

The cost of doing nothing: Preventable premature births for at-risk women

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ABSTRACT: Background: The effects of poverty in the United States are growing, and the impacts are most severe for the already vulnerable populations. This analysis looks at the cost of doing nothing for at-risk pregnant women in one county in NE Ohio. Most of these women are living at or below the poverty level, lack safe, affordable, and stable housing, and often do not receive the recommended levels of prenatal care. This examination uses data from Mahoning County, Ohio, where one program has provided wrap-around support for any at-risk pregnant mother since 2016. **Objective:** Examine the cost/savings of providing wrap-around support services to at-risk pregnant women. **Methods:** Data was provided by the Mahoning County Pathway HUB (MCPH) regarding all births since its 2016 inception. Data was extracted from the Ohio Department of Health, the CDC, and other sources regarding the cost of births, specifically premature births. These sources of data were analyzed using causal-comparative methods in order to understand the frequency of premature births with and without the support services provided by the MCPH. **Conclusion:** The results of these causal-comparative analyses suggest that the cost of doing nothing for at-risk pregnant women is substantial for all stakeholders. The results demonstrate a savings of 2.45 million dollars for the five years included in the analysis. Because most of the services provided by the MCPH are billable to public health insurance, this model of supporting pregnant mothers who are at risk is important. The cost of doing nothing can lead to a lifetime of avoidable suffering and financial hardship for women and infants who are born premature. The results from the MCPH suggest that this model of support and service delivery is making a difference, based on the lower-than-expected pre-term births over their tenure of operation.

KEYWORDS: infant mortality; Pathway HUB; poverty; cost benefit; prevention

1. Introduction

Ohio is grappling with a persistent issue of infant mortality. Factors contributing to infant mortality, such as poverty^[1], chronic stress^[2,3], lack of access to prenatal and postnatal care^[3,4], maternal health issues^[5,6], substance abuse^[7,8], low birth weight^[9,10], and premature births^[11,12], are challenging to address in the short term^[13,14]. Mitigation efforts focus on the prenatal-to-birth health of mothers and infants. At the same time, data reveals that at least 45% of infant deaths in Ohio occur after the first month of life.

Data from the Ohio Department of Medicaid^[15] indicates Mahoning County's infant mortality rate is 9.1/1000 through 2021. According to this report, this is an increase of 12.1% from 2019 to 2020. Overall, the pre-term rate was 19.4% in Mahoning County, representing an increase of 18.2% from 2020 to 2021. This pre-term rate is 4% higher than the state average for Ohio. Consistently, the rate of Caucasian infant deaths and pre-term births is decreasing. At the same time, there continues to be a rise in infant mortality for minority infants of non-Hispanic black women. This ranks Ohio eighth in the nation for its infant mortality rate, with "black infants are 2.7 times more likely to die before their first birthday than white infants"^[16]. Specifically, this report indicates that the infant mortality rate for white infants is 5.4/1000, while for black infants, it is a staggering 14.2/1000.

One of the core objectives outlined in Healthy People 2030^[17] is to reduce the overall infant mortality rate. Promoting healthy behaviors and addressing maternal health before and between pregnancies aim to improve birth outcomes and reduce the risk of adverse events for mothers and infants. This comprehensive approach recognizes the interconnectedness of maternal and infant health. It highlights the potential for long-term impact through comprehensive strategic interventions such as those organized by the Ohio Commission on Minority Health^[18]. Consistent with the focus of the CDC goals, the OCMH has led the charge to reduce the factors that impede the likelihood of a healthy pregnancy, healthy birth outcomes, and first birthday celebrations for all infants.

The OCMH seeks to accomplish this through the funding of pathway HUBs to support healthy pregnancies and births for at-risk, low-income, minority women across the state of Ohio. Mahoning Valley Pathway HUB (MVPH) has been providing services to these groups since 2016. This model of support utilizes CHWs from the same neighborhoods as the enrollees. CHWs effectively support mothers throughout pregnancy and delivery^[19]. As a pathway HUB, the MVPH provides wrap-around support and navigation of all life needs through an extensive list of pathway services. Each enrollee is assigned a community health worker (CHW) who supports her in navigating twenty identified pathways, including education on all topics related to pregnancy and child care, Social Service Referral, Medical Referral, Pregnancy, Postpartum, Housing, Medical Home, Family Planning, Adult Learning, Tobacco Cessation, Medication Assessment, Health Insurance, Behavioral Health, Employment, Immunization Screening, Medication Management, Lead Screening, Developmental Referral, Developmental Screening, and Immunization Referral. A description of the pathways is in Appendix. This evolving list of pathway services is based on the Pathways Community HUB model developed by Redding and Redding^[20] and Redding et al.^[21]. Since its inception, the MVPH has served more than five hundred mothers and infants.

