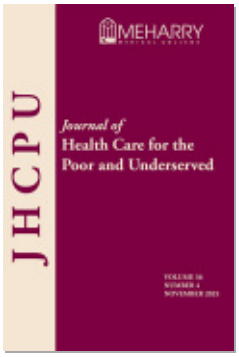
Five-Year Outcomes of a CHW-Driven Maternal-Infant Health Model through a County Health Department in a Medically Underserved Region



Jasmine D. Gonzalvo, Faria Chaudhry, Heather N. Burney, Lynn Herr, Sarah Harness, Sophie French, Kenneth Spear, Kayra Ucpinar, Ashley Meredith

Journal of Health Care for the Poor and Underserved, Volume 36, Number 4, November 2025, pp. 1317-1343 (Article)

Published by Johns Hopkins University Press

Five-Year Outcomes of a CHW-Driven Maternal-Infant Health Model through a County Health Department in a Medically Underserved Region

Jasmine D. Gonzalvo, PharmD, MPH
Faria Chaudhry, PharmD
Heather N. Burney, MS
Lynn Herr, BSN, RN, CPN
Sarah Harness, MPH
Sophie French, BSN, RN
Kenneth Spear, MD
Kayra Ucpinar, MPH
Ashley Meredith, PharmD, MPH

Abstract: The Pre to 3 Program in Vanderburgh County, Indiana (United States) was designed to affect maternal-infant health in medically underserved populations through community health worker (CHW) led initiatives. This program provides free, hands-on support for infants, parents, and families from the first trimester of pregnancy until the child's third birthday. The CHW-driven Pre to 3 Program demonstrates improved outcomes in breastfeeding initiation, safe sleep practices, adequate prenatal care, child vaccination rates, food security, housing stability, and employment status. The Vanderburgh County Health Department Pre to 3 Program presents the state of Indiana, and similarly medically underserved counties, the opportunity to improve maternal-infant health through expanded implementation. With increased financial resources, and subsequently more program personnel, there is significant potential for positive impact on the health outcomes of high-risk communities.

Key words: Community health workers, reimbursement mechanism, maternal-child health services, medically underserved area.

JASMINE D. GONZALVO *and* ***ASHLEY MEREDITH*** *are affiliated with the Center for Health Excellence, Quality, and Innovation and the Community Health Workforce Development Institute at Purdue University.* ***FARIA CHAUDHRY*** *and* ***KAYRA UCPINAR*** *are affiliated with the Center for Health Excellence, Quality, and Innovation at Purdue University.* ***HEATHER N. BURNEY*** *is affiliated with the Department of Biostatistics and Health Data Science at Indiana University School of Medicine.* ***LYNN HERR*** *is affiliated with the Clinical and Outreach Division at Vanderburgh County Health Department.* ***SARAH HARNESS, SOPHIE FRENCH,*** *and* ***KENNETH SPEAR*** *are affiliated with the Vanderburgh County Health Department. Please address all correspondence to: Jasmine Gonzalvo, 640 Eskenazi Ave, Indianapolis, IN, 46202; Email: jgonzalv@purdue.edu.*

Maternal mortality rate (MMR) and infant mortality rate (IMR) are key indicators for assessing the health of a community.[1] These indicators illustrate readily preventable deaths influenced by access to quality health care, nutritional status, education status, and income level.[2] *Healthy People 2030* set a goal of fewer than five infant deaths per 1,000 live births to improve the well-being of future generations.[3] In 2022, the national IMR was 5.6 deaths per 1,000 live births, while the IMR in Indiana was 7.16 deaths per 1,000 live births.[1] Indiana continues to rank in the top ten states with the highest infant mortality rate in the United States.[1] To address these outcomes, Nurse Family Partnership (NFP) [4] has received funding from the Indiana Department of Health to provide support to first-time parents since 2011. Despite state efforts, infant death rates in southwestern Indiana are above the goal set by *Healthy People* largely due to preterm birth, low birth weight (LBW), pregnancy complications, birth defects, and sudden unexpected infant deaths, including from suffocation.[5] From 2015–2019, the infant mortality rate for southwestern Indiana was 6.1 per 1,000 live births. Notably, rates for Black and Hispanic/Latino populations in southwestern Indiana were significantly higher at 15.6 and 8.8, respectively.[1,3]

While the infant mortality rate in southwestern Indiana has stabilized in recent years, major racial and ethnic disparities remain that carry serious implications for the overall health of the community. Vanderburgh County, and the surrounding counties, continue to be designated as medically underserved areas (MUA).[6] Vanderburgh County Health Department's (VCHD) Pre to 3 program serves four counties (Vanderburgh, Posey, Gibson, and Warrick) where Black individuals made up 7% of the population yet experienced 25% of the fetal and infant loss in 2019. A Black infant born in southwestern Indiana has a 2.5–3 times higher rate of death before their first birthday than infants of other races within the community.[2] These disparate outcomes indicate a critical need for more resources to improve overall maternal, infant, and child health.

Considering these disparities, more health leaders are looking toward community health workers (CHWs) to close care gaps in populations that are medically underserved. Community health workers are distinctively capable of overcoming disparities[7] by providing individualized care, often times with shared lived experience, that establishes trust in ways that traditional health care providers have been unable to foster.[7] By definition, CHWs are lay members of the community who play a pivotal role in improving the health of communities through offering community-based services and information, navigating health care systems, and improving accessibility to resources, among a wide variety of other support services.[8–10] Community health worker programs operating out of county health departments are reaching under-resourced populations across the country. For example, the Arizona Department of Health Services together with the Bureau of Women's and Children's Health has led the Health Start Program that assists pregnant individuals with obtaining early, consistent, and culturally conscious pre-and postnatal care. Community health workers serve as the primary interventionists and health visitors of the program.[11] In Kentucky's Health Access Nurturing Development Services (HANDS) program, paraprofessionals such as CHWs visit first-time families and provide information, aid in parenting skill development, and assist in meeting housing, food, health care, and other basic needs.[12] Health Access Nurturing Development Services CHWs (also referred to as family support workers) are eligible

for reimbursement from Kentucky Medicaid for these services, provided that they are supervised by a public health nurse or a licensed social worker.[13]

Community health worker support has demonstrated an improvement in chronic disease and mental health outcomes, and a decrease in hospitalizations.[14] Similarly, a systematic review of the impact of CHWs on infant mortality revealed that home visits in coordination with CHWs have shown an improvement in neonatal deaths and stillbirths in under-resourced populations.[15] In central Indiana, a CHW-driven maternal-infant program has demonstrated improvement in maternal and child health disparities.[16] Large-scale expansion of similar CHW programs has been slow to develop, largely due to unsustainable reimbursement models, despite evidence to support CHW initiatives. A CHW-driven maternal-infant program operating out of a county health department in a more rural, medically underserved area of Indiana has yet to be evaluated and widely disseminated.

