The Effects of Home Visiting on Prenatal Health, Birth Outcomes, and Health Care Use in the First Year of Life

Final Implementation and Impact Findings from the Mother and Infant Home Visiting Program Evaluation-Strong Start

OPRE Report 2019-08
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Overview

Improving birth outcomes among socioeconomically disadvantaged women has been a long-standing policy goal. One potential approach to improving birth outcomes is home visiting, which provides pregnant women and families who have young children with education and support, assessment, and referrals to community services. A few prior studies of evidence-based home visiting models — specifically, Healthy Families America (HFA) and Nurse-Family Partnership (NFP) — revealed some improvements in low birth weight and preterm birth. However, these results have not been found in all prior studies of the models' examinations of birth outcomes and were conducted years ago, from the late 1970s through the early 2000s. Given that both families and local programs have changed since those studies were completed, a new test of whether home visiting programs can improve birth outcomes was warranted.

The Mother and Infant Home Visiting Program Evaluation-Strong Start (MIHOPE-Strong Start) was launched in 2012 to test whether evidence-based home visiting provided during pregnancy improves birth outcomes, prenatal health, and health care use in infancy. Specifically, the MIHOPE-Strong Start analysis includes 2,900 families across 66 local HFA and NFP home visiting programs in 17 states. The Administration for Children and Families partnered with the Centers for Medicare and Medicaid Services and the Health Resources and Services Administration to sponsor MIHOPE-Strong Start. MDRC conducted the evaluation in collaboration with James Bell Associates, Johns Hopkins University, Mathematica Policy Research, and New York University. This report presents final implementation and impact results from the study. A separately published report from the Mother and Infant Home Visiting Program Evaluation (MIHOPE) presents program effects on a wider range of family outcomes and for two additional evidence-based models.

Primary Research Questions

1. What services do families receive from home visiting programs to promote prenatal health and improve birth outcomes?

2. What are the effects of evidence-based early childhood home visiting on prenatal care, birth outcomes, and infant health care use?

3. How do the effects of home visiting programs vary across different types of families, based on the features of local programs, and according to the dosage of home visiting services families receive?

Key Findings and Highlights

- **Families who received at least one home visit had an average of eight visits over four months before the woman gave birth.** Families received a similar amount of home visiting as found in prior studies, including those that found reductions in the percentage of infants born preterm or with low birth weights.

- **Women who were more and less vulnerable to poor birth outcomes received similar levels of home visiting services.** Among women who received at least one home visit, those who exhibited risks for compromised birth outcomes (such as being of a younger age or being a smoker) received the same number of visits and participated for similar lengths of time, on average, as women who didn't demonstrate such risks.

- **The home visiting programs in the study had no statistically significant effect on the evaluation's focal outcomes, including families' prenatal behaviors, birth outcomes, or health care use in the first year after birth.** The estimated differences found in the study's main outcomes, such as low birth weight and preterm birth, are small, and they are not statistically significant.

- **Effects of the home visiting programs in the study are not greater for higher-risk or for lower-risk families or depending on how the programs were implemented.** Home visiting did not have larger effects on prenatal behaviors, birth outcomes, or health care use after birth for any subgroups of families, nor do the effects vary across local programs or by evidence-based model.

One reason that the effects of home visiting in this study are small might be that there was little room for improvement on modifiable risk factors such as smoking, nutritional support, and access to prenatal health care. For example, only a small percentage of women smoked during pregnancy and most had access to health care providers during and after pregnancy. Another possible reason is that families did not receive as many home visits as the evidence-based models had intended, although they participated at levels similar to those found in prior HFA and NFP evaluations of birth outcomes. In addition, the findings are specific to the primarily urban sample of local programs and families, who would have had greater access to alternative prenatal health care services, and may not be generalizable to home visiting in areas where access to prenatal health care might be more limited.

It is important to remember that at the time of MIHOPE-Strong Start's launch, previous studies of the evidence-based models' effectiveness at improving birth outcomes were inconsistent or relevant only to subgroups of families. In addition, these studies' analyses of birth outcomes were completed between 15 and 40 years ago, and the characteristics of families who are eligible for home visiting have changed; for example, the prevalence of smoking is lower and home visiting programs have evolved, raising the question of whether the next generation of programs is more likely to have effects on birth outcomes. MIHOPE-Strong Start provides new evidence that home visiting, as implemented by the local programs in this study, did not have a substantial effect on improving birth outcomes for the first birth after women enrolled in the program. Research on the epidemiology of newborn health suggests that it is challenging for any single intervention to improve birth outcomes, given the cumulative effects of stress that women with low

incomes often experience.[1] Whether home visiting programs may have longer-term impacts, including positively affecting birth outcomes for later pregnancies, is a question for future research. Furthermore, as local programs in this study were recruited from 2012 to 2015, it is possible that they have continued to evolve over the past few years in ways that could make them effective at improving birth outcomes.

Methods

MIHOPE-Strong Start included home visiting programs that implemented either HFA or NFP, two widely used models and the only ones with some prior evidence of having effects on improving birth outcomes at the time programs were recruited into the study. Sixty-six local programs that primarily served Medicaid beneficiaries contributed to the MIHOPE-Strong Start analysis. Local programs did not have to be receiving MIECHV funding to participate in the study. A total of 2,900 women who were no more than 32 weeks pregnant and were eligible and interested in receiving home visiting were included in the analysis. Families were randomly assigned either to a local home visiting group or to a control group whose members were given information on other appropriate services in the community. The random assignment design was intended to create program and control groups that were similar when they entered the study, so that systematic differences between the two groups in the outcomes of interest could be attributed to the home visiting services rather than to the preexisting characteristics of the women. Although 14 percent of the program group sample received no home visiting, all program group families were included in the analysis even if they did not receive any services, as is standard practice in studies that use random assignment. This was done to maintain the comparability between program and control groups generated by random assignment.

Information on program implementation comes from family surveys at baseline, descriptions home visitors provided about the services they delivered to families, surveys of home visitors and local program managers, interviews and surveys with evidence-based model developers, and management information system data. For the impact analysis, family outcomes were obtained from state vital records and Medicaid data.

[1]Michael S. Kramer, Louise Seguin, John Lydon, and Lise Goulet, "Socio-Economic Disparities in Pregnancy Outcome: Why Do the Poor Fare So Poorly?" *Paediatric and Perinatal Epidemiology* 14, 3 (2000): 194-210.

