

Head: A META-ANALYSIS OF HOME VISITING PROGRAMS

A Meta-Analysis of Home Visiting Programs: Moderators of Improvements in Maternal Behavior

M. Angela Nievar

University of North Texas

Laurie A. Van Egeren

Michigan State University

Sara Pollard

University of North Texas

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Angela Nievar may be reached at the University of North Texas, Development and Family Studies, P. O. Box 311335, Denton, TX 76203. phone, fax, and e-mail, 940-891-6800, 940-565-2185, Angela.Nievar@unt.edu

Laurie Van Egeren may be reached at Michigan State University, 93 Kellogg Center, East Lansing, MI 48824, phone and e-mail, 517-355-0140, vanegere@msu.edu

Sara Pollard may be reached at the University of North Texas, Department of Psychology, P.O. Box 311280, Denton, TX 76203, phone and e-mail, 713-446-5662, sarapollard@unt.edu.

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Abstract

A meta-analysis of home visiting programs for at-risk families ($K = 35$, $N = 6,453$) examined differences in the effects of programs on maternal behavior. On average, programs with more frequent visitation had higher success rates. The frequency of home visits explained significant variance of effect sizes among studies in the United States, with two visits per month predicting a small, substantive effect. Intensive programs or programs with at least three visits per month were more than twice as effective as less intensive programs. Home visiting programs using nurses or mental health professionals as providers were not significantly more effective than programs using paraprofessionals. In general, programs showed a positive effect on maternal behavior, but programs with frequent home visits were more successful.

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The early years are essential to a child's later development, and young children living in poverty often lack the basic resources and experiences needed for optimal well-being (Shonkoff & Phillips, 2000). Based on this knowledge, family support programs and other early intervention programs attempt to improve the potential of children in low-income families. These programs have used various models to improve the trajectory of children's life course. Interventions may include center-based therapy for parents, preschool programs for children, or parent education through home visiting. This meta-analysis of home visiting programs measures improvements in maternal behavior among at-risk families. Possible reasons for program effectiveness are also examined empirically.

The evaluation of home visiting interventions is interesting for two reasons. First, from an applied perspective, questions have been raised about the effectiveness of such interventions. While randomized controlled trials demonstrating the effectiveness of individual programs have resulted in increased government funding, questions remain about which programs work and the reasons for success or failure (Olds & Korfmacher, 1997; Korfmacher et al., 2008). Studies have found that early intervention programs, appropriately implemented, ultimately lead to cost savings for governments and schools. Cost-benefit analyses indicate that successful programs which serve low-income or at-risk families reduce costs to the child welfare system, public schools, and public health by strengthening families and improving school achievement (Aos et al., 2004; Karoly, Kilburn, & Cannon, 2005).

Second, well-designed interventions may be viewed as experiments that inform researchers about parenting and child development. For example, successful home visiting

programs that focus on changing parenting behavior to improve child outcomes confirm the relevance of attachment theory and self-efficacy theory (Olds, 1997). Home visiting programs that increase parents' self-efficacy as teachers for their children can improve their children's opportunities for school success (Bradley & Gilkey, 2003; Kagitcibasi, Sunar, & Bekman, 2001). Programs that improve maternal sensitivity enhance the mother-child attachment relationship and may prevent child abuse (Bilukha et al., 2005; author cite).

Conceptual Basis for Home Visiting Programs

Home visiting gives the provider license to observe and interact with the family in its natural setting. Most home visiting programs are based on ecological theory, which postulates that the child develops in a multi-faceted environment (Bronfenbrenner, 1992). Parenting and the parent-child relationship are presumed to directly affect child outcomes. Distal factors such as governmental family policy, neighborhood quality, and income indirectly influence child functioning by impacting the proximal environment. Most home visiting programs attempt to improve indirect influences on the child by connecting the family with economic and social supports. The direct influence of parenting is addressed through parenting education, which in turn is theorized to affect the developing child by improving the parent-child relationship. In fact, some of the most successful early childhood programs with long-term outcomes are those that involve the parents (Yoshikawa, 1995).

The present study is based in part on the theory of developmental contextualism, which recognizes the importance of family context (Lerner, 1991). According to this theory, child development is a function of the environment, while taking into consideration certain heritable traits. Moreover, the family environment may change over time and across historical contexts. Applied to home visiting, program implementation and effectiveness may vary between

historical periods based on changing family and government resources. For example, home visitors may find it difficult to make daytime contact with low-income mothers who are pursuing employment requirements added by welfare reform in the United States (Brookes, Summers, Thronburg, Ispa, & Lane, 2006). As another example of an historical effect, increased government funding of health visitor programs may have replaced the niche for paraprofessional home visiting programs in Australia.

In general, governments vary in the amount and type of funding for home visiting. In recent years, many industrialized countries, such as Australia, the United Kingdom, and the Netherlands, have initiated universal postpartum health visits (Barlow, 2006). In universal health visitor programs, families with young children receive a government nurse or other health personnel into their home for parent education, regardless of their income or “at-risk” designation. In contrast, the United States government currently offers no such programs, and other services to assist young children, such as income supports, quality child care, and universal health care, are also comparatively lacking. Perhaps as a result, the United States ranks next to highest in terms of infant mortality among countries in this study (United Nations, 2008; U.S. Department of State, 2008). Infant health reflects the resources available to children within a country and relates to their potential for optimal development (Irwin, Siddiqi & Hertzman, 2007).