Although CHWs provide an evidence-based model to affect health disparities and improve patient outcomes, sustainability poses a major barrier to using CHWs.[17] Funding is often unsustainable due to limited funding avenues, complex reimbursement systems, and low reimbursement rates. As of July 2018, CHWs can be reimbursed for eligible services provided to Medicaid beneficiaries in Indiana. Despite this advance, a 2022 mixed-methods study from Indiana revealed the need for improved infrastructure to support and sustain the local CHW workforce, including improvements in funding and reimbursement mechanisms.[17] Additionally, there is a lack of published data that assess the strengths and barriers of the current reimbursement policy in Indiana. As of 2021, the National Academy of State Health Policy reported that 25 states had established reimbursement mechanisms for CHW services through Medicaid or managed care organizations.[18]

In 2018, the VCHD established the CHW-driven Pre to 3 Program specifically to address gaps in care to improve maternal, infant, and child health in the southwestern Indiana region. This program provides free, long-term, hands-on support for infants, parents, and families from the first trimester of pregnancy until the child's third birthday. The link between the social determinants of health (SDOH), including social, economic, and environmental conditions, and health outcomes is at the forefront of the program with an overarching goal of eliminating disparities and improving the health of all groups in the community. Additionally, the Pre to 3 program was the first program in the state of Indiana to bill Medicaid for CHW services rendered. Community health workers who are certified, employed, and enrolled as a billing provider by an Indiana Health Coverage Program can bill for rendered services. Eligible covered services that Indiana Medicaid will reimburse include diagnosis-related patient education to increase self-management, health education to prevent chronic diseases, facilitation of cultural brokering between an individual and a member, and services aimed at slowing the progression of chronic diseases.[19] Unfortunately, many essential tasks that significantly affect patient outcomes and require substantial time to complete are not considered eligible covered services by CHWs. These services include insurance navigation, telephone/remote services, care coordination, transportation arrangement, interpretation, and other activities. Opportunities exist to enhance reimbursement through expansion of the list of eligible services (e.g., care coordination, advocacy, transportation services,

insurance navigation), increasing the number of billable units per calendar year for eligible services provided, and including virtual delivery of services.[20,21]

Our primary aim is to evaluate the five-year clinical outcomes and reimbursement data from a CHW-driven maternal-infant health program in a medically underserved county health department. The outcomes analyzed to support this discussion include a) the impact of the CHW-driven Pre to 3 program on surrogate markers of infant and maternal mortality, and b) associated programmatic costs and Medicaid reimbursement for the CHW-driven Pre to 3 program. This will help inform strategies to implement evidence-based policies that use CHW-driven programs to affect maternal-infant health.

Methods

Program description. The Pre to 3 Program team is a program oversight and care delivery team. The program oversight team includes the VCHD health officer, one Health Department administrator, and the finance supervisor. The care delivery team consists of 16 CHWs, registered nurses, and client advocates/social workers. The CHWs conduct home visits with Pre to 3 participants to support families from pregnancy until the child is 3 years old. The CHWs use the evidence-based Growing Great Kids™ (GGK) curriculum,[22] focused on addressing the needs of the mothers and infants by setting individualized goals to address food insecurity, housing, transportation, community safety, education, healthy lifestyles, and employment.

Pre to 3 clients are identified and recruited primarily through direct referral partnerships with non-profit organizations, health care providers, local county jails, and transitional recovery homes. Self-referrals also occur through regional health fairs, cultural events, social media interactions, and direct marketing. Additionally, community-based organizations, including Black Nurses and the Evansville Latino and Americano Center, make client referrals to facilitate referrals from racial and ethnic minority groups. On average, about 25% of referrals to Pre to 3 come from Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), 20% come from local birthing centers, 10% are self-referrals, and 5% from Department of Child Services (DCS). About 80% of clients enter the program prenatally, with 40% of those individuals being in their first trimester. The remaining 20% enter the program within the infant's first 90 days of life.

Community health workers are assigned enrolled families and complete home visits to identify and address needs every week from prenatal enrollment to one year of age, every other week until two years of age, then monthly until three years of age. Of note, from March 1, 2020 through July 20, 2022 service delivery was primarily virtual due to the COVID-19 pandemic. Virtual visits may currently still be completed in place of a home visit if either the client or CHW has symptoms of upper respiratory illness. Services provided at the initial program intake visit include a needs assessment and resource identification, such as for childcare, pediatrician, mental health provider, housing, and utility assistance. Transportation needs are also addressed through rideshare arrangements, if necessary. Some of the CHWs have breastfeeding certification and can address basic breastfeeding needs. Community health workers continually assess child developmental status and needs, with provision of caregiver education and referrals,

as needed. When given permission from the client, CHWs can contact providers or services to advocate on their behalf. Evidence-based screening tools are used throughout the program, such as Adverse Childhood Experiences (ACEs), Ages and Stages Questionnaires (ASQ-3), and Ages and Stages Questionnaires Socio-Emotional (ASQ SE-2) for physical and social-emotional development.[23-25] Other screening tools are used to assess depression (prenatally and postnatally), SDOH, and preeclampsia. While all these areas were assessed at each visit, the wording of the questions from some content areas may have differed from program intake to follow-up visits (i.e., mental health, substance use, and food insecurity). Any identified complex health needs are referred to Pre to 3 program nurses. Community health worker services provided during home visits are submitted to Medicaid for reimbursement.

Along with CHW visits, registered nurses who are Certified Lactation Consultants (CLCs) provide breast/chest feeding support, postpartum visits, nurse support visits to follow up on depression or mental health concerns, baby feeding and weight checks, blood pressure checks, and status visits every three to six months. Additionally, client advocates or social workers assist with obtaining more time-consuming resources; support clients with completing forms, making appointments, and organizing required paperwork; and manage the onsite food pantry.

Study design. *Study population, data collection, and analysis*. This study was a retrospective review of the clinical and reimbursement outcomes of the CHW-driven Pre to 3 Program at VCHD. The inclusion criteria were pregnant and post-partum people and children up to three-years old who were enrolled in the VCHD Pre to 3 Program between August 2018 and February 2024.

Data were extracted from VCHD Health Insurance Portability and Accountability Act (HIPAA)-compliant digital tracking programs and imported into Tableau for data analysis.[26] Baseline characteristic descriptive statistics (mean percent) were computed to contextualize the study population. Baseline characteristics included maternal race/ethnicity, SDOH (e.g., household income, health insurance status, employment) and health status (e.g., substance use, physical activity, prenatal depression). Outcome measures of the Pre to 3 Program consisted of maternal and newborn health outcomes among enrolled clients from 2018 to 2024. These outcomes included the initiation of breastfeeding, employment status, food security, maternal tobacco use from preconception until the 3rd trimester of pregnancy, and number of clients that received adequate prenatal care. Outcomes related to infant to toddler health (birth to 12 months) include the use of safe sleep methods, breastfeeding duration, and childhood immunizations. This study was approved by the Institutional Review Board of Indiana University. The reporting of studies Conducted using Observational Routinely collected health Data (RECORD) statement [27] was consulted in the reporting of this study.

Statistical methods. Descriptive statistics were used to summarize caregiver characteristics at study intake. Continuous variables were summarized using mean ± standard deviation. Categorical variables were summarized using frequency (percentage). Independent samples t-tests and chi-squared tests were performed as appropriate for comparisons between study entry timepoint. Dichotomous study outcomes were compared by study entry timepoint using chi-squared tests. Changes in caregiver characteristics throughout the study were assessed across two intervals: study intake

to the three-month child status visit and study intake to the caregiver's most recent study visit. Changes in dichotomous study outcomes were assessed using McNemar's test. McNemar's test assesses whether discordant pairs in a 2x2 table are significantly different from one another. For the outcomes in this study, discordant pairs were labeled as "improvement" or "decline" as appropriate. Concordant pairs were considered "stable." P-values less than .05 were considered statistically significant. Subgroup analyses were completed to compare outcomes for people enrolled prenatally versus postnatally. All analyses were performed using SAS version 9.4 (SAS Institute; Cary, NC). Descriptive data were analyzed for participants who had at least one follow-up visit to allow for inclusion in intake to final visit comparisons.

Results

A total of 1,126 caregivers were included in data. Characteristics among caregivers enrolling prenatally (n=831) and postnatally (n=295) were generally similar (Table 1). Individuals enrolled postnatally were significantly younger (mean age: 25.8 years) than those enrolled prenatally (mean age: 27.1 years; $p = .004$). A higher proportion of individuals enrolled prenatally identified as Black (n=233, 28.1%) or Hispanic (n=147, 17.7%), while a greater proportion of those enrolled postnatally identified as White (n = 166, 58.0%; $p = .001$). Additionally, caregivers enrolled postnatally had significantly higher rates of WIC enrollment (n=224, 77.5%) than those enrolled prenatally (n=384, 47.4%; $p < .001$).