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The ability of the Mother and Infant Home Visiting Program Evaluation-Strong Start (MIHOPE-Strong Start) to develop a greater understanding of how evidence-based home visiting affects prenatal health, birth outcomes, and health care use in the first year of life comes from the states and local programs that participated in MIHOPE-Strong Start. We are deeply grateful for their involvement as well as for that of the families who contributed to the study. We also thank the project's recruitment team, which was led by Sharon Rowser and Dina Israel at MDRC and had team members from MDRC (Rebecca Behrmann, Marie Cole, Rachel Dash, Katie Egan, Suzanne Finkel, Caroline Mage, Colleen McCullough, Alexandra Parma, Ada Tso, Alexander Vasquez, Ashley Weech, and Evan Weissman); James Bell Associates (Patrice Cachat, Nicole Miller, Kerry Ryan, Lance Till, and Susan Zaid); Johns Hopkins University (Kristen Ojo); and Mathematica Policy Research (Charlotte Cabili, Jacob Hartog, Luke Heinkel, Jessica Jacobson, and Cheri Vogel), as well as contractors Courtney Harrison and Mike Sack. In addition, this effort would not have been possible without the assistance of Healthy Families America (HFA) and Nurse-Family Partnership (NFP) model staff members at the national and state levels as well as project officers from the Health Resources and Service Administration (HRSA) and administrators of the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program, whom the team consulted in various states.

At the Office of Planning, Research, and Evaluation (OPRE) of the Administration for Children and Families (ACF), Lauren Supplee helped launch MIHOPE-Strong Start and guide it during its early years, while Nancy Geyelin Margie and Laura Nerenberg have provided regular feedback to the study team more recently. This final report for MIHOPE-Strong Start reflects suggestions from Naomi Goldstein, Nancy Geyelin Margie, Laura Nerenberg, Emily Schmitt, and Maria Woolverton from OPRE; Caitlin Cross-Barnet, Susan Jackson, Donelle McKenna, and Erin Patton from the Center for Medicare and Medicaid Innovation of the Centers for Medicare and Medicaid Services (CMS); and Meseret Bezuneh, Rachel Herzfeldt-Kamprath, Laura Kavanagh, Judy Labiner-Wolfe, Kyle Peplinski, Cynthia Philips, and David Willis from the Maternal and Child Health Bureau of HRSA.

The discussion of the evidence-based home visiting service plans of HFA and NFP was greatly informed by available program documentation and through surveys and exchanges with the evidence-based model developers, including Kathleen Strader and Kathryn Harding at HFA and Felicia Fognani, Molly O'Fallon, and Kate Siegrist at NFP.

Medicaid and vital records agencies in the 17 states that participated in MIHOPE-Strong Start supplied the data used to analyze outcomes in this report. Sources include the Health Information and Research Section at the California Department of Public Health; the California Health and Human Services Agency's Department of Health Care Services; the Georgia Department of Community Health; the Georgia Department of Public Health; the Illinois Department of Healthcare and Family Services; the Illinois Department of Public Health, Division of Vital Records; the Indiana Family and Social Services Administration; the Iowa Department of Human Services; the Iowa Department of Public Health; the Kansas Department of Health and Environment, Bureau of Epidemiology and Public Health Informatics, Office of Vital Statistics; the Kansas Department of Health and Environment, Division of Health Care Finance; the Massachusetts Department of Public Health, Registry of Vital Records and Statistics; the Massachusetts Executive Office of Health and Human Services; the Michigan Department of Health and Human Services, Bureau of Epidemiology and Population Health/Early Childhood Health Section; the Nevada Department of Health and Human Services, Division of Health Care Financing and Policy; the Nevada Department of Health and Human Services, Division of Public and Behavioral Health; the New Jersey Department of Health, Center for Health Statistics; the New Jersey Department of Human Services, Division of Medical Assistance and Health Services; the New York State Department of Health, Office of Health Insurance Programs and Bureau of Production Systems Management, Vital Records; the Bureau of Vital Statistics at the New York City Department of Health and Mental Hygiene; the North Carolina Department of Health and Human Services, State Center for Health Statistics, as well as the State Division of Medical Assistance; the Pennsylvania Department of Health, Bureau of Health Statistics and Research in Harrisburg; the Pennsylvania Department of Public Welfare, Office of Medical Assistance Programs; the South Carolina Department of Health and Environmental Control; the South Carolina Office of Research Statistics; the Tennessee Department of Health; the Tennessee Department of Finance Administration, Division of Health Care Finance and Administration; the Washington Office of Medicaid Systems; the Washington Health Care Authority Department; the Wisconsin Department of Health Services, Division of Public Health, Office of Health Informatics; and the Wisconsin Department of Health Services, Division of Enterprise Services.

We would like to acknowledge the many contributions of the MIHOPE-Strong Start data team in acquiring and processing administrative data as well as in checking and analyzing information provided by the programs and families. In particular, at MDRC, Desiree Alderson oversaw the data work for MIHOPE. Electra Small developed the web surveys used with home visiting program staff members with assistance from Melinda Jackson and Alexandra Parma. Noemi Altman led the efforts in administrative

data acquisition and processing. Lori Burrell from Johns Hopkins University expertly managed home visitors' baseline survey data. Additionally, MIHOPE-Strong Start was able to use a multiplicity of data sources, thanks to the contributions of many staff members from various organizations who acquired, checked, and analyzed these data: MDRC (Patricia Chou, Eric Cohn, Kristen Faucetta, Hiwote Getaneh, Lakhpreet Gill, Jessica Kopsic, Lyndsay McDonough, Megan Millenky, Robert Mitchell, Katie Rue, Kelly Saunders, Jennifer Somers, Kelly Terlizzi, and Samantha Xia); James Bell Associates (Alexandra Joraanstad, Erin Morehouse, Yuan Wang, and Ziyun Wang); Johns Hopkins University (Alexandra Cirillo Lilli and Michele Trieb); and Mathematica Policy Research (Liz Clary, Brittany English, Jaimie Grazi, Sarah LeBarron, William Leith, Nora Paxton, Elizabeth Potamites, Adele Rizzuto, and Javier Rodriguez).

MIHOPE-Strong Start was a large and complex project, and this report benefited not only from those who contributed directly to it but also from those who made this evaluation possible. A number of experts in the field provided advice and insights in designing MIHOPE-Strong Start and planning for data collection. They include Mary Kay Fox, Martha Kovac, and Diane Paulsell at Mathematica Policy Research. Additionally, Joel Gordon and Angelica Manigbas at MDRC provided advice about data security; Rose Kob, Danielle-Ann Thomas, and Ellen Fried reviewed many documents predominantly related to administrative data acquisition; and Amy Nowell and the MDRC Institutional Review Board ensured the protection of the study participants and their confidential information.