Given the differences in programming, at-risk families in the United States may have different needs and access to services than at-risk families in other developed countries. Yet some federal funds are available to finance local home visiting programs for low-income families, such as Title I or Americorps. Programs for families in poverty were developed in the United States following the Supreme Court desegregation case affirming all children’s right to an

adequate education (Ramey & Ramey, 1998). Home visiting programs fell into disfavor in the late 1970s based on evaluation research (Olds & Korfmacher, 1997). Before the early 1980s, research designs were often inadequate, and programs were not always implemented properly. Meanwhile, early intervention at the national level focused on center-based programs such as Head Start, and federal funding has been allocated through local agencies to home-based programs.

Overview of Home Visiting Programs

While context may vary across place or time, home visiting programs have certain characteristics in common. One advantage of home visiting programs is the convenience of home-based service delivery (Gomby, Culross, & Behrman, 1999), which maximizes the likelihood that families will participate. At-risk families often have difficulty engaging in intervention programs; however, the home environment as a setting for intervention may improve participation rates. Home visiting eliminates transportation costs and issues of child care for children who may not be the targeted intervention group. Additionally, home-based services give the provider a more extensive knowledge of family background. Thus, home visiting may be a more successful method of parent education among at-risk families than center-based services.

Focus

Although all home visiting programs share the service delivery setting of the home environment, they vary in their area of focus. Three primary types of home visiting programs for at-risk families have been identified: improvement of maternal life course outcomes, promotion of children's health, and early childhood education (Durlak & Wells, 1997; Gomby et al., 1999; Wasik, Ramey, Bryant, & Sparling, 1990). Programs focused on outcomes for low-income

women with children promote employment, training, and economic stability. General health outcomes for children, such as immunization records, are often included in all program types. Programs designed to improve children's mental health are aimed at preventing child abuse, children's mental illness, or juvenile criminal behavior. Educational interventions have been designed primarily to affect academic outcomes and are usually reviewed separately from programs aimed at mental health promotion (Durlak & Wells, 1997).

Yet different models of intervention have overlapping effects in two primary early childhood outcomes: social-emotional and cognitive competence (Cowen, 1997). For example, the Perry Preschool Project, which was originally designed to increase academic achievement, showed long-term effects in reducing negative socio-political outcomes such as criminal behavior and welfare receipt (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984). In keeping with this finding, improvements in parenting attributed to home visiting may affect both social-emotional and cognitive development. Maternal sensitivity may affect children's later social-emotional skills (National Institute of Child Health and Human Development [NICHD], 2003), and the level of stimulation in the home may affect children's later academic competence (author cite). Furthermore, children with more positive social-emotional development are more likely to be able to develop the skills needed to achieve academically (Chen, Chang, & He, 2003; Masten et al., 1995).

Characteristics of Home Visiting Programs

Home visiting programs vary in other aspects, such as frequency of visits. A narrative review of 30 home visiting program evaluations suggested that the frequency of home visits is related to the size of effect (Olds & Kitzman, 1993). Although there have been multiple reviews of home-visiting research, none have systematically addressed the question of minimum number

or frequency of visits needed to influence outcomes (McNaughton, 2004). An early meta-analysis of home and center-based intervention programs indicated that the level of personnel training and the level of structure within the program were significant moderators of effect size (Casto & White, 1985). Earlier evaluations, however, frequently lacked a strong research design; for example, the Casto and White (1985) meta-analysis included studies with a pre-test/post-test design, whereas later published evaluations were more likely to use experimental random assignment or, more commonly, quasi-experimental comparison groups. Hence, results from this earlier meta-analysis may be called into question under current evaluation standards.

A recent meta-analysis (Sweet & Appelbaum, 2004) that targeted a subset of a broad meta-analysis of multiple types of family support programs (Layzer, Goodson, Bernstein, & Price, 2001) included home visiting programs aimed at all ages and income levels, but restricted the analysis to evaluations with a control group or comparison group design. Interestingly, this meta-analysis found that programs with paraprofessional home visitors were more successful in reducing child abuse potential than programs with professional home visitors; conversely, programs with professional home visitors were more successful in improving children's cognition than programs with paraprofessionals.

A review of the literature indicates that others have taken into consideration characteristics of providers and clients. Outcomes of home visiting programs are dependent on the investment and engagement of the client (Osofsky, Culp, & Ware, 1988). A study of home visiting in inner-city Chicago indicated that community-based paraprofessionals working in tandem with nurses had higher initial engagement rates and equivalent retention rates than a nurse-only team (Barnes-Boyd, Norr, & Nacion, 2001). This program was somewhat unusual

compared to most home visiting programs as it provided 6 months of training for paraprofessional visitors.

Olds and Korfmacher (1997) have suggested that professional nurse home visitors have greater chances of success than paraprofessionals. A randomized trial between nurse home visitors and paraprofessionals showed stronger effects on maternal behavior for nurse home visitors; however, a follow-up of this study indicated some positive outcomes for the paraprofessional group when compared to the nurse group (Olds et al., 2004). Thus, questions remain about the most cost-effective method, and Olds et al. recommend a replication of this trial before implementing of the paraprofessional version. Success related to particular provider characteristics may depend on the cultural group experiencing the intervention; in one study, African American clients valued provider education while Latino clients valued providers with more parenting experience (McCurdy, Gannon, & Daro, 2003).

Another issue is the number of participants in any given program. When government agencies expand successful pilot studies to serve large numbers of participants, resources for individual families may be decreased or models may not be replicated exactly. Large programs may have other constraints. For example, large programs run by government entities may change philosophies to meet mandates, such as parent-driven services (Duggan et al., 2004). Pilot studies run by universities in the early years of evaluation research may have achieved superior results because of their concentration on a smaller group of participants, the quality of home visitor supervision, or changes in the needs and experiences of low-income mothers over time.

One of our goals of this meta-analysis is to obtain a relatively homogeneous sample of studies so that moderators are measuring actual effects for this particular group of programs.

