

Mother and Infant Home Visiting Program Evaluation (MIHOPE) Cost Analysis Plan

September 21, 2015

This memo reviews our plans for two types of cost analyses — one type that will be included in the implementation report and another type that will be included in the impact report. Specifically, the implementation report will include a section that presents information on the cost per MIHOPE family and an aggregate cost per home visit across all sites. The impact report will include a section that brings together these costs per family with the estimated program impacts per family for an estimate of the cost-effectiveness of home visiting. This cost-effectiveness analysis will include an estimate of the effects of home visiting on health care costs, helping to address the legislative requirement that the evaluation analyze the effects of the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program on health care costs.

The memo is divided into two main sections that describe the analysis plan for the cost analysis to be presented (1) as part of the implementation report, and (2) as part of the impact report. Within each of these main sections, we present three types of information: (1) the data sources we use to construct the cost measure; (2) the specific steps we will take to estimate the measure; and (3) limitations of the measure.

Questions for the Committee

We welcome the Committee members' thoughts on all aspects of the plan, but in particular would appreciate input and advice on the following:

- Does the proposed plan for estimating *per family cost* and *per home visit cost* correspond to questions about cost that policymakers and practitioners are most interested in, and that MIHOPE has a unique opportunity to address?
- Does the proposed plan for estimating *cost-effectiveness* correspond to questions about cost-effectiveness that policymakers and practitioners are most interested in, and that MIHOPE has a unique opportunity to address?
- We plan is to estimate cost-effectiveness overall for each confirmatory outcome and each confirmatory subgroup for these outcomes. Does the Committee agree with this plan?
- We propose to analyze cost difference by national models, across sites, and by other characteristics (family or parent) as determined by the implementation team. Does the Committee recommend other types of cost differences that we should analyze?

Implementation Report: Analysis Plan for Estimating Cost per Family and per Home Visit

We plan to calculate two types of cost estimates for the implementation report:

- The total cost per family over a 12-month horizon after entry into a home visiting program
- The aggregate cost per home visit conducted, which will include a breakdown of site expenditures by resource category

Data sources

These cost analyses will be estimated based on data from two sources:

- Family service information for all families from the weekly logs completed by home visitors and supervisors at each MIHOPE site. These logs record what happened in home visits during that week.
- Actual program expenditures, number of families served, and home visits conducted for two fiscal years provided by staff at each MIHOPE site.

Steps for producing the estimates

We propose to use the following three-step process to calculate cost estimates per family and per home visit: (1) estimate family-level direct costs; (2) estimate aggregate site-level costs per home visit and a site-level estimate of the ratio of nondirect to direct aggregate costs; and (3) estimate total family-level costs. We describe each of these steps in more detail below.

Step 1: Estimate family-level direct costs

We will take a micro-costing approach to estimating direct costs, in which resources (personnel, materials, travel) are collected and valued for each family and summed to create an individualized estimate of direct service utilization and cost.¹ To facilitate a comparison across families and for comparability with the rest of the study, we will develop a family's direct cost estimate for the first 12 months the family could have received services from the home visiting program. Some families will have received services during the entire period while others will have dropped out and only received services for a shorter period. For the subset of families that could have remained in a program for more than 12 months, we will present a supplemental set of cost estimates covering the time until the child reaches 15 months old.

To estimate family-level direct costs, we will first **collect information on direct resources required for each family**. As mentioned above, MIHOPE is collecting information about the direct resources required for each family using a weekly log system at each site. Home visitors complete the log for each individual MIHOPE family they serve on a weekly basis with

¹Calculating the Costs of Child Welfare Services Workgroup, 2013.

responses specific to in-person contact, remote contact, and other activities related to the delivery of direct services. The specific variables of interest in the weekly log system that will be used for this cost analysis include (1) the number of home visits to the family; (2) materials provided to the family; (3) and the time spent preparing for home visits, in home visits, traveling for home visits, communication, and contact with families by other staff (such as clinical consultants).

