



Research paper

Recruitment and retention of WIC participants in a longitudinal dietary intervention trial

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ABSTRACT

Background: This paper describes strategies and outcomes of techniques to recruit and retain low-income women served by the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in a longitudinal dietary intervention trial.

Methods: Community engagement strategies, methods to recruit and retain participants, and recruitment and retention rates are reported. Demographic and lifestyle predictors of loss to follow-up, contacts required to reach participants at each data collection point, participant reactions to the recruitment and retention strategies used, and reasons for drop out (assessed among those who discontinued their study involvement) also were examined.

Results: Of 1281 eligible women, 744 were enrolled (58% recruitment rate); retention rates were 87%, 70%, and 55%, respectively, 2 weeks and 3 and 6 months post-intervention. Being unmarried, younger, and having low baseline vegetable intake predicted loss to follow-up. Between 4 and 5 contact attempts and 1 and 2 completed contacts were required to reach participants at each data collection point. Participants endorsed recruiting women while waiting for WIC appointments (as they were accessible, perceived the information provided as informative, and wanted to pass the time) and by word of mouth. Lacking time and loss of interest were commonly reported reasons for not completing assessments and dropout. To improve retention, shortening telephone assessments, conducting the assessments in person, and increasing the amount of incentives were recommended.

Conclusion: Despite using recommended strategies, recruitment and retention rates were modest. Research is needed to identify and test approaches to effectively engage WIC-enrolled adults in health intervention trials.

1. Introduction

The recruitment and retention of participants is critical to the success of randomized controlled trials (RCT) [1,2]. Prolonged or inefficient recruitment can reduce the statistical power of a study, increase costs of the study, and adversely affect the commitment of those already enrolled [3]. Similarly, attrition, the failure of individuals to complete their participation after enrolling in a study, alters the composition of experimental and control groups, and consequently affects the internal validity of the study [1]. Particular groups of people may be lost in subsequent data collection, resulting in a biased sample or lack of generalizability [3].

To reduce the higher rates of refusal and attrition found among low-income and minority populations, community involvement strategies, e.g., working through community-based organizations, using lay outreach workers from the targeted population, and including minority

(“cultural insider”) investigators are recommended [4–9]. By increasing community trust and ownership, community-engaged research can enhance participant recruitment and retention [9]. Working with different settings requires different protocols and an understanding of features unique to a setting and population that may influence efforts to enroll and retain participants [8].

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a promising dietary intervention setting. The program operates in all 50 states, serving 7.3 million participants monthly [10,11]. Successful intervention strategies could therefore be replicated nationwide [11]. WIC serves an important low-income population [11]. Large proportions of participants are racial/ethnic minorities [11]. Lessons learned from work with this population could therefore provide insights for other low-income groups [11]. WIC provides nutrition education to all participants. Programs could therefore be integrated into WIC nutrition education services. WIC

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Table 1

Recruitment and retention rates in dietary intervention studies conducted with Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) samples.

Author and year	Behavior	Follow-up period	Recruitment rate ^a	Retention rate ^b
Havas et al., 1997 [11]	FV intake	6 months	78% (I) 82% (I) 85% (C)	63% 89% 45%
Krummel et al., 2010 [13]	Weight management	12 months	NR	42%
Chang et al., 2009 [14]	Weight management	6 months 12 months	66%	59% 41%
Campbell et al., 2004 [15]	Fat, FV intake	1–2 months	NR	75%
Havas et al., 1998 [16]	FV intake	2 months 12 months	66% (I phase) 87% (C phase)	75% (I) 76% (C) 64% (I) 60% (C)
Fung et al., 2010 [17]	Yogurt intake	2 months	86%	89%
Havas et al., 2003 [18]	Fat, FV, and fiber intake	2 months 12 months	39% (I) 39% (C)	71% (I) 75% (C) 53% (I) 60% (C)
Herman et al., 2008 [19]	FV intake	6 months	NR	75% (all participants) 70% (I) 84% (I) 71% (C)
Phelan et al., 2017 [20]	Weight loss	6 months 12 months	NR	93% 89%
Anderson et al., 2001 [21]	FV intake	2 months	84%	81%
Bensley et al., 2011 [22]	FV intake	3 months 6 months 9 months	NR	NR NR 48%
Briley et al., 2002 [23]	Nutrient intakes	5 months	NR	74%
Au et al., 2016 [24]	Breakfast knowledge, attitudes, and behaviors	2–4 months	NR	88%
Au et al., 2017 [25]	Salt knowledge and behaviors	2–4 months 9 months	NR	89% 79%

Note. FV indicates fruit and vegetable; I, intervention; C, control; and NR, not reported.