Home visiting programs for medically fragile or handicapped children, for example, are likely to have different goals and contexts than programs for children from low-income families.

Similarly, programs with universal access will differ when compared to programs targeting low-income families. Other meta-analyses of home visiting have used a broader framework including programs for low-birth-weight newborns or children with failure-to-thrive and programs with universal access. Yet these meta-analyses are based on a heterogeneous sample (Sweet & Applebaum, 2004; Layzer et al., 2001; Bakermans-Kranenburg, van IJzendoorn, & Bradley, 2005) or do not assess homogeneity (Kendrick et al., 2000). In order to maximize homogeneity, we set stringent criteria for the group of studies to be included. In addition, we accounted for additional sources of variance among studies and programs by testing moderators hypothesized to contribute to differences in child outcomes.

Methods

This meta-analysis reviewed evaluations of home visiting for at-risk families in order to quantify the effect of moderators on effect sizes, representing changes in maternal behavior. Five moderators were of interest: (a) country of program, (b) frequency of visits, (c) training of home visitors, (d) date of study, and (e) number of participants.

Sample Selection

An initial search conducted in 2002 of ERIC, Social Work Abstracts, and PsychInfo of studies published after 1980 used “home visit*,” “family support,” or “early intervention” as keywords. Terms such as “not handicapped” and “low-income” restricted the database of articles to the studies of interest. We found 102 possible studies from which we selected 12 based on our narrower selection criteria. In additional searches conducted between 2002 and 2008, we found several more studies. These searches included the Medline database. Reviews of parenting

interventions were also examined (Bakermans-Kranenburg et al., 2003; Olds, Sadler, & Kitzman, 2007; Sweet & Applebaum, 2004). Finally, 29 studies met our criteria, including 35 different groups of participants ($N = 6453$ families). Table 1 summarizes program characteristics.

Only programs serving at-risk families were included. Risk may be defined as living in a high-risk neighborhood, income status, or teenage childbearing. While not all families in these studies lived in poverty, all authors reported that the families in their respective programs were generally low-income. Evaluations of programs outside of the United States were included; however, we hypothesized that home visiting in developed countries outside of the United States would have a different effect size based on differences in government policies and funding for family programming.

Criteria for exclusion from the study were: (a) a pre-test/post-test study design, (b) a center-based approach in addition to or instead of a home visitor model, (c) unpublished studies including dissertations and conference abstracts, and (d) programs for handicapped or medically fragile children. Both randomized control-treatment models and quasi-experimental models using a comparison group were included. We did, however, exclude programs where the control group was significantly different than the treatment group at pre-test. For example, in a study of video home training in Israel, workers apparently selected families who were not in need of immediate help for the control group due to ethical issues, thus limiting the usefulness of the data for this meta-analysis (Weiner, Kuppermintz, & Guttman, 1994). Program evaluations of home visitation services are of varied quality (Guterman, 2001). We therefore did not include publications that were not published in a peer-reviewed journal or book from an established academic press.

We excluded programs designed exclusively for handicapped or medically at-risk infants, such as premature infants, infants with high irritability, or infants of drug-using mothers (e.g., Field, Widmayer, Stringer, & Ignatoff, 1980; Larson, 1980; Schuler, Nair, & Black, 2000; van den Boom, 1994). Home visiting programs serving families of children with medical risks or special needs have challenges and objectives that set them apart from participants in our meta-analysis. Our purpose was to focus exclusively on programs for low-income families with typically developing young children and to examine which characteristics of these programs were related to improvements in maternal behavior. We did review some programs that served special needs or chronically ill children in addition to typically developing children; however, these programs were not designed specifically to serve medically at-risk young children.

Twenty-four items were included in the coding framework, which had three categories: (a) basic identifying data, such as year of publication, (b) characteristics of subjects, such as average age of mothers, and (c) intervention characteristics, such as frequency of home visits. We contacted authors for additional information as needed; this information was obtained for two of the studies. All studies were double-coded with differences resolved by consensus. A reliability test noted 83% agreement between coders.

Measures

The effect size for this meta-analysis represents change in maternal behavior, particularly behavior that directly impacts the child's development (e.g., maternal sensitivity, stimulation, parenting practices). Measures of maternal behavior were, for the most part, observations. The Home Observation for the Measurement of the Environment (HOME) (Caldwell & Bradley, 1984) was one of the more common measures used in these studies, and it combines both survey and observation methods to measure parenting behavior. Several studies used coded videotapes

of parent supportiveness or parental sensitivity that were tested for inter-rater reliability (e.g., Raikes et al., 2006). The Nursing Child Assessment Satellite Training (NCAST), used in some studies, is a standardized scale for observing mother-child interaction that has been tested for validity (Sumner & Spietz, 1994). Measures used less frequently included the Maternal Interactive Behavior scale and the Home Environment Review (Jester & Guinagh, 1983; Levenstein, O’Harra, & Madden, 1983). No studies were included in this meta-analysis which used a strictly paper-pencil self-report method for assessing maternal behavior.

We identified two general types of scales in these studies that directly measure maternal behavior: (a) maternal sensitivity, and (b) a stimulating home environment. When studies included both types of measures, we randomly selected one of the types for inclusion in the data set. To justify random selection, we used the Q statistic, a chi-square value used in meta-analysis, to analyze differences between sensitivity and home environment types. A preliminary analysis of effect sizes showed no significant difference between effect sizes from sensitivity and environment measures ($Q_{between} = 1.76, df = 1, ns$). It should be noted that some instruments, such as the Home Observation for the Measurement of the Environment (HOME) (Caldwell & Bradley, 1984), often included both types of maternal behavior measures. If the HOME and the Sensitivity subscale from the HOME were used in the same study, we selected the total HOME scale for inclusion in the data set. When multiple measures of maternal behavior of the same type were included in the same study, we averaged the two measures together.

