PREDICTORS OF MATERNAL INVOLVEMENT IN THE MOM PROGRAM RANDOMIZED CONTROLLED HOME VISITING PROGRAM:

DEMOGRAPHIC AND PROGRAM IMPLEMENTATION FACTORS

Final Report to The Pew Home Visiting Campaign of the Pew Center on the States

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Home visiting programs are widely recognized as important in promoting healthy outcomes in mothers and children. Targeted for mothers who are considered "at risk" for reasons of their age, income, or identified psychosocial issues, home visiting programs have reported success in improving child and maternal health outcomes, delaying subsequent pregnancies, improving maternal employment, and raising subsequent family income (American Academy of Pediatrics Council on Child and Adolescent Health, 1998; Howard & Brooks-Gunn, 2009; Olds, Eckenrode, et al., 1997; Olds, Henderson, et al., 1999; Olds, Kitzman, et al., 2007a).

Home visiting programs differ greatly in their aims, the types of services and resources they provide to parents, whom they target, and the credentials of the home visitors (Howard & Brooks-Gunn, 2009; Paulsell, Avellar, Sama Martin, & Del Grosso, 2011). Some programs aim to improve the physical and mental health of mothers, including increasing time to subsequent pregnancies and improving parenting skills, while others address child health and development or attempt to reduce child abuse. Services for these programs may include implementing a structured health-oriented or parenting protocol during home visits, providing emotional support and assistance with referrals, and accompanying mothers and children to visits with service providers. Accordingly, programs may provide parents with social support, linkages to resources, literacy teachers, parenting coaches, role models, or expert help in maternal and child health and well-being (Howard & Brooks-Gunn, 2009). The aims of the program often determine who the program is targeting, such as teen mothers (Barnet, Liu, DeVoe, Alperovitz-Bichell, & Duggan, 2007; Koniak-Griffin, Anderson, Verzemnieks, & Brecht, 2000), first-time mothers (Olds, Eckenrode, et al., 1997; Olds, Henderson, et al., 1999;

Olds, Kitzman, et al., 2007a), mothers at risk for child abuse (Duggan et al., 1999), or mothers with a variety of indicators of "risk" status (Fergusson, Grant, Horwood, & Ridder, 2006; Olds, Robinson, O'Brien, et al., 2002).

Although home visiting programs are typically intensive in terms of planned number of home visits and the scope of program outcomes, another set of programs employ a narrower focus on intended outcomes and a less intensive schedule of home visits. Representative programs include a four-visit randomized controlled program over 6 months to promote breast-feeding (Barshour et al., 2008); a single home visit public health initiative to encourage mothers to enroll in WIC (Ogbuanu et al., 2009); an 8-session program (4 prenatal visits, 4 postnatal visits spaced 2 weeks apart) over 2 months to promote maternal health (Rotheram-Borus et al., 2011); and a 5-visit program over 12 month program to identify infant health problems and promote receipt of immunizations (Barnes-Boyd, Norr, & Nacion, 2001). These programs share a focus on specific health-related outcomes for mothers, infants, or both.

Definitions. The home visiting literature is vast and complex, with a wide array of terms used to describe key program features and outcomes. The following definitions are used here, with the aim of contributing to clarity within the home visiting and program implementation literatures. We use the term *program* to refer to the new program, The MOM Program, from which these data are drawn (Schwarz et al., *in press*). The term *intervention group* within The MOM Program refers to those participants who were randomized at program entry to receive home visiting services, as compared with those participants who were randomized to receive no home visits, but only periodic telephone calls to maintain contact information. *Involvement* is defined as the process of

the mother's connecting with and using the services of a home visiting program to the best of the mother's and the program's ability (Korfmacher et al., 2008). *Participation* here refers to the quantity of intervention a family receives. Aspects of participation include *retention,* the length of time a family remains in the program from point of entry until withdrawal, or until program completion (Raikes et al., 2006); and *dosage,* the amount of programming a family receives as compared with the amount of programming that is intended at program entry, such as the number of home visits completed as compared to the number planned (Durlak & DuPre, 2008; Raikes, et al., 2006).

Staffing in Home Visiting Programs. A key component of home visiting programs is staffing, which may vary across programs with regard to staff background and ongoing training. Some programs require that home visitors be professionally trained (with master's degrees in nursing, human services, or mental health degrees), while others require only a bachelor's degree or less for their home visitors. Interestingly, research comparing the effectiveness of home visitors with different backgrounds has found favorable outcomes for nurse home visitors as compared to community home visitors (Korfmacher, O'Brien, Hiatt, & Olds, 1999; Olds, Robinson, O'Brien, et al., 2002), and also positive outcomes with paraprofessional home visitors (Duggan et al., 1999). Despite these mixed findings in research on optimal staff background for home visiting program effectiveness, researchers agree that having well-trained staff whose credentials are consistent with program goals is critical to achieving program outcomes (Howard & Brooks-Gunn, 2009).

Staff turnover has been recognized as a problem in home visiting programs. One program, Healthy Families America, reported a turnover rate of 30-35% in one year

(Klagholz & Associates, LLC, 2005; Williams, Stern, & Associates, 2005), and similar programs have reported turnover over 18-36 months to be about 70% (Landsverk et al. 2002; LPC Consulting Associates, 2001). If home visitors are not employed long enough to maintain consistent contact with parents over the course of the program, it is not surprising then, that staff turnover is associated with decreased program effectiveness and increased rates of parent drop out (Gomby, 2007).

