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Planning for a Pay for Outcomes Approach in Home Visiting

A Review of Research to Inform Maternal, Infant, and Early Childhood Home Visiting Outcome Selection, Projected Savings, and Pricing

Module 3: Economic Value of Outcomes in Non-Home Visiting Research

OPRE Report 2020-90

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Module 3: Economic Value of Outcomes in Non-Home Visiting Research

OPRE Report 2020-90

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Introduction

Pay for outcomes (PFO) is a payment model that promotes innovative financing for social initiatives, connecting funding to outcomes and cost savings. The Bipartisan Budget Act of 2018 (Public Law 115–123, Section 50605) allows Maternal Infant and Early Childhood Home Visiting (MIECHV) Program awardees to pursue PFO arrangements. PFO can help awardees expand services, improve outcomes, reach new or underserved populations, and/or engage new stakeholders. This resource provides information to inform PFO feasibility studies and PFO project development, including outcome selection, projected savings, and outcome payment pricing for financial agreements. **Module 3 summarizes the economic value of related outcomes in research beyond home visiting studies.**

Purpose of this resource

One of the first steps in a PFO feasibility study (see Introduction) is to identify outcomes to be monetized. This resource provides information about existing studies and reports to inform decisions about outcomes, but it does not walk through how to conduct a PFO project.

- *Introduction* provides background information on PFO and feasibility studies.
- *Module 1: Overview of Outcomes Demonstrated in Home Visiting Studies* presents an in-depth scan of home visiting outcomes achieved by model.
- *Module 2: Economic Value of Home Visiting Outcomes* details monetary values researchers have used to establish savings in home visiting return on investment analyses.
- *Module 3: Economic Value of Outcomes in Non-Home Visiting research* summarizes monetary values researchers have used for similar outcomes beyond home visiting studies.
- *Module 4: Administrative and Government Cost Data sources* collates the administrative data sources used in the return on investment calculations.

Module 3 Overview

An important component of PFO is identifying measurable outcomes to assess program success and whether payments should be made (Office of Planning, Evaluation, and Policy Development, 2017). MIECHV awardees considering a PFO approach should first seek out evidence that a home visiting model is likely to improve specific, measurable outcomes for a target population (see Module 1). Awardees also should identify and use local cost data when possible and determine whether and how the outcomes of interest have been monetized in home visiting studies (see Module 2). Return on investment research can suggest how to determine these costs or fill the gap when local data are not available.

Public health and social science research can help MIECHV awardees determine the economic value of similar outcomes in studies beyond home visiting. Module 3 reviews studies of non-home visiting programs to determine whether outcomes related to home visiting have been monetized. For example, research examining the costs associated with preterm birth or low birth weight can help home visiting programs value prevention-related savings.

The Home Visiting Evidence of Effectiveness (HomVEE) review assesses the evidence of effectiveness for early childhood home visiting models across eight domains (Administration for Children and Families, 2019). Module 3 presents monetized outcomes from non-home visiting studies that correspond to three HomVEE domains: child development and school readiness, child health, and maternal health. These domains are underrepresented in the home visiting monetized outcomes literature and measures are included in non-home visiting studies. Module 3 provides summaries of the monetized outcomes, including per unit costs and the data sources informing calculated costs.

HomVEE Domains

- **Child development and school readiness**
- **Child health**
- Family economic self-sufficiency
- Linkages and referrals
- **Maternal health**
- Positive parenting practices
- Reductions in child maltreatment
- Reductions in juvenile delinquency, family violence, and crime

Bolded domains have studies included in this module

Module 3 Study Profiles provides a brief description of the individual studies, including the name of the program or intervention studied, research design, target population, study location, and program

costs. The profiles also identify the monetized outcomes, the data sources used to calculate the monetized outcomes, and the limitations related to these analyses.