In a few studies, data were collected at multiple timepoints. In all cases, we did not use follow-up data that were collected after the intervention was completed, as effects may fade over time. Some studies were reported in multiple articles, particularly those with follow-up data.

With a few exceptions (e.g., Love et al., 2002; Raikes et al., 2006), all necessary information was contained within one study, so we did not cite additional studies from the same data.

For the most part, we did not use data collected at midpoint; however, we did use data collected from 24-month old-children in the National Evaluation of Early Head Start (Raikes et al., 2006). This intervention lasted for 3 years, but it was not possible to calculate effect sizes using the data collected when children were age 36 months due to incomplete information. In addition, Some studies used multiple regression or other multivariate techniques. If bivariate data were not included, we could not easily obtain a measure of significance, and we did not include the study. Many studies reported only child outcomes and did not report measures of material behaviors; such studies were excluded. When only bivariate significance was reported, we used $p = .50$ and $p = .05$ as the cutoffs to estimate no difference and statistically significant difference, respectively.

Five variables were tested as moderators of home visiting effectiveness, including study location, frequency of visits, training of home visitors, date of study publication, and number of participants. Number of participants was defined as the number of families completing the outcome measure.

The majority of the studies evaluated programs within the United States ($n = 22$), with 2 studies from the United Kingdom and the remaining 5 studies from Australia, the Netherlands, Ireland, Canada, and Bermuda. Because of the smaller number of studies from outside of the United States, the study location was a dichotomous variable with two groups: (a) programs in the United States and (b) programs from other countries.

The frequency of visitation represented the number of visits per month. In determining the frequency of home visits, differences may arise between the intended frequency (e.g., visits

were intended to be scheduled once per month) and the actual frequency of visits that were able to be delivered. In cases where both numbers were reported, we used the actual frequency of home visitation. Most papers only reported one number and did not always state whether this was the scheduled number of visits per month or the actual number of visits.

In another analysis, we designated two groups based on frequency of home visitation. The intensive group consisted of programs with home visits at least three times a month; groups with less frequent visits were placed in the non-intensive group. Of three studies that did not provide exact information regarding frequency of visits (Cole, Kitzman, Olds, & Sidora, 1998; Huxley & Warner, 1993; Olds, Henderson, Chamberlin, & Tatelbaum, 1986), two described their home visiting services as intensive (Cole et al.; Huxley & Warner). These two studies were included in the intensive group.

To assess the effect of home visitor training, we compared licensed professionals, such as social workers, counselors, or nurses, to paraprofessional personnel, who had at most a bachelor's degree but no professional certification or clinical training. Another review defined a paraprofessional home visitor as someone without a college education (Gomby, Culross, & Behrman, 1999). In this paper, we refer to anyone without clinical training as "paraprofessional," whether or not they have some college or a college degree. For example, paraprofessionals included students who may have received some professional training while working as home visitors; other programs had a combination of high school and college graduates working as "paraprofessional" home visitors.

Results

The 29 studies in the meta-analysis included 35 groups of participants with a grand total of 6,453 individual participants. The number of individual participants per group ranged from 20

to 794, with a mean of 184.37. The age of the child at assessment ranged from 6 weeks to 4 years. The average length of client enrollment was 19.2 months, ranging from 1.4 months to 54 months. For 21 of the 29 studies, the program lasted at least one year. Some programs were not uniform in length ($n = 10$). For example, two programs lasted 6-12 months (Diener, Nievar, & Wright, 2003; Field, Widmayer, Greenberg, & Stoller, 1982); another program had flexible exit dates but intensive services (Huxley & Warner, 1993).

Figure 1 shows confidence interval plots of the effect sizes measuring the difference in maternal behavior between experimental and control groups. All but one of the effect sizes was positive, indicating that most studies found that the home visiting program had a positive effect on maternal behavior when compared to the control group. The study resulting in a negative effect size (Wasik et al., 1990) was somewhat different from the other home visiting programs in that home visitors worked with clients on setting personal goals and controlling their own impulsivity, whereas other programs focused more directly on parenting skills and child well-being. We included this program in the meta-analysis because it met all other study criteria.

The confidence interval plot suggests that studies are not homogeneous, and this was confirmed by a significant chi-square test for homogeneity ($Q = 145.11$, $df = 1$, $p < .001$); that is, they do not share a common effect size. The fixed-effect model was thus contraindicated. A random-effects variance component was computed, with a weighted mean effect size equal to .37. The confidence interval ranged from .21 to .53, indicating a positive effect for home visiting on maternal parenting behavior.

In cases of heterogeneity, Hedges (1994) suggests that meta-analysts look for a moderating variable to explain the variance in effect sizes. Within sets of studies, certain characteristics may determine study outcomes. In fact, researchers should proceed with caution

in analyzing significantly different effect sizes unexplained by moderators (Cook, Sackett, & Spitzer, 1995). A meaningful common effect size cannot be identified in such cases.

Initially, we tested for differences in effect size between home visiting studies in the United States and those in other countries. The resulting chi-square was significant, $Q = 41.2$, $df = 1$, $p < .001$, indicating that programs outside of the United States had a stronger effect on maternal behavior. Yet there remained a significant amount of variance in effect sizes unexplained by the location of the study, ($Q_{\text{Residual}} = 103.91$, $df = 33$, $p < .001$). Using random effects, studies outside the United States had a grand mean of .44, while studies in the United States had a grand mean of .30. The group of studies from other countries and the group of studies from the United States remained heterogeneous within their respective groups.