Home Visiting Program Factors Related to Maternal Involvement. Although some research has evaluated the impact of home visitors with different backgrounds and credentials on mothers' involvement in these programs, less is known about program activities that facilitate home visit completion. Published reports include little detail regarding the types or amounts of efforts of the home visitors to maintain contacts with parents, such as telephone follow-up calls, or informal contacts at home or in the neighborhood that support parent participation. Such efforts are key to the ultimate success of home visiting programs, since having mothers stay in the programs long enough to receive adequate program dosage is essential to achieving program outcomes. Unfortunately, retaining mothers in home visiting programs has been most frequently reported at around 50%, with even well established home visiting programs describing retention rates of 20 to 50% (Gomby, 2005; Olds, Sadler, & Kitzman, 2007b). However, even if mothers remain in a home visiting program from start to finish, they generally do not receive the targeted dosage of program activities. Actual program dosage among home visiting programs is not often reported separately from program retention, but has been found to range widely, from 27% to 85% (Heinrichs, 2006; McFarlane, et al., 2010). To deconstruct parent involvement factors that relate to target outcomes in home visiting

programs, it is important to evaluate parent *retention* separately from *dosage* (Korfmacher et al., 2008; Raikes et al., 2006). The impact of maternal and child characteristics and type of program staffing have been studied in terms of their impact on participant retention and dosage within home visiting programs (e.g., Duggan et al., 1999; Gomby, 2007; Howard & Brooks-Gunn, 2009; Korfmacher et al., 2008; Olds, Robinson, O'Brien, et al., 2002). Adding program implementation variables, such as types and amounts of staff outreach activities, to those examined as related to home visiting program outcomes, may contribute to a more nuanced understanding of how maternal, staff, and program factors are associated with program involvement and outcomes.

The MOM Program. The MOM Program is an innovative randomized controlled home visiting program that aims to empower low-income urban mothers to seek health and early intervention services for their infants and children (Schwarz, O'Sullivan, Guinn, Mautone, Carlson, Zhao, Zhang, et al., 2012,). Mothers were enrolled in this demonstration home visiting program shortly after they had given birth to a healthy, singleton infant if they met inclusion criteria (lived in a ZIP Code with high poverty rate; infant had no medical, neurologic, or genetic difficulty, was at least 39 weeks gestation and weighed at least 2500 grams). After mothers gave consent to participate in this study, they were randomized to receive the home visiting intervention or standard care (no home visits), with periodic telephone calls to maintain contact information. Randomization occurred by having mothers select an envelope that had been previously prepared by a staff member that contained a card with group assignment.

We randomized mothers in blocks of 20, to maintain equal assignment to the intervention throughout the recruitment period.

A team of home visitors, consisting of 2 nurse practitioners (both Master's trained Caucasian females in their late 30s) and 2 trained community workers (both African American females, one with some college coursework completed, in her mid20s, and the other in her mid-50s), alternated individual home visitor contacts with the mother. Although our program did not describe them in this way, the community home visitors in the MOM Program are similar to those described as "paraprofessional" in other programs (Olds, Robinson, O'Brien, et al., 2002; Duggan, et al., 1999).The goal of the Program is to provide the mothers with nursing professional expertise as well as community wisdom regarding child development and health promotion. All four home visitors remained employed in the MOM Program throughout its duration.

According to the Program model, the mothers were visited at home with visits scheduled before each planned primary care health appointment for their child, in accordance with the guidelines of the American Academy of Pediatrics at the time of program implementation (American Academy of Pediatrics, 2000). During the visits, mothers received information on age-appropriate developmental expectations for children and guidance on what to expect in terms of recommended immunizations and other procedures at upcoming well-child visits. Mothers were encouraged to ask questions about their child's development at health care visits. Over the 33-months of the program, nine home visits were planned, along with an additional two visits for children with developmental delay to facilitate the children's entry into early intervention programs. The additional two visits were designed to support mothers in setting up and completing

the required initial screening visits and intervention plan for the child and family. Regular reminder telelphone calls to mothers were included in the program. Mothers were reminded of upcoming home visits and health care provider visits. After the scheduled health care visit, mothers were called to ask if the visit occurred, if the child had received recommended immunizations, and if there were recommendations for developmental services. If the well child visit did not occur, or not all immunizations received, or developmental services were recommended, the program made additional follow up calls to the mother until all recommended services had been completed.

A high level of training and supervision is embedded within the program. As described in Schwarz, et al. (2012), all home visiting staff were trained in the implementation of home visits through group training and role play, a detailed procedure manual, and specific checklists for each visit. Videotapes of each type of home visit were also created for training purposes. Training was provided throughout the course of the intervention. Each week, the cases of all participating mothers are reviewed in a group supervisory meeting. In the demonstration randomized trial described in this report, the supervisory group included a Board-certified pediatrician, the director of nurse practitioner training at a local university, two clinical psychologists, and a Masters level program manager. Home visitors were encouraged to continue to attempt to contact mothers who were difficult to reach until prescribed, time-bound "windows" for each age-related visit "closed." The "window" for each visit varied in length, but was generally 8 weeks long. If a home visit had not been completed within a specified time window, that visit was recorded as incomplete. However, once one time window closed, another time window opened up for the next planned home visit. For example, if a home

visit planned for a child at two months of age had not been completed by the time the child was four months of age, the window for the four month home visit would then open. Detailed records of attempts to contact mothers were kept by staff members, and these efforts were also described in the weekly staff meeting. The entire home visiting team and supervisory staff participated in troubleshooting regarding making successful contacts with the participant mothers. Examples of troubleshooting included making telephone calls at varying days and times during the week, including weekends, making calls to alternate contacts the mothers had given us, making unannounced visits to the home in an effort to "catch" mothers at home, and sending "we miss you" postcards in bright colors to the home address. We found it particularly effective to have more than one staff person attempt to reach the mother. Although this sometimes led to unexpected success in reaching the mother, alternating efforts to reach out to unresponsive mothers reduced staff frustration considerably. We also checked phone directories and the hospital registry to locate working telephone numbers. We did not drop any participants from the program unless they asked to be taken out.

Of the 302 mothers originally enrolled in the MOM Program, 89.7% (271) completed the entire 33 month program, including 136 (89%) of those in the intervention (home visiting) group. We have reported elsewhere that, at 33 months, significantly more children in the intervention group were referred to and received early intervention servicees as compared with those in the control group (22 of 142 in the intervention group received services, as compared with 6 of 145 in the control group, CI: 2.78 [1.62, 4.76], $p = .0002$) (Schwarz, et al., 2012). The relatively overall high retention rate within the MOM Program allows an opportunity to examine other factors that may impact

program involvement, and in this way we aim to contribute to the science of home visiting program implementation.

In this report, we examine the effects of maternal characteristics [age; maternal level of education], type of program staff [nurse practitioner; community home visitor], amount of staff activity [time spent on telephone calls and home visits], and child gender as they relate to maternal participation (rention and program dosage) among the home-visited (intervention group mothers) within the MOM Program.

