

COMMENT



Reducing infant mortality: maternal health is infant health

Kristen H. Shanahan^{1,2,3}, Kendall J. Burdick⁴, Lois K. Lee^{1,3,5}✉ and on behalf of the Pediatric Policy Council*

© The Author(s), under exclusive licence to the International Pediatric Research Foundation, Inc 2022

Pediatric Research (2022) 92:623–625; <https://doi.org/10.1038/s41390-022-02142-4>

Maternal health and infant health are inextricably linked. Fetal development is dependent on a healthy in utero environment, which is influenced by the mother’s health and her associated environmental stressors. Furthermore, healthy mothers are needed to care for infants after birth. Thus, to improve infant health and reduce infant mortality, we must optimize maternal health. Ultimately the health of infants and children are a critical foundation for adult health and overall population health. Policies and interventions to improve maternal health are essential for population health as they will pay future dividends for maternal and infant health.

Without healthy mothers, we will not have healthy infants. During the prenatal period, pregnancy-related disorders are risk factors for worse infant outcomes, including infant mortality. In this issue of *Pediatric Research*, Yurkiw et al. report twofold greater odds of mortality in preterm (<29 week gestation) twin infants born to mothers with hypertensive disorders of pregnancy, compared to those born to normotensive mothers. Two basic questions arise: (1) How does this happen? and (2) Why does this happen? The cellular pathways by which hypertensive disorders of pregnancy affect infant health capture only one part of the problem, answering the “how” of the pathophysiology. A more daunting aspect of the problem begs to know “why”? Why did the mothers of these infants develop hypertension? If we know the “why” there is potential to develop approaches for prevention, which is important to improve maternal health and infant health outcomes.

The social determinants of health are major drivers of hypertensive disorders of pregnancy.¹ Social determinants of health are defined by the World Health Organization as “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life.”² These conditions include financial instability, food insecurity, inadequate housing, and poor access to education, employment, and healthcare. The social determinants of health also include community conditions, such as neighborhood violence, greenspace, environmental pollution, and access to healthy food.

Racism, poverty, education, and geography all contribute to worsening maternal health outcomes and thereby worse infant health outcomes.³ For example, maternal mortality has risen sharply in the United States (U.S.) for the past several decades.⁴ The maternal mortality rate increased threefold from 7.2 deaths per 100,000 live births in 1978 to 23.8 deaths per 100,000 live births in 2020.⁴ Effects of systemic racism³ are striking—mortality

rates are almost threefold higher for non-Hispanic Black women in 2020 than for non-Hispanic White women.⁴

Systemic racism and the burdens of social determinants of health also plague infant mortality, defined as death <365 days old. In the U.S., infant mortality has shown progress in overall trends, with a decline from 10.9 infant deaths per 1000 live births in 1983 to 5.4 infant deaths per 1000 live births in 2020.⁵ Despite this progress, existing racial inequities have been exacerbated. In 2018, the mortality rate for non-Hispanic Black infants was 2.3-fold higher than for non-Hispanic White infants, increased from a 2.1-fold difference in 1983.⁵ To improve infant health, we cannot invest in infant health alone, we must also invest in maternal health.

INVESTING IN MATERNAL HEALTH

The social determinants of health accumulate to impact maternal health in the pre-pregnancy, prenatal, and postpartum periods. Exposure to poor social determinants of health is associated with higher rates of chronic disease, which is one manifestation of the effects of systemic racism.³ Chronic diseases in the pre-pregnancy period can lead to poorer health during pregnancy and subsequent effects on fetal development. The same populations of pregnant women who experience chronic diseases due to social determinants of health also face challenges in accessing high-quality healthcare during and after their pregnancy, which may result in further complications.

Major investments in reducing the effects of social determinants of health on maternal health throughout the lifespan are needed to create meaningful change—finally reducing maternal mortality and reducing racial health inequities for Black mothers and infants. These investments may include financial support in the form of cash transfers, safe housing, access to education and employment, improvements in the built environment in the community, and reductions in community violence. Another essential investment is improved healthcare access through increased health insurance coverage.

MATERNAL HEALTH AND MEDICAID EXPANSION IN THE UNITED STATES

Lack of health insurance is a substantial barrier to access timely prenatal and postpartum care for women in the U.S. Insurance disruptions and periods of lack of coverage are common due to changes in employment and eligibility for insurance before and

¹Division of Emergency Medicine, Boston Children’s Hospital, Boston, MA, USA. ²Division of Pediatric Emergency Medicine, Massachusetts General Hospital, Boston, MA, USA. ³Department of Pediatrics, Harvard Medical School, Boston, MA, USA. ⁴University of Massachusetts Medical School, Worcester, MA, USA. ⁵Department of Emergency Medicine, Harvard Medical School, Boston, MA, USA. *A list of authors and their affiliations appears at the end of the paper. ✉email: lois.lee@childrens.harvard.edu

