The Maternal and Infant Health Program (MIHP): Impact on healthcare utilization and birth outcomes

Cristian Meghea, PhD
Michigan State University
College of Human Medicine
Institute for Health Policy and
Department of Obstetrics, Gynecology and Reproductive Biology
Co-authors

- **Jennifer Raffo, MA** - Michigan State University, Department of Obstetrics, Gynecology and Reproductive Biology
- **Qi Zhu, MA** - University of Michigan, SRO Technical Service
- **Lee Anne Roman, MSN, PhD** - Michigan State University, Department of Obstetrics, Gynecology and Reproductive Biology

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MIHP Evaluation Program: Healthcare Use and Birth Outcomes

• Objective 1: Examine effects of MIHP on birth weight and gestational age, particular interest in racial differences (Black women who are at greater risk)
• Objective 2: Examine effects of MIHP on birth weight and gestational age, particular interest in racial differences (Black women who are at greater risk)
• Issues of program selection bias, content and timing and dosage of service
• Randomization not possible (population eligibility)
• Quasi-experimental evaluation
Background

- Home visiting (HV) is a service delivery strategy used to provide a broad set of services to families with pregnant women and young children.
- Issues addressed: access to services, maternal and child health, safe home environments, and parenting.
- In general, the participants are low-income and other at-risk groups with worse health outcomes and underutilization of services.
- There is a need for evidence of the effectiveness of HV programs (including the 2010 Patient Protection Affordable Care Act and state legislation).
Maternal and Infant Health Program - MIHP

• Medicaid covers 40% of the births in the U.S. and 45% of the births in Michigan

• The Maternal and Infant Health Program (MIHP) is a population-based HV program available to all Medicaid-eligible pregnant women and infants aged ≤1 year in Michigan

• MIHP provides support to promote healthy pregnancies, positive birth outcomes, and healthy infants.

• MIHP supplements medical prenatal and infant care through home-based care coordination, referrals, and interventions based on individual care plans
Maternal and Infant Health Program - MIHP

- Services are provided by nurses and social workers
- MDCH strengthened the content of the program by integrating evidence-based strategies
- Standardized protocol – matching strategies/interventions to specific risks (e.g. smoking and MI)
- 30% participation in MIHP
- Medicaid women and infants: disadvantaged vs. privately-insured population
What’s known and what’s new

• Many of the prior rigorous evaluations of HV programs were small sample RCT

• Prior evaluations not easy to generalize in diverse populations (race, gravidity) – our study, all Medicaid pregnant women in MI

• Most statewide programs evaluations: selection bias

• This evaluation: rigorous quasi-experimental, statewide HV program, diverse population
Research Questions

1. Was MIHP effective in improving maternal and infant healthcare utilization among Medicaid beneficiaries?

2. Was MIHP effective in reducing the risk for adverse birth outcomes among Medicaid beneficiaries and were there differences by race?
Population and data

• The cohort of singleton Medicaid-insured births between January 1, 2010 and December 31, 2010 in Michigan
• Data obtained through Michigan Department of Community Health (MDCH) data warehouse from MDCH
• Data for this cohort of mother-infant pairs: all birth records, Medicaid maternal and infant claims during pregnancy and 1st year of life, and monthly Medicaid eligibility from 3 months prior to conception until 1st year
• Data also included other program participation (such as cash assistance).
• N = 60,653 mother-infant pairs with complete information
Matching baseline covariates

- Maternal age at birth, marital status, race/ethnicity, smoking status during pregnancy, first-time pregnancy, and repeat pregnancy within 18 months were included in the matching process.
- Two SES measures: 1) income at ≤33% of the federal poverty level (FPL) and 2) Medicaid eligibility before pregnancy (<63% FPL vs 63%-185% FPL).
- Maternal chronic conditions: asthma, diabetes, and hypertension
Objective 1: MIHP exposure

- Yes if any MIHP reimbursement Medicaid claim (FFS) was present during pregnancy
- No otherwise
Objective 1: Analyses

- Propensity score = predicted probability of MIHP participation
- One-to-one random-sort nearest-neighbor matching without replacement, within a 0.2 SD caliper
- To test the MIHP effects, conditional logistic regressions were used to compare outcomes in MIHP group and matched nonparticipant group
- Upon matching, all baseline covariates were matched (one exception: county of residence)
- Hidden bias assessment
## Results: baseline equivalence

