Impacts on Family Outcomes of Evidence-Based Early Childhood Home Visiting

Results From the Mother and Infant Home Visiting Program Evaluation

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Overview

In 2010, Congress authorized the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program, which started a major expansion of evidence-based home visiting programs for families living in at-risk communities. MIECHV is administered by the Health Resources and Services Administration in collaboration with the Administration for Children and Families within the U.S. Department of Health and Human Services (HHS). The authorizing legislation required an evaluation of the program, which became the Mother and Infant Home Visiting Program Evaluation (MIHOPE), conducted for HHS by MDRC with James Bell Associates, Johns Hopkins University, Mathematica Policy Research, the University of Georgia, and Columbia University.

MIHOPE was designed to learn whether families benefit from MIECHV-funded early childhood home visiting programs, and if so, how. The study includes the four evidence-based models that 10 or more states chose in their initial MIECHV plans in fiscal year 2010-2011: Early Head Start — Home-based option, Healthy Families America, Nurse-Family Partnership, and Parents as Teachers. MIHOPE is the first study to include these four evidence-based models. To provide rigorous evidence on the MIECHV-funded programs' effects, the study randomly assigned about 4,200 families to receive either MIECHV-funded home visiting or information on community services.

This report presents the early effects on family and child outcomes from the local programs included in the study. Key findings include:

- **There are positive effects, and they are generally similar to but somewhat smaller than the average effects found in past studies.** Of 12 outcomes the study focused on, 4 had estimated effects that are statistically significant. No outcome area stands out as one where home visiting programs had large effects.
- **Differences in effects among the evidence-based models are generally consistent with the models' focuses.** For example, Parents as Teachers produced the largest increase in parental supportiveness and Nurse-Family Partnership produced the largest reduction in emergency department visits for children, although the differences are sensitive to the statistical methods used.
- **Effects on family outcomes do not vary much by family characteristics,** suggesting that home visiting is not having larger effects for different types of families. The effects may vary in ways that were not examined in this report.

This report examines MIECHV-funded home visiting programs from 2012 through 2017, and local programs have continued to evolve. In addition, this report presents effects when children are only 15 months old, which may be too early to see effects on child development. There is evidence from past studies that the benefits of home visiting persist, so it may be too early to make a final judgment about the programs studied in MIHOPE. For that reason, the study is planning to collect follow-up data over the longer term with participating families.

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Acknowledgments

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The Authors

Executive Summary

Children develop fastest in their earliest years, and the skills and abilities they develop in those years lay the foundation for their future success.[1] Similarly, early negative experiences can contribute to poor social, emotional, cognitive, behavioral, and health outcomes both in early childhood and in later life. Children growing up in poverty tend to be at greater risk of encountering adverse experiences that negatively affect their development. One approach that has helped parents and their young children is home visiting, which provides individually tailored support, resources, and information to expectant parents and families with young children. Many early childhood home visiting programs aim to support the healthy development of infants and toddlers and work with low-income families, in particular, to help ensure their well-being.

In 2010, Congress authorized the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program by enacting section 511 of the Social Security Act, 42 U.S.C. § 711, which also appropriated funding for fiscal years 2010 through 2014.[2] Subsequently enacted laws extended funding for the program through fiscal year 2022.[3] The program is administered by the Health Resources and Services Administration (HRSA) in collaboration with the Administration for Children and Families within the U.S. Department of Health and Human Services (HHS). The initiation of the MIECHV program began a major expansion of evidence-based home visiting programs for families living in at-risk communities.

The legislation authorizing MIECHV recognized that there was considerable evidence about the effectiveness of home visiting, but also called for research to increase knowledge about the implementation and effectiveness of home visiting.[4] States that receive MIECHV funding are required to devote the majority of their MIECHV funding to delivery of services according to the specifications of designated evidence-based models that meet HHS' criteria for evidence of effectiveness. [5] At the same time, states can spend part of their MIECHV funding on promising approaches to home visiting as long

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[1]National Research Council and Institute of Medicine. 2000. *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Washington, DC: National Academy Press.

[2] SEC. 511 [42 U.S.C. 711] (j) (1).

[3] Funds for subsequent fiscal years were appropriated by section 209 of the Protecting Access to Medicare Act of 2014, Pub. L. 113-93 (fiscal year 2015); section 218 of the Medicare Access and Children's Health Insurance Program Reauthorization Act of 2015, Pub. L. 114-10 (fiscal years 2016-2017); and section 50601 of the Bipartisan Budget Act of 2018, Pub. L. 115-123 (fiscal years 2018-2022).

[4]SEC. 511 [42 U.S.C. 711] (h) (3) (A).

[5]SEC. 511[42 U.S.C. 711] (d) (3) (A) (ii).

as research is conducted into the effects of those promising approaches.[6] The legislation also required an evaluation of MIECHV in its early years,[7] which became the Mother and Infant Home Visiting Program Evaluation (MIHOPE). The evaluation, which is studying the effects of MIECHV-funded evidence-based home visiting, is being conducted for HHS by MDRC in partnership with James Bell Associates, Johns Hopkins University, Mathematica Policy Research, the University of Georgia, and Columbia University.

The overarching goal of MIHOPE is to learn whether families and children benefit from MIECHV-funded early childhood home visiting programs as they operated from 2012 through 2017, and if so, how. The study is examining a broad range of outcome areas mentioned in the authorizing legislation:[8]

- Prenatal, maternal, and newborn health
- Child health and development, including child maltreatment
- Parenting skills
- School readiness and child academic achievement
- Crime and domestic violence
- Family economic self-sufficiency
- Referrals and service coordination

This report presents early effects on family and child outcomes in these areas, with the exception of school readiness and academic achievement (which are not included in the current report because children were too young to measure those outcomes, but which will be studied when additional information is collected from families when their children are in kindergarten).[9] In addition to investigating the overall effects on family outcomes of the local home visiting programs included in MIHOPE, the report explores whether the programs' effects vary among different subgroups of families. Finally, the report presents information on whether there is variation in effects related to the ways local programs were implemented (including which evidence-based model of

[6]Social Security Act of 1935. SEC. 511 [42 U.S.C. 711] (d) (3) (A) (i) (II) (2010).

[7]Social Security Act of 1935. SEC. 511 [42 U.S.C. 711] (g) (2) (2010).

[8]Social Security Act of 1935. SEC. 511 [42 U.S.C. 711] (d) (2) (B) (2010).

[9] MIHOPE is currently collecting information from study participants when the children are in kindergarten and will examine school readiness and academic achievement, in addition to the other outcome areas. See www.acf.hhs.gov/opre/research/project/mother-and-infant-home-visiting-program-evaluation-long-term-follow-up.

home visiting they used) and whether there is variation in effects related to the levels of services that families received.

Overview of the MIHOPE Design

MIHOPE includes the four evidence-based models that 10 or more states chose in their fiscal year 2010 plans for MIECHV funding: Early Head Start — Home-based option, Healthy Families America, Nurse-Family Partnership, and Parents as Teachers.

MIHOPE included women who met the following criteria when they enrolled in the study:

- They were pregnant or had children under 6 months old.
- They were at least 15 years old.
- They spoke English or Spanish well enough to provide consent and complete a survey when they entered the study.
- They were interested in receiving home visiting services and met the relevant local program eligibility criteria.

To provide reliable estimates of the effects caused by home visiting programs, women who enrolled in the study were randomly assigned to a MIECHV-funded local home visiting program or a control group who received information about other appropriate services in the community. From October 2012 to October 2015, a total of 4,229 families entered the study.

The Evidence-Based Home Visiting Models Studied in MIHOPE

In general, home visiting consists of three types of activities:

- Assessing family needs
- Educating and supporting parents
- Referring families to needed services in the community and supporting the family's use of those services

Home visitors use a variety of strategies to provide education and support to families, including setting goals with caregivers and creating plans for meeting those goals, helping caregivers resolve problems, helping parents and children build better relationships, intervening during crises, providing information on children's developmental stages and commenting on parenting, working to strengthen families' support

networks, and providing emotional support, pamphlets, or other materials. Home visitors also use methods such as positive reinforcement, direct comments, and motivational interviewing to promote positive attitudes and behaviors. Finally, home visitors provide referrals to community health and human service resources based on each family's identified needs.

Although the four evidence-based models shared these major components and the overall goal of improving family outcomes during the period they were studied in MIHOPE, they differed in several important ways.

- **Goals.** All four models tried to improve child health and development, but Healthy Families America has historically focused on preventing child maltreatment, Nurse-Family Partnership on improving maternal and child health, and Early Head Start — Home-based option and Parents as Teachers on positive parenting or school readiness.

- **Target population and age at enrollment.** The models all aimed to serve at-risk families, but they focused on different types of risk. Nurse-Family Partnership targeted first-time mothers, Healthy Families America focused on families at risk of child maltreatment or with behavioral health issues, Early Head Start sought to serve a broad group of low-income families, and Parents as Teachers had no specific eligibility requirements at the national level. All four models could enroll women who met the MIHOPE eligibility criteria, although Early Head Start and Parents as Teachers also could enroll families with toddlers.

- **Home visitor qualifications.** Nurse-Family Partnership required home visitors to be nurses with baccalaureates, and Early Head Start required home visitors to have knowledge and experience in child development, early childhood education, or other areas. Parents as Teachers required home visitors to have at least a high school credential and a minimum of two years of supervised work experience with young children or parents. Healthy Families America required home visitors to have at least a high school credential and required local programs to look for relevant community-based experience and interpersonal characteristics.

Choosing States and Local Programs for MIHOPE

To allow the study to include a diverse set of local programs and to provide enough statistical precision for the analyses, MIHOPE sought to include about 85 local programs from 12 states.

The study team chose local programs using the following criteria:

- They were operating one of the four evidence-based models of home visiting noted earlier.
- They had been in operation for at least two years.
- They could recruit enough families to allow for a randomly chosen control group.
- They had more than one MIECHV-funded home visitor.
- They were not operating in "frontier" locations, which were sparsely populated counties or those that were not adjacent to metropolitan areas. These areas were excluded to reduce the costs of recruiting families and collecting information.

In the end, MIHOPE included 88 local programs in 12 states: California, Georgia, Illinois, Iowa, Kansas, Michigan, Nevada, New Jersey, Pennsylvania, South Carolina, Washington, and Wisconsin. The 88 local programs consisted of 19 Early Head Start — Home-based option programs, 26 Healthy Families America programs, 22 Nurse-Family Partnership programs, and 21 Parents as Teachers programs. Since one local program did not enroll any families in the study and no sample members were randomized to the control group in another local program, the analysis included in the report is limited to 86 local programs.

The characteristics of the local programs included in MIHOPE reflect the criteria used in their selection. Reflecting both the exclusion of frontier locations and the difficulty of forming a control group in smaller locations, nearly 90 percent operated at least partly in metropolitan counties, a higher proportion than is the case for MIECHV-funded programs nationally. Most had been operating for six or more years and had considerable funding from other sources, reflecting the study team's decision to choose mature programs. They were relatively large, with 60 percent serving more than 100 families.

Characteristics of Families Who Enrolled in the Study

- **The mothers who enrolled in the study are racially and ethnically diverse, were young when they entered the study, and reflect the study's eligibility criteria.** About a third of the women in the study are Hispanic, a little more than a quarter are black, and a little more than a quarter are white. Almost two-thirds of the women were less than 25 years old when they entered the study, and 35 percent were less than 21 years old. Sixty percent were first-time mothers when they entered the study, and more than two-thirds of them were pregnant (with the rest having given birth within the past six months). While the racial and ethnic diversity of the MIHOPE sample is similar to that of women enrolled in MIECHV-funded programs nationally in fiscal year 2017, the MIHOPE sample was more likely to have women under 20 years old (27 percent compared with 16 percent).

- **Most had graduated from high school and had worked in the recent past, but nearly all were receiving some form of public assistance.** Almost 60 percent of women ages 18 to 20 had graduated from high school and more than three-quarters of all women had been employed during the previous three years. Nearly 75 percent were enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children and more than half were enrolled in the Supplemental Nutrition Assistance Program, but fewer than a quarter were enrolled in Temporary Assistance for Needy Families or disability insurance (Supplemental Security Income or Social Security Disability Income). Reflecting the high rate of public-assistance receipt, more than 90 percent had health insurance when they entered the study, primarily through Medicaid.

- **A sizable minority of women faced behavioral health issues.** Nearly one-third of the mothers in the sample reported substance use before pregnancy and more than 40 percent reported either depressive symptoms (38 percent) or symptoms of anxiety (23 percent).

- **Women faced rates of intimate partner violence that are similar to national averages for low-income women.** About one-fifth of women reported experiencing or perpetrating physical acts of intimate partner violence during the year before entering the study.

Home Visiting Services

Random assignment is designed to ensure that the program and control groups are similar in all respects when they enter the study. As is the standard method in studies that use random assignment, the primary analytical strategy in MIHOPE is to compare the outcomes of the entire program group with those of the entire control group. Any differences that emerge after random assignment can then be reliably attributed to the program group's access to evidence-based home visiting. A consequence of using this analytical strategy is that the estimated effects will be influenced by the extent to which program group and control group families received different amounts of home visiting services. This section therefore discusses how many program group and control group members received home visiting services after they entered the study.

As reported in a MIHOPE report on implementation research, weekly family service logs completed by home visitors indicate that 83 percent of program group families received at least one home visit (and 17 percent received no home visits), and that the average family who did receive a visit received about 18 visits during the first year of participation in home visiting services.[10] In addition, almost half of the families who had received at least one visit were still participating in home visiting at the child's first birthday. Although these participation rates are lower than those recommended by the evidence-based models, they are consistent with rates observed in past studies on home visiting.

Although family service logs are not available for the control group, the 15-month follow-up survey asked parents whether they received home visiting or parenting services in the year preceding the survey. During that year, 51 percent of the program group reported receiving home visiting or parenting services compared with 20 percent of the control group. In addition, program group members received much more intensive home visiting. For example, 26 percent of the program group reported receiving 26 or more visits in the past year compared with 4 percent of the control group. In other words, the control group was less likely than the program group to report receiving home visiting and reported receiving fewer home visits than the program group. It is common in studies such as MIHOPE for some control group members to be able to find similar services in their communities.

[10]Duggan, Anne, Ximena A. Portilla, Jill H. Filene, Sarah Shea Crowne, Carolyn J. Hill, Helen Lee, and Virginia Knox, *Implementation of Evidence-Based Early Childhood Home Visiting: Results from the Mother and Infant Home Visiting Evaluation*, OPRE Report 2018-76 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, 2018).

Estimated Effects for the Full Sample

As noted earlier, the legislation that authorized MIECHV indicated that the MIECHV program should improve a wide range of outcome areas for families.[11] Based on the evidence that existed before the analysis in this report was conducted, the policy relevance of various outcomes, and the quality of the tools available to measure those outcomes, the study team chose to focus the analysis of effects on 12 "confirmatory" outcomes that were measured around the time the child was 15 months old.[12] These outcomes are generally ones where previous studies had consistently found effects or that have objective measures that come from observations or direct child assessments. As noted earlier, the outcomes included all areas specified in the statute other than school readiness and academic achievement.

The 12 outcomes (and areas from the authorizing legislation in which they fall) are:

- Maternal health: new pregnancy after study entry
- Family economic self-sufficiency: mother receiving education or training
- Parenting skills: quality of the home environment and parental supportiveness
- Child health and development:
    - Frequency of minor physical assault toward the child
    - Frequency of psychological aggression toward the child
    - Health insurance coverage for the child
    - Number of Medicaid-paid well-child visits
    - Number of Medicaid-paid child emergency department visits

[11] Social Security Act of 1935. SEC. 511 [42 U.S.C. 711] (d) (2) (B) (2010).

[12] A plan for the impact analysis — including the confirmatory and exploratory outcomes and family subgroups — was reviewed by an Advisory Committee to the Secretary of Health and Human Services in September 2015. Materials from that meeting are available at https://www.acf.hhs.gov/opre/resource/secretarys-advisory-committee-maternal-infant-early-childhood-home-visiting-evaluation-9-21-2015. After receiving comments from the Advisory Committee, changes were made to two confirmatory outcomes: any emergency department visit for the child was changed to the number of Medicaid-reimbursed emergency department visits, and whether the child had language skills in the normal range was changed to a continuous measure of receptive language skills. These changes were made before the analysis began. The study was also registered at ClinicalTrials.gov.

- Any child health encounter for injury or ingestion
- Child behavior problems
- Child receptive language skills

The analysis also examines additional "exploratory outcomes" that capture other aspects of the areas the legislation intended home visiting to improve. These outcomes were considered exploratory because past home visiting studies had not found effects on them or they had not been examined in previous studies. Some exploratory outcomes provide information that can shed more light on a confirmatory outcome. Others represent areas where home visiting programs have increased their effects over time and where there might now be benefits for families.

Figure ES.1 shows the estimated effects for the full MIHOPE sample on the study's 12 confirmatory outcomes, and Box ES.1 provides an explanation of how to interpret the figure.

- **There are positive effects for families in MIHOPE. Most estimated effects are similar to but somewhat smaller than the average found in past studies of individual home visiting models.** Estimated effects are statistically significant for 4 of the 12 confirmatory outcomes: the quality of the home environment, the frequency of psychological aggression toward the child, the number of Medicaid-paid child emergency department visits, and child behavior problems.[13] Overall, for 9 of the 12 confirmatory outcomes, program group families fared better than control group families on average,[14] which is unlikely to have occurred for the study sample if the home visiting programs made no true difference in family outcomes.[15] However, no outcome or

[13]Consistent with the study's design and analysis plan, the 10 percent significance level is used in this report. See Michalopoulos, Charles, Anne Duggan, Virginia Knox, Jill H. Filene, Helen Lee, Emily K. Snell, Sarah Crowne, Erika Lundquist, Phaedra S. Corso, and Justin B. Ingels, *Revised Design for the Mother and Infant Home Visiting Program Evaluation*, OPRE Report 2013-18 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Service, 2013).

[14]This tally includes five outcomes where program group families had better outcomes on average than control group families but where the difference between them is not statistically significant.

[15]A statistical test of the number of outcomes for which estimated effects would be positive resulted in a p-value of 0.096 for having 9 or more positive findings out of 12, meaning there is less than a 10 percent probability that this pattern of results would have resulted if home visiting had no effect on any of the 12 outcomes. A statistical test that accounts for the magnitude of the estimated effects has a p-value of 0.025, meaning there is a 2.5 percent probability this pattern of results would have been found if home visiting had no effects on the 12 outcomes. Neither test was prespecified in the study's analysis plan.

Box ES.1

How to Interpret Estimated Effects

The effects of home visiting are estimated by comparing the outcomes of the program and control groups, adjusted for background characteristics of the sample members. Figure ES.1 shows the estimated effects for the study's confirmatory outcomes as circles. For example, there is a small, negative estimated effect on whether a child had health insurance coverage at 15 months but a small, positive estimated effect on whether a mother was receiving education or training at 15 months.

All results are presented as effect sizes, which is a way of standardizing outcomes so they are on the same scale. The interpretation of an effect size will vary with the outcome and the context, so it is difficult to characterize the magnitude of effect sizes in general. A standard intelligence quotient (IQ) test has a standard deviation of 10, for example, so an effect size of 0.10 would represent a one-point change in IQ. For an outcome expressed as a percentage, such as the percentage of mothers with a subsequent pregnancy, an effect size of 0.10 would represent a change of about 3 percentage points to 5 percentage points in the outcome.

The lines surrounding the estimated effect in Figure ES.1 represent the 90 percent confidence interval, an estimate of the variability (or statistical imprecision) of the effects. A narrower confidence interval suggests a more precise estimate than a wider confidence interval; a wider interval indicates greater variability and thus greater uncertainty. Confidence intervals that do not contain zero (that is, that are fully to the right or the left of the zero line) indicate that the effect is different from zero to a statistically significant degree, using 10 percent as the benchmark for statistical significance. That is, there is less than a 10 percent chance of finding an estimated effect this big if the true effect of the program were zero. The figure shows that the effect is different from zero to a statistically significant degree for four outcomes: quality of the home environment, frequency of psychological aggression toward the child during the past year, number of Medicaid-paid child emergency department visits, and child behavior problems.

outcome area stands out as having consistently large effects.[16] In addition, the effects are generally smaller than those found in past studies, although it is important to note that MIHOPE differs from those

[16]In addition, after adjusting for the number of confirmatory outcomes, none of the 12 estimated effects is statistically significant. Although the evidence as a whole points to positive effects for families, this finding reduces the study team's confidence that any individual outcome was improved by the home visiting services that were studied.

studies in many respects. For example, most of those studies were conducted in a single local area rather than including sites across the country, and some were conducted many years ago, when similar services were less likely to be available to control group families. In addition, previous studies each examined only one evidence-based model, and might have chosen outcomes where those models were expected to make the largest differences.

- **There are some statistically significant differences in effects on the confirmatory outcomes among the evidence-based models that are generally consistent with the models' focuses.** For example, in the main report analysis, Parents as Teachers produced the largest increase in parental supportiveness and Nurse-Family Partnership produced the largest reduction in emergency department visits for children. The differences are somewhat sensitive to the statistical method used to examine them but these two patterns were found across different estimation methods.

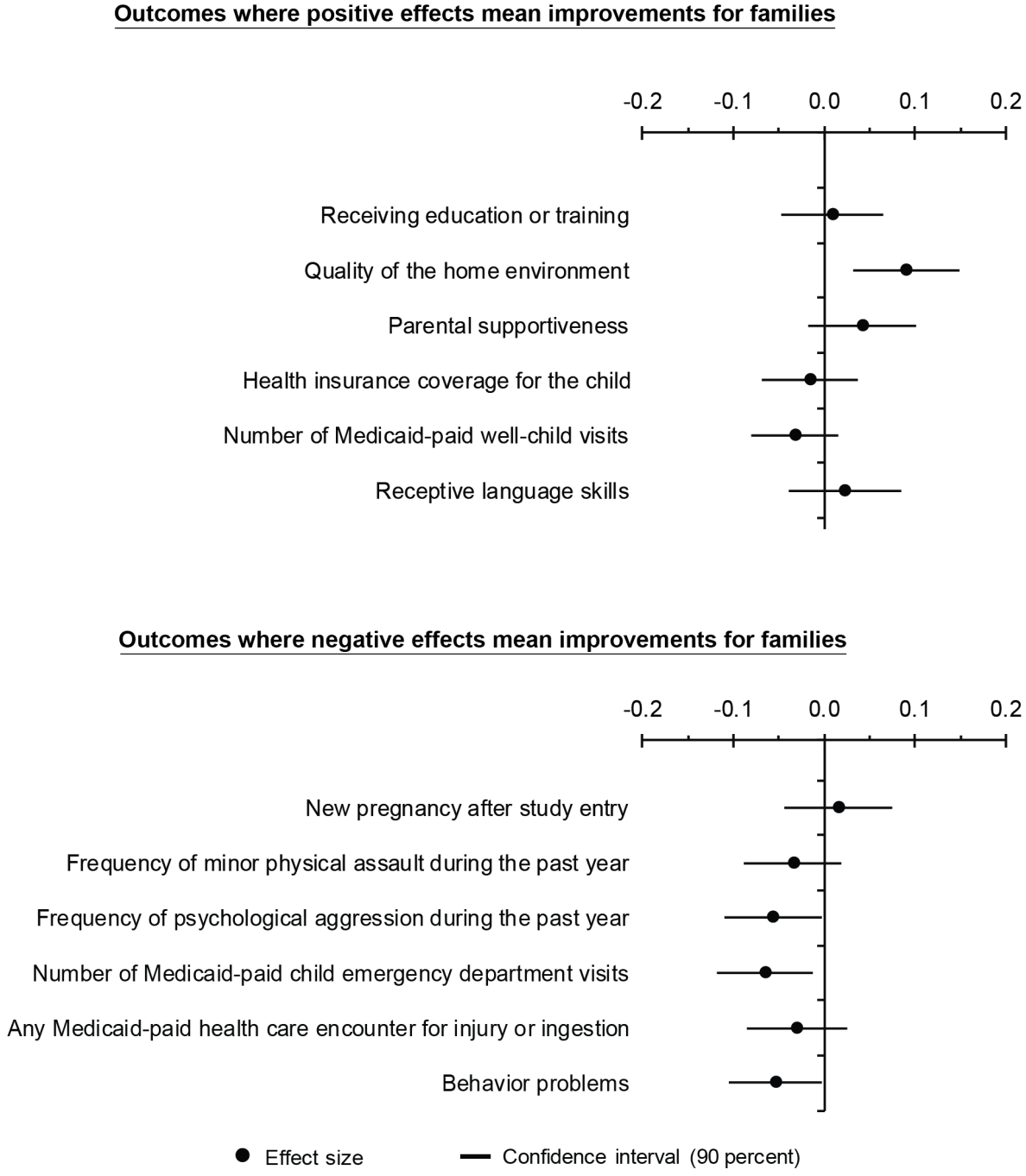
- **Most estimated effects are not statistically significant.** Although the results suggest that families are benefiting from MIECHV-funded home visiting services, it is important to note that only about one-third of the confirmatory outcomes and one-third of the exploratory outcomes showed effects that were statistically significant. In addition, only one of the 67 estimated effect sizes is greater than 0.20, a level sometimes used as a threshold for considering an effect to be small.[17]

- **Results for several exploratory outcomes suggest home visiting may improve maternal health**. MIHOPE found statistically significant improvements in women's general health, increases in health insurance coverage, and reductions in depressive symptoms (although program group mothers were also more likely to say they had abused drugs or alcohol in the recent past). Note that results for exploratory outcomes are not shown in Figure ES.1 because there are so many, but these results can be found in Chapter 3 of the report. Improving maternal mental health could be especially important since it could result in improvements in many other areas, such as child development and economic self-sufficiency.

[17] Jacob Cohen, *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. (Hillsdale, NJ: Lawrence Erlbaum, 1988).

Figure ES.1

Estimated Effects on Confirmatory Outcomes at 15 Months



SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: Effects are considered statistically significant if the 90 percent confidence interval does not intersect with 0. A statistical test of the number of outcomes for which estimated effects would be improvements for families resulted in a p-value of 0.096 for having 9 or more such findings out of 12.

- **Home visiting might reduce household aggression.** The results also suggest home visiting services reduce household aggression, which could have wide-ranging, long-term implications. For example, there are statistically significant effects on the frequency of psychological aggression toward children (a confirmatory outcome) as well as mothers' experience with intimate partner violence and mothers' use of domestic violence services (exploratory outcomes). This effect is consistent with other significant effects, such as those on exploratory outcomes such as parental depression (discussed above), parental stress, and parental discipline using gentle guidance. Reduced household aggression and improved parenting behaviors could also help explain observed reductions in child behavior problems (a confirmatory outcome). Because adverse childhood experiences such as child abuse and intimate partner violence have been shown to be associated with negative long-term outcomes, reducing household aggression could benefit children as they grow older.[18]

How Effects Vary Across Subgroups of Families

Since home visiting services are intended to be tailored to family needs, an important question is whether its effects are larger among some groups of families than others. There is little reliable evidence on this question from previous studies because those studies often had small samples, which made it difficult to examine subgroups. In addition, different studies have examined different groups. MIHOPE's size and centralized data collection give it a chance to address the question.

After considering the existing evidence and the policy relevance of various characteristics, the study team chose to focus on seven prespecified subgroups based on (1) gestational age (how far into the pregnancy a mother was when she entered the study — or if she had already given birth), (2) whether or not the mother had older children, (3) maternal race and ethnicity, (4) the presence or absence of intimate partner violence, (5) the mother's level of emotional functioning, (6) maternal psychological

[18]Vincent J. Felitti, Robert F. Anda, Dale Nordenberg, David F. Williamson, Alison M. Spitz, Valerie Edwards, Mary P. Koss, and James S. Marks, "Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study" (*American Journal of Preventive Medicine* 14, 4: 245-258, 1998).

resources,[19] and (7) mothers' demographic characteristics that put themselves or their children at risk of poor outcomes.

The findings of this analysis include the following:

- **Differences in estimated effects for the 12 confirmatory outcomes across subgroups of families are generally small and not statistically significant.** Of the 84 comparisons of effects that were made, only 8 differences were statistically significant at the 10 percent level. This pattern would be expected to occur by chance even if there were no real differences in effects across subgroups. Moreover, after applying an adjustment for conducting multiple tests, the only statistically significant difference in estimated effects is by race and ethnicity for a single outcome: the number of Medicaid paid well-child visits.

It is possible MIECHV-funded home visiting does benefit some types of families more than others in ways the study did not examine or could not detect. For example, home visitors might be able to assess changes in family needs over time, but the study was limited to examining the family's characteristics and needs when they entered the study. The findings do indicate that there are not large differences across the types of family characteristics that have been most commonly examined in prior studies of the four evidence-based models included in MIHOPE.

How Effects Vary with Program Features and Services Received

MIHOPE was designed to provide an opportunity to learn about whether some aspects of service delivery and program implementation are associated with greater effects for families. The large number of local programs included allows the study to tie together effects and program implementation at the local program level to examine how much effects vary across local programs, whether some characteristics of local programs are associated with larger or smaller effects, and how the services that families receive are associated with program effects.

[19]The concept of "psychological resources" is taken from the Nurse-Family Partnership Memphis pilot test, which hypothesized that effects on maternal caregiving and childhood injuries would be greater among mothers with few psychological resources. It is based on a composite of (1) mental health, (2) mastery (the extent to which a person thinks life chances are under her control), and (3) verbal abstract reasoning. See Harriet Kitzman, David L. Olds, Charles R. Henderson Jr., Carole Hanks, Robert Cole, Robert Tatelbaum, Kenneth M. McConnochie, Kimberly Sidora, Dennis W. Luckey, and David Shaver, "Effect of Prenatal and Infancy Home Visitation by Nurses on Pregnancy Outcomes, Childhood Injuries, and Repeated Childbearing" (*Journal of the American Medical Association* 278, 8: 644-652, 1997).

Although randomly assigning families to the program and control group resulted in reliable estimates (presented above) of the effects of home visiting on family outcomes, the results presented in this section of the report do not necessarily represent causal relationships. That is, a finding that local programs whose home visitors have higher morale produce larger effects than other programs would not necessarily mean that home visitor morale is the cause of those larger effects. It could be the case that local programs whose home visitors have higher morale are better implemented in other ways that result in larger effects, or that they serve families whose lives are easier to influence through home visiting. Nevertheless, the results suggest ways programs might improve their effectiveness.

Findings on how effects vary with program features and services families received include:

- **Effects were generally consistent across local programs.** The first analysis in this section of the report examined how much effects varied across local programs, without trying to explain that variation. For 10 of the 12 confirmatory outcomes, the results indicate that local programs were generally equally effective at helping families. For two outcomes, however, there was statistically significant variation in effects across local programs. The two outcomes are the number of Medicaid-paid well-child visits and whether the child needed health care for an injury or ingestion.

- **There is little evidence that any distinctive features of local programs are associated with better family outcomes.** This finding is consistent with the finding that effects are similar across local programs. However, the finding does not mean that program implementation does not matter. The analysis could examine only the aspects of program implementation that varied substantially among local programs, and important aspects of implementation may have been in common use. Moreover, the MIHOPE design could detect only fairly large associations between program features and program effects.

- **There is not a strong association between additional home visiting services and larger effects.** The estimated effects were similar for local programs where families received more home visiting services and those where they received fewer services, and effects were not generally larger among families who received more home visiting services than they were among families who received fewer. This analysis

included the number of home visits families received, the number of times outcome-specific topics were discussed, and whether referrals were made for outcome-specific community services. This result is also consistent with the overall finding that effects were similar across local programs.

Implications of the MIHOPE Impact Analysis Findings

Although the findings presented in this report indicate that families had better outcomes because of home visiting, the effects are somewhat smaller than those seen in earlier studies of the four evidence-based models included in MIHOPE. Many of the earlier studies were done before home visiting had been expanded to a national scale, and the smaller effects in MIHOPE might show that it is difficult to maintain high-quality services on such a large scale consistently. In addition, previous studies were of individual models and could focus on outcomes where those models were expected to have the largest effects, whereas MIHOPE examined a consistent set of outcomes across the four evidence-based models. Home visiting is also more widely available today than in the past, and observed effects could be smaller in MIHOPE because control group families sought out home visiting services on their own. In addition, during the period that home visiting was studied in MIHOPE, the evidence-based models and the local programs were just beginning to respond to the MIECHV program's expectation that they improve a broad set of family outcomes, and their effectiveness might have grown as they have adapted to meet those expectations.

Because home visiting continues to evolve, researchers and practitioners continue to look for ways to make the services more effective. This is seen in the provision of the MIECHV statute that allows states to use MIECHV funds to implement and study promising practices. It is also reflected in the extensive time, effort, and funding that HRSA and ACF have put into providing technical resources to home visiting programs to improve their effectiveness. The Innovation Toward Home Visiting national research and development platform and the Home Visiting Collaborative Improvement and Innovation Network (HV CoIIN) are likewise working to identify ways to strengthen the impact of home visiting.[20]

[20] For more information on the research and development platform, see funding opportunity number HRSA-17-101 at U.S. Department of Health and Human Services, "MCHB Funding Opportunities" (https://mchb.hrsa.gov/fundingopportunities) and the Home Visiting Applied Research Collaborative (www.hvresearch.org). For information on HV CoIIN, see http://hv-coiin.edc.org.

Implementation research conducted as part of MIHOPE suggested several areas where home visiting implementation could be improved.[21] These areas include providing more opportunities for home visitors to practice and reinforce the skills they learn, providing training to home visitors in working with families on sensitive topics such as substance use and intimate partner violence, having supervisors observe home visitors more often, and developing better ties to community service providers.

The finding that the effects observed in MIHOPE varied across the four evidence-based models in ways that roughly align with the models' historical emphases suggests that evidence-based models have different strengths. A mix of evidence-based models within a community could consequently have more wide-ranging effects than any single model.

This report presents effects when children are 15 months old, which may be too early to see the full effects of the MIECHV-funded programs that participated in MIHOPE, particularly when it comes to child development. For that reason, families who enrolled in the study are responding to brief surveys when children are 2.5 and 3.5 years old, and extensive information on family outcomes is being collected when children are in kindergarten.[22] Longer-term follow-up data collection is important because previous studies suggest that the benefits of home visiting have persisted as children have grown older, and that the long-term benefits have eventually exceeded the short-term costs.[23]

[21]Duggan, Anne, Ximena A. Portilla, Jill H. Filene, Sarah Shea Crowne, Carolyn J. Hill, Helen Lee, and Virginia Knox, *Implementation of Evidence-Based Early Childhood Home Visiting: Results from the Mother and Infant Home Visiting Evaluation*, OPRE Report 2018-76 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, 2018).

[22]See www.acf.hhs.gov/opre/research/project/mother-and-infant-home-visiting-program-evaluation-long-term-follow-up.

[23]Charles Michalopoulos, Kristen Faucetta, Anne Warren, and Robert Mitchell, *Evidence on the Long-Term Effects of Home Visiting Programs: Laying the Groundwork for Long-Term Follow-Up in the Mother and Infant Home Visiting Program Evaluation (MIHOPE)*, OPRE Report 2017-73 (Washington, DC. Office of Planning, Research, and Evaluation, Administration for Children and Families, US Department of Health and Human Services, 2017).

Chapter 1

Introduction

Children develop fastest in their earliest years, and the skills and abilities they develop in those years lay the foundation for their future success.[1] Similarly, early negative experiences can contribute to poor social, emotional, cognitive, behavioral, and health outcomes both in early childhood and in later life. Children growing up in poverty tend to be at greater risk of encountering adverse experiences that negatively affect their development. One approach that has helped parents and their young children is home visiting, which provides individually tailored support, resources, and information to expectant parents and families with young children. Many early childhood home visiting programs aim to support the healthy development of infants and toddlers and work with low-income families, in particular, to help ensure their well-being.

Home visiting programs in the United States have their origins in the late nineteenth century, when charitable organizations used home visiting to try to reduce poverty by changing the behavior of the urban poor.[2] Home visiting later expanded to include approaches such as visits by public health nurses to promote infant and child health, Head Start home visiting to promote child development, and home-based family support to promote positive parenting and prevent child maltreatment.[3] As currently practiced, home visitors identify family strengths, needs, concerns, and interests and attempt to address those in partnership with families through education and support during home visits or through referrals to and coordination with community services.

In 2010, Congress authorized the federal Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program by enacting section 511 of the Social Security Act, 42 U.S.C. § 711, which also appropriated funding for fiscal years 2010 through 2014.[4] Subsequently enacted laws extended funding for the program through fiscal year 2022.[5] The program is administered by the Health Resources and Services Administration (HRSA)

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[1]National Research Council and Institute of Medicine (2000).

[2]Weiss (1993).

[3]Combs-Orme, Reis, and Ward (1985); Harding et al. (2007); Love et al. (2005).

[4] SEC. 511 [42 U.S.C. 711] (j) (1).

[5] Funds for subsequent fiscal years were appropriated by section 209 of the Protecting Access to Medicare Act of 2014, Pub. L. 113-93 (fiscal year 2015); section 218 of the Medicare Access and Children's Health Insurance Program Reauthorization Act of 2015, Pub. L. 114-10 (fiscal years 2016-2017); and section 50601 of the Bipartisan Budget Act of 2018, Pub. L. 115-123 (fiscal years 2018-2022).

in collaboration with the Administration for Children and Families (ACF) within the U.S. Department of Health and Human Services (HHS).[6] The initiation of the MIECHV program began a major expansion of evidence-based home visiting programs for families living in at-risk communities.

The legislation authorizing MIECHV recognized that there was considerable evidence about the effectiveness of home visiting, but also called for research to increase knowledge about the implementation and effectiveness of home visiting.[7] States that receive MIECHV funding are required to devote the majority of their MIECHV funding to the delivery of services according to the specifications of designated evidence-based models that meet HHS' criteria for evidence of effectiveness.[8] At the same time, states could spend part of their MIECHV funding on promising approaches to home visiting as long as research was conducted into the effects of those promising approaches.[9] The legislation also required an evaluation in its early years,[10] which became the Mother and Infant Home Visiting Program Evaluation (MIHOPE). The evaluation, which is studying the effects of MIECHV-funded evidence-based home visiting, is being conducted for HHS by MDRC in partnership with James Bell Associates, Johns Hopkins University, Mathematica Policy Research, the University of Georgia, and Columbia University.

The overarching goal of MIHOPE is to learn whether families and children benefit from MIECHV-funded early childhood home visiting programs as they operated from 2012 to 2017, and if so, how. The study is examining a broad range of outcome areas mentioned in the authorizing legislation,[11] including:

- Prenatal, maternal, and newborn health
- Child health and development, including child maltreatment

[6]HRSA distributes funds from the federal MIECHV program to MIECHV state and territory awardees. In 2017, HRSA provided awards to 56 states and territories, including 47 state agencies; 3 nonprofit organizations serving Florida, North Dakota, and Wyoming; the District of Columbia; and 5 U.S. territories. Awardees distribute funds to local implementing agencies — also commonly referred to as local programs — that work directly with families. Additionally, ACF oversees the tribal MIECHV program, which as of 2017 funds 29 tribes, consortia of tribes, tribal organizations, and urban Indian organizations across 16 states.

[7]SEC. 511 [42 U.S.C. 711] (h) (3) (A).

[8]SEC. 511 [42 U.S.C. 711] (d) (3) (A) (ii).

[9]SEC. 511 [42 U.S.C. 711] (d) (3) (A) (i) (II).

[10]SEC. 511 [42 U.S.C. 711] (g) (2).

[11]SEC. 511 [42 U.S.C. 711] (d) (2) (B).

- Parenting skills
- School readiness and child academic achievement
- Crime and domestic violence
- Family economic self-sufficiency
- Referrals and service coordination[12]

This report presents early effects on family and child outcomes in these areas, with the exception of school readiness and academic achievement (which are not included in the current report because children were too young to measure those outcomes). In addition to investigating the overall effects on family and child outcomes of local home visiting programs included in MIHOPE, the report explores whether the programs' effects vary among different demographic groups or are larger or smaller for families that have certain risk factors (such as low education or maternal depression). Finally, the report presents information on whether there is variation in effects related to the ways local programs were implemented (including which evidence-based model of home visiting they used) and whether there is variation in effects related to the levels of services that families received.

This is the fourth MIHOPE report. Earlier reports provided:

- A detailed description of the study design[13]
- Early information on local programs and families in the study as well as an analysis of the information states provided to receive initial MIECHV funding[14]
- Detailed information on the implementation of home visiting services in the local programs participating in MIHOPE[15]

A future MIHOPE report will describe and estimate the costs of providing home visiting services and examine the relationship between effects and costs.[16] Finally, a report from a separate but related study called MIHOPE-Strong Start presents the

[12]SEC. 511 [42 U.S.C. 711] (d) (2) (B) (i-vii).

[13]Michalopoulos et al. (2013).

[14]Michalopoulos et al. (2015).

[15]Duggan et al. (2018).

[16]Corso, Ingels, and Walcott (forthcoming).

effects of evidence-based home visiting on birth outcomes and prenatal care, which are not discussed in the current report.[17]

Overview of the MIHOPE Design

MIHOPE was designed to accomplish several goals, including:

- Providing information on the effectiveness of MIECHV-funded home visiting programs
- Systematically studying how home visiting programs are implemented
- Estimating the costs of providing home visiting services
- Linking program effects to information on how home visiting programs are implemented, the communities they operate in, and the families they serve, to clarify which program features are associated with improved outcomes for children and families

The legislation that authorized the MIECHV program required awardees to devote a majority of MIECHV funding to home visiting models designated as evidence-based by HHS.[18] To determine which home visiting models would be defined as evidence-based, HHS commissioned the Home Visiting Evidence of Effectiveness (HomVEE) review.[19] MIHOPE includes the four evidence-based models that 10 or more states chose in their fiscal year 2010-2011 plans for MIECHV funding: Early Head Start — Home-based option, Healthy Families America, Nurse-Family Partnership, and Parents as Teachers.

MIHOPE included families who were interested in receiving home visiting services. However, not all such families were eligible to participate in MIHOPE. Since women are more likely to enroll in home visiting than men, the study limited enrollment to women.[20] Since it can be difficult to compare many outcomes across a broad range of children's ages, the study includes only women who were pregnant or had children less than 6 months old when they entered the study (a group who are eligible for most

[17]Lee et al. (2019). MIHOPE-Strong Start is a study of the effects of Healthy Families America and Nurse-Family Partnership home visiting services on prenatal health, birth outcomes, and infant health care for women who enroll before their thirty-second week of pregnancy.

[18]SEC. 511 [42 U.S.C. 711] (d) (3) (A) (ii).

[19]U.S. Department of Health and Human Services (n.d.).

[20]In fiscal year 2017, women were 96 percent of the adults participating in MIECHV-funded home visiting.

MIECHV-funded local programs).[21] The study was also limited to women and girls who were at least 15 years old.[22] Women were excluded from the study if they were assessed as unable to provide consent and complete a survey in English or Spanish when they entered the study, or if they were already receiving home visiting services from a participating local program. Finally, the team allowed each local program to exempt a small number of families (typically three) from the study (and thereby from random assignment, meaning they could be offered services automatically).

To allow the study to include a diverse set of local programs and to provide enough statistical precision for the analyses, MIHOPE sought to include about 85 local programs from 12 states. The study team chose local programs using the following criteria.

- They were operating one of the four evidence-based models of home visiting noted earlier.
- They had been in operation for at least two years.
- They could recruit enough families to allow for a randomly chosen control group.
- They had more than one MIECHV-funded home visitor.
- They were not operating in "frontier" locations, which were sparsely populated counties or those that were not adjacent to metropolitan areas. These areas were excluded to reduce the costs of recruiting families and collecting information.

In the end, MIHOPE included 88 local programs in 12 states: California, Georgia, Illinois, Iowa, Kansas, Michigan, Nevada, New Jersey, Pennsylvania, South Carolina, Washington, and Wisconsin. The 88 local programs consisted of 19 Early Head Start programs, 26 Healthy Families America programs, 22 Nurse-Family Partnership programs, and 21 Parents as Teachers programs. Since one local program did not enroll

[21]As noted elsewhere in the report, the study plans to examine the effects of home visiting for families as children get older. Brief surveys are being conducted when children are 2.5 and 3.5 years old, and a major round of data collection is happening when children are in kindergarten.

[22]During its initial review of MIHOPE, the MDRC Institutional Review Board suggested an age cutoff because of a concern that younger women would represent a more vulnerable population. The study team chose 15 based on an estimate that it would exclude fewer than 3 percent of eligible women from the study and because local home visiting programs could have had concerns about randomly assigning women younger than that age. As an additional step to protect the rights of women between 15 and 18, who were still potentially more vulnerable than older women, the study also required a legal guardian to consent to each minor's participation in the study.

any families in the study and no sample members were randomized to the control group in another local program, the analysis included in the report is limited to 86 local programs.

To provide reliable estimates of the effects of home visiting programs, families who enrolled in the study were randomly assigned to a MIECHV-funded local home visiting program or a control group who received information about other appropriate services in the community. From October 2012 to October 2015, a total of 4,229 families entered the study through 87 local home visiting programs in 12 states (with one local program enrolling no families into the study).[23]

Data Sources

To describe how local programs were implemented, the team analyzed:

- Surveys conducted with program managers, supervisors, and home visitors at each local home visiting program at two points in time: when the programs joined the study and 12 months later
- Weekly, web-based logs completed by home visitors and supervisors to provide information on services delivered to families during home visits, and on training and supervisory activities
- Video recordings of 200 home visits for 186 families
- Qualitative, semistructured interviews with all 12 MIHOPE state MIECHV administrators, and with home visiting staff members in a subset of local programs

For the current report, information on child and family outcomes comes from several sources. Data were collected around the time the child was 15 months old:

- A one-hour telephone interview with the child's mother.[24] The survey asks about outcomes in all the domains mentioned in the authorizing legislation

[23]Over the course of MIHOPE, 11 families withdrew from the study, 2 sample members from a small local program were removed from the analysis, and 1 sample member was found to have a child who was too old for the study, for a final analytical sample of 4,215 families (2,102 in the program group and 2,113 in the control group).

[24]In 64 cases where the mother was not available to answer the survey (in most cases because she no longer had custody of the child), data collection was conducted with the child's primary caregiver.

other than school readiness and academic achievement (response rate of 79 percent).[25]

- A video recording of an interaction between the child and mother using the "Three Bags" and "Clean-Up" tasks, during which the child and mother play with toys contained in three bags and place the toys back in the bags (response rate of 68 percent).[26]
- The Preschool Language Scales, Fifth Edition, Auditory Comprehension scale, to assess the child's ability to be attentive and respond to stimuli in the environment and to comprehend basic vocabulary or gestures (response rate of 70 percent).
- The child's weight and height, to provide information about whether the child's growth is within a normal range or the child exhibits early signs of being underweight or at risk of overweight. In addition, the mother's weight was measured to assess the effects of home visiting on maternal weight and obesity (response rate of 70 percent).
- The Infant-Toddler Home Observation for Measurement of the Environment, to measure the quality and amount of stimulation the child could receive in the home using observations from study team data collectors in the family's home and parent responses to the 15-month survey (response rate of 71 percent).
- Administrative data (data collected to help administer a public program) in three areas: (1) health care use (for which data came from Medicaid and the Children's Health Insurance Program), (2) child maltreatment (for which data came from state administrative child welfare records), and (3) employment and earnings (for which data came from the National Directory of New Hires).

[25]Follow-up data collection was attempted with 4,218 families. All response rates are relative to that sample. Response rates were similar for the program group and control group for all aspects of data collection. As shown in Appendix C, the baseline characteristics of program group and control group families who participated in follow-up data collection are similar.

[26]The Three Bags and Clean-Up Tasks were completed by 68 percent of families. However, 188 Three Bags Task videos and 318 Clean-Up Task videos were not coded by the team because of problems with the videos (for example, technical difficulties with the recording), resulting in usable videos for 64 percent of the sample for the Three Bags Task and 61 percent of the sample for the Clean-Up Task.

Limitations of the Study Design

The use of random assignment and the large number of families and locations included in the study provide a strong framework MIHOPE can use to investigate the ability of MIECHV-funded home visiting programs to improve family outcomes, but the study design has some important limitations.

- As discussed in Chapter 2, the team sought to include a diverse set of local home visiting programs in the study, but the programs differ in some important respects from the larger set of MIECHV-funded programs. For example, MIHOPE includes a smaller proportion of rural locations than MIECHV as a whole. Thus, the effects presented in this report might differ somewhat from the effects of all MIECHV-funded home visiting programs.

- MIHOPE enrolled local programs and families during the early years of the MIECHV program. Since the implementation of home visiting has evolved, the current effects of home visiting may differ somewhat from those presented in this report.

- Although the study strove to collect high-quality information on family outcomes, each data source that was used has some limitations. Information collected directly from families is available only for families that provided the information. Parent reports may be inaccurate if individuals cannot remember relevant information or are reluctant to accurately report that information, as may be the case with sensitive outcomes. Although administrative data may accurately reflect the information collected by state agencies, they are limited to families who have not moved from the state and are often limited in other respects. For example, Medicaid-reimbursed health care is available only for individuals who receive Medicaid benefits.

- The main results presented in this report compare outcomes for all families assigned to the program group with all families assigned to the control group.[27] Since about 17 percent of program group families never received home visits, the results may be larger among families

[27]This is standard practice in studies that use random assignment and is done to maintain the comparability between program and control groups that was generated by random assignment. See, for example, Chapter 2 of Orr (1999).

who received services.[28] In addition, some control group members received home visits or other services to promote positive parenting, and the effects observed in the study might have been larger if the control group did not have access to such services. The issue of "dosage" (the amount of services families received) is investigated in Chapter 5.

