

# A Quasi-Experimental Population-Based Evaluation of the Michigan Maternal Infant Health Program

## Summary Report

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*Michigan Department  
of Community Health*



**Rick Snyder, Governor**  
**James K. Haveman, Director**

Michigan Department of Community Health and  
Michigan State University

Cristian I. Meghea, PhD, LeeAnne Roman, MSN, PhD, Stacey A. Duncan-Jackson, MPA, RN, BSN,  
Jennifer E. Raffo, MA, Debra Darling, RN, BSN, Qi Zhu, MA

# A Quasi-Experimental Evaluation of the Michigan Maternal Infant Health Program

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The Maternal Infant Health Program (MIHP) is a well-established population-based home visiting program targeting all Medicaid-eligible pregnant women and infants up to age one in Michigan. The MIHP, jointly administered by Medical Services Administration and the Bureau of Maternal and Child Health, Michigan Department of Community Health (MDCH), is the largest program dedicated to serving Medicaid pregnant women and children in the state. MIHP provides support to promote healthy pregnancies, positive birth outcomes, and healthy infants.

The Michigan Department of Community Health requested that Michigan State University conduct an independent evidence-based evaluation of MIHP effectiveness in promoting healthy pregnancies, positive birth outcomes, and healthy infants. A randomized trial was not feasible as Medicaid is an entitlement program and all insured pregnant women were eligible for MIHP.

This report summarizes the initial key findings emerging from a statewide population-based quasi-experimental evaluation of the MIHP impacts on maternal and infant health and health services utilization during pregnancy, at birth, and during the infant's first year of life. We found maternal and infant favorable MIHP effects in two successive population cohorts consisting of all Medicaid eligible infants born in 2009 and 2010 and their mothers.

Specifically, we found that MIHP had favorable effects on:

- **Prenatal Care:** Pregnant women enrolled in MIHP were more likely to present for any prenatal care and had an improved adequacy of prenatal care through pregnancy.
- **Birth Outcomes:** Infants whose mothers were enrolled in MIHP had reduced rates of low birth weight, very low birth weight, and extreme prematurity. They also had increased birth weight and gestational age at delivery, but the findings were not clinically relevant.
- **Maternal Postnatal Care:** Mothers enrolled in MIHP were more likely to present for an appropriate postnatal checkup.
- **Infant Use of Preventive Health Services:** Infants whose mothers were enrolled in MIHP were more likely to present for any well-child visits and were more likely to have the appropriate number of well-child visits over the first year of life.

The impacts emerging from the initial evaluation of the MIHP program are encouraging. There was a pattern of significant favorable effects across a range of maternal and infant

outcomes. The favorable impacts began during pregnancy, continued at birth, and were sustained for mothers and infants through the first year after birth. These early results are conservative, and generally robust to the possibility of bias due to unobserved confounders. Future reports will include analyses of program effectiveness in various subgroups, including the effects of MIHP among early enrollees in the program, African-American participants, primiparous women, and young mothers. The evaluation work is continuing and will include the most up to date birth cohorts.

## **1. THE MATERNAL INFANT HEALTH PROGRAM (MIHP)**

The Maternal Infant Health Program (MIHP), a population-based home visiting program targeting all Medicaid-eligible pregnant women and infants up to age one, has received significant attention and effort over the recent years. The MIHP, which is jointly administered by Medical Services Administration and the Bureau of Maternal and Child Health, Michigan Department of Community Health (MDCH), is the largest program dedicated to serving Medicaid pregnant women and children in the state. MIHP provides support to promote healthy pregnancies, positive birth outcomes, and healthy infants.

The MIHP is administered by a network of certified provider agencies throughout the state in rural, urban, and native communities. Providers are located in private freestanding offices, hospital-based clinics, federally qualified health centers, and in local/regional public health departments. MIHP services include:

- evidence-based maternal and infant health and psychosocial assessments completed by registered nurses or social workers;
- comprehensive, individualized plans of care developed by teams comprised of RNs, licensed social workers, dietitians and infant mental health specialists;
- coordination of services between MIHP providers, medical care providers and Medicaid health plans; and
- interventions based on the participant's plan of care, which may include but are not limited to referrals for community services (e.g., mental health, substance abuse, domestic violence, basic needs assistance, referral to local childbirth education or parenting classes).

