



# The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health

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## Abstract

**Issue:** Maternal morbidity — health conditions stemming from or worsened by pregnancy — is on the rise in the United States, disproportionately affecting people of color and those with social disadvantages.

**Goal:** To model the societal costs of maternal morbidity and associated maternal and child outcomes through five years following childbirth.

**Methods:** Through a comprehensive literature review, we identified maternal and child outcomes that may result from each maternal morbidity condition. We then calculated the excess cases of each outcome attributed to maternal morbidity, modeled the associated medical and nonmedical costs of each outcome, and projected costs through five years postpartum.

**Key Findings:** We identified evidence to support connections between nine maternal morbidity conditions, such as hypertensive disorders, and 24 maternal and child outcomes, such as cesarean section delivery and preterm birth. We estimated total maternal morbidity costs for all U.S. births in 2019 to be \$32.3 billion from conception through the child's fifth birthday. This amounts to \$8,624 in additional costs to society for each maternal–child pair.

**Conclusion:** Our model likely underestimates the full financial costs of maternal morbidity. Policy and systems reforms could reduce these costs and shape the social factors affecting quality of life for birthing people and their children.

## Introduction

Maternal morbidity encompasses physical and psychological conditions resulting from, or aggravated by, pregnancy. These conditions do not necessarily lead to death, but they can have a negative impact on quality of life that lasts for months, even years.

Maternal morbidities caused or aggravated by pregnancy range from short, acute episodes to longer, chronic ailments.<sup>1</sup> The Centers for Disease Control and Prevention (CDC) has identified 21 indicators of severe maternal morbidity, ranging from blood transfusion to eclampsia, hysterectomy, and sepsis.<sup>2</sup> Maternal morbidity conditions can lead to adverse outcomes for birthing people, such as cesarean delivery and stroke, as well as adverse outcomes for their children, such as asthma, preterm birth, and suboptimal breastfeeding.<sup>3</sup>

The toll of maternal morbidity is significant and growing (Exhibit 1). The occurrence of severe maternal morbidity in the United States rose approximately twofold between 1998 and 2014, affecting 1.4 percent of birthing people during delivery. It can increase length of hospital stays up to 70 percent.<sup>4</sup>

### Key terms

**Birthing people and maternal morbidity:** We use “birthing people” to describe those who are pregnant and those who give birth to a child. We continue to use the term “maternal morbidity conditions” to describe the adverse medical conditions experienced by birthing people.

**Maternal morbidity and severe maternal morbidity:** Maternal morbidity encompasses health conditions caused or aggravated by pregnancy, ranging from short, acute episodes to chronic conditions. Severe maternal morbidity is a subset of maternal morbidity identified by the Centers for Disease Control and Prevention through a list of 21 indicators and corresponding ICD codes. Our model estimates the economic impact of maternal morbidity more broadly to obtain a comprehensive picture of adverse outcomes resulting from pregnancy.

### Exhibit 1. Maternal Morbidity in the United States



**Occurrence of maternal morbidity doubled over the past few decades**

The rate of severe maternal morbidity increased from

**74 to 140 cases**

per 100,000 hospitalizations between 1998 and 2014.



**The maternal mortality rate in the U.S. is now double that of most other developed countries**

The U.S. maternal mortality ratio was

**17.4 deaths**

per 100,000 live births in 2018, compared to

**fewer than 9 deaths**

per 100,000 live births in most other high-income countries.



**Most maternal morbidity occurs after leaving the hospital**

**1 in 7**

commercially insured birthing people and

**1 in 6**

Medicaid-insured birthing people experience severe maternal morbidity after leaving the hospital.

Data: Centers for Disease Control and Prevention, “Severe Maternal Morbidity in the United States,” last updated Feb. 2, 2021; Roosa Tikkanen et al., Maternal Mortality and Maternity Care in the United States Compared to 10 Other Developed Countries (Commonwealth Fund, Nov. 2020); Jiajia Chen et al., “Assessment of Incidence and Factors Associated with Severe Maternal Morbidity After Delivery Discharge Among Women in the US,” JAMA Network Open 4, no. 2 (Feb. 2, 2021): e2036148.