Because of the variance between groups, which indicates differences in program effects by nationality, we regressed effect size on home visitation frequency within these two groups. Studies conducted in the United States yielded the chi-square value of $Q = 22.86$, $df = 1$, $p < .001$. This test excluded one study because frequency of visitation information was unavailable (Huxley & Warner, 1993). $Q_{\text{Residual}} (29.01, df = 22)$ was not significant, indicating that home visitation frequency explained the residual variance in effect size for those studies within the United States; programs with more frequent home visitation were likely to show more improvement in maternal behavior. The resulting equation, $d = .067 + .072t$, suggested that home visitors should see families at least two times per month to achieve a small, substantive effect ($d = .2$) on maternal behavior.

Studies conducted in countries outside of the United States also had a significant chi square for the frequency of visitation variable ($Q = 82.44$, $df = 1$, $p < .001$). Within this group, however, significant variance remained ($Q = 29.68$, $df = 7$, $p < .001$). We also found significant

frequency of visitation effects within the total sample; however, residual variance remained in the total sample also ($Q_{\text{Residual}}, 103.68, df = 30$).

An additional analysis with the overall sample tested the variance in effect sizes between non-intensive and intensive home visitation for the total sample. A weighted analysis of variance yielded significant results ($Q = 20.92, df = 1, p < .001$), indicating that intensive home visiting programs were more likely to have strong effects than non-intensive programs. The random effects mean of intensive programs was .58, representing a medium effect size, compared with a small effect of .27 for non-intensive programs. A comparison of these effects is displayed in Figure 1, using random-effects confidence intervals.

Other moderators tested included home visitor training, date of publication, and number of participants. Training of home visitors did not explain a significant amount of variance, even when separated into groups by study location or intensity of services. The date of publication was a significant moderator within the total set of studies ($Q = 13.04, df = 1, p < .001$). Effects varied when studies were separated into dichotomous groups based on nationality and on frequency of visits (intensive and non-intensive groups). The date of publication was significant for studies within the United States only, with earlier studies showing higher effect sizes ($Q = 8.58, df = 1, p < .01$). The date of publication was also significant only for the group of studies with non-intensive programs, with earlier studies showing higher effect sizes ($Q = 7.57, df = 1, p < .01$).

Our final moderator, number of participants, showed significant effects. Studies with larger numbers of participants had lower effect sizes ($Q = 24.25, df = 1, p < .001$). This was true for all subgroups: studies within the United States ($Q = 9.85, df = 1, p < .01$), international studies ($Q = 11.00, df = 1, p < .001$), intensive studies ($Q = 12.25, df = 1, p < .001$), and non-

intensive studies ($Q = 5.75, df = 1, p < .05$). All moderators, with the exception of frequency of visits, left significant unexplained residual variance in individual tests.

Intercorrelations among moderators indicated that the date of study publication was negatively related to frequency of visits ($r = -.61, p < .001$), suggesting that later programs had fewer visits per month; however, authors of later publications were more likely to report actual visit attendance, whereas authors of earlier publications tended to only report number of visits scheduled. A post-hoc analysis showed that earlier publications were significantly less likely to report actual visitation frequency ($t = 3.29, df = 30, p < .05$). This relation may have inflated the correlation between frequency of visits and date of publication.

Date of study publication was positively related to the number of participants, indicating an increase in the number of participants over time ($r = .49, p < .01$). Studies with more participants were likely to have fewer visits per family each month ($r = -.37, p < .05$). The only significant moderator indicating differences by country was size of sample ($t = 2.20, df = 32, p < .05$). Studies in the United States (mean of $n = 207$) were likely to have more participants than studies based in other countries (mean of $n = 107$).

Discussion

One difficulty with reviewing the home visiting literature is the diversity within the field. Programs vary in design, implementation, administration, and size. Successful home visiting programs may be located in rural or urban settings (Olds & Korfmacher, 1997). Some programs have a special focus on serving teenage mothers (e.g., Wagner & Clayton, 1999). Other programs incorporate mothers of varied ages who are from diverse cultures and largely immigrant populations (e.g., Diener, Nievar, & Wright, 2003; Riksen-Walraven, Meij, & Hubbard, 1996).

Our results indicated that effects of home visiting programs are also diverse. One program had a negative effect on maternal behavior (Wasik et al., 1990). Several studies showed no significant effects (e.g., Wagner & Clayton, 1999). Yet, on average, programs were somewhat successful, even when we adjusted for heterogeneity. The average program effect for all countries ($d = .37$) represents a modest but substantive improvement in maternal behavior. A critical predictor of the differences in effect sizes across studies was the frequency of home visiting. In addition, accounting for the frequency of home visiting resulted in homogeneity of studies in the United States. Across all studies, intensive programs or programs with more than three visits per month had a medium mean effect size, more than twice the size of mean effects in non-intensive programs. Findings suggest that programs with more frequent contact between home visitors and their clients are most successful.

The research community has already established that early intervention does work (Shonkoff & Phillips, 2000). This study confirms that home visiting for low-income or at-risk families improves maternal behavior. A recent meta-analysis confirms that interventions aimed at clinical samples are more effective when compared to non-clinical samples (Bakermans-Kranenburg et al., 2003), potentially because they have the greatest room for improvement. Similarly, at-risk samples may have more room for improvement than low-risk families. While universal services may be attractive due to the lack of stigma attached, it appears to be more cost-effective to target at-risk families.

Yet another meta-analysis with a different set of studies raises the argument that at-risk families tended to gain less from interventions than middle-class families, citing the Matthew effect (Bakermans-Kranenburg et al., 2005; Matthew 15:29, King James Version). The Matthew effect dictates that those who have fewer resources will fare worse than those who are more

advantaged in the beginning. This meta-analysis assessed a broad range of studies that included medically at-risk children, middle-class families, pre-test/post-test designs, and center-based education programs. Although this meta-analysis differs from the present study in the breadth of studies examined, the point that families with less stress and fewer personal challenges are more able to successfully engage with program content is echoed in a primary research study (Wagner, Spiker, Linn, Gerlach-Downie, & Hernandez, 2003).

