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## Prescriptions for Produce: An intervention with nutrition education, cooking instruction and produce vouchers to increase fruit and vegetable consumption.

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## Prescriptions for Produce: A Pilot Feasibility Assessment of an Intervention with Nutrition Education, Cooking Instruction, and Produce Vouchers to Increase Fruit and Vegetable Consumption

In 2015, about 14.6% of children and adults in San Antonio, Texas, lived in poverty,<sup>1</sup> and 58,000 individuals received emergency food assistance weekly.<sup>2</sup> Approximately 25% of 2- to 17-year-old Hispanic youth in San Antonio were obese<sup>3</sup> and 25% of the children were food insecure.<sup>4</sup> This compares to a food insecurity average of 12.7% in the United States in 2015.<sup>5</sup>

Food insecurity is related to poor diets, including low intakes of fruit and vegetables (FV) and whole grains, and higher intakes of energy-dense foods, which may lead to weight gain.<sup>6-10</sup> Therefore, improving food security and eating behaviors are health and economic priorities.

Barriers to healthy food choices in the home include financial issues, inadequate food preparation knowledge and cooking skills, and low self-efficacy.<sup>11-13</sup> Availability of foods in the home has been related to consumption of both healthy and energy-dense, nutrient-poor foods.<sup>14-17</sup> These are key constructs of Social Cognitive Theory (SCT)<sup>18</sup> and influence eating behavior. Targeting these constructs in behavioral interventions is necessary to improve dietary behaviors.

Several recent interventions have had some success in helping low-income families improve diets. When limited-resource households participating in the Supplemental Nutrition Assistance Program (SNAP) received a 30% bonus for purchasing targeted fruit and vegetables that was added to their monthly benefits, they consumed significantly more fruit and vegetables compared to those in a control group.<sup>19</sup> In addition, low-income participants in a 10-session intervention that included cooking demonstrations, food baskets, newsletters, and group discussions improved knowledge, self-efficacy, and vegetable consumption.<sup>20</sup> Similarly, an Australian 10-session cooking program also increased participants' cooking confidence and vegetable intakes<sup>21</sup> and reduced fast-food expenditures.<sup>22</sup> These studies suggest that improving cooking skills, providing nutrition education, and increasing low-income women's food budgets could impact purchasing and dietary behaviors such as the consumption of fruit and vegetables in the home for themselves and their children.

Regularly scheduled, fully reimbursed obstetric visits provide a unique opportunity to present a consistent, ongoing channel for delivering nutrition education to mothers. This paper presents the outcomes of a pilot study with low-income obstetric patients, Prescriptions for Produce, testing a multifaceted intervention that provided nutrition education during prenatal visits, a grocery store tour and cooking class, and a monthly \$40 gift card for produce purchases at the participating retailers. It was hypothesized that a combination of targeted, culturally appropriate health education and financial incentives would increase nutrition-related behaviors and skills as well as the purchase and consumption of fruits and vegetables by low-income pregnant mothers.

## **METHODS**

This study was approved by the Institutional Review Board at Baylor College of Medicine. The evaluation used a single-group design with baseline, post 1, and post 2 measurement.

**Setting.** Participants were first-trimester pregnant mothers receiving prenatal care at a local Federally Qualified Health Clinic (FQHC) in San Antonio. A research nurse introduced the study to eligible women at their regular clinic appointment. If they were interested, the study was explained and informed written consent was obtained. Recruitment took place from February through December, 2015.

**Intervention.** Participants were scheduled to attend a shopping tour and cooking class conducted by a grocery retail store registered dietitian. The grocery store and cooking class content focused on participants' current meal planning habits and how to increase fruits and vegetables served in meals (Table 1). At the beginning of each tour, the dietitian queried the participant about their nutrition and food questions. Based on these questions and the tour discussions, recipes were selected for preparation in the cooking class.

Each month, participants received a \$40 gift coupon for the store, redeemable for fruit and vegetables. To continue to receive the gift card incentives, participants had to attend the grocery store tour and cooking class, and obstetric appointments, where they received the designated nutrition education modules. Education concepts included: My Plate, portion control, sugar intake, label reading, breastfeeding, cooking at home, and healthy eating postpartum.

