

Components Associated With Home Visiting Program Outcomes: A Meta-analysis

abstract

BACKGROUND: Although several systematic reviews have concluded that home visiting has strong evidence of effectiveness, individual evaluations have produced inconsistent results. We used a component-based, domain-specific approach to determine which characteristics most strongly predict outcomes.

METHODS: Medline and PsycINFO searches were used to identify evaluations of universal and selective home visiting programs implemented in the United States. Coders trained to the study criterion coded characteristics of research design, program content, and service delivery. We conducted random-effects, inverse-variance-weighted linear regressions by using program characteristics to predict effect sizes on 6 outcome domains (birth outcomes, parenting behavior and skills, maternal life course, child cognitive outcomes, child physical health, and child maltreatment).

RESULTS: Aggregated to a single effect size per study ($k = 51$), the mean effect size was 0.20 (95% confidence interval: 0.14 to 0.27), with a range of -0.68 to 3.95 . Mean effect sizes were significant and positive for 3 of the 6 outcome domains (maternal life course outcomes, child cognitive outcomes, and parent behaviors and skills), with heterogeneity of effect sizes in all 6 outcome domains. Research design characteristics generally did not predict effect sizes. No consistent pattern of effective components emerged across all outcome domains.

CONCLUSIONS: Home visiting programs demonstrated small but significant overall effects, with wide variability in the size of domain-specific effects and in the components that significantly predicted domain-specific effects. Communities may need complementary or alternative strategies to home visiting programs to ensure widespread impact on these 6 important public health outcomes. *Pediatrics* 2013;132:S100–S109

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KEY WORDS

birth outcomes, child cognitive development, child maltreatment, child physical health, early childhood, effectiveness, home visiting, infancy, maternal life course, meta-analysis, parenting behavior

ABBREVIATIONS

CI—confidence interval

HomVEE—Home Visiting Evidence of Effectiveness

Ms Cachat collected data and critically reviewed the manuscript; Ms Filene conceptualized and designed the study, designed the data collection instruments, and drafted the initial manuscript; Dr Kaminski conceptualized and designed the study, designed the data collection instruments, conducted the analyses, and drafted the initial manuscript; and Dr Valle conceptualized and designed the study, designed the data collection instruments, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

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Early childhood marks a period of rapid growth and development that lays the foundation for future health and success in school and life.¹ Because parents play a critical role in shaping children's early development, interventions that reach families in these early years have great potential for producing long-term benefits.² Prenatal and early-childhood home visiting is a widely endorsed method for delivering a vast array of preventive and early intervention services to families in need of support. By engaging families in home visiting programs during the prenatal or early-childhood period, providers seek to improve children's long-term developmental trajectories by fostering improved parenting knowledge and skills, social support, coping and problem-solving skills, and access to community and health services.³

Despite national and international endorsement of home visiting as a strategy to prevent child maltreatment and promote enhanced functioning and well-being for children and families,^{4–8} previous meta-analyses and literature reviews of home visiting programs across a wide range of outcomes suggest mixed, modest findings depending on the programs and outcomes examined.^{6,9–12} A recent review funded by the US Department of Health and Human Services, the Home Visiting Evidence of Effectiveness (HomVEE) review, identified 13 models that met the department's criteria for effectiveness.¹³ Across and even within these "evidence-based" models, the findings have been inconsistent, leaving gaps in knowledge about the effectiveness of home visiting across various outcome domains. The mixed findings may be due to program design, the match between program components and expected outcomes, or the quality of implementation of the program or the evaluation. Alternatively, the differences in effects might simply be explained by the variation in the way home visiting programs are comprised and delivered.

Best-practice recommendations concerning home visiting have generally either taken the form of suggesting wholesale adoption of models that have been shown to be effective (eg, HomVEE [homevee.acf.hhs.gov], Promising Practices Network [promisingpractices.net]) or have been based on clinical impression about particular approaches (eg, recommendations for a particular schedule of home visits). Although model ratings are important for guiding practitioners in adopting a program model, any particular program may not include the most effective combination of components to produce maximum results for a given population or community. In addition, as the Maternal, Infant, and Early Childhood Home Visiting Program¹⁴ impels increased focus on outcomes, a pressing question is how to best build the effectiveness of a program model or enhance models that may already be in operation; that is, what elements (eg, content, service delivery methods) in home visiting programs seem most important for program success?

