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Quasi-Experimental Pilot Study of Intervention to Increase Participant Retention and Completed Home Visits in the Nurse-Family Partnership

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Abstract

We evaluated an intervention to increase participant retention and engagement in community practice settings of the Nurse-Family Partnership (NFP), an evidence-based program of nurse home visiting for low-income, first-time parents. Using a quasi-experimental design (six intervention and 11 controls sites that delivered the NFP), we compared intervention and control sites on retention and number of completed home visits during a 10-month period after the intervention was initiated. Nurses at the 5 intervention sites were guided in tailoring the frequency, duration, and content of the visits to participants' needs. NFP nurses at the control sites delivered the program as usual. At intervention sites, participant retention and completed home visits increased from the pre-intervention to intervention periods, while at control sites these outcomes decreased from the pre-intervention to intervention periods, leading to a significant intervention-control difference in change in participant retention (Hazard Ratio: 0.42, $p = .015$) and a 1.4 visit difference in change in completed home visits ($p < .001$, $ES = 0.36$). We conclude that training nurse home visitors to promote adaptation of program dosage and content to meet families' needs shows promise as a way to improve participant retention and completed home visits.

Keywords

Home; visits; retention; pregnancy; infancy

As evidence-based preventive interventions are translated from research into community practice, participant engagement is often attenuated (IOM National Academies, 2009), and when participation is inconsistent or ends prematurely, program impact is likely reduced (Brown & Liao, 1999). This is particularly challenging for family-based preventive interventions in which parents may not have conditions that lead them to become involved. The National Academies report on *Preventing Mental, Emotional, and Behavioral Disorders among Young People* has drawn attention to the challenges of participant engagement and retention when evidence-based family interventions are translated to community settings, and has referred to implementation and dissemination research as a new frontier of prevention science (IOM National Academies, 2009).

Theoretically, engagement is likely to be less of a challenge for nurse-delivered programs that serve pregnant women and parents of infants, as pregnant women have natural concerns about pregnancy, labor, delivery, and care of the newborn that make them particularly receptive to offers of help from nurses. In the most recent trial of the Nurse-Family Partnership (NFP), a preventive program of prenatal and infancy home visiting by nurses, families were randomly assigned to a control condition or to versions of the program delivered either by nurses or by paraprofessional visitors. Nurses completed more visits and had higher rates of participant retention than did paraprofessionals (Korfmacher, O'Brien, Hiatt, & Olds, 1999).

The NFP is a program of prenatal and infancy home visitation in which nurses visit participants in their homes to accomplish three goals: 1) improve pregnancy outcomes; 2) improve child health and development; and 3) improve families' economic self-sufficiency (Olds, 2002). Nurses are provided with detailed visit-by-visit guidelines for 64 scheduled visits from early in pregnancy through the child's second birthday. The NFP has employed a

visit schedule recommended for all participants: four weekly visits immediately after registration during pregnancy, then visits every other week until birth, weekly visits for six weeks following the child's birth, visits every other week until the child is 21 months of age, and then monthly visits until the child's second birthday.

In series of trials, the NFP has produced impacts on a range of maternal and child outcomes with different populations living in different contexts (Olds, 2002; Olds, Robinson, O'Brien, et al., 2002; Olds, Kitzman, Cole, et al., 2004; Olds, Robinson, Pettit, et al., 2004; Kitzman, et al., 1997; 2010; Olds, et al., 2010). In at least two of the three trials, the program produced consistent improvements in women's prenatal health (e.g., reductions in prenatal tobacco use, pregnancy-induced hypertension), reductions in childhood injuries, increases in inter-pregnancy intervals, reductions in women's use of welfare, and improvements in children's cognitive, language, and academic achievement outcomes for children born to mothers with low psychological resources. NFP has been identified as an intervention that meets the Coalition for Evidence-Based Policy's "Top Tier" of evidence (Coalition for Evidence-Based Policy: <http://toptierevidence.org/wordpress/>), and as the primary evidentiary foundation for the Maternal, Infant, and Early Childhood Home Visitation program funded under the Affordable Care Act (Haskins, Paxson, & Brooks-Gunn, 2009).