The Evidence-Based Home Visiting Models Studied in MIHOPE

In general, home visiting consists of three types of activities:

- **Assessing family needs.** To identify family strengths, needs, concerns, and interests, home visitors gather information from families through formal screening and assessment and through informal means that include reading cues provided by family members.

- **Educating and supporting parents.** Having identified family needs, home visitors devote most of their time to providing education and support to families. For example, home visitors educate parents on topics such as children's developmental stages and provide comments on their parenting. Home visitors can also provide support during crises such as threats of being evicted or incidents of family violence. In addition, home visitors work to strengthen families' support networks. Home visitors use methods such as positive reinforcement, direct suggestions and encouragement, and motivational interviewing to support healthy behavior and positive parenting.[29]

- **Referral and coordination.** For some family needs, home visitors may think the family will benefit from receiving more specialized services in the community. In MIHOPE, referrals were most commonly made to address breastfeeding and nutrition, economic self-sufficiency, and public assistance or health insurance.[30] This aspect of home visiting

[28]See Duggan et al. (2018) for detailed results concerning the amounts of home visiting services received by families who enrolled in MIHOPE.

[29]Rubak, Sandbæk, Lauritzen, and Christensen (2005). Motivational interviewing emerged from the experiences of clinicians treating individuals with alcohol dependency, and is defined as "a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence." See Miller and Rose (2009). It is viewed as a particularly important technique when working with clients who are resistant to changing their behaviors, and when standard cognitive behavioral approaches and social learning approaches (that is, positive or constructive reinforcement) are not working. See Iannos and Antcliff (2013).

[30]Duggan et al. (2018).

highlights the place of home visiting as one component in a comprehensive system of care for early childhood.

Box 1.1 provides a hypothetical example of how a home visitor can tailor home visits to serve a family's needs.

Characteristics of the Evidence-Based Models

Although all four evidence-based models use these activities and share the overall goal of improving outcomes for at-risk families and their young children, they differ in several important ways. Table 1.1 summarizes some important features of the four evidence-based models as they existed when MIHOPE began.

- **Program goals.** While all four models tried to improve child health and development in the broad sense, their specific goals differed. For example, Early Head Start provided comprehensive services that focused on the development of infants and toddlers, supporting parents in their roles as caregivers and teachers of their children, and promoting school readiness. In addition to the goals of strengthening nurturing parent-child relationships, promoting healthy childhood growth and development, and enhancing family functioning, Healthy Families America emphasized preventing child maltreatment. Nurse-Family Partnership strongly emphasized the social determinants of health, improving birth outcomes through preventive health practices, and improving child health and development. It also aimed to improve mothers' economic self-sufficiency and development. Parents as Teachers focused on supporting families to enhance parents' knowledge of early childhood development, improve parenting practices, detect early signs of developmental delays and health issues, and promote children's school readiness and success.

- **Target population and age at enrollment.** Most of these models served families they identified as being at risk of poor child outcomes, based on one or more family characteristics. Although the indicators used to identify families at risk differed among the models, most models targeted low-income families. Nurse-Family Partnership specifically targeted women early in their first pregnancies, while Healthy Families America targeted families during any pregnancy or shortly after birth who faced a variety of risk factors for child maltreatment or other negative childhood experiences (risk factors such as histories of trauma or

Box 1.1

A Snapshot of a Home Visitor's Day with Three Families

Tracy has been a home visitor for about a year. She spends most of her time visiting the 17 families on her caseload, who are spread out across her small suburban county. She spent yesterday in a training session on recognizing postpartum depression and is eager to get started today on the three home visits she has scheduled. The families she will visit are similar in that they are young parents with small children. But each family is also unique, so Tracy will need to be attentive to their cues as well as their concerns, interests, understanding, and readiness to take actions that will improve family life and their children's health and development.

At the first visit, Tracy is greeted warmly by Kimmy and her 6-month-old girl, Shanna. Tracy sits on the floor with them and rolls out a plastic mat with toy fish inside. She encourages Kimmy to press on the mat and move the fish around to catch Shanna's attention. Kimmy helps support Shanna to sit up and she eagerly bats at the fish. Kimmy listens attentively as Tracy explains how this activity promotes motor development. Tracy also encourages Kimmy to count the number of fish to Shanna, explaining that it is never too early to introduce language and number concepts. As the baby plays, Tracy recalls that Kimmy had felt nervous about starting solids with Shanna. She asks whether Kimmy read the handouts on the topic she had left and how she is now feeling about starting solids. After Kimmy expresses interest, they agree to spend time in the next visit preparing purees to practice feeding Shanna.

Next, Tracy visits Gloria, a relatively new client, and her baby, Jessica. Gloria says that she is more stressed out than normal, and she smokes while Tracy asks more about what is going on. Gloria states that her phone bill is unusually high this month and she is not sure she can pay the bill, and she is running low on infant formula. Tracy nods empathetically as Gloria talks, and then suggests that they focus on each concern, one at a time. Although Gloria is worried about her phone bill, Tracy advises Gloria to pay what she can, as doing so will prevent her services being cut off. She further suggests that she and Gloria focus on budgeting at the next visit. She gives Gloria a number to call to apply for Women, Infant, and Children services and in the meantime offers to bring over infant formula that the office has in stock. Tracy probes more into the sources of stress Gloria typically faces and how she deals with them, seeing an opportunity for Gloria to open up more. She comments to Gloria on how healthy Jessica looks and praises Gloria for how affectionate she is with the baby. Tracy wants to talk to Gloria about smoking in the home and ponders how best to raise this subject sensitively at the next visit to explore Gloria's readiness for change.

Last, Tracy visits parents Marine and Bill and their infant son, Tyler. Both parents are typically quiet, but Tracy often can involve Marine in activities with Tyler. Bill usually

(continued)

Box 1.1 (continued)

sits and watches from a distance or focuses on something else. Tracy wants to involve him in learning to play with the baby. She uses strategies suggested by her supervisor to engage the family in play together — when Tyler starts to point to Bill, Tracy remarks, "Bill, someone's looking for you!" and Bill waves and smiles. In addition to fostering parent-child interactions, Tracy encourages the parents to meet goals that are important to them. She asks them about goals they have for their family. Marine and Bill look blankly at each other and shrug. Tracy comments positively that "anything can be a goal" and asks them to think about what would make their lives better over the next year — "big or small." Tracy could choose some home visit topics from her program's curricula, but she thinks that partnering with the family is a more effective way to empower them and make home visiting relevant for them. She reflects on ways to help them think through what matters to them and how home visiting might be helpful.

NOTE: The home visitor and families featured in these vignettes were created from the MIHOPE video and qualitative interview data-collection efforts and do not represent any single individual. Pseudonyms are used to protect the identity of individuals

intimate partner violence, behavioral health issues, and single parenthood). Parents as Teachers has historically served a broad array of families with children in its target age range. All models could enroll women who met the MIHOPE eligibility criteria, although Early Head Start and Parents as Teachers accepted families whose youngest children were up to 3 years old and through kindergarten entry, respectively. In other words, Early Head Start and Parents as Teachers enrolled a much broader range of families than are being studied in MIHOPE, which includes only families with children under 6 months old at enrollment.

- **Program intensity and duration.** The evidence-based models also varied somewhat in the frequency of their home visits. Early Head Start had weekly home visits, while Healthy Families America and Nurse-Family Partnership offered weekly visits during critical periods (for example, shortly after birth) and Parents as Teachers specified monthly, biweekly, or weekly visits depending on families' needs (not shown in Table 1.1). The four models also differed in how long they provided

Table 1.1

Planned Services of the Evidence-Based Home Visiting Models in MIHOPE: Goals, Recipients, Enrollment, Duration, Training, and Supervision

Component	Early Head Start – Home-Based Option	Healthy Families America	Nurse-Family Partnership	Parents as Teachers
Evidence-based model goals[a]	Enhance the development of very young children Promote healthy family functioning Promote school readiness	Build and sustain community partnerships to systematically engage overburdened parents in home visiting services prenatally or at birth Cultivate and strengthen nurturing parent-child relationships Promote healthy childhood growth and development Enhance family functioning by reducing risk and building protective factors Prevent child maltreatment and adverse experiences	Improve prenatal health and birth outcomes Improve child health and development Improve families' economic self-sufficiency and maternal life course development	Provide parents with child development knowledge and parenting support Provide early detection of developmental delays and health issues Prevent child maltreatment Increase school readiness
Intended recipients	Low-income pregnant women and families with children from birth to 3 years of age, families at or below the federal poverty level, and children with disabilities who are eligible for Part C services under the Individuals with Disabilities Education Act in their states	Parents facing challenges such as single parenthood, low incomes, childhood histories of abuse or adverse experiences, current or past behavioral health issues, or domestic violence Local programs select the specific characteristics of the target populations they plan to serve	First-time, low-income, pregnant mothers and their children	No eligibility requirements for participants Local programs select the specific characteristics of their target populations, such as children with special needs, families at risk for child abuse, low-income families, teen parents, first-time parents, immigrant families, families with little literacy, or parents with mental health or substance use issues

(continued)

Table 1.1 (continued)

Component	Early Head Start – Home-Based Option	Healthy Families America	Nurse-Family Partnership	Parents as Teachers
Intended timing of enrollment	Pregnancy through age 3	Pregnancy or within the first 3 months after a child's birth	Before the end of the 28th week of pregnancy[b]	Pregnancy or soon after birth, though can continue until age 5
Intended duration of enrollment	Through the child's third birthday[c]	Through the child's third birthday but can extend to child's fifth birthday	Through the child's second birthday	Local programs required to offer at least two years of services to families; recommend offering three years of services; services can be offered until kindergarten entry
Initial training in model implementation				
Length	No requirement	Minimum 4 days	13-14 days	5 days
Modality	In person and web-based	In person	In person, self-study, and web-based	In person
Provided by	EHS national office, EHS trainer, TA providers	HFA-certified trainer	NFP National Service Office and online learning management system (LMS)	PAT-certified trainer
Timing	No requirement	Within 6 months of hire	Majority must be completed before serving families; remainder within the first 6 months of employment	After completing curriculum training and before serving families
Training in curriculum				
Length	Depends on curricula selected	Depends on curricula selected	Included as part of initial training in model implementation	Included as part of initial training in model implementation
Modality	Depends on curricula selected	Depends on curricula selected	In person	In person
Provided by	Depends on curricula selected	Depends on curricula selected	NFP National Service Office	PAT-certified trainer

(continued)

Table 1.1 (continued)

Component	Early Head Start – Home-Based Option	Healthy Families America	Nurse-Family Partnership	Parents as Teachers
Ongoing training				
Length	Minimum 15 hours per year	Minimum 36 hours in the first year required; minimum of 15 hours recommended for subsequent years	3-5 hours of online education per year	Minimum 20 hours of professional development within one year of certification, 15 hours during the second year after certification, 10 hours in the third and subsequent years after certification
Modality	In person and web-based	In person and web-based	In person and web-based	In person and web-based
Provided by	EHS national office, EHS-certified trainer, local program TA providers, community agencies	HFA national office of e-learning, local program, community agencies	LMS, webinars, local program, community agencies	PAT-certified trainer, local program, community agencies
Type of supervision				
Group supervision/ team meetings	Not specified	Group supervision is optional and allowable if facilitated by a qualified reflective group consultant; team meetings are encouraged at least monthly	1-1.5 hours per week	Minimum of 2 hours per month
Individual supervision	Not specified	Minimum 1.5 hours per week for staff working more than 0.75 FTE; minimum 1 hour for staff working less than 0.75 FTE	1 hour per week	Minimum of 2 hours per month for staff working more than 0.5 FTE; minimum of 1 hour per month for staff working less than 0.5 FTE
Observation of home visits	Required; frequency not specified	Required; minimum of twice per year	Required; minimum of every 4 months	Required; minimum once per year

SOURCES: Evidence-based model websites (EHS: eclkc.ohs.acf.hhs.gov/hslc; HFA: www.healthyfamiliesamerica.org; NFP: www.nursefamilypartnership.org; PAT: parentsasteachers.org), the U.S. Department of Health and Human Services Home Visiting Evidence of Effectiveness (HomVEE) website (homvee.acf.hhs.gov/programs.aspx), and MIHOPE evidence-based model developer interviews.

NOTES: EHS = Early Head Start–Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers, TA = technical assistance, FTE = full-time equivalent.

[a]Goals are as stated by each evidence-based model.

[b]Local programs are recommended to begin conducting visits as early as possible in the pregnancy.

[c]Children can remain with EHS until they transition into other appropriate settings.

services, although all continued to provide services past the child's fifteenth month, which is the period for which effects are estimated in this report.

- **Training.** All evidence-based models required training for home visitors, but the models differed in the timing, intensity, and content of that training. Table 1.1 describes their requirements for initial training in model implementation, training in their curricula, and ongoing training.

- **Supervision.** Table 1.1 also shows guidelines for group supervision, individual supervision, and observation of home visits for each evidence-based model. Group supervision typically included supervision of multiple home visitors in a team meeting or similar group setting. Individual supervision generally consisted of formal, scheduled one-on-one supervision of a home visitor. Observation of home visits refers to a supervisor directly observing an actual home visit as it occurs or by reviewing a video recording of the visit.

- **Home visitor qualifications.** Although not noted in the table, the evidence-based models had a wide range of standards for home visitor qualifications. Nurse-Family Partnership required home visitors to be registered nurses with baccalaureate degrees. Early Head Start required home visitors to have knowledge and experience in child development, early childhood education, or other areas.[31] Parents as Teachers required home visitors to have at least a high school credential and a minimum of two years of supervised work experience with young children or parents. Healthy Families America required home visitors to have at least a high school credential and required local programs to look for relevant community-based experience and interpersonal characteristics.

Outcomes the Models Seek to Improve

As noted earlier, MIECHV-funded early childhood home visiting programs are intended to affect a wide range of outcomes for parents and children. The four evidence-based models in MIHOPE all try to improve child health and development in the broad sense. However, there are several pathways by which home visiting programs can improve child and family outcomes. Figure 1.1 shows which outcomes home visiting

[31]The other areas include principles of child health, safety, and nutrition; adult learning principles; and family dynamics.

services might improve in the short term, and how those short-term improvements might lead to longer-term benefits for parents and children.

The leftmost box in the figure shows the three home visiting activities described earlier: gathering information on family strengths, needs, and interests; providing education and support during home visits; and providing referrals to services in the community and coordinating with those service providers.

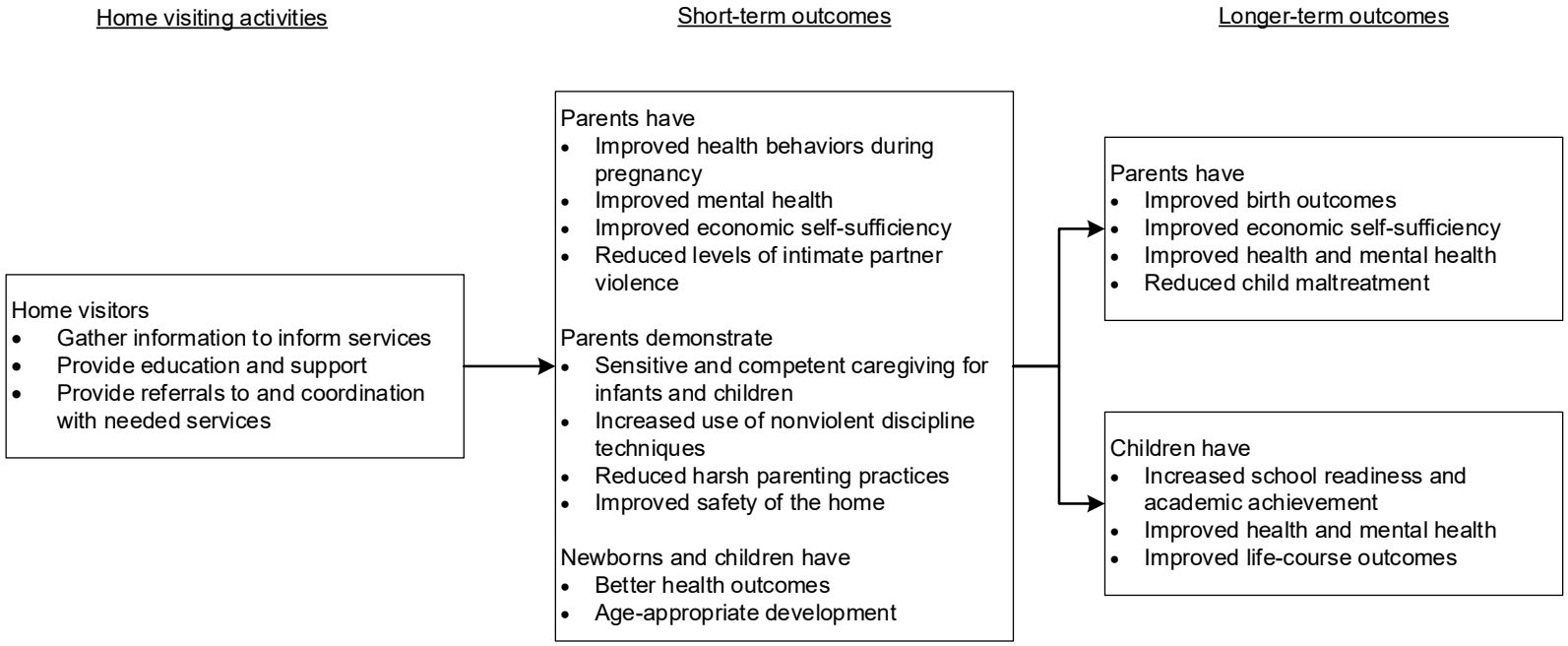
In the short term, these activities can lead to improvements in outcomes in several areas, as described in the middle box in the figure.

- During pregnancy, home visitors can help mothers obtain and use prenatal care, can teach them about healthy behavior such as abstaining from smoking and drinking, and might help to reduce stress that has been tied to adverse birth outcomes.
- In addition to reducing stress, home visitors can try to improve maternal mental health by referring mothers to mental health services in their communities or getting them assistance from other clinical staff members in their agencies.
- Home visitors can help improve families' economic self-sufficiency by helping mothers obtain additional education and training, or by helping them find employment. Home visitors can also help mothers understand whether they are eligible for public assistance that can provide economic support, and can help them apply for those benefits.
- Many women receiving home visiting are in violent relationships,[32] and reducing violence can influence many other family outcomes. Although home visitors could assess whether families are at risk for violence and provide information to parents who are at risk, many home visitors in MIHOPE did not feel well positioned to help families in this area (as discussed in the summary of the MIHOPE implementation research later in this chapter). Nevertheless, they could make referrals to intimate partner violence services in the community.

[32]Michalopoulos et al. (2015).

Figure 1.1

Home Visiting Activities and Outcomes



SOURCES: Early Head Start Parent, Family, and Community Engagement Framework, Healthy Families America logic model, Nurse-Family Partnership logic model, and Parents as Teachers logic model.

- Home visitors commonly give parents information on positive parenting practices to help them provide sensitive and competent caregiving and to reduce child maltreatment.
- By promoting healthy behavior during pregnancy and positive parenting practices, home visiting programs can also help newborns and children have better health outcomes and age-appropriate development.

These short-term improvements in outcomes can lead to longer-term improvements for families and children, as shown in the rightmost box in the figure. For example, economic self-sufficiency can be improved in the long term by helping mothers obtain education and training in the short term, by improving their mental health, or by reducing substance use. Likewise, child development can be improved in the long term through short-term improvements in family income, maternal mental and physical health, and positive parenting practices, and through reduced child maltreatment and family violence.

Evidence of Effectiveness

This section summarizes the evidence that existed before the MIHOPE analysis was conducted on the effects of the four evidence-based models for families with children two years old or younger. Note that, unlike MIHOPE, these past studies were limited to individual models and were usually conducted in one location. As was done in the HomVEE review,[33] outcomes are grouped into seven areas:

- Maternal health
- Family economic self-sufficiency
- Parenting
- Child maltreatment
- Child health
- Child development and school readiness
- Juvenile delinquency, family violence, and crime

Table 1.2 is a representation of the past evidence, showing the number of estimates and the number that are statistically significant and favorable, by evidence-based

[33]U.S. Department of Health and Human Services (n.d.).

model and outcome area, for children two years old or younger.[34] Each result is taken from a study that was rated by the HomVEE review as being of high or moderate quality.[35] Across the studies, 125 of the 1,104 estimated effects — or 11 percent — are statistically significant and indicate improved outcomes for families. About 5 percent of estimated effects across this many findings would be expected to be statistically significant even if home visiting had no benefits for families.[36] Using this standard, the evidence reviewed here suggests that home visiting has had positive effects on families and children. Moreover, statistically significant effects can be seen in each of the seven outcome areas, and for each evidence-based model.

The table also provides a visual representation of the following:

- **All seven outcome areas have been extensively examined.** However, studies of the four evidence-based models have focused on different outcome areas. For example, studies of Early Head Start have focused on child development, parenting, and economic self-sufficiency, and studies of Nurse-Family Partnership have focused on child and maternal health, but child maltreatment has been studied primarily for Healthy Families America. Studies for all four models have examined child development, child health, and parenting.

- **There is evidence of effectiveness across all domains and multiple evidence-based models.** In each domain and for three of the evidence-based models, there are more statistically significant effects than would be expected by chance.

Table 1.2 is consistent with published syntheses of the effects of home visiting, which have generally found modest benefits for families on average and found that effects have varied across studies.[37] MIHOPE has sought to address these findings by including a large enough sample of families to provide more precise estimates of the effects for subgroups of families than have been possible in previous studies. MIHOPE also provides an opportunity to compare the effects of the four evidence-based models on the

[34] Results were also included if the analysis indicated the follow-up period was two years or less.

[35] Although all studies were included in the HomVEE review, the table includes information on outcomes that were in the published papers but not listed on the HomVEE website.

[36] Although this report uses the 10 percent significance level in drawing inferences about the effects of MIHOPE, a 5 percent significance level was used in compiling the information in Table 1.2 because some studies did not provide enough information to determine whether the estimated effect was significant at the 10 percent level.

[37] Filene, Kaminski, Valle, and Cachat (2013).

Table 1.2

Evidence from Past Home Visiting Studies with Follow-Up Data Collection Through Children's First Two Years

Domain	Early Head Start — Home-Based Option		Healthy Families America		Nurse-Family Partnership		Parents as Teachers	
	Number of Outcomes Examined	Statistically Significant and Favorable Effects	Number of Outcomes Examined	Statistically Significant and Favorable Effects	Number of Outcomes Examined	Statistically Significant and Favorable Effects	Number of Outcomes Examined	Statistically Significant and Favorable Effects
Maternal health	4	0	120	9	40	10	4	0
Family economic self-sufficiency	54	14	99	3	25	5	40	0
Juvenile delinquency, family violence, and crime	1	0	31	2	0	0	0	0
Parenting	36	4	130	28	13	3	100	5
Child maltreatment	2	0	123	10	2	0	0	0
Child health	10	2	75	7	40	7	17	0
Child development and school readiness	19	1	41	8	16	1	62	6

SOURCE: MDRC summary of past research.

NOTES: Statistically significant results are those with p-values of less than 0.05.

A small number of statistically significant, not favorable results were found in past studies. Past studies of Early Head Start — Home-based option found one statistically significant and not favorable result in the family economic self-sufficiency domain. Past studies of Healthy Families America found seven statistically significant and not favorable results across the family economic self-sufficiency, parenting, child maltreatment, and child health domains. Past studies of Nurse-Family Partnership found one statisitically significant and not favorable result in the child health domain. Past studies of Parents as Teachers found five statisitically signficant and not favorable results across the family economic self-sufficiency, parenting, and child development domains.

same set of outcomes. By tying together detailed information on program implementation with effects, MIHOPE is also positioned to investigate how effects are associated with program implementation. Finally, MIHOPE provides a more recent assessment of home visiting programs — as expanded to a larger scale and beginning to be implemented under the MIECHV program — rather than how they operated in studies conducted 10 to 40 years ago. On this larger scale, in contexts where early childhood home visiting services are more available in the community, the effects of home visiting measured today may be smaller than those observed in these earlier studies.

A Summary of How Home Visiting Programs Were Implemented

How home visiting programs are implemented can influence how much families benefit from them. This section summarizes results from a recent MIHOPE report on how local programs in the study were implemented.[38] To provide some context for the impact and impact variation analysis findings presented in Chapters 3 and 5, this summary focuses on areas such as the training and supervision of home visitors, the clinical and administrative support provided to home visitors, and the community service environment available to local programs. In addition, Chapter 2 discusses the characteristics of local programs and families in the study, while Chapter 5 includes information on the services received by program group families.

- **Home visitors typically reported receiving more frequent training and less frequent supervision than is specified by their evidence-based models.** Home visitors reported receiving an average of more than 8 hours of training per month, compared with model expectations of 3 to 36 hours per year. Home visitors spent 43 minutes per week in individual supervision on average, compared with model expectations that ranged from 2 hours per month to 1 to 1.5 hours per week.[39] About one-third of home visitors were not observed by their supervisors during home visits, about one-fourth were observed once a year, about a third were observed two to four times a year, and one-tenth were observed more than four times over a 12-month period.

- **In general, home visitors felt both well supported and effective in working with families, although those feelings varied by outcome**

[38] Duggan et al. (2018).

[39] The average time spent in individual supervision ranged from 17 minutes for Early Head Start to 72 minutes for Healthy Families America. The average was less than expected by model guidelines for full-time home visitors for all four evidence-based models.

area. For example, more than 75 percent of home visitors felt they were well supported in promoting positive parenting and child development, but fewer than 60 percent felt well supported to address tobacco use, substance use, mental health, or intimate partner violence. Further, most home visitors felt effective in many of the same outcome-specific areas in which they felt well supported.

- **Local home visiting programs provided home visitors with many forms of administrative support and various tools and strategies to facilitate their work with families.** Programs reported having administrative support in place consistent with the legislation authorizing the MIECHV program, which emphasizes that state agencies that receive MIECHV funding should build organizations' capacity to help local home visiting programs deliver intended services.[40] This support included management information systems to allow home visitors and supervisors to monitor service delivery and continuous quality improvement activities designed to improve how services were delivered.

- **At least 80 percent of local programs reported that community service providers were available for all the outcome areas that home visiting programs are accountable for, but they often thought the services were ineffective and often did not have formal agreements with providers.** As one part of a comprehensive system of care for early childhood, home visiting is expected to improve outcomes not only by delivering services directly but also by referring families to other providers in the community, and by coordinating with those providers. The finding that most local programs reported services were available suggests that those programs could refer families to a wide range of services. However, there is room for improvement in this area. While nearly all home visitors who could name a specific service provider thought services were accessible and effective for prenatal care and maternal and child preventive health, one-fourth or more reported that it was not easy to gain access to the services of providers for several areas, including substance use treatment, mental health treatment, child care, and intimate partner violence counseling. In addition, nearly half reported that providers of substance abuse and mental health treatment were not effective. Finally, fewer than half of local programs had formal agreements in place with community service

[40]SEC. 511 [42 U.S.C. 711] (d) (3) (B) (iv).

providers and — depending on the outcome area — about one-third to two-thirds did not have designated points of contact with those providers. Families in home visiting might be better able to take advantage of community services if those ties were more widespread and the services were effective.

- **Local programs used a variety of parenting curricula.** Parenting curricula provide structured guidance to home visitors for their work with parents on positive parenting and child development. The 88 local programs in MIHOPE used several such curricula. The three most common were the Parents as Teachers Foundational Curriculum, Partners in Parenting Education (PIPE), and Partners for a Healthy Baby. Nurse-Family Partnership required its local programs to use PIPE and Parents as Teachers required its local programs to use the Parents as Teachers Foundational Curriculum. A substantial number of Early Head Start, Healthy Families America, and Nurse-Family Partnership local programs recommended or required the Parents as Teachers Foundational Curriculum, while many Early Head Start and Healthy Families America local programs used Partners for a Healthy Baby.

Questions Addressed by This Report

This report presents early evidence from MIHOPE to address the following questions:

- **What are the characteristics of families and local home visiting programs included in the study?** Chapter 2 describes how local programs and families were recruited into the study and discusses some of their characteristics.
- **What are the effects of home visiting programs across the range of outcomes specified in the authorizing legislation?** Chapter 3 addresses this question by comparing the outcomes of the program and control groups in these outcome areas around the time children in the study were 15 months old.
- **Are the effects of home visiting larger among some types of families than for others?** Chapter 4 compares the effects of home visiting among several subgroups of families defined by demographic and psychosocial risk factors such as educational attainment and depression.

- **How do the effects of home visiting programs vary with the features of local programs and the services families receive?** Chapter 5 explores how effects vary across the four evidence-based models and with features of local programs such as the educational backgrounds of home visitors and the supervisory practices programs used. The chapter also examines whether any differences in effects are associated with differences in the home visiting services families received, including the number of home visits they received, the topics mothers discussed with their home visitors, and the referrals home visitors made for services mothers needed.

The final chapter summarizes the findings and discusses their implications for the field of home visiting.

Chapter 2

Local Programs and Families in MIHOPE

This chapter summarizes how local home visiting programs and families were recruited into the Mother and Infant Home Visiting Program Evaluation (MIHOPE), a process that began in 2012 and ended in 2015. It also describes characteristics of the local programs and families at the time they entered the study. This information is provided to help readers understand how the study relates to the Mother, Infant, and Early Childhood Home Visiting (MIECHV) program nationally, and to describe the risk factors faced by families in the study.

Summary of Findings

- **States and local programs chosen for the study reflect a diverse set of mature programs.** After a thorough review of the places where MIECHV funds were being spent in the first few years after the start of the program, MIHOPE chose 88 local home visiting programs across 12 states to participate in the study. Reflecting the criteria used by the study team, the local programs were concentrated in larger metropolitan areas, had a substantial amount of funding outside of MIECHV, and were relatively large.

- **Families faced risks that are associated with poor outcomes for them and their children.** Mothers were fairly young when they joined the study: 35 percent of those in the sample were between the ages of 15 and 20. The majority received some form of public assistance during the month before they entered the study, suggesting that they had low levels of income. More than 40 percent of women had not completed high school. More than 40 percent had depressive symptoms or symptoms of anxiety. Almost one-fifth reported that their relationships with their spouses or partners involved physical violence.

Selection of States and Local Programs for MIHOPE

When local programs were recruited into MIHOPE, states had proposed to use funds from MIECHV to support home visiting in several hundred communities around the country. To allow the study to include a diverse set of local programs and to provide enough statistical precision for the analyses, MIHOPE sought to include about 85 local

programs from 12 states. The study was limited to 12 states to contain the costs of enrolling families and collecting data. This section describes how the study chose states and local programs.

Selection of States

First, the study team reviewed the 2010 and 2011 state MIECHV plans and identified 31 states that were the most likely to contribute the right mix and number of local programs to the study because they met the following initial set of criteria:

- They were planning to implement more than one of the four evidence-based models being studied by MIHOPE. This criterion would help analyses distinguish between the influence of each state and the influence of each evidence-based model. As noted in Chapter 1, the four evidence-based models being studied in MIHOPE are Early Head Start — Home-based option (Early Head Start), Healthy Families America, Nurse-Family Partnership, and Parents as Teachers.
- They were planning to support five or more eligible local programs. Such states were considered a higher priority because they would help the study achieve its goal of choosing about 85 local programs from 12 states.
- They mentioned an intention to serve military families. Since the legislation that created MIECHV includes military families in its list of target populations, and military families were not a group that was commonly targeted by local programs, the study sought to include states whose local programs served such families.[1]

Next, the study team further narrowed the list of eligible states by making a priority of states that would allow the final sample to:

- Represent each of four geographic regions of the United States[2]

[1]Although MIHOPE made a priority of these states, only 1.4 percent of MIHOPE families included a sample member or a spouse or partner who was serving in the military at the time of study enrollment. This percentage is similar to the percentage of military families in the MIECHV program nationally in fiscal year 2017 (3.9 percent).

[2]The major regions were defined using smaller regions defined by the Health Resources and Services Administration (HRSA). The four major regions used in MIHOPE are the Northeast (HRSA regions 1-3), South (HRSA regions 4 and 6), Midwest and Plains (HRSA regions 5 and 7), and Mountain and West (HRSA regions 8-10).

- Include a similar number of local programs for each of the four evidence-based models
- Include some local programs operating in nonmetropolitan areas

The study team next met with a subset of these states to assess each state's progress in implementing MIECHV, including whether other research on home visiting was taking place in the state and the status of decisions regarding MIECHV funding. The study team then expanded discussions to several additional states to ensure the models were about equally distributed and that the local programs were geographically diverse. Those discussions resulted in a choice of 12 states to participate in MIHOPE: California, Georgia, Illinois, Iowa, Kansas, Michigan, Nevada, New Jersey, Pennsylvania, South Carolina, Washington, and Wisconsin.[3]

Selection of Local Programs

MIHOPE's initial goal was to select about 85 local programs evenly distributed across the four evidence-based models. Local programs had to meet several criteria to be included in MIHOPE:

- They had to have been in operation for at least two years when they entered the study. This criterion was designed to allow MIHOPE to examine mature local programs rather than those still working through startup issues.[4]
- They had to be able to recruit enough families to fill program slots and to allow for a randomly chosen control group.
- They had to have more than one MIECHV-funded home visitor so that evaluation activities would be spread across program staff members.
- They had to contribute to the goal of roughly equal representation of the four evidence-based models.
- They could not be operating in "frontier locations," which included both counties with fewer than 2,500 people and urban areas with fewer than

[3]As written in the authorizing legislation, states were required to participate in MIHOPE if they were chosen (SEC. 511 [42 U.S.C. 711] (e) (8) (B)). They were further expected to pass this requirement on to MIECHV-funded local programs.

[4]If a mature local program increased the priority it gave to a specific outcome because of MIECHV, it could have had less experience providing services to achieve that outcome during the period studied in MIHOPE.

20,000 people that were not adjacent to a metropolitan area. These areas were excluded to reduce the costs of recruiting families and collecting information.

In states with more eligible programs than were needed for the study, the study team randomly chose programs to participate, with some weighting toward programs in rural counties where possible.

Overall, 87 local programs entered MIHOPE between October 2012 and February 2014. An eighty-eighth local program was added in December 2014. The study included more than 85 programs to increase the number of families enrolled through Early Head Start programs. Nevertheless, the study included fewer local programs operating Early Head Start (19) than the other three evidence-based models (26 operating Healthy Families America, 22 operating Nurse-Family Partnership, and 21 operating Parents as Teachers). These numbers reflect the number of eligible local programs operating each evidence-based model in the selected states.

Local Program Characteristics[5]

As shown in Table 2.1, the characteristics of the local programs included in MIHOPE reflect the criteria used in their selection. Given the study's requirements for local programs, the home visiting programs participating in MIHOPE are not representative of all MIECHV local programs, although it is not clear how the effects of home visiting where it was studied in MIHOPE would compare with the results for MIECHV as a whole.

Close to 90 percent of local programs in MIHOPE served families in metropolitan counties, which means metropolitan counties are more heavily represented in MIHOPE than in the MIECHV program as a whole.[6] In fiscal year 2017, approximately 50 percent of all MIECHV-served counties were rural.[7] The design of MIHOPE called for selecting programs to represent both urban and rural counties, but it proved to be difficult to include states that funded multiple home visiting models and also funded programs in rural counties. To get states that funded multiple models MIHOPE included many of the most populous states in the country, which limited the

[5]Information on local program characteristics was provided by program managers or the study's site-selection team around the time programs started participating in MIHOPE.

[6]To designate counties as metropolitan or rural, this report follows the Department of Agriculture Economic Research Service's Rural-Urban Continuum Codes classification scheme. See U.S. Department of Agriculture, Economic Research Service (2013).

[7]U.S. Department of Health and Human Services (2017a).

Table 2.1

Basic Characteristics of Local Programs at Study Entry

Characteristic (%)	Local Programs
Type of county served[a]	
Metropolitan	78.4
Rural	13.6
Both	8.0
Type of local implementing agency	
Community-based nonprofit organization	62.5
Local health department	15.9
School district	9.1
Health care organization	5.7
Other[b]	6.8
Years the program had been in operation[c]	
2 to 3	8.0
4 to 5	15.9
6 or more	76.1
Proportion of funding from the MIECHV program	
Less than 20%	46.5
20 to 49%	27.9
50 to 74%	15.1
75% or more	10.5
Enrollment capacity[d]	
50 families or less	12.5
51 to 100 families	27.3
More than 100 families	60.2
Number of home visiting staff members[e]	
1 to 4	19.3
5 to 9	58.0
10 or more	22.7
Number of supervisors[e]	
0	4.6
1	54.6
2 or more	40.9
Sample size	88

(continued)

Table 2.1 (continued)

SOURCES: Calculations based on data from the MIHOPE program manager baseline survey and the MIHOPE site-selection team.

NOTES: Local programs entered MIHOPE between September 2012 and December 2014. Percentages may not sum to 100 because of rounding.

[a]To designate counties as metropolitan or rural, this report follows the Department of Agriculture Economic Research Service's Rural-Urban Continuum Codes classification scheme (Economic Research Service, 2013).

[b]Other types of organizations include state-funded institutions of higher education, local governments and cooperative extensions, universities, social-service nonprofit organizations, Community Action Agencies, and Healthy Families providers.

[c]Years operating the specific evidence-based model are those reported at study entry.

[d]"Enrollment capacity" is the number of families who can be served at any time.

[e]Current staffing combines full-time and part-time employees.

number of counties that were deemed to be rural. Even within the populous states that participated in MIHOPE, some local programs in rural counties were excluded for other reasons. For example, in one state, five local programs in rural counties were deemed to be poor candidates for MIHOPE because they were in small communities, because there were other home visiting programs, or because there was not enough demand for services to provide a control group for the study.

Most local programs that participated in MIHOPE (63 percent) were run by community-based nonprofit agencies; others were implemented by local health departments, school districts, health care organizations, or other types of organizations.

Most local programs (76 percent) had been operating for six or more years when they began participating in the study. This finding reflects the facts that initially states used MIECHV funds primarily to expand existing programs and that MIHOPE required local programs to have been in operation for at least two years.

Programs reported considerable funding from other sources. As might be expected — since most of them had existed for some time before MIECHV — nearly half of the local programs participating in MIHOPE received less than 20 percent of their funding from MIECHV. For about 11 percent of local programs, however, MIECHV provided 75 percent or more of their financial resources.

Most local programs reported enrollment capacity of more than 100 families, and about 80 percent reported having five or more home visitors on staff. MIHOPE was limited to local programs with at least two MIECHV-funded home visitors and the capacity to contribute at least 40 families to the study while still providing a control group. These features probably explain the relatively large size of participating local programs.

Enrolling Families in the Study

The process of recruiting families into the study involved both local home visiting programs and the study team. The process began when a local home visiting program identified a woman who was eligible and interested in receiving home visiting services. A staff person from the local program entered information about the woman into an online system maintained by the study team. This information — including the woman's age, the gestational age or age of the child, and her contact information — was used by the team to verify that the family was eligible for the study and was not already participating in it.[8] The local program could also indicate if it thought a family was not eligible for the study and why. In addition, each local program could exempt from the study a number of families equal to 5 percent of the target sample for that local program (for example, a local program could exempt 3 families if its goal was to recruit 60 families for the study). These exemptions ensured that the families who received them would not be randomly assigned to the control group; they were intended to allow local programs to serve families who were thought to be at especially high risk. The local programs collectively exempted 205 families.

Once a family was determined to be eligible for the study, the study team used the contact information entered into the online system to locate the family and schedule an in-person appointment to explain the study and to obtain informed consent.[9] Of 6,231 eligible families entered into the online system, 4,229 (68 percent) consented to be in the study, while 572 (9 percent) declined to provide consent, 1,402 (23 percent) could not be located within two weeks, and another 27 (0.4 percent) fell into another category, such as not being able to provide consent in English or Spanish. In addition, one family withdrew from the study between completing the baseline survey and random assignment. All families who were eligible for the study were assigned at random to the home visiting program or to the control group, even if they did not consent to be in the study. However, only women who provided consent were asked to participate in study activities, including answering baseline and follow-up surveys, allowing the study team access to their families' administrative records, and allowing the team to make contact with them when their children were 15 months old to collect information on family outcomes. The likelihood of receiving services therefore did not depend on agreeing to participate in the study. This practice ensured that families did not have an incentive to opt out of

[8]As discussed in Chapter 1, to be eligible for MIHOPE women had to be at least 15 years old, had to be pregnant or have a child less than 6 months old, had to speak English or Spanish well enough to provide informed consent, and could not already be receiving home visiting services for another child. "Gestational age" means how many weeks along the mother was in her pregnancy.

[9]For eligible minors, the team sought to obtain assent from the minor and consent — either written or verbal — from the minor's parent.

the study (which they might have had if those who opted out were guaranteed access to the home visiting program) but also ensured that they did not feel compelled to agree to study activities (as they might have if being in the study were the only way to receive home visiting services).

After consent was obtained, women completed a one-hour phone survey.[10] The evening after the survey was completed, the local program was sent an email indicating the family's assignment.[11]

As soon as it received that email, the local program could initiate home visiting services with families assigned to the program group and provide a list of other relevant services in the community to control group members.[12] The study team gave each local program discretion in developing the list of other relevant services for the control group, but the list could not include other evidence-based home visiting services in the community. It could include non-evidence-based home visiting services.

Characteristics of Families in MIHOPE

Understanding the characteristics of the women in the MIHOPE sample when they entered the study makes it possible to place the sample in a broader context, to compare their levels of risk factors with those of other women (and other low-income women) in the United States, and to begin to understand the extent to which home visiting programs have an opportunity to ameliorate their risks.

Table 2.2 displays selected characteristics of families in the MIHOPE sample when they entered the study, providing some demographic information about the sample and highlighting a mixture of risk factors and protective factors across all the domains home visiting programs seek to affect. Because most children in the study had not been born when their mothers entered the study, child characteristics are not shown in Table 2.2. The characteristics in Table 2.2 are shown for the total sample and separately for

[10]This survey and all other data-collection instruments used in MIHOPE were approved by the federal Office of Management and Budget and can be found on its website. See Office of Information and Regulatory Affairs (n.d.).

[11]For women who did not provide consent but were eligible for the study, the team sent the local program information on whether each woman was assigned to the home visiting program or the control group the evening after that woman did not provide consent.

[12]Local programs varied in how they provided this list to control group members — with some mailing the list and some calling — and in how much information was included on the list.

Table 2.2

Selected Characteristics of Families in the MIHOPE Sample at Study Entry, by Pregnancy Status

Characteristic	Pregnant	Not Pregnant	Total	P-Value
First-time mother (%)	69.1	41.6	60.0	0.000
Maternal average age (years)	22.9	25.3	23.7	0.000
Maternal race and ethnicity (%)				0.000
Mexican origin	24.9	21.4	23.7	
Other Hispanic	13.2	10.6	12.3	
Non-Hispanic white	23.5	32.0	26.3	
Non-Hispanic black	28.7	28.1	28.5	
Other or multiracial	9.7	7.9	9.1	
Language other than English spoken in the home (%)	38.1	34.2	36.8	0.014
Biological father in the home (%)	39.0	49.0	42.3	0.000
Less than a high school diploma or equivalent (%)	43.2	39.4	41.9	0.019
Mother employed during the past three years (%)	78.6	82.4	79.9	0.004
Food insecurity (%)	54.7	54.8	54.7	0.946
Received any public assistance during the past month (%)				
Supplemental Nutrition Assistance Program	55.4	66.4	59.1	0.000
Disability insurance	18.4	16.1	17.6	0.066
Temporary Assistance for Needy Families	17.8	24.6	20.1	0.000
Women, Infants, and Children	68.3	86.7	74.4	0.000
Health insurance coverage for the mother (%)	92.0	89.7	91.2	0.018
Substance use before pregnancy (%)	33.5	28.1	31.7	0.000
Maternal symptoms of depression or anxiety (%)	45.4	36.5	42.5	0.000
Presence of physical intimate partner violence (%)	20.2	17.6	19.3	0.041
Experience with battering (%)	5.0	5.9	5.3	0.236
Sample size	2,824	1,391	4,215	

SOURCES: Calculations based on the MIHOPE family baseline survey, state birth records, and Medicaid enrollment data.

NOTES: Distributions may not add to 100 percent because of rounding.

To assess differences between pregnant and nonpregnant women, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

women who were pregnant and for those who had already given birth, since women who enroll in home visiting when they are pregnant face different challenges and have different needs than those who enroll after giving birth.

Three additional tables showing baseline characteristics are included in Appendix A. Appendix Table A.1 compares the program and control groups across a more extensive set of characteristics (including some child characteristics) and indicates that random assignment resulted in program and control groups that were evenly matched. Appendix Table A.2 shows baseline characteristics separately for women who enrolled

in MIHOPE through each evidence-based model. Appendix Table A.3 shows baseline characteristics for first-time mothers and for those who already had children.

Demographics and Household Composition

The women in the MIHOPE sample are racially and ethnically diverse, were young when they entered the study, and reflect the study's eligibility criteria in expected ways.

As noted, women were eligible for MIHOPE if they were pregnant or had children less than 6 months old. More than two-thirds of the women in the sample were pregnant when they entered the study, though this proportion varied among the evidence-based models: 100 percent of women enrolled through Nurse-Family Partnership were pregnant when they entered the study (enrolling before the twenty-eighth week of pregnancy is an eligibility criterion for Nurse-Family Partnership) and approximately half of the women enrolled through Early Head Start, Healthy Families America, and Parents as Teachers were pregnant when they entered the study.

Women were young when they entered the study, and women who were pregnant when they entered the study tended to be younger than those who had already given birth. Almost two-thirds of the women were less than 25 years old, and 35 percent were less than 21 years old.[13] Sixty percent were first-time mothers, but this proportion varied among models, from 32 percent for Early Head Start to 36 percent for Parents as Teachers to 54 percent for Healthy Families America to 99 percent for Nurse-Family Partnership (being a first-time mother is an eligibility criterion for Nurse-Family Partnership).

The MIHOPE sample is racially and ethnically diverse; about a third of the women in the sample are Hispanic, a little more than a quarter are non-Hispanic black, and a little more than a quarter are non-Hispanic white.[14] In terms of language abilities,

[13]In contrast, 16 percent of women enrolled in MIECHV in fiscal year 2017 were under age 20, although MIECHV enrollees might be older than women in the MIHOPE sample because (1) some evidence-based home visiting programs enroll women with children who are older than the children in the MIHOPE sample; (2) some MIECHV caregivers might not be biological mothers, unlike the MIHOPE sample members; and (3) the age of MIECHV enrollees was not measured when they enrolled in home visiting programs. Similarly, only 15 percent of MIECHV households in fiscal year 2017 included an individual who was pregnant and under 20 years old, compared with the 28 percent of MIHOPE sample members who were pregnant and under 21 when they entered the study.

[14]Similarly, almost a third of all MIECHV participants were Hispanic in fiscal year 2017. While 31 percent of MIHOPE sample members are black or African American (including those who indicated they are Hispanic) and 37 percent are white (including Hispanic whites), MIECHV served about 28 percent black or African American families and about 58 percent white families in fiscal year 2017.

more than a third reported a language other than English being spoken in their homes. Most of these women reported being proficient in English, and more than half of them chose to take the English version of the baseline survey. (Women were eligible for the study only if they were proficient enough in English or Spanish to respond to data-collection efforts in one of these languages).

In terms of social support, most of the women (81 percent) lived with at least one other adult at the time they entered the study. About 40 percent lived with the biological fathers of their children, and about half lived with other adult relatives. More than two-thirds reported having spouses or partners (not shown in Table 2.2). Younger women were less likely to live with the biological fathers of their children, and more likely to live with other adult relatives (women who were pregnant were also less likely to live with the biological fathers of their children than women who had already given birth).[15]

Risk Factors

The next section of this chapter describes characteristics of MIHOPE women in three of the outcome areas the MIECHV program is designed to affect according to the authorizing legislation.[16] Research has documented the links between limited economic resources, maternal mental health issues, and intimate partner violence on the one hand, and on the other negative effects on child well-being (including negative effects on child health, cognitive development, academic achievement, and social and emotional development).[17]

Economic Self-Sufficiency

More than three-quarters of the women in the study had been employed at some point during the three years before they entered the study, but only 25 percent reported that they were working at the time they entered the study. This level of current

[15]Among women in the study sample, rates of living with a biological father increase and rates of living with another relative decrease with age. Fifteen percent of women ages 15 to 17, 35 percent of women ages 18 to 20, and 50 percent of women 21 and over reported living with the biological father of their child. Ninety-five percent of women ages 15 to 17, 70 percent of women ages 18 to 20, and 33 percent of women 21 and over reported living with another adult relative.

[16]As indicated earlier in the chapter, characteristics related to child functioning and parenting are not discussed in this section because most of the children in the MIHOPE sample had not been born when their mothers entered the study.

[17]Duncan and Brooks-Gunn (2000); Aber, Bennett, Conley, and Li (1997); Eamon (2001); Glover (2011); Mulder et al. (2002); Van den Bergh and Marcoen (2004); Davis et al. (2004).

employment is not unexpected given the sample's youth and how close women were to a recent or upcoming birth.

Forty-two percent of the women in the sample did not have high school diplomas. Older women in the sample were more likely to have completed high school. Not surprisingly, only 3 percent of the women ages 15 to 17 had high school diplomas, compared with almost 60 percent of the women ages 18 to 20 and almost 70 percent of the women ages 21 and over.

