



# Access to maternity care: challenges and solutions for improving equity across US communities

Katy B. Kozhimannil<sup>a</sup>, Julia D. Interrante<sup>a</sup> and Alecia J. McGregor<sup>b</sup>

## Purpose of review

Improving maternal health is a clinical and policy priority in the United States. We reviewed recent literature on access to maternity care and impacts on racial and geographic equity.

## Recent findings

New research indicates a wide range of consequences of obstetric unit closures, as well as health challenges for lower-volume obstetric units and those who travel long distances to care.

## Summary

As maternal mortality rates rise, maternity care access is declining in the US, especially in rural areas and communities with a higher proportion of Black, Latinx, or Indigenous residents. Lack of resources and financial strain are challenges for low-volume and Black-serving obstetric units, and targeted investments may help improve safety and access.

## Keywords

maternal health, obstetric care, racial equity, rural health

## INTRODUCTION

Maternity care access has been declining in the United States (US) for at least two decades [1,2]. Over the same time period, maternal mortality has increased and profound inequities in maternity care access and maternal health outcomes have been observed. Inequities in access and in severe maternal morbidity and mortality largely fall along the lines of racial and ethnic disparities, rural/urban differences, class and socioeconomic status, and are amplified at the intersection of these factors [3–6,7<sup>\*\*\*</sup>]. There is a growing body of research on this topic and increasing policy attention to improving maternal health and addressing inequities in recent years. However, recent research shows that most inequities remain unchanged, or have worsened [5,8<sup>\*\*\*</sup>]. In this review, we describe inequities in maternal health outcomes and access to maternity care, drivers and consequences of these inequities, potential policy solutions, and what data indicate is needed to improve maternal health equity in communities across the US.

## REVIEW

Maternity care access is determined by structural factors and social drivers of health and healthcare [9<sup>■</sup>,10]. Access to care and the quality of care both

contribute to outcomes for birthing people, and new evidence about the choices that healthcare delivery systems and communities make about healthcare services can help inform patients, clinicians, policy-makers, and other stakeholders [11].

## Maternal health inequities: access, quality, and outcomes

The United States faces a longstanding and worsening maternal mortality crisis [11,12<sup>■</sup>]. Some communities are more affected than others, and have been for centuries. The most recent federal data show maternal mortality rates increased during the COVID-19 pandemic, and the groups that experienced the highest increases included American Indian and Alaska Native (AI/AN or Indigenous)

<sup>a</sup>University of Minnesota Rural Health Research Center, Division of Health Policy and Management, University of Minnesota School of Public Health, Minneapolis, Minnesota and <sup>b</sup>Department of Health Policy and Management, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA

Correspondence to Katy B. Kozhimannil, PhD, MPA, Division of Health Policy and Management, University of Minnesota, 420 Delaware St. SE MMC 729, Minneapolis, MN 55455, USA. Tel: +612 626 3812; e-mail: kbk@umn.edu

**Curr Opin Obstet Gynecol** 2024, 36:000–000

DOI:10.1097/GCO.0000000000001003

## KEY POINTS

- As maternal mortality rates continue to rise, maternity care access is declining in the United States, especially in rural areas and communities with a higher proportion of Black, Latinx, or Indigenous residents.
- New research indicates a wide range of consequences of obstetric unit closures, as well as health challenges faced by pregnant patients at lower-volume obstetric units and those who travel long distances to care.
- Lack of resources and financial strain are challenges for low-volume obstetric units, and targeted investments may help improve safety and access.

birthing people and rural residents [5,8<sup>■</sup>]. From 2019 to 2021, rates of maternal mortality more than doubled for Indigenous birthing people, and rural residents saw a 21% relative increase [8<sup>■</sup>]. Black birthing people experience maternal mortality at three times the rate of white birthing people, and Medicaid enrollees experience severe maternal morbidity and mortality at a rate greater than 30 per 10,000 births more than those privately insured [4,5]. Racial and ethnic, geographic, and income-based disparities also exist in the quality of perinatal care received. Black, Indigenous, and people of color (BIPOC), rural residents, and those enrolled in Medicaid are less likely to receive essential components of postpartum care, including depression screening and contraceptive counseling [13<sup>■</sup>].