Since 1997, the NFP has been replicated in contexts outside of research settings, with considerable attention to ensuring that sites and nurses implement the program with essential fidelity to the program model tested in the trials (Olds, Hill, O'Brien, Racine, & Moritz, 2003). One of the structures set in place to help ensure effective implementation is a web-based information system that monitors features of implementation and maternal and child health. Data are entered on every attempted and completed home visit and are used to guide continuous quality improvement and research on the model and its implementation. Today, the program is serving over 23,000 families per year in over 440 counties in 42 states. Responsibility for program replication with fidelity to the NFP model is managed by a non-profit organization known as the Nurse-Family Partnership© (Nurse Family Partnership, 2012).

As the NFP is replicated in an increasing number of community replication sites, the rates of participant attrition are higher (60–70%) than in the original trials (38% in the most recent Denver trial; Korfmacher et al, 1999). The work reported in the current paper grew out of a mixed methods study conducted to understand individual, nurse, and site variations in participant retention and completed home visits in NFP community replication sites (O'Brien, Moritz, Luckey, McClatchey, Ingoldsby, & Olds, 2012). This study found that mothers who were younger, unmarried, and African Americans, dropped out more rapidly, while Hispanics dropped out less. Moreover, nurse turnover was associated with a large relative risk of mothers' dropping out of the program. Even after controlling statistically for these individual differences in risk, sites and nurses varied substantially in their retention of families (Obrien et al., 2012).

Qualitative analyses of high and low-retention sites found that irrespective of their success in retaining families, nurses in all sites emphasized the importance of the nurse-mother relationship in retaining families. Nurses in high-retention sites were more collaborative

with families and adapted the program more to align with families' needs. In low retention sites, nurses emphasized with mothers what the program could offer them, and how they could benefit from completing it (O'Brien, et al., 2012).

We concluded that in community replication insufficient attention was focused on how this structured program needs to be adapted thoroughly to the needs and aspirations of parents, and their abilities to participate. The NFP program was designed from the beginning to be adapted to families' needs, but it is possible that the emphasis on faithful reproduction of the program model in community settings may have led some nurses to focus on delivering the program as a set of highly structured, sequenced assessments and interventions, with insufficient attention to individualized adaptation.

As evidence-based interventions are implemented in community contexts, researchers have focused on the balance of intervention fidelity with local adaptation (Castro, Barrera, & Martinez, 2004; Lara et al., 2011), and with individual contexts and needs (Backer, 2001; Bell et al., 2007). Morrison et al. (2009) note that, "slavish fidelity may result in an intervention that is faithful to the form, but not the spirit, of the original" (p. 129). In the current case, an important part of the "spirit" of the NFP is likely to be embodied in nurses' collaboration with clients around their perceived needs, abilities to participate, and corresponding adaptation of the program dosage and content.

We reasoned that one way of deepening nurses' skills in listening and adapting the program to families' needs would be for nurses to give more explicit control over the visit schedule and content to families, while adhering to the program's overriding goals. This approach is consistent with Motivational Interviewing (MI, Miller & Rollnick, 2002), which has been shown to promote treatment engagement, positive behavior change (Carroll et al., 2006), and aligns with many of the more successful retention interventions tested in child and family therapeutic contexts (Miller & Prinz, 2003; Nock & Ferriter, 2005; Nock & Kazdin, 2005; Ingoldsby, 2010). According to MI, clients may be ambivalent about program participation, and more likely to miss appointments and drop out of the program if they do not experience providers as addressing their needs and values (Miller & Rollnick, 2002). We hypothesized that by enhancing nurses' a) abilities to help clients express and address their ambivalence about participation; and b) skills in allowing families' goals to drive the specific content and pacing of the NFP intervention, families' engagement and participation would increase.

We conducted this study as a quasi-experimental trial as we wished to use this phase of research to work out the details of the intervention, starting with sites that we knew were committed to addressing challenges with participant retention.