In addition to the above-named staff from ACF, CMS, and HRSA, a number of people at MDRC offered guidance on the structure and content of this final report. We received thoughtful comments on early drafts from Rekha Balu, Gordon Berlin, Carolyn Hill, Ximena Portilla, and Michael Weiss at MDRC.

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The Authors

Executive Summary

In the United States today, the vast majority of infants are born in good health. Yet, in 2015, the United States ranked in the top 10 countries with the highest incidence of adverse birth outcomes among Organisation for Economic Cooperation and Development (OECD) nations,[1] with a low-birth-weight prevalence of 8.1 percent and a preterm birth rate of 9.6 percent.[2] Reducing low birth weight and preterm birth have been long-standing policy goals for the nation,[3] given the well-documented financial costs as well as the short- and long-term implications of poor newborn health for compromised health and well-being in the infant's future. Moreover, socioeconomic, racial, and ethnic disparities in birth outcomes are profound and persistent, despite population-wide improvements in access to health care.

The determinants of adverse birth outcomes are complicated, reflecting a confluence of behavioral, biological, psychosocial, and structural factors, in addition to medical risk factors. A shared understanding of these determinants has led to calls for more research to illuminate the potential of nonmedical strategies to improve newborn health in relation to mothers who are at disproportionate risk of experiencing adverse birth outcomes. Evidence-based home visiting for low-income pregnant women represents one such strategy. In providing education and support to at-risk families and connecting families to community-based resources, home visiting may be uniquely positioned to address the complexity of risk often found among low-income women.

Promoting healthy births is but one goal among many targeted by early childhood home visiting programs. Accordingly, there is a large body of rigorous research examining the impacts of home visiting on parenting behaviors, child health, child development, and family functioning. Yet, to date, rigorous investigations of home visiting's effectiveness in improving prenatal health and birth outcomes have been limited to a few trials, and the results have been inconsistent. Specifically, individual studies of Healthy Families America (HFA) and Nurse-Family Partnership (NFP) have found reductions in the risk of low birth weight and preterm birth, but this evidence is limited because these

[1]Organisation for Economic Cooperation and Development, *Health at a Glance 2017: OECD Indicators*. Paris: OECD Publishing (2017), www.oecd-ilibrary.org.

[2]Joyce A. Martin, Brady E. Hamilton, Michelle J. K. Osterman, Anne K. Driscoll, and T. J. Mathews, "Births: Final Data for 2015," *National Vital Statistics Reports* 66, 1 (2017). Infants who are born before 37 weeks of gestation are considered preterm. Infants who weigh less than 2,500 grams (or 5.5 pounds) are considered low birth weight.

[3]Office of Disease Prevention and Health Promotion, "About Healthy People" (2018), www.healthypeople.gov/2020/About-Healthy-People.

positive findings have not been replicated across other studies or have been concentrated primarily in subgroups of families. Moreover, sample sizes in prior studies have often been small, making it difficult to detect effects, particularly on relatively rare outcomes such as preterm birth and low birth weight, where the impacts would have to be proportionately larger to be estimated precisely. Furthermore, earlier research has not often provided systematic information on whether home visiting programs have been structured and implemented in ways that could support the improvement of birth outcomes. Given the societal, medical, and financial import of improving birth outcomes among those at greater risk, a new test of whether evidence-based home visiting programs improve newborn health, including a deeper look at how these programs are being implemented, was warranted.

Launched in 2012, the Mother and Infant Home Visiting Program Evaluation-Strong Start (MIHOPE-Strong Start) was a large-scale examination that rigorously tested the effectiveness of evidence-based home visiting in improving birth as well as health outcomes during pregnancy and in the year after birth. Local programs included in the study's analysis implemented one of two evidence-based models: HFA and NFP. These models were chosen because earlier evaluations found some evidence of their having positive impacts on birth outcomes. At the time the study began, these were the only evidence-based home visiting models to have found positive effects on improving birth outcomes, according to the Home Visiting Evidence of Effectiveness (HomVEE) review.[4] The Office of Planning, Research, and Evaluation (OPRE) of the Administration for Children and Families (ACF) partnered with the Center for Medicare and Medicaid Innovation (CMMI) of the Centers for Medicare and Medicaid Services (CMS) and the Maternal and Child Health Bureau (MCHB) of the Health Resources and Services Administration (HRSA) to sponsor the study. MIHOPE-Strong Start was part of the CMMI's Strong Start for Mothers and Newborns Initiative, which evaluated whether enhanced, nonmedical prenatal interventions, when provided in addition to routine medical care, have the potential to improve birth outcomes and reduce health care costs for women enrolled in Medicaid or the Children's Health Insurance Program (CHIP).[5] MDRC led MIHOPE-Strong Start in collaboration with James Bell Associates, Johns Hopkins University, Mathematica Policy Research, and New York University.

[4]In 2009, the U.S. Department of Health and Human Services (HHS) launched HomVEE to conduct a thorough and transparent review of the home visiting research literature and assess whether home visiting models meet HHS's criteria for evidence of effectiveness (see https://homvee.acf.hhs.gov). The HomVEE website presents detailed information about all of the studies HomVEE has reviewed, providing an inventory of existing evidence across multiple domains related to early childhood health and well-being.

[5]Hereafter, "Medicaid" refers to either Medicaid or CHIP.

This fifth and final report of MIHOPE-Strong Start presents implementation and impact results.[6] Specifically, it investigates the following research questions:

- What are the characteristics of the local programs and families included in the study?
- How are the local programs structured and how are front-line staff members supported in the delivery of home visiting services? What services did program group families receive, and what explains the variation in services delivered?
- What are the effects of home visiting programs on improving prenatal health, reducing low birth weight and preterm birth, and promoting preventive infant health care use? How do the effects on families vary according to family risk factors and across local programs?

