as their preferred language. Many participants did not graduate from high school (41%), but 27% had attended some college, graduated college or obtained an advanced degree. Medicaid (60%) was the most common type of medical insurance, followed by private insurance (26%). The average household size was 3.6 individuals (2.0 adults and 1.6 children). The mean FAD-GF score was 1.92 ± 0.47, the median score was 2.00 and the scores ranged from 1.00 to 2.83. A slight majority of participants (53%) had FAD-GF scores in the range of unhealthy family functioning (≥ 2.0), but the mean FAD-GF score is in the healthy range (< 2.0).

Table 4. Demographic data and family functioning scores (N=129)

Age, *years* (n=129)	38.5 ± 13.6 (13 – 73)[A]
Sex (n=129) Female	 108 (84)[B]
Race/Ethnicity (n=128) Asian or Pacific Islander African American Hispanic Caucasian Other	 1 (1) 24 (19) 90 (70) 10 (8) 2 (2)
Country of Origin (n=127) USA Puerto Rico Other countries	 60 (47) 32 (25) 35 (28)
Family's Country of Origin (n=125) USA Puerto Rico Other countries 2 countries listed	 38 (30) 45 (36) 39 (31) 3 (2)
Primary Language (n=110) English Spanish English and Spanish	 46 (42) 52 (47) 12 (11)
Education level, (n=108) Did not graduate from high school Graduated high school or GED Some college, graduate or professional school	 44 (41) 35 (32) 29 (27)
Insurance Type, (n=91) Medicaid Medicare Private Uninsured	 55 (60) 4 (4) 24 (26) 8 (9)
Household size, *persons* Adults (n=109) Children (n=106) Total (n=105)	 2.0 ± 1.1 (0 – 6) 1.6 ± 1.2 (0 – 5) 3.6 ± 1.8 (0 – 8)
Baseline Family Functioning Score (n=129) Healthy (< 2.0) Unhealthy (≥2.0)	 61 (47) 68 (53)
Baseline Family Functioning Score (n=129)	1.92 ± 0.47 (1.00 – 2.83)

A. Mean ± SD (range)
B. n (%)

Laboratory Testing and Body Measurements

Table 5 shows laboratory data from adult participants enrolled at the diabetes screenings. The body measurements shown in table 5 include all adult participants with measurement data available within 3 months of their study enrollment date.

Table 5. Laboratory data and measurements for adults age ≥ 18 (N=107)

Laboratory Testing	**n (%)**
2-hour 75 g OGTT (n=98)	
Normal	52 (53)
Prediabetic	43 (44)
Diabetic	3 (3)
HbA1C (n=95)	
Normal (< 5.7)	43 (45)
Prediabetic (5.7-6.4)	50 (53)
Diabetic (≥ 6.5)	2 (2)
Fasting lipids (n=97)	
High total cholesterol (≥ 240)	5 (5)
High LDL (≥ 160)	5 (5)
Low HDL (< 40)	24 (25)
High triglycerides (≥ 200)	10 (10)
Measurements	**n (%)**
BMI (n=102)	
Healthy Weight (≥ 18.5 and < 25)	5 (5)
Overweight (≥ 25 and < 30)	23 (23)
Obese (≥ 30)	74 (73)
Obese – Class I (≥ 30 and < 35)	34 (33)
Obese – Class II (≥ 35 and < 40)	25 (25)
Obese – Class III (≥ 40)	15 (15)
Waist circumference (n=79)	
At risk (> 40 inches for men, > 35 inches for women)	66 (84)
Blood pressure (n=107)	
High systolic BP (≥ 140)	15 (15)
High diastolic BP (≥ 90)	17 (17)
High BP (SBP ≥ 140 or DBP ≥ 90)	21 (21)

Almost half of the adult participants tested had a suboptimal OGTT indicating prediabetes (44%) or diabetes (3%). Based on HbA1C, even more participants met criteria for prediabetes (53%) or diabetes (2%). The most common lipid abnormality was low HDL (25%), and 21% of participants had high blood pressure.

Obesity was very prevalent in our study cohort. Ninety-five percent of adult participants were at an unhealthy weight (BMI $\geq$ 25). Twenty-three percent were overweight (BMI $\geq$ 25 and <30) and seventy-three percent were obese (BMI $\geq$ 30). Eighty-four percent of the cohort had waist circumferences above the threshold associated with increased risk for diabetes and heart disease (> 40 inches for men, > 35 inches for women). [60]

Table 6 shows laboratory and measurement data from the 10 adolescents enrolled at the diabetes screenings. Three of these participants had a suboptimal OGTT indicating prediabetes and six had at least one lipid abnormality. Similar to the adult cohort, obesity rates were high among adolescent participants. Nine participants were obese, with BMIs $\geq 95^{th}$ percentile, and nine had waist circumferences $\geq 90^{th}$ percentile.

Table 6. Laboratory data and measurements for children ages 12-17 (N=10)

Laboratory Testing	n
2-hour 75 g OGTT[A]	
Normal	7
Prediabetic	3
Diabetic	0
HbA1C (n=10)	
Normal (< 5.7)	8
Prediabetic (5.7-6.4)	2
Diabetic (≥ 6.5)	0
Fasting lipids (n=10)	
High total cholesterol (≥ 240)	0
High LDL (≥ 160)	1
Low HDL (< 40)	5
High triglycerides (≥ 200)	0
Measurements	**n**
BMI percentile for age and sex	
Healthy Weight (≥5th and <85th percentile)	0
Overwieght (≥ 85th and <95th percentile)	1
Obese (≥ 95th percentile)	9
Waist circumference percentile for age and sex	
≥ 75th and < 90th percentile	1
≥ 90th percentile	9
Blood pressure	
High systolic BP (≥ 130)	0
High diastolic BP (≥ 85)	0

A. No missing values; n=10 for all outcome measures.

Longitudinal DPP/BB Program Outcomes

Sixteen adult study participants attended the DPP classes. Different sessions of the DPP varied slightly in terms of the number of exercise classes offered, with one session offering 32 exercise classes and one session offering 35. Both sessions studied offered 14 nutrition classes. Class attendance varied widely among the participants (Table 7). The mean percentage of nutrition classes attended was 46 ± 25% with a range of 7 – 93%. The mean percentage of exercise classes attended was 31 ± 22%, ranging

from 0 – 84%. The mean percentage of total classes attended was 35 ± 22%, ranging from 2 – 87%. The DPP participants returned an average of only 1.0 ± 1.5 food diaries (range 0 – 5), and 0.4 ± 0.6 exercise diaries (range 0 – 7). Among participants who had initial and final weights recorded ≥ 5 weeks apart during the program (n=11), the average weight change was -2.0 ± 4.5 lbs, ranging from -9.0 lbs to +4.0 lbs.