These same groups – BIPOC individuals, rural residents, and Medicaid enrollees – have limited and declining access to obstetric care in the wake of decades of hospital closures and closures of hospital-based obstetric units [1,14<sup>■</sup>]. Data from rural areas show that communities with more Black residents and remote rural communities have the highest risks of losing hospital-based obstetric services [1]. Further, states with the most racially diverse rural populations were the least likely to have rural hospital-based obstetric services available [15]. In urban areas, there are similar patterns. Philadelphia County, which is majority BIPOC, lost 13 of its 19 hospital obstetric units between 1997 and 2012; those that closed largely served a high percentage of publicly-insured and uninsured patients [16]. Additionally, the majority of hospital obstetric unit closures in New Jersey between 2006 and 2015 occurred at facilities where more than half of the patients were BIPOC [6].

Risks related to both access and outcomes are highest at the intersection of racial, geographic, and income vulnerability [17]. Tellingly, the highest rates of severe maternal morbidity and mortality

are among Indigenous rural residents enrolled in Medicaid, followed by Black rural and urban and Hispanic urban residents enrolled in Medicaid. Beyond the additive effect of these individual factors, their interaction creates additional risk, with 40% of severe maternal morbidity and mortality cases among Indigenous rural residents due to the interaction of rurality with income vulnerability [4,18]. The compounded risk among multiply-marginalized groups comports with evidence on intersectionality across other health outcomes [17,19].

These inequities in access and outcomes result from structural injustices derived from white supremacy, patriarchy, inadequately regulated capitalism, and structural urbanism. White supremacy devalues BIPOC individuals through insufficient payments and financial flows to hospitals that primarily serve BIPOC patients [20<sup>■</sup>]. Patriarchy ensures that despite childbirth being the most common reason for hospitalization, hospitals and clinicians are frequently reimbursed below the cost of providing care [21,22]. Capitalism influences payment systems such that pregnant people with Medicaid (public) coverage are less desirable patients due to lower reimbursement rates compared to private insurance. Inadequately regulated capitalism has produced some highly concentrated private hospital systems structured as near-monopoly organizations, closing less profitable service lines (including obstetrics) [23]. Structural urbanism – the way that healthcare financing and delivery is centered around heavily populated areas – means that many rural communities are systemically under-resourced in healthcare [24].

### Challenges for hospitals and communities in providing maternity care

Ensuring access to maternity care is crucial, but many healthcare systems struggle to provide reproductive, prenatal, obstetric, and postpartum care. These challenges are heightened for facilities that serve patients in higher risk groups [9<sup>■</sup>]. Recent research indicates that hospital administrators cite workforce, clinical safety, and finances as key factors affecting decisions about offering obstetric care [25].

### Workforce

Many rural hospitals face maternity workforce challenges including recruitment, retention, and clinician scheduling [25,26<sup>■</sup>]. Over half of rural hospitals cited workforce as an influential factor in their hospital's decisions on whether to provide obstetric care [25,26<sup>■</sup>]. Skilled maternity nursing staff are

essential for offering obstetric care and retaining physicians in rural communities, but rural (and some urban) areas face challenges ensuring an adequate nursing workforce for maternity care [27]. Variation in the political environment across states also impacts maternity care workforce distribution. Emerging data indicate that states with more restrictive reproductive health policies (e.g., the 17 states which have criminalized abortion in most circumstances), face challenges recruiting new obstetrics and gynecology residents and in retaining physicians who provide maternity services [28<sup>a</sup>,29<sup>a</sup>,30<sup>a</sup>].

### Quality and safety

Ensuring high quality patient care is also a concern. In many areas of clinical medicine, there is a volume-outcome relationship in which patient safety favors higher volume facilities. A 2023 study analyzed the relationship between hospital birth volume and maternal health outcomes in four states (California, Michigan, Pennsylvania, South Carolina) between 2004 and 2020 [31<sup>a</sup>]. Patients who gave birth at lower-volume rural hospitals (<460 births per year) faced elevated risks of severe maternal morbidity, compared to patients who gave birth at rural hospitals with >460 births per year; this risk was amplified for the lowest volume rural hospitals (<110 births per year). However, no similar pattern emerged among urban hospitals, highlighting the particular resource challenges in rural settings, which may be isolated from other sources of clinical and logistical support [31<sup>a</sup>]. Additionally, lower birth-volume facilities have significant training needs, but lack resources to support them, including for emergency obstetrics [32]. In a 2021 study of rural emergency departments in hospitals without obstetric services, 80% reported the need for additional training or resources to be able to adequately address emergency obstetric situations. In fact, almost one-third of these hospitals had experienced an emergency birth situation in the past year [32]. Telehealth support is one factor that could help in these emergency situations; the Mayo Clinic recently published a case study on the success of telemedicine support for emergency obstetrics in hospitals without obstetric services and those with limited maternity care [33<sup>a</sup>].