Second, we will **estimate the direct service costs**. The total family-level direct service costs will be the sum of (1) the costs of materials provided to the family, (2) the value of home visitor and other staff time, and (3) the cost of transportation for all home visits recorded in the first 12 months following enrollment. To value the costs of materials provided to families, the home visitor reports an estimate in the weekly log. To value the time reported in the logs, our team has collected wage information for all home visitors and supervisors completing the logs at each site. The value of all direct service related to time will be estimated as the product of “hours of time” and “hourly wage”. To value the costs of travel for home visits, we will multiply the number of home visits reported by the cost per home visit conducted. This cost will be determined uniquely for each site. The calculations of direct service costs per family will use the same dosage information (that is, number of home visits) that is used in the other parts of the implementation report, to ensure consistency and comparability across these parts of the study.

Step 2: Estimate aggregate costs per home visit and a ratio of non-direct to direct aggregate costs per site

From each site, we are collecting two years of annual expenditure data and annual number of home visits provided during the same period. From these data, we will estimate (1) aggregate costs per home visit conducted, and (2) a ratio of non-direct to direct aggregate costs. The aggregate costs per home visit conducted across sites will be presented by major resource categories such as personnel, space, supplies, and materials. Aggregate costs will not be presented for individual sites by name, but rather we will present distributions across the sites and estimates by national model or other local program characteristics. The expenditure data will also be used to develop an estimate of family-level non-direct costs by separating those expenditures that are already captured in the weekly logs (direct costs for home visits) versus all other expenditures (non-direct costs for administrative time and overhead expenditures). For each site, we will estimate a ratio of non-direct to direct aggregate expenditures. This ratio will indicate how many additional dollars are needed in administrative time and overhead costs (non-direct costs) to support the delivery of home visits (direct costs).

The first part of this process is to **collect aggregate expenditures**. During 2014, all sites were asked to provide the research team with annual expenditure data aligning with a fiscal or calendar year. Eighty-one percent in full compliance with this request. The majority of sites that reported expenditures (90 percent) did so for the entire home visiting program regardless of the funding stream, because most indicated that it would be easiest to provide full program data rather than providing costs for a subset of families — that is, families funded by MIECHV.

The other sites chose to provide costs for only MIECHV-funded families because the cost of the full program could not be shared externally or calculation of the full program costs was not feasible. In these cases, our team worked with each site to ensure that they accounted for all

resources needed to serve those families and that important cost categories were not omitted. For example, a portion of the salary of the program director would be included in proportion to his or her time spent on administrative tasks relative to the MIECHV-funded families. Similarly, a portion of all space-related costs would be included in proportion to the amount of space used by the home visiting program (or subset of the home visiting program). The majority of these sites indicated that allocation percentages based on intensity of service to different parts of the program were already made internally for all expenditure components of the program, including personnel and space.

In 2015, all sites have been requested to provide the research team with annual expenditure data for a second year.

Second, we will **estimate aggregate costs per home visit**. Specifically, annual expenditure data across two years will be averaged and adjusted for inflation to a common base year using the Consumer Price Index. Site-level expenditures will be further categorized by common budget categories such as personnel, space, supplies, and equipment. To estimate costs per home visit, we will take these data and divide by the average number of home visits delivered during the same time. These costs will be presented both as aggregate site totals and by the budget categories mentioned above. Basic summary statistics (mean, median, range, and standard deviation) will be estimated to determine trends across national models, sites, and other characteristics as determined by the implementation team.

Finally, we will **estimate a ratio of non-direct to direct aggregate costs per site** by categorizing site-level expenditures by administrative activities versus direct program delivery activities. This site-level ratio can then be used in Step 3 to estimate non-direct site-specific costs per family.

Step 3: Estimate total family-level costs

The total cost per family will be estimated by combining two pieces of information:

- The direct cost of home visiting services estimated for each family using the weekly log data and home visitor-specific wage data (Step 1)
- The non-direct costs of home visiting estimated for each site from the program expenditure data (Step 2)

The family-level non-direct cost estimate will be added to the family-level direct costs to derive the total cost of home visiting for each family.

Program or family characteristics that predict differences in dosage will be important for understanding program costs, since there is a direct relationship between dosage and costs for a given family. Some other differences in local programs may not affect dosage per se, but may be important determinants of program costs because of differences in hourly wages across different types of staff. These program features include, for example, differences in the use of paraprofessional versus professional staff, or in the use of clinical consultants for families with particular service needs.