**Measurement.** Participants completed paper surveys in the clinic during their visits at baseline, prior to delivery (post 1), and 6 weeks postpartum (post 2). Demographics were obtained from the clinic record. Produce card usage was obtained from the partnering grocery store.

Menu planning (MP) ( i.e. “How often do you look in the refrigerator/pantry before you go shopping to see what you need?”) and grocery shopping (GS) practices (i.e. “How often do you compare prices between items when you shop?”) were each measured with four questions.<sup>23</sup> The items were measured on a 4-point scale from “never” to “always,” with higher scores reflecting more positive practices. Among a group of diverse parents from Texas, previous reliability coefficients for the 2 scales were 0.68 (MP) and 0.67 (GS).<sup>23</sup> Baseline internal consistency values for this study were 0.68 (MP) and 0.69 (GS).

Home availability of fruit, juice, and vegetables was assessed with a survey used in previous research with diverse populations.<sup>23, 24</sup> Participants identified the items present in the home in the past week (yes, no), and were summed to create scales. Higher scores represent greater availability.

Fruit and vegetable intake was assessed with single questions used in previous studies (How many servings of fruits [vegetables] do you eat daily?) Responses were 0 to 4 or more servings per day.<sup>25-27</sup>

Household food security status was assessed with the 6-item form of the USDA Core Food Security Module. This scale uses a subset of the standard 18-item survey with adequate reliability.<sup>28</sup> The 6-item form correctly classifies households across three levels of food security status (food secure, low food secure, and very low food secure).

Twenty participants were interviewed after the program was completed to obtain their opinions about the specific components of the program: grocery store tour, cooking class, produce card, and nutrition education sessions. Participants were asked what they liked about each component, any problems, and how each could be improved.

**Statistical Analyses.** Chi-square tests were used to assess differences in demographic characteristics between completers and non-completers. The means for all scales were computed and tested for normality using the Kolmogorov-Smirnov test. The average amount of money used from the produce cards was calculated. Correlation analyses among the scales and fruit and vegetable intake were conducted.

Change between surveys completed at the first prenatal visit (baseline) and the last visit before delivery (post 1), and between baseline and the post 2 survey (at the postpartum visit), were assessed with the paired t-test or Wilcoxon signed rank test, for normally and not normally distributed variables, respectively.

The interview responses were collated and frequency distributions were calculated.

## RESULTS

A total of 87 pregnant mothers gave consent to participate in the study, 60 completed the baseline survey, 23 completed post 1, and 17 completed post 2 surveys. To qualify for study completion and be included in the analyses, mothers had to complete at least two surveys, plus the grocery store tour and obstetric visits. Twenty-five qualified for analyses. The mean number of obstetric visits was 9.2, with a range of 5-10.

All but one were Hispanic. Ages, level of education, and food security status are presented in Table 2. Of those who did not complete the program (n=27), 16 did not attend the grocery tour, 9 were lost to follow-up, and 2 suffered fetal loss. Compared to those who completed the program, non-completers tended to be younger than 21 years of age (p= 0.062) and reported low food security (p=0.054). The average amount of money used from the produce cards each month was \$28.70 (range=0-\$40). Four participants did not use their produce card.

Home availability of fruit and vegetables, MP, and GS skills were normally distributed. Fruit and vegetable intake were skewed distributions, so nonparametric tests were conducted.

Home fruit availability (p<0.01), MP skills (p<0.05), and GS skills (p<0.01) were significantly positively correlated with fruit intake (data not shown). For those mothers who reported higher MP and GS skills and more fruit in the home, fruit intake was higher. For the mothers who reported high GS skills, vegetable intake was significantly higher (p<0.01).



Participants who reported high MP skills ( $p < 0.05$ ) and GS skills ( $p < 0.01$ ) also reported high home vegetable availability.

From baseline to post 1, only the reported home availability of fruit ( $p = 0.012$ ) was significantly improved (Table 3). From baseline to post 2, home availability of fruit ( $p = 0.002$ ) and vegetables ( $p = 0.024$ ), MP ( $p = 0.003$ ) and GS skills ( $p = 0.001$ ), and fruit ( $p = 0.022$ ) and vegetable ( $p = 0.002$ ) intake were significantly higher.

