

# *Reducing Infant Mortality in Low-Income Urban Neighborhoods Through Mobile Clinics Providing Access to Resources and Healthcare Providers: The Milk Truck Proposition*

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## **Abstract**

High infant mortality in U.S. cities is partially the result of socioeconomic status and racial inequity negatively impacting access to preventative care, prenatal care, and nutrition. The majority of cases are confined to low-income neighborhoods where infant mortality is a function of poverty. Using Philadelphia as a model for low-income urban jurisdictions, we have designed a conceptual program that can be implemented nationally to address this problem. Public health programs have made progress, but targeted approaches are evidently needed to provide relief to neighborhoods left behind by current methods. Our group is proposing a targeted multi-focused program, the Milk Truck program, to improve education, access to resources, and follow through with prenatal and postnatal care in these neighborhoods via mobile outreach health clinics. The program is named and modeled after the concept of a 1950's milkman, where resources are brought to communities in need while requiring little effort on behalf of the recipient. The implementation of Milk Trucks will provide regular access points to prenatal supplementation and formula, food and childcare supplies via gift card/voucher exchanges, clinics providing lactation consultations, healthcare access education, and basic health screenings. Few public health programs addressing infant mortality and birthweight exist in the United States. Those that do have a very narrow focus or can be difficult to navigate and do not address many of the significant socioeconomic barriers low-income populations face. We believe that points of care focused on these underlying causes of high infant mortality in urban neighborhoods will decrease infant mortality rates and improve the quality of life for these residents.

## **Introduction**

Infant mortality, which is death within the child's first year of life, is a serious public health issue in cities across the United States. The leading causes of infant death include birth defects, preterm birth, low birth weight, injuries, sudden infant death syndrome, and maternal pregnancy complications (Centers for Disease Control and Prevention [CDC], 2022). Unfortunately, poverty is a significant driver of infant mortality. For example, low-income mothers struggle to access proper nutrition, which can lead

to preterm birth, birth defects, and occasionally death. Additionally, low-income mothers are exposed to higher degrees of psychosocial and environmental stress, which has been linked to infant mortality (Class et al., 2013). A review of the geographical distribution between poverty and infant mortality rates affirms this relationship, as the poorest neighborhoods in cities like Washington DC, Chicago, Cleveland, and Philadelphia all have infant mortality rates far higher than both national and city averages (DC Health Matters,

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n.d.; Cleveland Department of Public Health, n.d.; Illinois Department of Public Health, n.d.). Such impoverished areas experience high rates of infant mortality not only from poor nutrition and stress but also because low-income women have less access to prenatal care (Osterman & Martin, 2018). Unsurprisingly, research shows that pregnant women who receive late-term or no prenatal care during their pregnancy are more likely to have infants with adverse birth outcomes like preterm births, low birth weights, and infant death (Tekka et al., 2018).

The link between poverty and infant mortality is further elucidated when looking at the intersection of race and income in relation to birth outcomes. Racial and ethnic minority communities, which are overrepresented on the lower range of the socioeconomic spectrum, experience disproportionately high rates of infant mortality. Individuals who identify as Black, Hispanic, and Pacific Islander have annual incomes 30-40% lower than those identifying as White (Semega et al., 2020). Black women in Philadelphia, for example, are three to five times more likely to have an infant die compared to Whites or Asian/Pacific Islanders, respectively (Murphey et al., 2018). The evidence makes clear that poverty and inadequate prenatal care are directly connected, which ultimately impacts infant health and well-being in low-income and minority groups.

Disparities in infant health and well-being are particularly evident in several major U.S. cities. In Atlanta, 35% of children are born into poverty; in Memphis, 35%; in Milwaukee, 33%; in Cleveland, 46%; and in Detroit, 43% (Hall et al., 2017). The impacts of this are not felt equally across demographics. Poverty disproportionately affects minority inner-city children to such a degree that Black and American Indian children are seven times more likely to be raised in neighborhoods of concentrated poverty than White children (Annie E. Casey Foundation, 2019). This disproportionate exposure to poverty among ethnic groups has lifelong consequences. Research has demonstrated that poverty's impact on health outcomes begins

the moment that fetal development begins. The two most noticeable outcomes are low birth weights and preterm birth, which can alter lifelong neurodevelopmental trajectories (Ahishakiye et al., 2019). Therefore, increased access to perinatal care mitigates not only infant mortality but also associated morbidity.

