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SNAP Assistance, Food Purchasing Behaviors and Dietary Patterns Among Overweight/Obese, Pregnant, Low-income Latinas

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SNAP Assistance, Food Purchasing Behaviors and Dietary Patterns Among Overweight/Obese,
Pregnant, Low-income Latinas

Marta M. Holovatska

B.S., University of Connecticut, 2019

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APPROVAL PAGE

Master of Public Health Thesis

SNAP Assistance, Food Purchasing Behaviors and Dietary Patterns Among Overweight/Obese,
Pregnant, Low-income Latinas

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Abstract

Background- There are limited studies documenting if participation in the Supplemental Nutrition Assistance Program (SNAP) influences fruit and vegetable (F&V) consumption among pregnant Latinas.

Objective- To examine the association between SNAP assistance and prenatal dietary and shopping behaviors among low-income, overweight/obese, pregnant Latinas.

Methods- An exploratory secondary analysis was conducted using data from a larger prospective mixed-methods study and included demographic, food shopping and dietary pattern variables. Multivariable linear regression analyses were performed to determine independent associations between household and individual predictors of SNAP participation.

Results- Bivariate analyses showed that SNAP recipients compared to non-SNAP recipients were more likely to: a) consume green leafy vegetables more often per week; b) consume below the median serving of vegetables and fried vegetable-based snacks; c) shop for foods alone. Those who participated in SNAP were significantly more likely to be multiparous.

Conclusion- Findings show SNAP recipient's food shopping and F&V consumption patterns differ compared to non-SNAP recipients suggesting SNAP participation influences these behaviors.

Foundational and Concentration Competencies

Foundational Competencies	How Addressed in Thesis
Apply epidemiological methods to the breadth of settings and situations in public health practice	This project was a secondary data analysis of baseline data from the National Institutes of Health/National Institute for Nursing Research study entitled “Promoting Fruits and Veggies among Pregnant Latinas: Intervention Development” (Grant number: 1R21NR013970).
Select quantitative and qualitative data collection methods appropriate for a given public health context	The original prospective study collected survey data (which included demographic data, food security, purchasing patterns, and F&V intake data) and 24-hour recalls across two timepoints during pregnancy.
Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.	IBM SPSS 25 software was used to analyze quantitative data. Univariate, bivariate, and multivariate were conducted, specifically frequencies, t-tests, chi-square tests and multivariate logistic regression were conducted.
Interpret results of data analysis for public health research, policy or practice	Summarized variables using descriptive statistics and logistic regression. Interpreted data for associations.
Assess population needs, assets and capacities that affect communities’ health	This study assessed the household food security, dietary needs of low-income, overweight/obese, pregnant Latinas that utilize SNAP benefits.
Apply awareness of cultural values and practices to the design or implementation of public health policies or programs	This study assessed shopping and dietary patterns among Latinas, who are an understudied population. This study will aid in developing a culturally-appropriate nutrition education intervention for pregnant Latina SNAP participants.
Advocate for political, social or economic policies and programs that will improve health in diverse populations	To date, the association between participation in SNAP and prenatal dietary intake among low-income, pregnant, Latinas has not been extensively studied. This study provides recommendations to improve F&V consumption patterns among SNAP beneficiaries.
Evaluate policies for their impact on public health and health equity	The Supplemental Nutrition Assistance Program, better known as SNAP, is one of the first lines of defense against food insecurity for families in the U.S. SNAP is a federal entitlement program that provides eligible

	<p>low-income households with supplemental income to purchase food. SNAP reaches nearly 40 million people in an average month, making it the largest federally funded nutrition assistance program in the U.S. SNAP benefits. Its importance to ensure fruit and vegetables consumption is discussed throughout this thesis.</p>
<p>Communicate audience-appropriate public health content, both in writing and through oral presentation</p>	<p>A scientific poster was created to communicate preliminary findings to stakeholders in the community.</p>
<p>Apply systems thinking tools to a public health issue</p>	<p>Designed a systems thinking figure to illustrate factors relevant to SNAP participation and dietary patterns.</p>

Introduction

Supplemental Nutrition Assistance Program (SNAP)

The Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program (FSP), is the largest of the 15 federal nutrition-assistance programs (Caswell JA, 2013). This program provides financial assistance to households with a gross income of $\leq 130\%$ of the federal poverty level to purchase food (Leung et al., 2013). More than 44 million people, or roughly one in seven Americans, received SNAP benefits in 2016 (Whiteman, Chrisinger, & Hillier, 2018). SNAP provides food assistance to eligible low-income individuals and families and aims to alleviate food insecurity and improve nutritional status among low-income individuals and households by increasing the resources available to purchase food (Blumenthal et al., 2014). Household benefits are credited once every month to an electronic benefit transfer card given to each SNAP-participating family (United States Department of Agriculture. Food and Nutrition Service, 2019). The program has few restrictions on food purchases and has not been formally restructured to provide incentives for beneficiaries to purchase nutrient-rich foods, to restrict the purchase of nutrient poor foods with SNAP benefits, or to strengthen the SNAP-Ed, nutrition education program (Leung et al., 2012; Yen, Bruce, & Jahns, 2012). Some consider that limiting the food choices of SNAP recipients can be stigmatizing and unfair to low-income SNAP recipients (Committee on Accelerating Progress in Obesity Prevention, 2012).

In recent years, dietary quality among SNAP participants has emerged as a national public policy concern, given the increasing prevalence of diet-related chronic illnesses among Americans, particularly in low-income populations (Andreyeva, Tripp, & Schwartz, 2015). Thus, it is important to examine dietary patterns among SNAP participants to better understand the program's influence.