Five adult parents and four adolescents attended the BB classes, however attendance and weight loss data was only recorded for the adolescents (Table 8). Furthermore, no records of exercise class attendance or food/exercise diary completion were kept for the BB session attended by most participants, so this data was unavailable. The mean percentage of nutrition classes attended by the four adolescents was 43 ± 19%, ranging from 17 – 64%. Only three of the adolescents had initial and final weights recorded ≥ 5 weeks apart during the program. Their average weight change was -4.5 ± 0.46 lbs, ranging from -4.9 lbs to -4.0 lbs.

Only three participants (two DPP adults and one BB parent) completed a follow-up FAD-GF during week 11 or 12 of the program. Among these three participants, the mean baseline FAD-GF score was 2.33 ± 0.08, and the mean follow-up FAD-GF score was 2.03 ± 0.25, for an average decrease of 0.31 ± 0.32 indicating healthier family functioning at follow-up. We compared the mean FAD-GF score at baseline with the mean score at 11-12 weeks using a paired samples t-test and found that the difference was not significant in this small sample ($p = 0.235$).

Table 7. DPP program attendance, participation and weight change (n=16)

Attendance (n=16)	
Nutrition classes attended (%) *14 classes offered*	46 ± 25 (7 – 93)[A]
Exercise classes attended (%) *32-35 classes offered*	31 ± 22 (0 – 84)
Total classes attended (%)	35 ± 22 (2 – 87)
Participation (n=16)	
Food diaries returned (n)	1.0 ± 1.5 (0 – 5)
Exercise diaries returned (n)	0.4 ± 0.6 (1 – 2)
Total diaries returned (n)	1.4 ± 2.0 (0 – 7)
Weight Change[B] (n=11)	
Change in weight during program (pounds)	-2.0 ± 4.5 (-9.0 – +4.0)

A. Mean ± SD (range)
B. Among participants with first and last weights recorded ≥ 5 weeks apart

Table 8. BB program attendance and weight change (n=4)

Attendance (n=4)	
Nutrition classes attended (%) *11-12 classes offered*	43 ± 19 (17 – 64)[A]
Weight Change[B] (n=3)	
Change in weight during program (pounds)	-4.5 ± 0.46 (-4.9 – -4.0)

A. Mean ± SD (range)
B. Among participants with first and last weights recorded ≥ 5 weeks apart

Demographic Factors and Family Functioning

We did not find a significant difference between participants with healthy family functioning scores vs. unhealthy family functioning scores in terms of age ($p = 0.946$),

gender (p = 0.609), ethnicity (p = 0.230), country of origin (p = 0.638), primary language (p = 0.619), or education level (p = 0.146) (Table 9).

There was a trend towards an association between family functioning and insurance type. The group with healthy family functioning scores had a higher percentage of participants with private insurance (34% vs. 18%) and a lower percentage with Medicaid (51% vs. 71%) compared to the group with unhealthy family functioning scores, but the association was not statistically significant, χ^2 (3, n=91) = 6.466, p = 0.091. Using a one-way ANOVA, we did find significant variance in family functioning score with insurance type, F (3, 87) = 3.47, p=0.02. Tukey HSD post-hoc analysis shows a significantly higher (less healthy) family functioning score in participants with Medicaid v. private insurance (p = 0.048). The mean family functioning score is significantly higher (less healthy) among participants with Medicaid compared to those with private insurance (2.00 v. 1.72, p = 0.012).

The average family functioning score was higher (less healthy) in participants who did not graduate from high school compared to those who had completed some college, graduated college or attended graduate or professional school (2.05 v. 1.84), and this trend approached statistical significance (p = 0.056).

The average number of children in the household was higher in the group with unhealthy family functioning (1.76 v. 1.36), but this difference did not reach statistical significance (p = 0.090) and there was no significant correlation between number of household children and family functioning score, r (106) = 0.126, p = 0.19.

Table 9. Associations between demographic factors and family functioning (N=129)

	FAD-GF Score		p
	Healthy < 2.0 (n=61)	**Unhealthy** ≥ 2.0 (n=68)	
Age, *years* (n=129)	38.4 ± 13.9[A]	38.6 ± 13.4	p = 0.946
Sex (n=129)			
Female	50 (82)[B]	58 (85)	p = 0.609
Ethnicity (n=128)			
Asian or Pacific Islander	0 (0)	1 (2)	p = 0.230
African American	13 (22)	11 (16)	
Hispanic	40 (67)	51 (75)	
Caucasian	7 (12)	3 (5)	
Other	0 (0)	2 (3)	
Country of Origin (n=127)			
USA	31 (52)	29 (43)	p = 0.638
Puerto Rico	14 (23)	18 (27)	
Other	15 (25)	20 (29)	
Language (n=110)			
English	23 (47)	23 (38)	p = 0.619
Spanish	21 (43)	31 (51)	
English and Spanish	5 (10)	7 (12)	
Education level (n=108)			
Did not graduate from high school	15 (31)	29 (49)	p = 0.146
Graduated high school/ GED	19 (39)	16 (27)	
Some college, graduate or professional school	15 (31)	14 (24)	
Insurance Type (n=91)			
Uninsured	6 (13)	2 (5)	p = 0.091
Medicaid	24 (51)	31 (71)	
Medicare	1 (2)	3 (7)	
Private	16 (34)	8 (18)	
Household size, *persons*			
Adults (n=109)	2.08 ± 1.22	1.93 ± 1.07	p = 0.501
Children (n=106)	1.36 ± 1.07	1.76 ± 1.29	p = 0.090
Total (n=105)	3.47 ± 1.79	3.71 ± 1.74	p = 0.491

A. Mean ± SD
B. n (%)

Laboratory Data, Measurements and Family Functioning

We did not find a significant association between baseline family functioning score and baseline OGTT results, HbA1C, fasting lipids, BMI category, waist circumference or blood pressure in adult participants (Table 10).