How to Use Module 3

Module 3 summarizes monetized outcome data from research beyond home visiting studies. Before reviewing Module 3, an awardee should **select potential outcomes** for PFO, as described in Module 1. The next steps are to identify relevant local data and **examine the per unit cost data** used in home visiting ROI studies, as described in Module 2. If local data are limited and an outcome of interest has not yet been included in home visiting ROI studies, awardees can incorporate monetized outcome data from non-home visiting research.[1]

The studies included in Module 3 use benefit-cost analyses, ROI analyses, and cost-effectiveness analyses to describe costs and to estimate potential cost savings or cost avoidance and social benefit. Awardees can use this information to do the following:

1. **Identify per unit costs for an outcome with limited data in home visiting**. Module 3 provides information to estimate the costs associated with the outcomes of interest that have limited or no home visiting monetized outcome data. For example, health care costs associated with disruptive behavior disorder were reported in one study to be

Analyses in Module 3

Benefit-cost analysis identifies the resources required to implement a program, provides a basis for understanding the cost of providing services, and assesses whether a program's monetary benefits exceed program costs.

Return on investment compares program net costs and outcomes in dollars and expresses the comparison as the percentage gained or lost. ROI can also translate into savings for each dollar invested in the program.

Cost-effectiveness analysis estimates the cost of achieving a change in specific outcomes. Cost-effectiveness ratio is often expressed as cost per unit of improvement (e.g., cost per depression-free day).

[1] Data from local sources, home visiting studies and non-home visiting studies all can contribute to and inform studies. Measurement definitions, geographic location, time frame (e.g., publication date) and other contextual factors should be considered when deciding which cost estimates best reflect an accurate estimate of monetized outcomes for each study. In general, local data will be more accurate than national estimates or findings from other studies. Home visiting literature generally will be more reflective of the program of interest than studies that use other service delivery mechanisms. However, each study should review the available data from all sources to determine which estimates will be most useful.

$1,817 per year in 2005 dollars. Awardees will need to consider location (e.g., local data will provide a more accurate reflection of costs); year of dollars; and other contextual factors in determining the per unit cost for their feasibility study. Awardees can work with an economist or use an online Consumer Price Index-adjusted inflation calculator to convert per unit costs to current year dollars. Users will need the dollar amount and year of dollars as well as the year to which dollars should be converted.

2. **Estimate future cost savings or cost avoidance and social benefit**. As part of the feasibility study, awardees will calculate potential savings from the PFO outcome. Module 2 describes how to apply the per unit costs to the outcomes achieved in the past to estimate future savings. Awardees can use this approach to apply per unit costs from non-home visiting research to project future savings for outcomes reviewed in Module 3.

Module 3 Methods

Identification of References

Following a review of the home visiting research to identify monetized outcomes for HomVEE domains (see Module 2 for a description), gaps were identified for child development and school readiness; child health; maternal health; positive parenting practices; reductions in child maltreatment; and reductions in juvenile delinquency, family violence, and crime. Expert consultants reviewed and discussed the outcomes associated with these domains to determine which were perceived to have the highest potential cost impact (i.e., greatest yield or most significant returns) and were able to be tracked over 2 years (i.e., length of recent MIECHV grant funding periods). Based on that review, the resource's study team conducted a literature scan to identify monetized outcomes for internalizing and externalizing behaviors, maternal depression, child hospitalization, breastfeeding, parenting stress, family functioning, and maternal anxiety that were used in fields other than home visiting. Exhibit 1 links these outcomes to the relevant HomVEE domains.

Literature scan process. The process to identify studies comprised the following steps:

- Literature scan
- Title and abstract review
- Full text review
- Data abstraction

Exhibit 1. HomVEE Domains and Outcomes in the Non-Home Visiting Literature

HomVEE Domain	Outcome in Non-Home Visiting Literature
Child development and school readiness	Internalizing behavior problems or symptoms Externalizing behavior problems or symptoms
Child health	Breastfeeding Child hospitalizations[a]
Maternal health	Maternal depression

[a] The child health domain includes encounters with health care providers, including physician visits, emergency room visits, and hospitalizations. Child hospitalization outcomes in this module were because of low birth weight, nutritional deficiencies, medical illness, and injuries resulting from child abuse and neglect.

Conducting the Scan

Search terms. The scan used public health and social science academic search engines and databases to identify published and gray literature. The following databases were utilized: CINAHL, EBSCOhost, EconLit, Google Scholar, Grey Literature Report from the New York Academy of Medicine, PsycINFO, PubMed Central, PubMed/Medline, and Web of Science. Exhibit 2 summarizes the search terms used. All publication types (published journal articles, technical reports, briefs, and online material) were reviewed, regardless of the evaluation design.