Basic summary statistics (mean, median, range, and standard deviation) will be estimated to determine trends across national models, sites, and other characteristics as determined by the implementation team. The programmatic and family-level characteristics for which costs are presented will follow those for whom differences in service delivery are examined in earlier chapters of the MIHOPE implementation report. After costs per family are assessed, we may examine other cost differences between subgroups, based on analysis plans developed with the rest of the MIHOPE team.

Limitations of the cost analysis

There are three main limitations of this cost analysis:

First, to minimize the data collection burden for sites, we did not ask for (1) a list of donated resources or (2) a list of equipment that may have been purchased in the past to annuitize to the present. Therefore, with respect to the donated resources, this cost analysis is focused on local financial costs (expenditures) only, rather than economic opportunity costs. Opportunity costs provide a more complete picture of the resources needed to administer and deliver a program.² For example, opportunity costs would include donated resources, including volunteer time and other in-kind donations. Further, the total cost of all resources needed to produce home visits may go beyond local site expenditures (for instance, training or technical assistance provided by a state agency or by the national program model but not charged to the local program). Additionally, with regards to past equipment purchases, we were careful to ask sites about any major capital expenditures that may have been made during their cost period and suggested that they inform us of these expenditures. The cost information sent to us so far does not include any large capital expenditures. A recent cost analysis of home visiting programs found that only 1 percent of total annual costs fell into the capital expenditures category.³

Second, unlike capital expenditures, many sites report that their cost period included more training of new hires than is typical because of program expansion from the addition of MIECHV funding. We plan to exclude these one-time trainings from our annual estimates so that costs of newly hired home visitors do not skew the cost estimates for sites. Rather, we will present the costs of training new employees separately.

Finally, we may not receive costs from all sites for this analysis. We are currently in the second year of cost data collection and are hoping to have at least one year of cost data from each site. When the second year of data is available, if site cost data are incomplete, we will investigate whether there are differences between reporting and nonreporting sites. In addition, the MIHOPE sites as a whole may not be a fully representative sample of home visiting sites across the country. The cost estimates from this study represent costs of MIHOPE home visiting programs for families who enroll when they are expectant or their youngest child is under 6 months of age.

²Haddix, Teutsch & Corso, 2003.

³Burwick, Zaveri, Shang, Boller, Daro & Strong, 2014.

Impact Report: Analysis Plan for Estimating Cost-Effectiveness

We plan to include an estimate of the cost-effectiveness of home visiting in the impact report. Cost-effectiveness analysis is an analytic tool to compare costs and outcomes of one intervention (such as the MIHOPE program group) relative to a condition that is either the status quo (such as the MIHOPE control group) or another treatment (such as another home visiting program).

Data sources

The cost-effectiveness analyses will be conducted using data from the following sources:

- Family service information for all families from the weekly logs completed by home visitors and supervisors at each MIHOPE site
- Actual program expenditures, number of families served, and home visits delivered for two fiscal years provided by each MIHOPE site
- Medicaid claims
- Follow-up surveys of families
- Published studies and national estimates of home visiting service costs
- Administrative data and other sources for measuring program impacts⁴

Steps for producing the estimates

Cost-effectiveness will be estimated with the following ratio: NET COST / IMPACT.

These terms will be defined as follows:

$$NET\ COST = a + b + c$$

where

$$\begin{aligned} a &= \text{Costs of home visiting for program group} - \text{Costs of home visiting for control group} \\ b &= \text{Costs of other services for program group} - \text{Costs of other services for control group} \\ c &= \text{Costs of health care for program group} - \text{Costs of health care for control group} \end{aligned}$$

$$IMPACT = \text{Outcome Y for program group} - \text{Outcome Y for control group}$$

Step 1: Estimate net costs

An important aspect of the cost-effectiveness analysis is its presentation of net costs, or costs of the intervention less the costs that would have been experienced in the absence of the intervention. Just as the impact estimates compare average outcomes for program group members with average outcomes for control group members (discussed further below in Step 3), the net cost estimate compares, to the extent possible, the costs of all services for program group

⁴The Impact Analysis memo to the Committee provides detail on these data sources.

families with costs of all services for control group families. In MIHOPE, the costs we aim to estimate for both groups are those for (1) home visiting, (2) other services in the community, and (3) health care reimbursed through Medicaid.