High infant mortality rates in U.S. cities are partly a function of socioeconomic status and racial inequity negatively impacting access to preventative care, prenatal care, nutrition, and postpartum resources. Therefore, infant mortality can serve as an indicator of the effectiveness of public health measures, namely maternal and child healthcare services. One such measure that can address the lack of access to care and quality nutrition in low-income and minority communities are mobile outreach clinics (Lorenz et al., 2016). We propose the conceptual use of mobile health clinics, which we call Milk Trucks, to improve prenatal and postnatal care by delivering education, breastfeeding assistance, nutritional assistance, and supplies directly to high-risk families. This conceptual program is aimed at promoting the well-being of children and reducing infant mortality via increased access to nutrition and healthcare resources. It uses the history of Milk Trucks as both an operational mechanism and metaphor for reaching families at elevated risk for infant mortality. Milkmen have long been viewed as friendly faces who provide needed resources directly to the doorstep, which this program hopes to capitalize on. The intent of the Milk Truck program is to increase accessibility to perinatal care in low-income neighborhoods while balancing the effort required on behalf of the patient to utilize the provided resources.

### Evidence

Previous public health programs implemented in the United States that target infant mortality provide a framework for the Milk Truck proposal and suggest that it can both reduce infant mortality and improve pediatric well-being. For example, prior to the launch of the Baltimore City Health

Department's B'More for Healthy Babies project (BHB) in 2009, the Upton/Druid Heights neighborhood suffered from an infant mortality rate of 15 deaths per 1000 live births (Desmon, 2021). The BHB program focused on increasing access to prenatal care and primary care services through extensive outreach measures and provided prenatal and postnatal education to targeted groups in the community, primarily acting to provide resources like breastfeeding support, parenting classes, and coordinating access to public health services. Ten years into the BHB program, the Upton/Druid Heights neighborhood's infant mortality rate has dropped by 75% to 3.8 deaths per 1,000 live births (Desmon, 2021). The Milk Truck proposition draws from the BHB program's success while also providing additional resources like nutritional interventions with its proposed MommyEats program. The Milk Truck proposition also addresses several socioeconomic barriers to care through its dispersed mobile health clinic model, something not seen in the BHB program. Overall, the BHB program serves as a foundation and proof of concept for the effectiveness of neighborhood-specific interventions, which we expand upon with our Milk Truck proposition.

Certain communities have also benefited from programs providing gift cards and coupon books as incentives for continued prenatal care. The Alabama Medicaid Agency launched Healthy Beginnings, an incentive program that provided coupon books in exchange for pregnant mothers visiting their physicians or a health clinic, which was believed to aid in adherence to prenatal care guidelines (Ingram et al., 1993). Other programs providing conditional cash incentives to marginalized communities have shown similar improvements in prenatal care (Barber & Gertler, 2009). Our proposal thus incorporates incentive-laden practices as a means of building community trust and increasing participation in the Milk Truck program.

The Milk Truck program also acts to build upon growing public health movements to increase breastfeeding as a means of improving infant health.

One study that assessed the percentage of new mothers who have attempted breastfeeding found that major cities like Philadelphia are well below the national average of women who have ever breastfed (Murphey et al., 2018). This trend has unfortunate consequences for developing children, as data indicates that infants who are not breastfed or do not receive breast milk have increased incidences of infection, childhood obesity, type 1 and type 2 diabetes, immunologic disorders, and sudden infant death syndrome (SIDS) (Murphey et al., 2018). For mothers, a lack of breastfeeding is correlated with an increased incidence of breast and ovarian cancer, gestational weight gain, type 2 diabetes, and metabolic syndrome (Stuebe, 2009). Ultimately, breastfeeding or feeding infants breast milk benefits both mother and child. The CDC addressed the issue of breastfeeding in its Healthy People 2020 Law and Health Policy Program report, which set a goal to increase the number of breastfed infants across the United States. International public health groups have also recognized a need to improve breastfeeding rates. The Baby Friendly Hospital Initiative (BFHI), launched jointly by the World Health Organization and the United Nations Children's Fund, is one example. This initiative outlines ten specific steps to improve breastfeeding outcomes, and hospitals that employ this framework are seeing improved long-term breastfeeding success (CDC Foundation, 2020). The Milk Truck proposal can further expand such efforts by providing physical supplies and tools such as formula, breastfeeding pumps, and everyday childcare items directly to families. This initiative will also serve as an educational platform for mothers and pregnant women. It will emphasize the importance of breastfeeding, nutrition, and prenatal care in infant health through onsite consults with nutritionists, healthcare workers, and lactation specialists.