Although 2 systematic reviews conducted before 2002 examined the relationship between parent and child outcomes and a small subset of program components,^{12,15} no reviews have fully disassembled home visiting programs into individual components or included studies conducted during the last decade. Therefore, a component analysis applying meta-analytic techniques was used to synthesize the results of published evaluations of home visiting programs to determine which individual home visiting program components have the most power to predict key parent and child outcomes.

METHODS

Search Strategy

In September 2010, the PsycINFO and Medline databases were searched for literature published between 1979 and

2010 with evaluations of home visiting programs. Studies were limited to those published in English as a journal article, book, or book chapter, although programs could be implemented in any language. Details of the search strategy are outlined in the Appendix. The initial search was designed to be very broadly inclusive of home visiting programs.

The original literature search resulted in 3252 unduplicated studies. Of these, 49 were literature reviews and meta-analyses, from which we identified additional relevant publications. A secondary search was conducted on author names that appeared at least twice in the original search results. In addition, unduplicated studies from HomVEE were examined. These follow-up strategies yielded an additional 1875 records, providing 5127 total abstracts for possible inclusion.

Study Selection

Inclusion criteria were selected to define the scope of the meta-analysis as evaluations of universal and selective (ie, for at-risk families) programs that used home visiting as a primary delivery strategy for pregnant women and families with children from birth through age 3 years in the United States. Programs that conducted only 1 or 2 home visits were excluded as dissimilar to the rest of the field. Home visiting programs targeting families for existing identified problems (eg, family preservation programs or programs that provided services to families with a substantiated child maltreatment case) were excluded. Similarly, criteria were selected to ensure that evaluation results could be generalized to a broad population of typically developing children and parents. Thus, we excluded programs that targeted parents or children because of developmental disabilities, chronic illness, feeding disorders, or bereavement because the programs provide specialized components not found in the general field of home visiting.

Figure 1 presents the PRISMA flow diagram for study inclusion. Abstracts identified in the literature search were screened by 2 project staff members to determine eligibility. A study was excluded at this point only if both staff members agreed that it met none of the inclusion criteria; 525 documents were retrieved and reviewed in full text. To allow for calculation of comparable effect sizes, studies that used a single-case evaluation method, lacked a control or comparison group, or did not contain enough statistical information to calculate effect sizes were excluded. The resulting 126 studies were coded for meta-analysis; a subsample of the 51 articles including the 6 outcome measures (maternal life course, birth outcomes, parent behaviors and skills, child cognitive outcomes, child physical health, and child maltreatment) selected for this study were analyzed.

Data Abstraction

Coding forms adapted from Kaminski et al¹⁶ captured information about the document, author(s), home visiting program, participants, evaluation design,

outcome measures, and statistical results. Table 1 lists and describes the variables coded for these analyses. Full coding forms are available from the first author. When an article referred to a secondary study or article providing additional program information, that secondary document was obtained, and the information was coded. Before coding independently, data abstractors were trained to criteria of coding 3 consecutive articles with >90% accuracy.

Summary Measures

Effect sizes analogous to Cohen's *d* statistic¹⁷ were calculated from means and standard deviations whenever possible or from other reporting methods, including categorical data, correlations, and odds ratios, by using Comprehensive Meta-Analysis 2 software (Biostat, Inc, Englewood, NJ).¹⁸ Effect sizes were calculated based on unadjusted data if available or adjusted data if not. Once effect sizes were calculated, they were exported into SPSS version 20 (IBM SPSS Statistics, IBM Corporation, Armonk, NY) for analyses by using macros for multivariate analyses of effect sizes.^{19,20} We

applied Hedges' small sample correction to all effect sizes before analysis and weighted each by the inverse of the variance.²¹

Within and across articles, some samples were represented multiple times (eg, the same sample assessed at different time points, assessed with different measures, or reported in different articles). Including all published reports of those samples would have allowed a small number of frequently published programs to bias the results. Thus, for each analysis, we selected or aggregated effect sizes such that each sample (eg, a program implemented in a particular location) only provided a single effect size for that analysis. Data on birth outcomes at any time point in a study were included. For all other outcomes, immediate posttest assessments were preferred. If immediate posttest data were not available for a particular sample, we included assessments that occurred during the intervention but after two-thirds of the intervention was delivered. Follow-up data were excluded due to a lack of comparability in the length of follow-up periods. When "total" scores and "subscale" scores from