<table>
<thead>
<tr>
<th>2010 Medicaid birth cohort in MI</th>
<th>MIHP N=18,798</th>
<th>All not in MIHP N=41,855</th>
<th>Matched not in MIHP N=16,044</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>25.3</td>
<td>26.7</td>
<td>25.5</td>
</tr>
<tr>
<td>Smoked during pregnancy</td>
<td>30.64</td>
<td>28.42</td>
<td>30.74</td>
</tr>
<tr>
<td>White</td>
<td>51.22</td>
<td>65.91</td>
<td>50.38</td>
</tr>
<tr>
<td>Black</td>
<td>38.04</td>
<td>23.38</td>
<td>39.38</td>
</tr>
<tr>
<td>&lt;18 months from prior pregnancy</td>
<td>24.69</td>
<td>26.57</td>
<td>25.62</td>
</tr>
<tr>
<td>First pregnancy</td>
<td>39.32</td>
<td>31.53</td>
<td>36.38</td>
</tr>
<tr>
<td>Income ≤33% FPL</td>
<td>17.89</td>
<td>10.66</td>
<td>17.06</td>
</tr>
<tr>
<td>Medicaid before pregnancy (≤63%–150% FPL)</td>
<td>65.57</td>
<td>53.17</td>
<td>63.84</td>
</tr>
<tr>
<td>Marital status</td>
<td>33.17</td>
<td>21.88</td>
<td>33.23</td>
</tr>
</tbody>
</table>

Also included chronic disease indicators: asthma, diabetes, hypertension
Results: the effect of MIHP

• 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.

• Maternal Postnatal Care: Mothers enrolled in MIHP were more likely to present for an appropriate postnatal checkup.

• Infant Care: 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.
## Results: the effect of MIHP

### MIHP vs. matched controls

<table>
<thead>
<tr>
<th>2010 Medicaid birth cohort in MI</th>
<th>MIHP N=16,044</th>
<th>Matched not in MIHP N=16,044</th>
<th>Odds Ratios</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maternal prenatal and postnatal care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No prenatal care</td>
<td>0.83</td>
<td>2.56</td>
<td>0.34*</td>
<td>68%</td>
</tr>
<tr>
<td>Adequate prenatal care (Kotelchuck index)</td>
<td>39.60</td>
<td>38.16</td>
<td>1.06*</td>
<td>4%</td>
</tr>
<tr>
<td>Adequate or adequate plus prenatal care (Kotelchuck Index)</td>
<td>64.75</td>
<td>63.46</td>
<td>1.06*</td>
<td>2%</td>
</tr>
<tr>
<td>Appropriate postnatal checkups</td>
<td>50.14</td>
<td>41.14</td>
<td>1.50*</td>
<td>22%</td>
</tr>
<tr>
<td>Mother enrolled in postnatal Plan First!</td>
<td>12.19</td>
<td>11.13</td>
<td>1.14</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Infant care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any well-child visits</td>
<td>97.02</td>
<td>94.54</td>
<td>1.70*</td>
<td>3%</td>
</tr>
<tr>
<td>Appropriate number of well-child visits</td>
<td>92.18</td>
<td>89.67</td>
<td>1.47*</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Significantly different than zero at the 0.05 level, two-tailed test (p<0.05)
Results: vs. previous research literature

- Prenatal Care: Prior RCTs of other home-visitation programs did not find positive effects on the use of prenatal care
- Maternal Postnatal Care: there are no prior RCT or quasi-experimental evaluations of the effects of home visitation programs on the receipt of appropriate postnatal care
- Infant Care: consistent with RCT evaluations of other home-visitation programs
More on results

• The favorable MIHP effects are consistent with the roles of the MIHP case manager coordinating care with the medical care provider and Medicaid Health Plan and removing barriers to participation in care.

• Most of the favorable MIHP effects were robust to potential unobserved confounders (large unobserved bias needed to invalidate findings).
Objective 2: MIHP effects on birth outcomes

Research question #2:
• Was MIHP effective in reducing the risk for adverse birth outcomes among Medicaid beneficiaries and were there differences by race?
Methods

• Same population, same propensity score matching analyses, same baseline covariates
• Outcomes: preterm, LBW, very preterm, VLBW
• Separate analyses by race: women who are Black (higher risk of adverse outcomes) and others
Methods – MIHP exposure

• To account for timing: enrolled/screened in MIHP in 1\textsuperscript{st} or 2\textsuperscript{nd} trimester
• To account for timing/dosage: enrolled/screened in 1\textsuperscript{st} or 2\textsuperscript{nd} trimester plus 3 additional contacts
• Sensitivity analysis (hidden bias)
Avoiding over-estimation of MIHP effects

• All in MIHP vs. matched non-participants: over-estimates the MIHP effects
• Reasons include: late-enrolled women more likely to carry pregnancy past the preterm threshold
• A very narrow window for any interventions for the late-enrolled
• As a result: presented analyses excluded 3rd trimester MIHP enrolled women
## Results

### Women enrolled in MIHP 1\textsuperscript{st} or 2\textsuperscript{nd} trimester vs. matched controls

<table>
<thead>
<tr>
<th>2010 Medicaid birth cohort in MI</th>
<th>All races N=24,750</th>
<th>Blacks N=9,446</th>
<th>Other races N=15,304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low birth weight</td>
<td>0.94 (0.87,1.03)</td>
<td>0.93 (0.82,1.05)</td>
<td>0.96 (0.85,1.09)</td>
</tr>
<tr>
<td>Very low birth weight</td>
<td>0.83 (0.68,1.01)</td>
<td>0.76 (0.59,0.97)</td>
<td>0.97 (0.71,1.34)</td>
</tr>
<tr>
<td>Preterm</td>
<td>0.97 (0.89,1.05)</td>
<td>0.92 (0.82,1.03)</td>
<td>1.03 (0.92,1.15)</td>
</tr>
<tr>
<td>Very preterm</td>
<td>0.88 (0.75,1.04)</td>
<td>0.68 (0.54,0.85)</td>
<td>1.21 (0.94,1.54)</td>
</tr>
</tbody>
</table>