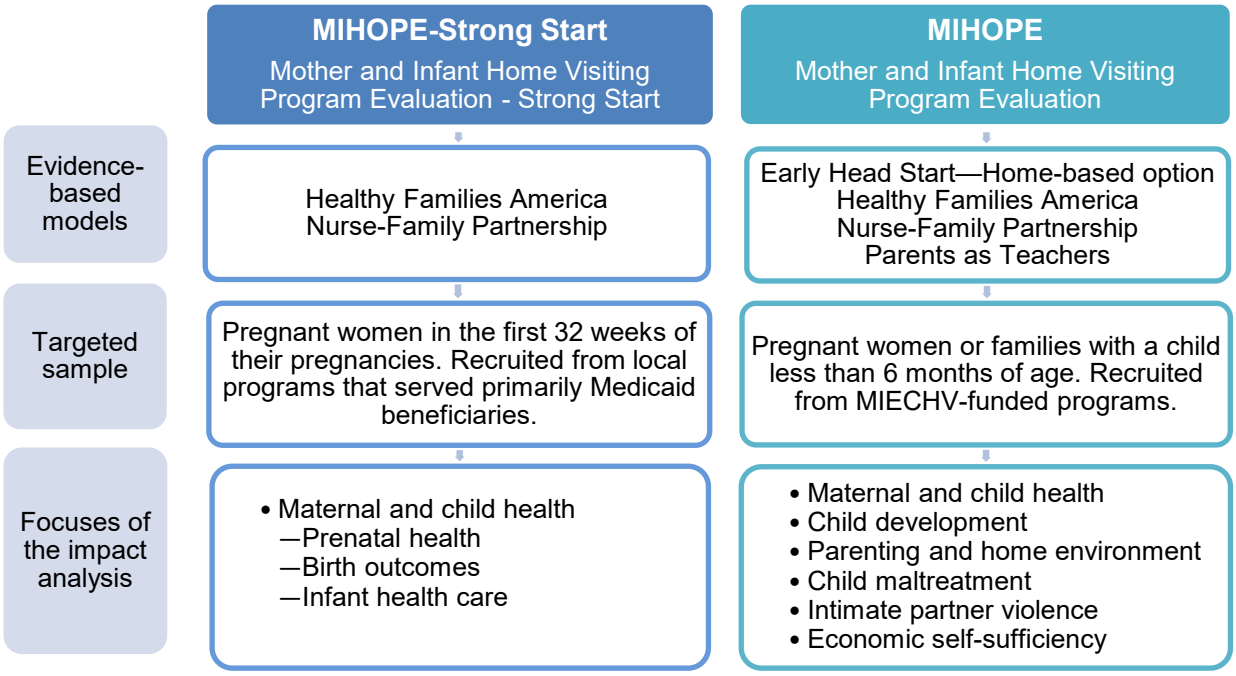
Whereas MIHOPE-Strong Start examined the relationship between home visiting and birth outcomes among HFA and NFP programs, a separate study called the Mother and Infant Home Visiting Program Evaluation (MIHOPE) is providing a broader investigation of evidence-based home visiting implementation and effectiveness. MIHOPE is the legislatively mandated evaluation of the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program.[7] As shown in Figure ES.1, MIHOPE examined a range of outcome domains beyond those examined in MIHOPE-Strong Start. In addition to HFA and NFP, MIHOPE also included programs implementing two other widely used evidence-based home visiting models: Early Head Start — Home-based option (EHS) and Parents as Teachers (PAT). Findings from MIHOPE, including

[6]For more information and to view earlier publications from MIHOPE-Strong Start, see www.mdrc.org/project/mother-and-infant-home-visiting-program-evaluation-mihope-strong-start and www.acf.hhs.gov/opre/research/project/mother-and-infant-home-visiting-program-evaluation-strong-start-mihope-ss.

[7]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 (§ 511[42 U.S.C. 711](j)(1)). Subsequently enacted laws extended funding for the program through fiscal year 2022; specifically, 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). For more information about the MIECHV program, see https://mchb.hrsa.gov/maternal-child-health-initiatives/home-visiting-overview and www.acf.hhs.gov/ecd/home-visiting/tribal-home-visiting.

Figure ES.1

Two Studies of the Effects of Evidence-Based Home Visiting: MIHOPE-Strong Start and MIHOPE



implementation, impact, and cost analyses, are also being published and made available on the OPRE and MDRC websites.[8]

Overview of MIHOPE-Strong Start's Design

The recruitment process for local programs and families included in the MIHOPE-Strong Start analysis began in 2012 and ended in 2015. To be considered for the study, local programs needed to have been in operation for at least two years, be employing at least three full-time home visitors (to ensure adequate sample enrollment), and be serving a prenatal client population mostly covered by Medicaid. In addition, they had to be interested in participating, serving an area with more demand than their services could meet, and not exhibiting evidence of implementation problems. The study team directed recruitment toward local programs that were located in an environment without other comparable home visiting services, so that the control group would be unlikely to receive

[8]See www.acf.hhs.gov/opre/research/project/maternal-infant-and-early-childhood-home-visiting-evaluation-mihope or www.mdrc.org.

these services. Finally, local programs could not be located in service areas where the families they served might be receiving services under other parts of the Strong Start for Mothers and Newborns Initiative.[9]

To provide unbiased estimates of the effects of evidence-based home visiting programs, families were randomly assigned either to a program group who could receive home visiting services from the local program or to a control group whose members were given information on other services available in the community. Families were randomly assigned after the home visiting program determined that a woman was eligible and interested in the program but before she enrolled in the program.[10] This was done to minimize the number of women assigned to the program group who subsequently did not receive home visiting services. Studies such as MIHOPE-Strong Start that use random assignment are designed so that the program and control groups are similar in all respects when they enter the study. As is standard in random assignment studies, the primary analytical strategy is to compare the outcomes for the program group with those of the control group. Differences that emerge after random assignment can then be reliably attributed to the program group's access to the intervention, which, in the case of MIHOPE-Strong Start, consisted of evidence-based home visiting services provided through the HFA and NFP programs in the study.[11]

Women were eligible for MIHOPE-Strong Start if they were no more than 32 weeks pregnant, were age 15 or older, spoke English or Spanish with enough proficiency to provide informed consent, and were eligible for and interested in receiving home visiting services. Although 32 weeks into a woman's pregnancy is a relatively late time for the programs to influence birth outcomes, this cutoff point was chosen based

[9]Other approaches being tested to improve birth outcomes for women enrolled in Medicaid under CMMI's Strong Start Initiative included providing enhanced prenatal care services in group settings, providing peer counselors at birth centers, and offering access to maternity care homes. See https://innovation.cms.gov/initiatives/Strong-Start-Strategy-2/index.html.

[10]Since receiving home visiting services and participating in the study were voluntary, the women included in the program and control groups were both eligible for and interested in having home visits. Nonetheless, the study team's discussions with local programs indicated that families generally did not seek out home visiting services on their own but instead were referred to home visiting by another agency, such as the Women, Infants, and Children nutrition program.