METHOD

The Human Subjects Committee of the Institutional Review Board of The Children's Hospital of Philadelphia approved and oversaw the conduct of this study.

Participants

To be eligible for the study mothers had to live in predetermined ZIP codes in a large Northeastern city with high poverty rates and had to have given birth to a singleton healthy infant (weight $\geq$ 2500 grams; no identified genetic or developmental disorders). Recruitment was conducted in the post-partum unit of an urban academic hospital between July 2001 and January 2002. Participants were randomly assigned to either the Intervention (N=152) or Control (N=150) conditions. The 152 intervention group mothers are the focus of the current report; they were largely high-school educated (mean years of education 12.0; SD = 1.9) African Americans (94%) in their early twenties (mean age = 23.1 years; SD = 5.6). Of the children, 54% were female and 44% were first births. Most participants (74%) reported having 10 or more prenatal visits.

Measures

Demographics were assessed through a series of questions regarding mothers' age, race/ethnicity, child gender, level of education, employment status, receipt of public services, and other social indicators. Members of the study team collected demographic information from the mothers through interviews at study enrollment and at a study visit when children were 33 months of age.

Program Retention. Mothers who remained in the program from initial enrollment for 36 months were considered "retained" in the program, regardless of the number of home visits that were completed. Only those mothers who asked to be taken out of the program were discontinued.

Target Program Dosage. Similar to the approaches taken by Heinrichs (2006) and McFarlane et al. (2010), the target dosage for number of home visits completed in the MOM Program was at least 75% completion of all planned home visits, or completion of at least 7 of the 9 planned home visits in the first 33 months of the child's life.

Program Implementation was evaluated through review of staff records of all attempts to contact participant mothers, including telephone calls to set up a home visit, home visits, telephone calls to remind mothers of upcoming primary care visits, and follow up calls to determine if mothers had kept the scheduled primary care visit. These program records included notation of which staff member completed each activity as well as the number of 5-minute time units spent on each activity. Program evaluation records were kept through the duration of the study. We coded for the numbers of telephone calls attempted and completed to each participant mother, and for the amount of time in 5 minute units spent on each call. We also coded whether an attempted home visit was

complete, and the amount of time, in 5 minute units, spent during the home visit, including travel time to and from the home to the work office.

Procedure

Two trained research assistants examined participant charts for the intervention group mothers and extracted and coded program implementation variables (as described above, including telephone calls and home visits). Because mothers who had been assigned to the control condition did not receive any home visits, we did not have comparable data on program implementation for those individuals. Two checks for inter-rater reliability were conducted. For the first ten cases coded, the research assistants separately extracted and coded program implementation variables. Data were examined for consistency, and 95.3% percent agreement was attained. Discrepancies between the two coders were discussed and necessary clarifications to coding categories were agreed upon. In a second inter-rater reliability review, one research assistant independently coded 20% of all charts coded by the second research assistant (i.e., 5 of every 25 charts, randomly selected); inter-rater reliability exceeded 95% per cent agreement. Throughout the study, all data were double entered and checked for accuracy.

Statistical Analysis

The number of home visits and telephone contacts made over the course of the program and the time needed to complete contacts were tabulated and summarized using standard descriptive statistics. The rates of visit completion achieved by the nurses and community home visitors were examined separately. Logistic regression was used to determine how program characteristics [staff background; amount of time expended for each participating mother; numbers of telephone calls and home visits] and demographics

[mother's age; first-time mom status; child gender] predicted program dosage. Model fitting procedures were conducted by first testing single covariates using simple logistic regression models and then using backwards selection procedures in which all single statistically significant covariate terms ($p < .10$) were included as candidates in a multiple logistic regression model. Nonsignificant terms were dropped from consideration iteratively based on overall fit statistics of relevant nested models.

RESULTS

Program Involvement, Retention and Program Dosage. Results on maternal retention are presented in Table 1. Mothers who were retained in the intervention arm of the MOM Program for 33 months were found to differ very little in demographic and other variables from those who were also enrolled at baseline and assigned to the intervention arm of the study, but not retained until the end of the program. Program dosage results are presented in Table 2. Mothers who met criteria for target program dosage (i.e., having completed at least 7 of the 9 planned home visits; N = 130, 86%) were then compared with those who did not (N = 22, 14%) to evaluate if systematic differences in baseline maternal characteristics could be identified. Mothers who received the target dose of The MOM Program were found to be slightly older than those who failed to receive the target (23.3 versus 21.3 years of age, $p = .05$) and more likely to have male children (93.3% of mothers of male children received full program dosage, $p = .02$).

Table 3 presents home visits completion rates for the home visits, as well as information on incomplete visits, cumulative drop outs, and missing participants. High rates of completed home visits were maintained throughout the intervention, with

percentages ranging from 82% (at age 4 months) to 91% (at age 6 months). Relatively few mothers dropped out of the program, and they did so at fairly even rates throughout the program.

Program Staff and Activity. During the three-year program, there was no turnover in home visiting staff. No statistically significant differences were found in measures of staff activity for those mothers who did and did not receive target program dosage (calculations were based on the total number of months mothers were retained within the program). Table 4 presents completion rates for scheduled home visits and telephone calls by the home visiting staff. Both the community workers and nurses were successful in completing family contacts, with community workers' completion rates ranging from 59% to 93%, and nurses' completion rates ranging from 72% to 92%. Two comparisons were statistically significant. At age 6 months, community workers completed relatively more successful family contacts than the nurses (p=.04), while at 30 months, nurses completed relatively more successful family contacts than the community workers (p=.05).

Table 5 presents comparisons of staff time expended on both home visits and outreach activities between mothers who did and did not receive target program dosage. Mothers who received target program dosage received 2.25 (0.84) follow up calls per month, as compared with 2.19 (1.26) follow up calls for those mothers who did not receive full program dosage. The actual numbers of home visits per month were similar: 0.51 (0.13) home visits for mothers receiving full program dosage; 0.60 (0.32) home visits for mothers not receiving full dosage. Likewise, no statistically significant differences were found between the total amount of time staff spent on both home visits

and outreach calls to each family per month, averaging 13.5 (2.05) minutes for those receiving full dosage, and 12.1 (5.1) minutes for those who did not receive full dosage.