Infant/toddler health outcomes. Looking specifically at markers related to infant to toddler health, the percentage of caregivers who breastfed at birth was 80.8%, which decreased to 25.9% by 12 months (see Table 2). Child immunization rates stayed above 90% from child intake through the 36-month status visit (93.8% and 93.2%, respectively). Safe sleeping practices ranged from 92.8% at child intake to 78.7% at the 12-month status visit.

A comparison of outcomes for participants who enrolled prenatally and postnatally was completed (Table 3). More participants who enrolled prenatally compared with those who enrolled postnatally practiced safe sleep (94.3% vs. 90.5%; $p = .048$), initiated breastfeeding (87.6% vs. 76.1%; $p < .001$), and received adequate prenatal care (89.4% vs. 84.4%; $p = .046$). Adequate prenatal care was defined as attending 10 or more prenatal visits with a physician/obstetrician-gynecologist (OB/GYN) or beginning prenatal care during the first trimester.

Caregiver outcomes. Improvements in caregivers' characteristics were observed as early as the three-month child status visit (Table 4) while some took until the final visit to demonstrate improvement (Table 5). A significant difference in participants experiencing an improvement compared with a decline in housing stability (9.2% vs. 2.8%; $p < .001$) was seen at the three-month visit. Among the caregivers assessed for food insecurity, both measures—whether food would run out (16.3% vs. 5.2%; $p < .001$) and whether food did not last (14.1% vs. 5.2%; $p < .001$)—demonstrated significant differences between participants whose status improved compared with those who declined at three months.

Between program intake and the final visit, caregiver employment status demonstrated

Table 1.

CAREGIVER CHARACTERISTICS AT INTAKE BY STUDY ENTRY TYPE

Variable	n	Total N=1,126	Prenatal Enrollment N=831	Postnatal Enrollment N=295	p-value
Relation to baby, n (%)	1,124				.004
Biological mother		1,116 (99.3)	829 (99.8)	287 (98.0)	
Biological father		2 (0.2)	1 (0.1)	1 (0.3)	
Other		6 (0.5)	1 (0.1)	5 (1.7)	
Age, years; Mean ± SD		26.1 ± 6.2	25.8 ± 6.0	27.1 ± 6.6	.004
Race, n (%)	1,115				.001
American Indian or Alaska Native		3 (0.3)	3 (0.4)	0 (0.0)	
Asian or Pacific Islander		11 (1.0)	7 (0.8)	4 (1.4)	
Black		302 (27.1)	233 (28.1)	69 (24.1)	
Hispanic		174 (15.6)	147 (17.7)	27 (9.4)	
White		543 (48.7)	377 (45.5)	166 (58.0)	
Other race		3 (0.3)	1 (0.1)	2 (0.7)	
Two or more races		79 (7.1)	61 (7.4)	18 (6.3)	
Female sex, n (%)	1,117	1,110 (99.4)	825 (99.6)	285 (98.6)	.08
Married, n (%)	1,126	275 (24.4)	197 (23.7)	78 (26.4)	.35
Involved partner, n (%)	1,126	889 (79.0)	654 (78.7)	235 (79.7)	.73
Support system, n (%)	1,126	1,055 (93.7)	774 (93.1)	281 (95.3)	.20
Stable housing, n (%)	1,126	993 (88.2)	726 (87.4)	267 (90.5)	.15
Employment status, n (%)	1,126				.09
Employed		493 (43.8)	379 (45.6)	114 (38.6)	
Unemployed, looking for work		201 (17.9)	147 (17.7)	54 (18.3)	
Unemployed, not looking for work		432 (38.4)	305 (36.7)	127 (43.1)	

(*continued on p. 1324*)

Table 1. (*continued*)

Variable	n	Total N=1,126	Prenatal Enrollment N=831	Postnatal Enrollment N=295	p-value
Enrolled in WIC, n (%)	1,119	671 (60.0)	447 (53.9)	224 (77.5)	<.001
Annual Income, n (%)	1,092				.74
Less than $10,000		511 (46.8)	384 (47.4)	127 (45.2)	
$10,000 to $14,999		171 (15.7)	129 (15.9)	42 (15.0)	
$15,000 to $24,999		178 (16.3)	126 (15.5)	52 (18.5)	
$25,000 to $34,999		119 (10.9)	91 (11.2)	28 (10.0)	
$35,000 to $49,999		54 (5.0)	39 (4.8)	15 (6.3)	
$50,000 to $74,999		40 (3.7)	30 (3.7)	10 (3.6)	
$75,000 to $99,999		11 (1.0)	8 (1.0)	3 (1.1)	
$100,000 or more		8 (0.7)	4 (0.5)	4 (1.4)	
Education level, n (%)	1,117				.35
Less than high school diploma or GED		431 (38.6)	316 (38.2)	115 (39.8)	
High school diploma or GED		323 (28.9)	243 (29.4)	80 (27.7)	
Some college (no degree)		242 (21.7)	173 (20.9)	69 (23.9)	
Associate degree		53 (4.7)	45 (5.4)	8 (2.8)	
Bachelor's degree or higher		68 (6.1)	51 (6.2)	17 (5.9)	
History of incarceration, n (%)	850	170 (20.0)	120 (19.1)	50 (22.6)	.26
Active DCS case, n (%)	1,103	136 (12.3)	55 (6.7)	81 (27.8)	<.001
Insurance coverage, n (%)	1,121				.17
Medicaid		927 (82.7)	682 (82.1)	256 (84.5)	
Commercial		99 (8.8)	71 (8.5)	28 (9.7)	
None, uninsured		95 (8.5)	78 (9.4)	17 (5.9)	

Notes:
DCS = Department of Child Services; GED = General Educational Development; SD = standard deviation; WIC = Women, Infants, and Children

Table 2.

CHILD INTAKE AND STATUS VISITS

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value
Health																		
Days during the past 30 days with not good physical health, median (IQR)	641	0 (0, 3)	416	0 (0, 2)	372	0 (0, 3)	301	0 (0, 3)	259	0 (0, 4)	184	0 (0, 2)	126	0 (0, 3)	73	1 (0, 4)	57	0 (0, 7)
Days during the past 30 days with not good mental health, median (IQR)	761	1 (0, 5)	464	1 (0, 5)	396	1 (0, 7)	311	1 (0, 5)	263	1 (0, 7)	184	2 (0, 6)	126	2.5 (0, 10)	73	3 (0, 10)	57	2 (0, 10)
Diagnosis present, n (%)	768																	
Depression		140 (18.2)																
Anxiety		136 (17.7)																
Schizophrenia		7 (0.9)																
Bipolar Disorder		42 (5.5)																
None		593 (77.8)																
Substance Misuse																		
History of substance abuse, n (%)	259																	
Yes		65 (25.1)																
No		194 (74.9)																
Substance use during the pregnancy, n (%)	762																	
E-cigarettes		71 (9.3)																
Cannabis		98 (12.9)																
Alcohol		34 (4.5)																
Narcotics		29 (3.8)																
None		586 (76.9)																

(*continued on p. 1326*)

Table 2. (*continued*)

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value
Any time spent in residential treatment center for substance use since program intake, n (%)	397		408		373		303		261		187		130		77		59	
Yes		19 (4.8)		15 (3.7)		4 (1.1)		3 (1.0)		1 (0.4)		3 (1.6)		1 (0.8)		1 (1.3)		2 (3.4)
No		378 (95.2)		393 (96.3)		369 (98.9)		300 (99.0)		260 (99.6)		184 (98.4)		129 (99.2)		76 (98.7)		57 (96.6)
Food Insecurity																		
Worry in the past 12 months if food would run out before money to buy more, n (%)	593																	
Yes		140 (23.6)																
No		453 (76.4)																
In the past 12 months, bought food that didn't last and didn't have enough money to buy more, n (%)	593																	
Yes		118 (19.9)																
No		475 (80.1)																
Worry in the past 3 months if your food would run out before money to buy more, n (%)			380		340		284		251		182		126		73		57	
Yes				59 (15.5)		40 (11.8)		39 (13.7)		39 (15.5)		24 (13.2)		15 (11.9)		5 (6.9)		9 (15.8)
No				321 (84.5)		300 (88.2)		245 (86.3)		212 (84.5)		158 (86.8)		111 (88.1)		68 (93.2)		48 (84.2)