Exhibit 2. Outcome and Economic Search Terms

Domain	Outcome Search Terms		Economic Search Terms
Child development and school readiness	Child internalizing behaviors OR child + Emotional problems OR Preschool + Anxiety Child externalizing behaviors OR child + aggression OR child + behavior problems OR child + conduct disorder	AND	Return on investment OR benefit-cost analysis OR cost-benefit analysis OR economic returns OR cost-effectiveness analysis
Maternal health	Maternal depression OR depression + mothers Maternal anxiety OR mothers + anxiety Parenting stress OR Parenting Stress Index (PSI) OR family stress Family functioning OR Family Assessment Device (FAD) OR family well-being OR family + well-being		

Domain	Outcome Search Terms		Economic Search Terms
Child health	Child + hospitalization OR child + Rehospitalization OR infant + hospitalization OR infant + rehospitalization Breastfeeding OR lactation OR breastfeeding program		

Abstract review. Screening was conducted to identify articles and reports that included the search terms within their abstracts. A total of 63 abstracts met inclusion criteria for full text review.

Full text review. The 63 publications were reviewed for the following inclusion criteria:

- The target population for child-specific outcomes was between 0 and 5 years of age.
- The key outcome of interest was monetized.
- ROI or a similar cost analysis approach was used.
- The study described the methodology and findings of the analysis.
- The study was conducted within the United States.[2]

Selected References

A total of 14 studies provided sufficient information for inclusion (see Exhibit 3). The selected studies used a range of designs and included assessments of interventions, literature reviews, and secondary data analyses. Most studies monetized short-term outcomes (i.e., 1 year or less) and found positive returns related to maternal depression, breastfeeding, child hospitalization, and externalizing behaviors. Nine studies used administrative data, four used government data, and two used published data. Several studies used multiple data sources.

Exhibit 3. References Noting an Outcome Monetized

HomVEE Domain	Outcome Monetized	Citations[a]
Child development and school readiness	Internalizing behavior problems	Lynch et al., 2017 Salloum et al., 2014

[2] Added criterion because data sources and actual costs used to monetize outcomes may differ substantially in other countries.

HomVEE Domain	Outcome Monetized	Citations[a]
	Externalizing behavior problems	French et al., 2018 Goldfine et al., 2008 Honeycutt et al., 2015 Lynch et al., 2017 Washington State Institute for Public Policy, 2019[b]
Child health	Breastfeeding	Ball & Wright, 1999 Bhandari & Nepal, 2014 Pugh et al., 2002
	Child hospitalizations	Avruch & Cackley, 1995 Ball & Wright, 1999 Noor & Caldwell, 2005 Windsor et al., 1993
Maternal health	Maternal depression	Grote et al., 2017 Wilkinson et al., 2017

[a] Full citations are in the reference list at the end of Module 3 and descriptions are in the *Module 3 Study Profiles*.

[b] Counted as one study but reported monetized outcomes for seven programs.

Special Note: WSIPP

Module 3 refers to the Washington State Institute for Public Policy (WSIPP), which has conducted ROI analyses for multiple social programs using a comprehensive analysis plan and a common set of cost figures. Cost data provided in Module 3 are common per unit costs WSIPP applied across home visiting models and non-home visiting programs.

Study profiles include separate entries for each WSIPP analysis to show distinct outcomes monetized by program. ROI results for each program are included only in the study profiles. More details about WSIPP per unit costs and approach to calculating ROI can be found here.

This literature scan was originally conducted for a project focused on ROI. The narrowly focused economic search terms reflect this limitation and exclude some articles and reports with monetized outcomes or cost-related information. For example, Bartick, Schwarz, et al. (2017), Bartick, Jegier, et al. (2017) and Steube et al. (2017) focus on breastfeeding costs but were not included because they did not contain the economic search terms. This resource provides a starting point that conveys relevant information but is not comprehensive. Awardees should identify additional references to

generate a more comprehensive picture of monetized outcomes for their areas of interest. Awardees also should identify local or state data sources or locally conducted studies that more accurately reflect their costs for services.