^a Defined as the proportion of eligible individuals consenting to participate in the study.

^b Defined as the proportion of pretest participants completing a follow-up assessment.

participants attend regular appointments for health screenings, nutrition education, and to pick up food vouchers [12], affording regular contact with participants and opportunities to engage participants in research activities while at WIC.

Despite a growing number of interventions to promote healthful dietary practices among WIC-enrolled adults [11,13–25], rates of recruitment (the proportion of eligible individuals consenting to participate in a study) are seldom reported (Table 1). Among studies providing this information, rates range from 39% to 87%. Rates of retention (the proportion of pretest participants completing follow-up assessments) range from 71% to 89% over shorter (2-month) periods, and from 41% to 89% over longer (12-month) intervals. Far less is known about strategies to successfully enroll and retain WIC participants in RCT of dietary interventions.

This study describes community engagement strategies and methods to recruit and retain WIC-enrolled adults in a longitudinal trial of online nutrition education to promote fruit and vegetable (FV) intake and the redemption of Farmers' Market Nutrition Program (FMNP) FV vouchers [26]. Demographic and lifestyle predictors of loss to follow-up, contacts required to reach participants for scheduled assessments, and qualitative data on participant reactions to the recruitment and retention strategies used and reasons for drop out (assessed among those discontinuing their study involvement) were examined. Findings may serve as a guide for the design of methods to recruit and retain WIC-enrolled adults in RCT of health interventions.

2. Methods

2.1. Brief overview of study procedures

The setting for the research was a New Jersey-based, urban WIC agency serving a primarily Hispanic (58%) and African American (28%) population. Participants (N = 744) were recruited from the waiting room of the WIC clinic, stratified based on FMNP voucher receipt, orally administered a pretest, and randomized to receive a newly developed online lesson (experimental group) or any of 7 existing online health education lessons of their choosing (active control group) at the collaborating WIC agency [26]. Two weeks after the lesson, participants were contacted by telephone to complete the posttest [26]. Telephone-administered follow-up assessments were conducted 3 and 6 months after the posttest [26]. Participants responded to items assessing their background characteristics (at pretest) and completed measures of the frequency and quantity of FV intake (a primary outcome) and farmers' market-related knowledge, attitudes, and skills (targeted secondary outcomes) at each time point. FMNP voucher redemption (also a primary outcome) was measured objectively using data provided by the collaborating WIC agency (coded as whether participants redeemed any FMNP vouchers [yes/no] over the FMNP voucher redemption period [June 1 to November 30, 2015]). Linear mixed effects models were used to examine whether participants who received to the new lesson had higher FV intake and better secondary outcomes than women who received an existing health education lesson. Covariates included

baseline measures of each outcome and prognostic factors (potential influences on FV intake). Logistic regression analysis was used to relate voucher redemption (yes/no) to the lesson received and covariates.

Qualitative exit interviews were held with a 10% subsample of participants ($n = 76$) to assess reactions to the recruitment and retention strategies used in the study. Follow-up contacts with participants who discontinued their study involvement also were made to explore reasons for dropout. To detect a .60 serving/day between-group difference in the primary outcome of FV intake, 630 women were needed (allowing for 40% attrition from pretest to final follow-up) [18,26]. The study was approved by the William Paterson University Institutional Review Board (2014–368) and registered with [ClinicalTrials.gov](https://www.clinicaltrials.gov) (NCT02565706). All participants provided informed written consent prior to their study involvement.