There were significant improvements in fruit ( $p < 0.05$ ) and vegetable ( $p < 0.001$ ) intakes from baseline to post 1 and from baseline to post 2 ( $p < 0.05$  for fruit and 0.01 for vegetables) (Table 4).

### Interviews

Twenty mothers were interviewed--8 who completed the program and 12 who did not. The majority of the participants reported that the nutrition education lessons they received during their prenatal visit were easy to understand (85%) and helped them learn how to make informed food choices in order to take better care of themselves and their babies (75%). They felt safe to ask questions (65%), liked the handouts (75%), and thought the nurse was a good teacher (75%). One mother commented that she “only gained baby weight during this pregnancy.” Another mother reported that she learned how to increase fruit and vegetable intake, and that the education helped with breastfeeding problems.

Only 15 of the mothers reported attending the cooking class and grocery store tour at the grocery store affiliated with the program. Transportation and childcare were major barriers. Fourteen thought the cooking class was easy to understand and liked being with the other mothers and felt the dietitian was a good teacher; 12 reported they felt safe to ask questions. One mother reported that her children liked the recipes that she made at home. Six reported that they would like to be able to have follow-up visits with the dietitian.

The grocery store tour led by the dietitian was also well received. Most comments were that the tours should be offered in more locations and at other times. Twelve mothers reported that the produce cards were easy to use, helped them to buy groceries on a budget and try new items, and that they want to eat more fruit and vegetables.

However, 5 mothers reported the card was too much of a hassle, and 7 reported that the card did not work when given to the cashier. Some mothers commented that the store manager had to be called and that some cashiers did not know about the card and therefore it was difficult to use. Five mothers suggested making the card like a regular gift card, and 9 suggested more training for cashiers. One mother would have liked to be able to see the card balance.

## **DISCUSSION**

Prenatal care visits provide an opportunity to provide mothers with the knowledge and skills to create a healthy home environment for their new babies that supports optimal growth. Healthy dietary behaviors are an important target behavior during this period.

This pilot study tested the feasibility of an intervention that included a \$40 produce voucher, a grocery store tour and cooking class, along with nutrition education delivered during routine obstetric visits. Despite the small sample, significant improvements in fruit and vegetable intake were found, along with improvements in important mediators of food consumption: the availability of fruit and vegetables in the home and MP and GS skills. Studies have documented that home availability of fruit and vegetables was associated with serving them at dinner, with parent vegetable intake,<sup>29</sup> and with child fruit and vegetable intake.<sup>16</sup> Parent MP skills were also associated with serving fruit at dinners.<sup>29</sup>

Few studies were found that provided a financial incentive for participants to purchase fruit and vegetables. A 30% bonus for purchasing targeted fruit and vegetables was added to SNAP participants' monthly benefits in a prior study. Significantly more fruit and vegetables were consumed by those in the intervention group compared to those in a control group.<sup>19</sup> A pilot study provided 29 low-income households with prepaid weekly coupons for 4 weeks to buy fresh produce in one grocery store.<sup>30</sup> Purchase data were obtained from the store. Fresh fruit purchases significantly increased during the intervention and were maintained during the 4-week follow-up period. Vegetable purchases did not change. Ten households did not use any of the coupons and 8 only used one.<sup>30</sup> In feedback from 22 of the participants, some reported losing their coupons or forgetting to bring them to the store. About 50% said they could not use them within each designated week and 2 reported issues with the redemption of the coupons with store personnel.

In the current study, 4 women did not use their produce cards, the monthly average spent was \$28.70 out of \$40 available each month, and 7 mothers reported problems redeeming the produce cards. Future research should investigate potential barriers to the use of incentive cards or gift cards in grocery stores, and potential strategies to overcome them.

Previous adult cooking skills programs have achieved improvements in vegetable consumption, similar to the current study, as well as in cooking confidence food preparation skills, home-prepared meals, and nutrition knowledge.<sup>20-22, 31, 32</sup> Most of these programs included multiple sessions and were conducted in community settings. Attrition was a problem for some, ranging from 14-57%, as noted in a review.<sup>32</sup> In the current study, transportation and childcare were issues interfering with attendance at the grocery store cooking class and tours. However, the cooking class and tours were appreciated. Almost 50% of the mothers in the current study requested more than one cooking class and suggested that multiple shopping tours or a one-on-one tour with the dietitian would be helpful.