Source: So O’Neil et al., The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health (Commonwealth Fund, Nov. 2021). <https://doi.org/10.26099/nz8s-4708>

The most severe consequence of maternal morbidity is death. The U.S. has a maternal mortality ratio of 20 maternal deaths per 100,000 live births, the worst among developed countries.<sup>5</sup> By addressing maternal morbidity through policy and systems change, we can help avert “near misses” as well as disabilities and chronic illnesses that can have ongoing, compounded effects on family members — shaping their workforce participation, nutrition, schooling, and other factors affecting quality of life.<sup>6</sup>

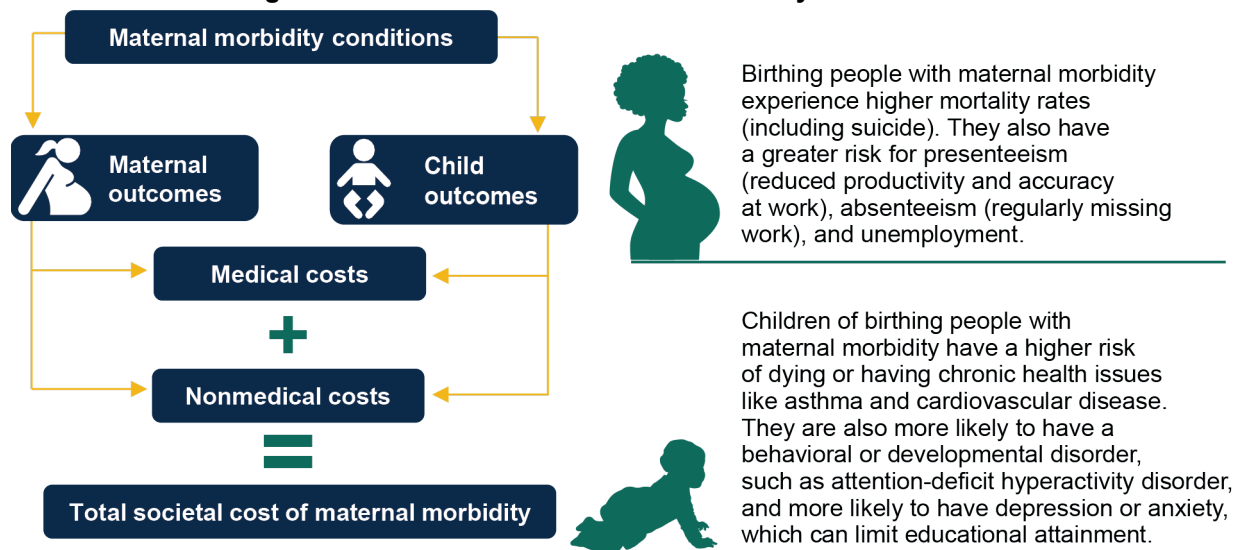
### Conceptual Model and Research Rationale

Few studies have attempted to estimate the overall costs of maternal morbidity. To our knowledge, this mathematical model represents the most comprehensive analysis to date of the economic toll of U.S. maternal morbidity.<sup>7</sup> Even so, the research literature lacks many of the impact estimates we needed to calculate the comprehensive costs of maternal morbidity; with additional data, the total economic burden might be much higher.

To develop our model, we searched peer-reviewed studies and secondary sources to collect data on: 1) the prevalence of maternal morbidity conditions; 2) the incidence of outcomes associated with these conditions; and 3) the medical and nonmedical costs associated with outcomes. We then developed cost estimates for all 2019 births in the U.S. when projecting outcomes of birthing people and their children from pregnancy through five years postdelivery. We focused on this postpartum period to estimate the costs of more immediate outcomes of maternal morbidity, understanding that the economic impact may continue well beyond a child’s fifth birthday. (For more details, see “[How We Conducted This Study.](#)”)

Exhibit 2 presents our conceptual framework for estimating the costs of maternal morbidity. Our model reflects costs related to needed medical care and other nonmedical costs. Medical costs include treatment and hospitalization costs for birthing people and their children. Nonmedical costs include productivity loss and use of social services, such as the Supplemental Nutrition Assistance Program (SNAP), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Medicaid, and Temporary Assistance for Needy Families (TANF). The medical and nonmedical costs directly result from each maternal morbidity outcome.