Table 6 presents the final regression model predicting mothers' receipt of target home visits. Three significant factors were identified: total staff time expended; number of completed home visits; and child gender. Total staff time expended included all time spent per mother, prorated for the amount of time the mother remained in the program, and included both home visits and outreach efforts. Home visit completion was a separate, significant predictor of receipt of targeted dosage (and not surprising, since this overlaps with obtaining the number of targeted home visits). Child male gender was significantly associated with mothers' receiving the targeted dose of home visits.

DISCUSSION

This final report from a demonstration home visiting program evaluated program retention and dosage as distinct components of maternal program participation, and related these variables to maternal and child characteristics and to program staff and program activities.

Retention in the MOM Program over 3 years was 89% overall. This is comparable to the 88% retention at 2 years in the Hawaii Healthy Start Program (Duggan, 1999), but higher than the 50% rate typically reported in home visiting programs (Howard & Brooks-Gunn, 2009). We believe that the relatively high retention rate within the MOM Program may be related to a number of factors. These could include program design factors such as the fewer number of visits planned, the shorter duration of the visits, persistence on the part of the home visiting team, the use of a team to prevent staff burnout over individual, hard-to-reach families, and the weekly group

supervision meeting to troubleshoot issues that came up. Besides the program design factors, there may have been characteristics of the mothers themselves that led to the retention rates for this program. Participant mothers were not approached for recruitment on the basis of "risk" factors other than living in neighborhoods associated with high rates of poverty. As compared with mothers in other home visiting programs, these mothers may have fewer issues such as drug/alcohol abuse or domestic abuse that might lead to premature program withdrawal. Although we cannot attribute the high retention rate to any of these factors, singly or in combination, the achieved 3-year retention rate of families within the MOM Program is noteworthy.

Program dosage, defined as the percentage of those completing at least 7 of the 9 planned home visits, was found to be 86%, similar to that reported in the Hawaii Healthy Start Program (Duggan, et al., 1999). Our sample had high rates of prenatal visit completion, overall, and their earlier adherence to medical care visits may have influenced their relatively high level of program dosage in the home visiting program. In comparison with findings on maternal retention, we did find some systematic differences between mothers who did and did not meet the target dosage of the home visits. Mothers meeting criteria for program dosage were slightly older and more likely to have male children than mothers who did not receive target dosage for the home visiting program.

An unexpected finding was the relationship between gender and maternal program dosage, in that mothers of male children were significantly more likely to achieve the targeted number of home visits. Unfortunately, our research design did not include data that might have shed light on this finding. Korfmacher and associates (2008) have found that mothers are more responsive to home visiting services if they

become aware of a need for services. Examination of the literature on how African American mothers view their male children offers some possible explanations that warrant further systematic investigation within home visiting program outcome research. African American mothers have been found to rate their male children as having more externalizing behaviors than their female children; ratings of externalizing behaviors in African American male children increase as they become older (Miner & Clarke-Stewart, 2008). In addition, mothers of African American male children have reported increased concerns about cognitive delays. Further, a large-scale study of predictors of cognitive delay in 24-month-old children found that male gender and African American ethnicity were strongly associated with cognitive delay (Hillemeier, Farkas, Morgan, Martin, & Maczuga, 2009). Although it is highly speculative to connect this literature with findings from the MOM Program, further research should include study of mothers' reasons for deciding to continue or discontinue their participation in home visiting programs.

An interesting finding from this study is that the nurse and community home visitors were equally successful in completing program activities. These results contrast with the staff-related program efficacy and outcomes reported by Olds, Robinson, O'Brien, et al. (2002) in which paraprofessionals produced only small effects, as compared to the more robust effects on maternal and child outcomes produced by the nurse home visitors. Some precedent to the relative success of the community workers in the MOM Program comes from the Healthy Families New York program, which used paraprofessional home visitors successfully to achieve program outcomes (DuMont, et al., 2008). Noteworthy, however, the staffing of the MOM Program differed from both these programs, in which the efficacy of nurses and paraprofessionals was directly

compared (Olds, Robinson, O'Brien, et al., 2002) or in which only trained paraprofessionals were used as home visitors (DuMont, et al., 2008). In the MOM program, individual mothers received home visits from one of four members of a team comprised of two nurse practitioners and two community workers. As a result, this study compares specific MOM Program activities completed by the nurse practitioners and community workers, not the outcomes of a dyadic relationship between a single type of home visitor and an individual mother. Additionally, it should be noted that there was no turnover among home visiting staff during the Program's three-year duration, which is much lower than turnover rates reported in comparable programs (Gomby, 2007). It is our belief that because mothers in the MOM Program developed home visiting relationships with more than a single home visitor, having home visitors from both nursing and community backgrounds may have promoted program involvement. The team model of the MOM Program facilitated cross-training among the nurse practitioners and community workers, such that best practices in conducting MOM Program activities were mutually developed, refined, and implemented. Also important to note is that both nurses and community workers engaged in high levels of outreach to all the mothers in the program, with no differences in the amount of time or effort toward those mothers who were engaged in the program or those who were not. Having the home visitors equally persistent in their efforts to involve mothers in the program was directly associated with the high rates of home visits and well child visits.

Limitations of this study include the use of a small, single cohort of mothers who were predominantly low-income African American, from a defined geographic urban East Coast region. This may limit the extent that conclusions may be extended to

programs serving mothers in other geographic regions or to those serving mothers with a wider race/ethnicity range. However, as others have described lower rates of program involvement among low-income urban African American mothers (Olds, Sadler, & Kitzman, 2007b), the high rates of retention and dosage in this sample are noteworthy. Another limitation is the unequal sample sizes were used in the analyses, which is due to the small sample size overall, and the relatively high rates of maternal involvement within the home-visited intervention. The low numbers of planned home visits limited the extent that dosage could be studied. A related study limitation is the small size of the program and its staff. Programs with a larger number of staff members may have more challenges in keeping staff motivated and persistent in outreach efforts. The relatively small number of staff of the MOM Program does not allow for examination of specific home visitor characteristics that might be related to maternal engagement, such as race or educational background (Daro, McCurdy, Falconnier, Stojanovic, 2003). However, the results of the MOM Program demonstrate that high rates of mothers' involvement with home visiting services are possible when a mixed model of professional support is utilized. Finally, engagement, mothers' feelings of connectedness with the program, and staff evaluations of their connectedness, were not studied within this program. Including direct reports of maternal engagement and staff ratings of maternal engagement would have allowed for a more broad-based evaluation of overall program implementation than the data collected for the present study permitted.