METHOD

Design

Figure 1 outlines the study design and flow of participating individuals and sites. Five sites were recruited to participate in the Retention Intervention (RI) in three states on the basis of supervisors' interest in addressing participant retention. To increase statistical power, within

each state, two control sites were identified on the basis of their similarities to the RI sites regarding population served, type of catchment area (urban, small city, rural), and pre-intervention attrition rates. One intervention site serving two counties split into two during the course of the intervention period. We added a single control site that served two counties to accommodate the additional RI site. This led to a design with six intervention and 11 control sites. We conducted the study in two cohorts registered during two 11-month periods: pre-intervention (March through December, 2003) and intervention (March through December 2004). Intervention impact was assessed by comparing changes in participant attrition and completed home visits between RI and control sites for cohorts enrolled during these two periods.

Participants

We enrolled nurses (n=112), supervisors (n=13) and NFP program participants served at the six RI and 11 control sites in the pre-intervention (n=1082, total) and intervention periods (n=1337, total). All nurses were female, most had bachelors' degrees in nursing, and they had an average of 13 years of nursing experience.

Sites in the intervention and control conditions (Table 1) were similar in type of agency administering the program, in length of time having served as NFP sites, and in catchment area population sizes, i.e., number in catchment counties living in urbanized areas or clusters: < 25,000, 25,000 < 50,000, 50,000, defined by US Bureau of Census criteria (http://www.census.gov/geo/www/ua/ua_2k.html).

As shown in Table 2, NFP participants in the study were young (M=19.76 years), unmarried (83%), low educational attainment (M=11.09 years), and racially and ethnically diverse - 58% Caucasian, 20% Latina, and 20% African-American. To be eligible for the NFP program, mothers must have no previous live births, and have limited incomes (usually indicated by Medicaid status).

Human Subjects

Nurses, supervisors, and NFP participants consented for their information system data to be used for program improvement purposes at enrollment; they were not further informed about, or re-consented, for this study. All nurses and supervisors at each site were considered part of this study, as the intervention was applied at the site level. The study was approved by the Colorado Multiple Institutional Review Board.

Retention Intervention (RI)

The RI encouraged nurses to talk with newly enrolled participants about adjusting visit frequency and program duration to meet their needs. Nurses described the typical visitation schedule and indicated that they could adapt the program schedule and to meet families' needs. Nurses asked participants if they preferred to be visited: a) according to the typical visit schedule, b) with reduced frequency, c) with increased frequency, d) allowing for a temporary program leave, or e) no more (terminated). They revisited participants' preferences at child age 6 weeks and 4 months.

To deepen nurses' skills in collaborating with clients, nurses were provided augmented training in MI (Miller and Rollnick, 2002). We emphasized two primary MI approaches: 1) "rolling with participants' resistance" about participation; and 2) clarifying participants' values and goals and aligning the nurse-client partnership with those goals. Other strategies extended elements of the existing NFP program model, including nurse and client joint planning of program content and agendas, and applying "pros and cons" decisional balance worksheets and importance and confidence rulers (Miller & Rollnick, 2002). While program content was flexed to address families' concerns and aspirations, core content was to be covered with all families. Nurses participated in telephone conference calls to learn and refine the RI as described below.

Procedures for RI Development and Implementation

We selected five NFP sites in three states to participate in refining and delivering the RI. Sites were selected because their nursing supervisors' expressed interest in working to improve participant retention. Nurses at these sites were educated in the RI through reviews of written materials, viewing video tapes on MI, and monthly teleconferences in which they reviewed their implementation of the intervention. As many as 50 nurses and 13 researchers and nurse consultants participated in each call. After completion of the pre-intervention period, RI sites began to implement and refine the RI in February, 2004, and continued through December 2004.

We provided nurses with written guidelines (e.g., scripts, strategies, examples) which they refined over the course of the intervention. We held monthly teleconferences in which we examined implementation challenges, reviewed case examples, provided detailed summaries of each call; and reviewed implementation and retention data. Nurses completed readings and watched MI training videotapes between calls. They were asked to implement the RI with all newly enrolled participants while learning it, which makes this a pilot study. We employed the Concerns-Based Adoption Model (CBAM) (Loucks-Horsley, 1996) to elicit nurses' concerns about the RI, address those concerns, and gradually shift the conversation toward its competent delivery.