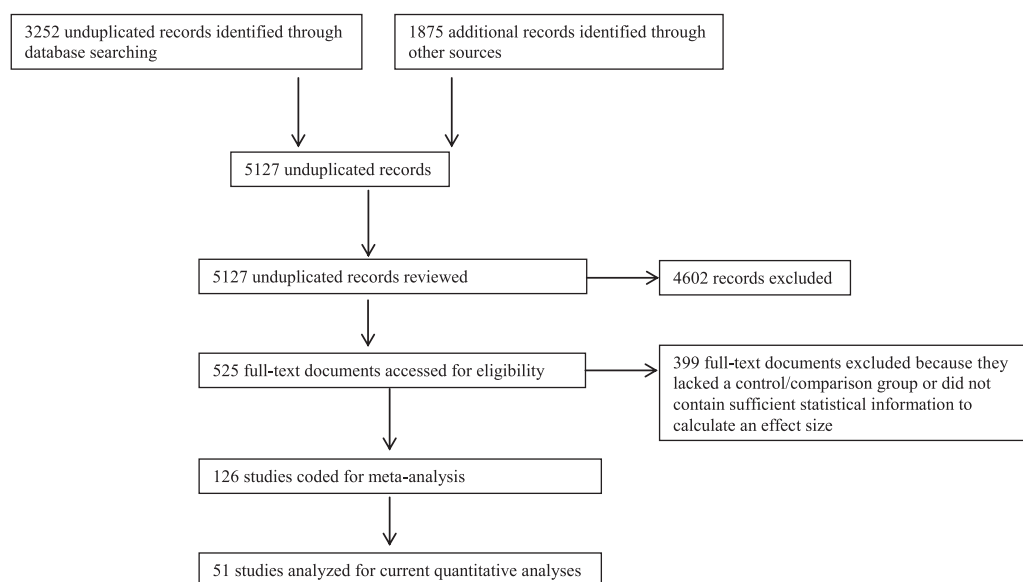


FIGURE 1
PRISMA flow diagram for study inclusion.

TABLE 1 Variables Coded for the Analyses and Definitions

Variable	Description or Definition
Home visiting content/delivery components	
Developmental norms and expectations	Information on typical child development, developmental milestones, and child behavior
Developmentally appropriate care and routines	Using developmentally appropriate behaviors related to satisfying a child's primary needs (eg, diapering, dressing, bathing)
Safe or clean home environment	Information or activities focused on home cleanliness, safety, accident prevention, and first aid
Stimulating home environment	Organizing environment to promote development (eg, books)
Responsiveness, sensitivity to cues, and nurturing	Providing developmentally appropriate responses to emotional needs, such as physical contact and affection
Discipline and behavior management	Using age-appropriate discipline or management, including discipline-related communication skills
Promotion of child's socioemotional development	Fostering children's positive adjustment and well-being, such as positive self-esteem, adaptability, creativity, and interpersonal comfort
Promotion of child's cognitive development	Includes using naturally occurring opportunities to promote child language or knowledge by describing aspects of the child's activity or environment and asking questions
Public assistance	Information on obtaining or being directly taught to obtain housing or food assistance (eg, SNAP, WIC, TANF, AFDC, welfare)
Concrete or instrumental assistance	Direct provision of resources to address basic needs, including transportation services, respite or child care, grocery certificates
Selecting appropriate alternative caregivers	Information or activities related to finding capable child or respite caregivers
Parental relationships	Enhancing parental relationship (eg, communication between parents)
Parental substance use	Providing education or direct services related to substance use
Parental mental health	Addressing mental health issues or directly providing mental health services
Prenatal health	Information or activities to promote prenatal health and behavior (eg, diet, nutrition, prenatal care, fetal development)
Family planning or birth spacing	Information or activities to promote family planning or birth spacing (eg, optimal intervals, contraception)
Self-, stress-, or anger-management	Providing services for stress-, anger-, or self-management (eg, self-sufficiency skills, such as time management)
Support group	Directly providing a support group
Social support or social network (need for)	Information and activities on the importance of and how to access social support (eg, teaching parents how to identify and access support groups or develop a support network)
Adult literacy or academic achievement	Information on obtaining GEDs, literacy, or other training or education
Problem solving	Teaching the use of problem-solving strategies
Goal setting	Teaching parents to engage in goal setting
Case management	Identifying and linking families to other services and resources (ie, hands-on assistance with contacting, making appointments, helping with forms or eligibility criteria, advocacy)
Rehearsal or role-playing	Using rehearsal, practice, or role-playing of techniques or behaviors
Home visitor is professional	Using professional home visitors, (eg, nurse, psychologist, social worker)
Match between home visitor and client: race/ethnicity	Purposive matching of home visitor and client on race and/or ethnicity
Standardized curriculum	Using an established curriculum or curriculum adapted to family needs
Program delivered in language other than English	Program delivered in language other than English
Research design characteristics	
Random assignment	Investigators randomly assigned individuals to treatment conditions before the intervention and maintained group assignment in analyses (eg, studies in which intervention-assigned "nonattenders" were analyzed because comparison participants were coded as not using random assignment)
Assessment of initial equivalence	Investigators reported assessment of group equivalence at baseline on either demographic or outcome measures
No-treatment comparison group	Comparison group for a given effect size received no alternate treatment or services
Home visiting tested as a stand-alone intervention	Intervention group for a given effect size received only the home visiting program (versus receiving the home visiting program as part of a broader package of interventions)
Timing of outcome assessment	Outcome was measured at 67% to 90% of treatment implementation versus immediately posttest
Outcome measure categories	
Maternal life course	Indicators of maternal health, economic self-sufficiency, educational attainment, and other life outcomes, such as criminal behavior or subsequent pregnancies and births
Birth outcomes	Indicators of the absence of negative birth outcomes, such as prematurity, low birth weight, or childbirth complications
Parent behaviors and skills	Indicators of parenting behaviors and practices, such as promoting a safe and stimulating home environment, positive parenting behaviors, well-child visits, and immunizations
Child cognitive outcomes	Indicators of cognitive and language development
Child physical health	Indicators of positive health outcomes, including the absence of child injury/ingestion, mortality, and illnesses
Child Maltreatment	Indicators of child maltreatment, including child protective services data and self-report of abusive/harsh parenting practices