SNAP Assistance and Dietary Quality

A review of recent research strongly suggests that SNAP benefits fall short of what many participants need to purchase and prepare a healthy diet (Carlson, 2019). SNAP participants generally have lower overall diet quality compared with income-eligible and higher income nonparticipants (Andreyeva et al., 2015; Leung et al., 2012; Whiteman et al., 2018). A study assessing the diet quality of food purchases among a large sample of US households that participated in SNAP, found that SNAP participants purchased significantly more unhealthy foods (e.g. starchy vegetables, deserts, sugar-sweetened beverages, saturated fats) (Grummon & Taillie, 2017). However, national data suggests that food purchasing by SNAP households does not differ substantially from purchasing by non-SNAP households and that both groups buy food inconsistent with the Dietary Guidelines for Americans (DGA) (Garasky, 2016). Indeed, studies that have examined purchasing patterns of sugar sweetened beverages (SSB) have found no differences between SNAP households and SNAP eligible households (Gustafson, 2017; Todd & Ver Ploeg, 2014).

Prior research has also suggested that current benefit levels provided through SNAP are insufficient to purchase foods such as, fruits and vegetables, which are in accordance with the DGA thus, leading to poorer quality food purchases (Whiteman et al., 2018). Likewise, SNAP participation has been shown to be associated with lower fruit and vegetable consumption (Leung et al., 2012; Wolfson & Bleich, 2015). Evidence is mixed on whether monthly SNAP benefit increases improve diet quality however, there is strong evidence that increasing monthly SNAP benefits would make a meaningful difference for participant's food expenditures and food security (Carlson, 2019).

Dietary Quality and Pregnancy

Although assessing the impact of SNAP on dietary quality is challenging due to individual and household factors, SNAP is an important social benefit to many low-income Americans, including to low-income pregnant women. Thus, it is important to understand food purchasing and dietary patterns among pregnant women who are beneficiaries of SNAP. Dietary quality, such as a diet rich in fruits and vegetables (F&V), is critically important to support a healthy pregnancy for both the mother and developing fetus. Evidence suggests that improving prenatal F&V intake can promote optimal pregnancy and birth outcomes (Hromi-Fiedler et al., 2016).

Minority groups, especially Latinas, are less likely to consume the recommended daily intake of F&Vs compared to non-Latino whites (Hromi-Fiedler et al., 2016). Some evidence suggests that women who are pregnant or planning to become pregnant make healthy lifestyle changes, however, the average diet quality of pregnant women remains suboptimal (Bodnar et al., 2017; Crozier et al., 2009). Specifically, a more recent study found that prenatal diet quality among low-income pregnant Hispanic women was suboptimal (Thomas Berube, Messito, Woolf, Deierlein, & Gross, 2019). Limited access, higher cost, lower perceived self-efficacy, and low social support are barriers to optimal F&V consumption among low-income women, especially during pregnancy (Chang, Nitzke, Guilford, Adair, & Hazard, 2008; Haynes-Maslow, Parsons, Wheeler, & Leone, 2013).

It has been recognized that low-income households rely more on cheaper and highly satiating and palatable foods, which are also high in calories, added sugars, and saturated fats (Hill, Nunnery, Ammerman, & Dharod, 2020). Having a poor diet during pregnancy can result in micronutrient deficiencies that predispose infants to neural tube defects, preterm birth, and being born small for gestational age (Carmichael, Shaw, Selvin, & Schaffer, 2003; Siega-Riz,

Savitz, Zeisel, Thorp, & Herring, 2004). Although factors, such as participation in SNAP and WIC, may increase access to healthy foods among women of reproductive age, it is unclear whether these programs improve diet quality in pregnant Hispanic women (Dammann & Smith, 2009).

Social Support and Dietary Behaviors

Social support plays a significant role in dietary behaviors, especially among pregnant women. Constant and comprehensive support is considered a key factor in having a positive pregnant outcome among pregnant Hispanics (Hopkins, Yeoman, & Ritenbaugh, 2018). Research that examined social support and dietary behaviors in low-income pregnant women found that women with more social support reported healthier dietary behaviors (Fowles et al., 2011; Fowles, Stang, Bryant, & Kim, 2012). Higher social support has been associated with increased micronutrient intake among Latinas during pregnancy (Singh et al., 2017). Hopkins and colleagues (2018) examined social support among pregnant Latinas and found social support was ideally provided by the participants' mother and included help with healthy meal preparation. Many times, a healthy diet was not possible without social support (Hopkins et al., 2018).

Although research examining the role of dietary support is limited, research suggests social support can influence F&V access, knowledge and preferences. Social support can improve F&V knowledge by improving self-efficacy and in turn can change F&V health outcome expectancies women have for themselves and their babies (Hromi-Fiedler et al., 2016). An established support system that provides a strong, encouraging environment can promote optimal F&V intake behavior change by indirectly promoting self-efficacy, especially perceived self-efficacy (Hromi-Fiedler et al., 2016). In other words, women who recognize the positive

impact of improving prenatal F&V intake on their developing fetus and who believe they have greater ability to eat more F&Vs during pregnancy are more likely to form intentions to increase prenatal F&V intake (Hromi-Fiedler et al., 2016). Therefore, increased social support empowers women to adopt healthy eating behaviors, that, in turn, has a substantial impact on maternal and neonatal outcomes.

Although prior research has examined SNAP participation and diet quality among women, very little research has been conducted among low-income pregnant, Latinas; many of whom have excessive body weight. Understanding how SNAP influences low-income, overweight/obese Latinas prenatal eating habits and food purchasing behaviors is warranted. Given this, the aim of this study is to examine the association between SNAP assistance and prenatal dietary patterns and food shopping behaviors, and the influence of social support in this socio-economically vulnerable population.

Methods

Study design. An exploratory secondary data analysis of baseline survey data from a larger prospective mixed-methods study designed to assess the feasibility of a F&V intervention was conducted (Hromi-Fiedler, Bermudez-Millan, Segura-Perez, & Perez-Escamilla, 2012).