### Financing

Ensuring sufficient financial resources is a major challenge for all obstetric units, especially low-volume facilities. There are high fixed costs for offering maternity care services, including the cost for 24–7 staffing, equipment, training, facilities, and medical

malpractice coverage. Yet, obstetric units – like most service lines – rely on volume-based revenues. Many rural hospitals have lower birth-volumes (more than half have fewer than 500 births annually), and for these hospitals, the high fixed costs of providing services frequently outweigh the volume-based revenues [9<sup>a</sup>,34]. As noted above, public insurance programs like Medicaid pay less for childbirth services than do private insurers, and many payors reimburse at rates below the full costs for providing obstetric services [9<sup>a</sup>]. Many rural hospitals have a higher proportion of births that are paid by Medicaid, further amplifying revenue shortfalls. Resources for hospital-based care are also shaped by structural racism and white supremacy. A 2023 analysis of hospital finances showed that Black-serving hospitals have fewer resources due to lower revenues, less capital, and lower profits than other hospitals [20<sup>a</sup>]. In addition, a nationwide study of 4476 hospitals in 2017 found that Black- and Hispanic-serving hospitals had a lower value of capital assets, smaller square footage, and tended to lack capital-intensive technologies and services associated with many life-saving procedures (e.g., robotic surgery and cardiac rehabilitation) [35]. These financial challenges exacerbate vulnerability to closure for obstetric units serving multiply-marginalized groups.

### Obstetric unit closures and loss of hospital-based obstetric care

In 2014, more than half of rural counties had no hospital that provided obstetric services [1]. These trends continued from 2014 to 2018, with further service losses disproportionately affecting the most remote, rural areas of the US [2]. Recent findings show that access to maternity care in rural counties continues to decline [36]. By 2022, almost 6 in 10 (58.8%) of rural counties had no hospital-based obstetric services [37]. This steady decline has affected all rural areas, but the most remote rural areas are the hardest hit. Rural ‘noncore’ counties (nonmetropolitan counties without a city or town of at least 10,000 people) had the least access and the steepest declines in hospital-based obstetric care 2010–2022, with approximately 75% of all such counties having no hospitals providing childbirth services by 2022 [37].

Obstetric services loss is also a challenge faced in urban communities, and closures in urban areas in Pennsylvania and New Jersey have resulted in adverse perinatal health outcomes, largely concentrated in BIPOC neighborhoods and communities [6,38<sup>a</sup>,39]. More research is needed on the scope of obstetric unit closures in urban areas, and on the

effects of closures in communities across the US on racial equity [14<sup>11</sup>].

### Consequences of obstetric unit closures

Recent research on the consequences of closures and subsequent challenges for patients, families, clinicians, and communities build upon prior findings and highlight risks to patient safety, mental health consequences, and increased distance to care. Access to timely care before, during, and after childbirth is a crucial determinant of birth outcomes, and obstetric unit closures can dramatically alter access and outcomes [40,41<sup>12</sup>,42<sup>13</sup>,43<sup>14</sup>]. Loss of hospital-based obstetric care is associated with increased risk of out-of-hospital and emergency room births in rural areas [40], and recent studies indicate that obstetric unit closures can influence the use of scheduled labor induction and cesarean delivery [44<sup>15</sup>,45<sup>16</sup>]. Earlier research in rural communities showed that health consequences associated with obstetric unit closures were larger and longer lasting in rural counties not adjacent to urban areas, where losing obstetric care was also associated with increased risk of preterm birth, a leading cause of infant mortality [40]; and future research could examine this association with a focus on rural BIPOC communities that face higher risks of preterm birth and infant mortality.