*Significantly different than zero at the 0.05 level, two-tailed test (p<0.05). OR (95% CI)
## Results

**Women enrolled in MIHP 1\textsuperscript{st} or 2\textsuperscript{nd} trimester and at least 3 additional contacts vs. matched controls**

<table>
<thead>
<tr>
<th>2010 Medicaid birth cohort in MI</th>
<th>All races N=15328</th>
<th>Blacks N=6126</th>
<th>Other races N=9202</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low birth weight</td>
<td>0.77* (0.69,0.87)</td>
<td>0.76* (0.65,0.89)</td>
<td>0.78* (0.66,0.93)</td>
</tr>
<tr>
<td>Very low birth weight</td>
<td>0.41* (0.31,0.56)</td>
<td>0.42* (0.30,0.61)</td>
<td>0.38* (0.22,0.66)</td>
</tr>
<tr>
<td>Preterm</td>
<td>0.74* (0.67,0.82)</td>
<td>0.71* (0.61,0.83)</td>
<td>0.77* (0.66,0.89)</td>
</tr>
<tr>
<td>Very preterm</td>
<td>0.49* (0.38,0.62)</td>
<td>0.41* (0.30,0.57)</td>
<td>0.63* (0.43,0.91)</td>
</tr>
</tbody>
</table>

*Significantly different than zero at the 0.05 level, two-tailed test (p<0.05). OR (95% CI)*
Result for women who are Black

Enrolled in 1\textsuperscript{st} or 2\textsuperscript{nd} Trimester

- 24\% reduction of risk for very LBW
- 32\% reduction of risk for very preterm

Enrolled in 1\textsuperscript{st} or 2\textsuperscript{nd} Trimester; \(\geq 3\) contacts:

- 24\% reduced risk for LBW
- 58\% reduced risk for very LBW*
- 29\% reduced risk for preterm
- 59\% reduced risk for very preterm*

(*most robust)
Results for women who are not Black

Enrolled in 1\textsuperscript{st} or 2\textsuperscript{nd} Trimester; \(>= 3\) contacts:

- 22% reduced risk for LBW
- 62% reduced risk for very LBW
- 23% reduced risk for preterm
- 37% reduced risk for very preterm
Limitations

- Matching was limited to characteristics in data
- Other selection factors unmeasured could affect our findings
- Women receiving our proposed dosage could be a select group with longer pregnancies (although 96% women had dosage by 37 weeks gestation)
Results: vs. previous research literature

- Consistent with several randomized controlled trial evaluations that found participation in prenatal home visiting programs had positive effects on birth weight and stronger effects for women enrolled in the first trimester and for Black women.
- Most state program evaluations: selection bias, no timing/dosage.
- Iowa study (Slaughter et al, MCHJ 2013): LBW reduced when receiving moderate/high prenatal care management contacts (PSM adjusted, not matched).
Research Implications

- Research is needed to understand:
  - How specific mechanisms are related to birth outcomes
  - How dose of services based on level of risk affects outcomes
  - Content of MIHP services
Program Implications

• Increase engagement of women in MIHP services; only 30% of women participate in Michigan
• Increase awareness of value of the program for providers
• Increase the number of women that enroll in 1\textsuperscript{st} or 2\textsuperscript{nd} Trimester (77%)
• Increase the number of women that enroll/screened early and receive a minimum of 3 additional visits (48%)
Conclusions

• Strong evidence for the effectiveness of a Medicaid-sponsored population-based home-visitation program in improving maternal prenatal and postnatal care and infant care.

• Strong evidence for the effectiveness of a Medicaid-sponsored population-based home-visitation program in reducing risk of adverse birth outcomes

• Benefits are especially noted for Black women, at higher risk for adverse outcomes

• Timing (1 or 2\textsuperscript{nd} trimester) and dosage (enrollment/screening and 3 + contacts) matters
Conclusions

- State-wide Medicaid programs can achieve improvement in health outcomes
- Especially relevant as Medicaid covers a large proportion of pregnancies and births in the U.S., a disadvantaged group.
- Important to consider as the federal healthcare reform is implemented and states undertake decisions on the expansion of the Medicaid program and evaluate the evidence-based status of home visiting programs.
References and Contact Information


Contact: Cristian I. Meghea, PhD
E-mail: Cristian.Meghea@hc.msu.edu

Michigan Department of Community Health (MDCH) Maternal and Infant Health Program (MIHP) web page: www.michigan.gov/mihp