The Michigan Department of Community Health continually assesses and improves MIHP to meet the needs of Michigan residents while demonstrating value in the challenging economic environment.

## 2. STUDY BACKGROUND

In 2011, the Michigan Department of Community Health requested that Michigan State University propose a research plan for an evidence-based evaluation of MIHP effectiveness in promoting healthy pregnancies, positive birth outcomes, and healthy infants. A randomized trial was not feasible as Medicaid is an entitlement program and all insured pregnant women were eligible for MIHP. As a result, the research team proposed a quasi-experimental evaluation of the program. Unlike other home visiting program evaluations, some focusing on very small, selected samples, our evaluation was representative for the entire MIHP program and for the Michigan population of Medicaid-eligible pregnant women and infants.

The **objective** of this study was to provide a quasi-experimental evaluation of MIHP effectiveness. The study's specific research questions and the corresponding hypotheses were:

1. **How effective was MIHP in improving maternal health?** Our hypothesis was that MIHP improved maternal prenatal and postnatal health compared to Medicaid beneficiaries not participating in MIHP.
2. **How effective was MIHP in improving infant health?** Our hypothesis was that MIHP improved birth outcomes, infant health, infant care, and use of services in the first year of life.
3. **How effective was MIHP in improving infant safety?** Our hypothesis was that MIHP reduced injury visits in the first year of life.

We used the matched comparison group (MCG) as our quasi-experimental evaluation strategy. Our proposed evaluation design aimed to establish baseline equivalence on selected measures. The aim of MCG was to create a comparison group so that each case in the intervention group (MIHP participants) is matched with an equivalent comparison case. This eliminates observable differences between the two groups that might lead to inaccurate estimates of the intervention's effect. Unlike some of the existing matched comparison group studies that match comparison cases based on one or few characteristics, we used propensity score matching to compare MIHP participants to non-MIHP participants. Propensity score matching matches each individual in the MIHP intervention group to equivalent non-participants based on several characteristics.

This report summarizes the initial key findings emerging from a population-based quasi-experimental evaluation of MIHP impacts on maternal and infant health and health services utilization during pregnancy, at birth, and during the infant's first year of life among all Medicaid eligible pregnant women and infants in Michigan. We replicated the analyses in two distinct year-long birth cohorts and found that MIHP has favorable effects on both maternal and infant

health. We anticipate our findings and this report will meet the requirements for MIHP to be considered an “evidence-based program” as defined by the State of Michigan Legislature.<sup>1</sup>

### **3. METHODS**

#### Design

We designed the study according to the Department of Health and Human Services (DHHS) criteria for an “evidence-based early childhood home visiting service delivery model.”<sup>2</sup> The study had a quasi-experimental design and created matched comparison groups with baseline equivalence on a variety of characteristics. Subjects enrolled in MIHP were matched to non-participants based on similar characteristics. We selected matched comparison groups using propensity scores.

#### Study populations

All births in Michigan with both mother and infant covered by Medicaid in calendar years 2009 (62,052 singleton births) and 2010 (60,653 singleton births) were included in this study. Infant–mother pairs were constructed using an MDCH proprietary algorithm linking Medicaid beneficiaries with a Master Record Number. Mothers were followed-up from 3 months before conception, through pregnancy, at birth, and for the first 12 months postpartum (for those who maintained continuous Medicaid eligibility). The infants were followed up from birth through the first 12 months of their lives (for those who maintained continuous Medicaid eligibility postpartum).