2.2. Community engagement strategies

As in other settings, WIC has multiple levels of administration requiring multiple layers of agreements [27]. Approval from the state WIC agency was required to partner with a local agency. During the “pre-research” period, 6 months before a grant application was submitted for funding, the principal investigator (PI) initiated contact with the state WIC office [28]. Regular, ongoing contact with state agency representatives and a focus on the importance of the research and the benefits to participants were vital to gaining approval. To facilitate discussion, a tentative outline of lesson content was developed. Suggestions provided by WIC representatives to promote FV intake and FMNP voucher redemption were incorporated into the outline.

The lesson was designed with extensive input from WIC participants served by the local agency designated as the site for the research. Focus groups with separate samples of 54, 56, and 52 WIC participants, respectively, were held to identify influences on FV intake and FMNP voucher redemption that were the focus of the lesson, gather data for designing the lesson, and pretest the resulting materials [26,29]. WIC participants also narrated the lesson. Key program messages were based on the experiences of other WIC participants as reported in focus groups.

The agency director (AD) set the tone for the research by presenting the project to agency staff as something she had committed the agency to doing and by stressing its importance. The AD also enlisted the support of agency staff. For example, front desk staff were tasked with advising research staff of which participants were receiving FMNP vouchers. The site supervisor was responsible for recording information on FMNP vouchers issued to participants (used to track voucher redemption). During the recruitment stage of the study, all agency staff assisted with tracking participants through the clinic (as described below). Front desk staff also provided research staff with contact and appointment information on file for participants lost to follow up.

The PI was onsite daily throughout the project. Being onsite was vital to coordinating activities, allowing face-to-face contact with WIC staff and a quick response to issues that arose. Channels of communication were established via weekly meetings with the AD and monthly meetings of an advisory board consisting of the AD, a stage agency representative, and the chief nutritionist and site supervisor of the local agency to discuss all aspects of the project.

The PI and AD worked quickly to resolve any issues that could delay completion of the study. For example, when insufficient numbers of participants were enrolled on days research staff were onsite, additional days were scheduled. To compensate for the additional days, staff hours were reduced during slow periods. The PI also hired and cross-trained more staff than were needed so that planned activities could be completed on time when unexpected delays occurred.

Equally important was celebrating when milestones were reached. Demands on agency staff were greatest during participant recruitment, owing to the extensive tracking of participants through the clinic. To acknowledge that this stage of the research had ended and recognize

staff efforts, the PI and AD organized a staff appreciation luncheon.

2.3. Recruitment strategies employed

Several strategies recommended for the recruitment of low-income and minority populations were utilized, e.g., enhancing the convenience of participation by embedding the research within routine clinic visits; staffing the project with bilingual (English/Spanish) and bicultural adults matched with participants based on race, ethnicity, and Hispanic origin; providing recruitment materials in English and Spanish; providing childcare during the informed consent and data collection process; emphasizing the confidentiality of participation; and enlisting positive support for the project from WIC staff [14,30–34]. Also employed were less well discussed strategies, i.e., structuring clinic visits to accommodate study activities and crediting the lesson as satisfying WIC's nutrition education requirement for certification.

2.3.1. Structuring clinic visits

Women presenting for services often met with several WIC staff, returning to the waiting room between contacts. As such, they could be enrolled from the waiting room at various stages of their appointments. To encourage participation, the AD established a policy to ensure that women electing to participate could resume their appointments where they left off after completing study activities. The AD informed agency staff of logistics (when research staff would be onsite and what they would be doing) and what was expected of them (to assist research staff with tracking participants through the clinic and making sure they knew who to meet with next).

2.3.2. Crediting the lesson as a WIC nutrition education contact

New Jersey WIC participants are required to complete two nutrition education contacts per 6-month certification period. To enhance the relevance of the project to participants, the agency agreed to credit the lesson as a nutrition education contact for purposes of recertification. Participants were informed of this arrangement at time of recruitment.

2.4. Retention strategies employed

Several strategies recommended to enhance retention also were used [13,14,33,35,36]. The PI spoke often about retention during regular debriefing sessions with research staff. At pretest, research staff collected contact information for the participant and a relative or friend who could be contacted if the participant could not be reached. Participants were contacted by telephone and mailed easy-to-read appointment reminders one month and two weeks before scheduled follow-up assessments and were sent thank you notes (with gift card incentives enclosed) after interviews.