Alignment of Outcomes With MIECHV Benchmarks

For this project, home visiting outcomes are grouped by HomVEE's eight outcome domains and were reviewed for consistency with the six MIECHV benchmarks areas. MIECHV's benchmarks and constructs are well defined with specific indicators and measures, as described in Module 2. HomVEE domains and outcomes also are defined but differ from the MIECHV benchmarks, constructs, and indicators.

Some of Module 3's monetized outcomes were consistent with HomVEE domains and MIECHV benchmarks. For example, breastfeeding was a specific HomVEE outcome and MIECHV construct for child health and maternal and newborn health, respectively. Similarly, child behavior problems were noted as an outcome of HomVEE's child development and school readiness domain and as a construct for MIECHV's school readiness and achievement benchmark.

Other monetized outcomes in Module 3 are not as closely aligned with MIECHV benchmarks and HomVEE domains, as the studies cited were not designed to fit within these frameworks. For example, both HomVEE and MIECHV identify depression screening as an outcome for maternal depression outcomes; by contrast, the non-home visiting research uses a range of measures and proxies to quantify maternal depression outcomes, which broadens the maternal depression construct. Similarly, HomVEE and MIECHV include studies leading to child hospitalizations according to their causal factors (e.g., low birth weight, intentional or unintentional injury, illness) rather than under the child health domain or benchmark, which notes routine health issues. Given the small number of references related to child hospitalizations, the study team grouped this monetized outcome under child health. Exhibit 4 presents a crosswalk of domains, benchmarks, and outcomes.

Exhibit 4. Crosswalk Between HomVEE Domains, MIECHV Benchmarks, and Monetized Outcomes in Home Visiting and Non-Home Visiting Studies

HomVEE Outcome Domain	MIECHV Benchmark Area	Monetized Outcome
Child development and school readiness	School readiness and achievement	Internalizing behaviors Externalizing behaviors
Child health	Maternal and newborn health	Breastfeeding Child hospitalizations

HomVEE Outcome Domain	MIECHV Benchmark Area	Monetized Outcome
Maternal health	Maternal and newborn health	Maternal depression

Child Development and School Readiness

Six of the 14 studies focused on the costs of internalizing and externalizing behaviors. Key monetized outcomes included health care costs, family costs, the value of client time, and other costs incurred by behavioral problems. Programs assessed by WSIPP noted ROI and average savings per child. Other studies focused on cost-effectiveness, with most calculating program costs and comparing the unit cost of improvement against other published values for the same or similar programs. Exhibit 5 shows studies reviewed, monetized outcomes, per unit costs, years of dollars, and data sources in each category.

Internalizing and Externalizing Behaviors

- Internalizing behaviors include withdrawn, anxious, inhibited, and depressed behaviors.
- Externalizing behaviors include disruptive, antisocial, or aggressive behaviors and include oppositional defiant disorder, conduct disorder, and disruptive behavior disorder.

Internalizing Behaviors

Two studies monetized outcomes related to health care that reduce problem behaviors and to family expenses incurred. Lynch et al. (2017) conducted a randomized trial of the Kids in Transition to School program, which focused on transitioning children in foster care to kindergarten by improving emotional and behavioral self-regulation, along with social and academic skills. Salloum et al. (2014) compared costs for adherent and nonadherent families in the Step One cognitive behavioral therapy (CBT) intervention program.

Salloum et al. (2014) found that the cost of a one-unit improvement in posttraumatic stress symptoms ranged from $28.78 to $218.51, depending on the instruments and measures used, severity of symptoms, and time of assessment. These costs were lower than other cited CBT treatment costs of $285 per 10 percent improvement in depression symptoms. Lynch et al. (2017) reported the cost of achieving a 1-point improvement on the Child Behavior Checklist (CBCL) at $64, health provider and emergency services at $30.72 to $147.99 per visit, and the costs of specialty services at $15.01 to $110.26 per hour. Annual costs for medical, emergency, mental/behavioral, school-based, and social work services were estimated at $5,125 to $5,289 per family, with an additional cost of $978 to $1,007 per family per year for costs related to foster care.