The Milk Truck program also seeks to address the issue of food insecurity and its impact on infant well-being and mortality. Nationwide, many low-income urban neighborhoods, wherein infant mortality tends to be elevated, are food deserts. A Yale University study found that low-income

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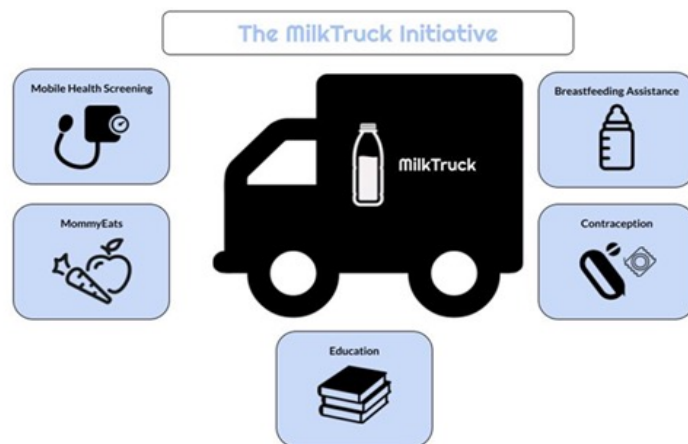
neighborhoods have less access to healthy food and lower quality produce compared to high-income neighborhoods; this trend also exists in Philadelphia (Andreyeva et al., 2008). A Drexel University study found that residents of low-income Philadelphia neighborhoods were 40-50% less likely to live within a half mile of a grocery store compared to higher-income neighborhoods (Go Red for Women, 2020). Additionally, the majority of these residents work low-income service jobs. The compounding effects of limited access to nutritious food and limited financial resources make it incredibly difficult for pregnant women and mothers to access proper nutrition in these neighborhoods. The Milk Truck program provides transportation and financial resources as a means of overcoming these systemic barriers.

### Intervention

#### Overview

The Milk Truck proposition is a community-centered outreach program that emphasizes the nutritional needs of mothers and infants. This intervention aims to address gaps in prenatal and postnatal care and to provide services that can mitigate contributing factors to infant mortality. The program will focus on needs including transportation, nutrition, access to providers, childcare supplies, and contraception, as summarized in Figure 1 below. The target demographic will be low-income individuals who are pregnant or have a child under the age of 2 years old. Trained healthcare professionals will be employed to serve as a link between mothers and their primary care physicians. These individuals will help with disease screening, facilitate medical enrollment with a primary care provider, and communicate/coordinate with healthcare providers. The Milk Truck program proposes community outreach using trucks staffed by a physician, nurse, social worker, and two healthcare navigational aids. This proposed intervention will reduce infant mortality and low birth weight while increasing access to the various resources outlined below, improving the quality of life of our youngest

residents. This program aims to improve nutrition and access to care from the point of conception through the first 2 years of a child’s life. The second year of life was determined as an endpoint to allow for a slow transition from Milk Truck resources starting at the infant’s first birthday. The additional year will allow for increased flexibility in situations where the transition is prolonged due to socioeconomic barriers or extenuating circumstances. This is on top of 2 years being a common age wherein children have been weaned off breastfeeding.



**Figure 1. Summary of the major resources provided through the Milk Truck program.** Mobile clinics will provide health screenings to patients. Clinics will also be a place of enrollment in our unique MommyEats nutrition program. Patients will be educated on the importance of nutrition, transitioning to long-term primary care, breastfeeding, and contraception at Milk Truck sites. Community members will also receive resources like formula, childcare supplies, and transportation funding.

### Mobile Health Screenings

The Milk Truck program works in a similar way to food trucks: Maximize exposure by bringing resources directly to the population in need. This program focuses on neighborhoods with infant mortality rates exceeding those of surrounding areas.

Milk Trucks will have pre-established destinations in which the truck will park and “set up shop.” Providers on board will conduct prenatal health screening for diabetes, hypertension, and urinary tract infections as well as counsel patients on the importance of receiving such care longitudinally in an office setting. In this way, we hope to further support the identification of high-risk obstetric patients in order to further encourage better child health outcomes. Healthcare navigators will be on board to aid in transitioning expectant mothers to prenatal care at the offices of locally participating providers. Health records will be sent to participating obstetricians and pediatricians to ensure continuity of care. Mothers can receive supplies like prenatal vitamin supplementation and personal blood pressure cuffs at these mobile health screenings.