AFDC, Aid to Families With Dependent Children; GEDs, General Educational Development Tests; SNAP, Supplemental Nutrition Assistance Program; TANF, Temporary Assistance for Needy Families; WIC, Supplemental Nutrition Program for Women, Infants, and Children.

particular measures were reported, preference was given to the total score if it fell within a single outcome category. When a single study included ≥ 3 study arms, the effect size most closely attributable to the effect of only the home visiting program (eg, treatment versus no-treatment comparison, or treatment plus enhancement versus enhancement only) was selected.

Analytic Plan

We first examined overall program effects on the 6 outcome categories by aggregating to a single effect size per study sample. We calculated overall weighted mean effect size, 95% confidence interval (CI), and Q and I^2 statistics.²² Adhering to the analytic strategies set forth by Kaminski et al,¹⁶ we next investigated outcome-specific mean effect sizes by aggregating to a single effect size per study sample for each outcome category, as well as CIs and Q and I^2 statistics. We used inverse-variance-weighted analyses of variance to examine the impact of 4 indicators of methodologic rigor (random assignment, assessment of initial equivalence, using a pure no-treatment comparison group, and testing the effect of the home visiting program as a stand-alone intervention versus as part of a larger package of interventions) and timing of the outcome measure (before versus at the end of treatment) on effect sizes for each outcome category. Finally, we used inverse-variance-weighted linear regression to test the impact of program components on effect sizes, with the goal of determining the predictors of strongest program effects. Only components theoretically expected to contribute to particular outcomes were tested for those outcomes. As the intent of the analyses was to model variability among studies, all reported results were obtained via random-effects models.

RESULTS

The overall weighted effect size of the final set of 51 studies was 0.20 (95% CI: 0.14 to 0.27). The 251 effect sizes ranged from -0.68 to 3.95 . The Q test of homogeneity of effect sizes was significant ($P < .001$), with an I^2 value of 65%. Table 2 shows the number of studies and summary statistics according to outcome category. Three outcome categories (maternal life course, child cognitive outcomes, and parent behaviors and skills) resulted in significant, positive average effect sizes. Average effects sizes were not significantly different from zero for birth outcomes, child physical health, and child maltreatment. Between 52% and 86% of the heterogeneity observed for each outcome was attributable to true variance rather than to chance, suggesting the need to further examine the nature of the heterogeneity.

In the inverse-variance-weighted analysis of variances, only 1 research design variable was a significant predictor of any outcome: effect sizes of maternal life outcomes were higher among studies reporting outcomes during treatment (mean effect size: 0.23 [95% CI: 0.13 to 0.33]) than studies reporting outcomes immediately posttest (mean effect size: 0.02 [95% CI: -0.11 to 0.15]). Measurement timing was therefore included as a covariate in the regression analysis of maternal life outcomes.