Little-known research has empirically investigated these supports' savings when provided to minority families^[22]. The only known study by Larwin et al. demonstrated that this model can have a fiscally positive impact on overall costs. Further, Larwin and Larwin^[23] demonstrated that participation in a pathway HUB resulted in significantly fewer pre-term births overall for enrollees with one or more previous pre-term or adverse birth outcomes. The number of repeat pre-term births was 86% lower than was expected.

This paper focuses on the savings realized by the HUB model of support, versus the cost of doing nothing, when specifically examining the MVPH data. As one of the first and larger pathway HUBs in the state of Ohio, the data examined herein provides a snapshot of the work of the OCMH and the MVPH in abating the structural and systemic issues driving infant mortality rates, specifically for at-risk minority women^[24-26]. As such, the MVPH can demonstrate the financial savings provided by this model. As the MVPH, in partnership with the OCMH, has existed for a decade, understanding the savings via direct

medical costs is a first step to understanding the overall savings to all stakeholders when a child is born to an at-risk minority woman in NE Ohio.

2. Method

This premature birth analysis relied on Waitzman et al.’s^[26] March of Dimes report on state-level costs, showing the differential cost for premature births beyond those incurred for full-term births. **Table 1** provides that the national average differential cost of prematurity is \$64,816; Ohio’s cost is \$62,389, based on Waitzman et al.^[26].

Table 1. Cost breakdown estimates.

Cost category	Cost	% of total cost
Medical care	\$44,116	68%
Maternal delivery	\$5024	8%
Early intervention services	\$1808	3%
Special education	\$1604	2%
Devices	\$28	0%
Lost labor market productivity	\$12,236	19%
Total	\$64,816	-

Waitzman et al.^[26] included indirect costs resulting from lost labor market productivity and heightened morbidity over a lifetime, as well as direct medical costs, early intervention, and special education services. This differential cost of prematurity is used to estimate the cost savings within the HUB relative to the local community, the state of Ohio, and the United States. The HUB’s prematurity rate for black infants was lower than the national average, the state average, and the overall Mahoning County average in each year from 2017 to 2021. The first year of the MCPH was not included in the analysis, as the MVPH was building its capacity to serve at-risk pregnant women during the first months of that first year.

3. Results

The analysis for understanding savings focuses on the premature births of minority infants, specifically black infants. The percentage of premature births among black infants in Mahoning County and surrounding areas is provided in **Table 2**.

Table 2. Black infant prematurity rates.

Year	MVPH	US ¹	Ohio ¹	Mahoning county ²	MVPH vs. US	MVPH vs. Ohio	MVPH vs. Mahoning
2017	6.1%	14.7%	15.6%	16.5%	8.7%	9.6%	10.5%
2018	5.1%	15.0%	14.7%	20.6%	9.8%	9.6%	15.5%
2019	5.4%	15.3%	15.1%	19.0%	10.0%	9.8%	13.6%
2020	4.1%	15.1%	15.3%	17.6%	11.1%	11.2%	13.5%
2021	9.8%	15.2%	15.8%	18.6% *	5.4%	6.0%	8.8%

Note: ¹CDC; ²ODH; * Preliminary data (Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System, Natality on CDC WONDER Online Database. Data are from the Natality Records 2016–2022, as compiled from data provided by the fifty-seven vital statistics jurisdictions through the Vital Statistics Cooperative Program^[27]).

Table 2 indicates that improved birth outcomes within the MVPH were realized from 2017 through

2021. However, a more direct measure is a comparison of outcomes within the HUB to those in the county who are not receiving the HUB’s services.

Therefore, the cost of doing nothing for at-risk mothers is best captured by the prematurity rates for black infants of mothers who are attempting to navigate their pregnancy without the available support provided by the MVPH.

The estimates of the expected reductions in pre-term births due to HUB participation were computed using the difference in pre-term birth rates in the HUB versus the rest of Mahoning County. These results are provided in **Table 3**.

Table 3. Premature births by a group.