The Matthew effect may explain our finding that nations other than the United States tend to have higher effect sizes in their home visiting programs. Children from low-income families in the United States have fewer supports than other industrialized countries and fare worse than those who are more advantaged (Smeeding, 2005). The United States ranks next to highest in the countries represented in terms of infant mortality, just below Bermuda (United Nations, 2008; U.S. Department of State, 2008). Following the Matthew effect, families with fewer available resources and less education should make fewer changes as a result of home visiting programs than families with more advantages. Yet it is likely that even small changes, if meaningful, have long-term benefit in low-resource families and communities. For example, children from at-risk families who participate in successful home visiting programs are less likely to access the criminal justice system or costly social services as adults (Karoly et al., 2005). The incidence of criminal behavior and welfare use in low-risk families is smaller, thus universal prevention efforts do not appear to have as strong an impact on government costs when compared to programs targeted towards at-risk families.

Another issue of concern is the appropriate training level of home visitors. In this study, average effect sizes of studies using professionally trained home visitors, such as nurses, counselors, psychologists, or social workers, did not differ significantly from those of studies

using trained paraprofessionals. Only eight programs, however, had home visitors with professional clinical training; two of these did not have sufficient visit frequency information to include in this analysis. Although these results are not definitive, it is worth noting that positive effects were achieved with trained paraprofessionals.

While higher levels of home visitor education are generally considered preferable, it is possible that higher education of home visitors combined with characteristics of families can have a negative effect on the success of programs. For example, in the Project Beethoven intervention involving the Robert Taylor housing project of Chicago, residents were unable to relate to college-educated home visitors (Curtis, 1995). When residents from the project were recruited for work as home visitors, program outcomes improved.

We found that home visiting for low-income families does work, regardless of the use of nurses or paraprofessionals; however, programs with infrequent visits may not be as successful. This may appear to contradict previous authors who suggest that home visiting is not effective, with an exception for the Nurse Home Visitation Model (Brooks-Gunn & Markman, 2005; Burchinal, Campbell, Bryant, Wasik, & Ramey, 1997; St. Pierre, Layzer, & Barnes, 1995). These papers did not, however, take into account either meta-analytic techniques or frequency of visitation. According to our analyses, program effectiveness is largely dependent on the intensity or frequency of services. This may appear to contradict Bakerman et al.'s (2004) findings that short-term programs had greater effect than long-term programs; however, many of the short-term programs in the Bakerman et al. study included frequent, intensive therapeutic intervention. A reanalysis of these studies found that short-term intensive video-based interventions focused on changing parental behavior were most highly effective (Dunst, 2008). Thus, the quality and

intensity of these brief video-based interventions may have resulted in the finding of effectiveness related to duration.

Context of Time and Place

In the present study, we found a trend over time toward fewer home visits per month in the United States only. Yet some later interventions reported both intensive services and strong effects in the United States (e.g., Heinicke et al., 1999). Further, this may have been affected by a tendency of later publications to report actual rather than planned visit frequency. We also found trends over time toward larger numbers of participants but fewer services. Thus, perceived historical changes in the effectiveness of home visiting programs are likely to be caused by changes in program delivery rather than changes in the ways that families live. Although several changes in government programs in the United States, such as welfare reform, have affected at-risk families in the past two decades, home visiting programs continue to demonstrate successful results.

Our findings are particularly interesting placed in the historical perspective of the family support movement for low-income families. An analysis of early childhood interventions discussed the differences between early model programs and later government implementation (Gomby, Lerner, Stevenson, Lewit, & Behrman, 1995). The authors suggested that in the United States, the intensity of early programs may have been diluted to meet fiscal constraints accompanying government funding and program expansion.

Within the total group, we were not able to completely explain the variance between studies. Each country and culture face unique circumstances, and in some cases, cross-cultural issues are addressed within one government program (e.g., Riksen-Walraven et al., 1996). This finding lends support to ecological theory, suggesting that the macrosystem--defined by

Bronfenbrenner (1979) as encompassing laws, government, and culture, affects families at the individual level.

Limitations and Directions for Future Research

Our sample of studies provided a much-needed focus on the quality of home visiting. It suggests that costly professionals need not be the first point of contact for at-risk families. A few studies have indicated costs and benefits involved in home visiting programs (Aos et al., 2004; Karoly et al., 2005; Olds & Kitzman, 1993). Others have listed only cost per family. The articles reviewed here did not indicate average cost; however, a cost variable in combination with other data from a broader range of studies may assist in the design of future home visitor programs.

There are many aspects of home visiting that it was not possible to measure in this study. We may not have had accurate counts of visit frequency, particularly in earlier years, if there was a difference between reported and actual frequency of visitation. Several studies merely stated that families were visited weekly, and we are uncertain whether the scheduled frequency matched actual frequency. A more thorough investigation of actual and scheduled visitation as a moderator of effect size would be a useful direction for future studies.

Another direction is the type of home visiting programming. Certain demographic groups appear to benefit more from home visiting programs than other groups (McCurdy, Gannon, & Daro, 2003). Yet little research has been done on variations in curriculum or program, and their differential benefit for certain types of families. Professional home visitors may be better suited for certain groups than others. Demographic groups may be taken into consideration in addition to the type of outcome when designing home visitor programs (Sweet & Appelbaum, 2004). Some of these questions have been discussed in qualitative literature reviews (Korfmacher et al., 2008; St. Pierre & Layzer, 1998; Yoshikawa, 1995); yet more quantitative research is needed.