Contact information was reviewed and updated with participants at each assessment. Agency staff provided contact information on file for participants who could not be reached by telephone or mail. Participants were offered a flexible appointment schedule, with time slots on evenings and weekends as well as during the daytime. Those presenting for appointments with WIC on or near (within two weeks of) the date of a scheduled assessment were offered the opportunity to complete the assessment in person while at WIC. Repeated calls were made to participants who could not be reached. As many had pay-as-you-go phones, disruptions in service were common. Post cards were mailed to participants who could not be reached asking them to phone in.

A study logo was used in all correspondence with participants to foster identification with the project. Gift card incentives were provided for completion of assessments and an optional exit interview. In light of research demonstrating that altruistic motives are reported for participating in RCT [37], throughout the trial, research staff stressed the importance of the research and the ways in which participants' involvement would benefit other WIC participants. Logs were used to

track all contacts with participants. Other less well discussed strategies also were used, i.e., offering participants a variety of gift cards and electronic gift card tracking.

2.4.1. Gift card options

It has been suggested that the level of an incentive should be large enough to encourage participation but not so large that it is coercive [38]. The AD provided guidance on the incentive amount (the recommended amount was \$10). To enhance the appeal of the incentives, the AD suggested offering participants a variety of gift card options. Cards redeemable at 2 supermarkets and 2 discount chain stores where participants were known to shop were offered.

2.4.2. Electronic gift card tracking

Despite the relatively short (6-month) duration of the trial, changes of address were common. As a result, gift card incentives mailed to participants often were returned as undeliverable. The AD and PI devised a system for ensuring that participants who did not receive gift cards by mail had the option to pick them up. On a weekly basis, research staff provided agency staff with the names and WIC identifiers of participants whose gift cards were returned, the cards, and a signature form. Agency staff entered a flag in the WIC electronic record system for each person on the list so that anyone accessing the record could inform the participant that a card was available for pick up. Cards were stored in a locked filing cabinet accessible to agency staff. Participants picking up cards were required to sign for them. Agency staff who distributed the cards updated participants' electronic records to indicate that they had been received.

2.5. Sources of data

Paper logs were used to track all contacts with potential participants (used to compute the recruitment rate) and those who were enrolled (used to compute retention rates, track reasons for loss to follow-up [possible reasons were loss of contact and dropout or discontinuation of study involvement], and determine the number of contacts required to reach participants for scheduled assessments). Contacts were coded as attempted (calls during which the participant was not reached) and completed (calls during which research staff spoke with a person [participant or other] about an assessment [excluding calls during which the assessment was completed]).

Qualitative data were collected from participants agreeing to complete a telephone exit interview regarding their study experiences. Questions to elicit feedback on the methods used to recruit and retain participants are shown in Table 2. Women who dropped out of the study also were contacted by telephone and asked why they discontinued their study involvement. All responses were manually recorded and entered into SPSS for analysis.

Table 2
Exit interview questions on recruitment and retention.

Question (area of focus)
1. As you may remember, we recruited women for this project from the waiting room here at WIC. Was this the best way to sign women up for the project? Why or why not? (Recruitment)
2. How might a researcher get a friend or relative of yours to sign up for a project like this (one where they would have to do a survey, watch a nutrition lesson, and complete telephone follow-up interviews)? (Recruitment)
3. As you may know, we planned to do three telephone interviews with each woman involved with the project (two weeks, 3 months, and 6 months after the first in-person interview). Some women did not complete all of the interviews. What, if anything, do you think may have prevented them from doing so? (Retention)
4. In future projects like this, how could we get more women to complete the interviews? (Retention)

2.6. Analysis

Descriptive statistics were used to compute recruitment and retention rates and to summarize data on the number of contacts by type at each data collection point. We examined whether baseline demographic and lifestyle characteristics predicted loss to follow-up 3 and 6 months post-intervention with logistic regression analysis. The included characteristics were age; Hispanic ethnicity; receiving assistance other than WIC; pregnancy, breastfeeding, foreign-born, marital, and employment status; educational attainment; number of children in the household aged 2–5 years; and number of other adults in the household (assessed via closed-ended, multiple-choice items) and food insecurity status, social desirability trait, and the frequency and quantity of FV intake (assessed with validated measures) [39–42]. All data were analyzed using SPSS for Windows (version 25; IBM Inc., Armonk, NY). A p -value < 0.05 was considered statistically significant.