Year	MVPH			Not using MVPH*		
	Full term	Pre-term	Total	Full term	Pre-term	Total
2017	31	2	33	530	109	639
2018	37	2	39	449	124	573
2019	53	3	56	484	123	607
2020	47	2	49	450	104	554
2021	92	10	102	367	95	462

Note: * indicates Mahoning County mothers not using the services of the MVPH.

Figure 1 illustrates the proportion of pre-term births for the participants in the MVPH and for those women who were not enrolled in the MVPH (Non-MVPH).

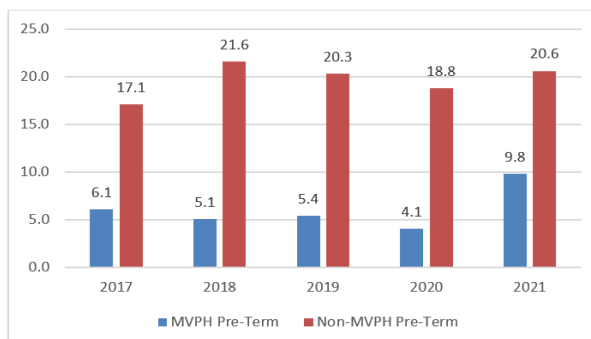


Figure 1. Proportion of MVPH pre-term relative to Non-MVPH pre-term.

Based on the values provided in **Table 3**, the prematurity rates were calculated for those receiving HUB services and those who are not receiving HUB services. These results are provided in **Table 4**.

Table 4. Prematurity rates for MVPH vs. non-MVPH mothers.

Year	MVPH	Not using MVPH*	Difference
2017	6.1%	17.1%	-11.0%
2018	5.1%	21.6%	-16.5%
2019	5.4%	20.3%	-14.9%
2020	4.1%	18.8%	-14.7%
2021	9.8%	20.6%	-10.8%

Note: * indicates Mahoning County mothers not using the services of the MVPH.

As indicated in **Table 4**, the computed differences are substantial. As demonstrated below, the cost of doing nothing for these at-risk mothers represents substantial costs for all stakeholders. In the absence of the HUB, how many more infants would have likely been born prematurely? The reduction in premature births because of the MVPH is presented in **Table 5**.

Table 5. Reduction in premature births based on the MPVH’s data.

Year	Prematurity rate	Total HUB births	Expected premature births	Actual premature births	Reduction in premature births
2017	17.1%	33	5.63	2	3.63
2018	21.6%	39	8.44	2	6.44
2019	20.3%	56	11.35	3	8.35
2020	18.8%	49	9.20	2	7.20
2021	20.6%	102	20.97	10	10.97
				Total	36.59

Note: Reduction equals Expected Premature Births Minus Observed (Actual).

As indicated in **Table 5**, without access to the MVPH’s wrap-around services, 36 infants would likely have been born prematurely in Mahoning County over the past five years. To examine the financial benefit resulting from this reduction in prematurity, Waitzman et al.’s^[26] differential cost of maturity in Ohio is used to estimate the savings. In 2016, a premature birth was \$62,389 more expensive than a full-term birth in Ohio. Price index data was used to determine the inflation factors to bring 2016 data forward. **Table 6** provides the additional costs of premature birth when applying the health care inflation factor.

Table 6. PPI commodity data for Health care services, not seasonally adjusted (WPU51).

Year	Index	Inflation vs. Prior year	Prematurity cost
2016	113.7	-	\$62,389
2017	115.7	1.76%	\$63,486
2018	117.6	1.64%	\$64,529
2019	120.0	2.04%	\$65,846
2020	123.0	2.50%	\$67,492
2021	127	3.25%	\$69,687

Note: For PPI, see <https://beta.bls.gov/dataViewer/view/timeseries/WPU51>.

Applying the yearly prematurity costs presented in **Table 6** to the expected reduction in premature births yields the expected savings. These results are provided in **Table 7**.

Table 7. Expected savings from the reduction of premature births.

Year	Prematurity cost	Reduction in premature births	Prematurity cost savings
2017	\$63,486	3.63	\$230,399
2018	\$64,529	6.44	\$415,553
2019	\$65,846	8.35	\$549,656
2020	\$67,492	7.20	\$485,845
2021	\$69,687	10.97	\$764,746
		Total	\$2,446,200

As indicated in **Table 7**, an expected \$2.45 million reduction in costs over five years is expected due

to the MVPH's wrap-around services to at-risk pregnant mothers. Without MVPH services, these savings represent the cost of doing nothing for these mothers and their infants.