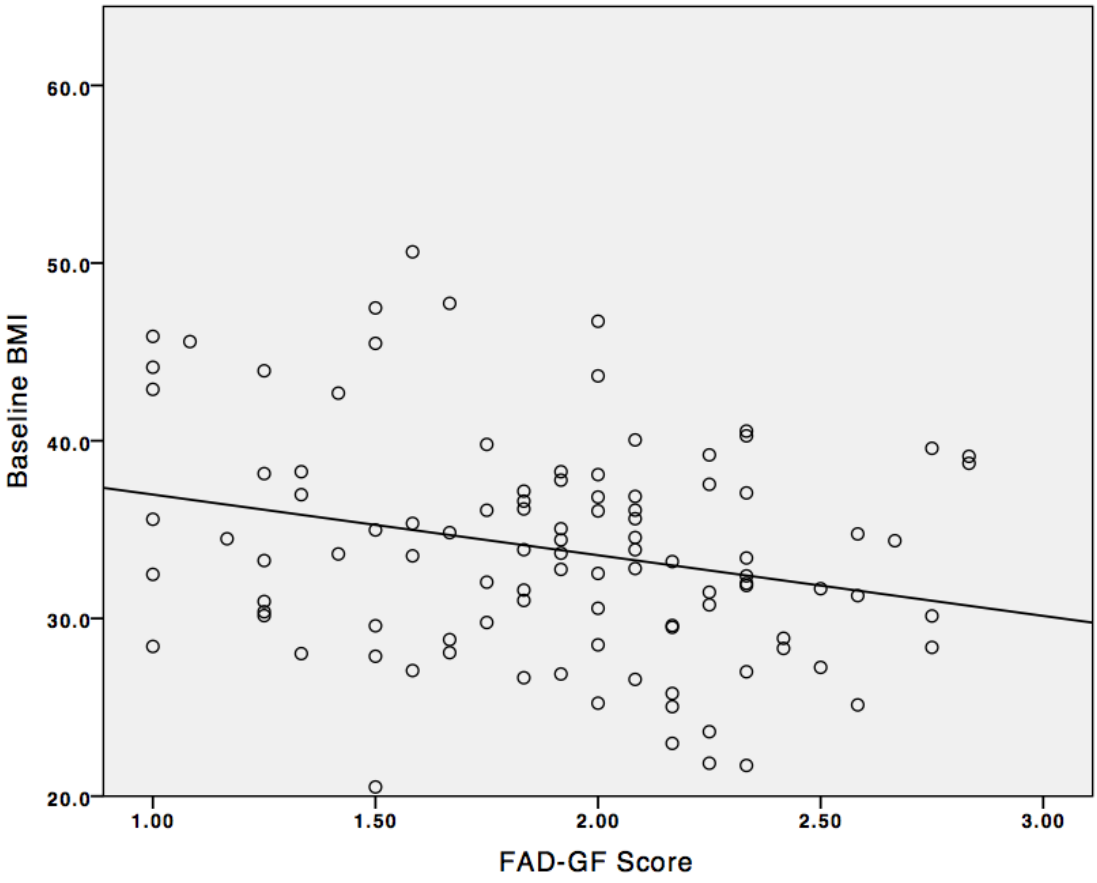
Table 10. Association between family functioning and laboratory data and body measurements in adult participants (N=107)

	FAD-GF Score		p
	Healthy < 2.0 (n=61)	**Unhealthy** ≥ 2.0 (n=68)	
Laboratory Testing			
2-hour 75 g OGTT (n=98)			
Normal	26 (52)[A]	26 (54)	p = 0.778
Prediabetes	23 (46)	20 (42)	
Diabetes	1 (2)	2 (4)	
HbA1C (n=95)			
Normal (< 5.7)	26 (52)	17 (38)	p = 0.378
Prediabetic (5.7-6.4)	23 (26)	27 (60)	
Diabetic (≥ 6.5)	1 (2)	1 (2)	
Fasting lipids (n=97)			
High total cholesterol	3 (6)	2 (4)	p = 0.698
High LDL	4 (8)	1 (2)	p = 0.191
Low HDL	10 (20)	14 (30)	p = 0.264
High triglycerides	5 (10)	5 (11)	p = 0.918
Measurements			
BMI (n=102)			
Healthy Weight (≥ 18.5 and < 25)	1 (2)	4 (8)	p = 0.262
Overweight (≥ 25 and < 30)	10 (20)	13 (26)	
Obese (≥ 30)	40 (78)	34 (67)	
BMI (n=102)	35.2 ± 6.4[B]	32.5 ± 5.7	**p = 0.027***
Waist circumference (n=79)			
At risk (> 40 inches for men, > 35 inches for women)	35 (88)	31 (80)	p = 0.337
Blood pressure (n=102)			
Hypertension (SBP ≥ 140 or DBP ≥ 90)	12 (24)	9 (18)	p = 0.463

A. n (%), B. Mean ± SD, *Statistically significant at $p < 0.05$

However, the average baseline BMI in the healthy family functioning group was significantly higher than in the unhealthy group (35.2 vs. 32.5, p = 0.027). There was also a significant negative correlation between baseline BMI and family functioning score at baseline, indicating an association between healthier family functioning (lower FAD-GF scores) and higher BMI in adults, *r* (102) = -0.257, p = 0.009 (Figure 8).

Figure 8: Correlation between FAD-GF score and baseline BMI in adults



Program Enrollment, Program Participation and Family Functioning

The number of study participants offered enrollment in the DPP/BB program was small (n=39), and only 19 participants enrolled in the program. Among participants

eligible for the program, the enrollment rate was slightly higher in participants with healthy family functioning (53%) compared to participants with unhealthy family functioning (46%), but the difference was not statistically significant (p = 0.643) (Table 11). The healthy family functioning group also had higher attendance rates, attending 36% of all classes vs. 28% in the unhealthy family functioning group, but the difference in means was not statistically significant (p = 0.435). Only 14 participants had initial and final weights recorded ≥ 5 weeks apart during the program. There was a statistically significant difference in average weight loss between the healthy and unhealthy family functioning groups. Unexpectedly, the group with unhealthy family functioning lost more weight (-5.02 ± 3.21 lbs) compared to the group with healthy family functioning (-0.61 ± 3.83 lbs), p = 0.042.

Table 11. Association between family functioning and DPP/BB program participation

	FAD-GF Score		**p**
	Healthy < 2.0	Unhealthy ≥ 2.0	
Enrollment (n=39)	n=17	n=22	
Eligible participants who enrolled in the DPP/BB program	9 (53)[A]	10 (46)	p = 0.643
Nutrition Class Attendance (n=21)	n=10	n=11	
Percent nutrition classes attended (%)	48 ± 26[B]	41 ± 23	p = 0.519
Total Class Attendance (n=18)	n=9	n=9	
Percent nutrition + exercise classes attended (%)	36 ± 26	28 ± 19	p = 0.435
Change in Weight (n=14)	n=8	n=6	
Change in weight, *pounds*	-0.61 ± 3.83	-5.02 ± 3.21	**p = 0.042***

A. n (%)
B. Mean ± SD
*Statistically significant at p < 0.05

Discussion

This study is the first to measure family functioning in a cohort being screened for diabetes at a community health center for the purpose of enrollment in a lifestyle intervention program. We characterized a sample of the patients who attended the FHCHC diabetes screenings, and found that these patients are predominantly Hispanic or African American females, with high rates of obesity and prediabetes compared to the general population. In the United States in 2009-2010 the prevalence of obesity was 36% among all adults, 38% among Hispanics and 50% among non-Hispanic Blacks.[1] Among 12-19 year olds, 34% had a BMI $\geq 85^{th}$ percentile.[2] In contrast, 73% of adults in our cohort were obese and 100% of adolescents age 12-18 had a BMI $\geq 85^{th}$ percentile.