#### Data sources

Data were assembled from the MDCH data warehouse. All Medicaid maternal medical claims, monthly Medicaid eligibility beginning 3 months prior to conception, during pregnancy, and through the first 12 months postpartum (for those who retained Medicaid eligibility), and other program participation (such as cash assistance) were linked to infant birth records, infant death records, monthly infant Medicaid eligibility, and infant medical claims for the first 12 months of life. Data were assembled for all births between 01/01/2009 and 12/31/2010.

### **4. RESULTS**

#### MIHP and maternal health

Women who enrolled in the MIHP had better prenatal and postnatal care compared to matched women who did not participate in the program:

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<sup>1</sup> Enrolled House Bill No. 5572, Act No. 291, approved by the Michigan Governor on Aug/1/2012.

<sup>2</sup> [http://homvee.acf.hhs.gov/HomVEE\\_Executive\\_Summary\\_2012.pdf](http://homvee.acf.hhs.gov/HomVEE_Executive_Summary_2012.pdf).

- MIHP participants were more likely to receive prenatal care; the results were replicated in both CY2009 and CY2010 birth cohorts. MIHP reduced the rate of women receiving no prenatal care by over two thirds compared to women not participating in MIHP (over 99% of MIHP women received prenatal care).
- MIHP participants who gave birth in CY2010 had higher odds of receiving adequate prenatal care compared to matched women not participating in MIHP; the results were replicated in both CY2009 and CY2010 birth cohorts
- MIHP participation increased the rate of women receiving appropriately-timed postnatal checkups by close to one fourth; results were replicated in both CY2009 and CY2010 birth cohorts

#### MIHP and infant health

Participants in MIHP had improved birth outcomes, and the infants enrolled in the program had a higher use of preventive health services compared to matched infants not participating in the program:

- MIHP reduced by one tenth the risk of infants to be born at low birth weight (LBW) in CY2010
- MIHP reduced by over one fourth the risk of infants to be born at very low birth weight (VLBW) in both CY2009 and CY2010
- MIHP reduced by one fifth the risk of extreme prematurity in CY2009
- MIHP reduced by 4% the risk of birth between 37-39 weeks gestation age in CY2010
- MIHP infants were born at increased weights and longer gestational ages compared to infants born by matched women not participating in MIHP
- MIHP had a strong favorable effect in increasing the likelihood of infants receiving any well-child visits over the first year of life by 3% (to over 97% in CY2010 and over 96% in CY2009)
- MIHP had a strong favorable effect in increasing the likelihood of infants receiving the appropriate number of well-child visits over the first year of life by approximately 5% (to over 92%) in both CY2010 and CY2009.

#### MIHP and infant safety

MIHP did not reduce the rates and counts of infant injury visits in the first year of life.

## **5. DISCUSSION**

The impacts that emerged from the initial evaluation of MIHP are encouraging. There was a pattern of significant favorable effects across a range of maternal and infant outcomes. The

favorable impacts began during pregnancy, continued at birth, and were sustained through the first year after birth. Most of the favorable maternal and infant MIHP effects were replicated in two successive population cohorts consisting of all Medicaid eligible infants born in 2009 and 2010 and their mothers.

MIHP reduced the risk of receiving no prenatal care by over two thirds (over 99% of MIHP women received prenatal care). In addition, MIHP increased the rates of participants receiving an appropriate postpartum care visit by close to one fourth. These findings were consistent with the role of the MIHP case manager to coordinate care with the participant's medical care provider and Medicaid Health Plan and remove barriers to participation in care. To our knowledge, there are no prior rigorous evaluations, including randomized controlled trials (RCT) or quasi-experimental analyses that found significant positive effects of home visiting programs on the use of prenatal care.

MIHP participation reduced by over one fourth the rates of very low birth weight (in both CY2009 and CY2010) and by one tenth the rates of low birth weight (in CY2010). These were consistent with the program's intent to assist women in meeting their families' basic needs, improving nutrition, and reducing risk behaviors. There were positive MIHP effects in reducing the rate of extreme prematurity in the 2009 cohort by one fifth and the rate of births at 37-39 weeks in the 2010 cohort. Only three RCTs (and no quasi-experimental studies) focusing on small samples consisting mostly of minority women found positive effects on birth weight for infants of women who participated in prenatal home visiting compared to those who did not. No RCT and no quasi-experimental study found effects of prenatal home visiting on reducing prematurity.