Recruitment is described in more detail elsewhere. Briefly, participants were recruited from a hospital clinic in Hartford, CT that serves a high proportion of Latina women (Hromi-Fiedler et al., 2012). Seventy-six women that met the following eligibility criteria were enrolled in the prospective study: a) ≥ 18 years old; b) in 2nd or 3rd pregnancy trimester; c) WIC enrolled or eligible; d) Latina; e) with a singleton pregnancy; f) overweight or obese (i.e., pregravid body mass index ≥ 25); g) not on a restricted diet; h) nonsmokers (Hromi-Fiedler et al., 2016).

Participants who met the inclusion criteria and who agreed to participate were scheduled to complete a baseline survey in their home or at the Hispanic Health Council, a service-based organization focused on improving the health and well-being of communities within Hartford, CT, especially Latinos.

A bilingual trained interviewer obtained consent of participants (in English or Spanish based on participant's language preference) and administered a pretested baseline quantitative survey. Maternal data were collected on: demographics; socioeconomic status; food assistance participation; food security; F&V purchasing and intake patterns; gestational weight gain; and psychosocial constructs of F&V intake including risk perception, outcome expectancies, self-efficacy, intentions, action planning and coping planning.

Participants received a \$15 incentive for participating. This study was approved by the human subjects Institutional Review Boards (IRB) of Yale University and Hartford Hospital. The Hispanic Health Council delegated IRB approval to both Yale University and Hartford Hospital IRB.

Measures. Trained and supervised staff applied a structured interview questionnaire that included the following three main sections: (i) demographics; (ii) socio-economic status; (iii) diet and food purchasing behaviors.

Demographics

Identity. Women reported their identity as Puerto Rican, Non-Puerto Rican Hispanic/Latina, or Other. This variable was further categorized as *Puerto Rican Latina* or *Non-Puerto Rican Latina*.

Country of Birth. Women identified their country of birth as United States, Puerto Rico, Mexico, or Other. This variable was further dichotomized as *U.S./U.S Territory* and *Non-U.S./Non-U.S. Territory*.

Years in the United States. Women were asked, “How long have you been in the United States?” Time in the United States was reported using the median length of time (years) categorized as < 14 years or ≥ 14 years.

Language Spoken. Women reported language spoken as English only, English and Spanish, Spanish only, or other. Women were categorized as *English only*, *Bilingual*, or *Spanish speaking only*.

Living Situation. Women were asked, “Where do you live right now?” Response options were at your own home/apartment or in a relative or friend’s house/apartment.

Marital status. Women reported whether they currently lived or did not live with a spouse or partner.

Number of Children Living in House. Women reported the number of children 17 years of age or younger that live in their house. Those that reported having zero children ≤ 17 years were categorized as *adult households*. Women who reported have one or more children ≤ 17 years were categorized as *household with children*.

Socioeconomic status

Employment Status. Women were asked, “Which of the following best describes your current employment status?” Responses of unemployed, student, homemaker, or other were aggregated into *unemployed* category. Those that identified themselves as working full-time or part-time were categorized as *employed*.

Education. Women were asked to provide the last grade of school they completed. Options were: no formal school, eight grade or less, some high school, high school graduate or GED equivalency, some college, associate's degree, or finished 4 years of college. Responses were categorized further as *less than high school* or *high school graduate or above*.

Food Assistance. Women reported current SNAP and Women Infants and Children (WIC) participation as *yes* or *no*.

Length of Time Food Stamps Last Every Month. Women reported the number of weeks per month the foods they buy with food stamps last: less than a week, one week, two weeks, three weeks, four week or more than 4 weeks. Response options were categorized further as *less than 4 weeks* or *four weeks or more*.

Monthly Household Income. Women categorized their total monthly household income as \$0 – 1000 or more than \$1000.

Access to Food Credit. Women reported whether they had access or not to get food on credit in bodegas.

Total Assistance. Women were asked, “Do you or any one in your household participate in the following food or public assistance programs: Cash Assistance, Food Pantries, Soup Kitchens, SSI, Title 19/Medicaid, Section 8, WIC or other Assistance? A composite variable was created by summing the total number of food or public assistance programs per household. Those that did not receive any assistance were classified as *no assistance* while any affirmative response was considered *some assistance*.

Food Security. Household food insecurity was assessed using a 15-item adapted and validated version of the original 18-item US Household Food Security Survey Module for

pregnant Latinas (Hromi-Fiedler, Bermudez-Millan, Melgar-Quinonez, & Perez-Escamilla, 2009; Hromi-Fiedler, Bermudez-Millan, Segura-Perez, Damio, & Perez-Escamilla, 2009). The timeframe assessed was one month before the baseline survey. Households were considered food secure if they did not answer any question affirmatively. Those who responded affirmatively to any questions were classified as food insecure (Bickel, 2000).

Food Purchasing Behaviors

Purchasing Behaviors. Participants were asked questions related to food purchasing and preparation. Women identified who cooks most of the meals in their household as: I do, I share it equally with someone, My partner, A family relative, My children or Someone else. Women who reported 'I do' were categorized as 'participant.' All other response selections were aggregated into *shares equally with someone/someone else*. Women also reported whether this situation (who cooks most of the meals) has always been the situation or has it changed since you became pregnant. Women identified whether or not they get support from family and friends to help them eat F&V during pregnancy. Lastly, women were asked, "Who is in charge of shopping for foods?" This variable was categorized as *shops by themselves* or *shares food shopping/others shop for her*.

Diet

24-hour recall. A 24-hour recall was administered at baseline and once during pregnancy to collect data on dietary intake during pregnancy and analyzed to examine F&V serving intake. The 24-hour recall was conducted in the participant's language of choice (English/Spanish), in the privacy of her home. Data from the 24-hour recalls were entered using the Nutrition Data System for Research (NDSR) software versions 4.0_35, 5.0_35

and 6.0 (University of Minnesota, Nutrition Coordinating Center, Minneapolis, MN, USA). The data entry of each 24-hour recall was checked three times to ensure that foods, serving sizes, and recipes had been entered correctly (Hromi-Fiedler et al., 2012).