Clearly this is a high-risk cohort, reflecting the fact that a clinician referred them to the FHCHC diabetes screening for having at least one diabetes risk factor. As expected, the rate of prediabetes (44%) among our cohort is high compared to the US prevalence, which ranges from 7-32% depending on the criteria used.[61] The rate of diabetes diagnosed at screening (3%) is consistent with the prevalence of undiagnosed diabetes in the United States (2.8%).[4]

About half of participants reported unhealthy family functioning (53%). The population prevalence of unhealthy family functioning has not been studied, but only 25% of families who have a child with a chronic medical condition reported unhealthy family functioning.[62] The high rates of unhealthy family functioning in this cohort suggest that family functioning may be an important issue for many FHCHC families being screened for diabetes.

Our data shows a significant association between family functioning and insurance type, with Medicaid being linked to less healthy family functioning and private insurance corresponding to healthier family functioning. These results are consistent with previously reported associations between higher socioeconomic status and healthier family functioning.[37, 62, 63]

The unexpected correlation between healthy family functioning and higher BMI in adults contradicts our original hypothesis that *unhealthy* family functioning would be linked to higher BMI. The association of unhealthy family functioning with significantly greater weight loss among program participants was also unexpected. The finding that healthy family functioning is associated with higher baseline BMI and less weight loss during the program raises interesting questions about the relationship between family, food, culture and obesity.

Results from previous studies of family functioning and BMI in children are mixed, with some studies demonstrating an association between unhealthy family functioning and higher BMI,[30] and others finding no relationship between family functioning and childhood obesity.[31, 32] Other studies have shown an association between healthy family functioning and healthy behaviors in children, like eating a healthier diet, lower soda intake and more physical activity.[33]

This is the first study to directly explore the relationship between family functioning and BMI in adults. Johnson, et al. asked adult participants to rate family functioning using the FACES instrument. Instead of rating current family functioning, these participants were asked to remember the functioning of their family of origin when they were 15 years old. This study showed that healthier scores on the family cohesion

scale were associated with healthier eating attitudes in adult men but not in women.[40] In contrast, healthier scores on the family adaptability scale were associated with an earlier onset of obesity in adult men. These results demonstrate that different domains of family functioning can either positively or negatively impact obesity risk. The finding that one aspect of healthy family functioning during adolescence (adaptability) was associated with earlier onset adult obesity supports our finding that healthy family functioning may be associated with higher BMI. However, Johnson, et al. used the FACES instrument to measure family functioning rather than the FAD-GF, they measured past family functioning instead of current family functioning, and they studied a different population – mostly Caucasian, highly educated men. Wen, et al. found that unhealthy family functioning scores on the FAD-GF were associated with a higher number of obesity-related behaviors in pregnant women, which contradicts our results, but they did not directly examine the relationship between family functioning and BMI.[41]

The association between healthier family functioning and higher socioeconomic status (SES) does not explain the association between healthy family functioning and adult obesity. We found no association between insurance type (a proxy for SES) and BMI, but previous work has demonstrated an association between higher SES and lower BMI.[64] If healthy family functioning is associated with higher SES (as demonstrated by our data and the literature), and higher SES is associated with lower BMI (as demonstrated by previous studies), then healthy family functioning should be associated with lower BMI. Our data show the opposite result. None of the other demographic characteristics we examined were significantly associated with family functioning and are unlikely to explain the association with BMI.

We expected healthy family functioning to be generally health promoting, but healthy family functioning maybe not be intrinsically linked to healthy behaviors. One possible explanation for our findings is that strong family relationships can serve to reinforce a family's lifestyle, regardless of whether it is a healthy or unhealthy lifestyle. Families that function well may be characterized by high degrees of family connectedness, closeness and influential relationships between family members. These relationships will only be protective against obesity if they augment healthy behavior, and could contribute to weight gain if they revolve around sharing unhealthy food, participating in sedentary activities, or perpetuating cultural norms that are more accepting of overweight and obesity. Healthy relationships and healthy families as defined by the FAD-GF, may be sharing and reinforcing unhealthy lifestyles in our cohort.

The Spread of Obesity in Social Networks

In 2007, Christakis, et. al. demonstrated the spread of obesity through large social networks within the Framingham Heart Study cohort.[65] They showed that if a person's friend became obese, the probability that the person would become obese increased by 57%. The chances of the person becoming obese increased by 40% if their sibling became obese and by 37% if their spouse became obese. These effects were not seen among neighbors, suggesting that social relationships rather than shared environments caused obesity to spread within social networks. Subsequent studies have also demonstrated the spread of smoking, alcohol consumption, health screening, happiness, loneliness, depression, sleep, drug use, divorce and food consumption within social networks, leading to the development of "Social Contagion Theory."[66] Christakis says

that, "the observation that people are embedded in social networks suggests that both bad and good behaviors might spread over a range of social ties."[65]

Consistent with CBPR, we continually have shared our preliminary findings and then results with the whole DPP/BB team. The idea that obesity spreads through social networks has resonated with the DPP/BB program staff based on their experience working with families who struggle with obesity. Elizabeth Magenheimer is a nurse practitioner at FHCHC who has developed a 2-hour educational lecture about obesity and diabetes that she presents to participants in the diabetes screenings during their OGTT. In her talk she introduces the idea that obesity and diabetes are contagious. "What happens when you have the flu, and you sneeze on your hand and shake hands with another person?" she asks the participants. "You give them the flu . . . What happens if you give your child cake everyday? Are you going to give them diabetes?" She goes on to talk about our motivations for sharing unhealthy food. "Often we give our family sweets to say, 'I love you,' but are we really saying, 'I love you and I want you to have diabetes someday?'" Magenheimer helps participants think about the complex relationship between food, family and parenting, and helps them confront the reality that using unhealthy food to express love and support can have detrimental long-term effects on whole families and communities.

Christakis and several others have proposed that the mechanism for the spread of obesity through social networks might involve the strong influence of social norms related to food, physical activity and body image.[65, 67, 68] The tendency to express love and affection with food is one example of a social norm that could contribute to a

person's perception that they have supportive relationships with their family members, and at the same time contribute to weight gain and obesity.