Information on household income is not included in Table 2.2 because the study was not able to obtain a reliable measure of income at study entry.[18] However, during the month before they entered the study, nearly 75 percent of women in the sample were receiving benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), which suggests that at least three-quarters of them had incomes that fell below 185 percent of the U.S. Poverty Income Guidelines.[19] More than half were enrolled in the Supplemental Nutrition Assistance Program (SNAP) and fewer than a quarter were enrolled in Temporary Assistance for Needy Families or disability insurance (Supplemental Security Income or Social Security Disability Insurance) in the month before they entered the study.

Though many sample members participated in SNAP and WIC, those programs might not cover all of a household's food needs and more than half of the women reported that their households had experienced food insecurity in the past year.[20] Of those who reported receiving SNAP in the month before they entered the study, almost 60 percent reported experiencing food insecurity at some point during the past year.[21]

[18]Women were not asked directly about household income. Instead they were asked to report separately on their own earnings, on the income of other household members, and on income they received from all other sources. Because of the way the question was worded, women may have included their own earnings when asked about other sources.

[19]To be eligible for WIC, an applicant's gross income must fall at or below 185 percent of the U.S. Poverty Income Guidelines. In 2015, 185 percent of the poverty guidelines ranged from $29,471 for a family of two to $44,863 for a family of four. See U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (2015).

[20]Food insecurity was defined as worrying about food or actually having food run out in the year before they enrolled in MIHOPE.

[21]Because the measures used two different time periods, it is possible that women experienced food insecurity before they began receiving SNAP or WIC benefits.

Maternal Health

Table 2.2 provides several pieces of information related to maternal health: whether a woman had health insurance when she entered the study, her substance use before pregnancy, and whether she had depressive symptoms or symptoms of anxiety.

More than 90 percent of the women in the sample had health insurance. Rates of health insurance coverage varied by state (ranging from 72 percent to 98 percent), although in 8 of the 12 study states over 90 percent of the women in the sample had health insurance.

This rate of health insurance coverage is higher than national estimates of coverage for women living in poverty (78 percent) or for women with less than a high school education (76 percent).[22] The coverage rate may reflect the pregnancy status and recent births of the MIHOPE sample; the Centers for Disease Control Pregnancy Risk Assessment and Monitoring System shows that 3 percent of pregnant women nationally lack health insurance, increasing to 14 percent after women give birth.[23] In the MIHOPE sample, slightly higher percentages of pregnant women had health insurance than did women who had already given birth.

Fewer than a third of the women in the sample reported substance use before pregnancy, a category that includes having seven or more drinks in a week (heavy drinking), consuming four or more drinks in one sitting at least once (binge drinking), or using drugs illicitly (either by using illegal drugs — including marijuana — or by misusing prescriptions). Illicit drug use was reported by 13 percent of the women in the sample, which is higher than the national estimate of illicit drug use for women of any age (9 percent), but lower than the rates for women 18 to 25 years old (almost 60 percent of the MIHOPE sample is 18 to 25 years old).[24] Binge drinking was reported by 24 percent of the sample, which is slightly higher than the 18 percent of women of childbearing age who are estimated to have engaged in binge drinking in the past 30 days.[25]

More than 40 percent of the women in the sample reported either depressive symptoms (38 percent) or symptoms of anxiety (23 percent).[26] Reports of depressive

[22]Kaiser Family Foundation (2017).

[23]Centers for Disease Control and Prevention (2018).

[24]The rate for women 18 to 25 years old is 20 percent. See Center for Behavioral Health Statistics and Quality (2017).

[25]National statistics in this paragraph are from Tan et al. (2015).

[26]A woman was deemed to have depressive systems if she scored 8 or higher on a 10-item version of the Center for the Epidemiological Studies-Depression scale. See Kohout, Berkman, Evans, and Cornoni-Huntley (1993). She was deemed to have anxiety symptoms if she scored 10 or higher

symptoms are higher than national estimates of depression during pregnancy (40 percent in MIHOPE compared with 14 percent to 23 percent among pregnant women in the United States).[27] The prevalence of depressive symptoms among MIHOPE mothers is instead comparable to those found in smaller, community-based studies of low-income, pregnant women.[28]

Intimate Partner Violence

About one-fifth of women reported experiencing or perpetrating acts of physical intimate partner violence, though more than twice as many reported perpetrating physical violence as reported experiencing physical or sexual violence (18 percent compared with 7 percent).[29] About 5 percent of women reported experiences with battering.[30]

The rate of physical victimization in the MIHOPE sample is higher than the overall rate of experiencing intimate partner violence for a national sample before pregnancy or during pregnancy (about 3 percent) but is similar to the rates estimated for the lowest-income group in that national sample (6 percent to 7 percent).[31]

Cumulative Risk

Though it is informative to understand the levels of each of the risk factors and protective factors present in MIHOPE families when they entered the study, it is also useful to understand the cumulative levels of stress families experienced. In recent years, members of the public health community have grown more and more interested in documenting how early life experiences — particularly stressful events — shape children's development, because these experiences may harm children's long-term health and well-being. For example, the Adverse Childhood Experiences study investigated

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on the Generalized Anxiety Disorder seven-item scale. Copyright © (2019) American Medical Association. All rights reserved. See Spitzer, Kroenke, Williams, and Löwe (2006). Although these scores are not based on clinical assessments, validation studies have found that measures of depressive and anxiety symptoms are moderately to highly correlated with clinical diagnoses. See Eaton, Neufeld, Chen, and Cai (2000); Kroenke, Spitzer, Williams, and Löwe (2010).

[27]American College of Obstetricians and Gynecologists (2017).

[28]Chung et al. (2004).

[29]Physical violence was measured using items from the Revised Conflict Tactics Scale. See Straus, Hamby, and Warren (2003). Women were considered to have perpetrated or experienced physical violence if they reported violent acts occurring with their current partners during the past year.

[30]Experience with battering was measured using a short form of the Women's Experience with Battering scale. See Smith, Earp, and DeVellis (1995).

[31]Centers for Disease Control and Prevention (2018); Pregnancy Risk Assessment Monitoring System (PRAMS) Data Portal (2018).

these links between early experiences and later life experiences using questionnaires of adults enrolled in a large health maintenance organization.[32] The study collected information on different categories of adverse childhood experiences including abuse (physical, sexual, or psychological), having a mother who was treated violently, living with substance abusers, living in households with mentally ill or suicidal people, and living with people who had been imprisoned. By linking reports of adverse early life experiences to indicators of current health and well-being, the Adverse Childhood Experiences study demonstrated that as the number of negative experiences in childhood increases, the risk for a number of problems in adulthood (such as alcoholism and alcohol abuse, depression, poor health-related quality of life, illicit drug use, and smoking) also increases.

Since the original Adverse Childhood Experiences study, researchers have used various categories to create a cumulative measure of adverse childhood experiences. For MIHOPE, a child risk index was calculated based on women's reports of current adverse experiences in their families. The risk index includes physical intimate partner violence (experienced or perpetrated), maternal substance use, maternal mental health issues, parents living separately, low levels of maternal education, and maternal arrests in the past year. More than half of families reported two or more of these risk factors, which suggests a high level of risk for poor outcomes among their children.

Conclusion

MIHOPE enrolled a selection of local programs that represented every region of the country and provided nearly equal representation for each of the four evidence-based models being studied. Most of the local programs that participated in MIHOPE were relatively large, operated in urban areas, and had been operating for six or more years.

The levels of risk factors and sources of stress present among women in the MIHOPE sample when they entered the study suggest that home visiting programs had opportunities to assist families, particularly to ameliorate women's low levels of education and employment (and high rates of public assistance) and higher-than-average rates of depressive symptoms. Local programs also had the opportunity to address risk factors that affected a somewhat smaller proportion of families when they entered the study, such as intimate partner violence.

With this background in mind, the next chapter presents the estimated effects of home visiting programs for the full MIHOPE sample.

[32]Felitti et al. (1998).

Chapter 3

Estimated Effects for the Full Sample

This chapter presents the effects of the home visiting programs that participated in the Mother and Infant Home Visiting Program Evaluation (MIHOPE) for the full study sample. Results are based on information collected from and about families through the time the child was about 15 months old and include most outcome areas that the legislation that authorized the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program indicated the program should affect, including:[1]

- Prenatal, maternal, and newborn health
- Child health and development, including child maltreatment
- Parenting skills
- Crime or domestic violence
- Family economic self-sufficiency
- Referrals and service coordination

The next chapter investigates how the effects vary across subgroups of families, while Chapter 5 explores whether there is variation in effects related to the features of local home visiting programs (including which evidence-based model they implement) and the amount and intensity of services families receive.

As described in Chapter 1, the study randomly assigned families to either a program group or a control group to provide rigorous estimates of the effects of access to home visiting on the outcome areas shown above. Control group members were given information on other community services, and the study made a priority of locations where control group members would be less likely to have access to evidence-based home visiting services. Thus, comparing the outcomes of the program and control groups provides an estimate of the effects of access to evidence-based home visiting programs compared with providing information on other community services.

[1]SEC. 511 [42 U.S.C. 711] (d) (2) (B). The legislation also indicated the program should improve school readiness and academic achievement, but children in MIHOPE were too young to provide information on that area in the current report.

The chapter presents effects on a broad set of outcomes because the legislation that authorized MIECHV indicated these areas should be improved by the program and because the evidence-based models and local programs collectively indicated they placed a high priority on them.[2] To focus the analysis on areas where home visiting programs were likely to have their greatest short-term effects, the study team chose 12 outcomes based on the evidence of effects from the four evidence-based models included in MIHOPE that existed before the analysis began, the policy relevance of those outcomes, and quality of the tools available to measure the outcomes. Following the terminology used in a report written for the Institute of Education Sciences, the 12 outcomes are considered "confirmatory."[3] The 12 confirmatory outcomes (listed with their outcome areas) are:

- New pregnancy after study entry (maternal health)
- Mother receiving education or training (family economic self-sufficiency)
- Quality of the home environment (parenting skills)
- Parental supportiveness (parenting skills)
- Frequency of minor physical assault toward the child during the past year (child maltreatment)
- Frequency or psychological aggression toward the child during the past year (child maltreatment)
- Health insurance coverage for the child (child health)
- Number of Medicaid-paid well-child visits (child health)
- Number of Medicaid-paid child emergency department visits (child health)
- Any Medicaid-paid child health encounter for injury or ingestion (child health)
- Child behavior problems (child development)

[2]Statements in this chapter about the priorities of the evidence-based models and local programs are based on information reported in Duggan et al. (2018).

[3]Schochet (2008).

- Child receptive language skills (child development)

The chapter also presents results for several dozen exploratory outcomes.[4] The exploratory outcomes fall into two broad categories. Some had rarely been examined in past studies of the four evidence-based models or had been examined but had rarely shown improvements.[5] Home visiting might have had an effect on them during the study period because home visiting services have evolved, particularly since home visiting programs now emphasize a broader set of outcome areas than they have in the past.[6] Maternal depression is an example of this type of outcome. Past studies have not found significant improvements in maternal depression, but home visiting programs have increasingly recognized maternal mental health as an important area to address. Because previous studies have not found effects in these areas, positive findings related to exploratory outcomes should be treated more cautiously and may warrant additional research. In addition to these outcomes, several exploratory outcomes are presented because they may help explain findings for the confirmatory outcomes.

The chapter is organized as follows:

- It begins by reviewing evidence from past studies of the four evidence-based models. This review provides context for MIHOPE's findings.
- Next it discusses the level of services received by the program and control groups. The study is likely to find effects on family outcomes only if program group families received more home visiting services than control group families.
- Finally, the chapter presents effects by domain in the following order: (1) maternal health, (2) family economic self-sufficiency, (3) intimate partner violence,[7] (4) parenting, (5) child maltreatment, (6) child health, and (7) child development.

[4]The exploratory outcomes are too numerous to list here. Please see Appendix B for a complete list and descriptions of all the confirmatory and exploratory measures.

[5]In the areas of parenting and child development, several exploratory outcomes are subscales of confirmatory outcome scales that can shed light on the confirmatory findings.

[6]Michalopoulos et al. (2015).

[7]The authorizing legislation refers to domestic violence, which has historically referred to violence in marital relationships. MIHOPE examined intimate partner violence, which refers to violence in the broader set of intimate relationships.

Summary of Findings

- **There are positive effects for families, but most estimated effects are similar to but somewhat smaller than the average effects found in past studies of the four evidence-based models**. Estimated effects are statistically significant for 4 of the 12 confirmatory outcomes: the quality of the home environment, the frequency of psychological aggression toward the child during the past year, the number of Medicaid-paid child emergency department visits, and child behavior problems.[8] Overall, for 9 of the 12 confirmatory outcomes program group families fared better than control group families on average, which is unlikely to have occurred for the study sample if the home visiting programs had no true effects on family outcomes.[9] However, no outcome or outcome area stands out as having consistently large effects.[10] For most outcomes, the effects are similar to but slightly smaller than the average effects found in past studies of the evidence-based models, although it is important to note that MIHOPE differs from those studies in many respects. For example, most of those studies were conducted in a single local area rather than including locations across the country, and some were conducted many years ago, when similar services were less likely to be available to control group families. In addition, the prior studies were conducted of individual models that may have focused on outcomes where the impacts were expected to be largest.

- **Most estimated effects are not statistically significant**. Although the results suggest that families are benefiting from MIECHV-funded

[8]Consistent with the study's design and analysis plan, the 10 percent significance level is used in this report. See Michalopoulos et al. (2013). The study's analysis plan as reviewed by an advisory committee to the Secretary of Health and Human Services is available online. See U.S. Department of Health and Human Services (2016b). The study was also registered at ClinicalTrials.gov.

[9]A statistical test of the number of outcomes for which estimated effects would be positive resulted in a p-value of 0.096 for having 9 or more positive findings out of 12, meaning there is less than a 10 percent probability that this pattern of results would have resulted if home visiting had no effect on any of the 12 outcomes. A statistical test suggested by Caughey, Dafoe, and Seawright (2017) that takes into account the magnitude of the estimated effects has a p-value of 0.025, meaning there is a 2.5 percent probability this pattern of results would have been found if home visiting had no effects on the 12 outcomes. Neither test was prespecified in the study team's analysis plan.

[10]As shown in Appendix D, after adjusting for the number of confirmatory outcomes, the estimated effects were no longer statistically significant. This finding reduces the study team's confidence in the estimated effects for any one outcome.

home visiting services, it is important to note that only about one-third of the confirmatory outcomes and one-third of the exploratory outcomes showed effects that were statistically significant. In addition, only one of the 67 estimated effect sizes is greater than 0.20, a level sometimes used as a threshold for considering an effect to be small.[11] (An effect size is a standardized measure of effect that is not sensitive to the scale of the outcome measure and is most commonly used when the outcome does not have a natural unit.)

- **Results for several exploratory outcomes suggest home visiting may improve maternal health**. MIHOPE found improvements in women's general health, increases in health insurance coverage, and reductions in symptoms of depression (although program group mothers were also more likely to say they had abused drugs or alcohol in the recent past). Improving maternal mental health may be especially important since it could result in improvements in many other areas such as child development and economic self-sufficiency.

- **Home visiting may reduce household aggression.** The results also suggest home visiting services reduce household aggression, which could have wide-ranging, long-term implications. For example, there are statistically significant effects on the frequency of psychological aggression toward children during the past year (a confirmatory outcome) as well as mothers' experience with intimate partner violence and mothers' use of domestic violence services (exploratory outcomes). This effect is consistent with other significant effects on other exploratory outcomes, such as those on parental depression (discussed above), parental stress, and parental discipline using gentle guidance. Reduced household aggression and improved parenting behaviors could also help explain observed reductions in child behavior problems (a confirmatory outcome). Because (as discussed in the previous chapter) adverse childhood experiences such as child abuse and intimate partner violence have been shown to be associated with negative long-term outcomes, reducing household aggression could benefit children as they grow older.

[11]Cohen (1988).

Past Evidence on the Study's Confirmatory Outcomes

Table 3.1 summarizes the evidence for the study's 12 confirmatory outcomes from studies that preceded the current analysis and were for families with children two years or less or had follow-up data collection over no more than two years. The table shows the evidence-based models for which the outcome has been studied, the number of estimates that are available across studies and the number that were statistically significant and favorable,[12] the average effect in those studies,[13] and the range of estimates. Details on the individual findings are provided in Appendix Table E.1. Results are presented as effect sizes, which as a standardized measure makes it easier to compare results across outcomes or studies.

Although this evidence provides some context for interpreting findings in MIHOPE, there are several differences between MIHOPE and the studies summarized here. First, most of the studies were published more than 10 years ago (and some more than 30 years ago). Home visiting programs have evolved over time — in part in response to the MIECHV program — and the service environment available to families who are not in home visiting programs has also changed over time. Both of these changes might alter the relative effectiveness of early childhood home visiting. Second, the studies summarized here were of individual home visiting models and thus could focus on outcomes that were hypothesized to be affected by those models, whereas MIHOPE examined the same outcomes across the four evidence-based models, even if some outcomes had not been emphasized historically by a model. The studies were also smaller than MIHOPE, which can result in substantial variation in results across studies.

A brief discussion of each outcome follows. The summaries highlight studies where estimated effects were statistically significant, although as indicated in Table 3.1 most estimated effects in these studies are not statistically significant.

Maternal Health

- **New pregnancy after study entry.** Studies of Nurse-Family Partnership in Memphis and Denver have found statistically significant reduc-

[12]Although this report uses the 10 percent significance level in drawing inferences about the effects of MIHOPE, a 5 percent significance level was used in compiling the information in Table 3.1 because some studies did not provide enough information to determine whether the estimated effect was significant at the 10 percent level.

[13]The average is weighted by the study's sample size.

Table 3.1

Summary of Evidence from Past Studies on Confirmatory Outcomes Through Children's First Two Years

Outcome	Models Examined	Number of Significant and Favorable Effects	Average Effect Estimate	Range	
				Smallest Estimate	Largest Estimate
Maternal health (%)					
New pregnancy after study entry	H, N, P	2 out of 9	-0.07	-0.25	0.02
Family economic self-sufficiency (%)					
Receiving education or training	E, H	2 out of 5	0.14	0.05	0.70
Parenting					
Quality of the home environment	E, H, N, P	4 out of 15	0.11	-0.09	0.88
Parental supportiveness	E, H, N, P	0 out of 8	0.09	-0.11	0.19
Child maltreatment					
Frequency of minor physical assault during the past year	H	2 out of 5	-0.08	-0.18	-0.02
Frequency of psychological aggression during the past year	H	3 out of 5	-0.11	-0.20	-0.03
Child health					
Health insurance coverage for the child (%)	H, P	2 out of 5	0.03	-0.13	0.19
Number of Medicaid-paid well-child visits	H, N	1 out of 4	0.04	-0.05	0.39
Number of Medicaid-paid child emergency department visits	H, N	2 out of 4	-0.08	-0.24	-0.04
Any Medicaid-paid health care encounter for injury or ingestion (%)	E, H, P	0 out of 7	-0.03	-0.20	0.11
Child development					
Behavior problems	E, H, N	2 out of 9	-0.08	-0.36	0.09
Receptive language skills	E, H, N, P	0 out of 11	0.06	-0.02	0.14

SOURCE: MDRC summary of past research.

NOTES: E = Early Head Start — Home-based option, H = Healthy Families America, N = Nurse-Family Partnership, P = Parents as Teachers.

Results were also included if the analysis indicated the follow-up period was two years or less.

tions in the number of pregnancies women had within 24 months of the pregnancy that made them eligible for the program.[14] Such increases in birth spacing can have long-term implications for maternal and child health, health care system expenditures, and family self-sufficiency. Studies of the other evidence-based models — mostly of Healthy

[14]Olds et al. (2002); Kitzman et al. (1997).

Families America and Parents as Teachers — have looked at this outcome but found small effects.[15]

Family Economic Self-Sufficiency

- **Currently receiving education or training.** Improvements in this outcome may precede improvements in employment, earnings, and income. Studies of Early Head Start — Home-based option (Early Head Start) and Healthy Families America have found statistically significant improvements in this outcome with effect sizes as large as 0.70 standard deviations (or about 28 percentage points), although the effects were smaller in three other studies of the two models.[16] Other possible measures of economic self-sufficiency, such as employment and earnings, have been studied extensively for mothers with children under 2 years old, but the effects observed have been small and generally not statistically significant.

Parenting

- **Quality of the home environment.** The quality of the home environment present in early childhood is one of the most examined outcomes in the home visiting literature. It is typically measured using the Infant-Toddler Home Observation for Measurement of the Environment (IT-HOME) scale.[17] This measure assesses the cognitive stimulation and emotional support that infants and toddlers receive through their home environment, family surroundings, and planned events.[18] A family's IT-HOME total score has been linked to children's cognitive development,[19] and its parental warmth and learning and literacy subscales,

[15]Mitchell-Herzfeld et al. (2005); El-Kamary et al. (2004); Wagner, Clayton, Gerlach-Downie, and McElroy (1999); Duggan et al. (2005).

[16]Landsverk et al. (2002); LeCroy and Krysik (2011); Love et al. (2001); Chazan-Cohen, Raikes, and Vogel (2013). All results for Early Head Start in Table 3.1 and Appendix Table E.1 are for the home-based option.

[17]Caldwell and Bradley (1984). The IT-HOME is a version of the HOME used for families with infants and toddlers. The Home Visiting Evidence of Effectiveness (HomVEE) review, which was the main source on evidence of the effects of home visiting discussed in this section, did not always indicate which version of the HOME was used in a study. Since this section is summarizing evidence from HomVEE only for children 2 years of age and younger, it assumes that the studies cited used the IT-HOME.

[18]Linver, Brooks-Gunn, and Cabrera (2004).

[19]Bradley et al. (1989); Totsika and Sylva (2004).

conceptually derived by Linver and colleagues,[20] have been positively associated with children's cognitive and language development.[21] There is less evidence that the total score predicts children's behavior or social-emotional development, although the lack of hostility, parental warmth, and learning and literacy subscales do.[22] Studies of all four evidence-based models have found statistically significant effects on the IT-HOME total score, including an evaluation of Early Head Start at two years,[23] a study of Healthy Families America at one year,[24] a study of Nurse-Family Partnership at two years,[25] and a study of Parents as Teachers at one year (but not at two years).[26] Most estimated effects from studies of these models have not been statistically significant.

- **Parental supportiveness.** Parental supportiveness was measured in MIHOPE using the Three Bags task, a video-recorded interaction between a mother and her child. In the task, participants are given three bags of objects such as board books and building blocks, and asked to play with the toys in sequence for 10 minutes. The task and various adaptations of it have been successfully administered and coded in a variety of large-scale experimental and longitudinal studies of toddlers,[27] including the national evaluation of Early Head Start,[28] which found a statistically significant estimated effect. The effect size was 0.14 for the home-based option (see Appendix Table E.1), which is reasonably large for this type of measure and intervention and large enough to produce a statistically significant estimated effect in MIHOPE.[29] Studies of the other three evidence-based models have examined the quality of the mother-child interaction using the Nursing

[20]Linver, Brooks-Gunn, and Cabrera (2004);

[21]Fuligni, Han, and Brooks-Gunn (2004).

[22]Fuligni, Han, and Brooks-Gunn (2004); McFarlane, Dodge et al. (2010).

[23]Love et al. (2001). Early Head Start results in this section are only for the home-based option of the program.

[24]Chambliss (1998).

[25]Kitzman et al. (1997).

[26]Wagner, Cameto, and Gerlach-Downie (1996).

[27]Vandell (1979); National Institute of Child Health and Early Development Early Child Care Research Network (1997); National Institute of Child Health and Early Development Early Child Care Research Network (1999); Andreassen and Fletcher (2007).

[28]Ware et al. (1998); Brady-Smith et al. (1999).

[29]Love et al. (2001).

Child Assessment Tools (NCAST) Teaching Scale total score,[30] a measure that is conceptually similar to the parental supportiveness composite scale used in MIHOPE. However, previous studies of Healthy Families America, Nurse-Family Partnership, and Parents as Teachers have not found statistically significant estimated effects on the quality of mothers' interactions with their children using the NCAST.[31]

Child Maltreatment

- **Frequency of minor physical assault.**[32] This measure is based on parent reports using the Conflict Tactics Scale: Parent-Child version (CTSPC); it is the number of times over the past year that the mother engaged in behaviors such as spanking, pinching, or hitting on the bottom with a hard object. These behaviors may be direct targets of home visiting programs. They can also be precursors to more serious acts of maltreatment later in children's lives.[33] The frequency of minor physical assault has been examined in studies of Healthy Families America, with two statistically significant effects found among five estimates.[34] The average reduction in the frequency of minor physical assault found across the studies is an effect size of 0.08.

- **Frequency of psychological aggression.** This measure covers behaviors such as yelling, screaming, or swearing at a child, or calling the child names in the past year. It is also derived from the CTSPC. Psychological aggression has been commonly examined in studies of Healthy Families America, and statistically significant improvements in psychological aggression have been found in three such studies.[35] The

[30]Barnard (1994).

[31]Duggan et al. (1999); Landsverk et al. (2002); Caldera et al. (2007); Kitzman et al. (1997); Wagner and Spiker (2001).

[32]The prevalence of physical assault (that is, the percentage of parents who ever engaged in the behavior) has also been examined a number of times in studies of Healthy Families America. None of the studies with follow-up periods of 2 years or less found statistically significant estimated effects. MIHOPE analyzed the *frequency* of minor physical assault and psychological aggression because more studies found favorable effects on frequency (number of occurrences) rather than prevalence (the percentage who ever engaged in the behavior once).

[33]Lee, Grogan-Kaylor, and Berger (2014).

[34]Landsverk et al. (2002); Duggan et al. (2007); DuMont et al. (2008).

[35]Landsverk et al. (2002); Duggan et al. (2007); DuMont et al. (2008).

average reduction in the frequency of psychological aggression found across the studies is an effect size of 0.11.

Child Health

- **Health insurance coverage for the child.** Although this measure has not often been examined, two studies of Healthy Families America found statistically significant effects on whether children had health care coverage.[36] These findings suggest that home visiting programs may be able to help families obtain insurance coverage for their children. Insurance coverage makes health care services affordable for families, and should in principle increase families' use of preventive health care services and screenings.[37]

- **Number of well-child health care visits.** Although all four evidence-based models place a high priority on promoting child preventive care, there is weak evidence that home visiting has an effect on well-child visits in the first two years. Of the four evidence-based models, only Healthy Families America has been found to increase the number of well-child visits among children.[38]

- **Number of child emergency department visits.** Home visiting may decrease families' emergency department visits in several ways: by encouraging regular preventive care, by connecting families to medical homes, and by teaching parents about self-care so that they understand better when they can care for their children and when they should take them to the hospital.[39] In addition, home visiting may reduce injuries due to child maltreatment that might require emergency department visits. At the same time, home visiting may encourage families to use emergency department services for many reasons, including if they reside in medically underserved areas where pediatric care is lacking. Previous studies have found mixed evidence regarding this outcome. Of the studies of the four evidence-based models that

[36]Mitchell-Herzfeld et al. (2005); Caldera et al. (2007).

[37]McMorrow, Kenney and Goin (2014); Yu et al. (2002).

[38]Landsverk et al. (2002).

[39]The American College of Physicians (2014) provides one definition of a medical home: a "care delivery model whereby patient treatment is coordinated through their primary care physician to ensure they receive the necessary care, when and where they need it, in a manner they can understand."

examined the number of emergency department visits during the first two years, one study of Nurse-Family Partnership found significant decreases,[40] and two studies of Healthy Families America did not find a significant change.[41]

- **Any health care encounter for injury or ingestion.** Home visiting studies have examined several different outcomes related to health care encounters for injuries or ingestions. These outcomes include broad measures of any injuries requiring medical care and any health care encounters for injury or ingestion. They also include more specific measures such as hospitalizations for injury or ingestion, emergency department visits for injury or ingestion, and outpatient visits for injury or ingestion. Studies of Healthy Families America, Early Head Start, and Parents as Teachers have examined health care encounters for injuries and ingestions, and no favorable estimated effects have been found.[42] Because hospitalizations or emergency room visits for injuries would probably be rare in a sample this young, MIHOPE defines this outcome as any type of medical care received to treat an injury or ingestion.

Child Development

- **Behavior problems total score.** Behavior problems are typically characterized along two dimensions: externalizing problems (which include aggression, acting out, and hyperactivity) and internalizing problems (which include anxiety, sadness, and social withdrawal). Having behavior problems in early childhood is a risk factor for mental health problems and academic difficulties throughout childhood and into adulthood.[43] Each of the four evidence-based models has been assessed on its ability to reduce children's behavior problems, with some evidence of positive effects for Healthy Families America and Nurse-

[40]Olds, Henderson, Chamberlin, and Tatelbaum (1986).

[41]Duggan et al. (2007); Mitchell-Herzfeld et al. (2005).

[42]Duggan et al. (1999); Mitchell-Herzfeld et al. (2005); Chazan-Cohen, Raikes, and Vogel (2013); Caldera et al. (2007); Wagner, Clayton, Gerlach-Downie, and McElroy (1999); Wagner and Spiker (2001).

[43]Hinshaw (1992); Reef et al. (2011); Masten et al. (2005).

Family Partnership,[44] but no statistically significant effects for Early Head Start or Parents as Teachers.[45]

- **Receptive language skills.** Children's early language development has been linked to later cognitive and language outcomes, as well as school readiness and later achievement.[46] Many home visiting programs therefore aim to help mothers stimulate their children's language development. Although studies of home visiting have not found significant effects on children's language development at one year,[47] a study of the Early Head Start—Home-based option at two years did find a statistically significant estimated effect.[48]

Service Differential

This section compares the home visiting services received by the program group with those received by the control group. This comparison is important because the study is more likely to find evidence of effects on family outcomes if program group families received more home visiting services than control group families.

While ideally program group families would all receive home visiting services while control group families would receive none, in a real-world setting, some program group members will end up not participating fully in the intervention being studied while some control group members will end up receiving similar services. In MIHOPE, control group families might have received similar services for several reasons. First, although the study team made a priority of locations without other evidence-based home visiting, other types of home visiting were available in some communities where the study took place. In fact, one-half of program managers said that there was other evidence-based home visiting available in their communities when their programs entered the study (between September 2012 and December 2014). Second, families in the MIHOPE sample tend to move around, and control group families might have received home visiting in a different location. Finally, some locations were chosen for the study even though it was

[44]Caldera et al. (2007); Sidora-Arcoleo et al. (2010).

[45]Love et al. (2001); Roggman and Cook (2010); Drotar, Robinson, Jeavons, and Kirchner (2009). The result for Parents as Teachers is not included in Table 3.1 or Appendix Table E.1 because it used a different measure of child behavior problems than is being used as the MIHOPE confirmatory outcome.

[46]Prior, Bavin, and Ong (2011).

[47]Wagner, Cameto, and Gerlach-Downie (1996); Wagner, Clayton, Gerlach-Downie, and McElroy (1999).

[48]Love et al. (2001).

known that control group families might be referred to less intensive home visiting services (perhaps consisting of one or two visits from public health nurses, for example).

This section draws on weekly family service logs completed by home visitors and on questions on the family follow-up survey conducted around the time the child was 15 months old on receipt of home visiting or parenting services in the previous year. The survey asked about home visiting and parenting services together because one of the main goals of home visiting is to improve parenting.

The weekly family service logs indicate that 83 percent of program group families received at least one home visit (17 percent received no home visits), and that the average family who received a visit received about 18 visits during the first year.[49] In addition, more than half of the families were still participating in the home visiting program at the child's first birthday. Although these are lower participation rates and fewer visits than the evidence-based models recommend, they are consistent with what past studies on home visiting have seen.[50]

As shown in Table 3.2, there is a substantial difference between the program and control groups in their receipt of home visiting and parenting services in the year before the 15-month survey (when children were about 3 to 15 months old): 51 percent of the program group reported receiving those services compared with 20 percent of the control group.[51] (In other words, when children in the program group were 15 months old, nearly half of their families reported not receiving home visits in the past year.)

In addition, families in the program group received much more intensive home visiting services than did those in the control group. For example, 26 percent of the program group had received 26 or more visits in the previous year, compared with 4 percent of the control group.

[49]Duggan et al. (2018).

[50]Boller et al. (2014).

[51]As noted earlier, family service logs completed by home visitors indicated that 83 percent of the program group received home visiting at some point. In the year before the 15-month survey, however, family service logs indicate that 64 percent of program group families who responded to the 15-month survey received a home visit, a figure closer to the 51 percent reported in the survey. Results from the family service logs are presented in Duggan et al. (2018).

Table 3.2

Receipt of Home Visiting or Parenting Services

Outcome	Program Group	Control Group	Difference	P-Value
Receipt of home visiting in the 12 months after study entry, as recorded in the family service logs[a]				
Any home visits (%)	82.7	NA	NA	NA
Average number of home visits	15.0	NA	NA	NA
Receipt of home visiting in the 12 months before the 15-month follow-up, as recorded in the family service logs[a]				
Any home visits (%)	57.7	NA	NA	NA
Average number of home visits	10.3	NA	NA	NA
Receipt of home visiting or parenting services in the 12 months before the 15-month follow-up survey, as reported on the survey				
Any home visiting or parenting services[b,c] (%)	50.7	20.1	30.7	0.000
Average number of home visits or parenting service visits[d]	18.2	4.0	14.1	NA
Number of home visits or parenting service visits (%)				0.000
0[c]	50.7	81.5	-30.8	
1-2	4.3	4.9	-0.7	
3-6	3.6	3.6	0.0	
7-12	6.2	2.9	3.4	
13-25	9.6	2.8	6.8	
26-52	12.8	1.5	11.3	
53 or more	12.9	2.8	10.0	
Receipt of evidence-based home visiting services in the 12 months before the 15-month follow-up survey, as reported on the survey[e]				
Any evidence-based home visits (%)	31.2	8.2	23.0	0.000
Average number of evidence-based home visits[d]	10.5	1.7	8.8	NA
Sample size (total = 4,215)	2,102	2,113		

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and the MIHOPE family service logs.
NOTES: NA = not applicable.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Distributions may not add to 100 percent because of rounding.

[a]Family service logs were available for program group families only.

[b]The comparison between the program and control groups with respect to receiving any home visits in the 12 months before the survey is not based on the same sample as the family service logs. Among the portion of the two samples that overlaps — survey respondents in the program group — 64.0 percent received services according to the family service logs and 50.7 percent received services according to the follow-up survey.

[c]The percentages for "any home visiting or parenting services" and "number of home visits or parenting service visits equals zero" do not add to 100 percent because of missing data. There were 44 program group members and 31 control group members who indicated they received home visiting services but did not know the number of days in which they participated in these services.

[d]No significance test was performed because this is a continuous measure based on categorical data.

[e]Evidence-based home visiting is limited to Early Head Start — Home-based option, Healthy Families America, Nurse-Family Partnership, and Parents as Teachers.

Estimated Effects

The remainder of the chapter presents estimated effects by domain.[52] Box 3.1 explains how effects were estimated and presented in the tables that follow.

Estimated Effects on Maternal Health

Of the four evidence-based models, only Nurse-Family Partnership indicated it places a high priority on maternal health and family planning and birth spacing, while Early Head Start and Healthy Families America indicated they place a medium priority on this outcome area. In part for that reason, the area of maternal health has only one confirmatory outcome: whether the mother reported a new pregnancy after she entered the study. The outcome area also has six exploratory outcomes: indicators of health care coverage, smoking, substance use, mental health, health status, and receipt of behavioral health services (that is, assistance with mental health issues or substance use). Although home visiting programs have increased their efforts in the area of maternal health — particularly in the area of maternal mental health — these outcomes are exploratory because there is little evidence from other studies that home visiting has effects on them.

The results in Table 3.3 show the following:

- **The home visiting programs included in MIHOPE did not significantly affect whether mothers had a subsequent pregnancy by the time the child in MIHOPE was 15 months old**. About 18 percent of both the program and control group women became pregnant by the time of the follow-up survey. This result is consistent with results from studies of Healthy Families America and Parents as Teachers that have not found effects on this outcome, although it is not consistent with the larger effects found for Nurse-Family Partnership.

- **There were generally positive effects on exploratory maternal health outcomes.** Program group mothers were significantly more likely to have health care coverage than were control group mothers, which may mean that they will have greater access to health care and better health outcomes in the future. Perhaps because they were more

[52]All effect estimates are based on a regression adjustment designed to increase the statistical precision of the estimates. Appendix D lists the family characteristics that were included in the regression and shows estimated effects for the confirmatory outcomes without the regression adjustment.

Box 3.1

How to Read the Tables in the Report Showing Estimated Effects

The effects of evidence-based home visiting are estimated by comparing the outcomes of the program and control groups, after accounting for the background characteristics of the sample members. The tables showing effects present a series of numbers that are helpful for interpreting the estimated effects of the home visiting programs. The first two columns of numbers show the average outcomes for the program and control groups. For example, the excerpt from Table 3.7, below, shows that the average program family had 2.1 incidents of minor physical assault on the child in the year before the 15-month follow-up survey (the survey conducted when the child was 15 months old), compared with 2.2 incidents on average for control group families.

Table 3.7

Estimated Effects on Child Maltreatment Outcomes at 15 Months (Excerpt)

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Frequency of minor physical assault during the past year	2.1	2.2	-0.1	-0.03	0.292	-0.3	0.1
Sample size (total = 4,215)	2,102	2,113					

The number in the "Difference (Effect)" column displays the estimated effect, or the difference between the average outcomes of the program group and the control group. As shown in the table, this difference is -0.1 incidents (2.1 in the program group minus 2.2 in the control group). Due to rounding, effects may not be equal to the difference in program and control group means presented.

The "Effect Size" column shows a measure of the estimated effect that is adjusted so that all outcomes have the same amount of variation. It is calculated by dividing the estimated effect by the standard deviation of the outcome in the study sample. The interpretation of an effect size will vary with the outcome and the context, so it is difficult to characterize the magnitude of effect sizes in general. A standard intelligence quotient (IQ) test has a standard deviation of 10, for example, so an effect size of 0.10 would represent a one-point change in IQ. For an outcome expressed as a percentage, such as the percentage of mothers with a subsequent pregnancy, an effect size of 0.10 would represent a change of about 3 percentage points to 5 percentage points in the outcome.

(continued)

Box 3.1 (continued)

The "P-Value" shown in the tables indicates the likelihood of estimating an effect of this magnitude or larger in absolute value if the intervention had zero effect (that is, if the estimated effect had occurred by chance). In this example, there is a 29 percent chance that a program with no effect would have generated the difference between research groups of -0.1 incidents. In this report, estimates are considered statistically significant if there is no more than a 10 percent likelihood that the effect is due to chance based on a two-tailed t-test (that is, assuming effects could appear in a positive or negative direction); that is, if the p-value is less than or equal to 0.100. In this example, therefore, the estimated effect would not be considered statistically significant.

The "90% Confidence Interval" column is an estimate of the variability (or statistical imprecision) of the effects of the home visiting program. Specifically, this column shows that there is a 90 percent chance that the estimated effect from any given study would fall within the 90 percent confidence interval. For a specific effect (difference in means or percentages), a narrower confidence interval suggests a more precise estimate than a wider confidence interval (which indicates greater variability and thus greater uncertainty). Confidence intervals that do not contain zero, such as 1.5 to 2.5, or -2.0 to -1.0, indicate that the estimated effect is significantly different than zero at the 10 percent level of statistical significance.

likely to have health care coverage, program group mothers were also significantly less likely to report that their health was fair or poor and reported fewer depressive symptoms. The reduction in maternal depression is intriguing since home visiting programs have been increasing their efforts to improve maternal mental health.[53] In addition, the finding might be important because maternal depression can hinder the early development of children, particularly low-income young children.[54]

At the same time, program group mothers were significantly more likely than control group members to report substance use (that is, heavy or binge drinking or the use of illegal drugs) to study team interviewers. It is important to interpret this finding with caution in light of the more pos-

[53]For example, 35 percent of the local home visiting programs studied in MIHOPE indicated they had raised the priority they placed on maternal mental health and substance use since MIECHV came into existence. See Michalopoulos et al. (2015).

[54]Knitzer, Theberge, and Johnson (2008).

Table 3.3

Estimated Effects on Maternal Health Outcomes at 15 Months

Outcome (%)	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes							
New pregnancy after study entry	18.2	17.6	0.6	0.02	0.664	-1.6	2.8
Exploratory outcomes							
Health insurance coverage for the mother	82.4	80.7	1.7	0.04	0.096	0.0	3.5
Current smoking	19.6	20.6	-1.0	-0.03	0.305	-2.7	0.6
Substance use during the past three months	17.5	15.0	2.5	0.07	0.041	0.5	4.6
Depressive symptoms	23.5	25.9	-2.4	-0.05	0.089	-4.7	-0.1
Health status self-rated as “poor” or “fair”	17.9	20.3	-2.5	-0.06	0.056	-4.6	-0.3
Received any behavioral health services	7.4	8.5	-1.1	-0.04	0.225	-2.5	0.4
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and Medicaid enrollment data.

NOTES: See Appendix B for descriptions of the outcome measures used.
Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.
The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure’s data source and the frequency of missing values within that data source.

itive findings on maternal health discussed above and the lack of a theoretical reason why home visiting would lead to increased substance use. Moreover, this outcome has been examined multiple times in past studies but no studies have found statistically significant increases in maternal substance use. Thus, the totality of the evidence suggests that home visiting is not increasing the prevalence of substance use.

Estimated Effects on Family Economic Self-Sufficiency

All four evidence-based models place a high priority on improving economic self-sufficiency. In this area, home visiting programs can help mothers receive education and training in the short term, and studies of both Early Head Start and Healthy Families America have found short-term increases in the percentage of mothers receiving education and training. Effects on other aspects of family economic self-sufficiency, including increased earnings and income and reduced use of public assistance, have taken longer to develop in previous studies of home visiting, however. For that reason, the sole

confirmatory outcome in this area is whether the mother was receiving education or training at the time of the follow-up survey, although other aspects of family economic self-sufficiency are presented as exploratory outcomes.

The results in Table 3.4 show the following:

- **The home visiting programs included in MIHOPE did not have a statistically significant effect on whether the mother was receiving education or training at the time of the follow-up survey.** In addition to not being statistically significant, the estimated effect is also small, at only about 0.4 percentage points. By comparison, studies of Early Head Start and Healthy Families America that examined this outcome before or when the child turned two years old found an average effect of 6.4 percentage points.

- **For the most part, the home visiting programs included in MIHOPE did not affect the exploratory measures related to economic self-sufficiency**. Program and control group families received various forms of public assistance (Temporary Assistance for Needy Families; Supplemental Nutrition Assistance Program benefits; benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children; and disability benefits) at similar rates, and program and control group mothers had similar employment and earnings. This finding is consistent with findings from earlier studies, which have rarely found significant short-term effects on these outcomes, although these outcomes are important components of positive benefit-cost findings in studies of home visiting that collected follow-up data over a longer time.[55]

- **Among the exploratory outcomes, one notable finding is that program group families were less likely to report food insecurity than control group families.** More than 35 percent of control group members said they had trouble securing enough food for their families, compared with less than 31 percent of the program group. This finding could be important, since food security can influence a range of other outcomes, but since this effect is on an exploratory outcome, other

[55]Michalopoulos, Faucetta, Warren, and Mitchell (2017).

Table 3.4

Estimated Effects on Family Economic Self-Sufficiency Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes (%)							
Receiving education or training	23.3	22.9	0.4	0.01	0.792	-2.0	2.7
Exploratory outcomes							
Received any public assistance during the past month (%)							
Supplemental Nutrition Assistance Program	57.6	59.0	-1.4	-0.03	0.349	-3.9	1.1
Disability insurance	7.8	7.9	-0.1	-0.01	0.866	-1.5	1.2
Temporary Assistance for Needy Families	15.0	14.9	0.1	0.00	0.923	-1.8	2.0
Women, Infants, and Children	71.4	71.3	0.1	0.00	0.971	-2.5	2.6
Food insecurity (%)	30.8	35.2	-4.4	-0.09	0.004	-6.9	-1.9
Employed five quarters after birth (%)	51.5	51.4	0.1	0.00	0.940	-2.4	2.7
Earnings five quarters after birth ($)	1,861	1,917	-56	-0.02	0.547	-208	97
Use of nonparental child care (%)	50.1	50.4	-0.3	-0.01	0.843	-3.1	2.5
Received any transportation services (%)	8.8	10.8	-1.9	-0.06	0.062	-3.7	-0.2
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and National Directory of New Hires records.

NOTES: See Appendix B for descriptions of the outcome measures used.
Rounding may cause slight discrepancies in sums and differences.
The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

studies should examine the outcome as well before it is accepted that home visiting is likely to produce the effect.

Estimated Effects on Intimate Partner Violence

Reducing intimate partner violence can improve a wide range of other areas of maternal well-being and family functioning over the long term, since experiences with intimate partner violence have been shown to influence parenting distress, maternal

behaviors such as substance use and engaging in unprotected sex,[56] and child stress and externalizing behavior.[57] Although intimate partner violence has not historically been a focus of all early childhood home visiting programs, both Healthy Families America and Nurse-Family Partnership place a high priority on this outcome area,[58] and the MIECHV authorizing legislation listed domestic violence as a benchmark area that home visiting programs should try to improve.[59] Consequently, 45 percent of local MIHOPE programs reported that they increased their emphasis on intimate partner violence.[60] Few of the previous studies of the four evidence-based models examined intimate partner violence for families with children under 2 and, of those that did examine it, only two found statistically significant effects.[61] The lack of findings is consistent with the fact that there is limited evidence any type of intervention can produce effects in this area.[62] Because there is so little evidence of effects on intimate partner violence, all outcomes in this area are designated as exploratory.

- **The home visiting programs included in MIHOPE had consistent statistically significant estimated effects on mothers' experience of intimate partner violence and in their use of services related to intimate partner violence.** For four of the five outcomes shown in Table 3.5 (maternal experience of physical or sexual violence, experience with battering, receipt of any domestic violence services, and receipt of any services from a domestic violence shelter),[63] estimated effects when children were 15 months old are statistically significant. Home visiting was estimated to have reduced the prevalence of these outcomes by only 1 percentage point to 2 percentage points, which represents reductions of about 30 percent to 45 percent. Home visiting did

[56]Scribano, Stevens, and Kaizar (2013); Easterbrooks, Fauth, and Lamoreau (2017).

[57]Sternberg et al. (1993); Wolfe et al. (2003).

[58]Families with histories of intimate partner violence are one of the groups Healthy Families America has sought to serve.

[59]SEC. 511 [42 U.S.C. 711] (d) (2) (B) (vi).

[60]Duggan et al. (2018).

[61]A MIHOPE review found that there are 32 effect estimates in studies of the four MIHOPE models, with 3 statistically significant at the 10 percent level.

[62]Nelson, Nygren, McInerney, and Klein (2004); Wathen and MacMillan (2003); Rivas et al. (2015); Sharps et al. (2016).

[63]Reports of service receipt were not limited to women with current partners, as they were for the physical violence and battering outcomes. However, a sensitivity test showed that effects on these outcomes were still statistically significant and favorable when reports of service receipt were limited to women with current partners.

Table 3.5

Estimated Effects on Intimate Partner Violence Outcomes at 15 Months

Outcome (%)	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Exploratory outcomes							
Maternal perpetration of physical violence	8.4	9.1	-0.7	-0.02	0.466	-2.3	0.9
Maternal experience with physical or sexual violence	3.4	5.9	-2.5	-0.11	0.001	-3.7	-1.3
Experience with battering	3.9	5.7	-1.8	-0.08	0.013	-3.0	-0.6
Received any domestic violence services	2.1	3.1	-1.0	-0.06	0.062	-2.0	-0.1
Received any services from a domestic violence shelter	1.7	3.1	-1.4	-0.08	0.009	-2.3	-0.5
Sample size (total = 4,215)	2,102	2,113					

SOURCE: Calculations based on the MIHOPE 15-month follow-up survey.

NOTES: See Appendix B for descriptions of the outcome measures used.
Rounding may cause slight discrepancies in sums and differences.
The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

not have a statistically significant effect on mothers' reports of perpetrating physical violence.

Though mothers in the program group reported experiencing less intimate partner violence and using fewer intimate partner violence-related services than mothers in the control group, there is little overlap between the group of mothers who reported experiencing intimate partner violence and the group of mothers who reported receiving services. This discrepancy raises questions about whether mothers who needed services were receiving them. However, program group mothers were less likely than control group mothers to report having a need for intimate partner violence services that had not been met.[64] This difference was present for both domestic violence counseling and anger management services (1.6 percent of the program group versus 3.4 percent of the control group) and the use of domestic violence shelters (1.2 percent of the program group versus 2.2 percent of the control group).

[64]Mothers who indicated that they had not received services were asked whether they wanted or needed services.

Estimated Effects on Parenting

Each of the four evidence-based models included in MIHOPE aim to affect parenting practices to some extent. For example, one of the main goals of Early Head Start is to support the development of close, supportive relationships between parents and their children, both because close relationships provide young children with the emotional security to develop healthy and trusting relationships with other individuals and because they lay the groundwork for enhancing children's development.[65] Healthy Families America seeks to cultivate and strengthen nurturing parent-child relationships and promote child health and development.[66] Nurse-Family Partnership has three broad goals, one of which is to improve children's health and development by helping parents provide more competent care.[67] Finally, Parents as Teachers emphasizes parent behavior as the mechanism through which the program benefits children and teaches parents about good parenting practices and principles of child development.[68] Since the four models all emphasize parenting, parenting is considered to be one of the most important areas examined in this impact analysis.