[11]Because some program group families might receive no home visits and some control group families might receive similar services, the effects on outcomes in MIHOPE-Strong Start depend on the extent to which program group and control group families received different amounts of home visiting services. Information about the home visiting services received by program group families is discussed later in this Executive Summary.

on findings from a study of birth outcomes in the Healthy Families New York program.[12] Most women completed study enrollment much earlier in their pregnancies, and most women in the program group (70 percent) received the first home visit in the first or second trimester.[13]

As described in an earlier report, the initial goal of the study was to recruit 15,000 families across 100 local HFA or NFP programs.[14] This ambitious goal was based in part on the relative rarity of the birth outcomes of interest and in part on actuarial calculations of the sample size needed to detect reductions in Medicaid costs due to improved birth outcomes. However, it soon became clear that recruiting such a large sample of programs and families in the time frame of the study would not be possible. For the study to achieve the initial targeted number of families, almost every eligible program approached by the recruitment team would have had to agree to participate in MIHOPE-Strong Start and complete all phases of the recruitment process. Upon conducting further analyses, the study team projected that a sample size of about 3,400 families from 75 local programs was realistic to obtain and would still allow for examination of the study's key questions of interest, although reducing the sample size reduced the confidence with which the study can detect effects on relatively rare outcomes, such as birth outcomes.

Though falling short of the initial recruitment goals, MIHOPE-Strong Start analyzes information from a final sample of 2,900 families across 66 local HFA or NFP home visiting programs in 17 states. These final sample size numbers are close to the revised projected targets of 3,400 families and 75 programs. As such, MIHOPE-Strong Start is the largest random assignment study to date to examine the effectiveness of home visiting services on improving birth outcomes, prenatal and maternal health behaviors,

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[12]Eunju Lee, Susan D. Mitchell-Herzfeld, Ann A. Lowenfels, Rose Greene, Vajeera Dorabawila, and Kimberly A. DuMont, "Reducing Low Birth Weight Through Home Visitation: A Randomized Controlled Trial," *American Journal of Preventive Medicine* 36, 2 (2009): 154-160.

[13]Among mothers in the program group, 20 percent received the first home visit in the first trimester and 50 percent received the first home visit in the second trimester. A small group received the first visit in the third trimester (15 percent) or after the baby was born (1 percent), and some never received a home visit (14 percent). Among the program group women who received the first home visit at some point during pregnancy, the average gestational age was 20 weeks and the median was 19 weeks. While entering the study later in pregnancy limits the number of home visits one would be expected to receive, most program group mothers who enrolled in the third trimester received at least one home visit during pregnancy.

[14]Helen Lee, Sarah Crowne, Kristen Faucetta, and Rebecca Hughes, *An Early Look at Families and Local Programs in the Mother and Infant Home Visiting Program Evaluation-Strong Start: Third Annual Report*, OPRE Report 2016-37 (Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, 2016).

and health care use in the first year after birth.[15] In addition, MIHOPE-Strong Start studied how home visiting programs were implemented, with a focus on understanding implementation features that could be related to improving birth outcomes.

For both the implementation and impact analyses, the study collected information directly from several data sources, including families, home visitors, local programs, and the two evidence-based model developers. Data on community characteristics of families were drawn from the U.S. Census Bureau's American Community Survey and the information on health care resources provided on HRSA's Data Warehouse. Service delivery data were gathered from management information system data and service delivery logs completed weekly by home visitors. Outcome measures were based on vital records and Medicaid data provided by state agencies.

Characteristics of the Local Programs and Families

Local programs in MIHOPE-Strong Start were large, with about 70 percent reporting the capacity to serve more than 100 families at any given time and employing an average of six to nine full-time home visitors, respective to the HFA and NFP programs, at the time of study recruitment.[16] Since the study sought to recruit local programs that received more referrals than they could serve and were large enough to substantially contribute to the study's sample size, the programs were located primarily in urban areas. Nearly 90 percent had been in operation for six or more years. Also, almost 90 percent of local programs received some funding from the MIECHV program. The home visitors working in these programs at the time of the study were diverse in age and racial and ethnic background, and three-quarters had at least a bachelor's degree. Corresponding to the two models' expected staff qualifications, nearly all NFP home visitors were baccalaureate-prepared nurses and HFA home visitors had a minimum of a high school diploma or equivalent.

Families in the study resided in communities that, on average, had higher poverty and unemployment rates as well as lower rates of health insurance coverage than the national average or the average for urban areas in the 17 study states. However, these

[15]Earlier reports from MIHOPE-Strong Start referred to a total of 67 local programs. Two of the local programs, run by the same parent organization but serving different geographic areas within the region, have been combined for the purposes of the analysis in this report. This was done because some home visiting staff members provided services to families in both areas.

[16]According to the *National Home Visiting Resource Center's 2017 Yearbook*, the average number of full-time home visitors for HFA programs nationwide was five, compared with six among local programs in MIHOPE-Strong Start. For NFP, local programs in MIHOPE-Strong Start employed about nine full-time home visitors on average, compared with seven among programs nationwide.

communities had similar if not better levels of access to primary health care resources than the national average, which is generally consistent with urban contexts.

In addition to meeting the eligibility criteria of MIHOPE-Strong Start (including enrollment in the study by 32 weeks of pregnancy), families had to meet the eligibility criteria of the local program and the evidence-based model. According to NFP's model requirements, women who enrolled in a local NFP program had to be first-time, low-income mothers and no later than 28 weeks pregnant, although the model strongly encouraged local programs to recruit women earlier in pregnancy. Nationally, HFA programs allowed women to enroll up to and shortly after birth, but only women who were within 32 weeks of pregnancy could be eligible for MIHOPE-Strong Start. Furthermore, in accordance with the model developer, local HFA programs had the flexibility to consider risk factors for child maltreatment or other negative child outcomes in defining their eligibility criteria to prioritize and serve families with certain risk factors.

Information on the characteristics of women at the time of study entry follows:

- **On average, women entered the study at 17 weeks of pregnancy.** At the time of random assignment, 37 percent were in the first trimester, 55 percent of women were in the second trimester, and about 8 percent were early in the third trimester (between 28 and 32 weeks). Women in NFP programs entered the study almost five weeks earlier than women in HFA programs, consistent with NFP's emphasis on early enrollment.

- **On some indicators related to healthy births, women had fairly positive health profiles.** About 90 percent of women reported being in good-to-excellent health at study entry. Among women who were randomly assigned in the second or third trimester of pregnancy, nearly three-quarters had initiated prenatal care in the first trimester. Roughly 9 percent of the sample reported smoking at the time of study entry — a rate that is lower than that of comparable populations and samples in earlier HFA and NFP evaluations of birth outcomes.[17]

- **The sample members were disadvantaged in their sociodemographic profiles and on other indicators of well-being that are associated with a higher level of risk for poor birth outcomes.** The sample members were young, with an average age of 22 years, and

[17]Note that because these indicators of smoking are based on self-reports, they likely underestimate the prevalence of smoking in the sample.

had low levels of education. The majority of women were not residing with the child's biological father at the time of study entry. The prevalence of elevated depressive or anxiety symptoms was 43 percent — this is notably higher than comparable estimates at the national level but on par with other studies of home visiting programs. Slightly more than half of the sample members reported experiencing food insecurity.