Exhibit 5. Child Development and School Readiness Outcome Summary

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
Internalizing Behaviors				
Lynch et al., 2017	Health services for medical provider, emergency room, and mental health provider	$30.72–$147.99 per visit	N/A	Oregon Health Plan (OHP)
Lynch et al., 2017	Specific needed services (e.g., vocational assistance, case management, family therapist)	$15.01–$110.26 per hour	N/A	Bureau of Labor Statistics; OHP Medical-Dental Fee Schedule; OHP Mental Health Fee Schedule
Lynch et al., 2017	Usual care services (medical, emergency, mental/behavioral, school based, social work) for the intervention and comparison groups	$5,125–$5,289 per family per year	N/A	Lynch et al., 2011, 2014
Lynch et al., 2017	Usual family costs related to foster care for the intervention and comparison groups	$978–$1,007 per family per year	N/A	Lynch et al., 2011, 2014
Salloum et al., 2014	Parent opportunity costs (i.e., cost of parent participation, wages for college graduates)	$18.06 per hour	N/A	Bureau of Labor Statistics
Salloum et al., 2014	Parent opportunity costs (i.e., cost of parent participation, wages for high school graduates)	$11.79 per hour	N/A	Bureau of Labor Statistics
Salloum et al., 2014	Cost for improvement in depression outcome with CBT	$285 per 10% improvement	N/A	Lynch et al., 2005
Externalizing Behaviors				
French et al., 2018	Client wages/salary	$18.83 per hour	2015	U.S. Department of Labor, 2015; U.S. General Services Administration, 2015

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
French et al., 2018	Clinician (counselors and psychologists) annual salary	$28.67 per hour	2015	U.S. Department of Labor, 2015a, 2015b; U.S. General Services Administration, 2015
French et al., 2018	Behavioral and mental health specialist salary	$25.20 per hour	2015	U.S. Department of Labor, 2015a, 2015b; U.S. General Services Administration, 2015
French et al., 2018	Transportation	$0.575 per mile	2015	U.S. General Services Administration, 2015
Goldfine et al., 2008	Benefit of completed PCIT[b] treatment across crime, substance use, educational outcomes, teen pregnancy, teen suicide attempts, child abuse and neglect, and domestic violence	$4,724 per child	2003	Aos et al., 2004
Goldfine et al., 2008	Conduct disorder costs, including school system and health care costs, for children 4 to 10 years of age	$28,000 per child per year	1999	Knapp et al., 1999
Goldfine et al., 2008	Cost savings because of treatment of disruptive behavior disorders, including averted costs for school dropout, future criminality, and substance use	$2 million per lifetime	1998	Cohen, 1998
Goldfine et al., 2008	High school-related cost of conduct disorder (above usual costs for unimpaired child)	$11,700 per student per year for 4 years	2003	Foster et al., 2005
Honeycutt et al., 2015	Therapist salary	Not provided	2010	Bureau of Labor Statistics, 2010
Honeycutt et al., 2015	Family cost (labor and other)	Not provided	N/A	Not provided

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
Lynch et al., 2017	Health services for medical provider, emergency room, and mental health provider	$30.72–$147.99 per visit	N/A	OHP
Lynch et al., 2017	Specific needed services (e.g., vocational assistance, case management, family therapist)	$15.01–$110.26 per hour	N/A	Bureau of Labor Statistics; OHP Medical-Dental Fee Schedule; OHP Mental Health Fee Schedule; OHP Medical-Dental Fee Schedule
Lynch et al., 2017	Usual care services (medical, emergency, mental/behavioral, school based, social work) for the intervention and comparison groups	$5,125–$5,289 per family per year	N/A	Lynch et al., 2011, 2014
Lynch et al., 2017	Usual family costs related to foster care for the intervention and comparison groups	$978–$1,007 per family per year	N/A	Lynch et al., 2011, 2014
WSIPP, 2019[c]	Health care associated with disruptive behavior disorder	$1,817 per year	2005	Medical Expenditure Panel Survey
WSIPP, 2019[c]	Health care associated with major depression	$1,763 per year	2011	Medical Expenditure Panel Survey

[a] Data sources are provided in *Module 3 Study Profiles* and cited in the studies listed in the table.

[b] PCIT: Parent–Child Interactive Therapy

[c] WSIPP reported monetized outcomes for seven programs, which are listed separately in *Module 3 Study Profiles,* and other monetized outcomes (see Module 2).