Results from a single site, model home visiting program such as the MOM Program contribute to the science of home visiting programs by distinguishing maternal, staffing, and program activity variables that were related to program retention and dosage

as well as program outcomes. Although program retention and dosage reflect program involvement and are clearly associated, our findings suggest that these are nonetheless distinct from one another and warrant separate inclusion and discussion in later reports from home visiting programs.

Future research on home visiting program effectiveness should include a wide range of indices of program involvement that include maternal retention and receipt of program dosage as well as reports of emotional attachment to the program by staff and by the mothers themselves. However, broadening the scope of implementation outcomes will require close attention to defining key terms and relating these to the wider home visiting literature in order to facilitate communication and reduce confusion within the field (Durlak & DuPre, 2008; Raines et al., 2006).

Evaluating program involvement throughout the course of an intervention will allow future researchers to examine vulnerable points within an intervention during which mothers are most likely to drop out. Brookes and colleagues (2006) present results from a qualitative study of the development of successful home visitor-mother relationships as these relate to program goals that offers guidance to others who wish to explore what goes into the formation and maintenance of successful home visitor relationships with mothers in the context of other types of home visiting programs other than Early Head Start. Going forward, efforts should be made to include mothers who do not complete the program or receive its intended dosage so as to identify ways that programs may better succeed in their efforts with less involved mothers. Finally, although the MOM Program has shown evidence of initial effectiveness, program

replication and outcome evaluation will be essential in providing empirical support for this model of home visiting.

The results of this evaluation study hold broader policy implications. Our findings offer initial support for the use of multidisciplinary teams of home visitors. However, in order to promote staff collaboration and cross training and to prevent staff burnout, weekly supervisory meetings are seen as essential in maintaining program integrity Our study found that the nurses and community home visitors were equally persistent and equally effective in their outreach to families, possibly related to the weekly supervisory reinforcement of program standards. The establishment of cross-disciplinary teams contributes to cost-effectiveness, so that home visiting programs that can have a higher return on investment in their delivery of services. However, given the increasing trends in child poverty and the negative social outcomes attributable (Brooks-Gunn & Duncan, 1997), it is imperative that future research determine cost-effective methods to deliver services to an increased number of families. Cross-disciplinary teams may avoid the higher personnel costs of programs utilizing only nurse home visitors. Finally, another key element to maximize the home visiting programs' likelihood of success is to develop ways to collect data throughout the program, and to use data to evaluate the accomplishment of program goals. The development and utilization of user-friendly software to track program activities and outcomes related to home visiting programs will allow programs, policy makers, and the public to have the information necessary to evaluate program success, modify program design as needed, and to develop more effective and cost-effective home visiting programs of the future. With these refinements, home visiting programs will be more sustainable and effective to mitigate

the negative effects of poverty to promote the increased human capital essential to a well functioning society.

References

American Academy of Pediatrics. (2000). Recommendations for preventative pediatric healthcare. *Pediatrics, 105*(3), 645.

American Academy of Pediatrics Council on Child and Adolescent Health. (1998). The role of home-visitation programs in improving health outcomes for children and families. *Pediatrics, 101*(3), 486-489.

Barnes-Boyd, C., Fordham, K., & Nacion, K.W. (2001). Promoting infant health through home visiting by a nurse-managed community worker team. *Public Health Nursing, 18*, 225-235.

Barnet, B., Liu, J., DeVoe, M., Alperovitz-Bichell, K., Duggan, A. (2007). Home visiting for adolescent mothers: Effects on parenting, maternal life course, and primary care linkage. *Annals of Family Medicine, 5*(3), 224-232.

Bashour, H.N., Kharouf, M.H., AbdulSalam, A.A., El Asmar, K., Tabbaa, M.A., & Cheikha, S.A. (2008). Effect of postnatal home visits on maternal/infant outcomes in Syria: A randomized controlled trial. *Public Health Nursing, 25*, 115-125.

Brookes, S.J., Summers, J.A., Thornburg, K.R., Ispa, J.M., & Lane, V.J. (2006). Building successful home visitor-mother relationshipos and reaching program goals in two Early Head Start programs: A qualitative look at contributing factors. *Early Childhood Research Quarterly, 21*, 25-45.

Brooks-Gunn, J., & Duncan, G.J. (1997), The effects of poverty on children. *The Future of Children, 17*(2), 5-71.

Daro, D.A., & Harding, K.A. (1999). Healthy families America: Using research to enhance practice. *The Future of Children, 9*(1), 152-176.

Daro, D., McCurdy, K., Falconnier, L., Stojanovic, D. (2003). Sustaining new parents in home visitation services: key participant and program factors. *Child Abuse and Neglect, 27*(10), 1101-1125.

Duggan, A.K., McFarlane, E.C., Windham, A.M., Rohde, C.A., Salkever, D.S., Fuddy, L., & Sia, C.J. (1999). Evaluation of Hawaii's healthy start program. *The Future of Children, 9*(1), 66-90.

Durlak, J.A., & DuPre, E.P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327-350.

DuMont, K., Mitchell-Herzfeld, S., Greene, R., Lee, E., Lowenfels, A., Rodriguez, M., & Dorabawila, V. (2008). Healthy families New York (HFNY) randomized trial: Effects on early child abuse and neglect. *Child Abuse and Neglect, 32*(3), 295-315.

Fergusson, D.M., Grant, H., Horwood, L.J., & Ridder, E.M. (2006). Randomized trial of the Early Start Program of Home Visitation: Parent and family outcomes. *Pediatrics, 117*, 781-787.