Retention Intervention Fidelity

Nurses completed an implementation data form that captured whether the RI was implemented, and clients' choices for visitation schedule. Feedback to sites regarding RI implementation, retention and completed home visits was shared during the conference calls. Nurses reviewed summary data across all sites, and each site received a confidential report on their performance.

Control Condition

Comparison sites delivered the NFP program as usual. They may have addressed retention using local quality improvement efforts, but we did not assess this.

Measures

Attrition and completed visit outcomes were derived from the NFP web-based information system for both RI and Control sites. In addition, at RI sites, nurses filled out

implementation data forms, which allowed us to monitor cases that received the intervention, when it was delivered, and mothers' responses to the flexible scheduling.

Addressable attrition—As a part of the standard implementation of the NFP, all nurses complete an information system form that codes whenever the participant is no longer participating in the program, and reasons for their non-participation: a) addressable reasons (declined further participation, missed excessive appointments, or was unable to be located) or b) non-addressable reasons (moved out of service area, child no longer in family custody, or fetal, child, or maternal death). During data analysis, cases with no recorded home visit over a 180-day period were designated addressable drops, the same threshold in the most recent randomized controlled trial of the NFP (Korfmacher, O'Brien, Hiatt, & Olds, 1999), and in the analysis of predictors of NFP attrition (O'Brien, et al., 2012). We assessed participant attrition for those enrolled in the program during a 10-month period during which the RI was developed and implemented (March through December, 2004) and contrasted that with rates among those enrolled during a 10-month pre-intervention period.

Number of completed visits during pregnancy—As part of the standard implementation of the NFP, nurses in both RI and Control sites filled out an encounter form for every attempted or completed home visit. We calculated the *number of completed home visits* and the date of the last completed visit for each enrollee in the program. The count of completed home visits was based upon every case registered during the pre-intervention and intervention periods whose expected dates of delivery occurred prior to the end of the pre-intervention and intervention periods (10 months each). To create a meaningful interval for estimate of completed home visits, we counted all visits completed between the first visit and last before the child's birth or estimated birth date assuming a 40-week gestation, given mother's estimated gestational age at registration.

Participant reach—Nurses delivering the RI completed a separate form indicating the date of each RI discussion, the components of the intervention that were delivered, and the self-dosing choices each participant made. Each newly enrolled case in the RI sites was assigned a value which indicated whether the nurse had at least one RI discussion, a variable labeled *participant reach*.

Participant choices—Nurses at the RI sites recorded clients' choices: use the recommended visit schedule; decrease the number of home visits; increase the number of visits; take a temporary leave from the program; or end the program early.

Demographics—Participant age, gestational age, race/ethnicity, marital status, education and employment history, and income were assessed at enrollment as part of the standard data gathering for all NFP participants.

Site Level Characteristics—We coded whether sites were administered in public health agencies, other public agencies, non-profit organizations, or hospitals; the duration of time (in days) that the NFP program had been operating in their respective organizations prior to the beginning of the "pre-intervention period;" and whether the population in catchment

counties lived in urbanized areas of particular sizes (< 25,000, 25,000 < 50,000, 50,000) (http://www.census.gov/geo/www/ua/ua_2k.html).

Data Analysis

Data analyses were conducted for all newly enrolled participants at intervention and control sites from March through December, 2003 (pre-intervention cohort) and for the same 10-month period in 2004 (intervention cohort). The core statistical model included treatment condition and cohort (pre-intervention versus intervention) as fixed factors, the interaction of treatment and cohort, and sites entered as levels of a random effect. Gestational age at registration was entered as a covariate as it was a powerful predictor of completed home visits (those registered earlier had greater opportunity for home visits), and there were some differences in gestational age at registration between RI and control sites. Treatment contrasts focused on changes in attrition and completed home visits from the pre-intervention to intervention cohorts. The analysis was conducted at the level of sites, as sites were the units of intervention assignment.