### Maternal Nutrition

The Milk Truck program and its associated clinics will serve as access points for enrollment into our unique MommyEats program. The MommyEats program is designed as a virtual nutrition resource where patients will submit weekly food choices for review by staff nutritionists. This program aims to improve maternal nutrition through goal-directed incentives. Upon enrollment, patients will establish baseline eating habits with nutritionists, then work with nutritionists to develop incremental goals for improving these eating habits during their pregnancies. Patients who progress towards their individualized goals, as evidenced by weekly submission to the app, will receive gift cards and transportation vouchers. To incentivize mothers to stay in the program through the duration of their pregnancy and the first 2 years of the child’s life, patients will receive raffle tickets for each week they actively participate in tracking their food intake on the MommyEats app. Raffles will include prizes ranging from movie tickets and date nights to car seats.

### Incentives

It is imperative that the target demographic “buys in” to the Milk Truck program and that socioeconomic barriers to care be mitigated. Therefore, transportation vouchers and gift cards will be provided to patients who receive prenatal care from one of our mobile clinics or participating providers. Vouchers will provide access to transportation via third-party ride-shares, like Lyft or Uber, and public transportation to ensure patient access to clinics as they transition from our mobile trucks to office-based care. Local clinicians who have partnered with the Milk Truck program will provide these destination-specific vouchers at the end of each appointment to improve access to long-term care for these mothers. Additionally, mothers can use gift cards distributed by clinicians and at Milk Truck sites to purchase childcare supplies, clothing, or food.

### Feeding and Pumping

When a child is born, it is vital that parents understand how to provide optimal nutrition to support the child’s health and well-being. The Milk Truck program aims to provide mothers with supplies that they may need following hospital discharge. Most insurance providers, as well as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), have programs in place that provide breast pumps. Therefore, our clinic staff will provide all the necessary documentation needed to guide new mothers through the process of acquiring their breast pumps. Milk Trucks will also be stocked with bottles and storage containers for mothers who wish to breastfeed but may be financially obligated to return to work shortly after delivery. The Milk Truck program, although primarily aimed at encouraging breastfeeding, will also be a distribution point for baby formula for mothers who may not be able—or want—to

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breastfeed. This program also recognizes that maternal nutrition is just as important during the postpartum period as it is during pregnancy. Thus, mothers will still be encouraged to enroll in MommyEats and have access to all incentive programs offered by Milk Trucks.

### Breastfeeding Clinics

Each weekend, the Milk Truck will provide pop-up clinics aimed at teaching new mothers how to navigate potential challenges associated with breastfeeding. In addition to the designated physician, nurse, social worker, and two healthcare navigational aids on site, weekend clinics will be staffed with lactation specialists—nurses with specialized training in the breastfeeding process. Lactation specialists will lead group classes as

well as provide individualized support to mothers who require additional assistance. In addition to supporting breastfeeding, these clinics will also provide health screenings to mothers and mothers-to-be. The Milk Truck professionals will assess basic vitals, blood sugar, check weight, and screen for postpartum depression.

### Nursing Kits

Patients that complete the weekend lactation class or can provide proof of gaining lactation education elsewhere will be provided nursing kits. Nursing kits will be equipped with a nursing brassiere, breast pads, nipple creams, and nursing pillows. Mothers will also be provided with a summary of nursing techniques provided in the lactation class.



### Contraception

Contraception is vitally important to postpartum mothers. Data has shown that additional pregnancies within the first 12 months following birth are at the highest risk for adverse health outcomes for both the mother and the child (Teka et al., 2018). Therefore, the Milk Truck will provide contraception education as well as be a point of distribution/referral to an obstetrician for birth control. We believe that making this a point of emphasis in each patient contact will lead to an increase in contraceptive use and concordant improvement in birth outcomes.

The Milk Truck will be a voluntary program; therefore, to enroll patients, we will encourage local hospitals, clinics, and community resources to educate the public about this program. Milk Trucks will employ an electronic medical record system where patient information can be sent to the participating provider of the patient's choice. Additionally, paper records will be provided for the patients to bring to appointments themselves. One concern is that patients may choose to use the clinics as their only point of care, which will be discouraged. After a grace period, women and children will be required to have a provider on file whom they see at regular intervals. The incentives offered through the program also promote patients' transition of care to doctors' offices. The Milk Truck program's primary metric is to decrease infant mortality, which is defined as death before the first birthday. However, when determining eligibility for the program, we felt it was necessary to continue providing care out to the child's second birthday, as that is the point where most children have been tapered off breast milk. Once the child's first birthday has passed, social workers aboard the Milk Truck will approach the families about beginning the transition to other local resources.