Lynch et al. (2017) assessed annual family costs of $978–$1,007 per family. Salloum et al. (2014) estimated hourly parent opportunity costs (e.g., time spent on therapy, phone support, parent-child meetings) at $18.06 for college graduates and $11.79 for high school graduates.

Externalizing Behaviors

Five studies monetized outcomes tied to externalizing behaviors; the WSIPP study alone spanned seven programs. The outcomes included health care, family, and long-term costs. Studies represented different approaches, scopes, levels of severity, and populations. For example, Goldfine et al. (2008) presented findings from three studies. The first cited study reported the overall impact of conduct disorders in 1999 was estimated at $28,000 per year per child between 4 and 10 years of age. A second reference reported extra high school-related costs associated with conduct disorders were estimated at $11,700 per student per year in 2003. A third study estimated the cost of school dropout, future criminality, and substance use at $2 million per lifetime in 1998 dollars.

Studies also noted health care costs. Lynch et al.'s (2017) Kids in Transition to School program assessed health service costs at $30.72 to $147.99 per visit, and specialty service costs at $15.01 to $110.26 per hour. The study reported costs for broader medical, emergency, mental/behavioral, school-based, and social work services at $5,125 to $5,289 per family per year. WSIPP (2019) more narrowly defined health care costs associated with disruptive behavior disorder, finding annual costs of $1,817 per family in 2005 dollars. Annual health care costs associated with major depression were $1,763 per family in 2011 dollars.

Family costs were also of interest to researchers. Lynch et al. (2017) estimated annual foster care costs of $978 to $1,007 per family, while French et al. (2018) valued parent/client costs to reduce externalizing behaviors at $18.83 per hour for the Parent–Child Interactive Therapy (PCIT) program. Honeycutt et al. (2015) also included family costs, though they did not specify a value or source.

Three studies focused on PCIT, a program that uses play and behavioral therapy to help parents learn new skills and techniques to manage child behavior (French et al., 2018; Goldfine et al., 2008; WSIPP, 2019). Direct benefits of using PCIT have been measured at $4,724 per child across outcomes related to crime, substance use, educational outcomes, teen pregnancy, teen suicide attempts, child abuse and neglect, and domestic violence. The costs per unit improvement on the Eyberg Child Behavior Inventory intensity scale were $13 to $39 and on the problematic scale were $87 to $121 (French et al., 2018; Goldfine et al., 2008; Honeycutt et al., 2015). The cost per unit improvement on the CBCL was $100.56 and on the Parenting Stress Index was $26.47 (Goldfine et al., 2008).

Child Health

Three of the 14 studies focused on breastfeeding outcomes, four studies focused on hospitalization-related outcomes and one study included both. Studies included four analyses of existing data and two interventions. Monetized outcomes reported in the studies included costs for pediatric care ($66–$224 per visit), antibiotics ($3–$37 per course), hospitalization ($5,179–$37,997 per birth depending on duration and severity), cost of food/infant formula ($334–$1,176 over 6 months), parent time designated for infant feeding ($2,509–$3,100), and psychological treatment ($431 per patient per day). Studies focused on national or state-level outcomes but used older data that may not directly translate to current costs, policies, and programming. Exhibit 6 shows studies reviewed, monetized outcomes, per unit costs, years of dollars, and data sources in each category.

Breastfeeding

Three breastfeeding studies focused on monetized outcomes related to health care and infant feeding costs. Two of the three studies demonstrated that breastfeeding, particularly exclusive breastfeeding, can reduce the costs of infant health and nutritional care. Ball and Wright (1999) analyzed existing data from two studies of hospitalization in children's first year of life and found that exclusive breastfeeding was associated with reduced medical costs. Bhandari and Nepal (2015) found that exclusive breastfeeding lowered expenses tied to the Special Supplemental Food Program for Women, Infants, and Children (WIC). By contrast, Pugh et al. (2002) found that program costs for a 6-month breastfeeding community nurse/peer counselor intervention were not offset by savings in the intervention group.