(*continued on p. 1327*)

Table 2. (*continued*)

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value
In the past 3 months bought food that didn't last and didn't have enough money to buy more, n (%)			380		340		284		251		182		126		73		57	
Yes				42 (11.1)		33 (9.7)		30 (10.6)		25 (10.0)		13 (7.1)		11 (8.7)		3 (4.1)		6 (10.5)
No				338 (89.0)		307 (90.3)		254 (89.4)		226 (90.0)		169 (92.9)		115 (91.3)		70 (95.9)		51 (89.5)
WIC enrollment, n (%)	760		463		396		113		78		0		0		0		0	
Yes		637 (83.8)		408 (88.1)		309 (78.0)		81 (71.7)		51 (65.4)		-		-		-		-
No		123 (16.2)		55 (11.9)		87 (22.0)		32 (28.3)		27 (34.6)								
Smoking																		
Smoking status, n (%)	641																	
Never smoked		356 (55.5)																
Former smoker		186 (29.0)																
Someday smoker		28 (4.4)																
Everyday smoker		71 (11.1)																
Cigarettes smoked per day BEFORE PREGNANCY, median (IQR)	135	10 (5, 20)																
Cigarettes smoked per day during the FIRST TRIMESTER, median (IQR)	135	8 (2, 10)																
Cigarettes smoked per day during the SECOND TRIMESTER, median (IQR)	136	5 (1, 10)																

(*continued on p. 1328*)

Table 2. (*continued*)

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value
Cigarettes smoked per day during the THIRD TRIMESTER, median (IQR)	136	3 (0, 5.5)																
Smoking in the household, n (%)	767		466		401		314		268		187		130		77		59	
Yes		219 (28.6)		155 (33.3)		132 (32.9)		107 (34.1)		82 (30.6)		50 (26.7)		38 (29.2)		20 (26.0)		15 (25.4)
No		548 (71.5)		311 (66.7)		269 (67.1)		207 (65.9)		186 (69.4)		137 (73.3)		92 (70.8)		57 (74.0)		44 (74.6)
Since child's birth, smoking in the household or in a vehicle with the child present, n (%)	768		466		401		314		268		187		130		77		59	
Yes		56 (7.3)		54 (11.6)		57 (14.2)		40 (12.7)		34 (12.7)		22 (11.8)		13 (10.0)		12 (15.6)		11 (18.6)
No		712 (92.7)		412 (88.4)		344 (85.8)		274 (87.3)		234 (87.3)		165 (88.2)		117 (90.0)		65 (84.4)		48 (81.4)
Any precautions taken to keep child free from exposure to second-hand smoke, n (%)			133		120		104		82		53		40		20		16	
Yes				124 (93.2)		115 (95.8)		99 (95.2)		79 (96.3)		47 (88.7)		39 (97.5)		18 (90.0)		12 (75.0)
No				9 (6.8)		5 (4.2)		5 (4.8)		3 (3.7)		6 (11.3)		1 (2.5)		2 (10.0)		4 (25.0)
Safe Sleep																		
Prepared a safe sleep environment for the child before delivery, n (%)	768																	
Yes		745 (97.0)																
No		23 (3.0)																

(*continued on p. 1329*)

Table 2. (*continued*)

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value	n	Value
Since delivery or the last status visit, child always placed to sleep back without bed sharing or soft bedding, n (%)	768		466		401		314		268		0		0		0		0	
Yes		713 (92.8)		388 (83.3)		341 (85.0)		265 (84.4)		211 (78.7)		-		-		-		-
No		55 (7.2)		78 (16.7)		60 (15.0)		49 (15.6)		57 (21.3)								
Breastfeeding																		
Initiation of breastfeeding at the hospital (or at home, for home births), n (%)	760																	
Yes		614 (80.8)																
No		146 (19.2)																
Currently breastfeeding, n (%)	754		463		396		311		263		184		126		73		58	
Yes, exclusively		268 (35.5)		111 (24.0)		57 (14.4)		34 (10.9)		22 (8.4)		11 (6.0)		5 (4.0)		2 (2.7)		0 (0)
Yes, with supplement		222 (29.4)		111 (24.0)		90 (22.7)		61 (19.6)		46 (17.5)		26 (14.1)		16 (12.7)		10 (13.7)		2 (3.5)
No		264 (35.0)		241 (52.0)		249 (62.9)		216 (69.5)		195 (74.1)		147 (79.9)		105 (83.3)		61 (83.6)		56 (96.6)

(*continued on p. 1330*)

Table 2. (*continued*)

	Child intake		3 months (n=466)		6 months (n=401)		9 months (n=314)		12 months (n=268)		18 months (n=187)		24 months (n=130)		30 months (n=77)		36 months (n=59)	
	n	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**	**n**	**Value**
Pregnancy Complications																		
Complications with prior pregnancies, n (%)	768																	
Gestational diabetes		20 (2.6)																
Gestational hypertension		18 (2.3)																
Preeclampsia		18 (2.3)																
Preterm labor		29 (3.8)																
Other		12 (1.6)																
None		694 (90.4)																
Current pregnancy complications, n (%)	768																	
Gestational diabetes		93 (12.1)																
Gestational hypertension		95 (12.4)																
Preeclampsia		74 (9.6)																
Preterm labor		103 (13.4)																
Other		44 (5.7)																
None		475 (61.9)																
Immunizations																		
Child immunizations up to date, n (%)	768		466		401		314		268		187		130		77		59	
Yes		720 (93.8)		441 (94.6)		365 (91.0)		294 (93.6)		240 (89.6)		169 (90.4)		118 (90.8)		73 (94.8)		55 (93.2)
No		48 (6.3)		25 (5.4)		36 (9.0)		20 (6.4)		28 (10.5)		18 (9.6)		12 (9.2)		4 (5.2)		4 (6.8)

Notes:
Gray boxes = Follow up questions to these content areas were assessed differently at these time points. See text for additional details.

Table 3.

COMPARING OUTCOMES BY STUDY ENTRY TIMEPOINT

	Study Entry Timepoint		
Variable	**Prenatal**	**Postnatal**	**p-value**
Practiced safe sleep	446 (94.3)	267 (90.5)	.048
Initiated breastfeeding	638 (87.6)	220 (76.1)	<.001
Received adequate prenatal care[a]	420 (89.4)	244 (84.4)	.046

Note
[a]Defined as attending 10+ prenatal care visits.

Table 4.

CHANGES IN CAREGIVER CHARACTERISTICS FROM INTAKE TO THREE-MONTH CHILD STATUS VISIT

Caregiver Characteristics	n	Decline n (%)	Stable n (%)	Improvement n (%)	p-value
Employed	457	61 (13.4)	340 (74.4)	56 (12.3)	.64
Stable housing	458	13 (2.8)	403 (88.0)	42 (9.2)	<.001
Poor physical health days	358	74 (20.7)	176 (49.2)	108 (30.2)	.012
Poor mental health days	456	139 (30.5)	167 (36.6)	150 (32.9)	.52
Food insecurity—worried food would run out before money became available to buy more	404	21 (5.2)	317 (78.5)	66 (16.3)	<.001
Food insecurity—food didn't last and didn't have enough money to buy more	404	21 (5.2)	326 (80.7)	57 (14.1)	<.001
Household smoking	458	47 (10.3)	360 (78.6)	51 (11.1)	.69

a significant difference in participants who reported an improved status compared with a decline in status (17.9% vs. 10.1%; $p < .001$). Caregiver housing stability also showed statistically significant differences in participants reporting an improved status compared with a declining status by the final visit (9.7% vs 2.9%; $p < .001$). Changes in household smoking approached significance for participants reporting improvements compared to those reporting a decline (13.4% vs. 10%; $p = .06$). Changes in food insecurity between intake and the final visit demonstrated statistically significant differences with more participants reporting improvements compared with declines for both indicators—feeling that food would run out before they had money to buy more (21% vs. 6.8%; $p < .001$) and food did not last (17.1% vs 6.1%; $p < .001$).