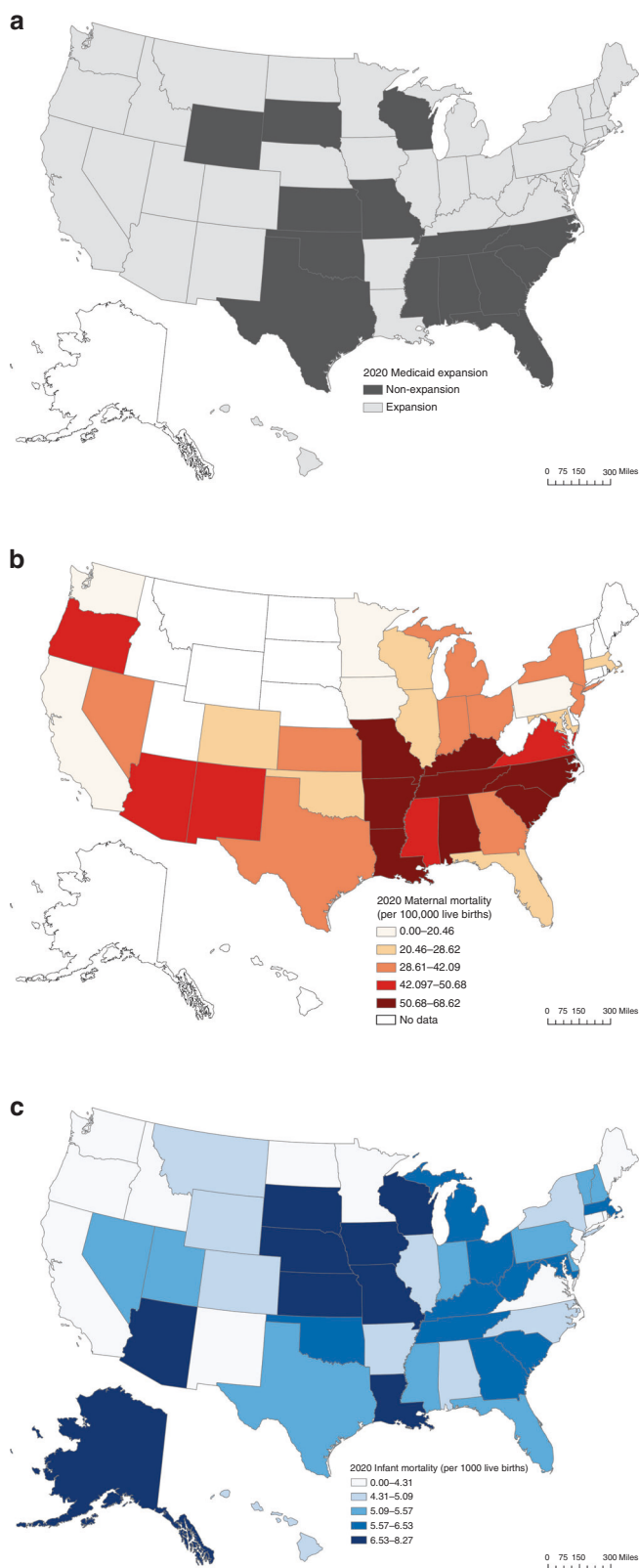


Fig. 1 Adoption of Medicaid expansion by state, maternal mortality, and infant mortality in the United States, 2020. **a** shows states by status on adoption of Medicaid expansion in 2020. Data obtained from the Kaiser Family Foundation. **b** shows quintiles of state-level maternal mortality in 2020 (maternal deaths per 100,000 live births). **c** shows quintiles of state-level infant mortality in 2020 (infant deaths per 1000 live births). Data are obtained from the CDC WONDER database.

after delivery.⁶ Few options exist for women who are uninsured at the time of the pregnancy and do not qualify for Medicaid.

The Affordable Care Act state option for Medicaid expansion provides expanded coverage for Medicaid to adults with incomes below 138% of the Federal Poverty Level. States can also opt to extend coverage to higher-income women for prenatal care. In 2022, 12 states have not adopted Medicaid expansion: Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming (Fig. 1a).

By covering low-income women before, during, and after pregnancy, Medicaid expansion provides much improved access to health insurance and healthcare. From 2013 to 2015, the percentage of reproductive age women covered by Medicaid increased fivefold in states that adopted Medicaid expansion compared to those that did not.⁶ Early enrollment in health insurance and timely access to prenatal care improved in Ohio after the adoption of Medicaid expansion.⁷ These women were more likely to receive guideline-concordant pregnancy screenings and prenatal vitamins. This type of care is essential for all pregnant women, including those with hypertensive disorders of pregnancy, multi-gestational pregnancies, and those at risk for preterm delivery.