The Cox proportional hazards model was used to estimate the hazard of addressable attrition for the pre-intervention and intervention cohorts. The continuous dependent variable (number of completed home visits during pregnancy) was analyzed with the general linear model. Findings are reported as adjusted Hazard Ratios or adjusted (least square) means controlling for the effects of the covariate, with 95% confidence intervals, and 2-tailed significance tests.

RESULTS

Site Characteristics

Intervention and control sites were similar with respect to program administrative auspices, duration of NFP program operation prior to the pre-intervention period, and numbers of people living in urban areas in the catchment counties (Table 1).

Participant Characteristics

Table 2 shows that participant characteristics were essentially the same for intervention and control sites for each cohort time period, except that there were trends for control sites to enroll participants earlier in gestation than did RI sites in both the pre-intervention and intervention periods, and there was a trend for control sites to have larger numbers of Native Americans in the intervention period.

Implementation of the Retention Intervention

Overall, nurses at RI sites delivered some component of the RI to an average of 79% of newly enrolled participants (50%, 54%, 84%, 95%, and 96% at each of the sites). The RI site that split in two had 96% reach summing across the two sites. When first introduced to the RI, 91% of participants chose the standard NFP recommended schedule. Approximately 7% chose to decrease the frequency of NFP visits. Very few participants chose to increase their visit schedule, take a temporary leave, or leave the program permanently (< 1% for each of these options).

Participant Retention and Completed Home Visits

Compared to the pre-intervention period, participants at intervention sites had a lower risk of dropout after the introduction of the intervention (hazard ratio [HR], 0.57; 95% CI, 0.33 – 0.99, $p = .046$), while participants at the control sites tended to drop out more in the intervention year, although the difference was not statistically significant (HR, 1.36; 95% CI, 0.88 – 2.12, $p = .167$); the RI-control difference in change from the pre-intervention to intervention periods was significant (HR, 0.42; 95% CI, 0.21, 0.84, $p = .015$). Figure 2 plots the time until drop for addressable reasons during the pre-intervention and intervention years for the control and RI sites.

As indicated in Table 3, there was a significant RI-control difference in completed home visits from the pre-intervention to intervention cohorts. Compared to their pre-intervention cohort counterparts, participants registered at RI sites in the intervention period completed more home visits (7.48 versus 8.19; $p = 0.03$) while participants at control sites completed fewer visits (7.97 versus 7.28; $p = 0.01$), leading to a significant treatment difference in change [1.4 visits (95% CI, 0.58, 2.2), $p < .001$]. This 1.4 visit difference constitutes a 0.36 effect size calculated in standard deviation units.

DISCUSSION

The contrast between the RI and control sites was estimated with a Hazard Ratio of 0.42 for participant attrition and a difference of 1.4 completed home visits. The difference in home visits should be interpreted in light of the 13 visits called for by the NFP visit-to-visit guidelines for women registered in the program at 19 weeks of gestation. These intervention-control contrasts provide preliminary evidence to support the promise of this approach for increasing participant retention.

During the formative development of the RI, some nurses were concerned that being explicit about parents' control of visitation may lead some to decrease their participation. Given that 7% of families chose fewer visits, 90% chose the standard visitation schedule, and that the RI was associated with greater retention and home visits overall, this concern appears to be unwarranted. Having explicit discussions about these fundamental aspects of the program appears to have helped nurses to align it with families' needs and aspirations, supporting greater engagement.

There are important limitations to this pilot study. First, it was quasi-experimental, with intervention sites selected on the basis of their interest in participating in research on retention. The effects reported here are probably greater than what might be achieved when the RI is tested in a wider range of NFP sites. The selection of control sites on the basis of their similarity to the RI sites, the near equivalence of intervention and control sites on pre-intervention retention and completed home visits, and grounding the RI in the results a mixed methods study of retention predictors in the NFP (O'Brien et al., 2012) increase the likelihood that this intervention produced these results. The RI needs to be tested, nevertheless, in a randomized trial with a wider range of sites not involved in its development.