Typical daily F&V intake. Women reported the number of servings of several different food groups. Women were asked, “In a typical day, how many servings of green leafy vegetables (like lettuce) do you eat? The same question was asked of non-green leafy vegetables (like tomatoes, onions, carrots, celery, corn, beets, etc.), viandas or starchy root vegetables (sweet potato, taro root, yam, green plantain) and servings of 100% fruit juice.

Statistical analysis

Of the 76 women who participated in the study, n= 3 were excluded from analyses due to unreliable data. The Statistical Package for the Social Sciences (SPSS) for Macintosh (version 25.0) was used for bivariate and multivariate analyses (IBM Corp, 2017). Demographic summary statistics were presented as percentages for categorical variables or as mean \pm standard deviation (SD) for continuous variables across SNAP participants and non-SNAP participants. Bivariate chi-square and ANOVA analyses were conducted to examine the associations between SNAP participation and demographic characteristics, food purchasing behaviors, and prenatal dietary patterns based on F&V consumption.

Prenatal dietary behaviors. 24-hour recall. In order to analyze prenatal dietary patterns, a composite variables of various food servings from the 24-hour recall were created. Servings of fried potatoes, fried vegetables and savory vegetable snacks consumed within the last 24 hours were combined into *fried vegetable-based snacks*. Likewise, lettuce, kale, broccoli, cabbage,

cauliflower and spinach were combined to reflect consumption of *green leafy vegetables* within the last 24-hours. Servings of beets, corn, eggplant, green beans, onions, peppers, tomatoes, carrots, celery, cucumber, yellow squash, and green zucchini within the last 24 hours were aggregated to reflect *non-green leafy vegetables*. Consequently, servings of potatoes, green bananas, plantains and sweet potatoes were combined to reflect consumption of *viandas* (Table 4; Table 5).

Daily F&V intake. Daily consumption of green leafy vegetables, non-green leafy vegetables, viandas, and 100% fruit juice were analyzed by the median number of servings.

Frequency of Consumption. Frequency of weekly vegetable intake was analyzed to examine differences in various vegetable food groups by SNAP assistance status. Mean weekly consumption of green leafy vegetables, non-green leafy vegetables and viandas were calculated by converting the reported monthly frequency of each vegetable into weekly frequency. Then, each vegetable was aggregated into its respective food group (*green leafy vegetables, non-green leafy vegetables, viandas*).

Predictors of SNAP Assistance. Unadjusted and adjusted multivariable linear regression analyses were performed to determine independent associations between sociodemographic characteristics and SNAP participation. Factors associated with SNAP assistance (SNAP recipient vs. non-SNAP recipient) at the $P \leq 0.05$ level in the bivariate analyses were included in the initial model. We used variance inflation factor (VIF) values to detect multicollinearity. Collinearity diagnostics indicated that all included variables were functioning independently. Backwards stepwise logistic regression was conducted to determine the final model. Odds ratio (OR) and the corresponding 95% confidence interval (CI) were reported for logistic regression analyses. Findings were considered significant if the CI excluded the value of 1.0. The goodness-

of-fit of the logistic regression model was assessed using the Hosmer-Lemeshow test. Variables that were significant in the bivariate analyses but that did not remain in the multivariate logistic regression model were: identity, length of time living in the US, number of children living in the house, and living situation.

Results

Participant Characteristics

Participants average age was 25 years, over half of participants (56%) received SNAP benefits with two-thirds of those women reporting that their monthly benefits lasted less than 4 weeks during a month. Three quarters of participants were WIC recipients. More than half of participants were born in the U.S./U.S. territory, lived in the U.S. for ≥ 14 years and were bilingual. Likewise, a majority of women lived in a household with children ≤ 17 years. Nearly two-thirds of women were unemployed. Almost half (43%) of participants experience some level of food insecurity. Bivariate results showed SNAP recipients were significantly more likely than non-SNAP participants to be multiparous, Puerto Rican, to have lived in the U.S. longer, to be unemployed, live in their own home, have children living in the household and receive some level of additional food or public assistance programs (Table 1).

Food Purchasing Behaviors

Non-SNAP recipients were more likely to share household food shopping or had others shop for them compared to SNAP recipients (Table 2). No other food purchasing and preparation behaviors differed by SNAP assistance.

24-hour Recall

Comparison of 24-hour recall servings intake showed that SNAP recipients were significantly more likely to consume below the median serving of vegetables (dark green vegetables, dark yellow vegetables, tomato and other vegetables) compared to non-SNAP recipients (Table 3). Likewise, SNAP recipients were significantly more likely to consume below the median serving of fried vegetable-based snacks (fried potatoes, fried vegetables and savory vegetable snack) compared to non-SNAP recipients.

Daily F&V intake (24- hour recall)

There were no statistically significant differences by SNAP assistance for daily servings of fruits, green leafy vegetables, non-green leafy vegetables, viandas and 100% juice consumed during pregnancy (Table 4).

Frequency of Consumption

As shown in Table 5, the mean frequency of weekly vegetable intake of green leafy vegetables was significantly lower for non-SNAP recipients compared to SNAP recipients ($p=0.056$). Additionally, SNAP participants consumed viandas more often per week than non-SNAP participants ($p=0.017$).

Predictors of SNAP Assistance

Unadjusted regression analyses estimating odds ratios of SNAP participation revealed multiparity, Puerto Rican identity, unemployment and living in own home, and additional assistance significantly increased the likelihood of receiving SNAP benefits. In the adjusted model, multiparous women were 4.9 times (95% CI: 1.27 – 19.01) significantly more likely to receive SNAP benefits compared to primiparous or nulliparous women (Table 5). Puerto Rican Latina women tended to be 3.5 times (95% CI: 0.924 – 13.07) more likely to receive SNAP benefits than Non-Puerto Rican Latina women. Unemployed women tended to be 2.9 times (95%

CI: 0.854 – 9.90) more likely to receive SNAP benefits compared to those who were employed. Likewise, women who received some level of additional assistance tended to be 3.2 times (95% CI: 0.918 – 11.33) more likely to receive SNAP assistance compared to who did not receive any additional assistance. However, these odds are only marginally significant.