Social Norms and Cultural Influences on Obesity

Since our cohort was predominantly Latino and African American, this discussion will focus on social norms that have been reported by these groups. The terms "Latino" and "Hispanic" encompass people from many different Spanish-speaking countries and different cultures, and "African American" refers to a similarly diverse racial/ethnic group within the US. We recognize that social norms and culture are heterogeneous,[69] but intend to offer several examples of social norms and cultural influences that may be contributing to the association between family functioning and obesity in our cohort.

Ideal body image varies across different cultures. In developing countries, obesity is often valued as a symbol of wealth and status, whereas developed countries have increasingly embraced the ideal of thinness.[70] African-Americans and Latinos tend to prefer a larger ideal body size than Caucasians.[71, 72] African-American women have less negative views about obesity, greater body satisfaction and a larger ideal body size than Caucasian women.[72, 73] The traditional ideal body type for Latinos is described as "curvy" or "thick," and this is considered healthier than being thin.[71] Some Latinos believe that thinness is related to sickness.[74] African-American and Latino women sometimes feel pressure from their families to maintain a larger body size. In Franko's work, a 19-year old Latina described this pressure: "Oh yeah, well I don't perceive myself as you know, skinny or whatever, my mom just always says it like, "Oh you're so skinny!" I don't know, I guess you could take that to mean, you know, you should be curvier, you're not eating enough, or something like that."[71]

Latinos also have heavier body image ideals for their children. Thinner children are considered fragile, unhealthy and less attractive than heavier children, and many parents consider their overweight children to be at a normal weight.[75] Healthcare providers have noted that when they call a baby "gordito" or "chubby" Mexican American parents take it as a compliment because the term indicates good health and good parenting.[76]

Possibly because of their heavier body image ideals, overweight and obese Latina and African-American women are more likely than Caucasian women to under-assess their weight.[77, 78] Lower income and lower education levels have also been associated with weight misperception – perceiving your weight as normal when you are actually overweight or obese.[77, 78] People are more likely to under-assess their weight if they are surrounded by heavier peers,[79, 80] and weight misperception has been associated with fewer behaviors aimed at weight loss or weight maintenance.[81, 82] Weight misperception may therefore contribute to the spread of obesity through social networks.

Social norms related to ideal body size and weight misperception that are shared within families could contribute to both healthy family functioning and obesity. Two questions on the FAD-GF ask participants whether members of their family are "accepted for what they are." Participants' families may be more likely to accept their current weight if they are overweight or obese and conform to a heavier ideal body image.

Feeling pressure from family members to overeat is a common theme in qualitative studies of African-American and Latino women. In one study, an African-American woman described feeling pressured by her mother: "I would say, 'It's my mother,' because I live with my mother now. . . She'll say, 'Honey, taste this, just taste

this,' and I'm the only child, so it's like she's always feeding me. No one's holding a gun to my head but my mother!"[72] The Latino cultural value *simpatia*, meaning " a deferent compliance with others' wishes in order to maintain interpersonal relationships,"[83] makes it socially unacceptable to refuse food when a family member insists on serving you.[84] This is especially true at family celebrations. In Thornton's work, a Latina woman said, "whenever someone offers us something to eat, to be polite, we don't refuse . . . we do that to be courteous or for the sake of our friendship."[85] Connors et al. found that adults use five main food-related values to make food choices: taste, health, cost, time and social relationships. They also found that these values are often in conflict (i.e. health v. maintaining social relationships), requiring people to prioritize their values in making food choices. The Latino cultural values of *simpatia*, and *familismo* (a strong sense of loyalty to the family)[83] are sometimes prioritized over health in social situations.

Many women feel it is their duty to feed their family and strongly identify with their traditional gender role as a caretaker and provider for the family. Sometimes these female cooks exert pressure on other family members to eat. One African-American woman takes offense when family members do not eat what she has prepared: "I get upset if my cousins come to my house, and they don't eat. It is sort of insulting because I am the cook in my house. Sunday I fried 3 pounds of chicken legs and thighs, and I fried a pound of potatoes then I baked the chicken with gravy, green beans, and mashed potatoes. My cousin came over and he didn't eat. I looked around that kitchen, and said, 'Why did I cook all this food?' I have to cook for everybody, I have to take care of everybody."[72] A young Latina women describes how her mother felt insulted when she tried to eat less food: "When I was younger I didn't really care, but when I was older and

I started to care more about my weight, I would cut down her portions and she would get offended almost, in a way, because it was like I didn't like her food, but really I was just trying to control my weight."[71]

Other women talk about the importance of cooking traditional food for their families. A 16-year old Puerto Rican girl describes how the women in her household cook for the men: ''[Our family is] very old fashioned, so [me and my sisters] are raised to cook and clean and take care of the guys and like I have to take care of my younger brother now and get him what he wants to eat and all because it is a tradition."[86] Cooking traditional food is a form of cultural expression and a way of preserving cultural traditions, but these foods are not always healthy. Traditional African-American "soul food" is high in fat, calories and salt.[87] One African American woman said, "if the hostess cooked less oily food for social functions, no one would come to the party."[72] Latino food can also be high in fat and calories.[84]

Many Latino women consider the preferences of their family members very important, and describe situations where the value of social relationships takes precedence over health when making food choices and other lifestyle choices. Mexican-American women shop for food that is affordable and that their family prefers, and these considerations are often more important than health concerns.[88] These women are reluctant to purchase healthier alternatives because they do not want to spend money on food that their family would not like. Parents may defer to the preferences of their children when making other lifestyle choices as well. One qualitative study found that child preference for avoiding physical activity, eating fast food and eating an unhealthy diet was an important barrier to adopting obesity prevention recommendations.[74]

The cultural values of *familismo* and *simpatia* are evident in Latino parents' infant feeding practices. Parents are often pressured by family members, especially the infant's grandmother, to adopt traditional feeding practices.[76] Traditional practices include the early introduction of complementary foods like cereal, which healthcare providers believe contributes to child obesity. Sweets, juice and unhealthy food are often used as a way to indulge children or as a bribe to control their behavior, a practice that is reinforced by extended family members.[89] *Familismo* and *simpatia* make it difficult for parents to ignore advice given by extended family members, especially when those family members are a source of child care or food for families with few resources.[76]

In an ethnographic study, Kaufman et al. describe how low-income Latino families in Brooklyn use food to show love and caring in the face of economic uncertainty:

> Food—in contrast with material goods and housing—is an achievable source of gratification for parents and children. Food is relatively inexpensive, and satisfies immediate needs. . . For kin and non-kin alike, feeding symbolizes nurturing and achievement. It is one arena where they can take care of themselves and their families in the face of daily poverty. When it comes to gratifying children with food, ''eating right'' means satisfying wants and needs. It frequently involves unhealthy options and overfeeding. For parents, ''eating right'' is good parenting. In this context, health takes a back seat to values of parental responsibility embodied in the act of food gratification.[90]

Many other qualitative studies have also identified the theme of using food to express love for family members.[71, 72, 76, 86, 89]

Latino and African-American cultural and social norms related to body image, weight perception, food preferences, child feeding practices and the expression of love and support through food may all contribute to the association between healthy family functioning and obesity. The FAD-GF showed an association between family functioning and adult obesity quantitatively, but the qualitative literature provides possible explanations for this association and rich insight into the relationship between family, food and obesity in different cultural groups. In the future, mixed methods studies combining quantitative measures of family functioning like the FAD-GF with focus groups and interviews may provide better insight into the relationship between family functioning and obesity.