Hospital closures and obstetric unit closures are also associated with increased travel distances to care, especially for rural residents. A recent study using data from Pennsylvania showed that longer distances to the delivery hospital were associated with greater risk of adverse maternal outcomes and NICU admission [41<sup>17</sup>]. Newer evidence also sheds light on mental health consequences and emotional stress of obstetric unit closures and increased travel distance [38<sup>18</sup>,46]. A 2023 study of pregnant women in rural Western North Carolina found that increased travel time and recent closure of a nearby labor and delivery unit was associated with greater stress levels [46]. Qualitative research published in 2022 presented data from women living in Trenton, New Jersey who gave birth in the period after all obstetric units in the city had closed, and found that the added distance of traveling outside of the city to deliver prevented their partners, parents, or other important support people from being present at the time of delivery [38<sup>19</sup>].

To date, most studies on obstetric unit closures, whether in rural or urban settings, have not documented effects on racial equity [14<sup>20</sup>], and future work should conduct not only stratified analyses of outcomes by racial and ethnic groups, but also focus on racial disparities as an outcome [47,48].

Additionally, while research study findings have been mounting and attention to these topics has been high in media and policy discussions, there have not been corresponding shifts in workforce, safety, or financing to ameliorate the challenges that healthcare delivery systems face in providing obstetric services. As such, obstetric units keep closing, BIPOC birthing people continue to die at a disproportionate rate, and maternal mortality accelerates for rural residents.

### Policy

Trends in maternal mortality and maternity care access will not change without fundamental restructuring of maternity care payment and reproductive health policy. The states with the highest maternal and infant mortality rates are also the places where obstetric units are closing, where restrictive reproductive health laws have been implemented, and where maternity care access is most limited [49<sup>21</sup>,50<sup>22</sup>]. To inform current discussions and future policy decisions about maternal healthcare access, rigorous health services and health policy research is needed to accompany clinical research on maternal health [51,52]. Average treatment or policy effects can mask disparities, and stakeholders require policy analytic research that address inequities in access and outcomes across race, geography, payer, and other important factors associated with perinatal health [52]. Several maternal health policy options have shown promise for increasing access to high-quality care and decreasing racial inequities in access and outcomes, including Medicaid coverage of doula care and policies that financially support midwife-led freestanding birth centers [53].

Still, current policies exist that may cause harm, or may not be effective. For example, state restrictions and abortion bans after the overturning of *Roe v Wade* risk physician flight from states with large rural populations already facing maternity care shortages. In a recent poll of medical students and physicians, 3 in 4 stated that they would not work or even apply for a job in a state with strict abortion policies for fear of not being able to adequately care for their patients or risk criminal penalties or even jail time for doing so [26<sup>23</sup>].

Many national policies could have unintended consequences when the circumstances of all facilities providing maternity care are not considered. For example, the Centers for Medicaid & Medicare Services has proposed the first minimum safety standards for hospitals providing obstetric services in an effort to reduce maternal mortality and improve health equity [54]. However, the proposed standards lack accompanying resources for hospitals,

potentially adding to the financial burden of already-strained obstetric units. Another example is state Medicaid expansion, often highlighted as a policy that has improved access to care. While Medicaid expansion did prevent or forestall rural hospital closures, a 2022 study found that it was not effective at preventing obstetric unit closures [55]. Conducting rigorous research on current and proposed policies can help inform ongoing legislative, programmatic, and regulatory efforts to address maternity care access.

## CONCLUSION

Improving maternal health is a clinical and policy priority in the United States. We reviewed recent literature on access to maternity care and impacts on racial and geographic equity. As maternal mortality rates continue to rise, maternity care access is declining in the US, especially in rural areas and communities with a higher proportion of Black, Latinx, or Indigenous residents.

Lack of resources and financial strain are challenges for low-volume obstetric units and for communities that are chronically under-resourced.

## Acknowledgements

We would like to thank Emily C. Sheffield, MPH and Alyssa H. Fritz, MPH for their input and assistance with this manuscript.

## Financial support and sponsorship

This study was supported in part by the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under PHS Cooperative Agreement No. 5U1CRH03717. The content is solely the responsibility of the authors and does not represent the official views of the funding entity. The information, conclusions, and opinions expressed are those of the authors, and no endorsement by any funder is intended or should be inferred.