Discussion

Our study suggests that SNAP assistance may play an important positive role in the dietary intake of F&V among this at-risk population, strongly suggesting that this program complements and is not redundant with WIC benefits. Our findings showed that SNAP recipients consumed green leafy and starchy vegetables (i.e. viandas) more frequently during the week, but that the amounts consumed were less than non-SNAP recipients. Additionally, SNAP participants consumed fewer servings of fried vegetable-based snacks than non-SNAP recipients. This suggests that pregnant SNAP recipients may be able to stretch out their purchasing benefits further and purchase smaller servings of healthier vegetables more frequently during the week than those who do not receive SNAP.

Although, to our knowledge this is the first study conducted among pregnant overweight/obese Latinas on the impact of SNAP on overall diet quality, studies examining participation in other food assistance programs, particularly WIC, show the importance of these programs in improving intake among Hispanic women. Hill et al. (2020) found that pregnant Hispanic women participating in WIC had higher fruit intake and lower consumption of empty calories compared to their non-Hispanic white counterparts. Indeed, Odoms-Young et al. showed that changes in the WIC packages in 2013 were very beneficial for improving fruit and low-fat dairy intake in Hispanic women and children.

In this study, SNAP participants were less likely to have social support to shop for food compared to their non-SNAP counterparts. Our results indicate the need to strengthen social support among SNAP recipients to promote food shopping behaviors and healthful eating (F&V intake) and shopping behaviors. Studies that have examined social support and dietary behaviors in low-income pregnant women found that women with more social support reported healthier dietary behaviors (Baskin, Hill, Jacka, O'Neil, & Skouteris, 2015; Florez, Dubowitz, Ghosh-Dastidar, Beckman, & Collins, 2015). Likewise, one study identified social support the primary distal factor driving prenatal F&V behavior change among pregnant Latinas (Hromi-Fiedler et al., 2016). Research shows high spousal social support improves vegetable intake among pregnant Latinas (Shah, Kieffer, Choi, Schumann, & Heisler, 2015). Family/friends are key sources for instrumental (cooking, purchasing of F&Vs) and informational F&V support (providing recipes, educating on choosing fresh F&Vs) (Hromi-Fiedler et al., 2016). Household food choices are constantly evolving, a function of the food landscape and program policy design (Andreyeva et al., 2015). Thus, social support encourages the purchasing and consumption of F&Vs. The structure and policies of food assistance programs such as, SNAP, ought to be re-evaluated to improve household social support.

In conclusion, our findings are relevant given that current research strongly suggests that the average diet quality of pregnant women remains suboptimal, especially among low-income pregnant Hispanic women (Bodnar et al., 2017; Crozier et al., 2009; Thomas Berube et al., 2019). Moreover, disparities in diet quality exist, particularly among low-income Hispanic women who have lower diet quality scores than their higher-income non-Hispanic white counterparts (Bodnar et al., 2017; Darmon & Drewnowski, 2008; Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012). A more recent study conducted among pregnant Hispanic women

demonstrated that most women did not meet the recommended intakes of total vegetables, whole grains, dairy, and fatty acids, dietary components that supply key nutrients needed during pregnancy (Thomas Berube et al., 2019). Thus, food assistance programs, especially SNAP, have an important role in helping pregnant Latinas improve their dietary intake. It is important for future studies to fully study and establish the impact of SNAP among pregnant overweight/obese Latinas.

Strengths and Limitations

Strengths of this study included examining important correlates of SNAP participation and dietary patterns among this understudied population of women and in a population where a majority of women were enrolled in WIC. By comparing SNAP participants to non-SNAP participants, we can better understand the relative influence the SNAP program has on food shopping and dietary patterns. Likewise, our study highlights a potential positive role of SNAP benefits among pregnant Latinas, which has not been suggested by previous studies.

There were several limitations to this study. First, due to the cross-sectional nature of these analyses, casual relations can be implied between food shopping behaviors, dietary intake (F&V consumption) and SNAP participation but, could not be fully evaluated here. Future studies can be conducted to investigate causal effects. Our findings are important in beginning a dialogue on the role SNAP benefits play during pregnancy. Second, given that this was an exploratory study, the small sample size limited the statistical power of our analyses. Prospective cohort studies with larger sample sizes are needed to confirm and expand from our findings. Third, this study was conducted among a population of pregnant Latinas living in the Hartford area of Connecticut. Therefore, findings from this study can only be generalized to other populations of pregnant Latinas that have characteristics similar to those in this study.

Systems Thinking and Theoretical Framework

When considering future studies in this area it is important to acknowledge the importance of using the Socio-Ecological Model (SEM). The SEM is widely used to understand interrelations between personal, social and environmental determinants (McLeroy, Bibeau, Steckler, & Glanz, 1988). The SEM proposes that individuals acquire behaviors by dynamic interaction between intrapersonal, interpersonal, environmental and policies that influence health outcomes. This study identified and determined if factors within multiple levels of the SEM were effective in explaining SNAP participation, food shopping, and dietary behaviors among low-income pregnant Latinas.

This study investigated individual factors within the SEM to understand what factors influence SNAP participation among pregnant Latinas. There are several interpersonal factors that are related to a woman receiving SNAP benefits. Some of these factors include parity, identity, length of time lived in the USA, socioeconomic status, and additional assistance from food or public assistance programs. It is important to highlight interpersonal factors related to receiving SNAP participation in order to better understand the needs of the population that SNAP is serving.

The current study briefly examined the role of interpersonal factors on SNAP participation. Factors studied within this domain included self-efficacy and psychosocial constructs of F&V intake (not discussed). This study also considered the role of the home environment in SNAP participation. Women that lived in their own home were more likely to receive SNAP benefits than compared to their counterparts, those that lived in a relative or friends house/apt. Likewise, we examined the association between food shopping behaviors and SNAP participation. SNAP participants were more likely to shop for food alone than with

someone else. Thus, strategies aimed to increase social support among SNAP participants is needed among this population.