Implementation Research Findings

The MIHOPE-Strong Start implementation research investigated aspects of program operations that are important for understanding how local programs were structured and how staff members were supported in providing services to program group families. This involved assessing whether the local programs and home visitors were focused on birth outcomes and reported being equipped to address the diverse types of risks found among program group families.

MIHOPE-Strong Start examined both the general features of program implementation and those related to prenatal health and birth outcomes. In addition, it looked at the services that program group families received, including the number of home visits, duration of participation, and content covered, such as the types of referrals made and topics discussed. Patterns in service receipt across family, home visitor, and local program characteristics were also observed.

Key findings from the implementation analysis follow:

- **Local programs and home visitors placed a high priority on improving a wide range of family outcomes, including but not limited to improving birth outcomes, underscoring their far-reaching areas of emphasis.** These outcomes include improving prenatal health, healthy births, and child preventive care, as well as positive parenting, child development, family planning, and maternal well-being.

- **The majority of local programs reported having policies, infrastructure, and support tools in place to help home visitors address the targeted outcomes.** For example, nearly all local programs expected home visitors to screen for and monitor pregnant women's receipt of prenatal care and to help them follow through on prenatal care providers' recommendations. And for the most part, home visitors reported feeling adequately supported by their programs' implementation systems and comfortable and effective in their roles.

- **Program group women who received at least one home visit during the study period received an average of about eight home visits over nearly four months before giving birth.** This level of home visiting receipt is consistent with the findings from earlier studies of HFA and NFP that have found positive impacts on birth outcomes,[18] but the number of home visits is lower than what the evidence-based models intended. Also, about 14 percent of program group families never received a home visit either during pregnancy or after birth.

- **Among the families who received at least one home visit and for whom information was available, almost all (96 percent) discussed prenatal health with their home visitor at least once.** Prenatal health was also the most common type of referral (42 percent of families), including such areas as nutrition, substance use, and childbirth education, in addition to physician-based prenatal care.

- **Women who were more and less vulnerable to poor birth outcomes received similar levels of home visiting services.** Among women who received at least one home visit, those who exhibited risks for compromised birth outcomes (such as being of a younger age, experiencing food insecurity, reporting poor or fair health status, and being smokers) received the same number of visits and participated for similar lengths of time, on average, as women who didn't demonstrate such risks.

Effects of Home Visiting on Prenatal Health, Birth, and First-Year Health Care Use Outcomes for the Full Sample

While there were many additional prenatal health, birth, and health care use outcomes the study could have examined, the analyses focused on assessing the effects of home visiting on a prespecified, limited set of outcomes — which are referred to as "confirmatory" — to reduce the chance of a false-positive finding of effectiveness, which is more likely to happen when more outcomes are examined. The confirmatory outcomes were selected based on a review of prior evidence, policy relevance, and measurement quality. In addition, the two evidence-based models and most local programs indicated that they place a high priority on improving birth outcomes and child health and at least a

[18]Lee et al. (2009); David L. Olds, Charles R. Henderson, Robert Tatelbaum, and Robert Chamberlin, "Improving the Delivery of Prenatal Care and Outcomes of Pregnancy: A Randomized Trial of Nurse Home Visitation," *Pediatrics* 77, 1 (1986): 16-28.

moderate priority on improving prenatal health. Other "exploratory" outcomes, as well as impacts on exploratory subgroups, were also included in the impact analysis. All exploratory analyses were prespecified, but the prior empirical evidence and theoretical links between home visiting and its impacts in relation to them were less clear. In addition to these analyses, the study explored whether impacts varied across local home visiting programs or by evidence-based model.

The eight confirmatory outcomes examined in MIHOPE-Strong Start are:

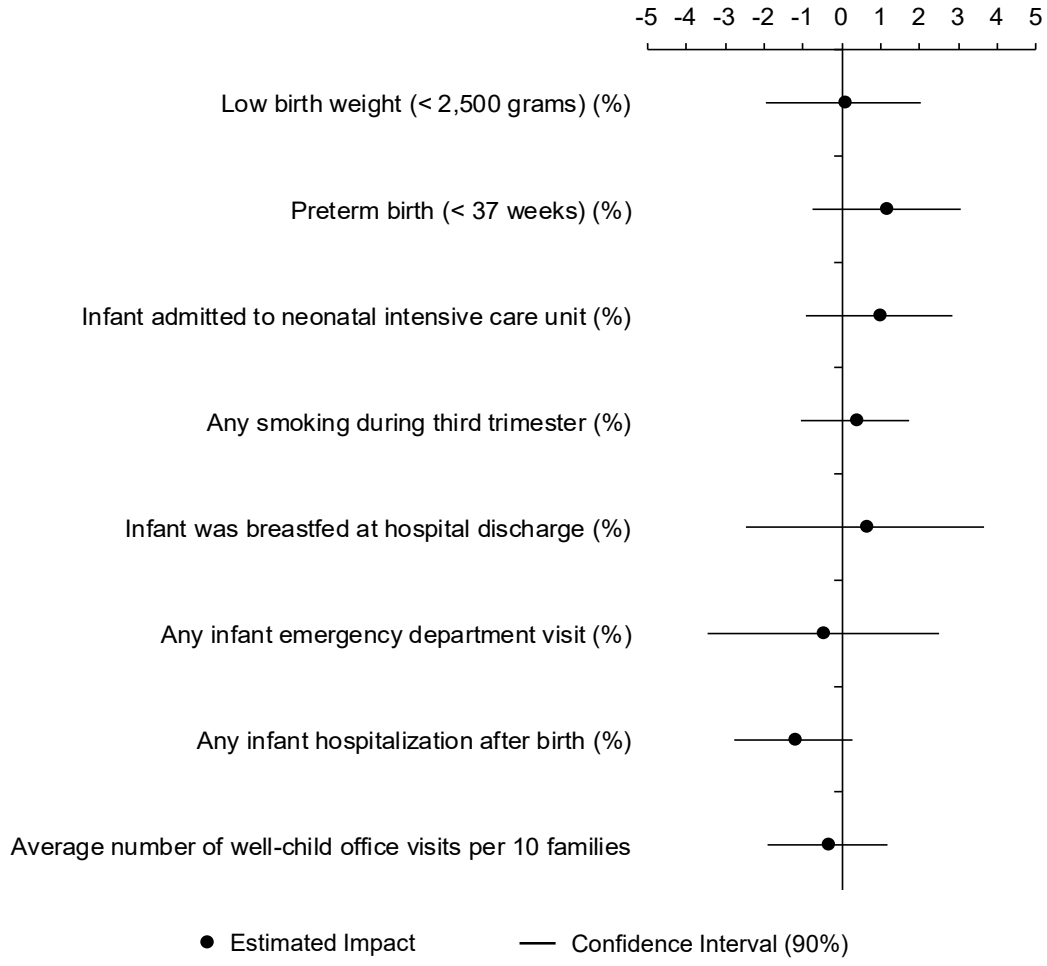
- Whether the infant was born with a low birth weight
- Whether the infant was born preterm
- Whether the infant was admitted to the neonatal intensive care unit (NICU)
- Whether the mother smoked cigarettes during the third trimester of pregnancy
- Whether the infant was breastfed at discharge from the hospital
- Whether the infant had an emergency department visit in the first year
- Whether the infant was admitted to the hospital in the first year (excluding the birth hospitalization)
- The number of Medicaid-paid well-child visits in the first year