Second, the data on sites' implementation of the RI drive home the possibility that the differences found in retention and completed home visits may be due to other factors, such as aspects of organizational context (Bell et al., 2007; Aarons, McCue, & Horwitz, 2011) that may affect nurses' skills in retaining families. While implementation was relatively high (79% of new families received some component of the RI), two of the five intervention sites implemented the intervention with only half of eligible participants. There were no evident differences in these organizations (e.g., organizational auspices or duration of having conducted the NFP) from the rest of the RI sites, but, it is possible that organizational leadership and culture (Aarons et al., 2011) or other unmeasured factors such as the degree to which nurses were supported to implement the RI and to conduct their work well may have affected their success in implementing it.

Third, part of the intervention effect on number of completed home visits was driven by a reduction in home visits over time in the control sites. There is evidence (not reported here) that one state experienced reduced retention and completed home visits over the time period covered by this study. Moreover, the reduction in retention and completed home visits found in the control group between the "pre-intervention" and "intervention" periods is consistent with the O'Brien et al. (2012) finding that nurses with longer durations of employment in the NFP had lower rates of participant retention and completed home visits. This reduces concerns about the RI-control differences being artifacts of year-to-year variability among sites. Moreover, the essentially equal length of time that NFP had been operating in RI and control sites prior to this study reduces concerns about RI-control differences in NFP program duration as an explanation for the RI-control differences in retention and home visits observed during the intervention period. Thus, the intervention effect on completed home visits, if it is real, appears to be explained at least in part by its staving off historical declines in completed home visits at this relatively early period of NFP national replication.

Fourth, given that retention and completed home visits were assessed over a short period of time (10 months), it is unclear whether the RI was associated with engagement during later phases of the program.

Fifth, this intervention was developed to address engagement concerns for a specific population (i.e., low income, first-time mothers and their families) and program model (the NFP). The approach grew out of the ideas and successful strategies employed by NFP nurse home visitors, and from analyses of data from NFP participants and sites. It shares some components included in other successful engagement interventions tested with families seeking mental health treatment, however, such as addressing both practical and psychological barriers to participation (Grote, Swartz, & Zuckoff, 2008; Nock & Kazdin, 2005; Szapocznik, et al., 1988; Ingoldsby, 2010).

Sixth, it is possible that the increased program flexibility may reduce nurses' focus on guiding change in challenging behaviors such as prenatal tobacco use or planning subsequent pregnancies, given the greater emphasis on participant control of dose and content. Number of completed visits and retention are important but crude indicators of engagement; the ultimate question is whether the RI improves maternal and child health. This should be monitored as the intervention is replicated in new trials.

Seventh, the RI required considerable effort in helping some experienced NFP nurses reframe their understanding of faithful program implementation. The RI consists of the conference calls, data feedback, and reviews of the RI manual and MI video tapes set in motion to shift nurses' and supervisors' approach to working with families. It is likely that it would take less effort to implement this intervention with new NFP nurses if the RI principles were integrated into basic nurse education. Those not oriented to the program following these principles during basic NFP education, however, are likely to require investments in education and consultation similar to those required in this study.

Eighth, helping nurses adapt program dosage and content to families' needs addresses one set of influences on participant attrition, but the mixed methods study that served as the foundation for this intervention found that nurse turn-over also poses a large relative risk for participant attrition (O'Brien et al., 2012). A case may be made, therefore, for developing better methods of selection, education, and support of nurse home visitors to reduce their turnover, as has been done, for example, with child protection workers (Aarons, Sommerfeld, Hecht, Silovsky, & Chaffin, 2009).

Adaptation to NFP families' individual needs is a critical aspect of intervention fidelity itself, which these data suggest had been insufficiently addressed in nurses' learning the model. The results of this study support the hypothesis that encouraging providers to directly address parents' ambivalence about participation and to offer flexible scheduling and content to match their needs shows promise as a means of reducing participant attrition and increasing completed home visits. While the apparent impact of the intervention is notable given that it was implemented by providers in existing community based organizations, the RI should be tested with a broader range of nurses and sites not involved in its development and in a randomized controlled trial.