Table 5.

CHANGES IN CAREGIVER CHARACTERISTICS FROM PROGRAM INTAKE TO FINAL VISIT

Caregiver Characteristics	n	Decline n (%)	Stable n (%)	Improvement n (%)	p-value
Employed	693	70 (10.1)	499 (72.0)	124 (17.9)	<.001
Stable housing	693	20 (2.9)	606 (87.5)	67 (9.7)	<.001
Poor physical health days	558	139 (24.9)	260 (46.6)	159 (28.5)	.25
Poor mental health days	686	222 (32.4)	241 (35.1)	223 (32.5)	.96
Food insecurity—worried food would run out before money became available to buy more	528	36 (6.8)	381 (72.2)	111 (21.0)	<.001
Food insecurity—food didn't last and didn't have enough money to buy more	528	32 (6.1)	406 (76.9)	90 (17.1)	<.001
Household smoking	693	69 (10.0)	531 (76.6)	93 (13.4)	.06

A subgroup analysis of caregivers enrolled prenatally found a significant difference in smoking status among participants reporting an improvement compared with a decline (14.6% vs. 9.5%; p=.025) (Table 6). All other changes in characteristics for caregivers enrolled prenatally remained consistent with the overall study population.

The Pre to 3 program also monitored caregivers' mental health through use of the Edinburgh Depression Scale (Table 7). A significant difference in scores that improved compared with scores that declined was seen among participants screened prenatally and at birth (18.4% vs. 8.9%; p = .022) and among those screened prenatally and during the postpartum period (24.6% and 4.4%; p < .001).

Reimbursement outcomes. From 2019 – 2024, the VCHD Pre to 3 program received a total of $402,425.96 in reimbursement for claims related to CHW efforts (Table 8). Delays in claim submission, incorrect code utilization, and clients not actively covered by Medicaid account for the majority of claim denials. The median percentage of claims approved each year was 70.8% with a range of 13.3% to 98.0%. In 2019, the first year of submitting claims for reimbursement, several months of trial and error were required to determine correct coding strategies for successful reimbursement of services, accounting for the low reimbursement rate that year.

Discussion

Many maternal-infant programs lack evidence-based curricula, provide services that end at the child's first birthday, restrict the program to first-time parents, impose financial restrictions, and/or offer no clinical or social work support.[28–32] Pre to 3 uses the evidence-based GGK curriculum and client access that is not limited by the afore-

Table 6.

CHANGES IN CAREGIVER CHARACTERISTICS FROM PRENATAL INTAKE TO FINAL VISIT

Caregiver Characteristics	n	Decline n (%)	Stable n (%)	Improvement n (%)	p-value
Employed	474	45 (9.5)	343 (72.4)	86 (18.1)	<.001
Stable housing	474	12 (2.5)	409 (86.3)	53 (11.2)	<.001
Poor physical health days	375	87 (23.2)	180 (48.0)	108 (28.8)	.13
Poor mental health days	470	159 (33.8)	165 (35.1)	146 (31.1)	.46
Food insecurity—worried food would run out before money became available to buy more	352	25 (7.1)	252 (71.6)	75 (21.3)	<.001
Food insecurity—food didn't last and didn't have enough money to buy more	352	22 (6.3)	269 (76.4)	61 (17.3)	<.001
Household smoking	474	45 (9.5)	360 (76.0)	69 (14.6)	.025

Table 7.

CHANGES IN EDINBURGH DEPRESSION SCALE RESULTS

Comparison	n	Decline n (%)	Stable n (%)	Improvement n (%)	p-value
Prenatal screening to birth screening	158	14 (8.9)	115 (72.8)	29 (18.4)	.022
Prenatal screening to postpartum screening	114	5 (4.4)	81 (71.1)	28 (24.6)	<.001
Birth screening to postpartum screening	170	9 (5.3)	146 (85.9)	15 (8.8)	.22

mentioned factors. Vanderburgh County Health Department's CHW-driven Pre to 3 Program has demonstrated clinically significant, sustained improvements in maternal, child, and infant health, consistent with existing literature for under-resourced populations.[33]

Currently, Nurse Family Partnership is the most widely used, federally funded program directed at maternal and infant care across Indiana.[34,35] Pre to 3 and NFP collect and report different program outcomes, limiting the ability to draw direct comparisons. The Pre to 3 and NFP programs both aim to improve maternal and infant health, but they differ in their approaches and target populations. To be eligible for NFP a person

Table 8.

REIMBURSEMENT RECEIVED FOR CHW CLAIMS

Year	Total Reimbursement Received	Claims Submitted	Claims Reimbursed n (%)	Type of Claim Reimbursed n (%)	
2019	$81,841.37	7,823	2,521 (32.2%)	Medicaid	2,510 (99.6)
				Commercial	7 (2.8)
				Self-Pay	4 (1.6)
2020	$90,319.7	14,085	3,518 (25.0%)	Medicaid	3,513 (99.9)
				Commercial	1 (0.03)
				Self-Pay	4 (0.1)
2021	$68,947.06	12,987	3,124 (24.1%)	Medicaid	3,120 (99.9)
				Commercial	—
				Self-Pay	4 (0.1)
2022	$61,392.81	12,315	3,046 (24.7%)	Medicaid	3,046 (100)
				Commercial	—
				Self-Pay	—
2023	$84,814.8	18,814	4,394 (23.4%)	Medicaid	4,394 (100)
				Commercial	—
				Self-Pay	—
2024	$88,369.38	5,921	1,775 (30.0%)	Medicaid	1,775 (100)
				Commercial	—
				Self-Pay	—

Note
CHW = community health worker

must be less than 28 weeks pregnant, have no previous live births (i.e., be a first-time parent), and be eligible for Medicaid (i.e., at 212% of the poverty level or below). Nurse Family Partnership provides home visits by registered nurses from early pregnancy until the child turns two years old. The focus of the program is on prenatal care, parenting skills, and maternal personal development. In contrast, Pre to 3 includes broader eligibility criteria that allows enrollment at any point pre or postnatally during a first or subsequent pregnancy and supports families until the child turns three years old. The Pre to 3 program involves various professionals, including CHWs, registered nurses, and social workers, and emphasizes comprehensive support for maternal and child health, early childhood development, family resilience, and access to community resources.