Gomby, D. S. (2005, July). *Home visitation in 2005: Outcomes for children and parents* (Invest in Kids Working Paper No. 7). Sunnyvale, CA: Invest in Kids Working Group.

Gomby, D.S. (2007). The promise and limitations of home visiting: Implementing effective programs. *Child Abuse and Neglect, 31*, 793-799.

Heinrichs, N. (2006). The effects of two different incentives on recruitment rates of families into a prevention program. *Journal of Primary Prevention*, *27*(4), 345-365.

Hillemeier, M.M., Farkas, G., Morgan, P.L., Martin, M.A., Maczuga, A. (2009). Disparities in the prevalence of cognitive delay: how early do they appear. *Paediatric and Perinatal Epidemiology, 23*(3), 186-198.

Howard, K.S., & Brooks-Gunn, J. (2009). The role of home-visiting programs in preventing child abuse and neglect. *The Future of Children, 19*(2), 119-146**.**

Klagholz, D.D., & Associates, LLC. (2005). *Healthy Families Montgomery Year 8 annual evaluation report, FY 2003-2004.* Retrieved from Healthy Families America website: http://www.healthyfamiliesamerica.org/downloads/eval_hfmont_2004.pdf

Koniak-Griffin, D., Anderson, N., Verzemnieks, I., & Brecht, M. (2000). A public health nursing early intervention program for adolescent mothers: Outcomes from pregnancy through 6 weeks postpartum. *Nursing Research, 49*, 130-138.

Korfmacher, J., Green, B., Staerkel, F., Peterson, C., Cook, G., Roggman, L., Faldowski, R.A., & Schieffman, R. (2008). Parent involvement in early childhood home visiting. *Child Youth Care Forum*, *37*, 171-196.

Korfmacher, J., O'Brien, R., Hiatt, S., & Olds, D. (1999). Differences in program implementation between nurses and paraprofessionals providing home visits during pregnancy and infancy: A randomized trial. *American Journal of Public Health, 89*, 1847-1851.

Landsverk, J., Carillio, T., Connelly, C., Leslie, L., Ganger, W., & Sylmen, D.(2002). *Healthy Families San Diego Clinical Trial: Technical Report*. San Diego: Child and Adolescent Services Research Center, Children's Hospital - San Diego, San Diego, California.

LPC Consulting Associates. (2001). *Birth and beyond: Year two report*. Submitted to Department of Health and Human Services.

Mather, M., & Adams, D. (2006). The risk of negative child outcomes in low-income families. Population Reference Bureau, Annie E. Casey Foundation.

McFarlane, E., Burrell, L., Fuddy, L., Tandon, D., Derauf, D. C., Leaf, P., & Duggan, A. (2010). Association of home visitors' and mothers' attachment style with family engagement. *Journal of Community Psychology, 38*(5), 541-556.

Miner, J.L., Clarke-Stewart, K.A. (2008). Trajectories of externalizing behavior from age 2 to age 9: Relations with gender, temperament, ethnicity, parenting and rater. *Developmental Psychology, 44*(3), 771-786.

Ogbuanu, C.A., Jones, C.A., McTigue, J.F., Baker, S.L., Heim, M., Baek, J., & Smith, L.U. (2009). A program evaluation of postpartum/newborn home visitation services in Aiken County, South Carolina. *Public Health Nursing, 26*, 39-47.

Olds, D. L., Eckenrode, J., Henderson, C. R., Kitzman, H., Powers, J., Cole, R., …Luckey, D. (1997). Long-term effects of home visitation on maternal life course and child abuse and neglect –fifteen-year follow-up of a randomized trial. *Journal of the American Medical Association, 278*(8), 637-643.

Olds, D. L., Henderson, C. R., Kitzman, H. J., Eckenrode, J. J., Cole, R. E., & Tatelbaum, R. C. (1999). Prenatal and infancy home visitation by nurses: Recent findings. *The Future of Children, 9*(1), 44-65.

Olds, D.L., Kitzman, H., Hanks, C., Cole, R., Anson, E., Sidora-Arcoleo, K.,…Bondy, J. (2007a). Effects of nurse home visiting on maternal and child functioning: Age-9 follow up of a randomized trial. *Pediatrics, 120*(4), e832-e845.

Olds, D. L., Robinson, J., O'Brien, R., Luckey, D. W., Pettitt, L. M., Henderson, C. R.,…Talmi, A. (2002). Home visiting by paraprofessionals and by nurses: A randomized, controlled trial. *Pediatrics, 110*(3), 486-496.

Olds, D.L., Robinson, J., Pettitt, L., Luckey, D.W., Holmberg, J., Ng, R.K.,…Henderson, C.R. (2004). Effects of home visits by paraprofessionals and by nurses: Age 4 follow-up results of a randomized trial. *Pediatrics, 114*(6), 1560-1568.

Olds, D.L., Sadler, L., & Kitzman, H. (2007b). Programs for parents of infants and toddlers: Recent evidence from randomized trials. *Journal of Child Psychology and Psychiatry, 48(3/4)*, 355-391.

Paulsell, D., Avellar, S., Sama Martin, E., Del Grosso, P. (2011). Home Visiting Evidence of Effectiveness Review: Executive Summary. Office of Planning, Research and Evaluation, Administration for Children and Families. U.S. Department of Health and Human Services. Washington, DC.

Raikes, H., Green, B.L., Atwater, J., Kisker, E., Constantine, J., & Chazan-Cohen, R. (2006). Involvement in Early Head Start home visiting services: Demographic predictors and relations to child and parent outcomes. *Early Childhood Research Quarterly, 21*, 2-24.

Rotheram-Borus, M.J., le Roux, I.M., Tomlinson, M., Mbewu, N., Comulada, W.S., le Roux, K., Stewart, J., O'Connor, M.J., Hartley, M., Desmond, K., Greco, E., Worthman, C.M., Idemundia, F., & Swendeman, D. (2011). Philani Plus (+): A mentor mother community health worker home visiting program to improve maternal and infants' outcomes. *Prevention Science, 12*, 372-388.

Schwarz, D.F., O'Sullivan, A.L., Guinn, J., Mautone, J.A., Carlson, E.C., Zhao, H., Zhang, X., Esposito, T.L., Askew, M., & Radcliffe, J. (2012). Promoting early intervention through a randomized controlled home visiting program. *Journal of Early Intervention, 34 (1),* 20-39.