Other barriers to participation were younger age of the mothers and low food security. Further research is needed to identify community support for pregnant women and new mothers to ensure the future health of moms and babies alike.

Several important limitations should be noted. The study did not have a comparison group. The original sample size for this pilot study was small, and there was a high attrition rate. All data were self-reported, and fruit and vegetable intakes were assessed with a short screener.

This pilot study provided pregnant women with nutrition education, a cooking class and grocery store tour, and produce cards worth \$40 each month. Preliminary results were positive and future studies should address the participant feedback obtained in this pilot study. In addition, interviews with low-income mothers about methods to improve use of the produce cards should be conducted. Future replications should also recruit larger samples and include a control group.

**Human Subjects Approval Statement:** The study was approved by the IRB at Baylor College of Medicine, Houston, Texas (H-36086,H-36909)

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**Table 1. Prescriptions for Produce Learning Modules**

1. MY PREGNANCY PLATE: My plate for balanced meals
2. GETTING A HANDLE ON PORTIONS: Portion Control
3. DECODING YOUR FOOD LABEL: Label Reading and Nutrient Density
4. KNOW YOUR SUGARS: Identify and Reduce Added Sugars
5. ORDER UP: Healthy Cooking at Home
6. EVERY OUNCE COUNTS: Breastfeeding 101
7. AWAY WE GO: Healthy Eating Post-Pregnancy

**Table 2. Participant characteristics**

| Age (y)              | Baseline Group |      | Completers |      |
|----------------------|----------------|------|------------|------|
|                      | n =60          | %    | n =25      | %    |
| <21                  | 10             | 16.7 | 1          | 4.0  |
| 21-35                | 41             | 68.3 | 21         | 84.0 |
| >=35                 | 7              | 11.7 | 3          | 12.0 |
| Missing              | 2              | 3.3  | 0          | 0    |
| <b>Education</b>     |                |      |            |      |
| High school          | 35             | 58.3 | 12         | 48.0 |
| Some college or more | 25             | 41.7 | 13         | 52.0 |

Food security status

|                   |    |      |    |      |
|-------------------|----|------|----|------|
| Food secure       | 32 | 53.3 | 17 | 68.0 |
| Low food security | 28 | 46.7 | 8  | 32.0 |

**Table 3. Changes in fruit and vegetable home availability and menu planning and grocery shopping skills from baseline to post 2 measurement**

|                                      | Baseline<br>n=25 |      | Post 1<br>n=23 |      | Post 2<br>n=18 |      |
|--------------------------------------|------------------|------|----------------|------|----------------|------|
|                                      | Mean             | SD   | Mean           | SD   | Mean           | SD   |
| Fruit availability <sup>a,b</sup>    | 8.00             | 3.57 | 10.39          | 3.34 | 10.56          | 3.20 |
| Vegetable availability <sup>b</sup>  | 7.00             | 2.52 | 8.09           | 2.68 | 8.53           | 2.12 |
| Menu planning skills <sup>b</sup>    | 10.70            | 2.49 | 11.26          | 2.54 | 12.50          | 2.41 |
| Grocery shopping skills <sup>b</sup> | 9.91             | 2.83 | 11.22          | 2.78 | 11.94          | 2.46 |

<sup>a</sup> Significant increase in fruit availability ( $p < 0.05$ ) from baseline to post 1.

<sup>b</sup> Significant increase baseline to post 2 for home fruit availability, menu planning, and grocery shopping skills ( $p < 0.01$ ), and for home vegetable availability ( $p < 0.05$ ).

**Table 4. Change in fruit and vegetable intake of participants**

|  | Baseline | Post 1 | Post 2 |
|--|----------|--------|--------|
|  | n=25     | n=23   | n=18   |
| Fruit intake (servings) <sup>a</sup>     | 2.00     | 2.61   | 2.50   |
| Vegetable intake (servings) <sup>b</sup> | 1.44     | 2.39   | 2.28   |

<sup>a</sup> Significant increase in fruit ( $p < 0.05$ ) and vegetable ( $p < 0.001$ ) intakes from baseline to post 1.

<sup>b</sup> Significant increase baseline to post 2 ( $p < 0.05$  for fruit and  $p < 0.01$  for vegetables).