Ball and Wright (1999) reported that, compared with infants who had never been breastfed, exclusively breastfed infants incurred $134 less in pediatric office visit costs during their first year of life, which cost $69 to $132, in 1995 dollars. Medical costs (including office visits, medication, and hospitalizations) were calculated to be $331 to $475 less per exclusively breastfed child compared with infants who had never breastfed.

Two studies monetized infant feeding outcomes. In 2014 dollars, monthly mother-infant WIC packages ranged from $55.74 to $102.38 per exclusively breastfeeding family and $137.85 to $196.06 for families exclusively using formula (Bhandari & Nepal, 2015). Pugh et al. (2002) estimated infant formula costs at $685 per month in 1999 dollars across the 6-month intervention for mothers in the control (usual care) group. The study also estimated costs in a mother's time (e.g., time away from work to feed her infant) as $2,509 per mother in the usual care group.

Exhibit 6. Child Health Outcome Summary

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
Breastfeeding				
Ball & Wright, 1999	Antibiotics	$3.22–$36.51 per course	1995	Thomas-Davis Medical Centers (TDMC)
Ball & Wright, 1999	Pediatric/office visits	$69–$132 per visit (depending on provider and insurance)	1995	TDMC and Regional Health Plan Database
Bhandari & Nepal, 2015	Monthly WIC food packages for exclusive formula – infant and mother	Infants aged 0–6 months: $196.06 per family Infants aged 6–12 months: $137.85 per family	2014	Bureau of Business & Economic Research; New Mexico WIC office
Bhandari & Nepal, 2015	Monthly WIC food packages for exclusive breastfeeding – infant + mother	Infants aged 0–6 months: $55.74 per family Infants aged 4–6 months: $54.75 per family Infants aged 6–12 months: $102.38 per family	2014	Bureau of Business & Economic Research; New Mexico WIC office
Pugh et al., 2002	Estimated mother's income (cost of time to feed infant, 6 months)	Intervention group: $3,101 per mother Usual care group: $2,509 per mother	1999	National Compensation Survey
Pugh et al., 2002	Infant formula (6 months)	Intervention group: $438 per mother Usual care group: $685 per mother	1999	Primary data collection
Child Hospitalization				
Avruch & Cackley, 1995	Initial hospitalization cost for very low birth weight, in excess of cost for normal birth weight)	$37,997 per very low birth weight infant	1992	Maryland Hospital Cost Review Commission; Office of Technology Assessment, Health Care Financing Administration

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
Avruch & Cackley, 1995	Initial hospitalization cost for moderately low birth weight, in excess of cost for normal birth weight)	$5,179 per moderately low birth weight infant	1992	Maryland Hospital Cost Review Commission; Office of Technology Assessment, Health Care Financing Administration
Avruch & Cackley, 1995	Hospitalization	$880 per day	1992	Maryland Hospital Cost Review Commission
Avruch & Cackley, 1995	Rehospitalization	$7,392 per very low birth weight infant	1992	Maryland Hospital Cost Review Commission
Avruch & Cackley, 1995	Rehospitalization	$3,256 per moderately low birth weight infant	1992	Maryland Hospital Cost Review Commission
Ball & Wright, 1999	Hospitalization	$886.16–$1,025 per day	1995	TDMC and Regional Health Plan Database
Noor & Caldwell, 2005	Hospitalization as a result of child abuse	1992: $5,498 per child 2002: $14,811 per child	2002	Daro, 1988; Blue Cross/Blue Shield of Michigan, 1991; Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project, 2000
Noor & Caldwell, 2005[b]	Outpatient medical costs because of child abuse	1992: $172 per child 2002: $224 per child	2002	Blue Cross/Blue Shield of Michigan, 1991
Noor & Caldwell, 2005[b]	Inpatient psychological treatment related to abuse	1992: $330 per patient per day 2002: $431 per patient per day	2002	Michigan Department of Mental Health, 1992
Windsor et al., 1993	Health care for low birth weight infant, in excess of normal birth weight)	$12,104–$30,935 per birth	1990	Office of Technology Assessment

[a] Data sources are provided in *Module 3 Study Profiles* and cited in the studies listed in the table.
[b] Study contained other monetized outcomes.