## Conflicts of interest

The authors have no conflicts of interest relevant to the content of this manuscript.

## REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

1. Hung P, Henning-Smith CE, Casey MM, Kozhimannil KB. Access to obstetric services in rural counties still declining, with 9 percentage losing services, 2004–14. *Health Aff* 2017; 36:1663–1671.

2. Kozhimannil KB, Interrante JD, Tuttle MKS, Henning-Smith C. Changes in hospital-based obstetric services in rural US counties, 2014–2018. *JAMA* 2020; 324:197–199.
3. Kozhimannil KB, Interrante JD, Henning-Smith C, Admon LK. Rural-urban differences in severe maternal morbidity and mortality in the US, 2007–15. *Health Aff* 2019; 38:2077–2085.
4. Interrante JD, Tuttle MS, Admon LK, Kozhimannil KB. Severe maternal morbidity and mortality risk at the intersection of rurality, race and ethnicity, and Medicaid. *Womens Health Issues* 2022; 32:540–549.
5. Hoyert DL. Maternal mortality rates in the United States, 2022. National Center for Health Statistics; 2024 May [cited 2024 Sep 9]. Available at: <https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2022/maternal-mortality-rates-2022.pdf>.
6. McGregor AJ, Hung P, Garman D, *et al.* Obstetrical unit closures and racial and ethnic differences in severe maternal morbidity in the state of New Jersey. *Am J Obstet Gynecol* 2021; 3:100480.
7. Adams EK, Kramer MR, Joski PJ, *et al.* Examination of the Black-White racial disparity in severe maternal morbidity among Georgia deliveries, 2016 to 2020. *AJOG Glob Rep* 2024; 4:100303.

This study used Georgia vital statistics data from 2016 to 2020 and shows nearly double the risk of severe maternal morbidity for Black vs. White Georgians. Additionally, in examining the factors that explain Georgia's Black-White gap in severe maternal morbidity, hospital factors played a greater role than residential and maternal factors, which also contributed.

8. Thoma ME, Declercq ER. Changes in pregnancy-related mortality associated with the coronavirus disease 2019 (COVID-19) pandemic in the United States. *Obstet Gynecol* 2023; 141:911–917.

Pregnancy-related mortality increased more rapidly in 2021 than 2020, with the largest increases occurring among American Indian/Alaska Native people and among rural residents.

9. Kozhimannil KB. Declining access to US maternity care is a systemic injustice. *BMJ* 2023; 382:2038.

This recent commentary describes the financing challenges that lead to declining maternity care access.

10. Crear-Perry J, Correa-de-Araujo R, Lewis Johnson T, *et al.* Social and structural determinants of health inequities in maternal health. *J Womens Health* 2021; 30:230–235.

11. The White House. White House blueprint for addressing the maternal health crisis 2022 [cited 2024 Sep 28]. Available at: <https://www.whitehouse.gov/wp-content/uploads/2022/06/Maternal-Health-Blueprint.pdf>.

12. Bianchi DW, Clayton JA, Zenk SN. Addressing the public health crisis of maternal mortality: a national research agenda. *JAMA* 2023; 330:1729–1730.

This opinion piece lays out a public health perspective on addressing maternal mortality, highlighting the need for research on access to maternity care.

13. Interrante JD, Admon LK, Carroll C, *et al.* Association of health insurance, geography, and race and ethnicity with disparities in receipt of recommended postpartum care in the US. *JAMA Health Forum* 2022; 3:e223292.

Using 2016–2019 data from the Pregnancy Risk Assessment Monitoring System (PRAMS), this analysis examined access and quality of postpartum care along the dimensions of health insurance, geography and race/ethnicity. Inequities in postpartum care content were extensive and compounded for patients with multiple disadvantaged identities. The study indicates that examining only 1 dimension of identity may understate the extent of disparities.

14. Smith JG, Brown KK. Rural hospital and obstetric unit closures as social determinants of racial and ethnic maternal health disparities: A scoping review. *J Adv Nurs* 2023; 80:3069–3071.

This review indicated that the impact of rural obstetric unit closures on racial and ethnic maternal health disparities is not well documented in the current research.