Qualitative data were analyzed by question. Similar responses were grouped together and assigned descriptive titles in accordance with established guidelines [43]. As the aim was to identify common responses to the questions, for each, up to three of the most frequently mentioned answers are reported (in descending order of frequency of mention).

3. Results

3.1. Participant recruitment

During the recruitment phase of the study, sufficient numbers of women in the FMNP stratum were not enrolled; therefore, the phase was extended by two weeks [26]. In total, 1345 women were screened for eligibility. Sixty-four were ineligible, and 744 of the remaining 1281 eligible individuals (58%) were enrolled. Participants had a mean age of 28.97 (6.83) years; 17% were pregnant and 21% were breastfeeding. Most were born in the U.S. (60%), Hispanic (59%; primarily of Dominican and Puerto Rican origin) and African American (30%), reported a high school education or less (50%), and lived with, on average, two children and one other adult [26].

3.2. Participant retention

Of the 744 participants, 645 (87%) completed the posttest (324 [87%] in the experimental group and 321 [86%] in the control group), 520 (70%) completed the 3-month follow-up assessment (260 [70%] in the experimental group and 260 [70%] in the control group), and 411 (55%) completed the 6-month follow-up assessment (205 [55%] in the experimental group and 206 [55%] in the control group). At posttest, 89 participants (45 [12%] in the experimental group and 44 [12%] in the control group) could not be reached and 10 (2 [1%] in the experimental group and 8 [2%] in the control group) discontinued their study involvement. At 3-month follow up, 196 participants (99 [26%] in the experimental group and 97 [26%] in the control group) could not be reached and 18 (10 [3%] in the experimental group and 8 [2%] in the control group) discontinued their study involvement. At 6-month follow-up, 303 participants (154 [41%] in the experimental group and 149 [40%] in the control group) could not be reached and 2 (both in the control group) discontinued their study involvement. Fifty-one (7%) participants completed the pretest only.

3.3. Predictors of loss to follow-up

The models predicting loss to follow-up 3 and 6 months post-intervention were significant (Table 3). Across time points, women lost to follow-up were more likely to be unmarried than married ($p < 0.01$). The likelihood of not completing the 3-month follow-up assessment also increased as age decreased ($p < 0.05$). The likelihood of not completing the 6-month follow-up assessment increased as age ($p < 0.05$)

Table 3
Predictors of loss to follow up 3 and 6 months post-intervention.

Variable	3 months post-intervention		6 months post-intervention	
	B (SE)	P-value	B (SE)	P-value
Age in years	-0.034 (0.014)	0.018	-0.027 (0.013)	0.035
Hispanic ^a	0.079 (0.185)	0.669	0.174 (0.174)	0.319
Receiving assistance other than WIC ^a	-0.054 (0.198)	0.787	-0.077 (0.186)	0.681
Pregnant ^a	0.135 (0.222)	0.544	0.306 (0.211)	0.148
Breastfeeding ^a	-0.036 (0.212)	0.864	0.077 (0.198)	0.697
Foreign-born ^a	-0.052 (0.197)	0.792	-0.173 (0.184)	0.348
Married ^a	-0.680 (0.240)	0.005	-0.707(0.211)	0.001
Employed ^a	-0.046 (0.179)	0.800	-0.114 (0.168)	0.498
Educational attainment ^b	0.002 (0.114)	0.984	-0.193 (0.107)	0.072
Number of children in household aged 2-5 years	0.157 (0.182)	0.388	-0.287 (0.169)	0.089
Number of other adults in household	-0.035 (0.081)	0.667	0.053 (0.076)	0.488
Food insecure ^a	-0.263 (0.168)	0.118	-0.239 (0.158)	0.132
Social desirability trait ^c	-0.047 (0.051)	0.353	-0.053 (0.048)	0.270
Frequency of fruit intake (times/day)	0.066 (0.049)	0.173	0.088 (0.048)	0.067
Frequency of vegetable intake (times/day)	-0.053(0.057)	0.359	-0.025 (0.053)	0.637
Quantity of fruit intake (cups/day)	-0.063 (0.055)	0.250	-0.021 (0.051)	0.684
Quantity of vegetable intake (cups/day)	-0.004 (0.082)	0.965	-0.165 (0.080)	0.039

^a Dichotomously coded (0 = no, 1 = yes).