Table 3.6 examines the effects on parenting behavior for 2 confirmatory outcomes and 17 exploratory outcomes. The confirmatory outcomes are the quality of the home environment and parental supportiveness. The exploratory outcomes are primarily subscales — or components — of the confirmatory outcomes. The subscales of quality of the home environment are parental warmth, parental support for learning and literacy, parental verbal skills, parental lack of hostility, and the home interior (which captures whether the home is well lit, not too crowded, and reasonably clean).[69] The subscales of parental supportiveness are parental sensitivity, parental positive regard, and parental stimulation of cognitive development.[70] Other exploratory outcomes are parental

[65]Love et al. (2001).

[66]Mitchell-Herzfeld et al. (2005).

[67]Olds et al. (2004).

[68]Wagner and Spiker (2001).

[69]See Linver, Brooks-Gunn, and Cabrera (2004); Fuligni, Han and Brooks-Gunn (2004).

[70]The parental sensitivity subscale measures how a parent observes and responds to a child's cues during times of distress and nondistress. The parental positive regard subscale assesses the parent's expression of love, respect, or admiration for the child. The parental stimulation of cognitive development examines how much effort the parent puts into teaching to enhance the child's perceptual, cognitive, and linguistic development.

Table 3.6

Estimated Effects on Parenting Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Impact)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes							
Quality of the home environment	38.8	38.5	0.4	0.09	0.010	0.1	0.6
Parental supportiveness	4.0	3.9	0.0	0.04	0.236	0.0	0.1
Exploratory outcomes							
Quality of the home environment							
Parental warmth	6.6	6.5	0.0	0.03	0.376	0.0	0.1
Parental support for learning and literacy	14.1	13.9	0.2	0.08	0.028	0.0	0.3
Parental verbal skills	2.9	2.9	0.0	0.03	0.439	0.0	0.0
Parental lack of hostility	4.7	4.8	0.0	-0.04	0.250	-0.1	0.0
Home interior	7.0	7.0	0.0	-0.02	0.508	-0.1	0.1
Parental supportiveness							
Sensitivity[a]	4.03	3.96	0.07	0.07	0.051	0.01	0.13
Positive regard	4.1	4.1	0.0	-0.01	0.880	-0.1	0.1
Stimulation of cognitive development	3.8	3.8	0.0	0.04	0.272	0.0	0.1
Parental unsupportiveness							
Intrusiveness	2.7	2.7	-0.1	-0.05	0.164	-0.1	0.0
Negative regard	1.5	1.5	0.0	0.03	0.510	0.0	0.1
Detachment	1.6	1.6	0.0	0.00	0.979	-0.1	0.1
Parental discipline							
Discipline strategies during parent-directed task							
Gentle guidance[a]	2.71	2.66	0.05	0.08	0.058	0.01	0.09
Control	3.0	3.1	0.0	-0.04	0.317	-0.1	0.0
Nonviolent discipline during the past year (%)	59.7	60.3	-0.6	-0.01	0.688	-3.3	2.0
Parenting stress							
Parenting distress	10.8	11.1	-0.3	-0.07	0.027	-0.5	-0.1
Parent-child dysfunctional interaction	10.5	10.8	-0.3	-0.08	0.006	-0.5	-0.1
Awareness of health and safety hazards	3.7	3.4	0.3	0.21	0.000	0.2	0.4
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, and the parent-child video-recorded interaction.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Two decimal places are shown to provide context to the size of the difference.

unsupportiveness,[71] parental discipline, parenting stress, and awareness of health and safety hazards.

The results in Table 3.6 show the following:

- **The home visiting programs included in MIHOPE had a statistically significant effect on the quality of the home environment.**[72] As described above, the quality of the home environment was measured using the IT-HOME total score, and home visiting had a statistically significant effect on that total score.[73] However, there was a statistically significant improvement only among one of the five subscales that were examined as exploratory outcomes: support for children's learning and literacy. These findings are consistent with the existing evidence, and the effect size of 0.09 for the IT-HOME total score is similar to the average impact seen in other studies (0.11, as shown in Table 3.1).[74] Since the IT-HOME total score has been linked to children's cognitive development,[75] the evidence-based models that participated in MIHOPE may have long-term effects on children's cognitive development. This hypothesis has not yet been studied.

- **The home visiting programs included in MIHOPE did not have a statistically significant effect on the confirmatory outcome of parental supportiveness.** As described above, this outcome was measured using the Three Bags task.[76] On average, mothers in the program

[71]The subscales, or components, of the parental unsupportiveness scale are: (1) parental intrusiveness (which assesses the degree to which the parent exerts control over the child), (2) parental negative regard (which measures the parent's expressions of discontent with, anger toward, disapproval, or rejection of the child), and (3) parental detachment (which measures the parent's awareness of, attention to, and engagement with the child).

[72]Caldwell and Bradley (1984).

[73]Linver, Brooks-Gunn, and Cabrera (2004).

[74]Love et al. (2001); Chambliss (1998); Caldera et al. (2007); Wagner, Cameto, and Gerlach-Downie (1996); Kitzman et al. (1997); Olds et al. (2002).

[75]Bradley et al. (1989); Totsika and Sylva (2004).

[76]For the Three Bags task, 151 cases were flagged as biased. Cases could be flagged as biased for several reasons: if the field interviewer interfered during the video-recorded protocol, the mother sought out confirmation from field interviewer throughout the protocol, other family members interfered with the interaction, the child was clearly upset or ill before the protocol began, the child appeared to have a developmental disability but could still engage in some of the play, the child was 13 months old or younger, a video malfunction made it impossible to code the case, it was hard to hear the parent, or the interaction took place where there were a lot of distractions. As a sensitivity analysis, the effects

and control group scored about 3.95 out of a possible 7 on parental supportiveness. The mothers in MIHOPE had similar scores to mothers who participated in the national evaluation of Early Head Start.[77] In addition, MIHOPE found estimated effects on subscales of parental supportiveness and unsupportiveness were generally not statistically significant. The exception is the degree to which the mother exhibited sensitivity during the play interaction with the child, which had a small effect size of 0.07.

In addition to results for outcomes measured with the IT-HOME and the Three Bags task, Table 3.6 shows results for several other exploratory outcomes:

- **MIHOPE found mixed evidence regarding parental discipline.** Parents' disciplinary practices are an important predictor of child well-being. The literature on parental discipline and child development has identified a number of disciplinary strategies that are associated with young children's compliance and behavior in the context of a task directed by a parent. Two of these are the focus of the Clean-Up task, an observational parent-child interaction rating scale that captures parental strategies to induce children to comply with parental requests.[78] Home visiting had a significant effect on mothers exhibiting gentle guidance toward their children by motivating and encouraging them to clean up the toys in a positive manner rather than one that asserts power (effect size equals 0.08),[79] but not on the extent to which mothers intruded and tried to control children's clean-up behavior by using simple commands and prohibitions instead of encouraging or

were reestimated excluding the biased cases. That analysis similarly found no statistically significant effects.

[77]Love et al. (2001).

[78]Morin, Martin, and Brooks-Gunn (2014).

[79]Although clean-up tasks have been used in numerous studies, they have typically been used with children ages 18 months and older. See Braungart-Rieker, Murphy-Garwood, and Stifter (1997); Kochanska (2002); Scaramella et al. (2008). MIHOPE is one of the first instances in which a clean-up task was used with children as young as 15 months. MIHOPE included this task because it had the potential to show how parents respond to noncompliance in different ways. At the same time, it is unclear whether it is developmentally appropriate to use the Clean-Up task with this age group. In light of this uncertainty, the parental discipline measures derived from the Clean-Up task were included in MIHOPE only as exploratory outcomes.

motivating children to complete the task on their own.[80] There was not a statistically significant estimated effect on the percentage of parents who reported using nonviolent discipline strategies in the past year.[81]

- **The home visiting programs included in MIHOPE had statistically significant effects on parental stress.** The effects were small, as seen by the effect size of -0.07 for parental distress and -0.08 for parent-child dysfunctional interaction.[82] Mothers in the program group and the control group reported more stress on both measures than parents who participated in Baby FACES, a nationally representative descriptive study of children enrolled in Early Head Start.[83] Since parental stress is an important risk factor for child maltreatment, reducing parental stress could reduce child maltreatment in the long term. This result is also important because even though home visiting programs aim to reduce parental stress, most studies that have examined this outcome have not found statistically significant effects. An exception is a two-year follow-up study of Healthy Families America that found significant effects on parental distress, but not on parent-child dysfunctional interaction.[84]

- **The home visiting programs included in MIHOPE had a statistically significant effect on awareness of health and safety hazards.** Parents were asked whether their children always rode in a car seat, whether they were aware of and knew how to prevent lead exposure, whether they were aware of mercury levels in fish, and whether they were aware of shaken baby syndrome. Their answers were combined into a composite measure, and that measure shows a statistically

[80]For the purposes of calculating effects on the Clean-Up task, 130 cases were flagged as biased for reasons discussed above for the Three Bags task. As a sensitivity analysis, the effects were reestimated with the biased cases excluded. That analysis resulted in similar findings.

[81]Nonviolent discipline strategies can include redirecting a child or explaining why something was wrong.

[82]Parental distress and parent-child dysfunctional interaction are subscales from the Parent Stress Index, which is the source of information on parental stress used at 15 months. See Whiteside-Mansell et al. (2007). Parental distress indicates the degree of distress parents experience in their role as parents. Parent-child dysfunctional interaction focuses on parents' perception that their children do not meet their expectations and that their interactions with their children are not reinforcing to them as parents.

[83]Vogel et al. (2015).

[84]Jacobs et al. (2015) ;

significant effect. However, the estimated effect is small, with an effect size of 0.21. This result is consistent with an increase in parents' use of safety practices found in a study of Healthy Families America.[85]

Estimated Effects on Child Maltreatment

All four evidence-based models studied in MIHOPE place a high priority on preventing and reducing child maltreatment. Moreover, Healthy Families America says its mission is to prevent child maltreatment, and Nurse-Family Partnership and Parents as Teachers list the prevention and reduction of child maltreatment as explicit program outcomes.

MIHOPE includes two confirmatory and four exploratory outcomes related to child maltreatment. The confirmatory outcomes reflect the number of times, or frequency, that the mother engaged in (1) minor physical assault and (2) psychological aggression, according to her responses on the survey conducted when children were 15 months old. The four exploratory outcomes are mothers' reports of any acts of severe or very severe physical abuse in the year before the 15-month survey and three measures derived from state child welfare data, including any substantiated maltreatment reports, any maltreatment reports, and any loss of custody.[86]

The results in Table 3.7 show the following:

- **The home visiting programs included in MIHOPE did not have a statistically significant effect on minor physical assault.** On average, mothers in both the program group and the control group reported engaging in acts of minor physical assault slightly more than two times in the previous year.[87] The most frequently reported acts of minor physical assault were spanking a child on the bottom with a bare hand or slapping a child on the hand, arm, or leg. The frequency of minor physical assault reported here is consistent with that found in previous evaluations of Healthy Families America. In those studies the average number of acts of minor physical assault against 1-year-old children ranged from 2.1 to 3.5 in a year.[88]

[85]LeCroy and Krysik (2011).

[86]Reports were included for all types of state-classified maltreatment, including neglect. Additionally, reports were included for all perpetrator types.

[87]The possible range is 0 to 40 times.

[88]DuMont et al. (2008); Landsverk et al. (2002).

Table 3.7

Estimated Effects on Child Maltreatment Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes							
Frequency of minor physical assault during the past year	2.1	2.2	-0.1	-0.03	0.292	-0.3	0.1
Frequency of psychological aggression during the past year	3.1	3.3	-0.3	-0.06	0.085	-0.5	0.0
Exploratory outcomes (%)							
Severe or very severe physical abuse during the past year	2.2	1.9	0.2	0.02	0.634	-0.6	1.1
Any substantiated maltreatment report	3.5	3.3	0.2	0.01	0.740	-0.7	1.1
Any maltreatment report	10.4	11.1	-0.7	-0.02	0.463	-2.3	0.9
Loss of custody	2.6	2.3	0.2	0.02	0.648	-0.6	1.0
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and state administrative child welfare records.

NOTES: See Appendix B for descriptions of the outcome measures used.
Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.
The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

- **The home visiting programs included in MIHOPE had a statistically significant estimated effect on psychological aggression.** On average, mothers reported engaging in acts of psychological aggression slightly more than three times in the past year, although mothers in the program group reported less frequent acts of psychological aggression than did mothers in the control group.[89] This frequency of psychological aggression is consistent with that found in previous evaluations of Healthy Families America, where the average number of acts of psychological aggression against 1-year-old children ranged from 2.7 to 4.7 in a year.[90] The effect size of the reduction in psychological

[89]The possible range is 0 to 32 times.

[90]DuMont et al. (2008); Landsverk et al. (2002).

aggression seen in MIHOPE (-0.06) is smaller than the reductions seen in previous studies, where the effect sizes ranged from -0.14 to -0.20.[91]

- **The home visiting programs included in MIHOPE did not have a statistically significant effect on any of the four exploratory outcomes.** Very few families had substantiated reports of maltreatment or loss of custody, and the percentages who did are consistent with the national rate of substantiated maltreatment for children less than 12 months old (2.4 percent) and for children between 12 and 24 months old (1.2 percent).[92] Previous rigorous evaluations of the four evidence-based models have also failed to find significant effects on state-reported maltreatment in children under 2 years of age.[93]

  One potential limitation of using state data on child maltreatment in studying home visiting is that home visiting itself could introduce surveillance bias. That is, program group families might be reported to child protective services at higher rates than they would be otherwise because they are more visible to home visitors, and because home visiting may connect them to other services provided by professionals who are also required to report suspected maltreatment. Two studies that systematically examined surveillance bias in research into child welfare found that surveillance bias is most likely to be a problem while families are actively engaged in services, and that its influence attenuates over time.[94] Since the outcomes in this study were measured during a time when many mothers were still enrolled in home visiting, surveillance bias may be an issue here. Long-term evaluations of home visiting using state data on maltreatment have found significant effects for children 7 years old and older, long after their active engagement in home visiting.[95]

[91]Duggan et al. (2007); Landsverk et al. (2002).

[92]U.S. Department of Health and Human Services (2016a).

[93]Olds, Henderson, Chamberlin, and Tatelbaum (1986); Chambliss (1998); Duggan et al. (1999); Duggan et al. (2004); Duggan et al. (2007); DuMont et al. (2008); Easterbrooks et al. (2012); Jacobs et al. (2015).

[94]Drake, Jonson-Reid, and Kim (2017); Chaffin and Bard (2006)

[95]DuMont et al. (2010); Olds et al. (1997).

Estimated Effects on Child Health

All four evidence-based models place a high priority on improving child preventive care. In addition, local MIECHV programs were expected to collect and report data to the state on several health indicators during the time that MIHOPE participants were receiving home visiting services. For example, in the benchmark area of maternal and newborn health, states used these data from local programs to indicate whether they were seeing improvements in outcomes such as the insurance status of children, child emergency department visits, and well-child visits.[96]

Home visiting can improve child health in several ways. Home visitors may help families obtain insurance coverage for their children, making health care services more affordable.[97] Home visitors also provide education and support to encourage breastfeeding and to discourage parents from smoking, which might contribute to improved child health. Home visitors can also encourage parents to maintain a well-child visit schedule for their children, ensuring that a health care provider monitors their healthy growth and development and provides immunizations on the recommended schedule. By encouraging regular preventive care or connecting families to medical homes, home visiting might also decrease the number of emergency department visits and hospitalizations children experience. However, home visiting might also encourage families to use emergency department services by helping parents understand when their children need medical care. Parents might be especially likely to increase their use of emergency department services in locales where pediatric care is lacking.

Because child health is a high priority for all four models, because it has important implications for child development, and because improvements in child health can reduce medical (and Medicaid) costs, the study included four confirmatory outcomes related to child health: whether a child has health insurance coverage, how many Medicaid-covered well-child visits a family makes, how many Medicaid-covered emergency department visits a family makes, and whether a child has any Medicaid-paid health care encounters related to injury or ingestion. In addition, seven exploratory outcomes were examined.[98]

The results in Table 3.8 show the following:

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[96]Health Resources and Services Administration (2016a).

[97]McMorrow, Kenney, and Goin (2014); Yu et al. (2002).

[98] The seven exploratory outcomes include the following: (1) whether the child has a primary care provider, (2) the number of Medicaid-paid immunizations, (3) whether the child was admitted to the hospital other than at birth, (4) whether the child was underweight, (5) whether the child was normal weight, (6) whether the child was overweight, and (7) the duration of breastfeeding.

Table 3.8

Estimated Effects on Child Health Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes							
Health insurance coverage for the child (%)	94.8	95.3	-0.5	-0.02	0.464	-1.7	0.6
Number of Medicaid-paid well-child visits	5.0	5.1	-0.1	-0.03	0.264	-0.2	0.0
Number of Medicaid-paid child emergency department visits	2.1	2.2	-0.2	-0.06	0.044	-0.3	0.0
Any Medicaid-paid health care encounter for injuries or ingestion (%)	25.7	26.8	-1.1	-0.03	0.445	-3.6	1.3
Exploratory outcomes							
Primary care provider for the child(%)	88.6	87.6	1.0	0.03	0.375	-0.8	2.8
Number of Medicaid-paid immunizations	6.3	6.3	0.0	0.00	0.952	-0.4	0.3
Any nonbirth hospitalizations (%)	15.5	18.3	-2.8	-0.07	0.020	-4.8	-0.8
Weight for length[a] (%)							
Underweight	10.8	12.0	-1.3	-0.04	0.313	-3.3	0.8
Normal weight	55.8	56.7	-1.0	-0.02	0.620	-4.2	2.2
At risk of overweight	33.5	31.3	2.2	0.05	0.225	-0.8	5.2
Duration of breastfeeding[b] (months)	4.5	4.4	0.1	0.02	0.619	-0.2	0.4
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Distributions may not add to 100 percent because of rounding.

[b]Sample limited to only those who enrolled in the study before birth (pregnant enrollees only).

- **The home visiting programs included in MIHOPE resulted in less frequent emergency department visits for children, but they had little effect on other confirmatory outcomes in this area.** In part, the lack of effects reflects the high rate of health insurance for children, with about 95 percent of both program group and control group children having health insurance coverage. In addition, the reduction in Medicaid-paid emergency department visits might lead to savings for the health care system if families were using primary care instead.

- **There is little evidence that the home visiting programs studied in MIHOPE affected the use of preventive care for children.** In addition to the small estimated effects on well-child visits (a confirmatory outcome), the program and control groups had similar numbers of immunizations, and similar percentages had primary care providers. As noted above, the high rates of health care coverage for both groups may have allowed them to receive the preventive care they needed.

- **The home visiting programs included in MIHOPE appear to have made families less likely to use more expensive forms of care.** In addition to using the emergency department less often, program group children were significantly less likely than control group children to be admitted to the hospital after they were born**.** Both results suggest that home visiting programs could reduce health care costs.

The mixed evidence in Table 3.8 is somewhat consistent with past studies of home visiting. For example, of the four evidence-based models, only Healthy Families America has been found to increase the number of well-child visits.[99] In addition, studies of Healthy Families America and Nurse-Family Partnership have found reductions in emergency department use, although only the effects of Nurse-Family Partnership were statistically signfiicant. [100] In addition, children's health insurance coverage has been examined several times but the effects observed have not always been statistically significant. Finally, studies of three of the evidence-based models have examined any health care encounters for injuries and ingestions, but no estimates have been statistically significant.[101]

Estimated Effects on Child Development

Each of the four evidence-based models targets child development, with some variation in how they approach that goal. Early Head Start focuses on enhancing child development while promoting healthy family functioning.[102] Healthy Families America seeks to promote healthy child growth and development and prevent child

[99]Landsverk et al. (2002).

[100]Mitchell-Herzfeld et al. (2005); Olds, Henderson, Chamberlin, and Tatelbaum (1986); Duggan et al. (2007).

[101]However, two studies of Nurse-Family Partnership found statistically significant estimated effects on the number of health care encounters for incidents such as injuries and ingestions (Kitzman et al. (1997); Olds, Henderson, Chamberlin, and Tatelbaum (1986)).

[102]Love et al. (2001).

maltreatment.[103] Nurse-Family Partnership has three broad goals, one of which is to improve children's health and development.[104] Finally, Parents as Teachers seeks to provide early detection of developmental delays and health issues, prevent child maltreatment, and increase school readiness.[105] Since home visiting can affect child development through many different pathways such as improved parenting behavior, improved parental mental health (for example, reduced depression severity and reduced parenting stress), and reduced violence in the home, it might take time for the effects of home visiting on child development to emerge. Thus, it was expected that effects on child development might be small when children were 15 months old; that expectation is generally met by the results described below.

Table 3.9 presents findings on home visiting's effects on child development for two confirmatory outcomes and seven exploratory outcomes. The confirmatory outcomes relate to children's behavior problems and receptive language skills. These outcomes were selected as confirmatory because there was evidence from previous studies that home visiting could affect them, and because MIHOPE made a priority of directly assessing children's development. The exploratory outcomes include children's social-emotional competence, children's behavior during a semistructured play session with a parent, children's behavior during a parent-directed task, and families' receipt of early intervention services (services for children under age 3 who have developmental delays or health conditions or other risks that may lead to such delays). Overall, home visiting had a significant effect on one of the two confirmatory outcomes — children's behavior — and none on the exploratory outcomes.

The results in Table 3.9 show the following:

- **The home visiting programs included in MIHOPE led to a statistically significant reduction in children's behavior problems.** Behavior problems include behaviors that are part of children's typical development (for example, aggression, sadness, and fear) but that become problematic when the frequency or intensity with which they occur is much higher or lower than would be expected. Behavior problems also include deviant behaviors that are never developmentally appropriate, such as self-harm. This finding is consistent with some evidence from earlier studies of Healthy Families America and Nurse-

[103]Mitchell-Herzfeld et al. (2005).

[104]Olds et al. (2004).

[105]Wagner and Spiker (2001).

Table 3.9

Estimated Effects on Child Development Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Confirmatory outcomes							
Behavior problems	44.5	44.9	-0.4	-0.05	0.087	-0.8	0.0
Receptive language skills	95.6	95.3	0.3	0.02	0.552	-0.6	1.2
Exploratory outcomes							
Social-emotional competence	27.5	27.4	0.1	0.02	0.615	-0.1	0.2
Behavior during semistructured play with the parent							
Engagement of the parent	4.3	4.2	0.0	0.02	0.537	0.0	0.1
Negativity toward the parent	1.9	1.9	0.0	0.00	0.978	-0.1	0.1
Sustained attention to objects[a]	5.4	5.4	0.0	-0.03	0.485	-0.1	0.0
Behavior during a parent-directed task							
Compliance	1.7	1.7	0.0	-0.02	0.700	0.0	0.0
Distress	1.9	1.9	0.0	0.00	0.992	-0.1	0.1
Received any early intervention services (%)	4.1	4.2	-0.1	0.00	0.908	-1.2	1.1
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, and the parent-child video-recorded interaction.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]In 56 cases, caregiver-child video-recorded interactions were also used.

Family Partnership,[106] albeit with a different measure of children's behavior problems.[107] While this effect was statistically significant, it is also small, with an effect size of -0.05.

[106]Caldera et al. (2007); Sidora-Arcoleo et al. (2010).

[107]Although none of these past evaluations used the parent-reported Brief Infant-Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan and Carter, 2002), which is the measure of behavior problems used in MIHOPE, the two favorable findings are based on the Child Behavior Checklist (CBCL), another parent-reported measure (Caldera et al., 2007; Sidora-Arcoleo et al., 2010). The BITSEA has been validated using the CBCL in a sample of 2- and 3-year-olds, suggesting that the two measures are highly correlated. See Briggs-Gowan et al. (2004).

- **The home visiting programs included in MIHOPE did not have a significant effect on children's receptive language skills.** At 15 months, children's ability to produce language is just beginning to develop. It continues to develop rapidly over the course of the second year of life. Therefore, MIHOPE assessed only receptive language skills for this early follow-up period. Receptive language skills include children's ability to be attentive and respond to stimuli in the environment and to comprehend basic vocabulary or gestures. Children's average receptive language skills standard scores were about 96 for both the program and control group, which represents a percentile rank of 39. (That percentile rank means that the average child in MIHOPE performs as well as or better than 39 percent of the children of the same age in the overall population.) As mentioned above, children's early language development has been linked to later cognitive and language outcomes, and to school readiness and later achievement.[108] But none of the previous studies of home visiting examined effects solely on receptive language skills, so it is difficult to place this finding into the larger literature. One relevant piece of evidence is that one study of Early Head Start found a statistically significant impact on vocabulary production at 24 months of age.[109]

- **The home visiting programs included in MIHOPE had no statistically significant effects on the seven exploratory outcomes related to child development.** Since child development can be affected through several pathways such as parenting behavior, maternal mental health, and child maltreatment, it might take some time for effects in this area to emerge. For example, in past studies of home visiting, most favorable effects on social-emotional competence were found at later ages.[110] In addition, at 15 months children's development can vary widely and still be considered normal,[111] and when "normal" covers a wide range it can be difficult to detect small effects using the measures currently available. Additional information on the seven exploratory outcomes is available in Appendix B.

[108]Prior, Bavin, and Ong (2011).

[109]Love et al. (2001).

[110]Love et al. (2002); Jones-Harden, Chazan-Cohen, Raikes, and Vogel (2012); Drotar, Robinson, Jeavons, and Kirchner (2009).

[111]Fenson et al. (1994); Vereijken (2010).

Conclusion

This chapter has presented the estimated effects of MIECHV-funded home visiting programs participating in MIHOPE through the time children were 15 months old. The evidence suggests that when results are combined across the four evidence-based models, family outcomes are better under home visiting than they would have been otherwise. Although the findings are positive, there are no especially large effects on any broad outcome area or specific outcome. The next two chapters explore whether effects are larger for some groups of families than others (Chapter 4) or are larger for some groups of local programs than others (Chapter 5).

Chapter 4

How Effects Vary Across Subgroups of Families

This chapter presents estimated effects among several prespecified subgroups of families, defined using family characteristics measured when women entered the study. The definitions of subgroups used in previous studies of home visiting vary widely, and the reporting conventions used for differences in estimated effects among subgroups do too. The seven subgroups selected for the study reflect characteristics that were often used to define subgroups in these previous studies, and that were likely to have policy or program implications if it emerged that home visiting had different effects among the subgroups defined by those characteristics. The seven characteristics used to define subgroups are:

- Gestational age (how many weeks into her pregnancy a woman was when she enrolled in MIHOPE — or if she had already given birth)
- Parity (whether the woman had children before the pregnancy or newborn with which she entered the study)
- The mother's race and ethnicity
- The presence of intimate partner violence
- The mother's level of emotional functioning
- The mother's psychological resources
- Demographic characteristics of mothers that put them or their children at higher risk of poor outcomes[1]

Following the study's prespecified analysis plan, the question examined in this chapter is whether the estimated effects are larger or smaller among any of these subgroups. The analysis examines differences in effects for each of the 12 confirmatory outcomes.

[1]The Mother and Infant Home Visiting Program Evaluation (MIHOPE) analysis plan discusses how the research team chose the subgroups included in this chapter and how the analysis would be conducted. The analysis plan as reviewed by an advisory committee to the Secretary of Health and Human Services is available online at U.S. Department of Health and Human Services (2016b).

Summary of Findings

- **Estimated effects generally do not vary across subgroups, suggesting that home visiting has similar effects for different kinds of families.** Across the 84 subgroup comparisons examined in the chapter, only 8 differences are statistically significant. Given the number of hypothesis tests conducted, this number is consistent with what would be expected if there were no real differences in effects across subgroups.[2] After an adjustment for conducting multiple tests was applied, only one statistically significant difference in estimated effects remained: Home visiting had different effects on the number of Medicaid-paid well-child visits among mothers of different races and ethnicities.[3]

- **Differences in estimated effects among subgroups of families are generally small.** It is possible for differences in effect to be substantively meaningful even when they are not statistically significant. In MIHOPE, however, the effects of home visiting seen among different subgroups of families do not vary much in magnitude.

Detailed Findings

This section presents descriptive statistics for each of the subgroups, as well as differences in effects among subgroups for each confirmatory outcome.

Table 4.1 shows the distribution of families in the subgroups defined using each of the seven characteristics listed above, overall and in the program and control groups. Subgroups generally had at least 10 percent of the total sample (about 400 families). For example, 60 percent of the women in the sample were first-time mothers, while 40 percent were not first-time mothers. Because subgroup sample sizes are smaller than the full sample, the subgroup tests cannot reliably detect differences as small as those that can be detected with the larger sample.

The final column of Table 4.1 presents results of a statistical test showing whether there are significant differences between the program group and the control group in the distributions of families across subgroups. For example, the first three rows

[2]If there were no actual differences in effects and 84 tests were conducted, 10 percent (or about 8) of the tests could show statistical significance based on sampling error alone.

[3]The adjustment used was the Benjamini-Hochberg adjustment. See Benjamini and Hochberg (1995).

Table 4.1

Subgroup Characteristics of Families in the MIHOPE Sample at Study Entry

Characteristic (%)	Program Group	Control Group	Total	P-Value
Gestational age at enrollment				0.213
Up to 28 weeks pregnant	55.2	52.5	53.8	
More than 28 weeks pregnant	12.8	13.5	13.2	
Not pregnant	32.0	34.0	33.0	
Parity				0.533
First-time mother	59.5	60.5	60.0	
Mothers with prior children	40.5	39.5	40.0	
Maternal race and ethnicity				0.007
Mexican origin	23.9	23.6	23.7	
Other Hispanic	12.7	11.9	12.3	
Non-Hispanic white	24.8	27.9	26.3	
Non-Hispanic black	30.5	26.6	28.5	
Other or multiracial	8.2	10.0	9.1	
Intimate partner violence (IPV)				0.310
IPV present	26.0	27.7	26.8	
No IPV present	74.0	72.3	73.2	
Level of maternal emotional functioning				0.907
Lower	30.3	30.6	30.4	
Moderate	28.9	29.3	29.1	
Higher	40.8	40.1	40.5	
Level of psychological resources[a]				0.166
At or below median	46.5	48.6	47.5	
Above median	53.5	51.4	52.5	
Level of demographic risk				0.340
Lower	62.1	63.5	62.8	
Moderate	29.7	29.4	29.6	
Higher	8.2	7.1	7.6	
Sample size	2,102	2,113	4,215	

SOURCES: Calculations based on the MIHOPE family baseline survey, state birth records, and Medicaid enrollment data.

NOTES: Distributions may not add to 100 percent because of rounding.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]"Psychological resources" is based on a composite of (1) mental health, (2) mastery (the extent to which a person thinks life chances are under her control), and (3) verbal abstract reasoning.

of the table show the three subgroups defined by gestational age at enrollment. The program and control group members have similar distributions across the three gestational-age subgroups (p-value = 0.213). The distribution of program and control groups is similar within all sets of subgroups except among those defined by the mother's race and ethnicity. The differences in the distributions of the racial and ethnic groups of

mothers are small, however, varying by just a few percentage points from the full-sample averages. These differences are unlikely to affect the subgroup findings.

Tables 4.2 through 4.8 show detailed results for the subgroups defined using each of the seven characteristics listed above, for the 12 confirmatory outcomes. For each subgroup, the table shows control group levels and estimated effects. The last column of each table shows the p-value of the statistical test assessing whether home visiting had the same effects across subgroups. The p-value indicates the probability of finding differences in effects at least as large as those shown in the table if there were no true difference across the subgroups.

Gestational Age

Table 4.2 presents findings for subgroups defined by gestational age. Three subgroups reflect the gestational age of the child at the time the mother entered the study:

- Up to the twenty-eighth week of pregnancy (about 54 percent of the sample, as shown in Table 4.1)
- After the twenty-eighth week of pregnancy (13 percent)
- After birth (33 percent)

Home visiting had effects that varied among these subgroups to a statistically significant degree for two confirmatory outcomes: child behavior problems and the frequency of minor physical assault during the past year. As noted earlier, however, these differences in effects were not statistically significant after adjusting for the number of comparisons that were made.

Parity

Table 4.3 presents findings for two subgroups defined by parity:

- First-time mothers (60 percent of the sample)
- Mothers who had older children (40 percent)

Home visiting had effects that varied among these subgroups to a statistically significant degree for one confirmatory outcome: child behavior problems. This difference in effects was not statistically significant after adjusting for the number of comparisons that were made.

Table 4.2

Estimated Effects on Confirmatory Outcomes at 15 Months, by Gestational Age at Study Entry

Outcome	Entered Study Up to 28th Week of Pregnancy: Control Group	Entered Study Up to 28th Week of Pregnancy: Difference (Effect)	Entered Study After 28th Week of Pregnancy: Control Group	Entered Study After 28th Week of Pregnancy: Difference (Effect)	Not Pregnant at Study Entry: Control Group	Not Pregnant at Study Entry: Difference (Effect)	P-Value
Maternal health (%)							
New pregnancy after study entry	18.7	0.2	21.3	-8.2	16.7	-0.1	0.872
Family economic self-sufficiency (%)							
Receiving education or training	24.7	-0.1	19.2	3.1	20.8	1.9	0.858
Parenting[a]							
Quality of the home environment	-0.05	0.10	-0.09	0.11	-0.02	0.07	0.957
Parental supportiveness	-0.10	0.10	-0.07	0.14	0.07	0.03	0.686
Child maltreatment							
Frequency of minor physical assault during the past year	2.2	0.1	0.7	2.2	2.2	-0.2	0.091
Frequency of psychological aggression during the past year	3.3	0.0	2.0	2.0	3.4	-0.5	0.210
Child health							
Health insurance coverage for the child (%)	95.6	0.2	98.8	-7.9	93.4	1.5	0.483
Number of Medicaid-paid well-child visits	5.5	-0.1	4.9	1.0	4.3	0.0	0.388
Number of Medicaid-paid child emergency department visits	2.5	-0.3	2.4	-0.7	2.0	-0.1	0.682
Any Medicaid-paid health care encounter for injury or ingestion (%)	28.0	-1.6	19.8	5.2	28.7	-4.6	0.675
Child development[a]							
Behavior problems	-0.01	0.04	0.03	0.10	0.05	-0.17	0.034
Receptive language skills	0.06	0.01	-0.14	0.07	-0.08	0.02	0.940
Sample size (total = 4,215)		2,269		555		1,391	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, state birth records, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the effects are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

Table 4.3

Estimated Effects on Confirmatory Outcomes at 15 Months, by Parity at Study Entry

Outcome	First-Time Mothers: Control Group	First-Time Mothers: Difference (Effect)	Mothers With Prior Children: Control Group	Mothers With Prior Children: Difference (Effect)	P-Value
Maternal health (%)					
New pregnancy after study entry	17.6	2.2	17.5	-1.3	0.260
Family economic self-sufficiency (%)					
Receiving education or training	26.1	2.2	17.2	0.2	0.534
Parenting[a]					
Quality of the home environment	-0.02	0.13	-0.09	0.05	0.316
Parental supportiveness	-0.07	0.08	0.04	0.00	0.288
Child maltreatment					
Frequency of minor physical assault during the past year	2.6	-0.1	1.5	0.0	0.694
Frequency of psychological aggression during the past year	3.7	-0.3	2.7	-0.2	0.760
Child health					
Health insurance coverage for the child (%)	95.1	-0.9	95.3	0.6	0.857
Number of Medicaid-paid well-child visits	5.3	-0.1	4.4	0.6	0.413
Number of Medicaid-paid child emergency department visits	2.5	-0.1	1.6	0.4	0.532
Any Medicaid-paid health care encounter for injury or ingestion (%)	30.1	-2.8	22.9	-0.1	0.872
Child development[a]					
Behavior problems	0.07	0.00	-0.04	-0.12	0.090
Receptive language skills	0.02	0.03	-0.08	0.06	0.695
Sample size (total = 4,204)		2,523		1,681	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, state birth records, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the effects are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

Maternal Race and Ethnicity

Table 4.4 presents findings for subgroups defined by the following maternal races and ethnicities:

- Families of Mexican origin (24 percent)
- Other Hispanic (12 percent)
- Non-Hispanic white (26 percent)
- Non-Hispanic black (29 percent)
- Other race or multiracial (9 percent)

Before adjusting for the number of subgroup comparisons, home visiting had effects that varied among these subgroups to a statistically significant degree for two confirmatory outcomes: the number of Medicaid-paid well-child visits and the child's receptive language skills. After adjusting for the number of comparisons, the differences in effects on Medicaid-paid well-child visits remained significant.

As shown in Table 4.4, the estimated effects on the number of Medicaid-paid well-child visits are different from each other to a degree that is significant at the 1 percent level. The children of non-Hispanic white mothers in the program group had 0.7 fewer well-child visits than children of non-Hispanic white mothers in the control group (who had 5.5 visits on average). The estimated effects for the other subgroups were positive but small (children of mothers in the program group had more Medicaid-paid well-child visits than children of mothers in the control group). One would expect home visiting to encourage families to attend well-child visits, resulting in greater numbers of well-child visits among program group families. It appears to have done so to a small extent among all subgroups except non-Hispanic white mothers.[4]

Presence of Intimate Partner Violence

Table 4.5 presents findings for two subgroups defined by the presence of intimate partner violence at the time women entered the study:

[4]Because the measure is limited to Medicaid-paid well-child visits, a negative effect can occur if control group children are more likely to be enrolled in Medicaid than program group children. Although program group members within the non-Hispanic white subgroup have enrollment rates that are 1.4 percentage points less than control group members, that difference is not large enough to explain the difference in effects on Medicaid-paid well-child visits by race and ethnicity.

Table 4.4

Estimated Effects on Confirmatory Outcomes at 15 Months, by Mother's Race and Ethnicity

Outcome	Mexican Origin		Other Hispanic		Non-Hispanic White		Non-Hispanic Black		Other or Multiracial		P-Value
	Control Group	Difference (Effect)	Control Group	Difference (Effect)	Control Group	Difference (Effect)	Control Group	Difference (Effect)	Control Group	Difference (Effect)	
Maternal health (%)											
New pregnancy after study entry	13.6	3.9	15.4	1.9	17.0	-1.1	21.8	-2.7	22.3	2.0	0.527
Family economic self-sufficiency (%)											
Receiving education or training	26.0	-2.0	20.7	0.8	15.0	4.3	27.0	-1.6	23.2	12.8	0.231
Parenting[a]											
Quality of the home environment	0.02	0.16	0.02	-0.18	0.20	0.07	-0.30	0.08	-0.11	0.11	0.189
Parental supportiveness	-0.14	0.06	-0.21	0.10	0.32	0.12	-0.16	0.04	0.03	-0.14	0.799
Child maltreatment											
Frequency of minor physical assault during the past year	1.8	-0.6	1.5	-0.1	3.0	-0.1	2.0	0.1	2.6	0.2	0.304
Frequency of psychological aggression during the past year	2.6	0.0	2.6	-0.5	3.3	0.1	4.1	-0.3	3.4	0.2	0.814
Child health											
Health insurance coverage for the child (%)	94.3	1.1	97.0	-2.5	94.6	0.2	95.7	0.3	94.1	-2.2	0.661
Number of Medicaid-paid well-child visits	4.9	0.2	5.3	0.2	5.5	-0.7	4.7	0.1	4.8	0.2	0.001

(continued)

Table 4.4 (continued)

Outcome	Mexican Origin Control Group	Mexican Origin Difference (Effect)	Other Hispanic Control Group	Other Hispanic Difference (Effect)	Non-Hispanic White Control Group	Non-Hispanic White Difference (Effect)	Non-Hispanic Black Control Group	Non-Hispanic Black Difference (Effect)	Other or Multiracial Control Group	Other or Multiracial Difference (Effect)	P-Value
Number of Medicaid-paid child emergency department visits	1.9	-0.4	2.4	-0.3	2.3	-0.3	2.3	0.0	2.5	-0.3	0.531
Any Medicaid-paid health care encounter for injury or ingestion (%)	22.8	-5.8	29.5	-1.7	33.9	-3.1	23.4	-1.0	25.7	10.5	0.290
Child development[a]											
Behavior problems	-0.09	-0.05	0.13	0.07	-0.22	-0.08	0.18	0.00	0.24	-0.06	0.769
Receptive language skills	0.00	0.07	0.24	-0.36	0.04	0.01	-0.10	0.07	-0.12	-0.02	0.061
Sample size (total = 4,193)		995		516		1,104		1,196		382	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the effects are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

Table 4.5

Estimated Effects on Confirmatory Outcomes at 15 Months, by Presence of Intimate Partner Violence at Study Entry

Outcome	IPV Present: Control Group	IPV Present: Difference (Effect)	No IPV Present: Control Group	No IPV Present: Difference (Effect)	P-Value
Maternal health (%)					
New pregnancy after study entry	17.7	-0.1	18.2	0.3	0.909
Family economic self-sufficiency (%)					
Receiving education or training	29.7	-4.5	20.7	0.4	0.256
Parenting[a]					
Quality of the home environment	-0.09	0.25	0.03	0.10	0.129
Parental supportiveness	-0.05	0.11	0.04	0.03	0.477
Child maltreatment					
Frequency of minor physical assault during the past year	3.3	-0.4	1.9	-0.2	0.553
Frequency of psychological aggression during the past year	4.7	-0.1	2.7	-0.2	0.813
Child health					
Health insurance coverage for the child (%)	95.8	-2.5	95.4	0.3	0.167
Number of Medicaid-paid well-child visits	5.1	-0.4	5.2	-0.1	0.155
Number of Medicaid-paid child emergency department visits	2.3	-0.1	2.1	-0.2	0.773
Any Medicaid-paid health care encounter for injury or ingestion (%)	23.8	0.0	28.4	-3.8	0.363
Child development[a]					
Behavior problems	0.23	-0.11	-0.12	-0.03	0.354
Receptive language skills	-0.06	0.11	0.07	-0.03	0.202
Sample size (total = 3,017)		810		2,207	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, state birth records, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used. IPV = intimate partner violence.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the impacts are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

- Mothers who indicated that intimate partner violence was present (27 percent)
- Mothers who indicated that intimate partner violence was not present (73 percent)

Home visiting did not have effects that varied between these subgroups to a statistically significant degree for any of the 12 confirmatory outcomes.

Maternal Emotional Functioning

Table 4.6 presents findings for subgroups defined by maternal emotional functioning in three areas: the presence of depression, relationship anxiety, and relationship avoidance at the time mothers entered the study.[5] The subgroups are defined as follows:

- Mothers who did not exhibit depressive symptoms, did not exhibit relationship anxiety, and did not exhibit relationship avoidance were classified in the "high maternal functioning" subgroup (about 41 percent of the sample, as shown in Table 4.1).
- Mothers who exhibited one of these characteristics were in the "moderate maternal functioning" subgroup (29 percent of the sample).
- Mothers who exhibited two or three of these characteristics were in the "low maternal functioning" subgroup (about 30 percent).

Home visiting had effects that varied among these subgroups to a statistically significant degree for one confirmatory outcome: frequency of psychological aggression toward the child in the year before the follow-up survey. This difference in effects was not statistically significant after adjusting for the number of comparisons that were made.

Maternal Psychological Resources

Table 4.7 presents findings for subgroups defined by maternal psychological resources, a composite measure based on mothers' mental health (that is, depressive

[5]"Relationship anxiety" refers to an individual's excessive need for reassurance, fear of rejection, and a desire to merge with relationship partners. "Relationship avoidance" reflects the extent to which an individual avoids intimacy and is distrusting of others. See Mikulincer and Shaver (2007); McFarlane, Burrell et al. (2010).

Table 4.6

Estimated Effects on Confirmatory Outcomes at 15 Months, by Level of Maternal Emotional Functioning at Study Entry

Outcome	Lower Level of Emotional Functioning: Control Group	Lower Level of Emotional Functioning: Difference (Effect)	Moderate Level of Emotional Functioning: Control Group	Moderate Level of Emotional Functioning: Difference (Effect)	Higher Level of Emotional Functioning: Control Group	Higher Level of Emotional Functioning: Difference (Effect)	P-Value
Maternal health (%)							
New pregnancy after study entry	16.7	1.2	18.4	-0.7	17.5	0.9	0.871
Family economic self-sufficiency (%)							
Receiving education or training	25.9	-3.6	23.2	-1.1	21.9	1.5	0.378
Parenting[a]							
Quality of the home environment	-0.31	0.09	-0.03	0.08	0.14	0.07	0.963
Parental supportiveness	-0.17	0.15	-0.15	0.14	0.13	0.00	0.201
Child maltreatment							
Frequency of minor physical assault during the past year	2.6	-0.3	2.1	0.1	1.9	0.0	0.544
Frequency of psychological aggression during the past year	4.5	-0.9	3.5	-0.4	2.4	0.3	0.014
Child health							
Health insurance coverage for the child (%)	95.5	-0.8	95.6	-0.8	95.0	0.1	0.844
Number of Medicaid-paid well-child visits	4.9	0.0	5.3	-0.4	5.1	-0.1	0.159
Number of Medicaid-paid child emergency department visits	2.5	-0.4	2.3	-0.1	2.0	-0.1	0.463
Any Medicaid-paid health care encounter for injury or ingestion (%)	29.6	-2.0	25.4	1.9	25.8	-3.0	0.425
Child development[a]							
Behavior problems	0.38	-0.07	0.02	0.00	-0.22	-0.07	0.631
Receptive language skills	-0.05	-0.04	-0.07	0.10	0.08	-0.05	0.253
Sample size (total = 4,156)		1,265		1,209		1,682	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the impacts are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

Table 4.7

Estimated Effects on Confirmatory Outcomes at 15 Months, by Level of Psychological Resources at Study Entry

Outcome	At or Below Median Level of Psychological Resources: Control Group	At or Below Median Level of Psychological Resources: Difference (Effect)	Above Median Level of Psychological Resources: Control Group	Above Median Level of Psychological Resources: Difference (Effect)	P-Value
Maternal health (%)					
New pregnancy after study entry	18.4	0.0	16.1	2.3	0.423
Family economic self-sufficiency (%)					
Receiving education or training	22.2	-1.3	23.8	1.2	0.395
Parenting[a]					
Quality of the home environment	-0.24	0.04	0.14	0.12	0.342
Parental supportiveness	-0.24	0.10	0.16	0.00	0.207
Child maltreatment					
Frequency of minor physical assault during the past year	2.1	-0.1	2.3	-0.2	0.803
Frequency of psychological aggression during the past year	3.5	-0.3	3.2	-0.3	0.886
Child health					
Health insurance coverage for the child (%)	95.6	-0.8	95.2	-0.3	0.702
Number of Medicaid-paid well-child visits	5.0	-0.1	5.1	-0.1	0.740
Number of Medicaid-paid child emergency department visits	2.4	-0.2	2.1	-0.2	0.962
Any Medicaid-paid health care encounter for injury or ingestion (%)	28.2	-2.2	25.0	0.7	0.342
Child development[a]					
Behavior problems	0.30	-0.03	-0.23	-0.06	0.701
Receptive language skills	-0.05	0.00	0.01	0.05	0.462
Sample size (total = 4,118)		1,958		2,160	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the effects are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

symptoms and anxiety),[6] mastery,[7] and verbal abstract reasoning when they entered the study.[8] The subgroups are:

- Mothers with psychological resources at or below the median level (48 percent)
- Mothers with psychological resources above the median level (53 percent)

Home visiting did not have effects that varied between these subgroups to a statistically significant degree for any of the 12 confirmatory outcomes.

Demographic Risk Categories

Table 4.8 presents findings for subgroups defined by maternal characteristics that put them or their children at higher risk of poor outcomes: whether mothers received public assistance or were enrolled in Medicaid, whether they were 20 years old or younger, whether the child's biological father did not live in the home, and whether the mother was not enrolled in school (if younger than age 19) or had not received a high school degree (if at least 19 years old).

- Mothers in the lowest-risk subgroup had zero to two of these risk factors (63 percent)
- Mothers in the moderate-risk subgroup had three of the risk factors (30 percent)

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[6]Depression severity ranges from 0 (not depressed) to 30 (most severely depressed) and is based on a 10-item version of the Center for Epidemiologic Studies-Depression Scale. See Radloff (1977). Anxiety was measured using the Generalized Anxiety Disorder 7-item scale. See Spitzer, Kroenke, Williams, and Löwe (2006).

[7]Mastery measures the extent to which a person thinks life chances are under his or her control. See Pearlin and Schooler (1978).

[8]The concept of "psychological resources" is taken from the Nurse-Family Partnership Memphis pilot test, which hypothesized that effects on maternal caregiving and childhood injuries would be greater among mothers with few psychological resources. See Kitzman et al. (1997). Maternal psychological resources reflect (1) mental health as measured by the Center for Epidemiologic Studies-Depression Scale and the Generalized Anxiety Disorder 7 Scale; (2) mastery as measured by the Pearlin Mastery Scale; and (3) verbal abstract reasoning as measured by the Wechsler Adult Intelligence Scale – III and the Spanish equivalent Escala de Inteligencia Wechsler para Adultos – Tercera Edicion. Used by permission of NCS Pearson. See Wechsler (1997); Wechsler (2008). The analysis summed these standardized scores (each of which had a mean of 100 and a standard deviation of 10), and standardized the sum in a similar way. Sample members were then divided into subgroups with total scores either below the median or above it.