Our study was unable to examine community level factors (settings) in explaining SNAP participation, shopping behaviors and, dietary patterns. However, factors related to the community environment, such as physical characteristics of the built environment, having access to healthy, safe and affordable food choices should not be dismissed. Future research examining the role of community level factors and its association with SNAP participation and dietary patterns among pregnant Latinas is needed. Ultimately, individual choices are enhanced when sectors and settings ensure the accessibility of safe, affordable, and healthy food choices (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015).

This study explored SNAP participation, food purchasing behaviors and dietary patterns among low-income Latinas. SNAP is one of the nation's largest federal food assistance programs and eligibility rules and benefit levels, are for the most part, set at the federal level. Our study identified differences in sociodemographic characteristics among SNAP participants and non-SNAP participants. Observed differences in prenatal dietary intake of F&V were seen among non-SNAP recipients and SNAP recipients. Changes at the policy level of the SEM are needed to improve maternal dietary patterns among this population. Our study adds to the literature for policy makers to consider when drafting program policies in order to promote a healthy maternal dietary intake in Latinas. Likewise, healthcare professionals can better understand how SNAP participation influences an individual's food shopping behaviors and prenatal dietary intake.

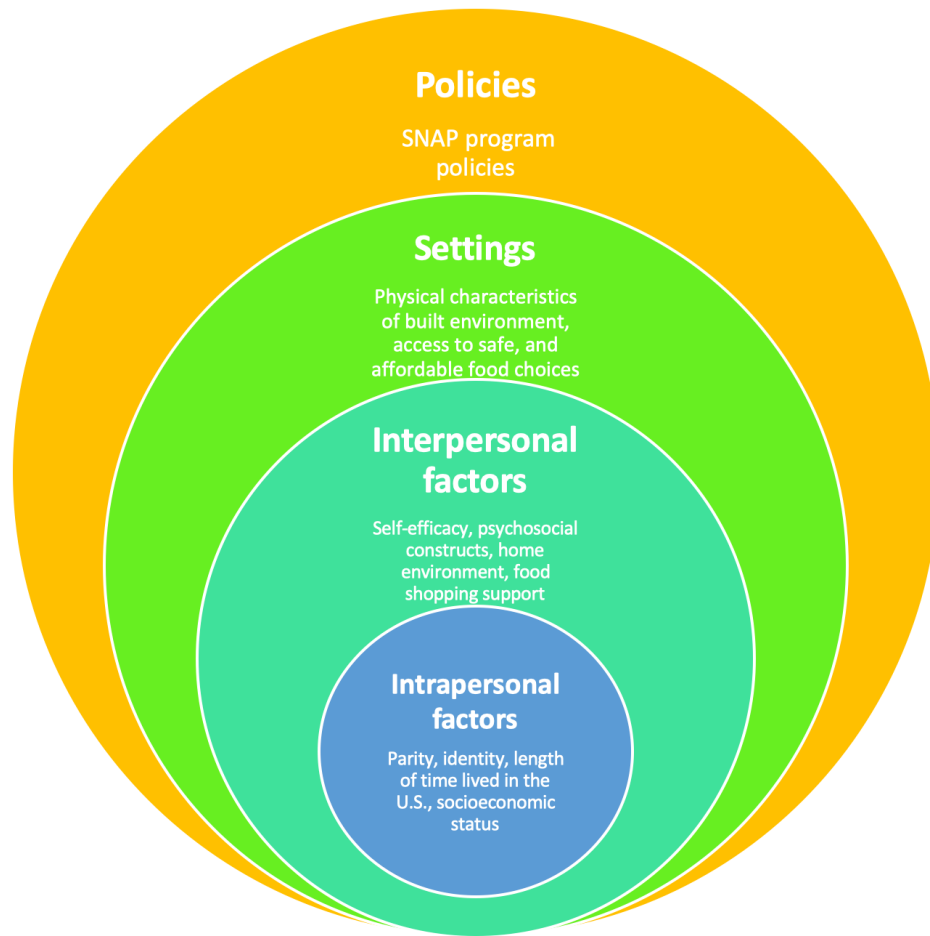


Figure 1. Socio-Ecological Model of SNAP participation, food shopping behaviors and dietary patterns. Adapted from CDC

Conclusion

To our knowledge, our study is the first to suggest that SNAP is an important program to support dietary intake patterns among Latinas, independently from WIC. Study findings suggest that SNAP recipients have different food group serving intake patterns compared to non-SNAP recipients. SNAP recipients were significantly less likely to have social support by food shopping alone compared to non-SNAP recipients. Results of this study could inform future nutritional education interventions to help overweight/obese, pregnant, Latina, SNAP recipients overcome obstacles to healthy eating. Food shopping and dietary patterns are modifiable factors that are important for both prenatal care providers, social workers, and patients to understand in order to optimize pregnancy outcomes. Findings from this study support continued funding in order to protect SNAP benefits among this vulnerable population. However, there is a continuing need for program evaluation. Policy makers should focus on further improving food assistance programs through culturally sensitive equitable interventions. If possible, future changes to food assistance program policies should promote social support among participants in effort to improve food shopping behaviors and prenatal consumption of F&V.