The generalizability of this meta-analysis is limited by two factors. First, we excluded programs that specifically targeted children with disabilities or other medical diagnoses. Many of the studies included, however, did serve children with multiple risks, as children in low-income families often have co-occurring risk factors. Second, generalizability may be limited by our exclusion of fugitive or unpublished literature (Rosenthal, 1994). Our intention was to include high-quality publications to ensure accurate effects. Home visiting program evaluators may have incentive to produce positive effects in technical reports; however, this may be counterbalanced by unpublished dissertations or conference papers with non-significant findings. Our exclusion of this literature precluded a test of differences based on publication status.

The difficulty of measuring frequency of visitation, given the tendency of earlier researchers to report only scheduled visits rather than attended visits, is another limitation of this meta-analysis. Further, we recognize that frequency of home visitation is an inadequate proxy for family engagement in a home visiting program. Actual observation of home visitor-family interactions is the preferred method; coded videotapes indicating more parent engagement in the home visit predict greater improvements in family life (Roggman, Boyce, Cook, & Jump, 2001). Ideally, evaluation design and reporting will continue to improve to allow for a more thorough understanding of the home visiting process.

Although large randomized study designs may be able to answer these questions more definitively (LeLorier, Gregoire, Benhaddad, Lapierre, & Derderian, 1997), a large-scale randomized clinical trial of home visiting services with several different study designs is unlikely to occur in the near future. In fact, large-scale randomized studies are relatively rare in this literature with the exception of work by Olds and colleagues (Olds & Korfmacher, 1997). Understandably, nonprofit agencies and government programs find it difficult to deny services to

a large number of eligible families in order to ensure that a randomized control group exists to examine study effects. Moreover, large studies of low-income families are often plagued by high amounts of attrition (McNaughton, 2004). Currently, meta-analysis may be one of the best methods of determining future directions for home visiting programs.

Conclusion

Our findings clearly indicate the importance of frequent visitation in home visiting programs for low-income families. On average, these programs do appear to produce improvements in maternal behavior, especially with frequent home visitation. Of course, substantive interventions must accompany frequent home visits. We conclude that appropriate, frequent home visiting for low-income families improves the environment of children's development by improving maternal behavior.

It is also important to note that diminishing effect sizes over time appear to be related to changes in program size and dilution effects rather than family changes, at least within the United States. Future meta-analyses may find changes related to broader historical context as published studies showing post-welfare reform results begin to accumulate. Certainly, cultural diversity and existing government programs should be taken into account in order to maximize the potential benefit of home visiting for low-income families.

Clinical Implications

The importance of frequent visitation to home visiting implies the need for extra effort on the part of practitioners to fully engage their clients. Engagement is a key to success in home visiting; moreover, a positive parent-visitor relationship fosters parent participation (Korfmacher, Green, Spellman, & Thornburg, 2007; Raikes et al., 2006). In some communities, cultural competence may be the key to client engagement; paraprofessional providers from the

community who were able to develop relationships with their clients showed remarkable success. Understanding the communication styles and preferred learning styles of clients may assist in relationship development and program engagement (Barnes-Boyd, Norr, Nacion, 2001; McCurdy, Gannon, & Daro, 2003).

The ability to connect with the family may be independent of an advanced degree. Yet the combination of education and authority may carry some stigma. For example, social workers associated with county agencies that also investigate child abuse or neglect may have more difficulty establishing trust than a community worker associated with the school system. Nurse home visitors who are culturally competent and work through a trusted community agency may have the benefits of community paraprofessionals as well as the benefits of advanced training. Certainly, programs must set goals to visit families frequently and provide a low case load to make frequent visitation feasible.

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Table 1

Home visiting studies with sample and program characteristics

<u>Study</u>	<u>Publication Date</u>	<u>n</u>	<u>Professional</u>	<u>Measure</u>	<u>Frequency</u>	<u>U.S.</u>
Armstrong	1999	174	yes	HOME	weekly	yes
Barlow	2006	121	no	CARE Index	41 per yr.*	no
Caldera et al. (2)	2007	249	no	NCAST Social Emotional	30 per yr.*	yes
Cole et al.	1998	410	yes	HOME	intensive	yes
Culp et al.	2004	263	yes	HOME Learning Materials	28 per yr.	yes
Davis	1998	92	no	HOME	25 per yr.*	no
Diener, Nievar, & Wright	2003	101	no	HOME	monthly	yes
Duggan et al. (2)	1999/2004	567	no	HOME	22 per yr.*	yes
Field et al.	1982	80	no	Maternal Interactive Behavior	biweekly	yes
Gray & Ruttle	1980	36	yes	HOME	36 per yr.	yes
Heinicke et al.	1999	64	yes	Maternal Responsiveness	3 per mo.*	yes
Huxley & Warner	1993	40	yes	HOME	intensive	yes

Table 1 (cont.)