4. Conclusion

The absence of prenatal care can significantly impact the health outcomes of both the mother and the child. Research indicates that inadequate or no prenatal care, as experienced by women in poverty and minority mothers, is associated with higher rates of pre-term birth, low birth weight, and infant mortality^[2-4,28], lack of access to prenatal and postnatal care^[2,4-8,11,12]. Additionally, failure to receive prenatal care may result in undetected medical conditions, such as gestational diabetes or hypertensive disorders, as well as untreated stress, that negatively influence birth outcomes.

Women missing prenatal care do not have opportunities for education and counseling on proper nutrition, substance use, maternal behaviors, and other factors that can contribute to healthier pregnancies, such as those provided by the MVPH. As indicated in this analysis, the absence of MVPH wrap-around support and interventions is related to a substantially increased risk of adverse birth outcomes, specifically premature births, the strongest predictor of infant mortality^[26]. Premature birth, according to Waitzman et al.^[26], creates a lifetime of morbidities for the child, such as asthma, learning disabilities, cerebral palsy, and vision and hearing impairments. These health issues are estimated to cost at least three times more for a child with one of these disabilities than that of a child born without them^[28]. The 2.45 million dollars in potential savings estimated here is only a small estimate of how much can be saved by providing more women with the prenatal support they need to ensure their infant grows into a healthy and productive citizen. In light of the results of this case study, doing nothing for at-risk mothers can no longer be an option.

Author contributions

Conceptualization, KHL and SEH; methodology, SEH; software, KHL and SEH; validation, KHL and SEH; formal analysis, SEH; investigation, KHL; resources, KHL; data curation, SEH; writing—original draft preparation, KHL; writing—review and editing, KHL and SEH; project administration, KHL. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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Appendix

Table A1. Maternal pathways 1.0.

Adult education	<p>Confirm that the client successfully completes the stated education goal:</p> <ul style="list-style-type: none"> • Course/Class completed • Quarter/Semester completed • Training program completed
Behavioral health	<p>Client has kept three scheduled behavior health appointments:</p> <ul style="list-style-type: none"> • Developmental Referral • Document the date and results of the completed developmental evaluation • Developmental Screening • Child successfully screened using the age-appropriate ASQ (Ages & Stages Questionnaire) or ASQ-SE (Ages & Stages Questionnaire: Social Emotional)
Education	<p>Client reports he/she understands the educational information presented (document and format). Education needs to be provided at each visit. Topics should include infant mortality; safe sleep; breastfeeding; and other appropriate topics to meet the client's needs. An education pathway should be opened and closed on the same day as provided.</p>
Employment	<p>Client has obtained a steady income and has been employed for period of 3 months.</p>
Family planning	<p>Confirm that the client has kept appointments and document the family planning method:</p> <ul style="list-style-type: none"> • Completed with permanent sterilization or LARC (Long-acting reversible contraceptive) • All other methods, completed if the client is still successfully using the method after 30 days
Health insurance	<p>Completed if the client has received the health insurance document plan and insurance number.</p>
Housing	<p>Confirmation that the client and/or family has moved into an affordable suitable housing unit for a minimum of 3 months.</p>
Immunization referral	<p>Client who was behind on immunizations has his/her immunization record reviewed and the date is verified.</p>
Immunization screening	<p>Client is up to date on all age-appropriate immunizations.</p> <ul style="list-style-type: none"> • Confirm that the appointment was kept and document the results of the lead blood test
Medical home	<p>Confirm client in need of ongoing primary care has kept the first appointment with a medical home.</p>
Medical referral	<p>Verify with the primary care provider that the client has kept the appointment.</p>
Medication assessment	<p>Verify with the primary care provider that the medication chart was received (Requires chart).</p>
Medication management	<p>Verify with the primary care provider that the client is taking medication as prescribed (Requires chart).</p>
Postpartum	<p>Confirm that the client has kept the postpartum appointment.</p>
Pregnancy	<p>Confirm that the client has delivered a healthy baby weighing more than 5 pounds 8 ounces (2500 grams).</p>
Smoking/Tobacco/Cessation	<p>Confirm that the client has stopped using tobacco products for at least 6 months.</p>
Social service referral	<p>Verify client has kept a scheduled appointment with the social service provider by calling the referral and asking if the client kept the appointment.</p>