States who have adopted Medicaid expansion have shown a relative decrease in maternal mortality compared to states that have not adopted Medicaid expansion.⁸ Although maternal mortality continues to rise across the U.S., this increase is attenuated in Medicaid expansion states compared to non-expansion states (Fig. 1b).⁸ Data suggest that Medicaid expansion is one strategy for advancing maternal health equity by increasing health insurance coverage and ultimately access to prenatal care—the effects of Medicaid expansion were greatest among non-Hispanic Black women.⁸

Women living in poverty with special healthcare needs, including mental health disorders and substance use disorders, also benefit from the extended healthcare coverage before, during, and after pregnancy. Coverage is especially important in these populations. Improving access to and quality of prenatal care is essential for optimizing health outcomes for mothers and their infants, especially for multi-gestational pregnancies and preterm births.

INFANT HEALTH AND MEDICAID EXPANSION

In addition to Medicaid expansion's association with improved maternal health outcomes, it has also been associated with improved infant health outcomes with reductions in infant mortality (Fig. 1c). Medicaid expansion states have demonstrated decreased rates of infant mortality, which has been rising in non-expansion states.⁹ Furthermore, state Medicaid expansion has advanced health equity in infants, potentially countering the effects of systemic racism. Declines in infant mortality were greatest in Black infants.⁹ Disparities for Black infants in preterm birth, very preterm birth, low birth weight, and very low birth weight declined in states that adopted Medicaid expansion compared to non-expansion states.¹⁰

CONCLUSIONS

Infant health flows directly from maternal health, which provides a foundation for strong population health. Therefore, it must be a priority to have a healthy maternal population with access to high-quality healthcare, especially among populations who experience worse health outcomes related to their social determinants of health. We must address the “why” related to infant mortality as well as researching the causes and treatment for the “how” of infant mortality. Investments in maternal and infant health and health equity must include comprehensive interventions to

counteract the effects of poor social determinants of health. Solutions to these issues will be complex in nature and will require a multi-pronged policy approach. Improved access to health insurance and optimal maternal and child healthcare are essential to improve health outcomes in pregnant women and their infants.

REFERENCES

- Harris, M., Henke, C., Hearst, M. & Campbell, K. Future directions: analyzing health disparities related to maternal hypertensive disorders. *J. Pregnancy* **2020**, 7864816 (2020).
- World Health Organization. Social determinants of health. *Nosileftiki* **54**, 231–240 (2015).
- Bailey, Z. D. et al. Structural racism and health inequities in the USA: evidence and interventions. *Lancet* **389**, 1453–1463 (2017).
- CDC. Pregnancy mortality surveillance system. <https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm> (2022).
- Federal Interagency Forum on Child and Family Statistics. Infant mortality. America's children: key national indicators of well-being. <https://www.childstats.gov/americaschildren/health2.asp> (2021).
- Daw, J. R., Hatfield, L. A., Swartz, K. & Sommers, B. D. Women in the United States experience high rates of coverage "churn" in months before and after childbirth. *Health Aff.* **36**, 598–606 (2017).
- Adams, E. K. et al. Prepregnancy insurance and timely prenatal care for Medicaid births: before and after the Affordable Care Act in Ohio. *J. Women's Health* **28**, 654–664 (2019).
- Eliason, E. L. Adoption of Medicaid expansion is associated with lower maternal mortality. *Womens Health Issues* **30**, 147–152 (2020).
- Bhatt, C. B. & Beck-Sagué, C. M. Medicaid expansion and infant mortality in the United States. *Am. J. Public Health* **108**, 565–567 (2018).
- Brown, C. C. et al. Association of state Medicaid expansion status with low birth weight and preterm birth. *JAMA* **321**, 1598–1609 (2019).

ON BEHALF OF THE PEDIATRIC POLICY COUNCIL

Shetal Shah⁶, Mona Patel⁷, Jean Raphael⁸, DeWayne Pursley⁹, David Keller¹⁰, Sherin U. Devaskar¹¹, Tina Cheng¹², Joyce Javier¹³ and Lois Lee¹⁴

⁶Pediatric Policy Council, Valhalla, NY, USA. ⁷Academic Pediatric Association Representative, Los Angeles, CA, USA. ⁸Academic Pediatric Association Representative, Houston, TX, USA. ⁹American Pediatric Society Representative, Houston, TX, USA. ¹⁰American Pediatric Society Representative, Denver, CO, USA. ¹¹Association of Medical School Pediatric Department Chairs Representative, Los Angeles, CA, USA. ¹²Association of Medical School Pediatric Department Chairs Representative, Cincinnati, OH, USA. ¹³Society for Pediatric Research Representative, Los Angeles, CA, USA. ¹⁴Society for Pediatric Research Representative, Boston, MA, USA.

AUTHOR CONTRIBUTIONS

K.H.S. and L.K.L. conceived the study. K.H.S. and K.J.B. acquired and analyzed the data. K.H.S., K.J.B. and L.K.L. interpreted the data. K.H.S. drafted the article. K.J.B. and L.K.L. critically revised it for important intellectual content. All authors approve of this version.

FUNDING

No external funding was used for this manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

No patient consent was required for this article.

ADDITIONAL INFORMATION

Correspondence and requests for materials should be addressed to Lois K. Lee.

Reprints and permission information is available at <http://www.nature.com/reprints>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.