15. Interrante JD, Tuttle MS, Ibrahim BB, *et al.* State and regional differences in access to hospital-based obstetric services for rural residents, 2018. 2021. Available at: <https://hrhc.umn.edu/publication/state-and-regional-differences-in-access-to-hospital-based-obstetric-services-for-rural-residents-2018/>.

16. Lorch SA, Martin AE, Ranade R, *et al.* Lessons for providers and hospitals from Philadelphia's obstetric services closures and consolidations, 1997–2012. *Health Aff* 2014; 33:2162–2169.

17. Bowleg L. The problem with the phrase *Women and Minorities*: intersectionality—an important theoretical framework for public health. *Am J Public Health* 2012; 102:1267–1273.

18. Kozhimannil KB, Interrante JD, Tofte AN, Admon LK. Severe maternal morbidity and mortality among indigenous women in the United States. *Obstet Gynecol* 2020; 135:294–300.

19. Crenshaw K. Demarginalizing the intersection of race and sex: a black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *University of Chicago Legal Forum*. 1989 [cited 2024 Sep 21]. Available at: <https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=1052&context=ucfl>

20. Himmelstein G, Ceasar JN, Himmelstein KE. Hospitals that serve many black patients have lower revenues and profits: structural racism in hospital financing. *J Gen Intern Med* 2023; 38:586–591.

This first of its kind analysis of hospital finances shows that Black-serving hospitals have fewer resources due to lower revenues, less capital, and lower profits than hospitals that care for mostly white patients.

21. Hay K, McDougal L, Percival V, *et al.* Disrupting gender norms in health systems: making the case for change. *Lancet* 2019; 393:2535–2549.

22. Kawachi I, Kennedy BP, Gupta V, Prothrow-Stith D. Women's status and the health of women and men: a view from the States. *Soc Sci Med* 1999; 48:21–32.

23. Liu JL, Levinson ZM, Zhou A, *et al.* Environmental scan on consolidation trends and impacts in healthcare markets. RAND Corporation; 2022 [cited 2024 Sep 21]. Available at: [https://www.rand.org/pubs/research\\_reports/RRA1820-1.html](https://www.rand.org/pubs/research_reports/RRA1820-1.html).

24. Probst J, Eberth JM, Crouch E. Structural urbanism contributes to poorer health outcomes for rural America. *Health Aff* 2019; 38:1976–1984.

25. Kozhimannil KB, Interrante JD, Admon LK, Basile Ibrahim BL. Rural hospital administrators' beliefs about safety, financial viability, and community need for offering obstetric care. *JAMA Health Forum* 2022; 3:e220204.

26. Grover A. A physician crisis in the rural us may be about to get worse. *JAMA* 2023; 330:21.

This commentary describes the deepening challenges faced by rural hospitals and communities in recruiting and retaining physicians.

27. Henning-Smith C, Almanza J, Kozhimannil KB. The maternity care nurse workforce in rural U.S. hospitals. *J Obstet Gynecol Neonat Nurs* 2017; 46:411–422.

28. Sepper E, White K, Beasley A. The Texas Medical Board and the futility of medical exceptions to abortion bans. *JAMA* 2024; 33:2073–2074.

This opinion piece highlights the ways that restrictive reproductive health policies may affect medical care access for pregnant people, with a focus on Texas.

29. Sabbath EL, McKetchnie SM, Arora KS, Buchbinder M. US obstetrician-gynecologists' perceived impacts of post *Dobbs v Jackson* state abortion bans. *JAMA Netw Open* 2024; 7:e2352109.

This analysis of a national survey of Obstetrician-Gynecologists shows how the *Dobbs* decision has impacted clinical practice and clinician considerations and fears about providing care.

30. Verma N, Grossman D. Obstacles to care mount 1 year after *Dobbs* decision. *JAMA* 2023; 330:119–120.

This opinion piece indicates how state-level reproductive health policy changes implemented in the wake of the Supreme Court's *Dobbs* decision impact access to maternity care.

31. Kozhimannil KB, Leonard SA, Handley SC, *et al.* Obstetric volume and severe maternal morbidity among low-risk and higher-risk patients giving birth at rural and urban US hospitals. *JAMA Health Forum* 2023; 4:e232110.