**Exhibit 2. Calculating the True Costs of U.S. Maternal Morbidity**



Source: So O’Neil et al., The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health (Commonwealth Fund, Nov. 2021). <https://doi.org/10.26099/nz8s-4708>

## Key Findings

Of the 31 maternal morbidity conditions identified in the literature, we found nine with documented outcomes and associated costs (Exhibit 3).<sup>8</sup> The nine conditions include: amniotic fluid embolism, cardiac arrest, gestational diabetes mellitus, hemorrhage, hypertensive disorders, maternal mental health conditions, renal disease, sepsis, and venous thromboembolism.

**Exhibit 3. Cost Estimates of Maternal Morbidity for U.S. Births in 2019, from Child’s Conception to the Child’s Fifth Birthday (in millions of dollars)**

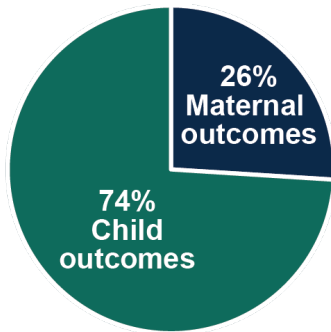
Condition	Medical costs	Nonmedical costs	Total
Maternal mental health conditions	\$6,977.0	\$11,082.0	\$18,059.0
Hypertensive disorders	\$5,970.9	\$1,569.9	\$7,540.8
Gestational diabetes mellitus	\$3,944.7	\$899.2	\$4,843.9
Hemorrhage	\$1,828.9	\$0	\$1,828.9
Cardiac arrest	\$1.0	\$9.9	\$10.9
Venous thromboembolism	\$0.5	\$6.0	\$6.4
Amniotic fluid embolism	\$0.3	\$4.0	\$4.4
Sepsis	\$0.2	\$3.1	\$3.3
Renal disease	\$0.2	\$2.7	\$3.0
<b>Total</b>	<b>\$18,723.7</b>	<b>\$13,576.8</b>	<b>\$32,300.6</b>

Source: So O’Neil et al., The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health (Commonwealth Fund, Nov. 2021). <https://doi.org/10.26099/nz8s-4708>

Notes: Please contact the authors for a full list of the studies included in this analysis. There were 6,348,913 total pregnancies and 3,745,540 births in 2019, according to the CDC. Costs for each condition may not add to total because of rounding.

Using prevalence estimates for each condition, we estimated that the total costs of these nine maternal morbidity conditions for all U.S. births in 2019 reached \$32.3 billion from conception through the child’s fifth birthday (Exhibit 4). This amounts to roughly \$8,624 in additional costs to society for each maternal–child pair associated with 6.3 million pregnancies and 3.7 million births in the U.S. annually. Two-thirds of these costs occurred within the first year postpartum.

**Exhibit 4. Maternal and Child Costs Due to Maternal Morbidity for U.S. Births in 2019**



**\$21.9 billion from conception to age 1**

- **\$3.8 billion** from maternal outcomes
- **\$18.1 billion** from child outcomes

**\$32.3 billion from conception to age 5**

- **\$8.3 billion** from maternal outcomes
- **\$24.0 billion** from child outcomes

Source: So O’Neil et al., The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health (Commonwealth Fund, Nov. 2021). <https://doi.org/10.26099/nz8s-4708>