Translational Science

This study adds to the literature about family functioning and obesity in several ways. First, this was the first study to directly examine the relationship between family functioning and adult BMI, and we found an unexpected association between healthy family functioning and adult obesity. Certain themes in the qualitative literature support this association, but further study of family functioning and obesity are warranted to better explain how family functioning is related to obesity in different cultural and socioeconomic groups.

Second, this study demonstrates how CBPR principles can be used to answer research questions that are important to an existing community program, and how these questions can be studied within the existing framework of that program. Investigators from Yale collaborated with key stakeholders from the DPP/BB program to develop research questions that were of interest to the program. We then attempted to answer

those questions by creating a study design that took advantage of the existing structure of the FHCHC diabetes screenings and the DPP/BB program. This approach had several advantages over more traditional study designs; it allowed us to conduct meaningful research with limited research funding and ensured that the results were applicable to FHCHC's patient population and the DPP/BB program participants. In addition to answering some of the research questions, we discovered novel information about the structure of the DPP/BB program, revealing how patients flow through the process of FHCHC diabetes screening, DPP/BB program enrollment and program participation. Our results reveal the complexity of the screening and enrollment process, which could inform the design of future studies about the program.

According to Woolf, a definition of translational research is "translating research into practice; ie, ensuring that new treatments and research knowledge actually reach the patients or populations for whom they are intended and are implemented correctly."[91] By asking research questions informed by the needs of a community program, and conducting research in collaboration with that program, we were able to ensure that our results were applicable to the diabetes screening and DPP/BB program participants.

Limitations

Our study design ensured that our results would be applicable to our study population, but this limits the generalizability of our results. We recruited our cohort at diabetes screenings held at one community health center, and our cohort reflected the characteristics of that population: predominantly low-income Latino and African-American women, with a high prevalence of overweight and obesity. Our results may not be applicable to other racial/ethnic groups, people of higher SES or men. Only 5% of

the adults in our study were at a normal weight, so we do not know whether the association between healthy family functioning and higher BMI is also true among normal weight individuals.

We collected data about family functioning from all 107 adults, BMI data from 102 and OGTT data from 98, so we were able to confidently examine the relationship between family functioning, and obesity and prediabetes. However, our ability to answer questions about family functioning and program enrollment and participation was limited by a small sample size in that phase of the study. While we enrolled a total of 129 participants, only 39 were eligible for the DPP/BB program. We did not find any factors predictive of enrollment or program participation in this small cohort, but these questions warrant further study with a larger sample. The association between unhealthy family functioning and greater weight loss during the program was statistically significant, but this result should be considered with caution given the very small sample size (n=14).

The FAD-GF has been validated in English[51] and Spanish,[52] but it has not been adapted for low-literacy populations. Given that 41% of our cohort did not graduate from high school, some may have had difficulty understanding the questions on the FAD-GF. Several questions on the FAD-GF involve negative statements such as, "Do you strongly agree, agree, disagree or strongly disagree with the statement: 'We cannot talk to each other about sadness we feel.'" These statements could be especially confusing to participants with low literacy levels. Recognizing that literacy could be an issue for our participants, we adapted the FAD-GF by adding pictorial representations of the answer choices and eliminating abbreviations to make it easier to understand. We did not

conduct a formal validation of the pictorial instrument but we did assess it for acceptability by asking research team members and DPP/BB program staff to review it.

The questions about household size were interpreted in different ways by different people. Some participants included themselves in the number of adults in their household as we intended, but other adult participants wrote "0" for the number of adults in their household. The number of children in each household was probably recorded more accurately by adults in the study, and this was the only measure of household size where the difference in means between participants with healthy vs. unhealthy family functioning approached statistical significance.

The FAD-GF should ideally be completed by multiple family members.[53] We did attempt to recruit multiple family members when they were attending the diabetes screening together, but the majority of our participants did not have other family members participating in the study. Our 129 participants represent 111 distinct families; 96 families had only one person enrolled and only 15 families had two or more family members enrolled. Due to the small number of families with multiple family members represented, we did not conduct any family-level analysis of family functioning.

We did not clearly define the concept of "family", allowing participants to answer questions about their family in the way that they define it. Among Latino participants, the cultural value of *familismo* may have influenced participants to define their family more broadly to include extended family members.[83] The decision to leave the concept of "family" open to interpretation makes the results less specific, but also makes them more representative of how participants conceptualize and view their families.

Designing this study within the existing framework of the DPP/BB program had several advantages, but also created some limitations. Given the dynamic, flexible and complex nature of the program, it was harder to control for factors that may have influenced our results. This was first illustrated at the diabetes screenings (figure 1A). We had attendance lists of all of the people signed up to participate in the screening, but many screening participants brought other family members or friends with them. These family members or friends were invited to participate in our study as well, so the actual number of eligible subjects present at the screenings was slightly higher than the attendance sheets indicated, and not all study participants came to the diabetes screenings to get screened.

In the phase of the study when eligible adults and children were invited to participate in the DPP/BB program (figure 1C), 5 adults and 1 child were not invited because they were not considered good candidates for intervention. It is unclear why these participants were not considered good candidates, but it is possible that they were considered unlikely to attend due to prior problems with follow-up or treatment adherence. Removing these 6 participants from the sample could have biased the sample away from those who might need the intervention the most, while also biasing the sample toward those who might best engage in the intervention.

Of the 18 adults who went through the diabetes screening process and were eligible and willing to enroll in the DPP/BB program, 6 were enrolled in the delayed arm of a separate randomized controlled trial studying the effectiveness of the DPP and were scheduled to attend the lifestyle intervention in one year. One of the limitations of doing community-based, translational research is that study participants may be involved in

multiple studies looking at a specific population or program. Involvement in one research study may interfere with a subject's involvement in a second study.