This study analyzed the relationship between hospital birth volume and maternal health outcomes in four states (California, Michigan, Pennsylvania, South Carolina) between 2004-2020, showing that the risk of severe maternal morbidity was higher at rural hospitals with <460 births a year, compared to births at hospitals with an annual birth volume over 460 births a year.

32. Kozhimannil KB, Interrante JD, Tuttle MS, *et al.* Local capacity for emergency births in rural hospitals without obstetrics services. *J Rural Health* 2021; 37:385–393.

33. Theiler RN, Torbenson V, Schoen JC, *et al.* Virtual obstetric hospitalist support for obstetric emergencies and deliveries: the Mayo Clinic experience. *Telemed e-Health* 2024; 30:1600–1605.

This research study provides detail on the telehealth approach taken by the Mayo Clinic in addressing obstetric emergencies, including at facilities that do not offer obstetric care.

34. Handley SC, Passarella M, Herrick HM, *et al.* Birth volume and geographic distribution of us hospitals with obstetric services from 2010 to 2018. *JAMA Netw Open* 2021; 4:e2125373.

35. Himmelstein G, Himmelstein KEW. Inequality set in concrete: physical resources available for care at hospitals serving people of color and other U.S. hospitals. *Int J Health Serv* 2020; 50:363–370.

36. U.S. Government Accountability Office. Maternal health: availability of hospital-based obstetric care in rural areas. 2022 [cited 2024 Aug 19]. Report No.: GAO-23-105515. Available at: <https://www.gao.gov/products/gao-23-105515>

37. Kozhimannil KB, Interrante JD, Fritz AH, Sheffield EC. Loss of hospital-based obstetric services in rural counties in the United States, 2010–2022. 2024 [cited 2024 Sep 9]. (UMN Rural Health Research Center Infographic). Available at: <https://rhrc.umn.edu/publication/loss-of-hospital-based-obstetric-services-in-rural-counties-in-the-united-states-2010-2022>

38. McGregor AJ, Addo NK, Amutah-Onukagha NN, Arroyo J. I Feel Like That Was the Only Option I Had': a qualitative study of structural inequities in obstetric hospital choice in Trenton, New Jersey. *J Healthcare Poor Underserved* 2022; 33:1772–1792.

This qualitative analysis interviewed birthing people in Trenton, NJ, where the last obstetric unit within city limits closed in 2011. The manuscript reports on themes that emerged, including limited choices for prenatal care or delivery hospital, increased travel distances, and institutional mistrust.

39. Lorch SA, Srinivas SK, Ahlberg C, Small DS. The impact of obstetric unit closures on maternal and infant pregnancy outcomes. *Health Serv Res* 2013; 48(Pt 1):455–475.

40. Kozhimannil KB, Hung P, Henning-Smith C, *et al.* Association between loss of hospital-based obstetric services and birth outcomes in rural counties in the United States. *JAMA* 2018; 319:1239.

41. Minion SC, Krans EE, Brooks MM, *et al.* Association of driving distance to maternity hospitals and maternal and perinatal outcomes. *Obstet Gynecol* 2022; 140:812–819.

This study presents data from Pennsylvania (2011-2015) but provides recent US-based evidence on the association between driving distance and perinatal outcomes. The study found that longer distances to the delivery hospital were associated with greater risk of adverse maternal outcomes and NICU admission.

42. Battaglia E. The effect of hospital maternity ward closures on maternal and infant health. *Am J Health Econ* 2023; Available at <https://doi.org/10.1086/727738>. [Epub ahead of print]

This analysis uses vital statistics data and documents an association between a large decline or loss of in-county hospital births care (termed 'maternity ward closures' in this analysis) and the use of cesarean delivery. It does not show an association with infant health outcomes.

43. Fischer S, Royer H, White C. Healthcare centralization: the health impacts of obstetric unit closures in the United States. *Am Econ J Appl Econ* 2024; 16:113–141.

This analysis uses national vital statistics data from 1989 to 2019 and identifies 'closures' as occurring when the number of hospital-based births in a county in a given year drops to near zero. The analysis shows that 'closures' are associated with increased distance to care and changes in the use of labor induction and cesarean birth.