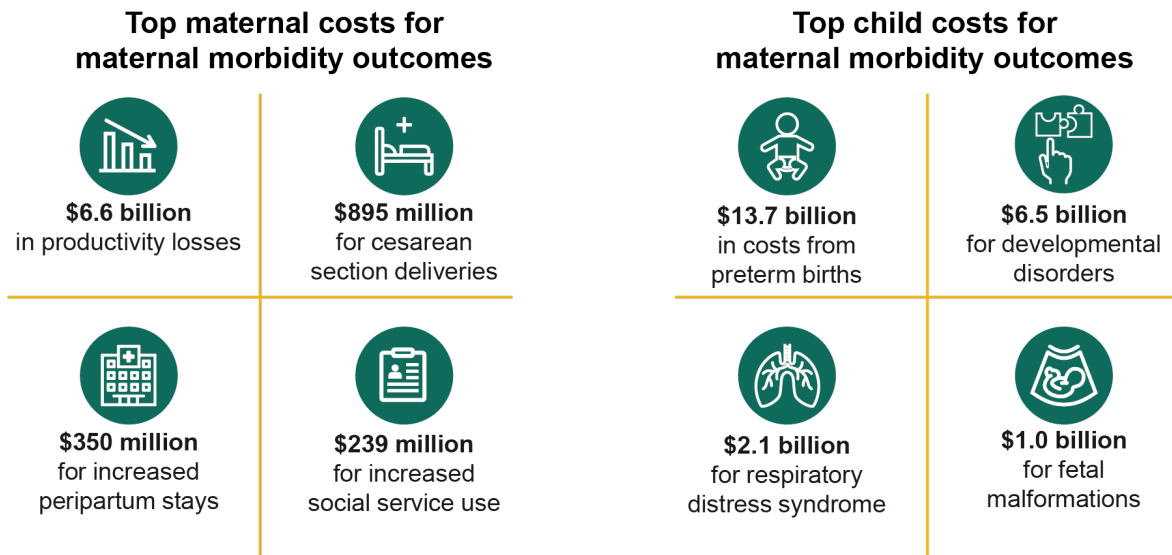
The largest costs included maternal mental health conditions (\$18.1 billion), hypertensive disorders (\$7.5 billion), gestational diabetes (\$4.8 billion), and postpartum hemorrhage (\$1.8 billion). These conditions also represented the most prevalent conditions among those with documented cost information.

The child outcomes with the highest costs were preterm birth (\$13.7 billion), developmental disorders (\$6.5 billion), and respiratory distress syndrome (\$2.1 billion) (Exhibit 5). The maternal outcomes driving the costs of these conditions included productivity losses (\$6.6 billion), cesarean section delivery (\$895 million), and increased peripartum stay (\$350 million).

The costs of child outcomes (\$24.0 billion) far outweighed the costs of maternal outcomes (\$8.3 billion) from the beginning of pregnancy through a child’s fifth birthday (Exhibit 4). If there were better data available on maternal morbidity conditions and outcomes, our estimates of the costs of maternal outcomes might have been substantially higher.

The health care system bore more than half these costs (58%), with the rest shouldered by employers, public social services programs, and other nonmedical sectors. These nonmedical costs included losses in productivity (\$6.6 billion), costs associated with behavioral and developmental disorders in children (\$6.5 billion), and increased use of social programs like SNAP, WIC, Medicaid, and TANF (\$239 million).

**Exhibit 5. Top Maternal and Child Costs Due to Maternal Morbidity, from Conception to Age 5**



Source: So O’Neil et al., The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health (Commonwealth Fund, Nov. 2021). <https://doi.org/10.26099/nz8s-4708>

**Limitations of the Study**

Our model likely underestimates the true societal costs of maternal morbidity, because data on the many nonmedical costs associated with the nine conditions included in the model were lacking in the research literature. Also missing was supporting evidence for many of the morbidity–outcome connections from our original conceptual model.

In addition, to avoid duplicating cost estimates, we intentionally chose not to model secondary outcomes. For example, one of the outcomes in our model is child developmental disorders, which often require social services, such as Supplemental Security Income payments, to address. Our model did not include this set of costs.

Finally, we designed this model to focus on a six-year period (pregnancy through five years postdelivery) to measure the immediate impacts of maternal morbidity. We recognize, however, that maternal morbidity can have long-term effects on the birthing person and the child. Our estimates may therefore represent only a fraction of lifetime costs.

**Discussion**

Our model estimated that nine common maternal morbidity conditions associated with births in a given year (2019) cost society \$32.3 billion from the beginning of pregnancy through five years postpartum. The lack of comprehensive data for other conditions suggests that maternal morbidity has the potential to exact a much higher toll on society than what we have found, rivaling that of expensive chronic conditions like diabetes, whose costs run into the hundreds of billions of dollars.<sup>9</sup>

Of the costs documented, medical costs made up the majority (58%). This preponderance of medical costs is likely driven by the relative availability of hospital discharge data compared with other cost information. The focus of these costs on the delivery period also implies our estimates might further miss costs associated with later and longer-term physical and mental health consequences of maternal

morbidity for birthing people and their children, including consequences for subsequent pregnancies.<sup>10</sup> For example, our maternal mortality cost estimate (\$30.8 million) included medical costs due to hospitalization and only the nonmedical costs of maternal funerals; there was no additional information in the research literature on the longer-term physical and psychological costs for other household members.