In the DPP/BB program phase of the study (figure 1D), our sample size was very small; 5 adults and 4 adolescents in the BB program and 16 adults in the DPP. Unfortunately attendance records and weekly weights were not kept for the adults enrolled in the BB program, further decreasing our sample size when examining program attendance and outcomes. Some of the study participants had participated in previous sessions of the DPP/BB program that occurred before the beginning of this study, but we could not reliably collect this information for all participants. Prior participation in the program could influence subsequent participation, but we could not account for this variable in our analysis.

Implications

Unhealthy family functioning is an important issue among patients attending the FHCHC diabetes screenings, and likely affects a large number of people in the Fair Haven neighborhood and other low-income urban neighborhoods. Although unhealthy family functioning was prevalent, we found that healthy family functioning may be a risk factor for adult obesity. This finding highlights the importance of exploring the relationship between family, food, culture and obesity. Strong family relationships may actually be perpetuating social and cultural norms that cause obesity to spread through social networks.

FHCHC continues to develop family-based programs to address obesity and diabetes in the Fair Haven community. This presents an exciting opportunity to study the impact of these programs on social and cultural norms that are reinforced by family

relationships and contribute to unhealthy lifestyle choices. Mixed methods studies that combine quantitative measure of family functioning with qualitative methods could be particularly useful. Small sample sizes limited our ability to draw conclusions about the impact of family functioning on enrollment and participation in the DPP/BB program, but these questions also warrant further research. Further research is necessary to better define the relationship between family functioning and obesity and the interaction of this relationship with cultural and economic factors.

Appendices

A. "Supporting Each Other" Family Time Activity
B. English Survey and FAD-GF
C. Spanish Survey and FAD-GF

A. Supporting Each Other Family Time Activity

Healthy Lifestyle Program

Healthy Eating
Being Active

Fair Haven Community Health Center
Diabetes Prevention Program

Session 11:

Supporting Each Other

A. Supporting Each Other Family Time Activity (continued)

Fair Haven Community Health Center Diabetes Prevention Program
Session 11 Facilitator Script Summary

Session 11:
Supporting Each Other Activity

Goals of the Activity:

- Parents will discuss ways that their kids can support them in being healthy (i.e. eating healthy food and exercising more)
- Kids will discuss ways that their parents can support them in being healthy (i.e. eating healthy food and exercising more)
- Each group will contribute ideas for a "Letter to the Parents" and a "Letter to the Kids" expressing ways that family members can support each other in adopting healthier lifestyles. These letters will be given to all participants at the final class
- The letters will serve as a way for kids and parents to communicate with each other.
- The letters will also be used to examine participants' perceptions of the role of the family in achieving/maintaining health through diet and exercise. Themes identified through this activity may be helpful in developing the family-centered components of the DPP and Bright Bodies programs.

Structure:

- Each Session will last **30 minutes**
- Give each participant the Supporting Each Other Handouts, blank paper and pens/markers/crayons to write down any ideas that they come up with on their own
- Select one of the participants to write down the group's ideas on the large paper provided
- At the end of the session, collect all of the written ideas and type them up as a list of ways that the kids/parents can support one another. This list should reflect the discussion as accurately as possible.
- A DPP/BB Coordinator will collect these lists and draft the "Letter to the Kids" and "Letter to the Parents" to be translated and handed out at the next class

A. Supporting Each Other Family Time Activity (continued)

Fair Haven Community Health Center Diabetes Prevention Program
Session 11 Facilitator Script - Kids Group

Session 11:
Supporting Each Other Activity

Facilitator To Do Before the Session:

- Gather supplies:
  - Large sheets of white paper
  - Tape for hanging paper
  - Markers
  - Pens
  - Handouts
- Read through suggested questions

Guidelines for Facilitating Discussion

- Try to keep the questions simple
- Start with the positive (i.e. "What can your family do to support you?" rather than "What does your family do wrong.")
- However, talking about barriers or difficult family dynamics is okay, too.

Introduction

- Introduce yourself and welcome all.
- Briefly describe your background and qualifications for leading the group. Introduce any other staff members. Describe your roles.
- Give each participant the Supporting Each Other Handouts, blank paper and pens/markers/crayons to write down any ideas that they come up with on their own

Today we are going to talk about ways that our families can help us be healthier. Sometimes our family members do things that help us stay healthy, and sometimes they do things that make it hard for us to stay healthy. We imagine there are things that you would like to tell the grown-ups in your family that are hard to say – this is your chance. Without letting them know which one of you said it, we will tell your parents what you, as a group, say in a letter.

A. Supporting Each Other Family Time Activity (continued)

- Give the group about 5 minutes to write down their ideas on the handouts before starting the group discussion
- Select one of the participants to write down the group's ideas on the large paper provided.

Questions for Group Discussion

1. How can the grown-ups in your family help you be healthier?

2. Are there things that they do that make it harder for you to be healthy?

3. What can the grown-ups in your family do to help you make healthy food choices?

    a. How about at breakfast? Dinner? Snacks?
    b. Are there healthy foods you wish were in your home?
    c. Are there unhealthy foods you wish were not in your home?

4. In the future my family could help me move more / get more exercise by . . .

    a. What games and exercises have you learned here that you could do at home or teach your family?
    b. Tell us about your favorite games and exercises here.
    c. Are there times you were outside and/or active with your family in the past? Would you like to do those things again?

Wrap-Up

- At the end of the session, collect all of the written ideas and type them up as a list of ways that the kids/parents can support one another. This list should reflect the discussion as accurately as possible.
- A DPP/BB Coordinator will collect these lists and draft the "Letter to the Kids" and "Letter to the Parents" to be translated and handed out at the next class

A. Supporting Each Other Family Time Activity (continued)

Supporting Each Other Activity

Questions for Kids

- Write down at least one way that the grown-ups in your family can help you be healthier.

- Write down at least one thing that the grown-ups in your family do that makes it harder for you to be healthy.

A. Supporting Each Other Family Time Activity (continued)

Supporting Each Other Activity
Questions for Kids

- Write down at least one thing that the grown-ups in your family can do to help you make healthy food choices.

- Write down at least one way that your family can help you move more or get more exercise.