Results of the inverse-variance-weighted linear regressions assessing relationships between program components and effect sizes are presented in Table 3. Controlling for timing of assessment, no components significantly predicted maternal life outcomes. Effect sizes based on birth outcomes were significantly larger for programs using nonprofessional home visitors, programs that matched clients and home visitors on race and/or ethnicity, and programs that included problem solving. Effect sizes for the parent behaviors and skills outcome were significantly larger for

programs that taught parents developmental norms and appropriate expectations, discipline and behavior management techniques, responsive and sensitive parenting practices, and programs that addressed parental substance use. Children's cognitive outcomes were better in programs that taught parents responsive and sensitive parenting practices and programs reporting that they required parents to role-play or practice skills during home visits. Using professional home visitors was a significant predictor of better child physical health outcomes, as was teaching discipline and behavior management techniques. However, providing parents with a support group was associated with smaller effect sizes on child physical health. Better child maltreatment outcomes were associated with teaching parents how to select alternative caregivers for children and problem solving.

To ensure that these results were not unduly influenced by effect sizes based on results reported in studies as adjusted statistics, we removed those effect sizes and re-examined regression analyses with significant components. Of the 14 components reported earlier as significant, 3 could not be analyzed without the adjusted effect sizes due to low frequency (the 2 components significant for child maltreatment outcomes and the relationship between child physical health outcomes and teaching discipline and behavior management techniques). Ten of the other 11 components maintained statistical significance in these sensitivity analyses. The effect of teaching parents problem-solving strategies on birth outcomes was no longer significant and thus may be a less robust finding than other component effects.

DISCUSSION

The overall effect size of home visiting programs (aggregated across the 6

TABLE 2 Number of Studies, Mean Effect Sizes, and Results of Heterogeneity Analyses According to Outcome Category

Variable	Maternal Life Course Outcomes	Birth Outcomes	Parent Behaviors and Skills	Child Cognitive Outcomes	Child Physical Health	Child Maltreatment
No. of studies in analysis	12	14	32	24	15	9
Mean effect size (95% CI)	0.20 (0.07 to 0.32)*	0.061 (−0.08 to 0.20)	0.23 (0.13 to 0.33)*	0.25 (0.11 to 0.38)*	0.11 (0.00 to 0.22)	−0.08 (−0.24 to 0.07)
Heterogeneity analysis	$P < .02$	$P < .0001$	$P < .0001$	$P < .0001$	$P < .0001$	$P < .01$
I^2	52%	86%	75%	78%	80%	65%

* $P < .05$.

selected outcome domains) was significant and equivalent to approximately one-fifth of a standard deviation favoring the intervention group. Translated to an odds ratio, such an effect is equivalent to the comparison group being ~1.5 times more likely to have poorer outcomes. Consistent with results of previous meta-analyses of home visiting programs,^{6,9,12,15} parents and children participating in home visiting programs achieved more positive outcomes overall than parents and children in control/comparison groups. However, outcome-specific mean effect sizes revealed significant but small effects only on maternal life course, child cognitive outcomes, and parent behaviors and skills. In contrast, home visiting programs did not produce significant average effects on 3 frequent program targets (birth outcomes, child physical health, and child maltreatment), suggesting that programs were, on average, not effective in addressing these outcomes. The nonsignificant effect sizes, combined with the relatively small significant effect sizes, suggest that communities may need complementary or alternative strategies to home visiting programs to have a greater impact on these important public health outcomes.

Although surveillance bias (ie, program involvement increases the likelihood of detecting maltreatment) may partially explain the lack of a significant effect size on child maltreatment outcomes measured through child protective services data, previous studies have found surveillance bias effects to attenuate but not eliminate group differences where

they exist.^{23,24} In addition, the present analyses included self-reports of abusive parenting practices in addition to child protective services reports. Thus, the presence of a surveillance bias would likely not fully explain the lack of statistical significance.

Research design variables were generally not significantly predictive of effect sizes, whereas many program components were. Similar to other systematic reviews, no clear and consistent pattern of effective home visiting program components emerged across outcome domains.¹² Only 3 components were predictors of larger effects on >1 outcome; 1 of those components was only robust for 1 outcome in the sensitivity analyses. All other significant components were only predictive of effect sizes for a single outcome domain. These results suggest that the “home visiting” label represents a diversity of approaches with differing effectiveness, and that attention to specific program content and delivery characteristics is critical to the effectiveness of these programs.