The effects on the study's confirmatory outcomes are shown in Figure ES.2. A guide to interpreting the estimated impacts in the figure is provided in Box ES.1. A summary of the findings follows.

- **No statistically significant effects of the home visiting services provided by the programs in the study were found on any of the eight confirmatory outcomes.** Home visiting services provided by the local HFA and NFP programs in MIHOPE-Strong Start did not significantly decrease rates of low birth weight, preterm birth, or admission to a NICU, nor did they decrease smoking in the last trimester of pregnancy. There were also no statistically significant effects of home visiting on breastfeeding at hospital discharge or on infant health care use outcomes during the first year of life.

Figure ES.2

Effects on MIHOPE-Strong Start Confirmatory Outcomes



SOURCES: Calculations based on state vital records and Medicaid enrollment and claims data.

NOTES: The scale represents the difference in percentage points between the program group and the control group for the first seven outcomes and the difference in number of visits for the last outcome. See Box ES.1 for more explanation.

Estimates were regression-adjusted using generalized least squares, controlling for pre-random assignment characteristics of sample members weighted to adjust for differing random assignment ratios used in MIHOPE and MIHOPE-Strong Start. Sample sizes vary depending on the data source and measure.

Infant emergency department visits, hospitalizations, and well-child visits are based on Medicaid-paid health care use from birth until the first birthday.

Box ES.1

How to Interpret Estimated Impacts

The effects, or impacts, of home visiting are estimated by comparing outcomes for the program and control groups, adjusted for the background characteristics of the sample members. Figure ES.2 shows the estimated impacts for the study's confirmatory outcomes as dots. For example, 11.7 percent of births in the program group and 11.6 percent of births in the control group were low birth weight, resulting in an estimated impact of 0.1 percentage point (found by subtracting 11.6 percent from 11.7 percent).

The horizontal lines on either side of the dots showing the estimated impact in Figure ES.2 represent the 90 percent confidence interval, which is an estimate of the variability (or statistical imprecision) of the impact of the home visiting programs. A shorter confidence interval suggests a more precise estimate of the population parameter than a wider confidence interval, which indicates greater variability and, thus, greater uncertainty. A confidence interval that does not contain zero — that is, it is fully to the right or the left of the zero line — indicates that the impact is statistically significantly different from zero at the 10 percent level.

- **Home visiting provided by the programs in the study did not appear to have larger effects on birth outcomes, prenatal behaviors, or health care use after birth for any subgroups of families.** The analysis also compared program impacts on confirmatory outcomes by maternal race and ethnicity, by whether the mother smoked prior to pregnancy, by the mother's stage of pregnancy at study entry, and by maternal age. In general, the impacts did not differ between the program and control groups for these subgroups, suggesting that home visiting did not have a differential effect on higher- and lower-risk families.

- **The effects of home visiting on birth outcomes, prenatal behaviors, and health care use after birth did not vary across local programs in MIHOPE-Strong Start.** There is no evidence that impacts differ by how local programs were implemented or by evidence-based model.

Discussion

The large-scale examination produced by MIHOPE-Strong Start provides important new information about the effects of two evidence-based home visiting models, HFA and NFP, on improving prenatal health, birth outcomes for families, and health care use in infancy. While a separate report from MIHOPE presents the impacts of home visiting across a broader range of child and maternal outcomes and for two additional evidence-based models, the findings from MIHOPE-Strong Start show that the local home visiting programs in the study did not have a discernible effect on prenatal health and birth outcomes or on infant health care use.

Low birth weight and preterm birth are still relatively uncommon events in the United States. Even in a large sample, like the one in MIHOPE-Strong Start, the number of children born prior to 37 weeks of gestation or weighing less than 5.5 pounds is usually small. With a sample of 2,900 mothers, this study was designed to reliably detect differences of a reduction of 2.8 percentage points in the rate of low birth weight and a reduction of 2.5 percentage points for preterm births. The impacts estimated by MIHOPE-Strong Start — 0.1 percentage point and 1.1 percentage point, respectively — are much smaller than these levels and are not statistically significant.

It is important to note some of the limitations to the findings in this report. As with all evaluations, the estimates from MIHOPE-Strong Start are specific to this sample of local programs and families, which, while racially, ethnically, and geographically diverse, is not necessarily representative of all HFA and NFP programs. Furthermore, when the study began in 2012, the MIECHV program had recently been launched. Most (57) of the local programs included in MIHOPE-Strong Start received some funding from the MIECHV program, which created changes in local program priorities and monitoring requirements that might have resulted in their implementation evolving over time. For example, the MIECHV program includes a number of efforts that encourage continuous quality improvement in awardees and for awardees' local programs. The findings here should be understood within this broader policy context.

As noted earlier, the study's impact analysis compared outcomes for all program group and control group families, following best practices in a random assignment study. Given that 14 percent of program group families received no home visits, the effects would be about 16 percent larger if the analysis had estimated the effects

among families who received at least one home visit.[19] However, the conclusions based on statistical significance would be unaltered.

While there are advantages of using administrative data for measuring outcomes, as was done in MIHOPE-Strong Start, there are also limitations. For example, it is known that the information provided on birth records tends to underreport the mother's smoking. Thus, the smoking outcomes examined are likely underestimates of true prevalence. It is also important to keep in mind that the service delivery measures examined in the implementation analysis — including the amount of home visiting and duration of participation — capture aspects that are distinct from the quality of home visiting services received.