Table 4.8

Estimated Effects on Confirmatory Outcomes at 15 Months, by Level of Demographic Risk at Study Entry

Outcome	Lower Level of Demographic Risk		Moderate Level of Demographic Risk		Higher Level of Demographic Risk		
	Control Group	Difference (Effect)	Control Group	Difference (Effect)	Control Group	Difference (Effect)	P-Value
Maternal health (%)							
New pregnancy after study entry	16.6	0.8	18.1	2.7	7.0	26.0	0.072
Family economic self-sufficiency (%)							
Receiving education or training	18.9	-1.0	31.5	-2.5	26.4	24.4	0.122
Parenting[a]							
Quality of the home environment	0.06	0.10	-0.21	0.10	-0.50	0.14	0.991
Parental supportiveness	0.08	0.10	-0.26	0.05	-0.41	0.27	0.671
Child maltreatment							
Frequency of minor physical assault during the past year	2.2	-0.2	2.2	-0.2	2.1	0.4	0.819
Frequency of psychological aggression during the past year	3.2	-0.3	3.6	-0.3	3.9	-0.8	0.917
Child health							
Health insurance coverage for the child (%)	95.9	-0.6	93.9	1.4	94.7	-3.9	0.357
Number of Medicaid-paid well-child visits	5.2	-0.1	4.9	0.1	4.9	-0.1	0.443
Number of Medicaid-paid child emergency department visits	2.0	-0.2	2.7	-0.1	2.5	0.3	0.548
Any Medicaid-paid health care encounter for injury or ingestion (%)	26.3	-2.1	27.2	0.0	29.3	2.4	0.737
Child development[a]							
Behavior problems	-0.09	-0.06	0.22	-0.11	0.10	0.50	0.066
Receptive language skills	-0.01	0.01	0.00	-0.01	-0.33	0.62	0.135
Sample size (total = 4,203)		2,640		1,242		321	

SOURCES: Calculations based on the MIHOPE family baseline survey, the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Subgroup effects control for evidence-based model to account for differences in the distribution of the evidence-based models within subgroups.

Subgroup difference p-value was calculated with an omnibus test (HT statistic) that tests whether the effects are different across all groups to a statistically significant degree.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

- Mothers in the high-risk subgroup had all four risk factors (8 percent)

Home visiting had effects that varied among these subgroups to a statistically significant degree for two confirmatory outcomes: whether the mother had a new pregnancy after entering the study and child behavior problems. These differences in effects were not statistically significant after adjusting for the number of comparisons that were made.

Baseline Risk Factors

In addition to the prespecified subgroups discussed above, the study team conducted several ad hoc analyses using subgroups defined by maternal characteristics recorded when mothers entered the study. These analyses examined whether effects on several outcomes were concentrated in the subgroup whose members were assessed as facing a risk factor for the outcome when they entered the study. For example, the analyses examined whether effects on maternal depression were concentrated among those who exhibited depression when they entered the study. These subgroup comparisons were not specified in the study's analysis plan. They are considered exploratory and therefore they were not included in the adjustment for multiple comparisons described above.

The characteristics used to define these subgroups are:

- Experience with battering
- Perpetrating or experiencing physical violence
- Receipt of domestic violence services
- Depressive symptoms
- Smoking
- Food insecurity
- Substance use

For none of these comparisons did the estimated effects vary across subgroups of families. For example, home visiting did not have effects on experiences with battering among women who had experienced battering before entering the study that were significantly different from its effects among women who had not experienced battering before entering the study.

Conclusion

Past studies of home visiting show little consistency in their definition of subgroups, in the way they report subgroup findings, or in the differences in effects they find among subgroups. The current study attempted to reflect subgroup definitions that had been used more commonly in previous home visiting research, and to examine those subgroups where there were likely to be policy or program implications if differences in effects emerged.

The study finds that for the most part, home visiting had similar effects across all subgroups of the families served in home visiting programs. Differences in effects among subgroups were often small and were seldom statistically significant. After adjusting for multiple comparisons, just 1 difference in effects out of the 84 that were tested retained statistical significance.

Because the effects of home visiting appear to have been consistent across families with different characteristics, it is unlikely that using mothers' characteristics to target home visiting services would result in larger program effects. It is nevertheless possible that targeting could result in larger effects if it were based on characteristics that were not examined here, if it were based on combinations of characteristics not examined here, or if it were combined with changes in the kinds of services offered to families with particular risk factors. Since this chapter focused on confirmatory outcomes, it is also possible that there are subgroup differences for exploratory outcomes. Future research could further examine these targeting and outcome questions. For example, predictive modeling approaches could use the MIHOPE data, or program administrative data, to examine relationships between combinations of family characteristics and effects. Program operators could assess the feasibility of these kinds of approaches, the improvements in effectiveness they achieve, and their cost-effectiveness relative to their current practices.

Chapter 5

How Effects Vary with Program Features and Services Received

The Mother and Infant Home Visiting Program Evaluation (MIHOPE) was designed to make it possible to learn how service delivery and program implementation are associated with programs' effects. While Chapter 3 showed the effects of the programs as a whole on a range of family outcomes, the study's implementation research identified some features of local programs that might contribute to those effects.[1] This chapter ties the two strands together to address the following broad research questions:

- How much do effects vary across local home visiting programs?
- Are any features of local home visiting programs associated with larger or smaller effects on family outcomes?
- Are any aspects of the home visiting services that families received associated with larger or smaller effects on family outcomes?

Although randomly assigning families to the program and control groups resulted in reliable estimates of the effects home visiting caused on family outcomes, the results presented in this chapter do not necessarily represent causal relationships. For example, a finding that local programs whose home visitors have higher morale produce larger effects than other programs would not necessarily mean that home visitor morale is the cause of those larger effects. It could be the case that local programs whose home visitors have higher morale are better implemented in other ways that result in larger effects, or that they serve families whose lives are easier to influence through home visiting. Nevertheless, the results suggest ways programs might improve their effectiveness.

Summary of Findings

- **For most of the confirmatory outcomes, there is little variation in the effects of local programs.** For example, the estimated effect on whether a mother had another pregnancy after entering the study ranges across local programs from a reduction of about 25 percentage points to an increase of about 39 percentage points. With 86 local

[1]Duggan et al. (2018).

programs, most of which included 60 or fewer families, this range is about what would be expected if all local programs had the same true effect on this outcome. Of the 12 confirmatory outcomes, 10 follow a similar pattern.

- **There is significant variation across local programs in effects on two outcomes: the number of Medicaid-paid well-child visits and whether a child had any health care encounter related to an injury or ingestion.** This is consistent with variation in the four evidence-based models' emphasis on health-related issues, although differences in estimated effects across the four models are not statistically significant for these two outcomes (discussed below). It is also consistent with a finding from MIHOPE-Strong Start that some effects were larger in locations with a higher density of primary care physicians.[2]

- **There are some statistically significant differences across the evidence-based models.** Differences by model are generally consistent with the focus of the models. For example, in the main report analysis, Parents as Teachers produced the largest increases in parental supportiveness and Nurse-Family Partnership produced the largest reductions in emergency department visits for children. The differences are somewhat sensitive to the statistical method used to examine them but the two patterns described above were found across different estimation methods.

- **There is not a strong association between additional home visiting services and larger effects.** The analysis examined the number of home visits families received, the number of times topics related to certain outcomes were discussed, and whether home visitors referred families to community services to address needs in certain areas. The estimated effects were similar among local programs where families received more of these home visiting services and those where they received fewer services, and effects were not systematically larger among families who received more home visiting services than they were among those who received fewer. This result is consistent with the overall finding that effects were similar across local programs.

- **There is little evidence that distinctive features of local programs are associated with better family outcomes.** Although there are a

[2]Lee et al. (2019).

number of statistically significant associations between program features and effects, most of them are counter to what was expected. For example, the results suggest that local programs with staff members dedicated to continuous quality improvement had less positive effects on several outcomes, although it is possible that the continuous quality improvement efforts focused on outcomes that were not examined. This finding does not necessarily mean that program implementation does not matter. One limitation of the analysis is that it could only investigate aspects of program implementation that varied substantially across local programs, and most programs included in MIHOPE were using similar practices in implementing their services.

Variation in Effects Across Local Programs

The first issue addressed in this analysis is whether the effects of home visiting vary across local programs, and if so, by how much. There are a number of potential sources of variation. The estimated effects of home visiting can vary across local programs because some local programs are more effective than others. They may also vary because some local programs are in communities where home visiting is more or less likely to have an effect, or because families in some local programs differed from families in other programs.

As shown in Appendix Table F.1, the 12 confirmatory outcomes fall into two groups.

- **For 10 outcomes, there appears to be little variation in effects across local programs:** new pregnancy after study entry, whether the mother is receiving education or training, the quality of the home environment, parental supportiveness, frequency of minor physical assault, frequency of psychological aggression, number of Medicaid-paid child emergency department visits, whether the child has health insurance, child behavior problems, and child receptive language skills.[3] The MIHOPE implementation research found that the local programs

[3]As with all results in this report, this result is based on a statistical analysis that comes with some uncertainty. It is possible that some local programs are more effective than others at improving these outcomes, but, if so, there are too few of those programs or their effects are not sufficiently different from those of other programs to have generated strong statistical evidence of those differences.

included in the study were often implemented in similar ways, which could be part of the reason they had similar effects.[4]

- **For two outcomes, there is significant variation in effects across local programs.** Both outcomes are in the area of child health: the number of Medicaid-paid well-child visits and whether a child had any health care encounter for injury or ingestion. Although all four evidence-based models and nearly all local programs make a high priority of child preventive care, Nurse-Family Partnership has historically placed more emphasis on this outcome area. The variation in effects might also reflect variation in the availability of primary care, which MIHOPE-Strong Start found was associated with differences in the effects of home visiting programs on several outcomes related to infant health and health care.[5]

How Effects Vary with Local Program Features

The next stage of the analysis explored how the features of local home visiting programs are related to the effects of those programs. For well-child visits and health care for injury or ingestion — where there are statistically significant variations in effects across local programs — the analysis could shed light on why the effects are larger in some places than others. For other outcomes, it is possible that local programs were adapted to their local environments in a way that would reduce the variation in effects across local programs. Thus, local program features could still be associated with larger or smaller effects.[6]

Results in this section are divided into two parts: (1) differences in effects among the four evidence-based models and (2) whether differences in effects are associated with other differences in the local programs, including the characteristics of their home visitors.

[4]Duggan et al. (2018).

[5]Lee et al. (2019).

[6]Adjusting for differences in local program characteristics might also have a statistical benefit in the analysis by making local programs look more similar to one another in other respects. Doing so might increase the statistical precision of the associations being examined.

Differences in Effects Among the Evidence-Based Models

There are several reasons why effects might vary among the evidence-based models.

- All four models try to improve a broad range of family and child outcomes, but they take somewhat different approaches to achieve that objective. For example, Early Head Start and Parents as Teachers focus more on parenting and child development, Healthy Families America has its origins in reducing child maltreatment, and Nurse-Family Partnership — with its use of nurses as home visitors — has the strongest emphasis on health care and health outcomes.

- Beyond these core outcomes, the four models have somewhat different priorities. Although they all make a high priority of parenting, child maltreatment, child development, and family economic self-sufficiency, they differ somewhat in how much priority they give to maternal health (physical, mental, and reproductive) and intimate partner violence.[7]

- Across local programs in MIHOPE, there are differences in how many home visiting services families received.[8] There are at least two potential reasons for these differences. First, more women in the program group served by Nurse-Family Partnership and Early Head Start received services for a year or longer than did women served by the other two models. Second, the models differed in how often they expected families to be visited, and families served by Early Head Start and Healthy Families America received more visits on average in the first year.

Taken together, these considerations might lead to the following expectations:

- A model's effects might be largest in its focal area: parenting and child development for Early Head Start and Parents as Teachers, child maltreatment for Healthy Families America, and maternal and child health for Nurse-Family Partnership.

- Effects might be consistent across models in the outcome areas they all identify as high priorities — parenting, child maltreatment, child development, and family economic self-sufficiency — but vary more in

[7]Michalopoulos et al. (2015).

[8]Duggan et al. (2018).

other areas, particularly those related to maternal health and intimate partner violence.

- Effects might be larger for Early Head Start and Nurse-Family Partnership if families benefit from receiving services for a longer time, and larger for Early Head Start and Healthy Families America if families benefit from receiving a larger number of visits.

Table 5.1 shows the estimated effects of the four evidence-based models on the 12 confirmatory outcomes. Results for parenting and child development outcomes are shown as effect sizes since those outcomes are scale scores for which the units do not have a natural interpretation. The results indicate that program group women in Early Head Start programs were 2.6 percentage points more likely to have new pregnancies than their control group counterparts, while the estimated effect for Healthy Families America was 0.7 percentage points. In contrast, the estimated effects for Nurse-Family Partnership and Parents as Teachers indicate small reductions in new pregnancies.

The last column of Table 5.1 shows the p-value of a statistical test of the hypothesis that the effects are the same for all four evidence-based models.[9] P-values of 0.10 and lower indicate outcomes where effects varied significantly among the models. For example, for new pregnancies the p-value is 0.963, suggesting that the effects are broadly consistent across the four models. In contrast, for differences in effects on the quality of the home environment the p-value is 0.004, indicating there is significant variation across the four models.

As shown in Table 5.1, the four evidence-based models have effects that are significantly different for four of the confirmatory outcomes:

- **Quality of the home environment.** The estimates suggest all four models improved this outcome — which is consistent with the aims of the four models. The effect size is about 0.11 for three of the evidence-based models — Early Head Start, Healthy Families America, and Parents as Teachers — and smallest for Nurse-Family Partnership (0.05).

- **Parental supportiveness.** The difference among the models appears to be primarily the result of a larger effect for Parents as Teachers

[9]The MIHOPE analysis plan specifies that the study would test whether effects varied across evidence-based models but would not test whether the estimated effect for any particular model was significantly different from zero.

Table 5.1

Estimated Effects on Confirmatory Outcomes at 15 Months, by Evidence-Based Model

Outcome	Estimated Effect				P-Value
	EHS	HFA	NFP	PAT	
Maternal health (%)					
New pregnancy after study entry	2.6	0.7	-0.1	-0.8	0.963
Family economic self-sufficiency (%)					
Receiving education or training	2.9	1.8	-5.6	3.3	0.477
Parenting[a]					
Quality of the home environment	0.11	0.11	0.05	0.11	0.004
Parental supportiveness	0.05	-0.09	0.08	0.17	0.077
Child maltreatment					
Frequency of minor physical assault during the past year	0.1	-0.5	0.2	0.1	0.254
Frequency of psychological aggression during the past year	0.2	-0.4	-0.3	0.0	0.465
Child health					
Health insurance coverage for the child (%)	1.3	-1.0	-0.8	-0.5	0.701
Number of Medicaid-paid well-child visits	0.5	-0.2	-0.3	0.0	0.262
Number of Medicaid-paid child emergency department visits	0.3	-0.2	-0.5	0.0	0.031
Any Medicaid-paid health care encounter for injury or ingestion (%)	-2.6	2.5	-3.5	-3.5	0.628
Child development[a]					
Behavior problems	-0.01	-0.07	-0.12	0.07	0.100
Receptive language skills	0.05	-0.01	-0.01	0.10	0.725
Sample size (total = 4,215)	571	1,454	1,231	959	

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: EHS = Early Head Start — Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers.

See Appendix B for descriptions of the outcome measures used.

Estimates come from a fixed effect, random slope model. See Appendix F text for more details.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

(effect size of 0.17). This difference is consistent with that model's focus on parenting and child development.

- **Number of emergency department visits for the child.** Two of the models have reductions in emergency department use, but the estimated reduction is greatest for Nurse-Family Partnership (-0.5). This difference is consistent with Nurse-Family Partnership's emphasis on

health outcomes, and might reflect nurses' ability to help parents navigate the health care system.

- **Child behavior problems.** The results show the largest estimated effects for Nurse-Family Partnership (effect size of -0.12) and Healthy Families America (-0.07).

Just as the estimated effects presented in Chapter 3 were compared under different statistical assumptions (shown in Appendix D), the robustness of the model differences was examined using two methods other than those shown in Table 5.1. Results for the two other methods are shown in Appendix Tables F.2 and F.3.[10] Although the patterns of impacts across evidence-based models are similar across the three methods, the outcomes for which differences are statistically significant differed across the three methods. In particular, results in Appendix Table F.2 indicate that none of the model differences are statistically significant. In contrast, results in Appendix Table F.3 show statistically significant differences across the models for three outcomes: parental supportiveness, frequency of minor physical assault during the past year, and frequency of psychological aggression during the past year. The last set of results suggest that Healthy Families America had the largest estimated effects on child maltreatment, which is consistent with the historical focus of that model (and also consistent with the pattern of findings in Tables 5.1 and F.2, even though differences across the models in those two tables are not statistically significant).

Variations in Effects Related to Home Visitor Characteristics and Local Program Features

This subsection presents information on whether there are features of local programs that are associated with effects. For this analysis, local program features were chosen based on three considerations: (1) theory and previous evidence about which aspects of program implementation are likely to be important, (2) results of a multivariate analysis presented in the MIHOPE implementation research report that linked local program features to variation in services received by families, and (3) a reasonable amount

[10]Materials presented to the Advisory Committee to the Secretary of Health and Human Services in September 2015 indicated that results in Chapter 5 would be based on a random effects model, but there are several ways to estimate these models. Results shown in Table 5.1 are based on a random effects model using a method called Maximum Likelihood Estimation. Appendix Table F.2 shows results from a random effects analysis with another method called Restricted Maximum Likelihood estimation. Appendix Table F.3 shows results when the sample was divided by evidence-based model rather than using a random effects model.

of variation in the measure across the MIHOPE local programs.[11] Because of the third criterion, the analysis could not examine program features common to most programs.

These criteria led to selecting the following features to focus on in these analyses:[12]

- **Whether the local program has a staff member dedicated to continuous quality improvement.** About 60 percent of program managers said their local program had such a person. According to the implementation research report, families served by local programs with staff members dedicated to continuous quality improvement were more likely than other families to receive at least one home visit. This finding is consistent with other research showing that continuous quality improvement activities in home visiting improve service delivery and family outcomes.[13]

- **Whether the home visitor had at least a bachelor's degree.** About 62 percent of home visitors had bachelor's degrees, and an additional 13 percent had master's degrees. According to the MIHOPE implementation research report, home visitors with bachelor's degrees or higher discussed various topics with families at different rates than other home visitors. Although some studies have found that families served by better-educated home visitors remain in home visiting longer,[14] that result has not been found consistently.[15]

- **Home visitor morale.** Past research indicates that families receive services longer when they are served by home visitors with high

[11]The team did not use a specific criterion for determining what was a "reasonable amount of variation" but tried to avoid program features where programs or their staffs were largely similar to one another. For example, the team preferred binary program features for which close to half of local programs had the feature (and close to half did not) to those that were true for most or few local programs.

[12]Another feature considered for the analysis was the parenting curricula used by the local programs. In total, the local programs reported using many different parenting curricula, although the three most common were the Parents as Teachers Foundational Curriculum, Partners in Parenting Education (PIPE), and Partners for a Healthy Baby (PHB). The curricula were ultimately not included in the current analysis because they are so highly associated with the evidence-based models. In particular, Nurse-Family Partnership requires its local programs to use PIPE and Parents as Teachers requires its local programs to use the Parents as Teachers Foundational Curriculum. Thus, it would be difficult to distinguish the effects of the evidence-based models from the curricula they require.

[13]Goyal et al. (2016); McCabe, Potash, Omohundro, and Taylor (2012).

[14]Korfmacher, O'Brien, Hiatt, and Olds (1999).

[15]Daro, McCurdy, Falconnier, and Stojanovic (2003); McGuigan, Katzev, and Pratt (2003).

morale.[16] In addition, the MIHOPE implementation research report found that home visitor morale was associated with the duration of families' participation in home visiting.

- **Percentage of supervisory sessions in which client issues were addressed.** During supervisory sessions, home visitors and their supervisors discuss logistical issues, administrative issues, or client-specific issues. About 62 percent of supervisory sessions in MIHOPE had discussions about client issues. Focusing on clients' needs and talking about how to solve them could reflect higher-quality home visiting practices, which could in turn be related to effects.

- **Number of hours per week supervisors observed home visits.** Local programs are increasingly using observations of home visits to build home visitors' skills, and a recent meta-analysis found that these observations can lead to larger program effects.[17]

- **Whether home visitors received training related to certain outcome areas.** This information was included for the three confirmatory outcomes where there was a reasonable amount of variation in the amount of training home visitors received: (1) new pregnancies after mothers entered the study, (2) whether mothers were receiving education or training at the time of the follow-up survey, and (3) whether children had health insurance coverage. Specifically, according to the MIHOPE implementation research, 44 percent of home visitors received training in addressing family planning and birth spacing, 55 percent received training related to family economic self-sufficiency, and 26 percent received training related to health insurance.[18] The implementation research report found that home visitors who received training in family planning and birth spacing, substance use, mental health, intimate partner violence, or child development discussed these topics with families more often than did other home visitors. In addition, home visitors who received more hours of training overall discussed economic self-sufficiency in more visits than did other home visitors.

[16]Latimore et al. (2017).

[17]Casillas, Fauchier, Derkash, and Garrido (2016).

[18]Duggan et al (2018). By comparison, 89 percent of home visitors received training related to child development, making it difficult to detect differences between home visitors who did and did not receive such training.

The relationships between these program features and estimated effects are presented in Table 5.2.[19] Each row shows 1 of the 12 confirmatory outcomes. Columns show results for one of the program features. The estimates show how much the effect varies with one unit of the program feature. Here is how to interpret these estimates:

- **Staff member dedicated to continuous quality improvement.** The table shows the estimated differences in effects between local programs with dedicated staff members and those without.
- **Hours allotted to supervisor observation of home visits.** The table shows the estimated differences in effects associated with an extra hour of supervision.
- **Percentage of supervision sessions where client issues were discussed.** This measure ranges from 0 percent to 100 percent, so the table shows the estimated difference in effects associated with an additional percentage point of supervisory time allocated to these issues.
- **Home visitor morale.** Morale was measured using a scale that is normalized to have a mean of 0 and a standard deviation of 1. Table 5.2 shows the estimated differences in effects associated with improving morale by one standard deviation.
- **Home visitors with bachelor's degrees.** This measure ranges from 0 percent to 100 percent of home visitors, so the table shows the estimated difference in effects associated with an additional percentage point of home visitors having bachelor's degrees.
- **Home visitor received training in an outcome area.** This measure ranges from 0 percent to 100 percent, so the table shows the estimated difference in effects associated with an additional percentage point of home visitors in a local program receiving relevant training.

The results in Table 5.2 do not suggest that differences in the program features that were examined are associated with differences in program effects. In fact, most of the estimates shown in Table 5.2 that are statistically significant are the opposite of what was expected. For example, local programs with dedicated continuous quality

[19]Results in Table 5.2 control for which evidence-based model a local program was using. The results are largely the same if the evidence-based model is excluded from the analysis.

Table 5.2

Association Between Estimated Effects and Local Program and Home Visitor Characteristics

Outcome	Having a Staff Member Dedicated to CQI[a]	P-Value	An Additional Hour Per Week of Supervisor Observing Home Visits	P-Value	A Percentage Point Increase in Supervisory Sessions Discussing Client Issues	P-Value
Maternal health (%)						
New pregnancy after study entry	8.17	0.002	1.14	0.293	-0.03	0.630
Family economic self-sufficiency (%)						
Receiving education or training	-1.47	0.605	-0.78	0.434	0.08	0.140
Parenting[c]						
Quality of the home environment	-0.02	0.690	-0.01	0.474	0.00	0.295
Parental supportiveness	-0.05	0.577	0.02	0.168	0.00	0.822
Child maltreatment						
Frequency of minor physical assault during the past year	0.21	0.466	0.11	0.090	0.00	0.839
Frequency of psychological aggression during the past year	0.44	0.154	0.16	0.047	0.01	0.213
Child health						
Health insurance coverage for the child (%)	-0.64	0.677	-0.51	0.233	-0.01	0.849
Number of Medicaid-paid well-child visits	-0.40	0.080	-0.11	0.048	0.01	0.040
Number of Medicaid-paid child emergency department visits	0.34	0.057	0.02	0.668	0.00	0.998
Any Medicaid-paid health care encounter for injury or ingestion (%)	6.22	0.071	-0.70	0.504	-0.04	0.514
Child development[c]						
Behavior problems	-0.10	0.083	0.03	0.015	0.00	0.078
Receptive language skills	0.01	0.861	-0.01	0.577	0.00	0.377

(continued)

Table 5.2 (continued)

Outcome	Higher Home Visitor Morale	P-Value	Home Visitor Having a Bachelor's Degree or Higher	P-Value	Home Visitor Ever Attending Training in Outcome Area[b]	P-Value
Maternal health (%)						
New pregnancy after study entry	-1.28	0.360	-0.01	0.904	-0.05	0.295
Family economic self-sufficiency (%)						
Receiving education or training	0.17	0.901	0.08	0.197	-0.05	0.313
Parenting[c]						
Quality of the home environment	0.03	0.283	0.00	0.067	NA	NA
Parental supportiveness	0.00	0.961	0.00	0.330	NA	NA
Child maltreatment						
Frequency of minor physical assault during the past year	-0.15	0.406	0.00	0.984	NA	NA
Frequency of psychological aggression during the past year	0.11	0.620	0.00	0.965	NA	NA
Child health						
Health insurance coverage for the child (%)	0.19	0.789	0.03	0.210	-0.03	0.243
Number of Medicaid-paid well-child visits	0.32	0.129	0.00	0.217	NA	NA
Number of Medicaid-paid child emergency department visits	-0.08	0.364	0.00	0.798	NA	NA
Any Medicaid-paid health care encounter for injury or ingestion (%)	-0.09	0.967	0.02	0.809	NA	NA
Child development[c]						
Behavior problems	0.07	0.022	0.00	0.112	NA	NA
Receptive language skills	0.02	0.628	0.00	0.141	NA	NA
Sample size (total = 4,215)						

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, the MIHOPE home visitor baseline survey, the MIHOPE program manager baseline survey, home visitor monthly training logs, and weekly supervision logs completed by supervisors of individual home visitors.

NOTES: NA = not applicable.

Estimates come from a fixed effect, random slope model. See Appendix F text for more details.

See Appendix B for descriptions of the outcome measures used.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]CQI = continuous quality improvement.

[b]Estimates are missing for some associations between estimated effects and whether the home visitor ever attended training in an outcome area because there is little variation in whether home visitors attended training in the areas of positive parenting, child maltreatment, child preventive care, and child development.

[c]Outcomes are standardized such that effect sizes are shown.

improvement staff members had effects on subsequent pregnancy that suggest an 8.2 percentage point increase compared with other local programs. Local programs with dedicated continuous quality improvement staff members are associated with increased child emergency department use and increased child health care encounters for injuries and ingestions compared with other local programs. Likewise, programs with more time allocated to supervisor observation of home visits have worse effects on the frequency of minor physical assault and the frequency of psychological aggression toward the child, reductions in the number of well-child visits, and worsened child behavior problems. Since continuous quality improvement and additional hours of supervision are not expected to make family outcomes worse (as these findings would suggest), these results might indicate that these features reflect the influence of other unmeasured characteristics that differ across local programs. For example, local programs that dedicate more time to supervisor observation of home visits might have less effective home visitors who need more supervision.

How Home Visiting Services Are Associated with Effects

The previous section presented the relationship between the features of local home visiting programs and their effects. This section explores how the services that families received are related to the effects of home visiting they experienced. The purpose is to gain a better understanding of whether receiving a higher *dosage* of home visiting (a larger number or greater intensity of services) improves family outcomes, and if so, by how much. The section is based on two statistical methods — *instrumental variables* and *causal mediation analysis* — that are described later in the section. Since each approach has strengths and weaknesses, the analyses might provide a range of results. If the two approaches produce consistent results, it would be reasonable to have greater confidence in them.

Overview of the Approaches Used

For this analysis, three types of services were examined:

- **Number of home visits between random assignment and the time of the follow-up survey.** For program group members, this information was taken from weekly logs completed by home visitors for the study. This period was chosen since most outcomes were measured at the time of the follow-up survey and home visiting services could have continued to produce effects through this period. On average, program group families received 18.1 visits during this period (including 0 visits for families for whom no visits were recorded).

- **Number of times outcome-specific topics were discussed.** Each additional home visit could broadly improve family outcomes, but discussing specific topics might have a larger effect on the outcomes related to that topic. The analysis therefore examines how effects vary with the number of times certain topics were discussed.
- **Referrals to services in the community.** One of the ways home visitors try to help families is by referring them to services in the community. The analysis therefore examines the relationship between effects and whether families received referrals to services related to the outcomes being examined. The study does not have information on whether parents used those referrals or received the services to which they were referred.

This chapter presents results related to the number of home visits, while Appendix F shows results for the number of times outcome-specific topics were discussed and referrals to services in the community. In general, results for topics discussed and referrals to services look similar to the results presented here for the number of home visits.

A concern about investigating the link between services and effects is that there may be associations between services received and effects on family outcomes even if the services do not *cause* the outcomes to be larger or smaller. For example, a mother who participates has to agree to schedule visits, has to let the home visitor in the door, and has to spend time with the home visitor. It is likely that the mothers who benefit the most from home visits will be those who are the most engaged in the program and who consequently remain enrolled in the program longer. Larger effects among such mothers would not necessarily mean that increasing the number or length of home visits for other mothers would lead to similar improvements in their families' outcomes. Alternatively, it is possible that mothers who can schedule and keep multiple appointments with home visitors may already have better parenting skills, be better able to navigate the health care system, and be more likely to delay having their next children than other parents. Such parents might not actually benefit much from the program, and effects might be smaller among them than among other mothers.

To attempt to overcome this problem, MIHOPE examined the data using the statistical method of instrumental variables. In MIHOPE, this method was based on examining the relationship between a local program's effects and the average level of home visiting services received by families in that local program. By focusing on local program averages rather than individual families, the method reduces statistical problems that

result from noncausal correlations between outcomes and the levels of services received by individual families.[20]

The idea behind instrumental variables analysis is illustrated in Figure 5.1, which plots the average number of home visits each local program provided to program group members between study entry and the 15-month follow-up point against that local program's estimated effect on the percentage of sample members with new pregnancies. Each dot represents one local program. The horizontal axis measures the average number of home visits, so dots to the right of the figure represent local programs with more visits. As the figure shows, the average number of home visits ranged from about 5 to about 45. The vertical axis represents each local program's estimated effect on new pregnancies, with estimates ranging from about -25 (indicating a reduction of 25 percentage points in the proportion of sample members with new pregnancies) to about 40 (indicating an increase of about 40 percentage points).

The solid line in Figure 5.1 shows the relationship between the average number of home visits and the estimated effect. The line has a slight upward slope, meaning that local programs with more home visits tended to have larger increases in new pregnancies, although the relationship between the number of home visits and the estimated effect is not strong. At the far right of the figure, the line suggests that a program that provided 45 home visits to the average program group families would increase new pregnancies by about 1.5 percentage points. In contrast, Chapter 3 showed that the overall effect on new pregnancies was an increase of 0.6 percentage points, an effect that was not significantly different from zero.

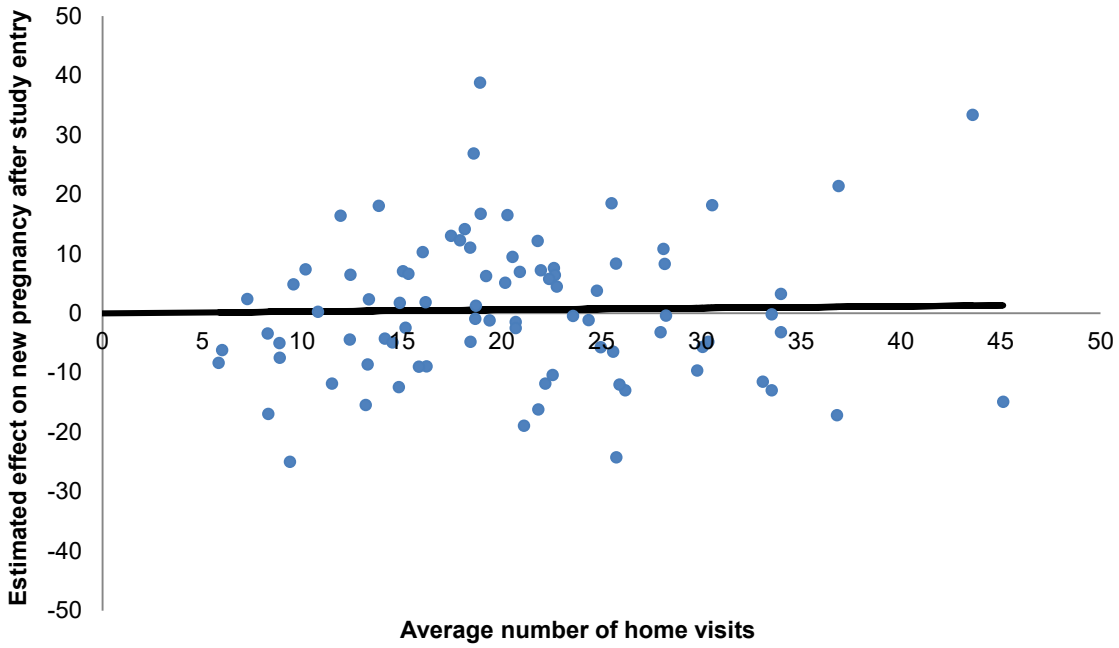
Although there are some advantages to analyzing variation across local programs, doing so does not use information on how home visits and outcomes vary among families within a local program. For that reason, this section also presents estimates generated using a second method called causal mediation analysis.[21]

[20]For a multisite study such as MIHOPE, however, instrumental variables analysis assumes that the effectiveness of services provided by local programs is not related to the levels of services received by families in those programs. These and other assumptions are discussed in Reardon and Raudenbush (2013).

[21]See, for example, Imai, Keele, Tingley, and Yamamoto (2011). While the name of this method implies that it produces causal estimates, this is only the case if the assumptions of the method are met. As discussed earlier in the chapter, this is unlikely to be the case in the current analysis.

Figure 5.1

Estimated Effects on New Pregnancy After Study Entry Versus Average Number of Home Visits Between Study Entry and 15 Months, for Each Local Program



SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.
Family service logs were available for program group families only.
The solid line shows the best-fitting linear relationship between the average number of home visits and the estimated effect, by local program.

An advantage of causal mediation analysis is that it exploits variation within the program and control groups in how much home visiting families *receive*. In comparison, the instrumental-variable approach examines how variation in the effects of local programs are related to the average level of services that program *provided*. Linking individual variation in services to outcome levels might increase the statistical power of the analysis, which might mean that this type of analysis could suggest a stronger relationship between home visiting services and effects than the instrumental variable analysis could suggest. However, this approach leaves the results susceptible to the bias described earlier: that service receipt is related to outcome levels due to other, unmeasured family characteristics such as maternal motivation. For that reason, one should

have more confidence in the findings produced by the two methods when they are consistent.

How Effects Vary with the Number of Home Visits

For each of the 12 confirmatory outcomes, Table 5.3 presents estimates of the relationship between effects and the number of home visits between study entry and the 15-month follow-up point using both instrumental variables and causal mediation analysis. Several columns of results are presented.[22]

- For reference, the estimated effect for the full sample (from Chapter 3) is shown in the first column. For parenting and child development outcomes, the results are presented in effect sizes.
- The second and third columns present results from the instrumental variable analysis.
- The last two columns present results from the causal mediation analysis.

Results for both the instrumental variable analysis and the causal mediation analysis divide that effect into two pieces.

- **Direct effect.** The first piece is a "direct" effect, which is the estimated effect for a family or in a location where program group families received no home visits. In other words, it is the effect of being assigned to the program group isolated from the effect of receiving any program services. A positive direct effect could mean that other aspects of home visiting services are influencing effects. A negative direct effect means that control group families had better outcomes than program group families either in locations where program group families received few home visiting services (the instrumental variable analysis) or among families who received no home visits (the causal mediation analysis).

[22]The results in Table 5.3 assume that control group members received no home visiting services. As a sensitivity check, home visiting services were imputed for control group families using their responses to questions on the 15-month survey about whether they had received home visiting or parenting services in the past year. Results using imputed levels for control group members are shown in Appendix F and are similar to those estimated without imputing control group services.

Table 5.3

Estimated Effects of an Additional Home Visit Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of an Additional Home Visit	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of an Additional Home Visit
Maternal health (%)					
New pregnancy after study entry	0.59	2.81	-0.16	-0.51	0.07
P-value	0.664	0.352	0.213	0.928	0.828
Family economic self-sufficiency (%)					
Receiving education or training	0.38	3.58	-0.16	5.74	-0.30
P-value	0.792	0.365	0.399	0.334	0.343
Parenting[a]					
Quality of the home environment	0.09	0.03	0.00	-0.01	0.01
P-value	0.010	0.779	0.359	0.947	0.518
Parental supportiveness	0.04	-0.01	0.00	-0.02	0.00
P-value	0.236	0.883	0.503	0.885	0.690
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.25	0.01	-0.63	0.03
P-value	0.292	0.360	0.446	0.231	0.345
Frequency of psychological aggression during the past year	-0.26	-0.81	0.03	-1.52	0.07
P-value	0.085	0.032	0.064	0.017	0.045
Child health					
Health insurance coverage for the child (%)	-0.51	-0.57	0.01	0.46	-0.05
P-value	0.464	0.404	0.754	0.876	0.729
Number of Medicaid-paid well-child visits	-0.09	0.08	0.00	0.32	-0.02
P-value	0.264	0.656	0.700	0.332	0.197
Number of Medicaid-paid child emergency department visits	-0.18	-0.13	0.00	-0.20	0.00
P-value	0.044	0.524	0.798	0.598	0.923
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.67	0.03	-1.70	0.02
P-value	0.445	0.498	0.858	0.791	0.945
Child development[a]					
Behavior problems	-0.05	-0.01	0.00	0.00	0.00
P-value	0.087	0.927	0.591	0.992	0.762
Receptive language skills	0.02	0.05	0.00	0.00	0.00
P-value	0.552	0.642	0.880	0.992	0.856
Sample size (total = 4,215)					

(continued)

Table 5.3 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.
NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See Appendix F text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Estimates assume control group families received no services.

[a]Outcomes are standardized such that effect sizes are shown.

One explanation for such a finding is that control group members received more services than the program group.[23]

- **The effect of each home visit.** The second result for each analysis represents the effect of an additional home visit. For these analyses, each home visit was assumed to have the same effect, an assumption that could be explored in future analyses.

Consider the quality of the home environment, which is shown in the third row.

- The first column repeats the result from Chapter 3: The effect size of the estimated effect for the full sample is 0.09, and that effect is statistically significant (p-value of 0.01).
- The instrumental variable analysis suggests that an additional home visit is associated with an increase of 0.004 (as an effect size) in the effect on the quality of the home environment (although this number is shown as 0.00 in Table 5.3 due to rounding). However, that effect is not statistically significant. The instrumental variable analysis also does not find strong evidence of a direct effect (that is, the effect of assigning families to the program group without changing the amount of home visiting they receive).[24]

[23]Typically, instrumental variable analyses assume that the direct effect is zero (the exclusion restriction). However, Small (2012) presents a method of using instrumental variable analysis to estimate the direct effect.

[24]Results in Table 5.3 were also examined by evidence-based model, but results did not differ among the models.

- The causal mediation analysis suggests that an additional home visit is associated with an increase in the effect on the quality of the home environment of 0.01 (as an effect size) and that that effect is not statistically significant (p-value of 0.518). For the causal mediation analysis, the direct effect is close to zero and is not statistically significant.

In short, both analyses found a small association between the number of home visits and the effects on the quality of the home environment, but that association was not statistically significant for either analysis. Neither analysis thus provides strong evidence that the number of home visits is by itself associated with improvements in the quality of the home environment, even though the estimated effect on the outcome is statistically significant for the full sample. This finding may mean that aspects of home visiting not captured by the number of home visits led to improvements in the quality of the home environment.

For the three outcomes with statistically significant estimated effects for the full sample, Table 5.3 shows the following:

- **The frequency of psychological aggression toward the child.** Both analyses indicate a negative direct effect, meaning that merely being assigned to the program group results in a reduction in psychological aggression. This result suggests that some aspect of home visiting services other than the number of visits may be causing effects on this measure. Both analyses also indicate that additional home visits are associated with an increase in psychological aggression. It is difficult to understand why additional home visits would cause an increase in psychological aggression toward the child, but the findings are consistent with the possibility that local programs serving families at high risk of child maltreatment target those families for more home visits.
- **Medicaid-paid emergency department visits.** The direct effect is similar in magnitude to the full-sample estimated effect and the estimated effect of each additional home visit is small and not statistically significant. As with psychological aggression, these results suggest that some aspect of home visiting other than the number of visits may be responsible for improvements in this outcome.
- **Child behavior problems.** Both the estimated direct effect and the estimated effect of each home visit are small and neither is statistically significant. Thus, the results provide little insight into how home visiting services may have improved child behavior.

For the eight outcomes where estimated effects for the full sample are not statistically significant, neither the estimated direct effect nor the estimated effect of additional home visits is statistically significant.

Conclusion

This chapter has expanded on the estimated effects of home visiting presented in Chapter 3 by exploring whether effects vary across local home visiting programs, and if so, how. The results indicate that the effects of home visiting do differ somewhat among the evidence-based models in ways that are somewhat consistent with the models' goals and priorities. These results suggest that there remain important differences among the models at the national level. Which model is the most appropriate for a community might therefore depend on local needs.

In other respects, however, the results do not suggest a clear link between program implementation and program effectiveness. The analysis examined several aspects of program implementation that varied substantially across the 86 local programs included in MIHOPE but did not find a strong association between these implementation features and program effects. Likewise, a comparison of effects with the number of home visits families received did not find that effects were larger in locations where families received more home visits or among families who received more home visits. It is important to note that even though MIHOPE was designed to address these types of questions, the MIHOPE design positioned the study to detect large differences in effects across local programs, but large differences did not appear across local programs for most of the study's confirmatory outcomes. The way programs are implemented and the intensity of the services they provide presumably are associated with program effects, but those effects were perhaps too small to be detected with the MIHOPE design.

Chapter 6

Implications of the Findings

This report has described the relatively short-term estimated effects of early childhood home visiting programs on a range of outcomes for the families who participated in the Mother and Infant Home Visiting Program Evaluation (MIHOPE). The report also investigated whether the effects were larger for some subgroups of families, whether effects were tied to any features of local programs, and whether there was variation in effects related to the amount of home visiting services families received.

This chapter discusses the implication of the study's findings for the home visiting field and discusses additional research that might shed light on some aspects of the findings or further investigate the effects seen in MIHOPE. The chapter's sections mirror the report chapters, discussing the implications of the full-sample effects (Chapter 3), variation across family subgroups (Chapter 4), and variation across local programs (Chapter 5).

Short-Term Effects of Home Visiting Programs

Chapter 3 presented evidence that home visiting programs have improved family outcomes across several outcome areas, but that the effects are generally not as large as the average effects on those outcomes found in earlier studies. To some extent, the effects reflect the broad goals of the four evidence-based home visiting models that were studied and the tailored nature of the services they aim to provide, both of which may have resulted in small effects on each outcome when measured across all families they served. In addition, the legislation that authorized the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program required awardees' early childhood home visiting programs to work toward demonstrating improvements in several benchmark areas.[1] As a result of these legislative requirements, evidence-based models and local programs might find themselves compelled to emphasize additional outcome areas. Even though MIHOPE included mature home visiting programs, it may take time for these expanded efforts to show larger effects.

The findings are also not surprising given the existing research on home visiting. Even for the evidence-based models studied in MIHOPE, the effects seen in different studies with different samples have often been modest and inconsistent. For example,

[1]SEC. 511 [42 U.S.C. 711] (d) (2) (B) (i-vii).

as discussed in Chapter 1, the evidence-based models have shown some improvements in child development and school readiness for young children in some studies, but many other studies have failed to find positive effects in these areas. In examining past research for the purpose of selecting confirmatory outcomes for the current analysis, the study team found that statistically significant effects were the exception rather than the rule for many outcomes.[2] Thus, the findings in the current report largely confirm what has been found in past studies.

The current report focused on describing the effects of home visiting on specific outcomes because the legislation that authorized MIECHV required awardees' early childhood home visiting programs to work toward demonstrating improvements in these areas.[3] However, the broad and tailored nature of home visiting services may mean that home visiting is helping each family in some way even though the average effect on any single outcome is small. Further analysis could explore this possibility, for example, by defining an aggregated outcome that is based on whether families improved in one or more areas relative to the control group.

In addition to the positive effects on some of the study's main outcomes, several exploratory analyses warrant further investigation. As a reminder, exploratory analyses were ones that had not been often examined in previous studies or where studies had not found evidence of effectiveness but where home visiting programs as implemented under MIECHV might have larger effects than in the past. For example, several results point to improved health for mothers in MIHOPE, including improvements in their general health, increased health insurance coverage, and reduced depressive symptoms (although program group mothers were more likely to say they had abused drugs or alcohol in the recent past). The possibility that home visiting helped improve maternal mental health is especially intriguing since this kind of improvement could lead to other, future improvements in many other areas such as child development and economic self-sufficiency. In addition, it is an area on which home visiting programs are placing increasing emphasis.[4]

Another area where the findings could have wide-ranging implications are the results described in this report that point to reduced household aggression. For example, there are significant reductions in the frequency of psychological aggression toward children as well as in mothers' experience with intimate partner violence and mothers' use of services related to domestic violence. These improvements could be related to

[2]U.S. Department of Health and Human Services (2016b).

[3]SEC. 511 [42 U.S.C. 711] (d) (1) (A) (i-vi); SEC 511 [42 U.S.C. 711] (d) (2) (B) (i-vii).

[4]Michalopoulos et al. (2015).

reductions seen in parental depression and parental stress; they could also be related to changes in parenting, including increases in parental discipline using gentle guidance. Reduced household aggression and improved parenting behaviors could also help explain observed reductions in child behavior problems. Because adverse childhood experiences such as child maltreatment and intimate partner violence have been associated with negative long-term outcomes for children, reducing household aggression could benefit children as they grow older.

Finally, although the current report describes analyses related to child development, children vary widely in their development at 15 months, and many of the activities undertaken by home visitors may take time to improve child development. For example, home visitors conduct screenings and make referrals for developmental delays, but depending on the nature of the developmental delay, children may need to participate in the intervention services for an extended length of time in order to change their developmental path. Home visitors also try to change other outcomes that might improve child development down the road, such as promoting positive parenting practices, encouraging parents to engage in healthy activities, including bringing their children in for well-child visits, helping parents improve their financial situations, and improving maternal mental health. MIHOPE did find some short-term effects in several of these areas, and it might take more time for those effects to result in larger effects on child development.

How Effects Vary Across Different Types of Families

Chapter 4 examined differences in effects across subgroups that were defined using family characteristics that had been used for subgroup analyses in earlier studies of the four evidence-based models. The results generally showed differences in effects small enough that the study could not reliably say that some types of families benefited more from home visiting than others. Like the overall estimated effects, this finding is consistent with past evidence, which has rarely found consistent evidence that effects are concentrated among specific subgroups of families. One possible reason that previous studies could not find that evidence is that those studies were conducted on relatively small scales. With its sample of more than 4,000 families, MIHOPE provides strong evidence that effects are consistent for the different types of families that were examined.

Because home visiting is a tailored approach, the effects should be concentrated among families whom home visitors identify as needing and wanting support and referrals to services in specific outcome areas. However, the analytical approach used in the current report might not be capturing the factors home visitors used to determine which services families needed or wanted. In particular, the analysis presented in Chapter 4 is based on risk factors measured using standardized assessments when families entered

the study. Home visitors can react to changes in family needs over time and might gain better information about those needs by observing and talking to family members.

Recent advances in statistical techniques for predicting outcomes might provide an opportunity to use the data collected in MIHOPE to better identify families who could benefit the most from home visiting. First, these techniques could be used to better identify which families are at the greatest risk of poor outcomes in the absence of home visiting. For example, they might make it possible to pinpoint the mothers at the greatest risk of suffering from depression at the 15-month follow-up point. Since home visiting cannot reduce depressive symptoms among mothers who do not suffer from depression, the effects are presumably concentrated in the high-risk group. Similar logic could be applied to find families where effects on other outcomes might be concentrated.

The effects of home visiting might also be concentrated in the group of families who received program services consistently over a long time. Using standard statistical techniques, the MIHOPE implementation research report found only a weak relationship between family characteristics and the amount of services families received. However, more cutting-edge statistical techniques that were beyond the scope of this report could better identify and examine effects for the group of participants who persisted in the program (and their control group counterparts).

How Effects Vary Across Different Types of Local Programs

MIHOPE was designed not only to assess the effects of MIECHV-funded programs as a group, but to investigate whether some aspects of program implementation are associated with improvements in family outcomes. One set of results indicates that effects vary among the four evidence-based models that were studied, and that they vary in ways that roughly align with the historical emphases of the models. For example, in the main report analysis, Parents as Teachers produced the largest increase in one of the parenting outcomes while the Nurse-Family Partnership produced the largest reduction in one of the health-related outcomes, although these patterns do not hold across all outcomes and the differences are somewhat sensitive to the statistical method used to examine them. Although MIECHV-funded programs strive to improve outcomes in all those areas, communities with needs in one of these areas might want to focus on one or more of the models that align with those needs. For example, Nurse-Family Partnership's improvements in health-related outcomes might compensate for a lack of health care resources in the community. The results might also suggest that a mix of evidence-based models within a community could have more wide-ranging effects than any single model.

The results do not provide a clear link between the amount or type of home visiting services that families receive and the estimated effects on their outcomes. Although some local programs provided more home visits to the families they served and discussed relevant topics more often, those local programs did not generally produce larger effects than others. It may be that simply doing more of what home visitors already do might not be sufficient to produce larger effects; the way home visiting programs are implemented might have to change as well in order to produce larger effects.