The components that emerged as significant for >1 outcome (teaching sensitive and responsive parenting, teaching discipline and behavior management techniques, and teaching problem-solving) make intuitive sense; teaching new parenting skills and behaviors was associated with greater effects on parenting behaviors, which may also translate into more positive impacts on other, sometimes more distal, outcomes, such as child cognitive development, child physical health, and child maltreatment. Using professional

home visitors was unexpectedly associated with smaller program effects on birth outcomes but larger effects on child physical health outcomes. The inconsistency in these results may be due to the professional background or type of professional providing the services, as different professionals may be more or less effective with different health outcomes. Alternatively, the inconsistent results might be due to other differences not analyzed here between programs using professional and nonprofessional home visitors. Programs that enroll participants prenatally and use professional home visitors may want to look for ways to boost their effectiveness, specifically on birth outcomes.

It is important to note that not all components were tested for each outcome, either because the components were not theoretically linked to the outcome or due to limited variability of the component among studies reporting a particular outcome. In addition, nonsignificant components may be contributing to program outcomes (eg, as precursors to or in combination with other components) in interactive ways that cannot be tested by using these analytic methods. The presence of a significant component thus indicates a robust effect, but the absence of significance for a component does not necessarily imply a lack of impact. We can only conclude that the nonsignificant components did not by themselves distinguish more successful programs from less successful programs on that outcome and are thus components that are unlikely to be sufficient to produce outcomes they did not significantly predict.

TABLE 3 Unstandardized Regression Coefficients and 95% CIs From Individual Inverse-Variance-Weighted Linear Regressions Predicting Outcome Category From Program Components