Study	Publication Date	<i>n</i>	Professional	Measure	Frequency	U.S.
Infante- Rivard et al.	1989	47	yes	Maternal Responsiveness	8 per yr.	no
Jacobson & Frye	1991	46	no	HOME	32 per yr.	yes
Jester & Guinagh	1983	207	no	HOME Environment Review	weekly	yes
Johnson, Howell et al.	1993	232	no	Cognitive Stimulation	monthly	no
Johnson, Breckenridge et al.	1984	78	no	HOME	weekly	yes
Levenstein et al.	1983	208	no	Maternal Interactive Behavior	biweekly	yes
Lieberman et al.	1991	82	yes	Maternal Responsiveness	weekly	no
Luster et al.	1996	83	no	HOME	weekly	yes
Marcenko	1994	187	no	HOME	22 per yr.	yes
Norr, Crittenden & Lehrer	2003	477	no	Cognitive Stimulation	monthly	yes
Olds, Henderson et al.	1986	198	yes	HOME Play Materials	--	yes
Olds, Robinson et al.	2002	990	no	Maternal Interactive Behavior	25 per yr.*	yes
Raikes et al.; Love et al. (2)	2002	794	yes	NCAST Supportiveness	32 per yr.*	yes

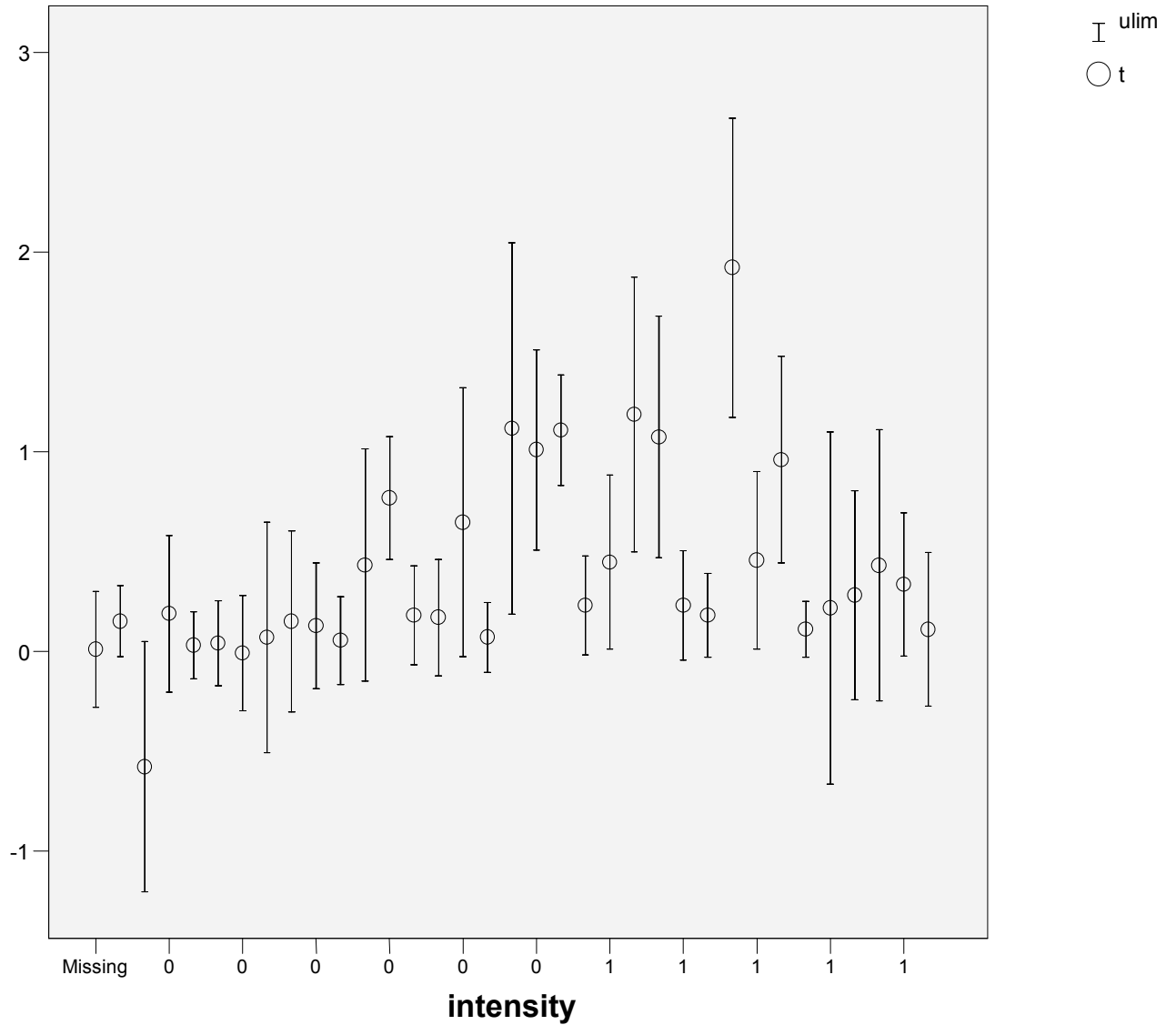
Table 1 (cont.)

Study	Publication Date	<i>n</i>	Professional	Measure	Frequency	U.S.
Riksen-Walraven et al.	1996	75	no	Quality of Instruction	weekly	no
Scarr & McCartney	1988	117	no	Maternal Teaching Ability	46 per yr.	no
Wagner & Clayton	1999	350	no	HOME	6.67 per yr.*	yes
Wagner & Clayton	1999	186	no	HOME	5 per yr.*	yes
Wasik et al.	1990	41	no	Maternal Sensitivity	30 per yr.*	yes

Note: Professional refers to status of provider as a nurse or mental health professional. In some cases, studies report on multiple groups; the two groups evaluated in the Wagner and Clayton article are reported separately as they differ in respect to frequency of visitation. If two studies used to gather necessary information for a particular program, the number 2 is placed in parentheses after the authors' names.

*These papers reported both planned and actual frequencies. Frequencies in this table were specifically designated as actual frequencies which were less than the planned frequency of visitation. Papers that reported only one number are not included in this group.

Figure 1. Confidence interval plot of effect sizes by intensity of service.



Note: On x-axis, 0 = low-intensity services. 1 = high-intensity services. One study was missing intensity or frequency of visitation information (Olds, Henderson, Chamberlin, & Tatelbaum, 1986).