Reimbursement and sustainability. Despite demonstrated CHW effectiveness, the scalability of CHW models, such as what is used by Pre to 3, remains a challenge due to lack of a comprehensive understanding of barriers and facilitators of successful CHW-driven programs. More evidence that identifies and addresses factors that hinder or support the integration of CHWs into health care systems on a larger scale could

help strategize CHW program development and policies to optimize patient care within communities. One of these barriers is financial sustainability of employing CHWs. Community health worker programs historically rely on grant funding, which poses a risk to the long-term impact of demonstrated outcomes. As of July 2018, CHWs can be reimbursed for eligible services provided to Medicaid beneficiaries in Indiana. Despite this advancement, a 2022 mixed-methods study from Indiana revealed the need for improved infrastructure to support and sustain the local CHW workforce, including improvements in funding and reimbursement mechanisms.[21] As aforementioned, in 2019, VCHD became the first organization in Indiana to implement Medicaid billing for CHW services and is the only community-based organization to demonstrate CHW reimbursement success.[36] Since then, VCHD has consistently received Medicaid reimbursement for its Pre to 3 CHW services. However, claims for Pre to 3 services were not always reimbursed, with common reasons for claim rejections including delays in claim submission and code utilization. Medicaid reimbursement for claims is insufficient to sustain the entire CHW team for the Pre to 3 program. Over the five-year span, revenue generation through CHW-rendered services fluctuated. The COVID-19 pandemic likely played a significant role in the changes in reimbursement seen in 2021 and 2022. Many CHW services were moved to virtual visits for the safety of program enrollees and staff, making them ineligible for reimbursement. The COVID-19 pandemic highlighted the stark gaps in health equity and the unsustainability of financial support for the CHW workforce. At the time of writing, later 2024 reimbursement payments had yet to be received, which accounts for the lower rate reported for 2024. In 2024, Medicare established SDOH assessment codes, Principal Illness Navigation (PIN) codes, and (Community Health Integration) CHI codes that allow for CHW service reimbursement. Given the recency of the establishment of these codes, no data exist concerning the impact or influence on broad CHW workforce sustainability; additionally, most maternal-infant programs do not serve Medicare beneficiaries.[37]

Community health workers who work across a variety of sectors commonly engage in vital services that are ineligible for reimbursement. Many of these activities are essential to facilitate positive clinical outcomes in communities that require significant resources to overcome existing barriers.[37] For example, the VCHD CHWs spend an average of 12–15 hours per week on home visit services that are eligible for reimbursement. In the time spent outside of billable home visits, CHWs are finalizing documentation, preparing for upcoming visits, completing referrals, coordinating services, working on continuing education, traveling to and from visits, providing translation services, conducting community outreach, and working with the team on family case management. Given the amount of time CHWs are currently spending on ineligible yet vital services, the number of billable units per calendar year should be increased. The current Indiana Medicaid reimbursement model limits services rendered by CHWs to four units, or two hours, per day per client, or 24 units, or 12 hours, per month per client. These reimbursement limitations are not unique to VCHD or Indiana.[38] Ideally, the impact of CHWs in under-resourced communities will be amplified as more infrastructure is developed to support the CHW workforce.

Pre to 3 program impact. The Pre to 3 program's impact on infant and caregivers' health underscores the importance of the program's early and consistent support. Key

successes were observed in various characteristics related to both maternal and infant health including breastfeeding initiation, safe sleep practices, child vaccination rates, food security, housing stability, and employment status. Breastfeeding initiation is an important surrogate health marker due to the numerous benefits provided to both infant and birth-giving individuals. For infants, breastmilk is associated with reduced mortality rates, enhanced immune system development, and lower risks of obesity, diabetes, and respiratory infections.[39] For breastfeeding caregivers, breastfeeding has been linked to reduced risks of breast, ovarian, and cervical cancer, as well as protection against osteoporosis and anemia.[40] The American Academy of Pediatrics currently recommends exclusive breastfeeding for up to six months.[39,41] Within Indiana, breastfeeding rates average 82.9% and nationally average 84.1%. Taken as a whole, the breastfeeding initiation rates for Pre to 3 program participants are on par with the state average. However, when participants were enrolled prenatally the breastfeeding initiation rates exceeded both state and national rates, emphasizing the value of prenatal program engagement.

Another critical surrogate health marker is promoting safe sleep as it directly reduces the risk of sudden infant death syndrome (SIDS) and other sleep-related infant deaths.[41,42] According to the Centers for Disease Control and Prevention (CDC), more than one half of parents reported bed-sharing, more than one third reported using soft bedding, and one fifth reported placing the child in a position other than on their back.[43] Reported safe-sleep practices among Pre to 3 program's participants show higher rates of safe-sleep practices compared with the CDC-reported data. Additionally, higher rates of initial safe-sleep practices were reported among participants enrolled prenatally. This highlights the program's success in providing education and resources that help families implement evidence-based practices to keep infants safe during sleep, particularly when education is provided prior to birth.

The Pre to 3 program's positive influence extended to child vaccination rates. In 2023, the Indiana average for completing the recommended vaccination series in children aged 19–35 months was 56.4%.[44] Infants in the Pre to 3 program consistently achieved vaccination rates at 90% or higher at each child status visit, demonstrating the program's success in connecting families with preventive care. Sustained high rates of vaccination ultimately have long-term benefits for the child and community through protection against communicable diseases leading to a decrease in infant and child mortality rates.[45]

Pre to 3 was able to successfully address challenges related to food security. Positive improvements were seen in food insecurity by the six-month child status visit and were sustained. Fluctuations between childbirth and the six-month visit were seen. It is possible that immediate postpartum financial strain may have played a role in the form of hospital-related expenses or increased nutritional demands associated with breastfeeding.[46–48] An unexpected observation in our study was the decline in Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) enrollment between three- and 12-months postpartum. This trend can likely be explained by the structure of WIC benefits and the changing needs of families over time. For example, WIC's formula support ends at 12 months, reducing its perceived value for families no longer relying on infant formula. Similarly, when the infant turns six months, the WIC benefits for non-breastfeeding individuals cease for this pregnancy, which may lead

to earlier program disengagement. Families eligible for both WIC and Supplemental Nutrition Assistance Program (SNAP) may also prioritize SNAP due to its greater flexibility, particularly after formula benefits cease. Addressing these structural challenges within WIC could help sustain enrollment and ensure continued support for families beyond the first year postpartum.

Community health workers contribute to improvements in housing stability and employment through focused home visits. During home visits to support housing stability, CHWs walk the family through a projected household budget, then identify available housing options based on the family's situation. The CHW follows up to ensure that housing applications are on track and continues to act as a navigator to support the family, often communicating on behalf of the family directly with Housing Authority representatives or organizations that provide rental support. Many families have a difficult time understanding the process due to language barriers or the complexity of the language used in housing agreements.

When focusing on employment, CHW home visits focus on ensuring that the caregiver has an updated resume, gathering information about type of position and schedule needed, and reasonable locations. The CHW will assist the caregiver with scheduling an appointment with a local employment group and support the caregiver in identifying positions that meet their needs.

Limitations. Although VCHD's CHW-led program demonstrated a positive effect on health outcomes, some limitations exist. The Pre to 3 program is specific to southwestern Indiana, which limits external validity. It cannot be assumed that similar results will be seen in other locations due to variations in populations served and existing resources. No reasonable and accessible comparator data was available to evaluate any potential superiority of the Pre to 3 program. The COVID-19 pandemic began approximately 18 months into the data collection period and required a drastic shift in program delivery, which may have affected the results.

Future directions. In Indiana and across the nation, the vast majority of CHW salaries are supported through grant funding.[14] Temporary funding sources and low reimbursement rates exacerbate the struggle for employers to be able to provide sustained livable wages.[49] More consistent and reliable funding models are necessary to support and scale the CHW workforce. Policy change aimed at developing alternative payment models, improving CHW reimbursement rates, expanding eligible covered services, and limiting other barriers to the access and provision of CHW services must be prioritized to facilitate new and continued CHW employment opportunities. Additionally, financial and non-financial incentives should be used to support a strong CHW workforce. Financial incentives include an appropriate wage and reimbursement without the current wage gaps that exist and that contribute to shortages and frequent turnover in the CHW workforce. Indirect incentives include recognizing the important role CHWs play as a valuable member of a health care team and offering opportunities for professional growth.[50,51]

Diversifying funding support for the Pre to 3 model is necessary to expand the program beyond Vanderburgh County. In addition to Medicaid reimbursement, allocating federal Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program and Title V funding, along with state general revenue funding to the Pre to 3 model would

enhance its ability to provide comprehensive support to a broader range of families. This funding would enable the program to expand its reach, ensuring more families benefit from early childhood development, maternal health, and family resilience services. By investing in the Pre to 3 model expansion, Indiana will create additional opportunities to address the priorities for maternal and child health outlined in the Indiana Department of Health (IDOH) 2022–2025 Public Health Plan.[52] Specifically, the five key priority areas are reducing infant mortality through programs that educate on safe-sleep practices and provide access to prenatal and postnatal care; improving maternal health through access to comprehensive maternal health services, including prenatal care, mental health support, and substance use treatment; promoting breastfeeding through support programs and education; addressing health disparities among different racial and socioeconomic groups; and enhancing early childhood development through programs that promote healthy growth, development, and early learning. Allocating these funds to the Pre to 3 model expansion would contribute to healthier communities across the state through reduced maternal and infant mortality rates.