Child Hospitalizations

Four studies examined hospitalizations related to (1) low birth weight because of prenatal smoking (Windsor et al., 1993) and nutrition (Avruch & Cackley, 1995); (2) injuries because of abuse and neglect (Noor & Caldwell, 2005); and (3) lack of breastfeeding practices (Ball & Wright, 1999). Three studies analyzed existing data; Windsor et al. (1993) examined an intervention. All used data from 2002 or earlier (i.e., 1990–2002). The monetized costs focused on daily or long-term hospital stays, and some also included the costs of health care associated with post-hospitalization care.

Ball and Wright (1999) reported hospitalization costs of $886 to $1,025 per day in 1995 dollars, while Avruch and Cackley (1995) reported costs of $880 per day in 1992 dollars. Ball and Wright (1999) found fewer hospitalizations among exclusively breastfed infants, calculating health care costs that were $188 lower per child compared with infants who had never breastfed.

Two studies examined costs associated with low birth weight. Avruch and Cackley's (1995) meta-analysis of studies conducted between 1971 and 1988 found that initial hospitalization costs were $5,179 per moderately low birth weight infant (between 1,500 and 2,499 grams) higher than for normal birth weight infants (in 1992 dollars). For very low birth weight infants (less than 1,500 grams), initial hospitalization costs were $37,997 higher per very low birth weight infant compared with normal birth weight infants. Rehospitalization during the first year of life added $3,256 for moderately low birth weight infants and $7,392 for very low birth weight infants (also in 1992 dollars). The total first-year medical savings was $3.07 for every dollar invested in prenatal WIC services.

For low birth weight infants born to women who smoked during pregnancy, Windsor et al. (1993) estimated additional health care and hospitalization costs associated with low birth weight were $12,104 to $30,935 per infant in 1990 dollars. The study examined a prenatal smoking intervention that returned an estimated $6.72 to $17.18 for every dollar spent.

Noor and Caldwell (2005) identified the cost of hospitalizations from child abuse and neglect in Michigan as $823 million in 1992 dollars and $1.8 billion in 2002 dollars. In 1992, the cost of hospitalization for abuse- and neglect-related injuries was estimated to be $5,498 per child; in 2002, these costs were estimated to be $14,811 per child. Daily inpatient psychological treatment was estimated at $330 per patient in 1992 and $431 per patient in 2002.

Maternal Health

Two of the 14 studies focused on intervention programs to identify or treat depressive symptoms. Costs related to maternal depression with and without posttraumatic stress disorder (PTSD) were estimated to be $570 to $776 per mother in 2013 dollars (Grote, 2017). Postpartum care was estimated to cost $6,842 to $8,985 per mother in 2014 dollars for usual care and $11,018 to $11,540 per mother who received usual care, screening, and additional treatment (Wilkinson, 2017). Both studies implemented interventions to reduce costs and better serve depressed mothers. Program costs ranged from $943 to $2,088 depending on the severity of the maternal depressive symptoms and presence of PTSD. Exhibit 7 shows studies reviewed, monetized outcomes, per unit costs, years of dollars, and data sources.

Exhibit 7. Maternal Health Outcome Summary

Study	Study-Defined Monetized Outcome	Per Unit Cost	Year of Dollars	Data Source[a]
Maternal Depression				
Grote et al., 2017	Maternity support services for mothers with major depression (above usual care)	$570 per mother	2013	Katon et al., 2005; Kaiser Family Foundation, 2015
Grote et al., 2017	Maternity support services for mothers with major depression and PTSD (above usual care)	$776 per mother	2013	Katon et al., 2005; Kaiser Family Foundation, 2015
Grote et al., 2017	Valuation of depression-free day	$20 per day	2013	Lave et al., 1998; Simon, Manning, et al., 2001; Simon, Katon, et al., 2001
Wilkinson et al., 2017	Postpartum care with screening for postpartum depression	$11,018–$11,540 per mother	2014	Medicaid, 2013; NC Department of Health and Human Services, 2012, 2013; Qui et al., 2009
Wilkinson et al., 2017	Usual postpartum care	$6,841.50–$8,985 per mother	2014	Guo et al., 2007; Medicaid, 2013; NC Department of Health and Human Services, 2014

[a] Data sources are provided in *Module 3 Study Profiles* and cited in the studies listed in the table.

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