There are several reasons why home visiting might not have been effective at improving the birth outcomes examined in this study. First, the families in MIHOPE-Strong Start, while disadvantaged in their sociodemographic profiles, tended to have healthy behaviors and sufficient access to health care — important factors in healthy pregnancies and birth outcomes — prior to enrolling in the study. For example, few women in the study smoked during pregnancy and most of the sample had access to health care providers.

Second, it is possible that control group families had access to home visiting programs outside the immediate neighborhood and to other effective services,[20] despite recruitment that prioritized local programs in an environment without other comparable evidence-based home visiting. MIHOPE-Strong Start did not gather data on the services that all control group members received after random assignment, but MIHOPE did collect information on service use among control group families to shed light on this issue. In MIHOPE, about 20 percent of women assigned to the control group indicated that they had received home visiting or parenting services in the year prior to completing a follow-up survey, which was conducted around the time the child was 15 months old. Additionally, 9 percent of control group families in MIHOPE indicated that they had re-

[19]For a given impact equal to 1 for the full sample, the impact for the 86 percent of program group families who received at least one home visit can be estimated by dividing the full-sample impact by 0.86. This assumes the impact is 0 for the 14 percent of program group members who received no home visits. As a result, the impact among those who received a home visit is about 16 percent (1 / 0.86) larger than for the full sample.

[20]For a description of other state-based initiatives to improve birth outcomes across the 17 states in MIHOPE-Strong Start, see Mariel Sparr, Alexandra Joraanstad, Grace Atukpawu-Tipton, Nicole Miller, Julie Leis, and Jill Filene, *Promoting Prenatal Health and Positive Birth Outcomes: A Snapshot of State Efforts*, OPRE Report 2017-65 (Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, 2017).

ceived behavioral health services, about 3 percent had received intimate partner violence services, and about 4 percent of children had received early intervention services. As part of the study protocol, MIHOPE-Strong Start control group families were given information on other types of services in the community, which covered areas such as pregnancy, substance abuse, housing, and food and nutrition; less frequently, they were given information on a home visiting program that was more limited in scope.

Another consideration is that due to the study requirements described earlier, the programs in MIHOPE-Strong Start recruited a sample of women residing in primarily urban areas who likely had greater access to alternative services. Thus, the findings may not be generalizable to programs that operate in areas where access to prenatal health care and other services is more limited.

An additional reason for the study's lack of impacts could be that although program group families received a level of home visiting services similar to levels reported in previous trials of HFA and NFP, most families in the program group received fewer home visits than the evidence-based models prescribed, including 14 percent of families who received no home visits at all. While impacts were not larger in local programs where families received more home visits, this may in part be because there were not large differences in local programs' ability to keep families engaged.

Future research could investigate these possibilities by studying such factors as whether home visiting would have a greater effect on birth outcomes if it were to use new approaches to engaging families in a high level of services; to target services to mothers who are engaged in risky behaviors associated with compromised birth outcomes, such as smoking, or to women who are not connected to community and safety net programs; and to study the effects of home visiting in rural areas.

Finally, research on the epidemiology of newborn health suggests that it is challenging for any single intervention to improve birth outcomes.[21] Scholars have increasingly focused on the role of stress — especially the cumulative exposure to stress — in altering the physiology of the fetal environment among low-income and racial minority women.[22] This research points to an important but more distal mechanism that could

[21]Institute of Medicine (U.S.) Committee on Understanding Premature Birth and Assuring Healthy Outcomes, *Preterm Birth: Causes, Consequences, and Prevention* (Washington, DC: National Academy of Sciences, 2007).

[22]Michael C. Lu, Milton Kotelchuck, Vijaya Hogan, Loretta Jones, Kynna Wright, and Neal Halfon, "Closing the Black-White Gap in Birth Outcomes: A Life-Course Approach," *Ethnicity and Disease* 20, 1, S2 (2010): 62-76; Michael S. Kramer, Louise Seguin, John Lydon, and Lise Goulet, "Socio-Economic Disparities in Pregnancy Outcome: Why Do the Poor Fare So Poorly?" *Paediatric and Perinatal Epidemiology* 14, 3 (2000): 194-210.

affect birth outcomes, given that the effects of chronic stress can be long-lasting.[23] While home visiting during pregnancy may not be enough to mitigate the negative impacts of stress on the current birth, home visitors' ongoing interactions and supportive role with families could reduce maternal stress and improve resiliency in the long run, thereby improving maternal and child health in the future.

Relatedly, to the extent that the local programs in this evaluation were able to improve the mother's health and well-being after the focal child's birth, there may be longer-term impacts of home visiting on future births. Researchers have increasingly emphasized the importance of health and care before pregnancy in improving newborn health,[24] although finding ways to intervene with women before they become pregnant is a persistent challenge. Home visiting thus has the potential to reach women and provide services between pregnancies in ways such as encouraging spacing between pregnancies and increasing families' economic self-sufficiency; these types of modifications might lead to improvements in maternal health and better birth outcomes.

[23]Margaret Comerford Freda, Merry-K. Moos, and Michele Curtis, "The History of Preconception Care: Evolving Guidelines and Standards," *Maternal and Child Health Journal* 10, 1 (2006): 43-52.

[24]Freda, Moos, and Curtis (2006).

Earlier Publications on MIHOPE-Strong Start

Promoting Prenatal Health and Positive Birth Outcomes: A Snapshot of State Efforts
2017. Mariel Sparr, Alexandra Joraanstad, Grace Atukpawu-Tipton, Nicole Miller, Julie Leis, and Jill Filene.

An Early Look at Families and Local Programs in the Mother and Infant Home Visiting Program Evaluation-Strong Start: Third Annual Report
2016. Helen Lee, Sarah Crowne, Kristen Faucetta, and Rebecca Hughes.

Design for the Mother and Infant Home Visiting Program Evaluation-Strong Start
2015. Charles Michalopoulos, Helen Lee, Emily K. Snell, Jill H. Filene, Mary Kay Fox, Keith Kranker, Tod Mijanovich, Lakhpreet Gill, and Anne Duggan

Cheaper, Faster, Better: Are State Administrative Data the Answer? The Mother and Infant Home Visiting Program Evaluation-Strong Start Second Annual Report
2015. Helen Lee, Anne Warren, and Lakhpreet Gill.

The Mother and Infant Home Visiting Program Evaluation-Strong Start: First Annual Report
2013. Jill H. Filene, Emily K. Snell, Helen Lee, Virginia Knox, Charles Michalopoulos, and Anne Duggan.

NOTE: A complete publications list is available from the OPRE (www.acf.hhs.gov/opre) and MDRC (www.mdrc.org) websites, from which copies of reports can also be downloaded.