^b coded as follows: 1 = some high school or less, 2 = high school diploma or GED, and 3 = more than high school.

^c Assessed with a short form of the Marlowe-Crowne Social Desirability Scale (higher scores indicate a stronger social desirability trait).

and baseline vegetable intake ($p < 0.05$) decreased.

3.4. Participant contacts

Few participants completed planned assessments on schedule. At posttest and 3- and 6-month follow up, the number and percent of participants having done so were 228 (31%), 154 (21%), and 114 (15%), respectively. Among those who could not be reached on schedule, between 4 and 5 contact attempts and 1 and 2 completed calls per participant were made at each time point (Table 4).

3.5. Qualitative data

Nearly all exit interview participants (75 or 99%) endorsed the approach of recruiting women from the waiting room of the WIC clinic. When asked why, participants frequently reported that this was the best way to reach women served by WIC (18 or 24%), women needed or wanted the information provided (16 or 21%), and participating was a good way to pass the time while waiting to meet with WIC staff (14 or 18%). In response to the item querying how best to recruit other women

Table 4
Contacts made to participants at posttest and follow-up assessments.

Assessment interval	N and % or Mean ± SD
Posttest	
Completed on first attempt	228 (31%)
Did not complete on first attempt	516 (69%)
Attempted	4 ± 5
Completed	2 ± 1
3-month follow-up	
Completed on first attempt	154 (21%)
Did not complete on first attempt	590 (79%)
Attempted	5 ± 5
Completed	2 ± 1
6-month follow-up	
Completed on first attempt	114 (15%)
Did not complete on first attempt	630 (85%)
Attempted	4 ± 3
Completed	1 ± 1

Attempted defined as calls during which the participant was not reached. Completed defined as calls during which research staff spoke with a person (participant or other) about a follow-up assessment (excluding calls during which the assessment was completed).

to sign up for similar such trials, participants commonly reported via referrals or word of mouth (34 or 45%), by distributing information about the study in other settings serving WIC participants, e.g., pediatric offices (14 or 18%), and by recruiting individuals via telephone (8 or 11%). Explanations given as to why some women did not complete all follow-up assessments included lacking time to do so (41 or 54%), loss of interest in the project (19 or 25%), and the length of time required to complete the questionnaire (9 or 12%). Suggestions for improving the response rate included shortening the questionnaire (10 or 13%), administering the questionnaire in person during routine clinic visits (9 or 12%), and increasing the amount of incentives provided (9 or 12%).

Of the 30 women who discontinued their study involvement, 4 did not provide a reason for doing so. Most of the remaining 26 participants reported lacking time (14 or 54%) and loss of interest (6 or 23%) as reasons for dropout. Commonly reported reasons for lacking time to complete the study were competing work, school, and childcare commitments.

4. Discussion

Despite using recommended strategies, the 58% recruitment rate observed in this study was modest relative to rates reported elsewhere (Table 1). Those who declined to participate were not asked their reasons for doing so; nevertheless, research staff reported that lacking time often was mentioned. To allow participants to plan for study activities, enrolling participants via telephone in advance of WIC clinic appointments was considered. The decision to forego this approach was based on concerns expressed by WIC representatives regarding the loss of participants failing to attend appointments. Therefore, an “on-the-spot” recruitment approach was used, possibly explaining the lower rate found. Women may not have been able to stay after appointments owing to such challenges as transportation limitations (e.g., missing a bus or friend who provided transportation) and time constraints (e.g., having other appointments) [33].