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Figure 1.
Outline of the study.

Figure 2. Cox proportional hazard curves showing the hazard of participant drop due to addressable reasons in intervention and control sites prior to and during intervention.

Table 1

Characteristics of Sites by Condition

	Intervention Sites (n = 6)	Control Sites (n = 11)
Organizational Auspices		
Public Health Department	2	7
Community Based Non-Profit	2	3
Hospital	1	1
Other public agency	1	-
Duration of NFP Program Operation		
Interval between first NFP visit at each site and March 1, 2003 (days)	1,113 days (mean) 804 (SD) -2113 to -330 (range)	944 days (mean) 815 (SD) -2142 to 52 (range)
Catchment Areas with Populations Defined as Urban¹		
50,000	3	5
25,000 50,000	2	4
25,000	1	2

¹ Counties served by implementing agencies were classified on the basis of the numbers of their populations that met the criteria for living in an "urbanized area" or "urban cluster", that is, they had population densities of at least 1000 people per square mile and surrounding census blocks with overall densities of at least 500 people per square mile (http://www.census.gov/geo/www/ua/ua_2k.html).

Table 2

Characteristics of Participants by Condition

<i>Participant Characteristics</i>	Pre-intervention Period			Intervention Period		
	Intervention Sites (<i>n</i> = 6)	Control Sites (<i>n</i> = 11)	<i>p</i> value ^c	Intervention Sites (<i>n</i> = 6)	Control Sites (<i>n</i> = 11)	<i>p</i> value ^d
	<i>M</i> (SD)	<i>M</i> (SD)		<i>M</i> (SD)	<i>M</i> (SD)	
N	345	737		427	910	
Maternal age (yrs)	20.1 (4.3)	19.6 (4.3)	.74	19.9 (4.1)	19.7 (4.0)	.97
Race/Ethnicity ^a						
% Asian	3	2	.65	1	1	.50
% African American	23	18	.56	21	19	.51
% Caucasian	52	61	.46	55	60	.22
% Hispanic	22	16	.55	24	21	.43
% Native American	5	7	.60	4	11	.09
% Other	9	9	.58	7	6	.29
% married	18	16	.90	19	16	.73
Maternal years of education	11.1 (2.5)	11.0 (2.3)	.89	11.2 (2.2)	11.1 (2.2)	.78
Total household income (\$)/yr.	13,429 (11,349)	15,044 (11,309)	.69	14,330 (10,912)	15,133 (11,377)	.47
% Mothers employed	34	33	.84	34	34	.97
Pre-intervention attrition (%) ^b	15.4 (1.8)	15 (7.2)	.82	15.3 (1.7)	15.5 (6.3)	.81
Gestational age at intake (wks)	20.8 (6.8)	17.6 (6.9)	.11	21.2 (6.5)	17.5 (6.9)	.07

^aMay not add up to 100% due to rounding.^bAddressable attrition (pregnancy through 6 months) calculated using all available data for each site.^cStatistical significance of treatment differences for pre-intervention year.^dStatistical significance of treatment difference for intervention year.

Table 3

Adjusted estimates of completed home visits during pregnancy for intervention and control sites before and after initiation of intervention.

Intervention Condition	Pre-Intervention Period Completed Home Visits	Intervention Period Completed Home Visits	Difference (CI)	p-value for Change over Time
	Mean (SE)	Mean (SE)		
Intervention sites	7.48 (0.37)	8.19 (0.35)	0.71 (0.07 to 1.35)	0.03
Control sites	7.97 (0.27)	7.29 (0.27)	-0.68 (-1.17 to -0.19)	0.01

NOTE. Model tested attrition outcomes with cohort (pre-intervention versus intervention period), condition (intervention or control), and site code (entered as levels of a random effect); gestational age at enrollment entered as a covariate. Difference in change by intervention condition (1.4 visits, 95% CI, 0.58, 2.2), is significant ($p < .001$). SE = standard error; CI = 95% confidence interval. Effect size = 0.36. Given that women registered in the program at around 19 weeks of gestation, the NFP visit guidelines call for the completion of 13 home visits.