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Table 1. Participants' Characteristics by SNAP Assistance				
	Overall sample N= 73	Non-SNAP Recipient n=32	Snap Recipient n=41	P value
Age, Mean \pm SD	25.3 \pm 5.7	25.2 \pm 5.1	25.7 \pm 6.2	0.914
Household size, Mean \pm SD	4.1 \pm 1.5	4.1 \pm 1.4	4.1 \pm 1.5	0.919
Maternal characteristics^b	N (%)	N (%)	N (%)	
Pregnancy Trimester ¹				.403
First/second trimester	61 (84.7)	25 (80.6)	36 (87.8)	
Third trimester	11 (15.3)	6 (19.4)	5 (12.2)	
Parity				.032*
Nulliparous	23 (31.5)	14 (43.8)	9 (22.0)	
Primiparous	25 (34.2)	12 (37.5)	13 (31.7)	
Multiparous	25 (34.2)	6 (18.8)	19 (46.3)	
Latina Identity				.012*
Puerto Rican Latina	35 (47.9)	10 (31.3)	25 (61.0)	
Non-Puerto Rican Latina	38 (52.1)	22 (68.8)	16 (39.0)	
Country of birth				.238
U.S. or U.S. Territory	53 (72.6)	21 (65.6)	32 (78.9)	
Non-U.S. or Non-U.S. Territory	20 (27.4)	11 (34.4)	9 (22.0)	
Length of time lived in the USA (years) ²				.047*
< 14	27 (37.0)	20 (62.5)	16 (39.0)	
\geq 14	46 (63.0)	12 (37.5)	25 (61.0)	
Employment Status				.045*
Employed	25 (34.2)	15 (46.9)	10 (24.4)	
Unemployed/Homemaker/Student	48 (65.8)	17 (53.1)	31 (75.6)	
Education				.487
Less than high school	33 (45.2)	15 (46.9)	10 (24.4)	
High school graduate or above	40 (54.8)	19 (59.4)	21 (51.2)	
Language Spoken				.217
English only	5 (6.8)	3 (9.4)	2 (9.4)	
Bilingual	49 (67.1)	18 (56.3)	31 (75.6)	
Spanish only	19 (26.0)	11 (34.3)	8 (19.5)	
Living situation				.045*
Live in own home	48 (65.8)	17 (53.1)	31 (75.6)	
In a relative or friends house/apt	25 (34.2)	15 (46.9)	10 (24.4)	
Currently lives with a spouse/partner				.915
Yes	52 (71.2)	23 (71.9)	29 (70.7)	

Number of children living in house Adult household	18 (24.7)	11 (34.4)	7 (17.1)	.089**
Household with children (≤ 17 years)	55 (75.3)	21 (65.6)	34 (82.9)	
WIC participant				.804
Yes	55 (76.4)	24 (75.0)	31 (77.5)	
Monthly household income ³				.789
\$US 0 - \$US 1000	30 (44.8)	12 (42.9)	18 (46.2)	
>\$US 1000	37 (55.2)	16 (57.1)	21 (53.8)	
Have access to receive food on credit (in bodegas)				.097**
Yes	7 (9.6)	1 (3.1)	6 (14.6)	
Total Assistance ⁴				.000*
No assistance	26 (35.6)	19 (59.4)	7 (17.1)	
Some assistance	47 (64.4)	13 (40.6)	34 (82.9)	
Food Security				.625
Yes	41 (56.2)	19 (59.4)	22 (53.7)	
No	32 (43.8)	13 (40.6)	19 (46.3)	

Percentages for Non-SNAP Recipient and SNAP Recipient are calculated vertically within each column.

WIC, Special Supplemental Nutrition Program for Women, Infants and Children; SNAP, Supplemental Nutrition Assistance Program, formerly known as food stamps.

* p < 0.05 ** p < 0.10

^a ANOVAs were conducted to determine differences between continuous socio-demographic characteristics and SNAP assistance.

^b Chi-square cross-tabulation analyses were conducted to determine a difference between categorical socioeconomic characteristics and SNAP assistance.

¹ Pregnancy trimester at the time of baseline survey; Missing n=1 from sample, total sample N=72

² Based on the median number of years lived in the U.S.

³ Missing n=9 from sample, total sample N= 67

⁴ Composite variable created by adding up the total number of food or public assistance programs (cash assistance, food pantries, soup kitchens, SSI, Title 19/Medicaid Section 8) per household.

Table 2. Food Purchasing and Preparation by SNAP Assistance^a				
	Overall N= 73	Non-SNAP Recipient n=32	SNAP Recipient n=41	P value
Purchasing patterns	N (%)	N(%)	N(%)	
Who cooks most meals (in the household)				.182
Participant	39 (54.2)	14 (45.2)	25 (61.0)	
Shares equally with someone/someone else	33 (45.9)	17 (54.8)	16 (39.0)	
Has this always been the situation or has it changed since being pregnant				.479
Yes	9 (12.9)	3 (9.7)	6 (15.4)	
No	61 (87.1)	28 (90.3)	33 (84.6)	
Receives support from friends and family to help eat fruits and vegetables during pregnancy				.890
Yes	40 (57.1)	18 (58.1)	22 (56.4)	
No	30 (42.9)	13 (41.9)	17 (43.6)	
Who is in charge of shopping for foods (in the household)				.026*
Shops by themselves	23 (32.4)	6 (18.8)	17 (43.6)	
Shares food shopping/ others shop for her	48 (67.6)	26 (81.3)	22 (56.4)	

Percentages for Non-SNAP Recipient and SNAP Recipient are calculated vertically within each column.

Note. Sample size may vary due to missing data, no more than 5% of data was missing.

SNAP, Supplemental Nutrition Assistance Program, formerly known as food stamps.

*p < 0.05

^aChi-square cross-tabulation analyses were conducted to determine a difference between categorical food purchasing and preparation and SNAP assistance.