Possibly, the modest recruitment rate was an artifact of the active recruitment method used. Relative to passive methods, active recruitment yields better results in terms of sample representation and retention [1]. Yet, this method also will have a high refusal rate because it requires that research staff contact potential participants by telephone or face-to-face [1]. This seems likely in light of the lower rates of

recruitment found for active as compared to passive methods among ethnic minority and low-income adults participating in health interventions [44,45]. For example, Lee and colleagues found a (64%) efficiency ratio (ratio of the number of women recruited to the number screened) for passive recruitment strategies (publicizing the study, providing a telephone number, and requiring interested individuals to initiate contact with the researchers), whereas for active recruitment (contacting targeted individuals in person, by phone, or by mail) the ratio was considerably lower (11%). Estabrooks and colleagues similarly found that a higher proportion of eligible individuals screened when responding to passive methods (announcements in newspaper ads and community flyers, e.g.) enrolled in a community lifestyle intervention (82%) than did those who were recruited through such active methods as telephone outreach and in-person face-to-face meetings (44%).

The low rate may be an artifact of the study population. It has been suggested that urban inner-city populations are harder to reach and tend to be younger and less educated, factors that may adversely affect the response to intervention programs [11]. Participants had less formal education for their age group than the U.S. population average [46]. Although oral and written descriptions of the study were provided, other strategies to maximize understanding of a study, e.g., presenting details on a flipchart using pictures and brief sentences or via DVD, were not used [14,33]. Such strategies may have improved understanding of and interest in the study.

Enrolling targeted numbers of participants required extending the recruitment phase, suggesting that allocating additional time for subject recruitment in advance may help overcome recruitment challenges. Despite the low recruitment rate found relative to rates reported elsewhere [11,13–25], a sufficiently large sample was enrolled to detect anticipated between-group differences in the primary outcome of FV intake. Further, although non-probability sampling was used, participants mirrored the ethnic/racial diversity of women served by the collaborating agency.

The 55% retention rate at 6-month follow-up is comparable to 6-month follow-up rates found in other WIC samples. Chang et al. reported a 59% retention rate at 6-month follow-up [14]. Havas et al. reported rates ranging 45%–89%, depending on study condition [11].

As found elsewhere, younger age and being unmarried were predictors of loss to follow-up [47–49]. The relationship between age and attrition may be explained by the competing responsibilities typically associated with young adulthood, such as the demands of parenting and familial responsibilities [50]. Older adults may be better able to commit to the requirements of a longitudinal trial than younger adults due to less demanding schedules [50]. It has also been suggested that young women and those who are unmarried are less likely stable and thus more difficult to contact and retain [51]. Emphasizing the need to obtain accurate and complete contact information from such participants is therefore recommended [51].

As found elsewhere, unhealthy baseline eating behavior also predicted loss to follow-up [52,53]. Possibly, those with poor eating habits lacked awareness of the importance of healthy eating. As such, adherence to the study protocol may not have been considered important. These at-risk women may require alternate or additional support to remain active study participants [54].

Despite having scheduled follow-up assessments and confirmed the appointments by telephone and mail, few participants were reached at the designated times (less than one-third at each assessment). The number of contacts required to reach these participants was comparable to the number reported by Barnett et al. in a breastfeeding intervention with low-income women (on average, 3.4, 3.3, and 3.9 contacts, respectively, at 1-, 3-, and 6-month follow-up) [2]. Yet, Barnett et al. achieved higher retention rates than were found in this study (93.4%, 94.5%, and 94% at 1-, 3-, and 6-month follow-up, respectively) [2]. In addition to the present methods, Barnett et al. also contacted participants by email and offered a higher (\$20.) incentive amount for

completing assessments [2], factors that may explain the higher retention found. These and other recommended strategies, e.g., providing small incentives to encourage participants to update their contact information and sending greeting cards monthly to maintain continuous contact with participants, may have been necessary to extend participation [14].

Qualitative feedback supports the utility of recruiting women from the waiting room of the WIC clinic. Perceiving the information provided as informative, a factor identified elsewhere as contributing to recruitment and retention [2], was among the reasons for endorsing this approach. Not surprisingly, wanting to pass the time while waiting for appointments also was mentioned. In research with WIC samples, excessive waiting times are a key barrier to using WIC services [55,56]. As suggested elsewhere, the time and place of the study were likely motivating factors for women to join because they were already at WIC and had time to spare [1].