There were strong improvements in both 2009 and 2010 populations for infant use of preventive health services compared to those not participating in the program. These included presenting for well-child visits and having the appropriate number of such visits over the first year of life. These results were consistent with our findings of improvements in maternal health care utilization and the role of MIHP case manager. The findings were robust to potential unobserved confounders. Our favorable findings on infant use of preventive services were consistent with prior research literature evaluating other home-visiting programs. RCT evaluations of the Healthy Steps home visiting program and the Healthy Families San Diego program, increased the likelihood to present for and the number of well-child visits. Our finding that the rates and counts of infant injury visits in the first year of life were not reduced by MIHP are similar to other programs, including a Healthy Family America assessment and a recent quasi-experimental Nurse Family Partnership evaluation.

## Overview of key maternal and infant improvements for MIHP participants

Characteristic	Description of improvement(s)
Maternal care	<p>Women participating in MIHP were more likely to present for any prenatal care and had an improved adequacy of prenatal care through pregnancy.</p> <p>Women participating in MIHP were much more likely to present for appropriate postnatal checkups.</p>
Infant health	<p>Infants in MIHP had reduced rates of low birth weight, very low birth weight, extreme prematurity, and birth at 37-39 weeks gestation.</p> <p>Infants in MIHP were more likely to present for any well-child visits and were also more likely to present for the appropriate number of well-child visits.</p>

This quasi-experimental evaluation of MIHP had several distinct strengths. First, the propensity score matching study design was rigorous. Second, it included two population-based statewide birth cohorts. Third, by linking births to pregnancies and to the postpartum period, including multiple sources of data, we were able to analyze multiple maternal and infant health outcomes. Fourth, we included analyses of the robustness of our findings to the possibility of unobserved confounders. The limitations were those inherent to administrative data (i.e., potential inaccuracies due to the inability to validate diagnostics by reference to medical records, potential under-diagnosing of some diseases, and somewhat limited sociodemographic characteristics). In addition, our matching was limited to observable characteristics documented in our dataset, which allowed for the possibility of unobserved bias.

To conclude, this is, to our knowledge, the first statewide population-based matched-group evaluation of a prenatal and postnatal home visiting program that found favorable effects on prenatal care and birth outcomes. Overall, MIHP had significant favorable effects across a range of maternal and infant outcomes. Specifically, MIHP demonstrated increased prenatal care use and adequacy, improved birth outcomes, maternal postnatal care, and infant use of preventive services. Most of the favorable effects were large and robust to the possibility of bias due to unobserved confounders. This pattern of findings is promising because it includes positive impacts identified by previous research literature as important for future maternal and child health. Pregnancy and perinatal maternal health can have long-lasting effects on the health of the woman. Better birth outcomes and improved infant health can have lifelong effects in improving child health, development, school performance, and other outcomes later in life. Future research will include analyses of program effectiveness in various subgroups, including the effects of MIHP among early enrollees in the program, African-American participants,

primiparous women, and young mothers. The evaluation work is continuing, and will be updated with the most recent birth cohorts as data become available.

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Cristian I. Meghea, PhD<sup>1,2</sup>, LeeAnne Roman, MSN, PhD<sup>2</sup>, Stacey A. Duncan-Jackson, MPA, RN, BSN<sup>1</sup>, Jennifer E. Raffo, MA<sup>2</sup>, Debra Darling, RN, BSN<sup>1</sup>, Qi Zhu, MA<sup>1</sup>

<sup>1</sup>Institute for Health Policy, Michigan State University, East Lansing, MI 48824

<sup>2</sup>Department of Obstetrics, Gynecology, and Reproductive Biology, Michigan State University, East Lansing, MI 48824