Williams, Stern, & Associates. (2005). *Healthy Families Florida evaluation report: January 1, 1999-December 31, 2003*. Retrieved from Healthy Families America website: http://www.healthyfamiliesfla.org/resources/Final_Evaluation_1999-2003.pdf#

Table 1. Comparisons of participants retained and not retained until program completion in the Intervention Arm of The MOM Program through 33 months (N = 152)

Baseline Variable	Retained (n = 136)	Non-Retained (n = 16)	
	Mean (SD)	**Mean (SD)**	***p***
Maternal age	23.3 (5.9)	20.4 (4.2)	.06
Maternal level of education	11.9 (1.9)	11.9 (1.8)	.97
No. of other children	1.0 (1.3)	0.5 (0.6)	.20
No. of months at residence	62.2 (76.2)	89.3 (78.5)	.06
No. months pregnant when started prenatal care	2.9 (2.0)	2.8 (1.2)	.63
Infant gestational age	39.4 (1.6)	39.3 (1.3)	.82
Infant birth weight, g	3303 (466)	3246 (367)	.64
	n (%)	**n (%)**	***p***
No. of prenatal visits			.64
0	3 (2.0)	0 (0)	
1-4	10 (7.4)	0 (0)	
5- 9	17 (12.5)	2 (10.5)	
≥ 10	106 (77.9)	14 (87.5)	
Pregnancy problems*	41 (30.2)	2 (12.5)	.14
Child gender			.19
Female	70 (51.5)	11 (68.8)	
Male	66 (48.5)	5 (31.3)	
Cesarean section	26 (19.1)	5 (31.3)	.25
No. other children in EI	9 (6.6)	0 (0)	.52
No. other children with learning problems	7 (5.2)	0 (0)	.54

* Pregnancy problems include hypertension, gestational diabetes, infection, passed out, premature labor, delivery problem, IUGR/inadequate fluid, and other.

Table 2. Comparisons of participants who did* and did not* receive target program dosage in the intervention arm of The MOM Program through 33 months (N = 152)

Baseline Variable	Received Target Program Dose (n = 130)	Did not Receive Target Program Dose (n = 22)	
	Mean (SD)	**Mean (SD)**	***p***
Maternal age	23.3 (6.0)	21.3 (4.1)	.05
Maternal level of education	11.9 (1.9)	11.6 (1.7)	.35
No. of other children	1.0 (1.2)	0.9 (1.1)	.75
No. of months at residence	63.3 (75.4)	75.5 (84.4)	.49
No. months pregnant when started prenatal care	2.9 (2.0)	2.8 (1.3)	.61
Infant gestational age	39.4 (1.6)	39.5 (1.2)	.84
Infant birth weight, g	3301 (478)	3272 (311)	.72
	n (%)	**n (%)**	***p***
No. of prenatal visits			.75
0	3 (2.3)	0 (0)	
1-4	10 (7.7)	0 (0)	
5- 9	16 (12.3)	3 (13.6)	
≥ 10	101 (77.7)	19 (86.4)	
Pregnancy problems*	40 (30.8)	3 (13.6)	.13
Child gender			.02
Female	64 (49.2)	17 (77.3)	
Male	66 (50.8)	5 (22.7)	
Cesarean section	29 (22.3)	2 (9.1)	.25
No. other children in EI	9 (6.9)	0 (0)	.57
No. other children with learning problems	7 (5.4)	0 (0)	.73

* Pregnancy problems include hypertension, gestational diabetes, infection, passed out, premature labor, delivery problem, IUGR/inadequate fluid, and other.
*"Target program dosage" is defined as having completed at least 7 of the planned 9 home visits.

Table 3. Home Visits Completed throughout Intervention (N = 152)

Child Age	Completed Home Visits N (%)	Incomplete Home Visits N (%)	Cumulative Drop Outs N (%)	Missing N (%)
6 weeks	136 (89.4)	14 (9.2)	2 (1.3)	0 (0.0)
4 months	125 (82.2)	21 (13.8)	4 (2.6)	1 (0.7)
6 months	138 (90.8)	9 (5.9)	5 (3.2)	0 (0.0)
9 months	131 (86.1)	15 (9.9)	6 (4.0)	0 (0.0)
12 months	133 (87.5)	11 (7.2)	8 (5.3)	0 (0.0)
15 months	131 (86.2)	12 (7.9)	9 (5.9)	1 (0.7)
18 months	135 (88.8)	5 (3.3)	12 (7.9)	1 (0.7)
24 months	132 (86.8)	5 (3.3)	14 (9.2)	1 (0.7)
30 months	129 (84.9)	4 (2.6)	15 (9.9)	4 (2.6)

Table 4. Completion of Home Visits and Telephone Calls by Home Visiting Staff

	Community Worker		Nurse		
Child Age	**Complete N (%)**	**Incomplete N (%)**	**CompleteN (%)**	**Incomplete N (%)**	***P***
6 weeks	232 (88.9)	29 (11.1)	130 (91.5)	12 (8.5)	0.49
4 months	221 (82.2)	48 (17.8)	100 (84.0)	19 (16.0)	0.77
6 months	308 (92.8)	24 (7.2)	46 (83.6)	9 (16.4)	0.04
9 months	250 (85.3)	43 (14.7)	62 (87.3)	9 (12.7)	0.85
12 months	265 (86.3)	42 (13.7)	57 (85.1)	10 (14.9)	0.85
15 months	230 (79.6)	59 (20.4)	53 (82.8)	11 (17.2)	0.61
18 months	242 (89.3)	29 (10.7)	78 (91.8)	7 (8.2)	0.68
24 months	263 (91.6)	24 (8.4)	54 (85.7)	9 (14.3)	0.16
30 months	135 (59.0)	94 (41.0)	52 (72.2)	20 (27.8)	0.05

Table 5. Staff Activity: Comparison of staff activity with mothers who received and did not receive target program dosage.