B. English Survey and FAD-GF

Study Number: _____ HIC #1201009529

1. Name: _____ Date: _____

2. If any of your family members are participating in this study please list their names here, and describe how they are related to you (ex: son, daughter, mother, father):

Name	Relationship
_____	_____
_____	_____
_____	_____
_____	_____

3. a) How old are you? _____
   b) What is your date of birth? _____ _____ _____
   month day year
4. What is your gender?
   ☐ Female
   ☐ Male
5. What is your race/ethnicity?
   ☐ Asian or Pacific Islander
   ☐ African American
   ☐ Hispanic
   ☐ Native American or Alaskan Native
   ☐ Caucasian
   ☐ Other: _____
6. In what country were you born? _____
7. What country does your family come from? _____
8. What is your native / preferred language?
   ☐ English
   ☐ Spanish
   ☐ Other: _____
9. What is your highest level of education?
   ☐ None
   ☐ Less than high school – grade: ____
   ☐ Some high school – grade: ____
   ☐ Graduated high school
   ☐ GED or Equivalent
   ☐ Some college
   ☐ Graduated college
   ☐ Graduate/professional school
10. How many adults live in your household? _____
    How many children live in your household? _____
11. Where are you completing this survey?
    ☐ Diabetes screening at FHCHC.
    ☐ Diabetes Prevention Program / Bright Bodies Program class
    ☐ Other: _____

B. English Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

Instructions

This assessment contains a number of statements about families. Read each statement carefully, and **decide how well it describes your own family**. You should answer according to how you see your family.

For each statement there are four (4) possible responses:

Strongly Agree 	Check **Strongly Agree** if you feel that the statement describes your family very accurately.
Agree 	Check **Agree** if you feel that the statement describes your family for the most part.
Disagree 	Check **Disagree** if you feel that the statement **does not** describe your family for the most part.
Strongly Disagree 	Check **Strongly Disagree** if you feel that the statement **does not** describe your family at all.

These four responses will appear below each statement like this:

8. ***We feel accepted for what we are.***

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

Try not to spend too much time thinking about each statement, but respond as quickly and as honestly as you can. If you have difficulty, answer with your first reaction. Please be sure to answer *every* statement and mark all your answers in the space provided *below* each statement.

B. English Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

1. Planning family activities is difficult because we misunderstand each other.

Strongly Agree | Agree | Disagree | Strongly Disagree

_____ _____ _____ _____

2. In times of crisis we can turn to each other for support.

Strongly Agree | Agree | Disagree | Strongly Disagree

_____ _____ _____ _____

3. We cannot talk to each other about the sadness we feel

Strongly Agree | Agree | Disagree | Strongly Disagree

_____ _____ _____ _____

4. Individuals are accepted for what they are.

Strongly Agree | Agree | Disagree | Strongly Disagree

_____ _____ _____ _____

B. English Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

5. We avoid discussing our fears and concerns.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

6. We can express feelings to each other.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

7. There are lots of bad feelings in the family.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

8. We feel accepted for what we are.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

B. English Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

9. Making decisions is a problem for our family.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

10. We are able to make decisions about how to solve problems.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

11. We don't get along well together.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

12. We confide in each other.

Strongly Agree	Agree	Disagree	Strongly Disagree
			
_____	_____	_____	_____

C. Spanish Survey and FAD-GF

Study Number: _____ HIC #1201009529

1. Nombre: _____ Fecha: _____

2. Si algún miembro de su familia está participando en este estudio, liste sus nombres aquí y escriba el parentesco familiar de ellos en relación a usted. (ejemplos: hijo, hija, madre, padre)

Nombre	Parentesco
_____	_____
_____	_____
_____	_____
_____	_____

3. a) ¿Cuantos años tiene? _____
   b) ¿Cuál es su fecha de nacimiento? _____ _____ _____
   mes día año

4. ¿Cuál es su género?
   - ☐ Femenino
   - ☐ Masculino

5. ¿Que raza/ étnica es usted?
   - ☐ Asiáticos o Isleños del Pacífico
   - ☐ Afroamericanos
   - ☐ Hispanos
   - ☐ Nativo de América o de Alaska
   - ☐ Cáucaso
   - ☐ Otro: _____

6. ¿En qué país nació? _____

7. ¿De cuál país proviene su familia? _____

8. ¿Cuál es su idoma natal/preferido?
   - ☐ Inglés
   - ☐ Español
   - ☐ Otro: _____

9. ¿Cuál es su nivel de educación?
   - ☐ Nada
   - ☐ Menos que secundaria – curso: ___
   - ☐ Parte de la secundaria – curso: ___
   - ☐ Graduado de secundaria
   - ☐ GED o equivalente
   - ☐ Parte de universidad
   - ☐ Graduado de universidad
   - ☐ Escuela de posgrado / profesional

10. ¿ Cuántos adultos viven en su hogar? _____ ¿ Cuántos niños viven en su hogar? _____

11. ¿Dónde esta completando esta encuesta?
    - ☐ Detección de diabetes en FHCHC
    - ☐ Programa de prevención Diabetes/Programa de clase de cuerpos
    - ☐ Otro: _____

C. Spanish Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

Instrucciones

Este cuestionario contiene varias declaraciones de la familia. Lea usted cada declaración detenidamente y decida hasta qué punto describe su propia familia. Debería responder con respeto a cómo le parece a usted su propia familia.

Hay quatro (4) respuestas por cada declaración:

Estoy de acuerdo completamente 	Marque **Estoy de acuerdo completamente** si le parece que la declaración describe su familia muy bien.
Estoy de acuerdo 	Marque **Estoy de acuerdo** si le parece que la declaración describe su familia generalmente
No estoy de acuerdo 	Marque **No estoy de acuerdo** si le parece que la declaración **no describe** su familia generalmente
No estoy de acuerdo en ninguna manera 	Marque **No estoy de acuerdo en ninguna manera** si le parece que la declaración **no describe** su familia de ninguna manera.

Las quatro respuestas aparece debajo de cada declaración así:

8. ***Sentimos que somos aceptados por lo que somos***

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

Trate de no dedicar mucho tiempo pensando en cada declaración. Responda tan rápidamente y con tanta frenqueza que pueda. Si no está seguro, responda con su primera intuición. Por favor no olvide responder a cada declaración y marcar todas las respuestas en los espacios debajo de las declaraciones.

C. Spanish Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

1. Es difícil planear actividades en la familia porque no nos entendemos bien.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

2. En tiempos de crisis podemos contar con el apoyo de los demás.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

3. No podemos hablar entre nosotros de la tristeza que sentimos.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

4. Cada uno es aceptado por lo que es.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

C. Spanish Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

5. Evitamos hablar de nuestros temores y preocupaciones.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

6. Podemos expresar nuestros sentimientos los unos hacia los otros.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

7. Hay muchos malos sentimientos en la familia.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

8. Sentimos que somos aceptados por lo que somos.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

C. Spanish Survey and FAD-GF (continued)

Study Number: _____ HIC #1201009529

9. El tomar decisiones es un problema para nuestra familia.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

10. Somos capaces de decidir cómo resolver los problemas.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

11. No nos llevamos bien.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

12. Nos hablamos en confianza.

Estoy de acuerdo completamente	Estoy de acuerdo	No estoy de acuerdo	No estoy de acuerdo en ninguna manera
			
_____	_____	_____	_____

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