First, we will **estimate net costs of home visiting services**. Costs of home visiting services for program group families will be estimated as described in Step 3 above from the implementation report. Control group members may have incurred home visiting services costs if they received home visiting services from another source during the study. Families in the study at the 15-month follow-up will report receipt of home visiting services outside of the study. Costs per family for these services will be obtained from either published sources or program developer estimates.

Next, we will **estimate net costs of other services**. Home visitors may refer a family to services other than home visiting that may also have an impact on family outcomes, and control group members may access these kinds of services on their own. As with control group home visiting costs, we will rely on national estimates to estimate the costs per person for sample members who report in the 15-month follow-up survey that they have used services other than home visiting that are available in the community.

Finally, we will **estimate net costs for medical services**. Medicaid claims are being collected for families who are enrolled in the study and will allow us to estimate the medical costs for families during participation in the study. The medical costs for families in fee-for-service health plans will be the sum of actual claims collected by the research team. For other families, we will have data on the use of particular medical services and will estimate the costs of those services to arrive at total medical costs.

Step 2: Estimate impacts

The impact chapters of the final report will present impact estimates for each confirmatory outcome and for any subgroups that will be used in the cost-effectiveness analysis.

Step 3: Estimate cost-effectiveness

A cost-effectiveness analysis provides a summation of costs relative to, in typical cases, a single impact or outcome Y . In MIHOPE, the program may affect a number of outcome domains, and 13 specific primary outcomes have been proposed. Given the range and number of outcomes in MIHOPE, we do not think it is appropriate to choose only one of these outcomes and compare the program impact on that outcome to a measure of costs. Instead, we propose to discuss the program's cost-effectiveness by comparing costs separately to each of the 13 confirmatory outcomes identified in the impact report.

This set of results is likely to be of particular interest if costs and/or impacts vary considerably for different subgroups of families, providers, or national models. Conducting this type of analysis will allow us to answer questions such as, "Do families who cost the most to serve also accrue the most benefit by the 15th month of follow-up?" or "Do local programs with

more expensive features have greater returns on investment by the 15th month of follow-up, relative to local programs with less expensive features?”

Limitations of the cost-effectiveness analysis

The proposed cost-effectiveness analysis has two major limitations.

First, we will have a summary measure of net program costs, but the net cost estimate will be compared to a number of different program impacts, making it difficult to draw summary conclusions. For example, we may find that serving a particular subgroup of families (say, first-time mothers) costs more than serving their counterparts (mothers who are not first-time mothers), but each of the two groups might exhibit larger impacts than their counterparts in some domains and smaller impacts in others. This kind of mixed result would make it difficult to draw summary conclusions about the program’s relative cost-effectiveness for the two groups.

Second, cost-effectiveness analysis is limited to the time horizon over which impacts are assessed, unless there are credible epidemiologic models to tie short-term impacts to long-term impacts. In the MIHOPE study, the 15-month analytic horizon for the assessment of impacts will be used for the cost-effectiveness analysis, thus potentially undervaluing the longer-term benefits of the intervention.

Both of these limitations could be addressed by using a full benefit-cost framework to analyze program costs and benefits. In a benefit-cost analysis, all impacts are included in a summary analysis, even across domains such as health and education, by assigning monetary values to each impact. Further, benefit-cost analysis often includes modeling to project benefits of programs over the lifetime of the participant. However, it would be premature to conduct a full benefit-cost analysis for MIHOPE at the 15-month follow-up because it would be quite difficult (and speculative) to project impacts into the future. If there were additional impact data available as children grow older, conducting a benefit-cost analysis would offer a potentially stronger economic evaluation methodology.

References

- Burwick, Andrew, Heather Zaveri, Lisa Shang, Kimberly Boller, Deborah Daro, and Debra A. Strong. 2014. *Costs of Early Childhood Home Visiting: An Analysis of Programs Implemented in the Supporting Evidence-Based Home Visiting to Prevent Child Maltreatment Initiative*. Princeton, NJ: Mathematica Policy Research.
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- Haddix, Anne C., Steven M. Teutsch, and Phaedra S. Corso. 2003. *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation*. 2nd Edition. New York: Oxford University Press.