Variable	**Received Target Dosage** (N=130)	**Did not receive Target Dosage** (N=20)	
	Mean (SD)	**Mean (SD)**	***p***
No. follow up calls per month	2.25 (0.84)	2.19 (1.26)	0.84
No. home visits per month	0.51 (0.13)	0.60 (0.32)	0.21
Total time with family per month (min.)	13.5 (2.05)	12.1 (5.1)	0.23

Table 6. Final Regression Model Predicting Mothers' Receipt of Target Dosage*

Parameter		DF	Estimate	Standard Error	Wald Chi-square	Pr > |Z|
Intercept		1	-1.1426	0.9312	1.5055	0.2198
Total staff time		1	0.1262	0.0321	15.4301	<.0001
Completed Home Visits		1	-0.2956	0.1107	7.1303	.0076
Child Gender	Male	1	0.6738	0.3034	4.9304	0.0264

*Variables initially entered were type of staff, staff activity type, staff time spent on outreach, maternal demographic variables, and child gender.

Appendix to Final Report to the Pew Home Visiting Campaign:
Report of Attempted Cost Analysis

We originally planned to associate costs of implementing the MOM Program with client retention and engagement. We knew that program retention was 89% of those randomized to the intervention arm of the randomized controlled trial, and we also knew that detailed records had been kept of time spent in completing aspects of the program. We hoped that, from a closer analysis of study records, we would be able to relate specific program costs to client involvement outcomes.

We had conducted a preliminary cost analysis of this program (Schwarz et al., 2009). To serve the 152 children in the intervention group, yearly salary costs for the home visitor staff were determined (these costs excluded research and administrative costs). Yearly costs were found to be $141,386 total, with an average cost of $930 per child per year.

For the additional analysis proposed, our plan was to examine client records to code specific staff activities related to outreach and program engagement, and to link measures of specific staff outreach activities with costs, with the ultimate goal of better understanding the costs associated with participants' program engagement and their achieving program goals.

Methods.

Program Implementation was evaluated through staff records of all attempts to contact participant mothers, including telephone calls to set up a home visit, home visits, telephone calls to remind mothers of upcoming primary care visits, and follow up calls to

determine if mothers had kept the scheduled primary care visit. These program records included notation of which staff member completed each activity as well as the number of 5-minute time units spent on each activity. Program evaluation records were kept through the duration of the study.

Program Costs were determined through calculating the hourly rates for the four home visitors and using these to derive costs of the specific activities associated with program outreach (calls to plan for home visits; travel to the homes of participants; completing the home visits; follow up calls).

Procedure. Two trained research assistants examined participant charts for intervention group mothers and extracted and coded program implementation variables. Two checks for inter-rater reliability were conducted. For the first ten cases coded, the research assistants separately extracted and coded program implementation variables. Data were examined for consistency, and 95.3% accuracy was attained. Discrepancies between the two coders were discussed and necessary clarifications to coding categories were agreed upon. In a second inter-rater reliability review, one research assistant independently coded 20% of all charts coded by the second research assistant (i.e., 5 of every 25 charts, randomly selected); inter-rater reliability exceeded 95% accuracy. Throughout the study, all data were double entered and checked for accuracy.

Results.

Appendix Table 1 presents costs for all outreach efforts for home visits to all participants, including those who were engaged and non-engaged in the intervention. These services included up to 11 home visits, follow-up calls, and reminder calls over 33 months of the home visiting program. For the group as a whole, the range of costs for all

services documented ranged from $22.13 to $281.77, with an average cost of $157.30 per participant, or about $57 per family, per year. There were no significant differences in costs for engaged versus non-engaged families.

Discussion.

The cost analysis of outreach activities reflects remarkably low staffing costs that could be linked to the high levels of outreach in this program. However, the average cost derived from our coded data, $57 per client, per year, greatly underestimates the actual costs of the program related to promoting retention and engagement. An earlier evaluation of program costs which based entirely on the salaries of the home visitors (which is unrealistic, as administrative personnel and activities were not included), found $930 in program costs per client, per year (Schwarz et al., 2009). Essential program activities that were not coded for inclusion in this analysis included the weekly supervision meeting as well as other necessary administrative tasks involved in planning and implementing outreach efforts and home visits. We also did not include costs related to the "research" component of this program.

There are no easy explanations for this discrepancy in cost analyses between the earlier analysis and the current one. In conducting the chart coding, we observed that the client charts did not fully document all the time spent on client-related activities. Incomplete or missing information related to travel time, length of home visits, and time spent on outreach calls occurred in approximately 75% of the client records that were reviewed. We were reluctant to apply imputation methods to compensate for this missing data in our statistical analyses, because it is not clear how to estimate or apply the missing values. An additional complication in completing the cost analysis planned was

that the client records were not uniformly clear about the purpose of each outreach activity. There were, at times, apparently dual goals, such as encouraging a mother to keep a child health care visit and also to obtain early intervention services. Thus, the incomplete and unclear client records prevented us from linking the costs of staff activity to the accomplishment of each program goal, as we had initially hoped to accomplish. We are unable to determine, for example, the amount of staff time expanded to achieve each home visit or to have a child health care visit completed.

Despite these unexpected complications in the cost analysis, it is clear that overall staff and program costs for the MOM Program are low, but, regrettably, costs associated with client retention and involvement could not be reliably estimated.

Reference.

Schwarz, D.F., Radcliffe, & O'Sullivan, A. (2009, April). The MOM Program: A cost-effective randomized controlled intervention to address the developmental needs of children living in poverty. Society for Behavioral Medicine, Montreal, Canada, April, 2009.

Appendix Table 1. Total Costs in Dollars for Professional Effort for All Home Visits, Reminder Calls, Follow-up Calls throughout Program for All Participants (N=149*) and those Engaged (N = 130) or Non-engaged (N = 19) in the Intervention.

Group	N	Mean (SD)	95% Confidence Interval	Range
Total	149	151.44(42.40)	144.57 - 158.30	22.13 - 281.77
Engaged	130	157.47 (35.95)	151.23 – 163.71	83.68 – 281.77
Non-engaged	19	110.18 (58.78)	81.84 – 138.51	22.13 – 234.55

* 3 participants withdrew from the program shortly after enrollment. No professional effort was documented in these charts, so no data could be included in these analyses.