Variable	Maternal Life Course Outcomes	Birth Outcomes	Parent Behaviors and Skills	Child Cognitive Outcomes	Child Physical Health	Child Maltreatment
Developmental norms and expectations	—	0.15 (−0.22 to 0.53)	0.34 (0.09 to 0.60)*	0.24 (−0.05 to 0.54)	0.08 (−0.24 to 0.39)	—
Developmentally appropriate care and routines	—	−0.06 (−0.44 to 0.33)	0.04 (−0.23 to 0.31)	0.00 (−0.30 to 0.30)	−0.01 (−0.26 to 0.23)	—
Safe or clean home environment	—	0.12 (−0.28 to 0.55)	−0.12 (−0.39 to −0.15)	−0.25 (−0.62 to 0.12)	0.04 (−0.21 to 0.28)	0.09 (−0.20 to 0.38)
Stimulating home environment	—	0.12 (−0.36 to 0.59)	0.20 (−0.16 to 0.56)	0.44 (−0.08 to 0.97)	—	—
Responsiveness, sensitivity to cues, and nurturing	—	—	0.47 (0.18 to 0.76)*	0.38 (0.02 to 0.74)*	—	—
Discipline and behavior management	—	—	0.29 (0.06 to 0.51)*	—	0.41 (0.13 to 0.68)*	—
Promotion of child's socioemotional development	—	—	−0.18 (−0.51 to 0.15)	0.21 (−0.09 to 0.50)	—	—
Promotion of child's cognitive development	—	—	0.01 (−0.26 to 0.29)	0.27 (−0.01 to 0.55)	—	—
Home management	—	—	—	—	—	—
Public assistance	—	0.15 (−0.22 to 0.53)	−0.24 (−0.62 to 0.14)	—	−0.06 (−0.36 to 0.25)	0.05 (−0.26 to 0.36)
Concrete or instrumental assistance	—	−0.06 (−0.44 to 0.33)	−0.21 (−0.53 to 0.12)	0.15 (−0.32 to 0.61)	−0.07 (−0.35 to 0.21)	−0.19 (−0.49 to 0.11)
Selecting appropriate alternative caregivers	−0.06 (−0.23 to 0.11)	0.12 (−0.28 to 0.55)	−0.15 (−0.48 to 0.19)	−0.33 (−0.70 to 0.05)	0.09 (−0.17 to 0.35)	0.26 (0.01 to 0.51)*
Parental relationships	—	—	−0.09 (−0.52 to 0.35)	—	—	0.02 (−0.50 to 0.35)
Parental substance use	—	—	0.32 (0.06 to 0.60)*	0.07 (−0.35 to 0.49)	—	—
Parental mental health	0.17 (−0.01 to 0.36)	—	0.17 (−0.13 to 0.47)	−0.01 (−0.38 to 0.36)	0.08 (−0.23 to 0.39)	—
Prenatal health	—	0.22 (−0.14 to 0.57)	−0.08 (−0.42 to 0.27)	−0.31 (−0.69 to 0.07)	0.17 (−0.09 to 0.43)	−0.05 (−0.37 to 0.26)
Family planning or birth spacing	0.01 (−0.17 to 0.18)	—	−0.24 (−0.60 to 0.13)	—	—	—
Self-, stress-, or anger-management	—	—	−0.17 (−0.43 to 0.09)	—	−0.28 (−0.47 to −0.10)*	−0.22 (−0.51 to 0.06)
Support group	−0.01 (−0.18 to 0.16)	−0.05 (−0.43 to 0.33)	−0.20 (−0.46 to 0.06)	0.01 (−0.30 to 0.31)	0.06 (−0.18 to 0.30)	0.01 (−0.29 to 0.31)
Social support or social network (need for)	−0.03 (−0.13 to 0.20)	—	—	−0.07 (−0.38 to 0.24)	—	0.05 (−0.26 to 0.36)
Adult literacy or academic achievement	0.15 (−0.25 to −0.56)	0.38 (0.03 to 0.73)*	−0.19 (−0.47 to 0.10)	−0.29 (−0.68 to 0.09)	−0.04 (−0.29 to 0.21)	0.27 (0.03 to 0.51)*
Problem solving	−0.14 (−0.30 to 0.03)	−0.01 (−0.46 to 0.44)	−0.14 (−0.44 to 0.17)	0.01 (−0.34 to 0.36)	0.05 (−0.23 to 0.32)	0.00 (−0.33 to 0.33)
Goal setting	—	—	−0.15 (−0.49 to 0.13)	—	—	—
Case management	—	—	0.09 (−0.22 to 0.40)	−0.17 (−0.48 to 0.13)	—	—
Rehearsal or role-playing	−0.04 (−0.24 to 0.15)	−0.38 (−0.70 to −0.06)*	0.01 (−0.25 to 0.28)	0.52 (0.13 to 0.91)*	—	−0.02 (−0.33 to 0.28)
Home visitor is professional	0.20 (−0.07 to 0.46)	0.39 (0.04 to 0.75)*	0.09 (−0.20 to 0.37)	0.02 (−0.29 to 0.32)	0.25 (0.04 to 0.45)*	—
Match between home visitor and client: race/ethnicity	0.20 (−0.03 to 0.44)	—	0.14 (−0.13 to 0.41)	0.09 (−0.33 to 0.50)	−0.01 (−0.27 to 0.26)	—
Standardized curriculum	—	—	0.03 (−0.24 to 0.29)	0.05 (−0.29 to 0.38)	−0.20 (−0.42 to 0.03)	—
Program delivered in language other than English	0.19 (−0.01 to 0.39)	—	—	−0.21 (−0.50 to 0.09)	—	—

Blank cells represent component-outcome relationships that were not tested because the particular component was not expected to contribute to that outcome. Cells containing “—” were unable to be tested due to insufficient variability on the component in programs measuring that outcome. * indicate findings significant at $P < .05$. For maternal life course outcomes only, the timing of the outcome assessment (ie, during the final one-third of treatment versus at the end of treatment) was entered as a covariate based on the results of the inverse-variance-weighted analysis of variances predicting effect sizes from study design variables.

Our results for the impact of different components must be taken as correlational and not as an experimental manipulation. Our results are also based on published studies and are dependent on the completeness of reporting of components within each study. Many theoretically interesting and relevant program characteristics (eg, program dosage, sample demographic characteristics, fidelity of implementation, staff training, home visitor caseload, study or program attrition) could not be tested due to insufficient numbers of studies reporting those characteristics. For example, the timing of enrollment in home visiting programs during pregnancy might be associated with a program's ability to promote positive birth outcomes; variability in gestation at enrollment could explain the lack of

significance with birth outcomes. However, this relationship could not be tested due to insufficient reporting on initiation of services.