In 2023, VCHD began discussions with Dubois County Health Department (DCHD) to expand the Pre to 3 program to their county. In October 2023, DCHD completed their first intake into the Pre to 3 program and are operating from a waitlist due to interest in enrollment. Dubois County Health Department funds two registered nurses (RNs) and two CHWs, one of whom is bilingual (English and Spanish), with plans to hire two additional bilingual CHWs in 2025. Currently, VCHD provides support to its staff in terms of training, quality assurance, billing, and data collection and analysis Initial success from the DCHD Pre to 3 program can inform effective implementation across other counties.

Conclusions. The Pre to 3 program provides a model that could be feasibly expanded to improve maternal and infant outcomes throughout the United States. The reported impacts are from 11 CHWs over a five-year period. With increased financial resources, and subsequently more program personnel, there is significant potential for positive impact on the health outcomes of high-risk communities.

References

1. Centers for Disease Control and Prevention (CDC). Infant mortality. Atlanta, GA: CDC, 2020. Available at: https://www.cdc.gov/maternal-infant-health/infant-mortality/index.html.
2. Bauserman M, Lokangaka A, Thorsten V, et al. Risk factors for maternal death and trends in maternal mortality in low- and middle-income countries: a prospective longitudinal cohort analysis. Reprod Health. 2015;12 Suppl 2(Suppl 2):S5. Epub 2015 Jun 8.
https://doi.org/10.1186/1742-4755-12-S2-S5
PMid:26062992
3. U.S Department of Health and Human Services. Goal: Improve the health and safety of infants. Washington, D.C.: U.S Department of Health and Human Services, 2020. Available at: https://health.gov/healthypeople/objectives-and-data/browse-objectives/infants.
4. Indiana Department of Health. Nurse Family Partnership (NFP). Indianapolis, IN:

Indiana Department of Health, 2025. Available at: https://www.in.gov/health/mch/program-initiatives/nurse-family-partnership-nfp/.
5. Indiana Department of Health. Indiana infant mortality and birth outcomes, 2019. Indianapolis, IN: Indiana Department of Health, 2021. Available at: https://www.in.gov/health/files/IndianaIMRFact2019.pdf.
6. 6. Health Resources and Services Administration. HPSA Find. Rockville, MD: U.S. Department of Health and Human Services, 2025. Available at: https://data.hrsa.gov/tools/shortage-area/hpsa-find.
7. National Heart, Lung, and Blood Institute. Community Health Workers. Bethesda, MD: National Heart, Lung, and Blood Institute, 2025. Available at: https://www.nhlbi.nih.gov/education/heart-truth/CHW.
8. Mwai GW, Mburu G, Torpey K, et al. Role and outcomes of community health workers in HIV care in sub-Saharan Africa: a systematic review. J Int AIDS Soc. 2013 Sep 10;16(1):18586.
https://doi.org/10.7448/IAS.16.1.18586
PMid:24029015
9. Widyasari V, Rahman FF, Lin KH, et al. The effectiveness of health services delivered by community health workers on outcomes related to non-communicable diseases among elderly people in rural areas: a systematic review. Iran J Public Health. 2021 Jun;50(6):1088–96.
https://doi.org/10.18502/ijph.v50i6.6408
PMid:34540730
10. Kangovi S, Mitra N, Norton L, et al. Effect of community health worker support on clinical outcomes of low-income patients across primary care facilities: a randomized clinical trial. JAMA Intern Med. 2018 Dec 1;178(12):1635–43.
https://doi.org/10.1001/jamainternmed.2018.4630
PMid:30422224
11. McCue K, Sabo S, Wightman P, et al. Health Start Program Evaluation, 2006–2016: Final Impact Report. Phoenix, AZ: Arizona Department of Health Services, 2021. Available at: https://www.azdhs.gov/documents/prevention/womens-childrens-health/reports-fact-sheets/health-start/health-start-final-impact-report-2021-12-02.pdf.
12. Williams CM, Cprek S, Asaolu I, et al. Kentucky health access nurturing development services home visiting program improves maternal and child health. Matern Child Health J. 2017 May;21(5):1166–74.
https://doi.org/10.1007/s10995-016-2215-6
PMid:28093688
13. Kentucky Administrative Regulations. Title 902 Chapter 4 Regulation 120. Frankfort, KY: Kentucky General Assembly, 2023. Available at: https://apps.legislature.ky.gov/law/kar/titles/902/004/120/.
14. Kangovi S, Mitra N, Grande D, et al. Community health worker support for disadvantaged patients with multiple chronic diseases: a randomized clinical trial. Am J Public Health. 2017 Oct;107(10):1660–7. Epub 2017 Aug 17.
https://doi.org/10.2105/AJPH.2017.303985
PMid:28817334
15. Gogia S, Sachdev HS. Home visits by community health workers to prevent neonatal deaths in developing countries: a systematic review. Bull World Health Organ. 2010 Sep 1;88(9):658–66B. Epub 2010 May 10.
https://doi.org/10.2471/BLT.09.069369
PMid:20865070

16. Litzelman DK, Umoren R, Inui TS, et al. Evaluation of a program to reduce infant mortality risk factors in Central Indiana. J Health Care Poor Underserved. 2022 Aug;33(3):1461–77.
https://doi.org/10.1353/hpu.2022.0124
PMid:36245175
17. Rodriguez NM, Ruiz Y, Meredith AH, et al. Indiana community health workers: challenges and opportunities for workforce development. BMC Health Serv Res. 2022 Jan 27;22(1):117.
https://doi.org/10.1186/s12913-022-07469-6
PMid:35086545
18. National Academy for State Health Policy. State community health worker models. Washington, DC: The National Academy for State Health Policy, 2021. Available at: https://www.nashp.org/state-community-health-worker-models/#tab-id-1.
19. Green and Healthy Homes Initiative. Using state plan amendments for community health worker Medicaid reimbursement: a best practice case study from Indiana. Baltimore, MD: Green & Healthy Homes Initiative, 2019. Available at: https://www.greenandhealthyhomes.org/publication/5940/.
20. Indiana Health Coverage Programs. Medical Practitioner Reimbursement. Indianapolis, IN: State of Indiana, 2022. Available at: https://www.in.gov/medicaid/providers/files/modules/medical-practitioner-reimbursement.pdf.
21. Lawson N. Momentum for Community Health Workers in Medicaid Continues in the New Year. Washington, DC: Center for Children and Families, Georgetown University Health Policy Institute, 2024. Available at: https://ccf.georgetown.edu/2024/01/29/momentum-for-community-health-workers-in-medicaid-continues-in-the-new-year/.
22. Tableau. Technical specifications. Seattle, WA: Tableau Software, 2016.
https://doi.org/10.5195/jmla.2016.75
23. Benchimol EI, Smeeth L, Guttmann A, et al. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. PLoS Med. 2015 Oct 6;12(10):e1001885.
https://doi.org/10.1371/journal.pmed.1001885
PMid:26440803
24. Great Kids Inc. Evidence-Based Home Visiting Curriculum—Growing Great Kids. Columbus, GA: Great Kids, Inc., 2025. Available at: www.greatkidsinc.org/p-36-curriculum-series/.
25. Great Kids, Inc. Growing Great Kids™: Prenatal to 36 Months Curriculum. Columbus, GA: Great Kids, Inc, 2025. Available at: https://www.greatkidsinc.org/p-36-curriculum-series/
26. Squires J, Bricker D. Ages & Stages Questionnaires®, Third Edition (ASQ®-3): A Parent-Completed Child Monitoring System. Baltimore, MD: Paul H. Brookes Publishing Co, 2009.
https://doi.org/10.1037/t11523-000
27. Squires J, Bricker D, Twombly E. Ages & Stages Questionnaires: Social-Emotional, Second Edition (ASQ:SE-2): A Parent-Completed Child Monitoring System for Social-Emotional Behaviors. Baltimore, MD: Paul H. Brookes Publishing Co, 2015.
28. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. Am J Prev Med. 1998 May;14(4):245–58.