Nonmedical costs accounted for the other 42 percent of total costs, which mainly stemmed from maternal mental health conditions — the maternal morbidity for which we had the most complete information on outcomes and costs. While the literature contained fewer documented nonmedical costs for the eight remaining maternal conditions in this model, studies of other health conditions have found that nonmedical costs attributable to lost earnings, productivity loss, and other indirect costs can account for more than half of overall costs.<sup>11</sup> Additional information on nonmedical costs related to maternal morbidity could raise our estimate of nonmedical and total costs.

Studies also tended to focus on severe maternal morbidity, a more narrowly defined subset of life-threatening maternal conditions. For these conditions, the CDC has published a clear definition of indicators and diagnosis codes that allows researchers to develop medical cost estimates through claims data. Of the nine conditions with sufficient evidence for inclusion in this model, six were included on the list of CDC indicators.<sup>12</sup> Development of a broader set of maternal morbidity indicators could improve the data needed to generate medical cost estimates for maternal morbidity. For example, complications during delivery increase medical costs of a vaginal and cesarean delivery by 20 percent and 25 percent, respectively. In addition, our model does not account for medical costs of readmissions linked to maternal morbidity, which could substantially increase our estimate.<sup>13</sup>

Nevertheless, our cost estimates confirm the substantial toll maternal morbidity has on society and signify further opportunities to invest in maternal health. These investments could support evidence-based maternal health initiatives, such as: midwifery models of care that extend beyond birth; comprehensive gender-specific primary health care that provides seamless transitions in and out of pregnancy; community-based models of care; and telehealth integration for maternal health.<sup>14</sup> These initiatives could be supported through various state or federal policies, such as incentives for extended postpartum coverage or expansion of insurance coverage more broadly. Policy also can address reimbursement for measuring and addressing social determinants of health associated with maternal morbidity, such as unstable housing and lack of transportation. Such interventions must specifically address root causes of inequities in maternal health, including structural racism.

Reducing maternal morbidity requires tackling the multiple factors that can influence whether a birthing person experiences maternal morbidity. This starts with measurement to capture, beyond medical care, the social and other factors influencing maternal outcomes. National entities driving measurement, such as the National Quality Forum and CMS, are exploring equity-centered measures that could specifically focus on those related to maternal health. These measures will support the development of better policy and program decisions that comprehensively address the multitude of complex factors underlying maternal morbidity.<sup>15</sup> Even without these measures, some states have been spurred to take a more comprehensive, team-based approach to perinatal care, such as by introducing pregnancy medical homes and group prenatal care.<sup>16</sup> Although evidence on the effectiveness of cross-sector, place-based initiatives are scarce, these efforts represent a trend toward holistically addressing the social and clinical determinants of maternal and child health.<sup>17</sup>

## Conclusion

The cost of maternal morbidity has significant implications for delivery system leaders and policymakers. System failures that result in today's severe maternal morbidity can result in tomorrow's maternal death, which makes preventing morbidity even more critical to addressing the U.S. maternal health crisis.

Affordable, continuous health insurance coverage is one part of the equation — albeit an important one. This includes an extension of postpartum Medicaid coverage for up to one year to help ensure that key physical and mental health needs following birth are identified and met. Health systems and payers can further address maternal health outcomes by increasingly monitoring maternal morbidity measures and undertaking root-cause analyses to address any inequities or adverse outcomes and to drive improvement. The growing recognition of the serious effects of maternal morbidity on families and society provides an opportunity to further invest in measurement to promote evidence-informed policy change and programming for maternal health.



## Appendix. How We Conducted This Study

Our model focused on maternal and child outcomes linked to maternal morbidity conditions in the literature. We initially identified 8,337 articles in our literature review and analyzed 449 articles that passed title and abstract screening. After our review, which included rigorous selection criteria that controlled for confounding factors, we selected 224 articles for a deeper full-text review. Through our review, we identified 111 studies that supported connections between nine maternal morbidity conditions and 24 maternal and child outcomes. With expert guidance, we retained certain morbidity-outcome connections and removed others.