Moving Forward

The implementation of home visiting has evolved since the time information was collected for MIHOPE, and it will continue to evolve. The evidence-based models and others in the field have undertaken continuous quality improvement efforts. The Health Resources and Services Administration (HRSA) also supports state-led efforts to learn from program evaluation and continuous quality improvement, and provides technical assistance to states with the goal of improving home visiting services.[5] In addition, the Home Visiting Applied Research Collaborative and the Home Visiting Collaborative Improvement and Innovation Network are working to identify ways to strengthen the effect of home visiting.[6]

MIHOPE's implementation research points to some ways home visiting programs can be strengthened, including: providing more opportunities to home visitors to practice and reinforce the skills they learn, training home visitors in working with families on sensitive topics such as substance use and intimate partner violence, having supervisors observe home visitors more often, and developing better ties to community service providers.[7] In the years since the data for MIHOPE's implementation report were collected, HRSA has been providing awardees technical assistance in these areas to support high-quality program implementation.

This report is the first installment in understanding the effects of MIECHV-funded programs that participated in MIHOPE. Families who enrolled in the study are responding to brief surveys when children are 2.5 and 3.5 years old, and a more extensive round of data collection will take place when children are in kindergarten.[8] This follow-up work

[5]See Health Resources and Services Administration (2016b) for a summary of technical assistance activities funded by HRSA.

[6]See www.hvresearch.org for information on the Home Visiting Applied Research Collaborative and http://hv-coiin.edc.org for information on the Home Visiting Collaborative Improvement and Innovation Network.

[7]Duggan et al. (2018).

[8]See U.S. Department of Health and Human Services (2017b).

is important since past studies of home visiting have found effects in areas such as child development, child maltreatment, and parental earnings as children have gotten older. In addition, past studies of home visiting with effects similar to those found in MIHOPE have accrued enough benefits over time that the long-term benefits exceed the short-term costs, but only over periods of nine or more years.

Appendix A

Additional Information on Baseline Characteristics

Random assignment is designed to make the program and control groups similar when they enter the study. This appendix compares the two groups across a more complete set of baseline characteristics and discusses the extent and statistical significance of the differences between the two groups. The appendix also shows selected baseline characteristics for the sample by evidence-based model and for women who did and did not have older children when they entered the study.

As shown in Appendix Table A.1, the program group and control group had similar baseline characteristics. As expected because of random assignment, an omnibus test did not find a statistically significant difference between them when all characteristics were considered simultaneously (p-value of 0.681). Although there are statistically significant differences for a few characteristics (for example, race and ethnicity and maternal experience with battering), there are no more than would be expected by chance.

Appendix Table A.2 shows selected baseline characteristics separately for women who enrolled in MIHOPE through each evidence-based model. Since different models target different types of families, many characteristics differ among the four models. For example, Nurse-Family Partnership targets women who are pregnant for the first time, and more women who enrolled through Nurse-Family Partnership than enrolled through the other three evidence-based models were first-time mothers and were pregnant when they enrolled. However, the program and control groups were similarly distributed across the models (not shown in the table), and the characteristics of program group and control group families within each model were similar (not shown in the table), as would be expected because of random assignment.

Appendix Table A.3 shows selected baseline characteristics of first-time mothers and mothers with older children. Here again, many characteristics differ between the two groups. Because of random assignment, however, first-time mothers in the program group were similar to first-time mothers in the control group and mothers with older children in the program group were similar to mothers with older children in the control group (not shown in the table).

Appendix Table A.1

Characteristics of Families in the MIHOPE Sample at Study Entry, by Research Group

Characteristic	Program Group	Control Group	Total	P-Value
Maternal and household characteristics				
Average age (years)	23.6	23.7	23.7	0.468
Age 15-20 (%)	36.2	34.6	35.4	0.275
Pregnant (%)	68.0	66.0	67.0	0.175
Pregnant and under 21 years old (%)	29.0	26.8	27.9	0.122
Up to 28 weeks pregnant (%)	55.2	52.5	53.8	0.079
More than 28 weeks pregnant (%)	12.8	13.5	13.2	0.479
First-time mother (%)	59.5	60.5	60.0	0.533
Race and ethnicity (%)				0.007
Mexican origin	23.9	23.6	23.7	
Other Hispanic	12.7	11.9	12.3	
Non-Hispanic white	24.8	27.9	26.3	
Non-Hispanic black	30.5	26.6	28.5	
Other or multiracial	8.2	10.0	9.1	
Language other than English spoken in the home (%)	36.3	37.3	36.8	0.472
Ability to speak English self-rated as "not very well" or "not at all" (%)	9.7	9.8	9.8	0.912
Foreign-born (%)	23.6	23.3	23.4	0.795
Relationship status (%)				0.155
Married to the focal child's biological father	18.7	18.6	18.7	
Living with a partner or spouse	24.7	26.2	25.5	
In a relationship but not living together	30.7	27.6	29.1	
Single	25.9	27.6	26.7	
Biological father in the home (%)	41.7	42.9	42.3	0.462
Child's father figure present in the home (%)	42.1	43.2	42.6	0.455
Other adult relative in the home (%)	49.3	48.7	49.0	0.665
Nonadult sibling of the child in the home (%)	36.1	34.1	35.1	0.172
Moved more than once during the past year (%)	20.3	20.8	20.6	0.688
Sample member or spouse serving in the military (%)	1.6	1.3	1.4	0.464
Average number of siblings of the focal child in the home	0.6	0.6	0.6	0.700
Maternal health, mental health, and well-being				
Health status self-rated as "poor" or "fair" (%)	11.3	12.5	11.9	0.238
Health problems self-rated as limiting activities "a lot" (%)	17.2	17.9	17.6	0.558
Intention to breastfeed (%)	83.7	82.5	83.1	0.400
Ever breastfed (%)	76.8	78.1	77.5	0.558
Future childbearing intention (%)	12.6	11.7	12.2	0.383
Body mass index (%)				0.538
Underweight	4.9	5.6	5.2	
Normal weight	41.0	41.7	41.3	
At risk of overweight	54.1	52.8	53.4	

(continued)

Appendix Table A.1 (continued)

Characteristic	Program Group	Control Group	Total	P-Value
Depressive symptoms score at or above cut-off (%)	37.6	38.4	38.0	0.606
Symptoms of anxiety score at or above cut-off (%)	21.3	24.5	22.9	0.015
Symptoms of depression or anxiety present (%)	41.4	43.5	42.5	0.186
Attachment style (%)				
Relationship anxiety score at or above cut-off	15.4	15.8	15.6	0.711
Relationship avoidance score at or above cut-off	45.7	46.4	46.1	0.631
Average level of mastery	22.2	22.0	22.1	0.063
Received any mental health services during the past year (%)	17.2	18.7	17.9	0.191
Received any alcohol or substance use treatment during the past year (%)	9.9	11.1	10.5	0.185
Initiated prenatal care during the first trimester (%)	81.2	81.1	81.1	0.932
Smoking (%)				
Any smoking during the three months before pregnancy	28.2	30.8	29.5	0.072
Any current smoking	14.5	16.3	15.4	0.098
Smoking is permitted in the home	16.8	17.0	16.9	0.886
Substance use before pregnancy (%)	31.2	32.3	31.7	0.458
Average perception of relationship quality with partner or spouse[a]	6.4	6.5	6.4	0.042
Maternal health insurance and access to care (%)				
Health insurance coverage for the mother	91.2	91.2	91.2	0.938
Has a usual source of general health care	62.8	62.6	62.7	0.891
Child characteristics				
Poor health at birth (%)	27.0	23.6	25.2	0.151
Health insurance coverage for the child (%)	97.6	98.0	97.8	0.587
A usual source of well-child care (%)	93.3	91.5	92.4	0.205
Involvement with Child Protective Services before study entry (%)	6.0	4.0	4.9	0.109
Average level of emotionality[b]	2.3	2.3	2.3	0.483
Gender (%)				
Female	48.6	49.1	48.8	0.713
Male	51.4	50.9	51.2	0.713
Average age (months)	1.4	1.4	1.4	0.880
Receives care from someone other than the mother on a regular basis (%)	16.4	19.2	17.9	0.179
Home environment and parenting				
Average quality of the home environment				
Weak maternal conversational skills (%)	6.3	6.0	6.1	0.703
Cluttered or unclean home (%)	14.7	16.1	15.4	0.244
Evidence of recent alcohol or nonprescription drug use in the home (%)	7.7	8.4	8.0	0.413
Fewer than 10 books visible (%)	48.9	47.9	48.4	0.542
Parental warmth	5.0	5.1	5.0	0.298
Parental verbal skills	2.8	2.8	2.8	0.632
Parental lack of hostility	4.6	4.6	4.6	0.573
Home interior	6.9	6.9	6.9	0.492
Father providing material support (%)	65.1	65.0	65.0	0.952

(continued)

Appendix Table A.1 (continued)

Characteristic	Program Group	Control Group	Total	P-Value
Maternal verbal abstract reasoning (%)				0.203
A weakness or below average	63.2	60.6	61.9	
Average	34.8	37.5	36.1	
A strength or above average	2.0	2.0	2.0	
Low level of maternal empathy (%)	22.4	21.9	22.2	0.653
Crime and intimate partner violence				
Arrested during the past year (%)	6.5	5.9	6.2	0.363
Maternal perpetration of physical violence (%)	17.8	18.5	18.2	0.570
Maternal experience with physical or sexual violence (%)	7.1	7.4	7.3	0.716
Experience with battering (%)	5.9	4.7	5.3	0.076
Received any domestic violence services (%)	8.5	9.4	8.9	0.311
Family economic self-sufficiency (%)				
Food insecurity	54.0	55.5	54.7	0.329
Mother currently employed	25.1	25.8	25.4	0.585
Maternal employment during the past three years				0.226
Not employed	20.6	19.7	20.1	
Employed for 12 months or fewer	39.7	37.9	38.8	
Employed for more than 12 months	39.7	42.4	41.1	
Any earnings during the past month	38.5	38.0	38.3	0.732
Received any public assistance during the past month				
Supplemental Nutrition Assistance Program	59.8	58.3	59.1	0.332
Disability insurance	18.0	17.2	17.6	0.470
Temporary Assistance for Needy Families	20.0	20.1	20.1	0.944
Women, Infants, and Children	74.8	73.9	74.4	0.492
Earnings from other household members	58.8	58.8	58.8	0.995
Currently taking or planning to take education or training classes	70.5	69.2	69.8	0.403
Maternal highest level of education				0.679
Less than a high school diploma or equivalent	42.4	41.5	41.9	
High school diploma	32.8	32.6	32.7	
Some college or more	24.8	26.0	25.4	
Sample size	2,102	2,113	4,215	

SOURCES: Calculations based on the MIHOPE family baseline survey, the research team's baseline home observations, state birth records, state administrative child welfare records, and Medicaid enrollment data.

NOTES: Distributions may not add to 100 percent because of rounding.

To assess differences between the research groups, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Scores can range from 1 to 7, with higher scores indicating that the mother is happier in her relationship.

[b]Measured using the 5-item emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity (EASI-II) Temperament Survey (Buss and Plomin, 1984). Scores can range from 1 to 5, with higher scores indicating greater levels of emotionality.

Appendix Table A.2

Selected Characteristics of Families in the MIHOPE Sample at Study Entry, by Evidence-Based Model

Characteristic	EHS	HFA	NFP	PAT	Total	P-Value
First-time mother (%)	31.9	54.2	98.9	35.7	60.0	0.000
Pregnant (%)	53.9	54.5	100.0	51.4	67.0	0.000
Maternal average age (years)	25.0	24.0	21.1	25.7	23.7	0.000
Maternal race and ethnicity (%)						0.000
Mexican origin	17.1	22.3	30.4	21.2	23.7	
Other Hispanic	7.0	11.7	18.0	9.1	12.3	
Non-Hispanic white	31.5	27.1	17.3	33.6	26.3	
Non-Hispanic black	33.8	30.8	23.9	27.9	28.5	
Other or multiracial	10.6	8.1	10.3	8.2	9.1	
Language other than English spoken in the home (%)	23.3	35.8	48.1	31.8	36.8	0.000
Biological father in the home (%)	41.1	41.8	37.4	49.9	42.3	0.000
Less than a high school diploma or equivalent (%)	37.1	42.5	41.4	44.5	41.9	0.040
Mother employed during the past three years (%)	84.6	80.7	76.3	80.5	79.9	0.000
Food insecurity (%)	52.4	58.5	49.1	57.7	54.7	0.000
Received any public assistance during the past month (%)						
Supplemental Nutrition Assistance Program	79.3	61.0	41.0	67.1	59.1	0.000
Disability insurance	24.0	16.7	16.3	16.9	17.6	0.000
Temporary Assistance for Needy Families	26.1	20.4	13.9	23.7	20.1	0.000
Women, Infants, and Children	84.3	81.3	57.5	79.5	74.4	0.000
Health insurance coverage for the mother(%)	92.3	90.0	91.5	92.0	91.2	0.212
Substance use before pregnancy (%)	32.1	29.2	33.4	33.3	31.7	0.072
Maternal symptoms of depression or anxiety (%)	42.7	42.5	44.2	39.9	42.5	0.261
Low level of maternal empathy (%)	23.6	21.3	23.4	21.0	22.2	0.403
Presence of physical intimate partner violence (%)	17.5	18.8	21.1	18.9	19.3	0.250
Experience with battering (%)	4.6	4.9	4.9	6.7	5.3	0.154
Sample size	571	1,454	1,231	959	4,215	

SOURCES: Calculations based on the MIHOPE family baseline survey, state birth records, and Medicaid enrollment data.

NOTES: EHS = Early Head Start — Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers.

Distributions may not add to 100 percent because of rounding.

To assess differences among women who enrolled in MIHOPE through the four evidence-based models, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix Table A.3

Selected Characteristics of Families in the MIHOPE Sample at Study Entry Among First-Time Mothers and Those With Prior Children

Characteristic	First-Time Mothers	Mothers With Prior Children	Total	P-Value
Pregnant (%)	77.1	51.8	67.0	0.000
Maternal average age (years)	21.4	27.1	23.7	0.000
Maternal race and ethnicity (%)				0.003
Mexican origin	24.9	22.1	23.7	
Other Hispanic	12.9	11.3	12.3	
Non-Hispanic white	24.7	28.8	26.4	
Non-Hispanic black	27.7	29.6	28.5	
Other or multiracial	9.8	8.1	9.1	
Language other than English spoken in the home (%)	37.8	35.4	36.8	0.123
Biological father in the home (%)	36.8	50.5	42.3	0.000
Less than a high school diploma or equivalent (%)	41.2	43.0	42.0	0.257
Mother employed during the past three years (%)	77.6	83.3	79.9	0.000
Food insecurity (%)	51.4	59.7	54.7	0.000
Received any public assistance during the past month (%)				
Supplemental Nutrition Assistance Program	48.9	74.1	59.1	0.000
Disability insurance	17.8	17.3	17.6	0.687
Temporary Assistance for Needy Families	15.7	26.5	20.1	0.000
Women, Infants, and Children	68.6	83.1	74.4	0.000
Health insurance coverage for the mother (%)	92.2	89.7	91.2	0.006
Substance use before pregnancy (%)	33.6	29.0	31.7	0.002
Maternal symptoms of depression or anxiety (%)	42.0	43.1	42.4	0.462
Low level of maternal empathy (%)	21.8	22.6	22.1	0.551
Presence of physical intimate partner violence (%)	20.0	18.4	19.4	0.189
Experience with battering (%)	4.8	6.1	5.3	0.076
Sample size	2,523	1,681	4,204	

SOURCES: Calculations based on the MIHOPE family baseline survey, state birth records, and Medicaid enrollment data.

NOTES: Distributions may not add to 100 percent because of rounding.

To assess differences between first-time mothers and those with prior children, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix B

Measure Descriptions

This appendix describes the outcome measures used in the report. It is organized by outcome area as follows: (1) maternal health, (2) family economic self-sufficiency, (3) intimate partner violence, (4) parenting, (5) child maltreatment, (6) child health, and (7) child development.

Maternal Health

Outcomes in the area of maternal health were derived from the 15-month follow-up survey and Medicaid enrollment data. For 64 families where the mother was not available to answer the survey (in most cases because she no longer had custody of the child), the child's new caregiver responded to the survey, but the analysis did not include maternal health outcomes for those families.

Confirmatory Outcomes

New pregnancy after study entry indicates whether the mother became pregnant with another child after she began participating in the study. It is based on items from the 15-month follow-up survey that ask about current pregnancies and pregnancies since the birth of the "focal child" (the child for whom the mother enrolled in home visiting). If the mother indicated that she was currently pregnant or that she had given birth to another baby, then she was considered to have a new pregnancy after study entry.

Exploratory Outcomes

Health insurance coverage for the mother indicates whether the mother had health insurance coverage at the 15-month follow-up point. It is based on both Medicaid enrollment data and items from the 15-month follow-up survey that ask about insurance. (Health insurance options on the survey are shown below.)

- If the mother was enrolled in Medicaid at 15 months or if the mother indicated that she had some type of insurance other than a single-service plan (see below) or an unknown insurance in the "Other" category, then the mother is considered to have had health insurance coverage.[1]

[1]If the mother does not have 15 months of data available in Medicaid but has at least 12 months of data available and the mother was enrolled at the end of that maximum number of months for which data are available, then the mother is considered to have been enrolled in Medicaid at 15 months. For example, if the mother has a maximum of 13 months of Medicaid data available and was enrolled at 13 months, then the mother is considered to have been enrolled in Medicaid and therefore to have health insurance.

- If the mother was not enrolled in Medicaid or if the mother indicated that she did not have any type of coverage or only had a single-service plan, then the mother is considered not to have had health insurance coverage.
- If the mother does not have at least 12 months of Medicaid data available; she could not be found in the Medicaid data; and she did not answer the survey items, indicated she only had an unknown insurance type in the "Other" category, or did not respond to the survey, then the mother is missing data and is left out of this outcome measure.

Health insurance response options (mothers could select all that apply):

- Private health insurance
- Medicare
- Medigap
- Medicaid
- State Children's Health Insurance Program (SCHIP)
- Military health care (Tricare/Veterans Administration/Champ Veterans Administration)
- Indian Health Service
- State-sponsored health plan
- Single-service plan (for example, covering dental care, vision, or prescriptions)
- No coverage of any type
- Other (specify)

Current smoking indicates whether the mother was smoking at the time of the 15-month follow-up survey. It is based on an item that asks how much the mother smokes on an average day. If the mother indicated that she smoked at least one cigarette on an average day, then she was considered to be currently smoking.

Substance use after birth indicates whether the mother engaged in heavy drinking, binge drinking, or used drugs after the birth of her child. It is based on items from the 15-month follow-up survey that ask about drinking habits and the use of drugs.

Survey questions that ask about specific drugs are listed below. If the mother indicated that she drank seven or more drinks in an average week or four or more drinks in one sitting at least once, or if she used any of the drugs listed, then she is considered to have used substances since the child's birth.

Questions about specific drugs:

- Prescription pain killers? (IF YES) What kinds?
- Marijuana (pot, bud) or Hashish (Hash)?
- Amphetamines (uppers, ice, speed, crystal meth, crank)?
- Cocaine (rock, coke, crack) or heroin (smack, horse)?
- Tranquilizers (downers, ludes) or hallucinogens (LSD/acid, PCP/angel dust, ecstasy)?
- Sniffing gasoline, glue, hairspray, or other aerosols?

Current depressive symptoms indicates whether the mother was experiencing depressive symptoms at the time of the 15-month follow-up survey. It is based on a 10-item version of the Center for Epidemiologic Studies-Depression Scale (CES-D),[2] which was administered as part of the 15-month follow-up survey. Scale items are listed below. Response options range from 0 (meaning that the mother felt this way rarely or none of the time) to 3 (meaning she felt this way most or all of the time).[3] If the mother answered all 10 items, then the depressive symptoms measure is equal to the sum of the responses. If the mother answered 8 or more items, then the measure is equal to the mean of the responses present, multiplied by 10.

- If the value is greater than or equal to 8, then the mother is considered to have experienced depressive symptoms in the week before the survey.
- If the value is less than 8, then she is not considered to have experienced depressive symptoms in the week before the survey.
- If the mother did not answer three or more items, then she is missing data and is left out of this outcome measure.

[2]Radloff (1977).

[3]Items from the CES-D were coded so that 0 indicated the least depressive symptoms and 3 indicated the most.

Health status self-rated as "poor" or "fair" is a binary measure that indicates whether the mother reported that she was in either "fair" or "poor" health on the 15-month follow-up survey. If the mother reported that her health was "fair" or "poor," then she is considered to have been in poor health. If the mother reported that her health was "good," "very good," or "excellent," then she is not considered to have been in poor health.

Received any behavioral health services indicates whether the mother received assistance for mental health issues or substance abuse in the year before the 15-month follow-up survey. It is based on an item from the survey that asks whether the mother received services for behavioral health. If the mother indicated that she received help or treatment in the last year, then she is considered to have received behavioral health services.

Family Economic Self-Sufficiency

For families where someone other than the mother completed the 15-month survey, measures of family economic self-sufficiency were not included in the analysis.

Confirmatory Outcomes

Receiving education or training indicates whether the mother reported on the 15-month follow-up survey that she was currently receiving education or training.

Exploratory Outcomes

Received any Supplemental Nutrition Assistance Program benefits during the past month indicates whether the mother reported on the 15-month follow-up survey that she had received benefits from the Supplemental Nutrition Assistance Program in the past month.

Received any Temporary Assistance for Needy Families benefits during the past month indicates whether the mother reported on the 15-month follow-up survey that she had received benefits from Temporary Assistance for Needy Families in the past month.

Received any Women, Infants, and Children benefits during the past month indicates whether the mother reported on the 15-month follow-up survey that she had received benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children in the past month.

Received any disability insurance during the past month indicates whether the mother reported on the 15-month follow-up survey that she had received benefits from Supplemental Security Income or Social Security Disability Insurance in the past month.

Food insecurity indicates whether the mother experienced food insecurity. It is based on questions from the six-item short-form U.S. Household Food Security Survey Module[4], administered as part of the 15-month follow-up survey. Items are listed below. Scoring for this outcome is based on affirmative responses to the following six items:

1. You ever ate less than you felt you should because there wasn't enough money for food.
2. You were ever hungry but didn't eat because there wasn't enough money for food.
3. The food you bought didn't last and you didn't have money to get more.
4. You couldn't afford to eat balanced meals.
5. You ever cut the size of your meals or skipped meals because there wasn't enough money for food.
6. If the answer to question 5 was yes, how often did this happen?

Families with more than one affirmative response were considered to have food insecurity. If the mother did not answer one of the items, missing responses were imputed based on responses to the other items and the level of severity of the item.[5] If the mother indicated she experienced a level of food insecurity on one of the more severe items and did not answer one of the less severe items, then she was considered to have experienced the less severe item of food insecurity as well.

Use of nonparental child care indicates whether the mother reported on the 15-month follow-up survey that she used nonparental child care for the focal child on a regular basis, at least once a week. If the mother said that the child was receiving nonparental child care on a regular basis at least once a week, or was attending a day care or preschool program on a regular basis at least once a week, then she was considered to have used nonparental child care.

[4]U.S. Department of Agriculture, Economic Research Service (2012)

[5]Bickel et al. (2000).

Received any transportation services indicates whether the mother or focal child received transportation to needed services in the year before the 15-month follow-up survey. It is based on an item from the survey that asks about transportation services.

Employed five quarters after birth indicates whether the mother was employed in the fifth quarter after the birth of the focal child. Since these data are reported in calendar quarters (January through March, April through June, and so on), the variable measures employment five quarters after the birth of the child, not including the quarter the child was born. This variable is based on quarterly wage records from the National Directory of New Hires. If the mother had a quarterly wage record in the fifth quarter after the birth of the focal child, then she is considered to have been employed.

Since individuals could be matched to the National Directory of New Hires data only through their Social Security numbers (SSNs), the National Directory of New Hires sample does not include the following:

1. Sample members who do not have a 9-digit SSN or who have a nonunique 9-digit SSN
2. Sample members where someone other than the mother responded to the 15-month follow-up survey
3. Sample members whose SSNs were received too late to be matched to the National Directory of New Hires for the current report[6]

Earnings five quarters after birth is total earnings in the fifth quarter after the birth of the focal child, as recorded in the National Directory of New Hires data.

Intimate Partner Violence

Outcomes in the area of intimate partner violence were derived from the 15-month follow-up survey. For families where someone other than the mother completed the survey, the outcomes were not included in the analysis.

Confirmatory Outcomes

There are no confirmatory outcomes in the intimate partner violence domain.

[6]There are also some women whose SSNs were received after they entered the study and could be matched to the National Directory of New Hires only for part of the study period.

Exploratory Outcomes

Maternal experience with physical or sexual violence indicates whether the mother experienced physical or sexual violence in her current relationship. It is constructed from five items from the Revised Conflict Tactics Scale administered as part of the 15-month follow-up survey.[7] With the permission of the developer, items from the Revised Conflict Tactics Scale were adapted for use in the MIHOPE follow-up survey. The primary changes were to combine items and to modify the response categories to make the questions easier to ask over the phone.

- If the mother indicated that she was in a relationship at the time of the survey and that her partner did any of the actions included in the five Revised Conflict Tactics Scale items at least once, then she is considered to have experienced physical or sexual violence.
- If the mother indicated that she was in a relationship and that her partner never did any of those actions, then she is not considered to have experienced physical or sexual violence.
- If the mother was not in a relationship at the time of the survey, then she is not considered to have experienced physical or sexual violence.
- If there is no answer recorded for whether the mother was in a relationship or for one or more of the Revised Conflict Tactics Scale items, and the mother does have answers recorded indicating her partner never did any of the other actions, then she is missing data and is left out of this outcome measure.

Maternal perpetration of physical violence indicates whether the mother perpetrated acts of physical violence in her current relationship. It is constructed using four items that were modified from the Revised Conflict Tactics Scale with the permission of the developer. As noted above, the primary changes were to combine items and to modify response categories to make the questions easier to ask over the phone.

- If the mother indicated that she was in a relationship at the time of the survey and that she had done any of the actions listed in the four Revised Conflict Tactics Scale items at least once, then she is considered to have perpetrated physical violence.

[7]For the Revised Conflict Tactics Scale, see Straus, Hamby, and Warren (2003).

- If the mother indicated that she was in a relationship and that she had never done any of those actions, then she is not considered to have perpetrated physical violence.
- If the mother was not in a relationship at the time of the survey, then she is not considered to have perpetrated physical violence.
- If the mother was in a relationship and one or more of the Revised Conflict Tactics Scale items was missing and the mother indicated she never did any of the other actions, or if there is no answer recorded for whether the mother was in a relationship, then she is missing data and is left out of this outcome measure.

Experience with battering indicates whether the mother had any experience with battering. It is constructed using six items from the Women's Experience with Battering scale administered as part of the 15-month follow-up survey.[8] These six items were chosen in consultation with scale developer Paige Smith as a short form of the scale. Scale items are listed below. Response options range from 1, indicating that the mother strongly disagrees with the statement, to 6, indicating that she strongly agrees with the statement.

The experience with battering raw score is calculated and the outcome measure reflects whether those scores fall above or below a threshold set in accordance with the developer's scoring instructions. Mothers were considered to have experienced battering if their scores rose above the threshold. If the mother said that she was currently in a relationship and she answered all six of the scale items, then the experience with battering raw score is equal to the sum of the responses. If the mother said that she was currently in a relationship and answered five of the scale items, then the experience with battering raw score is equal to the mean of the responses, multiplied by 6. If the experience with battering raw score is greater than or equal to 12, then the mother is considered to have experience with battering. If the experience with battering raw score is less than 12, then the mother is not considered to have experience with battering. If the mother said that she did not have a current spouse or partner, then she is not considered to have experienced battering. If the mother did not say whether she was in a relationship, or if answers to two or more of the scale items are missing, then she is considered to be missing data and is left out of this outcome measure.

[8]For more information on the Women's Experience with Battering scale, see Smith, Earp, and DeVellis (1995).

Received any domestic violence services indicates whether the mother reported on the 15-month follow-up survey that she had received any domestic violence or anger management services in the past year. It is based on an item from the survey that asks about the use of domestic violence services. If the mother said that she had received services or counseling in the past year, then she is considered to have received domestic violence services.

Received any services from a domestic violence shelter indicates whether the mother reported on the 15-month follow-up survey that she had received any services from a domestic violence shelter in the past year.

Parenting

Confirmatory Outcomes

Quality of the home environment was assessed using the 45-item Infant-Toddler Home Observation for Measurement of the Environment (IT-HOME).[9] The IT-HOME was administered as part of the 15-month in-home assessment. Information needed to score the measure was obtained from a combination of interview items and observations conducted in the home with the child's parent while the child was present. A total score was calculated by using the sum of the binary items. Higher scores represent higher-quality home environments. Additionally, five subscales were derived from this assessment: parental warmth, support for learning and literacy, parental verbal skills, parental lack of hostility, and home interior. (See descriptions under the exploratory outcomes.)

Parental supportiveness of the focal child was assessed during the Three-Bag Task,[10] a semistructured play interaction administered as part of the 15-month in-home assessment. The parent and child were given three bags of interesting toys and asked to play with the toys in sequence for 10 minutes. The interaction was video recorded and the parent's behaviors were coded by child development researchers at the National Center for Children and Families at Teachers College, Columbia University using a strict coding protocol.[11] This assessment was adapted for this evaluation from the Three-Bag

[9]Caldwell and Bradley (1984).

[10]As noted in Chapter 3 of the report, the task and various adaptations of the task have been successfully administered and coded in a variety of large-scale experimental and longitudinal studies of toddlers, including Vandell (1979); National Institute of Child Health and Human Development Early Child Care Research Network (1997); National Institute of Child Health and Human Development Early Child Care Research Network (1999); and Andreassen and Fletcher (2007).

[11]Morin, Martin, and Brooks-Gunn (2014).

Task coding scheme used at 14 months in the Early Head Start Research and Evaluation Project.[12] Parental supportiveness is a composite measure that is an average of three scales: parental sensitivity, positive regard, and stimulation of cognitive development during play. (See the descriptions of these scales under the parenting exploratory outcomes.) These scales were rated on a scale from 1 (very low) to 7 (very high). Higher scores indicate greater levels of parental supportiveness. Correlations between the three scales range from 0.47 to 0.49. Cronbach's alpha — an estimate of the internal consistency of the scale — equals 0.73, which is greater than 0.70, the level usually considered to be acceptable.

Exploratory Outcomes

Using the items from the Infant-Toddler Home Observation for Measurement of the Environment (IT-HOME) described above, five exploratory outcomes were constructed using subscales derived by Linver and colleagues. By analyzing data from four previous studies, they categorized the IT-HOME items into subscales that had good internal consistency and predictive validity for children's cognitive ability and behavior problems at 2 to 3 years of age:[13]

Parental warmth measures the mother's warmth toward the focal child. The score is constructed from the sum of seven binary items and ranges from 0 to 7. Higher scores indicate greater parental warmth. Cronbach's alpha equals 0.70.

Support for learning and literacy measures the mother's support for learning and literacy. The score is constructed from the sum of 17 binary items from the learning and literacy and developmental advancement subscales and ranges from 0 to 17.[14] Higher scores indicate greater parental support for learning and literacy. Cronbach's alpha equals 0.70.

Parental verbal skills is constructed from the sum of three binary items and ranges from 0 to 3. Higher scores indicate greater verbal skills. Cronbach's alpha equals 0.71.

Parental lack of hostility measures the mother's level of hostility toward the focal child. The score is constructed from the sum of five binary items and ranges from 0 to 5. Higher scores indicate lower hostility. Cronbach's alpha equals 0.66.

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[12]Ware et al. (1998).

[13]Linver, Brooks-Gunn, and Cabrera (2004); Fuligni, Han, and Brooks-Gunn (2004).

[14]Support for the combination of these two subscales is found in Fuligni, Han, and Brooks-Gunn (2004).

Home interior measures the quality of the interior of the mother and focal child's home (whether the home is well lit, not too crowded, and reasonably clean). The score is constructed from the sum of eight binary items and ranges from 0 to 8. Higher scores indicate better home interiors. Cronbach's alpha equals 0.71. In addition to items from the IT-HOME, this scale also includes items from the Project on Human Development in Chicago Neighborhoods.[15]

Three exploratory outcomes capture aspects of parental supportiveness during the Three-Bag Task described under the confirmatory outcomes section:

- *Parental sensitivity* measures how the mother observes and responds to the focal child's cues during times of distress and nondistress. It describes the extent to which the mother takes the child's perspective, perceives the child's signals, and promptly responds to these signals. The score on this scale ranges from 1 (very low sensitivity) to 7 (very high sensitivity).
- *Parental positive regard* is the mother's expression of love, respect, or admiration for the focal child. The score on this scale ranges from 1 (very low positive regard) to 7 (very high positive regard).
- *Parental stimulation of cognitive development* measures the effort the mother puts into teaching to enhance the focal child's perceptual, cognitive, and linguistic development. The score on this scale ranges from 1 (very low stimulation) to 7 (very high stimulation).

Three other exploratory outcomes capture aspects of *parental unsupportiveness* during the Three-Bag Task:

- *Parental intrusiveness* is the degree to which the mother is overinvolved and exerts control over the focal child. The score on this scale ranges from 1 (very low intrusiveness) to 7 (very high intrusiveness).
- *Parental negative regard* is the level of the mother's expression of discontent with, anger toward, disapproval, or rejection of the focal child. The score on this scale ranges from 1 (very low negative regard) to 7 (very high negative regard).
- *Parental detachment* measures the mother's awareness of, attention to, and engagement with the focal child. The score on this scale ranges from 1 (very low detachment) to 7 (very high detachment).

[15]Leventhal et al. (2004).

Three exploratory outcomes examined *parental discipline*:

- *Nonviolent discipline* is a binary measure that indicates whether the mother used a nonviolent disciplinary tactic with the focal child at least six times. It is based on two items from the Conflict Tactics Scale — Parent Child version (CTSPC) administered as part of the 15-month follow-up survey.[16] These items ask about the nonviolent disciplinary tactics "explained why something was wrong" and "gave child something else to do instead of what child was doing wrong." Response options ranged from 0, meaning the mother never did the action in the past year, to 4, meaning the mother did the action six or more times in the past year. If the mother said that she used either nonviolent discipline tactic six or more times in the past year, then she was said to have used nonviolent discipline frequently. If she said that she used neither tactic or used both five or fewer times in the past year, then she was not said to have used nonviolent discipline frequently.

- *Gentle guidance* by the mother was assessed during the Clean-Up Task,[17] a task in which the mother and focal child were asked to put away toys after the semistructured play interaction. It was administered as part of the 15-month in-home assessment. The interaction was video recorded and the mother's behaviors were coded by child development researchers at the National Center for Children and Families at Teachers College, Columbia University using a strict coding protocol.[18] This scale indicates the extent to which the mother encourages and motivates the child's clean-up behaviors. The scale ranges from 1 (very low gentle guidance) to 4 (high gentle guidance).

- *Control* by the mother was also assessed during the Clean-Up Task. This scale measures the extent to which the mother tries to control the child's clean-up behaviors instead of encouraging or motivating the child to clean up on her own. The scale ranges from 1 (very low control) to 4 (high control).

Parental stress was assessed using a modified version of the Parenting Stress Index — Short Form (PSI-SF) administered as part of the 15-month follow-up survey.[19] Two exploratory outcomes were constructed:

[16]For the CTSPC, see Straus, Hamby, and Warren (2003).

[17]Morin, Martin, and Brooks-Gunn (2014).

[18]Morin, Martin, and Brooks-Gunn (2014).

[19]For the PSI-SF, see Abidin (1995).

- *Parental distress* indicates the degree of distress a mother experiences in her role as a parent. The score is constructed from the sum of five items and ranges from 5 to 25. Response options range from 1, indicating the mother strongly disagrees with the statement, to 5, indicating the mother strongly agrees with the statement. Higher scores indicate higher levels of parental distress. Cronbach's alpha equals 0.72.

- *Parent-child dysfunctional interaction* focuses on the mother's perception that the child does not meet her expectations and that her interactions with the child are not reinforcing to her. The score is constructed from the sum of six items and ranges from 6 to 30. Response options range from 1, indicating the mother strongly disagrees with the statement, to 5, indicating the mother strongly agrees with the statement. Higher scores indicate higher levels of mother-child dysfunctional interaction. Cronbach's alpha equals 0.72.

Awareness of health and safety hazards is a measure of how aware the mother is of particular health and safety hazards and precautions. The score is constructed from the sum of five binary items from the 15-month follow-up survey: awareness of the need to have the child always ride in a car seat, awareness of how the family can be exposed to lead in the environment, awareness of steps to take to prevent family exposure to lead, awareness of how eating fish containing high levels of mercury can affect the baby, and awareness of shaken-baby syndrome. The score ranges from 1 to 5. Higher scores indicate greater awareness of these health and safety hazards and precautions.

Child Maltreatment

Confirmatory Outcomes

Frequency of minor physical assault during the past year is the number of times the mother engaged in minor physical assault toward the focal child in the past year. It is constructed from the five items from the CTSPC administered as part of the 15-month follow-up survey that ask about actions such as hitting, spanking, slapping, and pinching the child.[20]

The mother indicated how often she engaged in each behavior in the past year: never, once, twice, three to five times, or six or more times. To obtain the number of times the event occurred, response of three to five times were coded as "4" and

[20]Strauss, Hamby, and Warren (2003). With the permission of the developer, items from the CTSPC were adapted for use in the MIHOPE follow-up survey. Some items were combined and the response categories were modified to make the questions easier to ask over the phone.

responses of six or more times were coded as “8,” and the responses were summed for the five behaviors so that the scale has a possible range of 0 to 40.

Frequency of psychological aggression during the past year is the number of times the mother engaged in psychological aggression toward the focal child in the past year. It is constructed from the four items from the CTSPC administered as part of the 15-month follow-up survey that ask about actions such as shouting at the child or threatening to spank the child.

Using the same coding scheme described for the frequency of minor physical assault, the frequency of the four behaviors was summed so that the scale has a possible range of 0 to 32.

Exploratory Outcomes

Severe or very severe physical abuse indicates any severe or very severe abuse by the mother toward the focal child in the past year. It is constructed from two items from the CTSPC administered as part of the 15-month follow-up survey. The mother is considered to have engaged in severe or very severe physical abuse if she said she engaged in either of these behaviors at least once in the past year.

Any substantiated maltreatment report indicates whether there were any substantiated reports of maltreatment toward the focal child by any perpetrator between random assignment and the date the child turned 15 months old. It is constructed using state administrative child welfare data. Reports were included for all types of state-classified maltreatment, including neglect. If there were no substantiated reports of maltreatment and the child was at least 12 months old at the time the state sent its data, then the mother is considered to not have any substantiated maltreatment reports. If there were no substantiated reports of maltreatment and the child was not yet 12 months old when the state sent data, or the child could not be found in the child welfare database due to a lack of identifiers, then the mother is missing data and is left out of this outcome.

Any maltreatment report indicates whether there have been any reports of maltreatment toward the focal child by any perpetrator between the date of random assignment and the date the child turned 15 months old. It is constructed using state administrative child welfare data. Reports were included for all types of state-classified maltreatment, including neglect. This outcome measure includes unsubstantiated reports, substantiated reports, and reports handled through “alternative response” (a newer, less confrontational way of handling low-risk reports of child maltreatment). If there were no reports of maltreatment and the child was at least 12 months old at the time the state sent its data, then the mother is considered to not have any maltreatment

reports. If there were no reports of maltreatment and the child was not yet 12 months old, or the child could not be found in the child welfare database due to a lack of identifiers, or the state did not provide unsubstantiated report data and there were no substantiated reports, then the mother is missing data and is left out of this outcome.

Loss of custody indicates whether the focal child was formally removed from the home for any length of time between the date of random assignment and the date the child turned 15 months old. It is constructed using state administrative child welfare data. If the focal child was not removed between random assignment and 15 months and the child was at least 12 months old at the time the state sent its data, then the mother is considered not to have lost custody. If the focal child was not removed between random assignment and 15 months and the child was not yet 12 months old, or the child could not be found in the child welfare database due to a lack of identifiers, or the state did not provide data on loss of custody, then the mother is missing data and is left out of this outcome.

Child Health

Confirmatory Outcomes

Any Medicaid-paid health care encounter for injury or ingestion indicates whether the focal child received medical care for an injury or ingestion between random assignment and the 15-month follow-up point. It is based on Medicaid claims data.

Number of Medicaid-paid well-child visits is the number of well-child visits made to a medical care provider between random assignment and the 15-month follow-up point. It is based on Medicaid claims data.

Health insurance coverage for the child indicates whether the child had health insurance coverage at the 15-month follow-up point. It is based on both Medicaid enrollment data and items from the 15-month follow-up survey that ask about insurance. (Health insurance options on the survey are shown below.)

- If the child was enrolled in Medicaid at 15 months or if the mother indicated that the child was covered by some type of insurance other than a single-service plan (see below) or an unknown insurance in the

"Other" category, then the child is considered to have had health insurance coverage.[21]

- If the child was not enrolled in Medicaid or if the mother indicated that the child did not have any type of coverage or only had a single-service plan, then the child is considered not to have had health insurance coverage.
- If the child does not have at least 12 months of Medicaid data available; could not be found in the Medicaid data; and the mother did not answer the survey items, indicated the child only had an unknown insurance type in the "Other" category, or did not respond to the survey, then the child is missing data and is left out of this outcome measure.

Health insurance response options:

- Private health insurance
- Medicare
- Medigap
- Medicaid/[fill name of state-specific Medicaid program]
- SCHIP
- Military health care (Tricare/Veterans Administration/Champ Veterans Administration)
- Indian Health Service
- State-sponsored health plan
- Single-service plan (for example, covering dental care, vision, prescriptions)
- No coverage of any type
- Other (specify)

[21]If the child does not have 15 months of data available in Medicaid but has at least 12 months of data available and was enrolled at the end of that period, then the child is considered to have been enrolled in Medicaid at 15 months. For example, if the child has a maximum of 13 months of Medicaid data available and was enrolled at 13 months, then the child is considered to have been enrolled in Medicaid and therefore to have health insurance.

Number of Medicaid-paid child emergency department visits is the number of emergency department visits the focal child had between random assignment and the 15-month follow-up point. It is based on Medicaid claims data.

Exploratory Outcomes

Primary care provider for the child indicates whether the focal child has a primary care provider. It is based on an item from the 15-month follow-up survey that asks about the child's primary care provider.

Number of Medicaid-paid immunizations between random assignment and the 15-month follow-up point is calculated using Medicaid claims data.

Any Medicaid-paid nonbirth hospitalizations indicates whether the focal child was hospitalized any time between random assignment and the 15-month follow-up point, other than at birth. It is based on Medicaid claims data and on an item in the 15-month follow-up survey that asks whether the child was hospitalized.

Weight for length is a categorical measure that indicates whether the focal child is normal weight, underweight, or at risk of being overweight. It is based on height and weight measurements that were collected during the 15-month in-home assessment and computer code available from the Centers for Disease Control and Prevention (CDC). The source code uses growth charts available from the CDC to calculate where a child's weight fits into the distribution of height and weight nationally, and to calculate modified z-scores (which normalize the values so they have an average of 0 and a standard deviation of 1).[22] The outcome is then coded as follows:

- If the child's weight is less than the 10th percentile for the child's height, then the child is considered underweight.
- If the child's weight is above the 85th percentile relative to the child's height, then the child is considered at risk of being overweight.
- Otherwise, the child is considered to be normal weight.

If the child was flagged as having a biologically implausible value, the measure for the child was not included in the analysis.[23] Also, if the assessment was not

[22]For further information on the source code and an explanation on the derivation of modified z-scores, see www.cdc.gov/nccdphp/dnpao/growthcharts/resources/cdc-source-code.sas.

[23]In a small number of cases, a value was considered biologically implausible because the value of the modified z-score was less than -4 or greater than 8, indicating there is a very small probability

completed or if the assessment was completed with the wrong child, the measure for the child was not included in the analysis.

Duration of breastfeeding (months) is the number of months during which the focal child was breastfed with or without supplementation. It is based on whether the mother was pregnant when she entered the study and items on the 15-month follow-up survey that ask about breastfeeding practices. If the mother was not pregnant when she entered the study, then she is considered to be missing data for this outcome and is excluded from this analysis.

Child Development

Confirmatory Outcomes

Behavior problems were assessed using the problem total score from the Brief Infant Toddler Social and Emotional Assessment (BITSEA),[24] which was administered as part of the 15-month follow-up survey. The problem total score indicates the focal child's behavior problems that span several areas including externalizing, internalizing, dysregulation, atypical, and maladaptive behaviors. The total score is constructed from the sum of 31 items and ranges from 31 to 93. Response options range from 1, indicating the statement is rarely true, to 3, indicating the statement is often true. Higher scores indicate greater levels of behavior problems. Cronbach's alpha equals 0.81.

Receptive language skills were assessed using the auditory comprehension subtest of the Preschool Language Scales, Fifth Edition (PLS-5),[25] which was administered as part of the 15-month in-home assessment. Focal children who were exposed to Spanish in the home were administered the Preschool Language Scales, Fifth Edition Spanish (PLS-5 Spanish).[26] Higher scores indicate greater receptive language skills.

Exploratory Outcomes

Social-emotional competence was assessed using the competence total score from BITSEA,[27] which was administered as part of the 15-month follow-up survey. The competence total score indicates the focal child's level of social-emotional competence

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the value is valid. For those cases, information on the child's height and weight was not used in the analysis.

[24]Briggs-Gowan and Carter (2006). Used by permission of NCS Pearson.

[25]Zimmerman, Steiner, and Pond (2011). Used by permission of NCS Pearson.

[26]Zimmerman, Steiner, and Pond (2012).

[27]Briggs-Gowan and Carter (2006).

and aspects of social relatedness that are expected to develop in early childhood. The total score is constructed from the sum of 11 items and ranges from 11 to 33. Response options range from 1, indicating the statement is rarely true, to 3, indicating the statement is often true. Higher scores indicate greater levels of social-emotional competence. Cronbach's alpha equals 0.67.

Child behavior during semistructured play with the parent is described in three exploratory outcomes measured during the Three-Bag Task described above.

- *Engagement of the parent* indicates the focal child's level of engagement of the mother during semistructured play, for example the extent to which the child shows, initiates, or maintains interaction with the mother and communicates positive regard or affect to the mother. The scale ranges from 1 (very low engagement) to 7 (very high engagement).
- *Sustained attention to objects* indicates the focal child's level of sustained attention to objects during semistructured play. The scale ranges from 1 (very low sustained attention) to 7 (very high sustained attention).
- *Negativity toward the parent* indicates the extent to which the focal child shows anger, hostility, dislike, or other forms of negativity toward the mother during semistructured play. The scale ranges from 1 (very low negativity) to 7 (very high negativity).

Child behavior during a parent-directed task is described in two exploratory outcomes measured during the Clean-Up Task described above.

- *Compliance* indicates the degree of compliance the focal child exhibits during the Clean-Up Task. Compliance behaviors include being fully willing to engage in the task and cooperating in response to parental directives or requests. The scale ranges from 1 (never compliant) to 3 (always compliant).
- *Distress* indicates the level of distress the focal child exhibits during the Clean-Up Task, for example the degree to which the child displays frustration, anger, or signs of being upset. The scale ranges from 1 (no distress) to 4 (high distress).

Received any early-intervention services indicates whether the focal child ever received early-intervention services in the year before the 15-month follow-up survey. Early-intervention services are provided for children under age 3 with developmental delays, or with health conditions or other risks that may lead to such delays.

Appendix C

Response Bias Analyses

This report contains effect estimates that are calculated for families who responded to the 15-month follow-up survey and in-home assessment (hereafter referred to as the respondent sample). This appendix assesses the potential bias in the study findings resulting from families not completing data collection at 15 months. The appendix addresses two questions:

- **Are there systematic differences in baseline characteristics between program and control group families in the respondent sample?** To answer this question, the team compared the baseline characteristics of program group families who completed follow-up data collection with the characteristics of control group families who completed follow-up data collection.
- **Are there systematic differences in baseline characteristics between families who completed the 15-month data collection and those who did not?** To answer this question, the team compared the baseline characteristics of families who completed follow-up data collection (respondents) with those of families who did not (nonrespondents).

Baseline Characteristics of Those Who Completed Follow-Up Data Collection

Appendix Table C.1 compares selected baseline characteristics between the program and control group among families who completed any part of the 15-month follow-up survey. Appendix Table C.2 presents the same comparison between program and control group families who completed any part of the follow-up in-home assessment. The tables also include p-values to indicate whether differences between the two groups for individual characteristics were statistically significant.

Follow-up data collection might produce biased estimates of effects if program group respondents differed systematically from control group respondents when they entered the study. Although each table shows some significant differences between the research groups, some differences are expected by chance because of the number of characteristics shown. To confirm that there was no systematic difference between the two groups, a logistic regression was run using baseline variables to predict research group status among survey respondents. A joint test indicated that the baseline characteristics are not collectively related to whether the family was in the program or control group (the p-value is 1.000 for the follow-up survey and 0.9943 for in-home assessments). In other words, the number of statistically significant differences between the

groups is no more than would be expected by chance, suggesting that differences between the groups is unlikely to be a source of bias.