### Discussion

The Milk Truck program is a conceptual intervention designed for low-income urban neighborhoods to mitigate the impact of poverty on pregnancy and early childhood development. The proposed mobile

health clinics, which we call Milk Trucks, will improve perinatal care by delivering education, breastfeeding support, and childcare supplies directly to high-risk families. Healthcare workers onboard the Milk Trucks will actively link families to the appropriate next steps for their individual situations, whether that be scheduling a routine health screening, a 6-month prenatal care visit, or a 1-year postnatal visit for immunizations.

The impact of poverty on childhood well-being poses a serious public health threat. Poverty limits low-income mothers' access to important resources, which can have severe implications for a child. Stress, improper access to nutrition, and poor access to perinatal care can contribute to adverse birth outcomes such as preterm births, low birth weights, and infant death. In situations where the outcome is not fatal, the impacts of such situations should not be understated, as they negatively influence lifelong neurodevelopmental trajectories for the child. Therefore, children are born into environments that may negatively alter the course of their life while having no control over the situation themselves. Society has a responsibility to protect these children first and foremost by implementing practices to end structural poverty. However, a stop-gap program such as the Milk Truck program can aid in mitigating the lifelong impact of poverty on children.

A key aspect of the Milk Truck Program is its focus on integrating patients into the existing healthcare framework. A potential consequence of interventional programs is that once the patient loses access, low-income families fall back into the cycle of trying to navigate and access a complicated and intimidating healthcare system all on their own. To overcome the challenge disadvantaged communities face in accessing healthcare services, cross-sector collaboration is key. The collaboration that is required between community members, social services, and governmental agencies, as well as healthcare providers to mitigate the effects of poverty in these jurisdictions can no longer be shouldered purely by families themselves. The Milk Truck program involves professionals from

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multiple sectors to employ a multifaceted approach, ensuring patients are transitioned into long-term care and learn how to properly navigate resources for themselves.

This plan implements strategies based on evidence from previously successful interventional programs as well as unique strategies derived from conversations with pregnant mothers in Philadelphia. The Milk Truck program provides a distinct focus on lactation education following the CDC's Healthy People 2030 goal of improving breastfeeding among mothers (Hasbrouck, 2021). The program relies on a mobile approach to provide resources to the most disadvantaged communities. Along with education and supplies on the ground, transitioning patients to long-term care is an essential mechanism for sustaining these healthy habits well beyond the Milk Truck. We believe that points of care focused on these underlying causes of high infant mortality in urban neighborhoods will decrease infant mortality rates and improve the quality of life for these residents.

### Limitations

An important concern regarding the conceptualized Milk Truck program is the significant coordination and financial support required for initial implementation. However, public health efforts such as mobile health clinics have been proven to provide significant cost savings and improve health outcomes in underserved communities (Yu et al., 2017). Another concern regarding this program is a lack of public awareness or understanding of what the program provides. Strong social media campaigning, television marketing, and point of contact marketing from healthcare providers can assist in overcoming this initial barrier. Throughout the program, regular patient interviews can be used to provide feedback on the program's utilization and public perceptions. The effectiveness of the Milk Truck program can be

monitored through changes in infant mortality rates over time in the target neighborhoods. Additionally, establishing a network of providers who will later act as points of definitive care needs to be considered in the implementation of the Milk Truck program. Recruiting providers could prove to be a substantial challenge; however, clinicians will likely be open to partnering with the program, as it can act as a referral service for providers.

### Conclusion

To mitigate the impact of poverty on infant mortality and child well-being, we propose the Milk Truck program. This is a neighborhood-based intervention provides education, breastfeeding, nutritional assistance, and supplies directly to high-risk families through mobile health clinics. In this context, we define high-risk as pregnant mothers and individuals that are low-income, living in impoverished neighborhoods, and/or living in neighborhoods with reportedly high infant mortality rates. Such populations have further barriers to proper and adequate prenatal and postnatal care; therefore, our hope is to reach mothers right where they are.

A good deal of education is required to make sure a mother and her child—unborn or born—can lead healthy lives, making coordinated care vital in ensuring the health of future generations, no matter one's socioeconomic status. The phenomenon of disparate infant mortality rates within Philadelphia grossly underscores the lack of resources, health care, and education within obstetric-level care and this patient population. Healthcare hubs beyond the traditional office setting are necessary to help alleviate such disparities in our community. Ultimately, our program takes a holistic approach to pregnancy care through educating mothers beyond childbirth, since the work of improved infant mortality outcomes addresses nutrition, health screenings, and well-being support over the long term.



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