CONCLUSIONS

The present meta-analysis marks a distinct departure from the common practice of recommending the wholesale adoption of evidence-based programs. Although model ratings are important for guiding practitioners in adopting a packaged program model, any particular program may not include the most effective combination of components to produce maximum results. Instead of considering each program as a black box, the coding scheme used in the present study allowed the authors to disassemble home visiting programs and examine

the impact of specific components. The results suggest that certain existing components are more likely to be associated with positive effects on specific outcomes. Although careful evaluation of modifications or adaptations to existing programs would be critical, changes to include more of the significant components identified are likely to produce programs that are more potent with respect to these parent and child outcomes. For other outcomes, components that significantly predict positive outcomes remain to be identified. Our findings point to new program and research opportunities within the home visiting field, whether through the development or selection of a home visiting program, or for improving programs already labeled efficacious or effective.

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APPENDIX 1 Search Strategy and Search Terms

Search Step	Search Entries
S1. Program/Evaluation Terms	(parent and (training or education or program)) or ((support or treatment or intervention prevention) and ((parent or family) and results))
S2. General Program Target Terms	(parenting skills or home environment or family relations or parent child relations or mother child relations or father child relations or childhood development or at risk protective or (resilient or resilience or resiliency) or child management or competence))
S3. Specific Child Outcome Terms	((youth violence or juvenile delinquency or delinquent or conduct disorder or conduct problem or behavior problem or noncompliant or noncompliance or aggression or aggressive or (bully or bullying) or adhd or attention deficit disorder or academic problems or school adjustment or school problems or school dropout or impulsivity or impulse control or externalizing or prosocial or problem solving or communication skills or social skills or discipline or assertiveness or self esteem or drug abuse or substance abuse or alcohol or smoking or cigarette or sexual acting out or abuse or neglect or maltreatment or anxiety or depression or mental illness or suicide or eating disorder or internalizing or emotional adjustment or (Child* and (abuse or neglect or maltreatment or health or injury or violence or ingestion or poison* or attachment or immuniz* or "emergency department")) or "infant mortality" or ((juvenile or adolescent) AND delinquent*) or (child and (cognit* or language or "social-emotional" or "socioemotional" or "socio-emotional" or physical or health) and development)) or "school readiness" or "school achievement" or "child development" or "developmental delay" or (child AND behavior*) or (child AND disab*) or ((Preterm or "pre-term" or premature) AND birth) or "low birth weight" or "low birthweight")
S4. Specific Maternal/Family Outcome Terms	((parent* or family or matern* or mother* or father* or patern*) and (employment or career or stress or depress* or efficacy or "mental health" or health)) or ((subsequent or teen) AND (birth or pregnan*)) or "home environment" or "self sufficiency" or "self-sufficiency" or (parent* AND (skill* or ability*)) or (reduc* AND (crime or "domestic violence" or "family violence" or "intimate partner violence" or ((community AND coordinate*) or referral*) or (smoking or tobacco)) and (parent and (training or education or program)))
S5. Compiling results from "General Program Target Terms," "Specific Child Outcome Terms," and "Specific Maternal/Family Outcome Terms" searches	S2 or S3 or S4
S6. Restricting Program Targets/Outcomes to Parenting Program Evaluations	S1 and S5
S7. Restricting Relevant Parenting Program Evaluations to those delivered in the home	S6 and "home"
S8. Restricting Relevant Home Visiting Program Evaluations to those published in English	Limit S7 to English language

Articles for this meta-analysis were identified from a literature search for a wider set of parenting interventions and thus returned a larger set of article citations than might have been returned by a more focused search only for home visiting programs. The overall search strategy built on the search for Kaminski et al¹⁶ that was conducted in September 2002 and included articles published between 1990 and 2002. On September 16, 2010, we conducted a complementary, updated search to include studies published before 1990 and since 2002. The articles returned from the new search were added to the previous database. For simplicity of presentation, the search strategy shown here lists the terms and actions that would have returned the full set of publication years if the entire search had been conducted on September 16, 2010, instead of in 2 sections.

The search discussed here was conducted via OvidSP by using PsycINFO as the database. Terms in quotation marks were searched only as those explicit terms. Terms not in quotation marks were searched as a multipurpose term (ie, .mp) appearing in any relevant field. The option to conduct an "exploded" search was engaged whenever available for an entered search term. An * indicates a "wildcard" search wherein any possible endings of that term were included (eg, behavior* searched for behavior, behaviors, behavioral). The search entries were repeated in Medline with necessary adjustments for that search engine. The returned articles from the 2 databases were then combined. Unpublished dissertations and duplicates were deleted from the final set of results.

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