Baseline Characteristics of Respondents and Nonrespondents

Appendix Table C.3 compares the baseline characteristics of families who completed any part of the 15-month follow-up survey (respondents) with those of families who did not (nonrespondents). Appendix Table C.4 presents a similar comparison between families who completed any part of the follow-up in-home assessments with those of families who did not. Differences between respondents and nonrespondents could point to a source of bias if effects differ with family characteristics.

Both tables show many differences between respondents and nonrespondents. For example, respondents to both the survey and in-home assessments are older than nonrespondents, are less likely to have been pregnant when they entered the study (and thus to have had a shorter time between the time they entered the study and the time their child turned 15 months old), were more likely to be married when they entered the study, and have a different racial and ethnic mix. In addition, a statistical test indicated that the baseline characteristics are collectively significantly different for respondents than nonrespondents (p-value <0.001 for both the follow-up survey and in-home assessments).

Although there are systematic differences in baseline characteristics between respondents and nonrespondents, these differences would be a source of bias only if different types of families saw different effects. To assess how likely it is that differences between respondents and nonrespondents contributed to bias in the effect estimates, Appendix D presents the effect estimates when outcomes are imputed for families who did not respond to follow-up data collection.

Appendix Table C.1

Comparison of Selected Baseline Characteristics Between the Program and Control Groups Among the 15-Month Follow-Up Survey Respondents

Characteristic	Program Group	Control Group	Difference	P-Value
Maternal and household characteristics				
Average age (years)	23.8	23.8	0.0	0.958
Pregnant (%)	65.9	64.4	1.5	0.355
Relationship status (%)				0.252
Married to the focal child's biological father	20.0	20.1	0.0	
Living with a partner or spouse	24.2	26.3	-2.2	
In a relationship but not living together	30.7	27.8	2.9	
Single	25.1	25.8	-0.8	
Race and ethnicity (%)				0.039
Mexican origin	24.9	24.7	0.2	
Other Hispanic	13.2	12.1	1.1	
Non-Hispanic white	24.1	26.9	-2.8	
Non-Hispanic black	30.1	26.7	3.4	
Other or multiracial	7.7	9.6	-1.9	
Average number of siblings of the focal child in the home	0.7	0.6	0.0	0.410
Ability to speak English self-rated as "not very well" or "not at all" (%)	10.6	10.5	0.1	0.956
Moved more than once during the past year (%)	18.9	20.0	-1.1	0.430
Family economic self-sufficiency (%)				
Food insecurity	53.5	55.5	-2.0	0.247
Received any public assistance during the past month				
Supplemental Nutrition Assistance Program	59.6	57.8	1.9	0.274
Disability insurance	17.8	17.2	0.6	0.650
Temporary Assistance for Needy Families	19.1	19.9	-0.8	0.587
Women, Infants, and Children	76.7	75.6	1.1	0.474
Maternal highest level of education				0.905
Less than a high school diploma or equivalent	41.5	40.8	0.7	
High school diploma	32.3	33.0	-0.6	
Some college or more	26.2	26.3	-0.1	
Maternal employment during the past three years				0.290
Not employed	20.1	19.4	0.7	
Employed for 12 months or fewer	39.4	37.4	2.0	
Employed for more than 12 months	40.5	43.2	-2.7	
Currently taking or planning to take education or training classes	70.1	68.6	1.5	0.356
Maternal health, mental health, and well-being				
Symptoms of depression or anxiety (%)	40.2	42.5	-2.3	0.180
Substance use before pregnancy (%)	30.6	31.3	-0.7	0.662
Average level of verbal abstract reasoning	6.9	7.0	-0.1	0.305
Health status self-rated as "poor" or "fair" (%)	11.1	12.9	-1.9	0.100

(continued)

Appendix Table C.1 (continued)

Characteristic	Program Group	Control Group	Difference	P-Value
Past behavioral health services (%)	20.4	22.2	-1.8	0.219
Average level of mastery	22.2	22.0	0.2	0.199
Smoked during the three months before pregnancy (%)	26.6	29.2	-2.6	0.102
Average body mass index	27.7	27.3	0.4	0.176
Intention to breastfeed (%)	85.3	83.3	2.0	0.201
Future childbearing intention (%)	12.7	12.7	0.0	0.976
Average perception of relationship quality with partner or spouse[a]	6.4	6.5	-0.1	0.104
Health insurance and access to care (%)				
Usual source of well-child care	93.8	91.1	2.7	0.082
Health insurance coverage for the mother	90.7	91.1	-0.4	0.709
Crime and intimate partner violence (%)				
Arrested during the past year	5.9	5.7	0.3	0.747
Maternal perpetration of physical violence	17.4	19.2	-1.8	0.186
Maternal experience with physical or sexual violence	7.1	7.8	-0.7	0.448
Experience with battering	5.7	5.0	0.7	0.385
Past domestic violence services	7.8	9.2	-1.4	0.145
Parenting				
Average quality of the home environment				
Parental warmth	5.0	5.2	-0.1	0.319
Parental verbal skills	2.8	2.8	0.0	0.450
Parental lack of hostility	4.6	4.6	0.0	0.671
Home interior	6.9	6.9	0.0	0.403
Low level of maternal empathy (%)	22.2	21.6	0.6	0.687
Child characteristics				
Average age (months)	1.4	1.5	0.0	0.722
Gender (%)				
Female	48.8	49.0	-0.2	0.925
Male	51.2	51.0	0.2	0.925
Poor health at birth (%)	27.3	22.2	5.1	0.045
Involvement with Child Protective Services before study entry (%)	5.0	3.0	2.0	0.102
Average level of emotionality[b]	2.3	2.3	0.0	0.510
Sample size (total = 3,315)	1,648	1,667		

SOURCES: Calculations based on the MIHOPE family baseline survey, the research team's baseline home observations, state birth records, state administrative child welfare records, and Medicaid enrollment data.

NOTES: Rounding may cause slight discrepancies in differences.

Distributions may not add to 100 percent because of rounding.

To assess differences between the research groups, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Scores can range from 1 to 7, with higher scores indicating that the mother is happier in her relationship.

[b]Measured using the 5-item emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity (EASI-II) Temperament Survey (Buss and Plomin, 1984). Scores can range from 1 to 5, with higher scores indicating greater levels of emotionality.

Appendix Table C.2

Comparison of Selected Baseline Characteristics Between the Program and Control Groups Among 15-Month In-Home Assessment Respondents

Characteristic	Program Group	Control Group	Difference	P-Value
Maternal and household characteristics				
Average age (years)	23.9	23.9	0.0	0.878
Pregnant (%)	65.3	64.4	0.9	0.597
Relationship status (%)				0.447
Married to the focal child's biological father	20.7	21.0	-0.2	
Living with a partner or spouse	24.3	26.2	-1.9	
In a relationship but not living together	29.6	27.1	2.5	
Single	25.3	25.7	-0.4	
Race and ethnicity (%)				0.009
Mexican origin	26.4	26.2	0.2	
Other Hispanic	13.3	12.4	0.9	
Non-Hispanic white	23.5	26.9	-3.5	
Non-Hispanic black	29.4	24.9	4.5	
Other or multiracial	7.5	9.6	-2.1	
Average number of siblings of the focal child in the home	0.7	0.7	0.0	0.453
Ability to speak English self-rated as "not very well" or "not at all" (%)	11.5	11.3	0.2	0.840
Moved more than once during the past year (%)	18.2	19.0	-0.8	0.582
Family economic self-sufficiency (%)				
Food insecurity	54.4	56.1	-1.7	0.349
Received any public assistance during the past month				
Supplemental Nutrition Assistance Program	59.4	58.1	1.3	0.478
Disability insurance	17.5	16.9	0.6	0.668
Temporary Assistance for Needy Families	19.3	19.5	-0.2	0.917
Women, Infants, and Children	77.0	76.3	0.6	0.680
Maternal highest level of education				0.968
Less than a high school diploma or equivalent	41.1	40.8	0.3	
High school diploma	32.3	32.7	-0.4	
Some college or more	26.6	26.5	0.2	
Maternal employment during the past three years				0.223
Not employed	20.3	19.8	0.5	
Employed for 12 months or fewer	39.8	37.2	2.6	
Employed for more than 12 months	40.0	43.0	-3.0	
Currently taking or planning to take education or training classes	69.4	67.5	1.9	0.277
Maternal health, mental health, and well-being				
Symptoms of depression or anxiety (%)	40.3	42.4	-2.1	0.253
Substance use before pregnancy (%)	29.8	31.4	-1.7	0.322
Average level of verbal abstract reasoning	6.9	7.0	-0.1	0.229
Health status self-rated as "poor" or "fair" (%)	11.1	12.9	-1.7	0.149

(continued)

Appendix Table C.2 (continued)

Characteristic	Program Group	Control Group	Difference	P-Value
Past behavioral health services (%)	19.2	21.7	-2.6	0.086
Average level of mastery	22.2	22.0	0.2	0.096
Smoked during the three months before pregnancy (%)	26.1	28.2	-2.1	0.194
Average body mass index	27.8	27.3	0.5	0.094
Intention to breastfeed (%)	86.0	83.0	3.0	0.078
Future childbearing intention (%)	12.7	12.7	0.1	0.964
Average perception of relationship quality with partner or spouse[a]	6.4	6.5	-0.1	0.078
Health insurance and access to care (%)				
Usual source of well-child care	93.6	91.3	2.2	0.170
Health insurance coverage for the mother	90.3	90.6	-0.3	0.777
Crime and intimate partner violence (%)				
Arrested during the past year	5.6	5.4	0.2	0.816
Maternal perpetration of physical violence	17.1	18.7	-1.7	0.241
Maternal experience with physical or sexual violence	7.2	7.9	-0.7	0.492
Experience with battering	5.7	5.3	0.4	0.636
Past domestic violence services	7.7	8.8	-1.1	0.286
Parenting				
Average quality of the home environment				
Parental warmth	5.1	5.2	-0.1	0.538
Parental verbal skills	2.8	2.9	0.0	0.160
Parental lack of hostility	4.6	4.5	0.1	0.574
Home interior	6.9	6.9	0.0	0.466
Low level of maternal empathy (%)	22.5	21.4	1.1	0.476
Child characteristics				
Average age (months)	1.4	1.5	-0.1	0.545
Gender (%)				
Female	49.7	48.8	0.9	0.636
Male	50.3	51.2	-0.9	0.636
Poor health at birth (%)	26.7	22.2	4.5	0.093
Involvement with Child Protective Services before study entry (%)	4.4	2.9	1.5	0.232
Average level of emotionality[b]	2.3	2.3	0.0	0.964
Sample size (total = 2,976)	1,482	1,494		

SOURCES: Calculations based on the MIHOPE family baseline survey, the research team's baseline home observations, state birth records, state administrative child welfare records, and Medicaid enrollment data.

NOTES: Rounding may cause slight discrepancies in differences.

Distributions may not add to 100 percent because of rounding.

To assess differences between the research groups, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Scores can range from 1 to 7, with higher scores indicating that the mother is happier in her relationship.

[b]Measured using the 5-item emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity (EASI-II) Temperament Survey (Buss and Plomin, 1984). Scores can range from 1 to 5, with higher scores indicating greater levels of emotionality.

Appendix Table C.3

Comparison of Selected Baseline Characteristics Between 15-Month Follow-Up Survey Respondents and Nonrespondents

Characteristic	Respondents	Nonrespondents	Difference	P-Value
Maternal and household characteristics				
Average age (years)	23.8	23.1	0.7	0.001
Pregnant (%)	65.1	73.9	-8.8	0.000
Relationship status (%)				0.000
Married to the focal child's biological father	20.1	13.5	6.6	
Living with a partner or spouse	25.3	26.4	-1.1	
In a relationship but not living together	29.2	28.8	0.4	
Single	25.5	31.4	-5.9	
Race and ethnicity (%)				0.004
Mexican origin	24.8	19.9	4.9	
Other Hispanic	12.6	11.1	1.5	
Non-Hispanic white	25.5	29.4	-3.9	
Non-Hispanic black	28.4	29.0	-0.5	
Other or multiracial	8.7	10.7	-2.0	
Average number of siblings of the focal child in the home	0.7	0.5	0.1	0.004
Ability to speak English self-rated as "not very well" or "not at all" (%)	10.5	6.9	3.7	0.000
Moved more than once during the past year (%)	19.5	24.5	-5.1	0.002
Family economic self-sufficiency (%)				
Food insecurity	54.5	55.6	-1.1	0.543
Received any public assistance during the past month				
Supplemental Nutrition Assistance Program	58.7	60.4	-1.7	0.352
Disability insurance	17.5	18.0	-0.5	0.752
Temporary Assistance for Needy Families	19.5	22.3	-2.9	0.061
Women, Infants, and Children	76.1	67.9	8.3	0.000
Maternal highest level of education				0.041
Less than a high school diploma or equivalent	41.1	44.9	-3.7	
High school diploma	32.6	32.7	-0.1	
Some college or more	26.2	22.4	3.8	
Maternal employment during the past three years				0.126
Not employed	19.7	21.6	-1.8	
Employed for 12 months or fewer	38.4	40.3	-1.9	
Employed for more than 12 months	41.9	38.1	3.7	
Currently taking or planning to take education or training classes	69.4	71.6	-2.3	0.202
Maternal health, mental health, and well-being				
Symptoms of depression or anxiety (%)	41.3	46.6	-5.3	0.005
Substance use before pregnancy (%)	30.9	34.7	-3.8	0.032
Average level of verbal abstract reasoning	7.0	6.8	0.2	0.104
Health status self-rated as "poor" or "fair" (%)	12.0	11.7	0.3	0.799

(continued)

Appendix Table C.3 (continued)

Characteristic	Respondents	Nonrespondents	Difference	P-Value
Past behavioral health services (%)	21.3	24.0	-2.7	0.088
Average level of mastery	22.1	21.9	0.1	0.268
Smoked during the three months before pregnancy (%)	27.9	35.4	-7.5	0.000
Average body mass index	27.5	27.0	0.5	0.093
Intention to breastfeed (%)	84.3	79.3	5.0	0.006
Future childbearing intention (%)	12.7	10.3	2.4	0.053
Average perception of relationship quality with partner or spouse[a]	6.4	6.4	0.0	0.778
Health insurance and access to care (%)				
Usual source of well-child care	92.4	92.3	0.1	0.956
Health insurance coverage for the mother	90.9	92.5	-1.6	0.110
Crime and intimate partner violence (%)				
Arrested during the past year	5.8	7.7	-1.9	0.049
Maternal perpetration of physical violence	18.3	17.7	0.6	0.705
Maternal experience with physical or sexual violence	7.4	6.8	0.7	0.504
Experience with battering	5.3	5.1	0.3	0.757
Past domestic violence services	8.5	10.6	-2.1	0.064
Parenting				
Average quality of the home environment				
Parental warmth	5.1	4.8	0.2	0.133
Parental verbal skills	2.8	2.8	0.0	0.061
Parental lack of hostility	4.6	4.7	-0.1	0.137
Home interior	6.9	7.0	0.0	0.582
Low level of maternal empathy (%)	21.9	23.0	-1.1	0.485
Child characteristics				
Average age (months)	1.5	1.3	0.1	0.333
Gender (%)				
Female	48.9	48.6	0.3	0.893
Male	51.1	51.4	-0.3	0.893
Poor health at birth (%)	24.7	27.9	-3.3	0.298
Involvement with Child Protective Services before study entry (%)	3.9	9.7	-5.8	0.007
Average level of emotionality[b]	2.3	2.2	0.1	0.313
Sample size (total = 4,215)	3,315	900		

SOURCES: Calculations based on the MIHOPE family baseline survey, the research team's baseline home observations, state birth records, state administrative child welfare records, and Medicaid enrollment data.

NOTES: Rounding may cause slight discrepancies in differences.

Distributions may not add to 100 percent because of rounding.

To assess differences between respondents and nonrespondents, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Scores can range from 1 to 7, with higher scores indicating that the mother is happier in her relationship.

[b]Measured using the 5-item emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity (EASI-II) Temperament Survey (Buss and Plomin, 1984). Scores can range from 1 to 5, with higher scores indicating greater levels of emotionality.

Appendix Table C.4

Comparison of Selected Baseline Characteristics Between 15-Month In-Home Assessment Respondents and Nonrespondents

Characteristic	Respondents	Nonrespondents	Difference	P-Value
Maternal and household characteristics				
Average age (years)	23.9	23.1	0.8	0.000
Pregnant (%)	64.9	72.2	-7.3	0.000
Relationship status (%)				0.000
Married to the focal child's biological father	20.9	13.3	7.5	
Living with a partner or spouse	25.3	26.0	-0.7	
In a relationship but not living together	28.3	31.0	-2.7	
Single	25.5	29.7	-4.1	
Race and ethnicity (%)				0.000
Mexican origin	26.3	17.6	8.7	
Other Hispanic	12.8	11.1	1.8	
Non-Hispanic white	25.2	29.0	-3.8	
Non-Hispanic black	27.2	31.8	-4.7	
Other or multiracial	8.5	10.5	-2.0	
Average number of siblings of the focal child in the home	0.7	0.5	0.2	0.000
Ability to speak English self-rated as "not very well" or "not at all" (%)	11.4	5.8	5.6	0.000
Moved more than once during the past year (%)	18.6	25.2	-6.6	0.000
Family economic self-sufficiency (%)				
Food insecurity	55.3	53.4	1.8	0.279
Received any public assistance during the past month				
Supplemental Nutrition Assistance Program	58.8	59.8	-1.0	0.543
Disability insurance	17.2	18.6	-1.3	0.306
Temporary Assistance for Needy Families	19.4	21.8	-2.4	0.084
Women, Infants, and Children	76.7	68.9	7.8	0.000
Maternal highest level of education				0.022
Less than a high school diploma or equivalent	40.9	44.3	-3.4	
High school diploma	32.5	33.0	-0.5	
Some college or more	26.5	22.7	3.9	
Maternal employment during the past three years				0.673
Not employed	20.0	20.3	-0.3	
Employed for 12 months or fewer	38.5	39.6	-1.2	
Employed for more than 12 months	41.5	40.0	1.5	
Currently taking or planning to take education or training classes	68.5	73.2	-4.7	0.003
Maternal health, mental health, and well-being				
Symptoms of depression or anxiety (%)	41.4	45.1	-3.8	0.025
Substance use before pregnancy (%)	30.6	34.5	-3.9	0.014
Average level of verbal abstract reasoning	7.0	6.9	0.1	0.280
Health status self-rated as "poor" or "fair" (%)	12.0	11.7	0.3	0.785

(continued)

Appendix Table C.4 (continued)

Characteristic	Respondents	Nonrespondents	Difference	P-Value
Past behavioral health services (%)	20.5	25.4	-4.9	0.001
Average level of mastery	22.1	21.9	0.2	0.119
Smoked during the three months before pregnancy (%)	27.2	35.1	-8.0	0.000
Average body mass index	27.6	26.9	0.7	0.010
Intention to breastfeed (%)	84.5	80.1	4.4	0.006
Future childbearing intention (%)	12.7	10.9	1.8	0.113
Average perception of relationship quality with partner or spouse[a]	6.4	6.4	0.0	0.648
Health insurance and access to care (%)				
Usual source of well-child care	92.4	92.1	0.3	0.850
Health insurance coverage for the mother	90.5	93.0	-2.5	0.005
Crime and intimate partner violence (%)				
Arrested during the past year	5.5	8.0	-2.5	0.004
Maternal perpetration of physical violence	17.9	18.7	-0.8	0.529
Maternal experience with physical or sexual violence	7.5	6.7	0.8	0.345
Experience with battering	5.5	4.8	0.8	0.306
Past domestic violence services	8.2	10.6	-2.4	0.017
Parenting				
Average quality of the home environment				
Parental warmth	5.1	4.8	0.3	0.034
Parental verbal skills	2.8	2.8	0.0	0.051
Parental lack of hostility	4.5	4.8	-0.2	0.002
Home interior	6.9	6.9	0.0	0.545
Low level of maternal empathy (%)	21.9	22.7	-0.8	0.591
Child characteristics				
Average age (months)	1.5	1.4	0.1	0.288
Gender (%)				
Female	49.2	47.8	1.4	0.425
Male	50.8	52.2	-1.4	0.425
Poor health at birth (%)	24.4	27.7	-3.3	0.220
Involvement with Child Protective Services before study entry (%)	3.6	8.8	-5.1	0.003
Average level of emotionality[b]	2.3	2.2	0.0	0.475
Sample size (total = 4,215)	2,976	1,239		

SOURCES: Calculations based on the MIHOPE family baseline survey, the research team's baseline home observations, state birth records, state administrative child welfare records, and Medicaid enrollment data.

NOTES: Rounding may cause slight discrepancies in differences.

Distributions may not add to 100 percent because of rounding.

To assess differences between respondents and nonrespondents, chi-square tests were used for categorical variables and two-tailed t-tests were used for continuous variables.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Scores can range from 1 to 7, with higher scores indicating that the mother is happier in her relationship.

[b]Measured using the 5-item emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity (EASI-II) Temperament Survey (Buss and Plomin, 1984). Scores can range from 1 to 5, with higher scores indicating greater levels of emotionality.

Appendix D

Sensitivity Checks to the Main Analyses

This appendix presents several sensitivity checks to the main analyses in this report, which are shown in Chapter 3 (Estimated Effects for the Full Sample). The purpose of sensitivity checks is to ensure that the estimated effects are not sensitive to decisions that were made in choosing an estimation model.

The analyses conducted and their corresponding results are:

- An analysis using multiple imputations to fill in missing survey or administrative data on confirmatory outcomes for sample members who did not complete follow-up data collection or who could not be found in administrative data records (Appendix Table D.1). Like the findings reported in Chapter 3, program group families fared better on average than control group families for most of the outcomes. However, only one of the estimated effects is statistically significant with the imputed data.

- Estimated effects on confirmatory outcomes with unadjusted p-values and with p-values adjusted for the multiple comparisons using the Westfall-Young method (Appendix Table D.2).[1] After the adjustment, none of the 12 estimated impacts is statistically significant. This finding reduces the study's confidence about which outcomes are affected by home visiting. However, it does not change the conclusion mentioned in Chapter 3 that it is highly unlikely that the study would have found that program group families fare better than control group families for 9 of the 12 confirmatory outcomes if home visiting had no true effect.

- Effect estimates that are not adjusted for family baseline characteristics (Appendix Table D.3). The results are broadly consistent with the main findings presented in Chapter 3. Covariates in the regression adjustment include the following maternal characteristics: age; race, ethnicity, and place of birth; depression or anxiety; food security; education; substance use before pregnancy; marital status; number of children in the household; perpetration of physical violence; experience of physical or sexual violence; whether the mother was receiving education or training; employment; receipt of benefits from the Supplemental Nutrition Assistance Program, Supplemental Security Income, Temporary Assistance for Needy Families, or the Special Supplemental Nutrition Program for Women, Infants, and Children; verbal abstract reasoning; previous arrest; health status, childbearing intentions; health insurance

[1]Westfall and Young (1993).

coverage; smoking before pregnancy; previous receipt of behavioral health services; intention to breastfeed (if pregnant); whether the mother was pregnant when she entered the study; maternal body mass index; receipt of domestic violence services; whether any child had involvement with child welfare services; relationship quality; English proficiency; empathy; experience with battering; verbal skills; home interior; parental warmth; lack of hostility; mastery; and which home visiting program enrolled the mother. Covariates also included child sex and, for children who were born before they entered the study, child temperament, whether the child had a usual source of care, whether the child had poor health at birth, and the child's age at enrollment.

- Logistic regression results for binary confirmatory outcomes (Appendix Table D.4). Results are similar to those presented in Chapter 3.

Overall, therefore, these checks tell a similar story to the results presented in Chapter 3: that home visiting programs resulted in small improvements in family outcomes.

Appendix Table D.1

Estimated Effects on Confirmatory Outcomes at 15 Months Calculated Using Multiple Imputation

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Maternal health (%)							
New pregnancy after study entry	18.3	17.9	0.3	0.01	0.809	-2.0	2.6
Family economic self-sufficiency (%)							
Receiving education or training	23.2	23.1	0.1	0.00	0.914	-2.1	2.4
Parenting							
Quality of the home environment	38.0	37.7	0.3	0.04	0.249	-0.1	0.7
Parental supportiveness	3.9	3.9	0.0	0.03	0.325	0.0	0.1
Child maltreatment							
Frequency of minor physical assault during the past year	2.0	2.1	-0.1	-0.03	0.405	-0.3	0.1
Frequency of psychological aggression during the past year	3.0	3.2	-0.2	-0.04	0.203	-0.4	0.1
Child health							
Health insurance coverage for the child (%)	98.7	98.7	-0.1	-0.01	0.868	-0.7	0.6
Number of Medicaid-paid well-child visits	5.0	5.0	-0.1	-0.02	0.503	-0.2	0.1
Number of Medicaid-paid child emergency department visits	2.0	2.2	-0.2	-0.06	0.070	-0.3	0.0
Any Medicaid-paid health care encounter for injury or ingestion (%)	24.9	26.0	-1.1	-0.03	0.434	-3.4	1.2
Child development							
Behavior problems	44.6	44.9	-0.3	-0.04	0.171	-0.7	0.1
Receptive language skills	95.3	94.9	0.3	0.02	0.546	-0.5	1.2
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix Table D.2

Estimated Effects on Confirmatory Outcomes at 15 Months with Unadjusted P-Values and P-Values Adjusted for Multiple Comparisons

Outcome	Unadjusted P-Value	Adjusted P-Value
Maternal health (%)		
New pregnancy after study entry	0.664	0.948
Family economic self-sufficiency (%)		
Receiving education or training	0.792	0.948
Parenting		
Quality of the home environment	0.010	0.107
Parental supportiveness	0.236	0.882
Child maltreatment		
Frequency of minor physical assault during the past year	0.292	0.882
Frequency of psychological aggression during the past year	0.085	0.563
Child health		
Health insurance coverage for the child (%)	0.464	0.948
Number of Medicaid-paid well-child visits	0.264	0.882
Number of Medicaid-paid child emergency department visits	0.044	0.365
Any Medicaid-paid health care encounter for injury or ingestion (%)	0.445	0.948
Child development		
Behavior problems	0.087	0.563
Receptive language skills	0.552	0.948
Sample size (total = 4,215)		

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: The adjusted p-value was calculated using the Westfall-Young method. See Westfall and Young (1993).
See Appendix B for descriptions of the outcome measures used.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix Table D.3

Non-Regression-Adjusted Estimated Effects on Confirmatory Outcomes at 15 Months

Outcome	Program Group	Control Group	Difference (Effect)	Effect Size	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Maternal health (%)							
New pregnancy after study entry	18.2	17.6	0.7	0.02	0.609	-1.5	2.9
Family economic self-sufficiency (%)							
Receiving education or training	23.6	22.6	1.0	0.02	0.513	-1.5	3.4
Parenting							
Quality of the home environment	38.8	38.5	0.3	0.06	0.093	0.0	0.5
Parental supportiveness	4.0	3.9	0.0	0.02	0.578	0.0	0.1
Child maltreatment							
Frequency of minor physical assault during the past year	2.0	2.2	-0.2	-0.06	0.068	-0.5	0.0
Frequency of psychological aggression during the past year	3.0	3.3	-0.3	-0.07	0.046	-0.6	-0.1
Child health							
Health insurance coverage for the child (%)	94.9	95.2	-0.3	-0.01	0.650	-1.5	0.8
Number of Medicaid-paid well-child visits	5.0	5.1	-0.1	-0.02	0.491	-0.2	0.1
Number of Medicaid-paid child emergency department visits	2.1	2.2	-0.1	-0.05	0.094	-0.3	0.0
Any Medicaid-paid health care encounter for injury or ingestion (%)	25.7	26.8	-1.2	-0.03	0.429	-3.6	1.3
Child development							
Behavior problems	44.5	45.0	-0.5	-0.06	0.061	-0.9	-0.1
Receptive language skills	95.6	95.3	0.3	0.02	0.587	-0.6	1.2
Sample size (total = 4,215)	2,102	2,113					

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix Table D.4

Estimated Effects on Binary Confirmatory Outcomes at 15 Months Calculated Using Logistic Regression

Outcome (%)	Program Group	Control Group	Difference (Effect)	P-Value	90% Confidence Interval Lower Bound	90% Confidence Interval Upper Bound
Maternal health						
New pregnancy after study entry	18.2	17.6	0.6	0.675	-1.8	2.8
Family economic self-sufficiency						
Receiving education or training	23.4	22.9	0.5	0.788	-1.8	2.9
Child health						
Health insurance coverage for the child	94.8	95.2	-0.5	0.468	-1.7	0.7
Any Medicaid-paid health care encounter for injury or ingestion	25.7	26.8	-1.0	0.486	-3.8	1.5
Sample size (total = 4,215)	2,102	2,113				

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and Medicaid enrollment and claims data.

NOTES: See Appendix B for descriptions of the outcome measures used.

Rounding may cause slight discrepancies in sums, differences, and confidence interval bounds.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Appendix E

Detailed Results from Past Studies of Home Visiting

This appendix presents details on the previous evidence about the effects of the four evidence-based models on the 12 MIHOPE confirmatory outcomes. For each confirmatory outcome, Appendix Table E.1 provides details on each finding that was used in the summary presented in Table 3.1 of Chapter 3. For each finding, Appendix Table E.1 presents the following information:

- The confirmatory outcome
- The study the result came from
- The follow-up period of the finding relative to when families entered the study
- The estimated effect size (in some cases taken from the published studies, in some cases taken from the Home Visiting Evidence of Effectiveness review, and in some cases calculated by the study team)
- The sample size
- A p-value and indication of whether the impact estimate was statistically significant at the 5 percent significance level[1]
- A brief description of the outcome used in the study.

[1]The 5 percent level is used instead of the 10 percent level in this table because some studies reported only whether results were significant at the 5 percent level and did not report whether results was significant at a level between 5 and 10 percent.

Appendix Table E.1

Past Evidence on Confirmatory Outcomes

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Maternal health					
New pregnancy after study entry (%)				2 out of 9	
HFA HI — El-Kamary et al. (2004)	1 year	0.02	564	No (p = 0.83)	Rapid repeat birth
HFA NY — Mitchell-Herzfeld et al. (2005)	1 year	0.02	1061	No (p = 0.799)	Pregnancy or childbirth during first year
PAT CA — Wagner et al. (1999)	1 year	0.01	363	No (p > 0.05)	Mother had additional births
HFA AK — Duggan et al. (2005)	2 years	-0.03	325	No (p = 0.90)	Rapid repeat birth
HFA San Diego — Landsverk et al. (2002)	2 years	-0.19	403	No (p > 0.05)	Repeat pregnancy within 24 months of index birth
HFA MA — Jacobs et al. (2015)	2 years	-0.04	612	No (p = 0.715)	Repeat pregnancy
NFP Denver — Olds et al. (2002)	2 years	-0.25	436	Yes (p = 0.02)	Subsequent pregnancy
NFP Memphis — Kitzman et al. (1997)	2 years	-0.22	671	Yes (p = 0.006)	Subsequent pregnancy
PAT CA — Wagner et al. (1999)	2 years	-0.04	371	No (p > 0.05)	Mother had additional births
Family economic self-sufficiency					
Receiving education or training (%)				2 out of 5	
HFA AZ — LeCroy and Krysik (2011)	1 year	0.70	171	Yes (p = 0.01)	School or training for the mother
HFA San Diego — Landsverk et al. (2002)	1 year	0.05	435	No (p = 0.63)	Receiving adult education/job training
EHS Nationwide — Love et al. (2001)	7-16 months	0.12	1059	Yes (p < 0.05)	Ever in education or training
EHS Nationwide — Chazan-Cohen et al. (2013)	2 years	0.12	966	No (p < 0.10)	In school or job training
HFA San Diego — Landsverk et al. (2002)	2 years	0.09	403	No (p = 0.45)	Receiving adult education/job training
Parenting					
Quality of the home environment				4 out of 15	
HFA San Diego — Landsverk et al. (2002)	1 year	0.06	435	No (p = 0.52)	HOME total scale
HFA GA — Chambliss (1998)	1 year	0.88	132	Yes (p < 0.05)	HOME total score
HFA HI — Duggan et al. (1999)	1 year	0.00	564	No (p = 0.79)	HOME total scale

(continued)

Appendix Table E.1 (continued)

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Quality of the home environment (continued)					
PAT CA — Wagner et al. (1999)	1 year	0.06	310	No (p > 0.05)	HOME total scale
PAT 3-site sample — Wagner and Spiker (2001)	1 year	-0.01	343	No (p > 0.05)	HOME total scale
PAT Wagner et al. (1996)	1 year	NA	236	Yes (p < 0.05)	HOME total scale
NFP Memphis — Kitzman et al. (1997)	2 years	0.25	675	Yes (p = 0.003)	HOME total score
EHS Nationwide — Love et al. (2001)	2 years	0.13	966	Yes (p < 0.05)	HOME total score
HFA HI — Duggan et al. (1999)	2 years	0.08	567	No (p = 0.47)	HOME total scale
HFA AK — Caldera et al. (2007)	2 years	0.18	249	No (p = 0.10)	HOME total scale
HFA San Diego — Landsverk et al. (2002)	2 years	0.00	403	No (p = 0.96)	HOME total scale
NFP Denver — Olds et al. (2002)	2 years	0.17	406	No (p < 0.10)	HOME environment score
PAT CA — Wagner et al. (1999)	2 years	-0.09	350	No (p > 0.05)	HOME total scale
PAT 3-site sample — Wagner and Spiker (2001)	2 years	0.22	254	No (p > 0.05)	HOME total scale
PAT Wagner et al. (1996)	2 years	NA	195	No (p > 0.05)	HOME total scale
Parental supportiveness				0 out of 8	
HFA San Diego — Landsverk et al. (2002)	1 year	0.16	435	No (p = 0.14)	Mother-child interaction, caregiver score (NCAST)
HFA HI — Duggan et al. (1999)	1 year	0.03	564	No (p = 0.56)	Mother-child interaction, caregiver score (NCAST)
EHS Nationwide — Love et al. (2001)	2 years	0.14	794	No (p < 0.10)	Parent-child structured play: parent supportiveness
HFA San Diego — Landsverk et al. (2002)	2 years	-0.11	403	No (p = 0.31)	Mother-child interaction, caregiver score (NCAST)
HFA HI — Duggan et al. (1999)	2 years	0.11	567	No (p = 0.28)	Mother-child interaction, caregiver score (NCAST)
HFA AK — Caldera et al. (2007)	2 years	0.15	249	No (p = 0.40)	Mother-child interaction, contingent caregiver score (NCAST)
NFP Memphis — Kitzman et al. (1997)	2 years	0.05	675	No (p > 0.05)	Mother-child interaction, caregiver score (NCAST)
PAT 3-site sample — Wagner and Spiker (2001)	2 years	0.19	254	No (p > 0.05)	Average NCAST parent scale score

(continued)

Appendix Table E.1 (continued)

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Child maltreatment					
Frequency of minor physical assault during the past year				2 out of 5	
HFA NY — Dumont et al. (2008)	1 year	-0.13	1060	Yes (p = 0.017)	Frequency of minor physical aggression (CTS-PC)
HFA San Diego — Landsverk et al. (2002)	1 year	-0.07	422	No (p = 0.44)	Mild physical assault (corporal punishment) frequency (CTS-PC)
HFA AK — Duggan et al. (2007)	2 years	-0.18	246	Yes (p < 0.05)	Mild physical assault frequency (CTS-PC)
HFA NY — Dumont et al. (2008)	2 years	-0.02	992	No (p > 0.05)	Frequency of minor physical aggression (CTS-PC)
HFA San Diego — Landsverk et al. (2002)	2 years	-0.03	403	No (p = 0.77)	Mild physical assault (corporal punishment) frequency (CTS-PC)
Frequency of psychological aggression during the past year				3 out of 5	
HFA NY — Dumont et al. (2008)	1 year	-0.14	1060	Yes (p = 0.007)	Frequency of psychological aggression (CTS-PC)
HFA San Diego — Landsverk et al. (2002)	1 year	-0.14	422	No (p = 0.17)	Psychological aggression frequency (CTS-PC)
HFA AK — Duggan et al. (2007)	2 years	-0.14	246	Yes (p < 0.05)	Psychological aggression frequency (CTS-PC)
HFA NY — Dumont et al. (2008)	2 years	-0.03	992	No (p > 0.05)	Frequency of psychological aggression (CTS-PC)
HFA San Diego — Landsverk et al. (2002)	2 years	-0.20	403	Yes (p = 0.03)	Psychological aggression frequency (CTS-PC)
Child health					
Health insurance coverage for the child (%)				2 out of 5	
HFA San Diego — Landsverk et al. (2002)	1 year	-0.09	435	No (p = 0.61)	Child has insurance coverage
HFA NY — Mitchell-Herzfeld et al. (2005)	1 year	0.13	1061	Yes (p = 0.033)	Child has health insurance
HFA AK — Caldera et al. (2007)	2 years	0.19	249	Yes (p < 0.05)	Child has health care coverage
HFA San Diego — Landsverk et al. (2002)	2 years	-0.09	403	No (p = 0.19)	Child has insurance coverage
PAT 3-site sample — Wagner and Spiker (2001)	2 years	-0.13	265	No (p > 0.05)	Child covered by health insurance

(continued)

Appendix Table E.1 (continued)

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Number of Medicaid-paid well-child visits				1 out of 4	
HFA San Diego — Landsverk et al. (2002)	1 year	0.05	435	No (p > 0.10)	Number of well-child visits
HFA NY — Mitchell-Herzfeld et al. (2005)	1 year	-0.04	1061	No (p = 0.59)	Number of well-baby visits
HFA San Diego — Landsverk et al. (2002)	2 years	0.39	403	Yes (p < 0.05)	Number of well-child visits
NFP Memphis — Kitzman et al. (1997)	2 years	-0.05	671	No (p = 0.15)	Number of well-child visits
Number of Medicaid-paid child emergency department visits				2 out of 4	
HFA NY — Mitchell-Herzfeld et al. (2005)	1 year	-0.04	1061	No (p = 0.162)	Number of emergency room visits for child
NFP Elmira — Olds, Henderson, Chamberlin, Tatelbaum (1986)	1 year	-0.09	223	Yes (p = 0.04)	Number of emergency visits
HFA AK — Duggan et al. (2007)	2 years	-0.24	268	No (p = 0.31)	Number of times seen in emergency department
NFP Elmira — Olds, Henderson, Chamberlin, Tatelbaum (1986)	2 years	-0.09	196	Yes (p = 0.01)	Number of emergency visits
Any Medicaid-paid health care encounter for injury or ingestion				0 out of 7	
HFA HI — Duggan et al. (1999)	1 year	-0.07	564	No (p = 0.58)	Ever had injury needing medical care
HFA NY — Mitchell-Herzfeld et al. (2005)	1 year	0.11	1061	No (p = 0.068)	Emergency room visits due to injury or ingestion
EHS Nationwide — Chazan-Cohen et al. (2013)	2 years	-0.06	966	No (p > 0.10)	Emergency room visits due to accident or injury
HFA AK — Caldera et al. (2007)	2 years	-0.07	268	No (p = 0.83)	Injuries requiring medical care
HFA HI — Duggan et al. (1999)	2 years	-0.05	534	No (p = 0.51)	Ever had injury needing medical care
PAT CA — Wagner et al. (1999)	2 years	-0.08	365	No (p > 0.05)	Child treated for injury in the past year
PAT 3-site sample — Wagner and Spiker (2001)	2 years	-0.20	265	No (p > 0.05)	Child treated for injury in the past year

(continued)

Appendix Table E.1 (continued)

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Child development					
Behavior problems				2 out of 9	
HFA MA — Jacobs et al. (2015)	2 years	NA	539	No (p = 0.704)	Child behavior problems (BITSEA)
HFA San Diego — Landsverk et al. (2002)	2 years	0.09	395	No (p = 0.33)	CBCL behavior problems
HFA AK — Caldera et al. (2007)	2 years	-0.28	249	No (p = 0.09)	CBCL total externalizing score
HFA AK — Caldera et al. (2007)	2 years	-0.36	249	Yes (p < 0.01)	CBCL total internalizing score
NFP Denver — Olds et al. (2002)	2 years	-0.08	372	No (p > 0.10)	CBCL (behavior problems score)
NFP Memphis — Kitzman et al. (1997)	2 years	-0.14	1082	No (p > 0.05)	CBCL total score
EHS Nationwide — Love et al. (2001)	2 years	-0.01	966	No (p > 0.10)	CBCL aggression
NFP Memphis — Sidora-Arcoleo et al. (2010)	2 years	-0.21	721	Yes (p = 0.01)	CBCL physical aggression
EHS UT — Roggman and Cook (2010)	2 years	0.06	141	No (p > 0.10)	CBCL aggression
Receptive language skills				0 out of 11	
PAT — Wagner et al. (1996)	1 year	NA	236	No (p > 0.05)	DPII communication development scale: average months differential
PAT CA — Wagner et al. (1999)	1 year	0.14	315	No (p > 0.05)	DPII communication development scale: mean months differential
NFP Denver — Olds et al. (2002)	21 months	0.14	406	No (p > 0.10)	Language development (PLS-3)
EHS Nationwide — Love et al. (2001)	2 years	NA	814	No (p > 0.10)	Bayley language score
EHS Nationwide — Love et al. (2001)	2 years	0.08	966	No (p > 0.10)	Average MacArthur CDI - sentence complexity
EHS Nationwide — Love et al. (2001)	2 years	0.13	966	No (p < 0.10)	MacArthur CDI - vocabulary production
EHS Nationwide — Love et al. (2001)	2 years	0.04	966	No (p > 0.10)	Percentage MacArthur CDI combining words
PAT CA — Wagner et al. (1999)	2 years	-0.02	375	No (p > 0.05)	DPII communication development scale: mean months differential
PAT 3-site sample — Wagner and Spiker (2001)	2 years	0.08	266	No (p > 0.05)	DPII communication development scale: average months differential

(continued)

Appendix Table E.1 (continued)

Outcome	Follow-Up Period	Effect Size	Sample Size	Estimate Statistically Significant and Favorable?	Outcome Used
Receptive language skills (continued)					
HFA MA — Jacobs et al. (2015)	2 years	NA	539	No (p = 0.533)	English language skills (MB-CDI)
PAT — Wagner et al. (1996)	2 years	NA	196	No (p > 0.05)	DPII communication development scale: average months differential

SOURCES: Cited in the body of the table.

NOTES: NA = not applicable, EHS = Early Head Start — Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers, HOME = Home Observation Measurement of the Environment, NCAST = Nursing Child Assessment Satellite Training, BITSEA = Brief Infant-toddler Social and Emotional Assessment, CBCL = Child Behavior Checklist, DPII = Development Profile II, PLS-3 = Preschool Language Scale-3, MacArthur CDI = MacArthur Communicative Development Inventories, MB-CDI = MacArthur-Bates Communicative Development Inventories.

This table includes studies of EHS, HFA, NFP, and PAT that were included in the U.S. Department of Health and Human Services website, Home Visiting Evidence of Effectiveness review (http://homvee.acf.hhs.gov/). Only past evidence from the first two years of follow-up data collection is included.

Appendix F

Technical Details on the Analysis of Variation of Effects

While the main analysis presented in Chapter 3 showed the effects for the full sample, some local programs might produce larger effects than others. By including 86 local programs from around the country, the Mother and Infant Home Visiting Program Evaluation (MIHOPE) provides an opportunity to investigate this issue.[1] This appendix provides details on analyses that tie together information on family outcomes with information on local program implementation to investigate how much effects vary across local programs, whether the characteristics of local programs are associated with larger or smaller effects, and how the services that families receive are associated with program effects.

MIHOPE attempted to address three broad questions regarding effect variation:

- How much variation is there in effects across local home visiting programs?
- What is the relationship between the features of local home visiting programs and their effects on family outcomes?
- What is the relationship between the actual home visiting services that families receive and family outcomes?

This appendix provides technical details on how these questions were investigated.

Variation in Effects Across Local Home Visiting Programs

The first issue addressed in this analysis was whether the effects of home visiting vary across local programs, and if so, how much. In conducting this assessment, it is important to distinguish between estimated effects and true effects. The estimated effects of home visiting can vary across local programs because some are more effective than others or because some are in local communities where home visiting is more or less likely to have an effect. However, estimated effects can also vary because they are estimated using a particular group of families, and the estimates would have been somewhat different if the study had been conducted with a different group of families at a different time. Other factors such as error in measuring outcomes can also contribute to variation in estimates that does not reflect true variation in program effectiveness.

[1]As noted in Chapter 1, MIHOPE included 88 local programs but two programs were excluded from the impact analysis because one did not enroll any families into the study and no sample members were randomized to the control group at the other.

To estimate the amount of variation in effects across local programs, the study team used a random effects framework. This framework is expressed in equations (1a) and (1b):

$$Y_{ij} = \alpha_j + \beta X_i + \delta_j T_{ij} + u_{ij.} \quad (1a)$$

$$\delta_j = \delta_0 + \varepsilon_j \quad (1b)$$

In equation (1a), Y_{ij} represents an outcome for family i recruited through local program j. Control group levels vary with family characteristics (X_i) and by local program (α_j), as do effects (δ_j). The estimation method assumed that α_j is a fixed effect and δ_j is a random effect that is distributed normally with mean 0 and variance of τ_1^2. The model was estimated in Stata version 14.2 using the mixed statement. Results come from a linear regression for all outcomes because the main impact analysis used linear regression adjustment and because a logistic regression did not converge for all outcomes.

Estimates of τ_1 (the standard deviation rather than the variance) are shown in Appendix Table F.1 along with the 90 percent confidence interval of the estimated standard deviation.[2]

Using "new pregnancy after study entry" as an example, the table can be read as follows:

- The first column shows the estimated variance of effects across local programs, which is the estimate of τ_1. In this case it is 0, indicating that true effects are the same across local programs.[3]
- The second column shows a p-value of 0.954 for a test of the null hypothesis that the effects are the same across all programs. Thus the evidence suggests that the variance in estimated effects across programs is consistent with there being no variation in true effects (though that possibility can never be ruled out by statistical tests).
- The third and fourth columns show the confidence interval around this estimate. In this case, both the lower and upper bound of the confidence interval are indistinguishable from 0, providing more evidence that effects on this outcome do not vary across local programs.

[2]The 90 percent confidence intervals are based on the method described by Weiss et al. (2017).

[3]Results in Appendix Table F.1 expressed as 0.00 are less than 0.005.

The evidence in Appendix Table F.1 suggests there are two outcomes where effects vary across local programs: the number of Medicaid-paid well-child visits and any Medicaid-paid health care encounter for injury or ingestion. In both cases, the p-value of the Q-statistic for homogeneity of effects across sites is 0.01 or smaller, indicating a significant amount of variation. In these two cases, the estimate of τ_1 is distinguishable from zero, as is the lower bound of the 90 percent confidence interval for the estimate of τ_1.

How Effects Are Associated with Program Features

The next stage of the analysis explored how the features of local home visiting programs are related to the effects of those programs.[4] Even though the previous section indicated that effects do not vary significantly across local programs for most of the confirmatory outcomes, it is possible that local programs were adapted to their local environments in a way that would reduce the variation in effects across local programs. Thus, local program features could still be associated with larger or smaller effects. Adjusting for local program characteristics might also reduce the amount of unexplained variation across local programs, which could make it easier to detect differences.

This analysis is a natural extension of equation (1) that allows the effect of the local program to vary with the characteristics of the local program. These extensions are represented in equations (2) and (3).

$$Y_{ij} = \alpha_j + \beta X_i + \delta_j T_{ij} + \lambda T_{ij} X_i + \phi LP_j + u_{ij.} \qquad (2a)$$

$$\delta_j = \delta_0 + \Upsilon LP_j + \varepsilon_j \qquad (2b)$$

In equation (2a), outcome levels and effects are allowed to vary with a vector of family characteristics represented by X_i with associated parameters represented by β for outcome levels and λ for effects. Outcome levels also vary with local program features represented by LP_j with associated parameters ϕ. Effects are also allowed to vary across local programs after taking family characteristics into account. The impact for site j after adjusting for family characteristics is represented by δ_j. Note that the effects of family characteristics — β and λ — are not allowed to vary across local programs.

According to equation (2b), the deviation of δ_j from the overall cross-program average (δ_0) is associated with a vector of local program characteristics (LP_j), which

[4]The ideas discussed in this section are based on the methods used in Bloom, Riccio, and Hill (2003).

Appendix Table F.1

Estimated Variance in True Effects Across Sites

Outcome	Estimated Standard Deviation of True Effects	P-Value	90 Percent Confidence Interval of Estimated Standard Deviation of True Effects	
			Lower Bound	Upper Bound
Maternal health (%)				
New pregnancy after study entry	0.00	0.954	0.00	0.00
Family economic self-sufficiency (%)				
Receiving education or training	4.84	0.104	0.00	10.48
Parenting				
Quality of the home environment	0.00	0.977	0.00	0.00
Parental supportiveness	0.00	0.497	0.00	0.19
Child maltreatment				
Frequency of minor physical assault during the past year	0.46	0.216	0.00	0.78
Frequency of psychological aggression during the past year	0.42	0.203	0.00	1.01
Child health				
Health insurance coverage for the child (%)	0.00	0.949	0.00	0.24
Number of Medicaid-paid well-child visits	0.60	0.000	0.37	0.72
Number of Medicaid-paid child emergency department visits	0.17	0.691	0.00	0.35
Any Medicaid-paid health care encounter for injury or ingestion (%)	9.33	0.003	5.51	13.51
Child development				
Behavior problems	0.00	0.738	0.00	0.12
Receptive language skills	0.00	0.863	0.00	0.11
Sample size (total = 4,215)				

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the family service logs.