Recruiting women from the waiting room of the WIC clinic also produced a higher recruitment rate than the rates reported elsewhere for other recruitment locations, suggesting the promise of this approach [57,58]. For example, in a study by Silfee et al. [57], WIC participants were screened by WIC nutritionists in their offices during routine clinic visits. Interested women provided their contact information, which was then passed to a study recruiter who contacted the women to explain the study further, ask additional eligibility questions, and ascertain interest. Using this approach, 24.1% and 28.5% of eligible women were recruited into each of two study conditions. In an intervention for expectant fathers, Wolfberg and colleagues recruited expectant mothers (80% of whom were enrolled in WIC) seeking prenatal care at a university-affiliated hospital. Consenting women were randomly assigned to have their partner attend a class that taught them to support and facilitate breastfeeding or a control class that taught basic principles of baby care and safety. The women then identified their partners, who were contacted and invited to participate. Although the recruitment rate was not reported, of 567 pregnant women who were approached about the study, 59 (10%) completed the trial. The authors attributed the low completion rate to significant attrition during the enrollment process [58].

The primary method recommended by exit interview participants for enrolling other women in similar such studies was by word of mouth. In examining approaches to recruit low-income women into a randomized controlled contraceptive study, Rdesinski et al. found that the number of contact-attempts per enrollee was highest for community referrals (recruitment achieved through a relationship with a community agency) and lowest for individuals referred by word of mouth [35]. Together, these findings suggest the promise of using a combination of recruitment strategies, e.g., approaching potential participants on-site at WIC and asking participants to share their study experiences with other WIC participants and encourage them to enroll.

As found elsewhere, frequent explanations given for not completing all follow-up assessments (among exit interview participants and participants discontinuing their study involvement) were lacking time and loss of interest [1]. Exit interview participants also mentioned the time required to complete the questionnaire (up to 20 min was required to do so). In the aforementioned study by Barnett et al., the high retention found was attributed to short (10 min) interviews requiring little time commitment [2]. Unclear is the optimal amount of time participants are willing to spend completing assessments. Questions also are raised regarding how best to address participant concerns regarding questionnaire length and achieve the measurement goals of a study. Clearly, this is an important avenue for further research.

To improve retention, exit interview participants recommended administering the questionnaire in person and increasing the incentive amount. In light of time constraints reported by participants, unclear is why in-person (vs. telephone-administered) interviews were preferred (as the mode of administration would not affect interview length). Possibly, participants viewed their time at WIC as more flexible than at

other times. Alternatively, they may have preferred in-person assessments (as during the pretest), owing to the personalized contact provided. Possibly, in-person assessments were viewed as more convenient, owing to the childcare provided.

Although guidance was sought from WIC representatives regarding the incentive amount, feedback from participants was not solicited, possibly explaining why a higher amount was recommended. In other WIC samples, higher amounts (\$20-\$40 per interview) have been provided [19,43]. Warranting examination is the effects on retention, of different incentive amounts and approaches, e.g., increasing amounts provided at successive assessments, providing an amount per hour of study participation, and offering bonus incentives, e.g., additional amounts for achieving study milestones, e.g., completion of all scheduled assessments [1,14,35].

4.1. Study limitations and strengths

As found elsewhere, unknown is which techniques were more or less effective than others because numerous strategies were implemented simultaneously [14]. The efficacy of the strategies was not examined. The study was conducted in an urban WIC agency setting. Unknown is whether and how well the techniques described would work in non-urban settings. The setting and population focus, use of novel recruitment and retention strategies (structuring clinic visits to accommodate research activities, crediting the program as satisfying WIC's nutrition education requirement, offering a variety of gift card incentives, and electronic gift card tracking) and quantitative and qualitative assessments of recruitment and retention efforts are study strengths.

4.2. Conclusions

Despite using several recommended strategies to recruit and retain participants, recruitment and retention rates were modest. Special efforts are needed to retain younger, unmarried participants with low baseline vegetable intake in other similar such trials. Further research is needed to evaluate the strategies described and those recommended by participants (on-site recruitment and recruitment by word of mouth; the use of brief questionnaires, questionnaire administration in-person (vs. telephone), and higher [$>$ \$10] incentive amounts).

Data statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest statement

The authors have no competing interests to declare.

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