44. Durrance C, Guldi M, Schulkind L. The effect of rural hospital closures on maternal and infant health. *Health Serv Res* 2024; 59:e14248.

This analysis examined the association of hospital closures (this did not focus on obstetric care access specifically) in rural counties with maternal and infant health outcomes using national vital statistics data. Associations differed by degree of rurality, with closures associated with poor maternal/infant health in 'moderately rural' counties but potential improvements in 'the most rural counties.'

45. Mullens CL, Hernandez JA, Murthy J, *et al.* Understanding the impacts of rural hospital closures: a scoping review. *J Rural Health* 2024; 40:227–237.

This comprehensive review of literature on the effects of rural hospital closures (this did not focus on obstetric care specifically) indicated heterogeneity in effects across communities, and different studies (with different data, methods, and time periods) showing different impacts. However, they did identify some common associations between hospital closure and adverse impacts in various areas, including emergency medical service transport, local economies, availability and utilization of emergency care and hospital services, availability of outpatient services, changes in quality of care, and healthcare workforce.

46. Woodward R, Mazure ES, Belden CM, *et al.* Association of prenatal stress with distance to delivery for pregnant women in Western North Carolina. *Midwifery* 2023; 118:103573.

47. Howell EA, Brown H, Brumley J, *et al.* Reduction of peripartum racial and ethnic disparities: a conceptual framework and maternal safety consensus bundle. *Obstet Gynecol* 2018; 131:770–782.

48. Kozhimannil KB, Muoto I, Darney BG, *et al.* Early elective delivery disparities between non-Hispanic black and white women after statewide policy implementation. *Womens Health Issues* 2018; 28:224–231.

49. National Center for Health Statistics. Infant mortality rates by state. Centers for Disease Control and Prevention; 2024. Available at: [https://www.cdc.gov/nchs/pressroom/sosmap/infant\\_mortality\\_rates/infant\\_mortality.htm](https://www.cdc.gov/nchs/pressroom/sosmap/infant_mortality_rates/infant_mortality.htm).

This report shows updated infant mortality rates by date.

50. Kaiser Family Foundation. Maternal deaths and mortality rates per 100,000 live births. [cited 2024 Aug 19]. (State Health Facts). Available at: <https://www.kff.org/other/state-indicator/maternal-deaths-and-mortality-rates-per-100000-live-births/?currentTimeframe=0&sortModel=%7B%22colld%22:%22Location%22,%22sort%22:%22asc%22%7D>.

This publication shows state level maternal mortality rates.

51. Majumdar SR, Soumerai SB. The unhealthy state of health policy research. *Health Aff* 2009; 28(Suppl 1):w900–w908.

52. U.S. Government Accountability Office. Maternal health: HHS should improve assessment of efforts to address worsening outcomes. 2024. Report No.: GAO-24-106271. Available at: <https://www.gao.gov/products/gao-24-106271>.

53. Katon JG, Enquobahrie DA, Jacobsen K, Zephyrin LC. Policies for reducing maternal morbidity and mortality and enhancing equity in maternal health: a review of the evidence. *Commonwealth Fund*; 2021 [cited 2024 Oct 15]. Available at: <https://www.commonwealthfund.org/publications/fund-reports/2021/nov/policies-reducing-maternal-morbidity-mortality-enhancing-equity>.

54. Centers for Medicare & Medicaid Services. Biden Harris Administration proposes policies to reduce maternal mortality, advance health equity, and support underserved communities. 2024 [cited 2024 Sep 21]. Available at: <https://www.cms.gov/newsroom/press-releases/biden-harris-administration-proposes-policies-reduce-maternal-mortality-advance-health-equity-and>.

55. Carroll C, Interrante JD, Daw JR, Kozhimannil KB. Association between Medicaid expansion and closure of hospital-based obstetric services: study examines the association between Medicaid expansion and the closure of hospital-based obstetric services. *Health Aff* 2022; 41:531–539.

Downloaded from <http://journals.lww.com/co-obgyn> by BNDMfsePHKav12Eoum1tQIN4a+kLhEzpslH04XMI0hCwWC X1AMvYQp/llQHID3D00QORy7vStF4Cf3VCA/OAVpDDa8K2+Y6h5t5KE= on 11/15/2024