NOTE: The standard deviation of estimates across sites is the variance in estimated effects from a regression-adjusted generalized least squares model. The estimated standard deviation of true effects across sites is from a fixed effect, random slope model. See text for more details.

have associated estimated effects represented by ϒ. Note that implementation features of local programs that are shared by all local programs are incorporated into δ_0, so this approach can only investigate those features that vary substantially across local programs.

Results using this framework are presented in Tables 5.1 and 5.2 in Chapter 5. Although Table 5.1 shows effects by evidence-based model, Appendix Tables F.2 and F.3 show estimated effects by model using two alternative estimation methods.

How Home Visiting Services Are Associated with Effects

The third analysis investigated whether the effects of home visiting are related to the services families received through home visiting. This analysis examined three types of services: number of home visits, number of times outcome-specific topics were discussed with families, and whether families received outcome-specific referrals. Appendix Table F.4 shows the outcome area for each confirmatory outcome as well as the number of times each topic was discussed on average with families and the percentage of families who received a referral in that outcome area.

To analyze these relationships, MIHOPE used two methods: instrumental variables and causal mediation analysis.

Instrumental Variable Analysis

Instrumental variable analysis was used to examine the relationship between local program effects and the average level of home visiting services received by families in that local program. By focusing on local program averages rather than individual families, the method reduces statistical problems that result from spurious correlations between outcomes and service levels for individual families.[5]

In notation, the instrumental variable analysis is represented by the following equations:

$$Y_{ij} = \beta_{0j} + \varphi M_{ij} + \beta_2 X_{ij} + e_{ij}$$

$$M_{ij} = \mu_{0j} + \mu_j T_{ij} + \mu_2 X_{ij} + u_{ij}$$

[5]For a multisite study such as MIHOPE, however, instrumental variables analysis assumes that the effectiveness of services provided by local programs is not related to the level of services received by families in those programs. These and other assumptions are discussed in Reardon and Raudenbush (2013).

Appendix Table F.2

Estimated Effects on Confirmatory Outcomes at 15 Months Using the Restricted Maximum Likelihood Method, by Evidence-Based Model

Outcome	Estimated Effect				P-Value
	EHS	HFA	NFP	PAT	
Maternal health (%)					
New pregnancy after study entry	2.6	0.7	-0.1	-0.8	0.966
Family economic self-sufficiency (%)					
Receiving education or training	3.0	1.8	-5.6	3.4	0.578
Parenting[a]					
Quality of the home environment	0.11	0.11	0.05	0.11	0.135
Parental supportiveness	0.05	-0.09	0.08	0.17	0.137
Child maltreatment					
Frequency of minor physical assault during the past year	0.1	-0.5	0.2	0.1	0.320
Frequency of psychological aggression during the past year	0.2	-0.4	-0.3	0.0	0.458
Child health					
Health insurance coverage for the child (%)	1.3	-1.0	-0.8	-0.5	0.847
Number of Medicaid-paid well-child visits	0.4	-0.2	-0.2	-0.1	0.545
Number of Medicaid-paid child emergency department visits	0.3	-0.2	-0.5	0.0	0.101
Any Medicaid-paid health care encounter for injury or ingestion (%)	-0.8	2.4	-4.2	-2.5	0.776
Child development[a]					
Behavior problems	-0.01	-0.07	-0.12	0.07	0.309
Receptive language skills	0.05	-0.01	-0.01	0.10	0.834
Sample size (total = 4,215)	571	1,454	1,231	959	

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: EHS = Early Head Start — Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers.

See Appendix B for descriptions of the outcome measures used.

Estimates come from a fixed effect, random slope model using the restricted maximum likelihood method. See text for more details.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

The effect of being assigned to the program group (T_{ij}) on the mediator (M_{ij}) varies across local programs (indexed by j) as represented by μ_j, but the effect of the mediator on the outcome (φ) does not. Thus, there are multiple instruments (one for each local program) but only one estimated effect of the mediator. Because there are multiple instruments but only one endogenous variable, the model has overidentifying restrictions. MIHOPE tested whether these overidentifying restrictions could be rejected, and for the most part they could not be.

Appendix Table F.3

Estimated Effects on Confirmatory Outcomes at 15 Months Using a Split-Sample Approach, by Evidence-Based Model

Outcome	Estimated Effect				P-Value
	EHS	HFA	NFP	PAT	
Maternal health (%)					
New pregnancy after study entry	3.3	-1.2	2.2	-2.0	0.539
Family economic self-sufficiency (%)					
Receiving education or training	1.1	1.9	-3.8	3.5	0.293
Parenting[a]					
Quality of the home environment	0.01	0.13	0.07	0.09	0.723
Parental supportiveness	0.00	-0.07	0.14	0.15	0.064
Child maltreatment					
Frequency of minor physical assault during the past year	0.5	-0.6	0.0	0.0	0.035
Frequency of psychological aggression during the past year	0.5	-0.7	-0.1	-0.2	0.089
Child health					
Health insurance coverage for the child (%)	1.1	-1.1	-1.0	0.3	0.656
Number of Medicaid-paid well-child visits	0.1	-0.1	-0.3	-0.1	0.548
Number of Medicaid-paid child emergency department visits	0.2	-0.2	-0.5	-0.1	0.121
Any Medicaid-paid health care encounter for injury or ingestion (%)	-0.1	2.0	-3.1	-3.5	0.428
Child development[a]					
Behavior problems	-0.10	-0.10	0.02	-0.03	0.470
Receptive language skills	0.14	0.00	0.00	0.07	0.619
Sample size (total = 4,215)	571	1,454	1,231	959	

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, and Medicaid enrollment and claims data.

NOTES: EHS = Early Head Start — Home-based option, HFA = Healthy Families America, NFP = Nurse-Family Partnership, PAT = Parents as Teachers.

See Appendix B for descriptions of the outcome measures used.

Estimates are adjusted for baseline characteristics and were calculated by dividing the sample by evidence-based model.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

[a]Outcomes are standardized such that effect sizes are shown.

A standard assumption in instrumental variable analysis is the "exclusion restriction." Under the exclusion restriction, the effects of home visiting for families who received no services would be zero. This assumption might not hold in the current analysis because there could be unmeasured aspects of service delivery, including mismeasurement of the amount of home visiting services families received or variation in the quality of home visiting. Moreover, the effect of a local program where program group

Appendix Table F.4

Outcome-Specific Areas and Frequencies of Discussions and Referrals for Program Group Families

Outcome	Outcome Area	Average Number of Time Topic Was Discussed with Families	Percentage of Families Who Received a Referral
Maternal health			
New pregnancy after study entry	Family planning	3.6	21.6
Family economic self-sufficiency			
Receiving education or training	Family self-sufficiency	8.5	36.1
Parenting			
Quality of the home environment	Positive parenting	12.8	7.8
Parental supportiveness	Positive parenting	12.8	7.8
Child maltreatment			
Frequency of minor physical assault during the past year	Child maltreatment	7.0	9.2
Frequency of psychological aggression during the past year	Child maltreatment	7.0	9.2
Child health			
Health insurance coverage for the child	Health insurance	2.2	2.1
Number of Medicaid-paid well-child visits	Child preventive care	10.1	28.0
Number of Medicaid-paid child emergency department visits	Child preventive care	10.1	28.0
Any Medicaid-paid health care encounter for injury or ingestion	Child preventive care	10.1	28.0
Child development			
Behavior problems	Child development	13.8	12.6
Receptive language skills	Child development	13.8	12.6
Sample size (total = 2,102)			

SOURCE: Calculations based on the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.
Family service logs were available for program group families only.

families received no home visiting services might be negative if control group families did receive some home visiting services. Because the current analysis has more instruments than mediators, the exclusion restriction could be relaxed, as shown in the equations above.[6]

The idea behind this analysis is that local programs that resulted in a greater number of home visits and more referrals should be those where effects are larger, all other things being equal. This idea is illustrated in Appendix Figures F.1 through F.4, which show the effects of each local program plotted against the average number of home visits received by program group members at that local program between study entry and the 15-month follow-up point. Each figure also shows the best linear fit to the data using a regression weighted by the inverse of the variance of the local program's effect estimate.

The figures provide visual information on two issues: (1) whether there appears to be a relationship between the number of home visits a local program delivered and the local program's effects, (2) whether the exclusion restriction appears to hold in the sense that the intercept of the linear fit is approximately zero. To address the second issue, the linear fit is extended in each figure to show the predicted impact at 0 home visits, although every local program had some families with home visits.

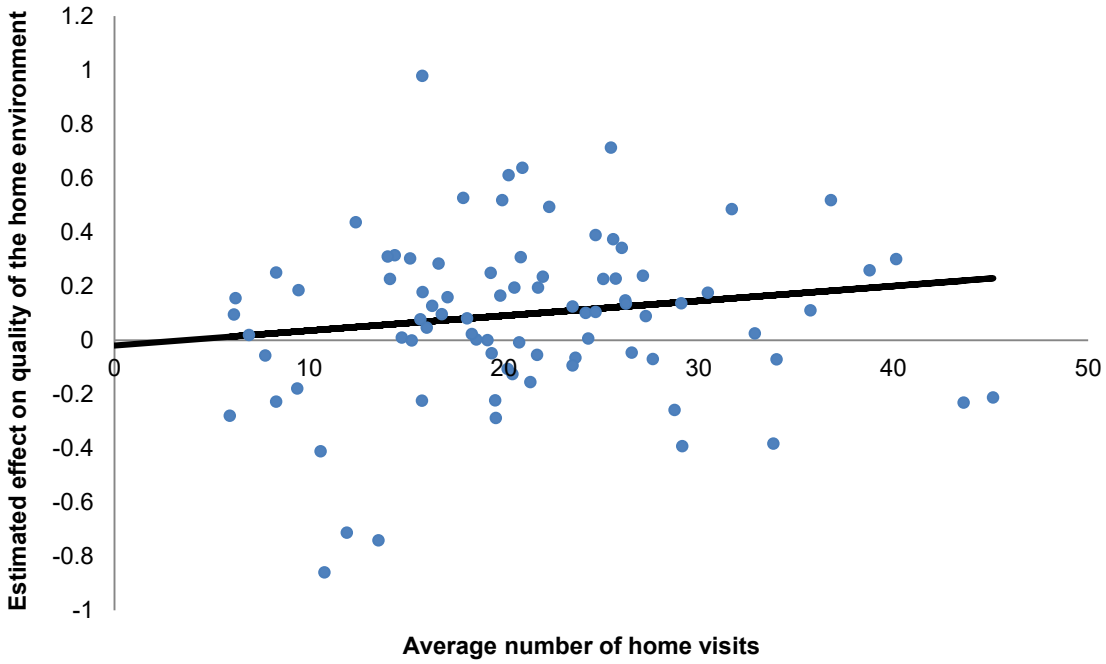
The four figures differ in the information they provide on these two outcomes:

- **Quality of the home environment.** There is a positive relationship between the average number of visits a local program delivered and the estimated effect, and the estimated effect at 0 visits is reasonably close to zero.
- **Psychological aggression toward the child.** Although there is a notable relationship between home visits and effects, it is in the unexpected direction: Local programs that delivered more home visits are those where psychological aggression increased, while psychological aggression decreased in local programs that delivered little home visiting. The projected effect at 0 visits is below zero, suggesting the exclusion restriction does not hold.
- **Number of Medicaid-paid child emergency department visits.** The link between home visits and effects on emergency department visits appears weak.

[6]Relaxing the exclusion restriction is suggested by Small (2012).

Appendix Figure F.1

Estimated Effects on Quality of the Home Environment Versus Average Number of Home Visits Between Study Entry and 15 Months, for Each Local Program



SOURCES: Calculations based on the in-home assessment and the MIHOPE family service logs.

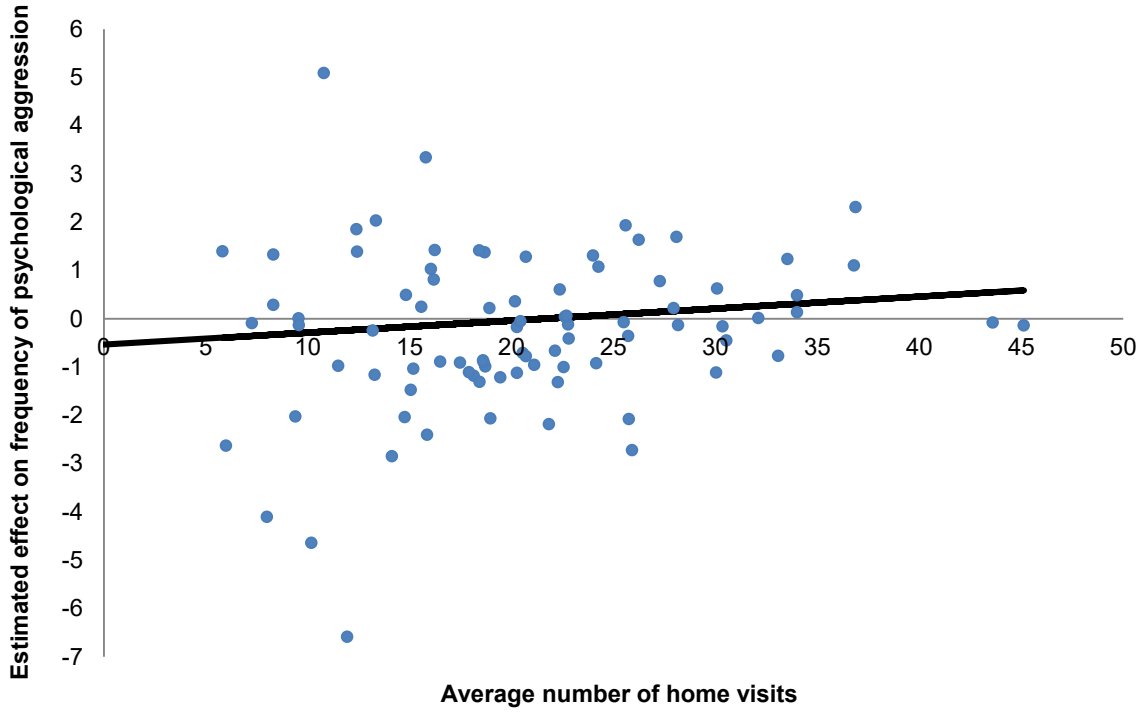
NOTES: See Appendix B for descriptions of the outcome measures used.
Family service logs were available for program group families only.
The solid line shows the best-fitting linear relationship between the average number of home visits and the estimated effect, by local program.

- **Child behavior problems.** There is a trend, although perhaps a slight one, and the projected effect at 0 visits is about zero.

The figures suggest the expected relationships between home visits and the effects on quality of the home environment and child behavior problems, an unexpected relationship between home visits and effects on psychological aggression toward the child, and little relationship between home visits and effects on child emergency department visits. In short, the best cases for the instrumental variable analysis and the exclusion restriction appear to be for the quality of the home environment and child behavior problems.

Appendix Figure F.2

Estimated Effects on Frequency of Psychological Aggression Versus Average Number of Home Visits Between Study Entry and 15 Months, for Each Local Program



SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and the MIHOPE family service logs.

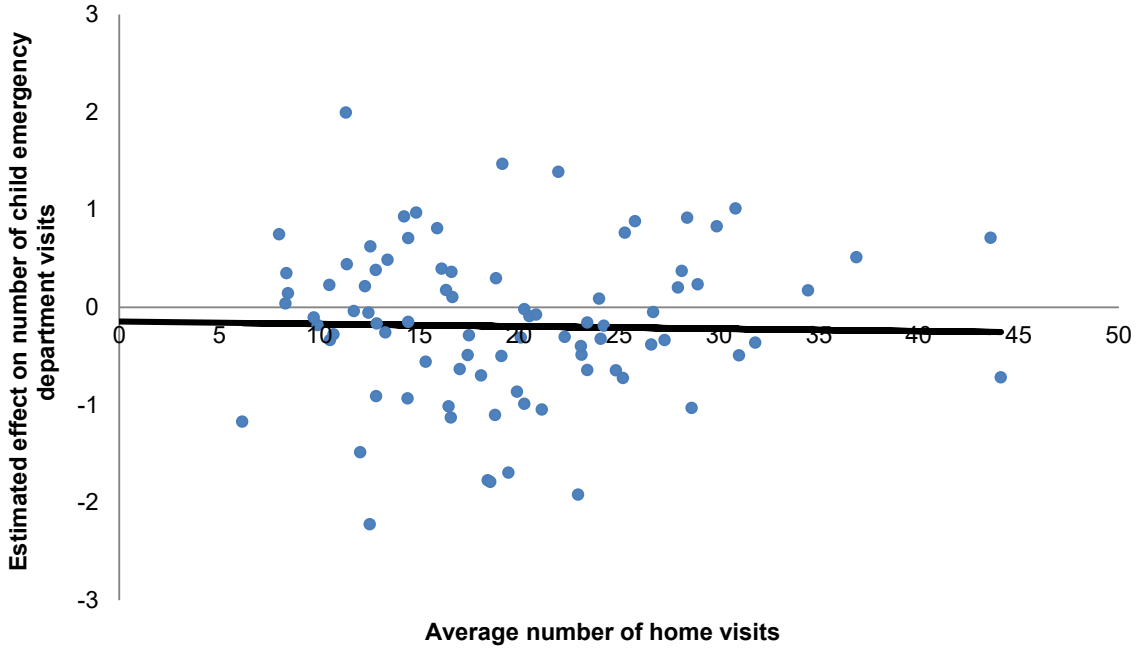
NOTES: See Appendix B for descriptions of the outcome measures used.
Family service logs were available for program group families only.
The solid line shows the best-fitting linear relationship between the average number of home visits and the estimated effect, by local program.

Causal Mediation Analysis

Causal mediation analysis is a way of dividing the effects of an intervention into a direct effect and an indirect effect. The direct effect represents the effect of merely being assigned to the program group without receiving any services. For example, the difference in outcomes between program group members who received no home visiting services and their control group counterparts would be a measure of the direct effect of being assigned to the program group. The indirect effect is the effect that operates through a mediator such as receiving home visiting services.

Appendix Figure F.3

Estimated Effects on Number of Child Emergency Department Visits Versus Average Number of Home Visits Between Study Entry and 15 Months, for Each Local Program



SOURCES: Calculations based on Medicaid claims data and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.
Family service logs were available for program group families only.
The solid line shows the best-fitting linear relationship between the average number of home visits and the estimated effect, by local program.

In MIHOPE, causal mediation analysis was estimated using the following statistical model:

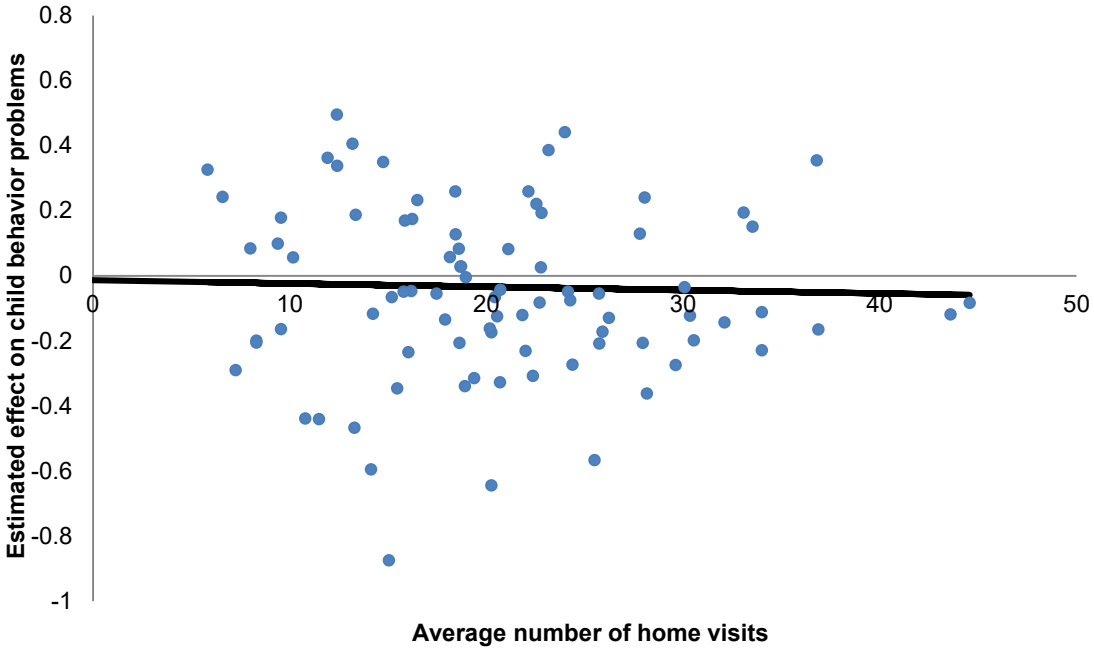
$$M_{ij} = \mu_{0j} + \mu_j T_{ij} + \mu_2 X_{ij} + u_{ij}$$

$$Y_{ij} = \beta_{0j} + \gamma T_{ij} + \varphi M_{ij} + \beta_2 X_{ij} + \theta \hat{u}_{ij} + e_{ij}$$

In words, the effect of the mediator on the outcome was estimated by regressing the outcome on both the mediator and the program group indicator. To correct for the possibility that unobservable characteristics that might affect the mediator — u_{ij} — might be correlated with unobservable characteristics that might affect the outcome — e_{ij} — the regression also included the residual from a regression of the mediator on the

Appendix Figure F.4

Estimated Effects on Child Behavior Problems Versus Average Number of Home Visits Between Study Entry and 15 Months, for Each Local Program



SOURCES: Calculations based on the MIHOPE 15-month follow-up survey and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.
Family service logs were available for program group families only.
The solid line shows the best-fitting linear relationship between the average number of home visits and the estimated effect, by local program.

program group indicator and family characteristics.[7] The model was run both as an ordinary least squares regression and as a mixed-effects model with γ allowed to vary across local programs. The mean of the distribution for γ from the mixed-effects regression and the estimate of γ from the ordinary least squares regression were similar, so only the latter is presented in this section.

[7]This approach is known as a control function approach and is suggested by Wooldridge (2015). It has been applied to causal mediation analysis by Courtemanche, Tchernis, and Ukert (2018).

Results

Table 5.3 in Chapter 5 shows results from the instrumental variable analysis and causal mediation analysis with respect to the number of home visits local programs provided. Appendix Tables F.5 and F.6 show results with respect to number of times outcome-specific topics were discussed and whether referrals were made for outcome-specific community services.

How Effects Vary with the Frequency That Outcome-Specific Topics Are Discussed

The number of home visits might be a useful measure for understanding the broad effects of home visiting services on family outcomes, but what happens during those visits might be more important for explaining particular outcomes. Appendix Table F.5 explores this possibility by presenting estimates from the instrumental variable and causal mediation analyses of the effect on family outcomes of an extra discussion of an outcome-specific topic during a home visit.

In general, the results are similar to those for the number of home visits. The causal mediation analysis indicates a statistically significant association between the number of times child maltreatment was discussed with parents and the effect on the frequency of psychological aggression toward the child (although the finding from the instrumental variable analysis is not quite statistically significant). Like the analysis of home visits, both the instrumental variable and causal mediation analyses also suggest there is an effect on the frequency of psychological aggression even when child maltreatment is not discussed, which could indicate that home visiting programs are affecting this outcome through other means.

The instrumental variable analysis also suggests that discussing health insurance coverage more often is associated with smaller effects on the proportion of children with health insurance coverage. However, the causal mediation analysis does not produce a similar finding, suggesting this finding is sensitive to the statistical approach that is used and therefore one where there is more uncertainty about the true relationship.

How Effects Vary with Referrals for Outcome-Specific Community Services

Another way home visiting can improve family outcomes is by helping families connect to community services. Appendix Table F.6 explores this possibility by presenting estimates from the instrumental variable and causal mediation analysis of the effect on family outcomes of any referral by the home visitor to outcome-specific services in the community. Here is a summary of findings from this analysis:

Appendix Table F.5

Estimated Effects of Each Time an Outcome-Specific Topic Was Discussed Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of Each Discussion	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of Each Discussion
Maternal health (%)					
New pregnancy after study entry	0.59	0.44	-0.25	0.60	-0.04
P-value	0.664	0.832	0.522	0.810	0.953
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.99	-0.16	1.35	-0.15
P-value	0.792	0.475	0.526	0.700	0.698
Parenting[a]					
Quality of the home environment	0.09	0.04	0.00	-0.01	0.01
P-value	0.010	0.651	0.388	0.940	0.458
Parental supportiveness	0.04	0.01	0.00	0.00	0.00
P-value	0.236	0.869	0.694	0.983	0.773
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	0.11	-0.02	0.03	-0.02
P-value	0.292	0.573	0.293	0.926	0.562
Frequency of psychological aggression during the past year	-0.26	-0.52	0.04	-0.84	0.08
P-value	0.085	0.045	0.110	0.027	0.100
Child health					
Health insurance coverage for the child (%)	-0.51	0.03	-0.16	-0.37	-0.04
P-value	0.464	0.929	0.090	0.773	0.933
Number of Medicaid-paid well-child visits	-0.09	0.06	0.00	0.30	-0.04
P-value	0.264	0.661	0.698	0.168	0.058
Number of Medicaid-paid child emergency department visits	-0.18	-0.11	-0.01	-0.17	0.00
P-value	0.044	0.506	0.636	0.516	0.998
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.85	0.07	-3.30	0.20
P-value	0.445	0.346	0.757	0.443	0.613
Child development[a]					
Behavior problems	-0.05	-0.01	0.00	0.01	0.00
P-value	0.087	0.917	0.546	0.891	0.583
Receptive language skills	0.02	-0.02	0.00	-0.05	0.01
P-value	0.552	0.800	0.511	0.694	0.526
Sample size (total = 4,215)					

(continued)

Appendix Table F.5 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.
Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.
Family service logs were available for program group families only. Estimates assume control group families received no services.
[a]Outcomes are standardized such that effect sizes are shown.

- The instrumental variable results indicate that two effects are significantly associated with referrals: the number of well-child visits and the number of child emergency department visits. However, neither result is confirmed by the causal mediation analysis.
- Like the analysis of home visits and topics discussed, both the instrumental variable and causal mediation analyses suggest there is an impact on the frequency of psychological aggression even when no referrals are made for child maltreatment services. This finding suggests that home visiting programs are affecting this outcome through other means.

Sensitivity Checks

This section reports on two alternative specifications of the instrumental variable and causal mediation analyses: (1) causal mediation analysis results without the control function approach and (2) results with imputed home visiting services for control group families.

As discussed above, the main causal mediation analysis uses a control function approach (the inclusion of the residual from the mediator equation to the outcome equation) to reduce the bias that would result from a correlation between unmeasured characteristics that affect the home visiting services families receive and those that affect the family's outcome. For example, a highly motivated mother might receive a lot of home visiting services or might be able to help her family achieve good outcomes even in the

Appendix Table F.6

Estimated Effects of Referrals for Outcome-Specific Services Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of a Referral	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of a Referral
Maternal health (%)					
New pregnancy after study entry	0.59	-1.32	3.10	-0.18	2.99
P-value	0.664	0.552	0.696	0.959	0.836
Family economic self-sufficiency (%)					
Receiving education or training	0.38	0.99	-1.45	1.13	-1.89
P-value	0.792	0.739	0.835	0.801	0.874
Parenting[a]					
Quality of the home environment	0.09	0.11	-0.09	0.10	-0.11
P-value	0.010	0.003	0.695	0.031	0.782
Parental supportiveness	0.04	0.03	0.13	0.04	0.06
P-value	0.236	0.410	0.603	0.438	0.880
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.11	0.51	-0.29	1.64
P-value	0.292	0.356	0.542	0.138	0.322
Frequency of psychological aggression during the past year	-0.26	-0.31	1.35	-0.48	2.25
P-value	0.085	0.060	0.184	0.043	0.262
Child health					
Health insurance coverage for the child[b] (%)	-0.51	-0.42	2.16	NA	NA
P-value	0.464	0.123	0.580	NA	NA
Number of Medicaid-paid well-child visits	-0.09	-0.17	0.67	-0.22	0.50
P-value	0.264	0.178	0.087	0.259	0.443
Number of Medicaid-paid child emergency department visits	-0.18	0.04	-0.79	-0.01	-0.54
P-value	0.044	0.770	0.048	0.957	0.467
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.86	7.43	-4.09	10.06
P-value	0.445	0.070	0.283	0.287	0.424
Child development[a]					
Behavior problems	-0.05	-0.04	-0.06	-0.03	-0.10
P-value	0.087	0.301	0.775	0.608	0.792
Receptive language skills	0.02	0.03	0.04	-0.01	0.28
P-value	0.552	0.567	0.878	0.895	0.543
Sample size (total = 4,215)					

(continued)

Appendix Table F.6 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: NA = not applicable.
See Appendix B for descriptions of the outcome measures used.
Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.
The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.
Family service logs were available for program group families only. Estimates assume control group families received no services.
[a]Outcomes are standardized such that effect sizes are shown.
[b]Due to low variation in sample members receiving health insurance referrals, estimates could not be calculated for the causal mediation analysis.

absence of home visiting services. For that family, the level of home visiting services might appear related to the good family outcomes even if both are due to the mother's motivation. Appendix Tables F.7 through F.9 show results when the control function approach is not used. In these tables, the instrumental variable results are the same as in Tables 5.3 and Appendix Tables F.5 and F.6 because the control function approach was not used in the instrumental variable analyses.

Appendix Tables F.7 through F.9 show a much stronger relationship between home visiting services and effects using the causal mediation analysis. For example, results in Appendix Table F.7 indicate that more home visits were associated with improved quality of the home environment, the likelihood that children had health insurance coverage, and the number of Medicaid-paid well-child visits. Likewise, Appendix Table F.8 indicates that more frequent discussions about outcome-specific topics is associated with increased maternal engagement in education or training, improved quality of the home environment, and more well-child visits. None of those findings are present in the main analysis shown in Appendix Table F.5. However, because of concerns that the causal mediation analysis without the control function approach are biased, the results in Table 5.3 and Appendix Tables F.5 and F.6 are preferred. Results without the control function are presented here because they represent a more common method of estimating direct and indirect effects through causal mediation analysis.

The second set of sensitivity analyses concerns the amount of home visiting services received by control group families. The main instrumental variable and causal mediation results used information from family service logs to measure the amount of home visiting services that program group families received but assumed control group families received no home visiting services. Since the 15-month follow-up survey indicates

that control group families did receive some home visiting or parenting services, assuming they received no home visiting services might affect the results. For that reason, information from the 15-month follow-up survey was used to impute the number of home visits those families received as well as the number of times they discussed outcome-specific topics and their probability of receiving an outcome-specific referral.

Results using these imputed values are shown in Appendix Tables F.10 through F.15. Appendix Tables F.10 through F.12 show results with imputed control group services without using the control function approach, while Appendix Tables F.13 through F.15 show results using the control function approach. For each set of tables, the first table shows results for the number of home visits, the second table shows results for the number of times outcome-specific topics were discussed with the family, and the third table shows results for referrals for outcome-specific community services. In general, results with imputed values for the control group are similar to those where control group families were assumed to have received no home visiting services. This set of findings means that results were not sensitive to the assumption used in the main analysis that the control group received no home visiting.

Appendix Table F.7

Estimated Effects of an Additional Home Visit Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of an Additional Home Visit	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of an Additional Home Visit
Maternal health (%)					
New pregnancy after study entry	0.59	2.81	-0.16	1.47	-0.04
P-value	0.664	0.352	0.213	0.437	0.501
Family economic self-sufficiency (%)					
Receiving education or training	0.38	3.58	-0.16	-0.58	0.05
P-value	0.792	0.365	0.399	0.791	0.443
Parenting[a]					
Quality of the home environment	0.09	0.03	0.00	0.02	0.00
P-value	0.010	0.779	0.359	0.696	0.005
Parental supportiveness	0.04	-0.01	0.00	-0.01	0.00
P-value	0.236	0.883	0.503	0.831	0.140
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.25	0.01	-0.29	0.01
P-value	0.292	0.360	0.446	0.082	0.099
Frequency of psychological aggression during the past year	-0.26	-0.81	0.03	-0.43	0.01
P-value	0.085	0.032	0.064	0.027	0.162
Child health					
Health insurance coverage for the child (%)	-0.51	-0.57	0.01	-3.38	0.16
P-value	0.464	0.404	0.754	0.001	0.000
Number of Medicaid-paid well-child visits	-0.09	0.08	0.00	-0.37	0.02
P-value	0.264	0.656	0.700	0.001	0.000
Number of Medicaid-paid child emergency department visits	-0.18	-0.13	0.00	-0.11	0.00
P-value	0.044	0.524	0.798	0.288	0.313
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.67	0.03	-1.88	0.03
P-value	0.445	0.498	0.858	0.380	0.483
Child development[a]					
Behavior problems	-0.05	-0.01	0.00	-0.02	0.00
P-value	0.087	0.927	0.591	0.667	0.343
Receptive language skills	0.02	0.05	0.00	0.05	0.00
P-value	0.552	0.642	0.880	0.193	0.318
Sample size (total = 4,215)					

(continued)

Appendix Table F.7 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Estimates assume control group families received no services.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.8

Estimated Effects of Each Time an Outcome-Specific Topic Was Discussed Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of Each Discussion	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of Each Discussion
Maternal health (%)					
New pregnancy after study entry	0.59	0.44	-0.25	-0.26	0.21
P-value	0.664	0.832	0.522	0.857	0.244
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.99	-0.16	-1.94	0.24
P-value	0.792	0.475	0.526	0.345	0.024
Parenting[a]					
Quality of the home environment	0.09	0.04	0.00	0.01	0.01
P-value	0.010	0.651	0.388	0.702	0.004
Parental supportiveness	0.04	0.01	0.00	0.01	0.00
P-value	0.236	0.869	0.694	0.833	0.326
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	0.11	-0.02	-0.15	0.00
P-value	0.292	0.573	0.293	0.317	0.795
Frequency of psychological aggression during the past year	-0.26	-0.52	0.04	-0.33	0.01
P-value	0.085	0.045	0.110	0.049	0.426
Child health					
Health insurance coverage for the child (%)	-0.51	0.03	-0.16	-0.72	0.12
P-value	0.464	0.929	0.090	0.298	0.176
Number of Medicaid-paid well-child visits	-0.09	0.06	0.00	-0.26	0.02
P-value	0.264	0.661	0.698	0.006	0.000
Number of Medicaid-paid child emergency department visits	-0.18	-0.11	-0.01	-0.16	0.00
P-value	0.044	0.506	0.636	0.107	0.918
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.85	0.07	-1.57	0.03
P-value	0.445	0.346	0.757	0.436	0.674
Child development[a]					
Behavior problems	-0.05	-0.01	0.00	-0.03	0.00
P-value	0.087	0.917	0.546	0.448	0.695
Receptive language skills	0.02	-0.02	0.00	0.04	0.00
P-value	0.552	0.800	0.511	0.409	0.721
Sample size (total = 4,215)					

(continued)

Appendix Table F.8 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Estimates assume control group families received no services.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.9

Estimated Effects of Referrals for Outcome-Specific Services Between Study Entry and 15 Months, Assuming Control Group Families Received No Services and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of a Referral	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of a Referral
Maternal health (%)					
New pregnancy after study entry	0.59	-1.32	3.10	-1.03	6.95
P-value	0.664	0.552	0.696	0.464	0.012
Family economic self-sufficiency (%)					
Receiving education or training	0.38	0.99	-1.45	1.85	-3.89
P-value	0.792	0.739	0.835	0.316	0.046
Parenting[a]					
Quality of the home environment	0.09	0.11	-0.09	0.09	0.06
P-value	0.010	0.003	0.695	0.005	0.470
Parental supportiveness	0.04	0.03	0.13	0.02	0.24
P-value	0.236	0.410	0.603	0.544	0.003
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.11	0.51	-0.18	0.45
P-value	0.292	0.356	0.542	0.181	0.168
Frequency of psychological aggression during the past year	-0.26	-0.31	1.35	-0.33	0.66
P-value	0.085	0.060	0.184	0.039	0.094
Child health					
Health insurance coverage for the child (%)	-0.51	-0.42	2.16	-0.55	4.28
P-value	0.464	0.123	0.580	0.386	0.001
Number of Medicaid-paid well-child visits	-0.09	-0.17	0.67	-0.10	0.05
P-value	0.264	0.178	0.087	0.370	0.632
Number of Medicaid-paid child emergency department visits	-0.18	0.04	-0.79	-0.12	-0.17
P-value	0.044	0.770	0.048	0.213	0.187
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.86	7.43	-1.52	0.94
P-value	0.445	0.070	0.283	0.449	0.696
Child development[a]					
Behavior problems	-0.05	-0.04	-0.06	-0.05	0.08
P-value	0.087	0.301	0.775	0.088	0.172
Receptive language skills	0.02	0.03	0.04	0.05	-0.20
P-value	0.552	0.567	0.878	0.134	0.009
Sample size (total = 4,215)					

(continued)

Appendix Table F.9 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Estimates assume control group families received no services.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.10

Estimated Effects of an Additional Home Visit Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of an Additional Home Visit	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of an Additional Home Visit
Maternal health (%)					
New pregnancy after study entry	0.59	2.94	-0.23	0.71	-0.01
P-value	0.664	0.175	0.037	0.636	0.863
Family economic self-sufficiency (%)					
Receiving education or training	0.38	3.85	-0.25	-0.23	0.05
P-value	0.792	0.168	0.161	0.895	0.365
Parenting[a]					
Quality of the home environment	0.09	0.05	0.00	0.04	0.00
P-value	0.010	0.391	0.365	0.163	0.006
Parental supportiveness	0.04	-0.01	0.00	0.01	0.00
P-value	0.236	0.855	0.306	0.778	0.122
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.10	0.00	-0.21	0.01
P-value	0.292	0.612	0.799	0.141	0.136
Frequency of psychological aggression during the past year	-0.26	-0.54	0.03	-0.35	0.01
P-value	0.085	0.055	0.123	0.037	0.214
Child health					
Health insurance coverage for the child (%)	-0.51	-0.35	0.00	-1.73	0.11
P-value	0.464	0.489	0.955	0.027	0.000
Number of Medicaid-paid well-child visits	-0.09	0.07	0.00	-0.26	0.01
P-value	0.264	0.570	0.606	0.036	0.000
Number of Medicaid-paid child emergency department visits	-0.18	-0.17	0.00	-0.11	0.00
P-value	0.044	0.245	0.873	0.245	0.109
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.30	0.10	-2.23	0.08
P-value	0.445	0.230	0.600	0.260	0.073
Child development[a]					
Behavior problems	-0.05	0.00	0.00	-0.02	0.00
P-value	0.087	0.981	0.325	0.561	0.148
Receptive language skills	0.02	0.07	0.00	0.03	0.00
P-value	0.552	0.324	0.546	0.387	0.732
Sample size (total = 4,215)					

(continued)

Appendix Table F.10 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.11

Estimated Effects of Each Time an Outcome-Specific Topic Was Discussed Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of Each Discussion	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of Each Discussion
Maternal health (%)					
New pregnancy after study entry	0.59	0.10	-0.26	-0.09	0.25
P-value	0.664	0.951	0.518	0.947	0.114
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.69	-0.21	-0.62	0.17
P-value	0.792	0.409	0.418	0.718	0.059
Parenting[a]					
Quality of the home environment	0.09	0.07	0.00	0.05	0.00
P-value	0.010	0.231	0.441	0.087	0.018
Parental supportiveness	0.04	0.02	0.00	0.03	0.00
P-value	0.236	0.774	0.541	0.453	0.398
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	0.05	-0.02	-0.16	0.01
P-value	0.292	0.724	0.262	0.264	0.547
Frequency of psychological aggression during the past year	-0.26	-0.36	0.04	-0.34	0.02
P-value	0.085	0.058	0.143	0.032	0.159
Child health					
Health insurance coverage for the child (%)	-0.51	-0.14	-0.13	-0.37	-0.06
P-value	0.464	0.633	0.107	0.567	0.605
Number of Medicaid-paid well-child visits	-0.09	0.04	0.00	-0.22	0.02
P-value	0.264	0.703	0.755	0.082	0.000
Number of Medicaid-paid child emergency department visits	-0.18	-0.15	-0.01	-0.13	-0.01
P-value	0.044	0.190	0.672	0.140	0.240
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.64	0.09	-1.61	0.06
P-value	0.445	0.219	0.717	0.400	0.334
Child development[a]					
Behavior problems	-0.05	0.00	0.00	-0.03	0.00
P-value	0.087	0.953	0.294	0.363	0.440
Receptive language skills	0.02	0.02	0.00	0.03	0.00
P-value	0.552	0.781	0.794	0.497	0.966
Sample size (total = 4,215)					

(continued)

Appendix Table F.11 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.12

Estimated Effects of Referrals for Outcome-Specific Services Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Not Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of a Referral	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of a Referral
Maternal health (%)					
New pregnancy after study entry	0.59	-0.95	2.00	-0.50	6.15
P-value	0.664	0.601	0.795	0.695	0.013
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.00	-2.46	0.78	-1.74
P-value	0.792	0.625	0.711	0.623	0.280
Parenting[a]					
Quality of the home environment	0.09	0.11	-0.17	0.09	0.00
P-value	0.010	0.001	0.448	0.001	0.940
Parental supportiveness	0.04	0.04	0.05	0.04	0.22
P-value	0.236	0.195	0.828	0.310	0.000
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.08	0.32	-0.15	0.31
P-value	0.292	0.431	0.694	0.257	0.226
Frequency of psychological aggression during the past year	-0.26	-0.26	1.27	-0.29	0.45
P-value	0.085	0.075	0.208	0.065	0.126
Child health					
Health insurance coverage for the child (%)	-0.51	-0.38	0.49	-0.46	1.94
P-value	0.464	0.126	0.860	0.457	0.251
Number of Medicaid-paid well-child visits	-0.09	-0.10	0.58	-0.10	0.10
P-value	0.264	0.313	0.117	0.378	0.383
Number of Medicaid-paid child emergency department visits	-0.18	-0.02	-0.83	-0.12	-0.22
P-value	0.044	0.879	0.024	0.164	0.038
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.28	7.09	-1.53	1.34
P-value	0.445	0.054	0.283	0.429	0.478
Child development[a]					
Behavior problems	-0.05	-0.04	-0.10	-0.05	0.10
P-value	0.087	0.193	0.600	0.092	0.032
Receptive language skills	0.02	0.02	0.15	0.03	-0.11
P-value	0.552	0.591	0.485	0.314	0.089
Sample size (total = 4,215)					

(continued)

Appendix Table F.12 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.13

Estimated Effects of an Additional Home Visit Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of an Additional Home Visit	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of an Additional Home Visit
Maternal health (%)					
New pregnancy after study entry	0.59	2.94	-0.23	2.05	-0.13
P-value	0.664	0.175	0.037	0.639	0.727
Family economic self-sufficiency (%)					
Receiving education or training	0.38	3.85	-0.25	5.12	-0.42
P-value	0.792	0.168	0.161	0.265	0.268
Parenting[a]					
Quality of the home environment	0.09	0.05	0.00	0.01	0.01
P-value	0.010	0.391	0.365	0.958	0.470
Parental supportiveness	0.04	-0.01	0.00	-0.04	0.01
P-value	0.236	0.855	0.306	0.733	0.484
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.10	0.00	-0.54	0.03
P-value	0.292	0.612	0.799	0.188	0.313
Frequency of psychological aggression during the past year	-0.26	-0.54	0.03	-1.20	0.08
P-value	0.085	0.055	0.123	0.015	0.048
Child health					
Health insurance coverage for the child (%)	-0.51	-0.35	0.00	-0.15	-0.03
P-value	0.464	0.489	0.955	0.949	0.868
Number of Medicaid-paid well-child visits	-0.09	0.07	0.00	0.25	-0.03
P-value	0.264	0.570	0.606	0.315	0.149
Number of Medicaid-paid child emergency department visits	-0.18	-0.17	0.00	-0.28	0.01
P-value	0.044	0.245	0.873	0.335	0.670
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.30	0.10	-4.24	0.25
P-value	0.445	0.230	0.600	0.390	0.534
Child development[a]					
Behavior problems	-0.05	0.00	0.00	0.00	0.00
P-value	0.087	0.981	0.325	0.992	0.678
Receptive language skills	0.02	0.07	0.00	0.03	0.00
P-value	0.552	0.324	0.546	0.814	0.989
Sample size (total = 4,215)					

(continued)

Appendix Table F.13 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.14

Estimated Effects of Each Time an Outcome-Specific Topic Was Discussed Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of Each Discussion	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of Each Discussion
Maternal health (%)					
New pregnancy after study entry	0.59	0.10	-0.26	0.68	-0.10
P-value	0.664	0.951	0.518	0.731	0.881
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.69	-0.21	0.63	-0.09
P-value	0.792	0.409	0.418	0.807	0.843
Parenting[a]					
Quality of the home environment	0.09	0.07	0.00	0.02	0.01
P-value	0.010	0.231	0.441	0.786	0.475
Parental supportiveness	0.04	0.02	0.00	0.00	0.01
P-value	0.236	0.774	0.541	0.976	0.612
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	0.05	-0.02	0.00	-0.03
P-value	0.292	0.724	0.262	0.995	0.445
Frequency of psychological aggression during the past year	-0.26	-0.36	0.04	-0.56	0.07
P-value	0.085	0.058	0.143	0.035	0.196
Child health					
Health insurance coverage for the child (%)	-0.51	-0.14	-0.13	-0.54	0.06
P-value	0.464	0.633	0.107	0.597	0.907
Number of Medicaid-paid well-child visits	-0.09	0.04	0.00	0.13	-0.04
P-value	0.264	0.703	0.755	0.398	0.104
Number of Medicaid-paid child emergency department visits	-0.18	-0.15	-0.01	-0.22	0.01
P-value	0.044	0.190	0.672	0.233	0.752
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-2.64	0.09	-3.14	0.30
P-value	0.445	0.219	0.717	0.301	0.480
Child development[a]					
Behavior problems	-0.05	0.00	0.00	0.01	-0.01
P-value	0.087	0.953	0.294	0.912	0.484
Receptive language skills	0.02	0.02	0.00	-0.02	0.01
P-value	0.552	0.781	0.794	0.853	0.613
Sample size (total = 4,215)					

(continued)

Appendix Table F.14 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

Appendix Table F.15

Estimated Effects of Referrals for Outcome-Specific Services Between Study Entry and 15 Months, Imputing Service Receipt for Control Group Families and Using a Control Function Approach for the Causal Mediation Model

Outcome	Full Sample Effect Estimate	Instrumental Variable Analysis: Direct Effect	Instrumental Variable Analysis: Effect of a Referral	Causal Mediation Analysis: Direct Effect	Causal Mediation Analysis: Effect of a Referral
Maternal health (%)					
New pregnancy after study entry	0.59	-0.95	2.00	-0.96	8.98
P-value	0.664	0.601	0.795	0.775	0.636
Family economic self-sufficiency (%)					
Receiving education or training	0.38	1.00	-2.46	1.01	-2.80
P-value	0.792	0.625	0.711	0.790	0.862
Parenting[a]					
Quality of the home environment	0.09	0.11	-0.17	0.10	-0.20
P-value	0.010	0.001	0.448	0.007	0.641
Parental supportiveness	0.04	0.04	0.05	0.04	0.08
P-value	0.236	0.195	0.828	0.281	0.863
Child maltreatment					
Frequency of minor physical assault during the past year	-0.13	-0.08	0.32	-0.25	2.24
P-value	0.292	0.431	0.694	0.129	0.299
Frequency of psychological aggression during the past year	-0.26	-0.26	1.27	-0.40	2.52
P-value	0.085	0.075	0.208	0.048	0.336
Child health					
Health insurance coverage for the child[b] (%)	-0.51	-0.38	0.49	NA	NA
P-value	0.464	0.126	0.860	NA	NA
Number of Medicaid-paid well-child visits	-0.09	-0.10	0.58	-0.21	0.65
P-value	0.264	0.313	0.117	0.216	0.401
Number of Medicaid-paid child emergency department visits	-0.18	-0.02	-0.83	-0.03	-0.69
P-value	0.044	0.879	0.024	0.892	0.440
Any Medicaid-paid health care encounter for injury or ingestion (%)	-1.13	-3.28	7.09	-3.46	10.93
P-value	0.445	0.054	0.283	0.302	0.466
Child development[a]					
Behavior problems	-0.05	-0.04	-0.10	-0.03	-0.14
P-value	0.087	0.193	0.600	0.451	0.747
Receptive language skills	0.02	0.02	0.15	0.00	0.31
P-value	0.552	0.591	0.485	0.944	0.551
Sample size (total = 4,215)					

(continued)

Appendix Table F.15 (continued)

SOURCES: Calculations based on the MIHOPE 15-month follow-up survey, the in-home assessment, the parent-child videotaped interaction, Medicaid enrollment and claims data, and the MIHOPE family service logs.

NOTES: NA = not applicable.

See Appendix B for descriptions of the outcome measures used.

Estimates come from models using instrumental variable and causal mediation frameworks. See text for more details.

The p-value indicates the likelihood that the estimated effect (or larger) would have been generated by an intervention with zero true effect.

The maximum sample size has been displayed; however, sample sizes may vary depending on a specific measure's data source and the frequency of missing values within that data source.

Family service logs were available for program group families only. Control group families were asked on the 15-month follow-up survey about their participation in home visiting or parenting programs in the past year. This information was used to impute service delivery between study entry and 15 months for the control group.

[a]Outcomes are standardized such that effect sizes are shown.

[b]Due to low variation in sample members receiving health insurance referrals, estimates could not be calculated for the causal mediation analysis.

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