https://doi.org/10.1016/S0749-3797(98)00017-8
PMid:9635069
29. Campos S, Kapp JM, Simões EJ. The evidence base for the Maternal, Infant, and Early Childhood Home Visiting Program constructs. Public Health Rep. 2018 May/Jun;133(3):257–65. Epub 2018 Apr 3.
https://doi.org/10.1177/0033354918764383
PMid:29614235
30. Michalopoulos C, Lee H, Duggan A, et al. The Mother and Infant Home Visiting Program Evaluation: Early findings on the maternal, infant, and early childhood home visiting Program. A Report to Congress. OPRE Report 2015–11. Washington, DC: US Department of Health and Human Services, 2015. Available at: https://eric.ed.gov/?id=ED558512.
31. Meghea CI, Raffo JE, Zhu Q, et al. Medicaid home visitation and maternal and infant healthcare utilization. Am J Prev Med. 2013 Oct;45(4):441–7.
https://doi.org/10.1016/j.amepre.2013.05.005
PMid:24050420
32. Scharff DP, Elliott M, Rechtenwald A, et al. Evidence of effectiveness of a home visitation program on infant weight gain and breastfeeding. Matern Child Health J. 2021 Apr;25(4):676–83. Epub 2020 Nov 28.
https://doi.org/10.1007/s10995-020-03072-5
PMid:33247824
33. Oregon Community Health Workers Association (ORCHWA). Community Health Worker Payment Model Guide. Portland, OR: ORCHWA, 2020. Available at: https://www.orchwa.org/resources/Documents/ORCHWA%20Payment%20Model%20Guide%202020.pdf.
34. Changent. Nurse-Family Partnership. Denver, CO: Changent, 2025. Available at: https://changent.org/what-we-do/nurse-family-partnership/.
35. Indiana Medicaid for Providers. IHCP updates CHW certification requirements; reminds providers of service coverage. Indianapolis, IN: Indiana Medicaid for Providers, 2024. Available at: https://www.in.gov/medicaid/providers/files/bulletins/BT2024198.pdf.
36. Centers for Medicaid and Medicare Services. Medicare Physician Fee Schedule Final Rule Summary: CY 2024. Baltimore, MD: Centers for Medicaid and Medicare Services, 2023. Available at: https://www.cms.gov/files/document/mm13452-medicare-physician-fee-schedule-final-rule-summary-cy-2024.pdf.
37. Schmit CD, Washburn DJ, LaFleur M, et al. Community health worker sustainability: funding, payment, and reimbursement laws in the United States. Public Health Rep. 2022 May–Jun;137(3):597–603. Epub 2021 Apr 28.
https://doi.org/10.1177/00333549211006072
PMid:33909522
38. Higgins E, Chhean E, Wilkniss S, et al. Lessons for advancing and sustaining state community health worker partnerships. Washington D.C.: COVID Collaborative, 2021. Available at: https://www.covidcollaborative.us/assets/uploads/img/community-healthworker-brief.pdf.
39. Meek JY, Noble L, Section on Breastfeeding. Policy statement: breastfeeding and the use of human milk. Pediatrics. 2022 Jul 1;150(1):e2022057988.
https://doi.org/10.1542/peds.2022-057988
PMid:35921640

40. Murphy S, Carter L, Al Shizawi T, et al. Exploring the relationship between breastfeeding and the incidence of infant illnesses in Ireland: evidence from a nationally representative prospective cohort study. BMC Public Health. 2023 Jan 20;23(1):140. https://doi.org/10.1186/s12889-023-15045-8
PMid:36670399
41. Goldman AS. Evolution of immune functions of the mammary gland and protection of the infant. Breastfeed Med. 2012 Jun;7(3):132–42. Epub 2012 May 11. https://doi.org/10.1089/bfm.2012.0025
PMid:22577734
42. Eunice Kennedy Shriver National Institute of Child Health and Human Development. Reduce the risk of SIDS and other sleep-related causes of infant death. Rockville, MD: National Institute of Child Health and Human Development, 2023. Available at: https://safetosleep.nichd.nih.gov/reduce-risk/reduce#:~:text=The%20safest%20sleep%20position%20is,by%20up%20to%2045%20times.
43. Bombard JM, Kortsmit K, Warner L, et al. Increase in hepatitis A virus infections—United States, 2013–2018. MMWR Morb Mortal Wkly Rep. 2018 Jan;67(1):39–46. https://doi.org/10.15585/mmwr.mm6701e1
PMid:29324729
44. Indiana Department of Health. County Immunization Rate Assessment. Indianapolis, IN: Indiana Department of Health, 2023. Available at: https://www.in.gov/health/immunization/files/County_Rate_Assessment_Report_2023.pdf.
45. Nandi A, Shet A. Why vaccines matter: understanding the broader health, economic, and child development benefits of routine vaccination. Hum Vaccin Immunother. 2020 Aug 2;16(8):1900–4. Epub 2020 Jan 24. https://doi.org/10.1080/21645515.2019.1708669
PMid:31977283
46. Cahn J, Sundaram A, Balachandar R, et al. The association of childbirth with medical debt in the USA, 2019–2020. J Gen Intern Med. 2023 Aug;38(10):2340–6. Epub 2023 May 18. https://doi.org/10.1007/s11606-023-08214-3
PMid:37199904
47. Centers for Disease Control and Prevention (CDC). Maternal diet. Atlanta, GA: CDC, 2023. Available at: https://www.cdc.gov/breastfeeding-special-circumstances/hcp/diet-micronutrients/maternal-diet.html#:~:text=Breastfeeding%20mothers%20generally%20need%20more,amount%20they%20consumed%20before%20pregnancy.
48. Picciano MF. Pregnancy and lactation: physiological adjustments, nutritional requirements and the role of dietary supplements. J Nutr. 2003 Jun;133(6):1997–2002S. https://doi.org/10.1093/jn/133.6.1997S
PMid:12771353
49. Backman I. A year of breastfeeding costs families as much as $11,000, study finds. New Haven, CT: Yale School of Medicine, 2023. Available at: https://medicine.yale.edu/news-article/a-year-of-breastfeeding-costs-families-as-much-as-dollar11000-study-finds/.
50. Jones M, Jeung C, Schulte A, et al. Hourly wages and turnover of community health workers and turnover of community health workers according the U.S state certification policy and Medicaid reimbursement. Am J Public Health. 2022 Oct;112(10):1480–8. Epub 2022 Aug 11. https://doi.org/10.2105/AJPH.2022.306965
PMid:35952329

51. Colvin CJ, Hodgins S, Perry HB. Community health workers at the dawn of a new era: 8. Incentives and remuneration. Health Res Policy Syst. 2021 Oct 12;19(Suppl 3):106.
https://doi.org/10.1186/s12961-021-00750-w
PMid:34641900
52. Indiana Department of Health. 2022–2025 IDOH Strategic Plan. Indianapolis, IN: Indiana Department of Health, 2024. Available at: www.in.gov/health/directory/office-of-the-commissioner/phpm/state-health-improvement-plan/.