Table 3. Servings of Fruits and Vegetables Consumed Within the Last 24 hours by SNAP Assistance^a				
Food group servings	Consumers N (%)	Non-SNAP Recipient N=32	SNAP Recipient n=41	P value
Fruit (no juice)				.736
At/below median serving	22 (47.8)	9(45.0)	13 (50.0)	
Above median serving	24 (52.2)	11 (55.5)	13 (50.0)	
Fruit (no citrus)				.217
At/below median serving	21 (50.0)	12 (60.0)	9 (40.9)	
Above median serving	21 (50.0)	8 (40.0)	13 (59.1)	
Juice (fruit juice and citrus)				.624
At/below median serving	48 (67.6)	20 (64.5)	28 (70.0)	
Above median serving	23 (32.4)	11 (35.5)	12 (30.0)	
Vegetables¹				.051*
At/below median serving	34 (48.6)	11 (35.5)	23 (59.0)	
Above median serving	36 (51.4)	20 (64.5)	16 (41.0)	
Starchy vegetables				.369
At/below median serving	24 (52.2)	13 (54.2)	11 (45.8)	
Above median serving	22 (47.8)	9 (40.9)	13 (59.1)	
White potatoes				.673
At/below median serving	10 (43.5)	3 (37.5)	7 (46.7)	
Above median serving	13 (56.5)	8 (32.5)	8 (53.3)	
Fried vegetable-based snacks²				.048*
At/below median serving	7 (36.8)	2 (18.2)	5 (62.5)	
Above median serving	12 (63.2)	9 (81.8)	3 (37.5)	

Percentages for Non-SNAP Recipient and SNAP Recipient are calculated vertically within each column.

Note. Sample size may vary due to missing data, no more than 5% of data was missing.

SNAP, Supplemental Nutrition Assistance Program, formerly known as food stamps.

*p < 0.05 **p < 0.10

^a Chi-square cross-tabulation analyses were conducted to determine a difference between categorical food group servings and SNAP assistance.

¹ Includes dark green vegetables, dark yellow vegetables, tomato and other vegetables

² Composite variable that contains servings of fried potatoes, fried vegetables and savory vegetable snack consumed within the last 24 hours.

Table 4. Daily Fruit and Vegetable Intake During Pregnancy by SNAP Assistance^a

Food group servings	Non consumers N (%)	Consumers N (%)	Non-SNAP Recipient (Mean ± SD)	SNAP recipient (Mean ± SD)	P value
Fruit	3 (4.2)				.171
At/below median serving		37 (54.4)	18 (64.3)	19 (47.5)	
Above median serving		31 (45.6)	10 (35.7)	14 (52.5)	
Green leafy vegetables¹	15 (20.5)				.418
At/below median serving		36 (62.1)	17 (68.0)	19 (57.6)	
Above median serving		22 (37.9)	8 (32.0)	14 (42.4)	
Non-green leafy vegetables²	9 (12.3)				.923
At/below median serving		33 (52.4)	15 (51.7)	18 (52.9)	
Above median serving		30 (47.6)	14 (48.3)	16 (47.1)	
Viandas³	21 (28.8)				.513
At/below median serving		41 (82.4)	19 (86.4)	23 (79.3)	
Above median serving		9 (17.6)	3 (13.6)	6 (20.7)	
100% juice	14 (19.2)				.967
At/below median serving		31 (57.4)	15 (57.7)	16 (57.1)	
Above median serving		23 (42.6)	11 (42.3)	12 (42.9)	

Percentages for Non-SNAP Recipient and SNAP Recipient are calculated vertically within each column.

Note. Sample size may vary due to missing data, no more than 5% of data was missing.

SNAP, Supplemental Nutrition Assistance Program, formerly known as food stamps.

^a Chi-square cross-tabulation analyses were conducted to determine a difference between categorical food group servings and SNAP assistance.

¹Includes lettuce, kale, broccoli, cabbage, cauliflower, and spinach

²Includes beets, corn, eggplant, green beans, onions, peppers, tomatoes, carrots, celery, cucumber, yellow squash, green zucchini

³Includes potatoes, green bananas, plantains and sweet potatoes

Table 5. Frequency of Weekly Vegetable Intake by SNAP Assistance^a

	<i>Consumers (Mean ± SD)</i>	<i>Non-SNAP Recipient (Mean ± SD)</i>	<i>SNAP Recipient (Mean ± SD)</i>	<i>P value</i>
Green leafy vegetables ¹	1.4 ± 1.4	1.0 ± 0.76	1.7 ± 1.8	.056**
Non-green leafy vegetables ²	1.7 ± 2.0	1.4 ± 2.0	2.0 ± 2.0	.240
Viandas ³	1.0 ± 0.9	0.74 ± 0.70	1.3 ± 0.97	.017*

SNAP, Supplemental Nutrition Assistance Program, formerly known as food stamps.

*p < 0.05 ** p < 0.10

^a ANOVAs were conducted to determine differences between continuous weekly vegetable frequencies and SNAP assistance.

¹ Includes lettuce, kale, broccoli, cabbage, cauliflower, and spinach

² Includes beets, corn, eggplant, green beans, onions, peppers, tomatoes, carrots, celery, cucumber, yellow squash, green zucchini

³ Includes potatoes, green bananas, plantains and sweet potatoes

Table 6. Unadjusted and adjusted odds ratios for factors associated with SNAP participation.

	<i>Unadjusted</i>			<i>Adjusted</i>		
	N	OR	95% CI	N	OR	95% CI
Multiparity						
Yes	25	3.74	1.27 – 11.01	25	4.91*	1.27 – 19.01
No	48	1.00		48	1.00	
Identity						
Puerto Rican Latina	35	3.44	1.30 – 9.12	35	3.48**	.924 – 13.07
Non-Puerto Rican Latina	38	1.00		38	1.00	
Employment						
Unemployed/homemaker/student	48	2.74	1.01 – 7.40	48	2.91**	.854 – 9.90
Employed	25	1.00		25	1.00	
Living situation						
Live in own home	48	2.74	1.01 – 7.40	48	3.22	.918 – 11.33
In a relative or friends house/apt	25	1.00		25	1.00	
Total assistance						
Some assistance	47	7.10	2.42 – 20.84	47	3.22**	.918 -13.07
No assistance	26	1.0		26	1.00	

*p < 0.05 ** p 0.50 – 0.10 OR, odds ratio; CI, confidence interval; *Backward stepwise logistic regression. Variables eliminated from the model were identity, employment, time spent living in the U.S. and living situation. Hosmer-Lemeshow fitness P-value= 0.822 (chi-square= 4.37, d.f.= 8)