We used a cost-of-illness methodology to synthesize existing evidence and reviewed literature and secondary data sources to inform the model's inputs. We generated three input types for the model: 1) impact estimates, which measure the incremental effects associated with exposure to maternal morbidity conditions (versus no exposure to untreated maternal morbidity conditions); 2) the prevalence of maternal morbidity conditions in the United States; and 3) the associated costs and baseline rates of each outcome affected by exposure to maternal morbidity conditions, such as preterm birth.

We used the baseline prevalence to calculate the number of birthing people in the U.S. experiencing each maternal morbidity condition in 2019. We then used the impact estimates and baseline incidence of each outcome to calculate the incremental number of birthing persons or children who would experience each outcome directly because of maternal morbidity. For example, our child injury impact estimate measures the incremental risk of injury to the child of a birthing person with an untreated maternal mental health condition relative to a birthing person without a maternal mental health condition. Adding this estimate to the baseline rate of child injury among the general population would yield an approximate likelihood of an injury for children of birthing persons with an untreated maternal mental health condition.

To calculate the aggregate excess costs of outcomes associated with maternal morbidity, we multiplied the individual incremental risk of each outcome with the expected number of birthing persons with each maternal morbidity condition. We then multiplied the product by the incremental unit cost. Through the literature and additional assumptions, we determined whether each outcome would incur one-time or ongoing costs to extrapolate the costs to the six-year period. For example, a cesarean section would incur a one-time medical cost, while the cost of child developmental disorders continues through the child's fifth birthday and beyond. We then calculated the economic burden of maternal morbidity by adding the costs across all outcomes and years.

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November 12, 2021

## Citation

So O'Neil et al., *The High Costs of Maternal Morbidity Show Why We Need Greater Investment in Maternal Health* (Commonwealth Fund, Nov. 2021).

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## Notes

<sup>1</sup> Kazuyo Machiyama et al., “Consequences of Maternal Morbidity on Health-Related Functioning: A Systematic Scoping Review,” *BMJ Open* 7, no. 6 (June 2017): e013903.

<sup>2</sup> The Centers for Disease Control and Prevention includes the following 21 indicators of severe maternal morbidity: acute myocardial infarction, aneurysm, acute renal failure, adult respiratory distress syndrome, amniotic fluid embolism, cardiac arrest/ventricular fibrillation, conversion of cardiac rhythm, disseminated intravascular coagulation, eclampsia, heart failure/arrest during surgery or procedure, puerperal cerebrovascular disorders, pulmonary edema/acute heart failure, severe anesthesia complications, sepsis, shock, sickle cell disease with crisis, air and thrombotic embolism, blood products transfusion, hysterectomy, temporary tracheostomy, and ventilation.

<sup>3</sup> Lois Jovanovič et al., “Trends in the Incidence of Diabetes, Its Clinical Sequelae, and Associated Costs in Pregnancy,” *Diabetes/Metabolism Research and Reviews* 31, no. 7 (Oct. 2015): 707–16; Pensée Wu et al., “Preeclampsia and Future Cardiovascular Health: A Systematic Review and Meta-Analysis,” *Circulation: Cardiovascular Quality and Outcomes* 10, no. 2 (Feb. 2017): e003497; Hannah Cookson et al., “Mothers’ Anxiety During Pregnancy Is Associated with Asthma in Their Children,” *Journal of Allergy and Clinical Immunology* 123, no. 4 (Apr. 2009): 847–53.e11; and Kathryn Wouk, Alison M. Stuebe, and Samantha Meltzer-Brody, “Postpartum Mental Health and Breastfeeding Practices: An Analysis Using the 2010–2011 Pregnancy Risk Assessment Monitoring System,” *Maternal and Child Health Journal* 21, no. 3 (Mar. 2017): 636–47.

<sup>4</sup> Centers for Disease Control and Prevention, “*Severe Maternal Morbidity in the United States*,” last updated Feb. 2, 2021; William M. Callaghan, Andreea A. Creanga, and Elena V. Kuklina, “Severe Maternal Morbidity Among Delivery and Postpartum Hospitalizations in the United States,” *Obstetrics and Gynecology* 120, no. 5 (Nov. 2012): 1029–36; William M. Callaghan, Andrea P. Mackay, and Cynthia J. Berg, “Identification of Severe Maternal Morbidity During Delivery Hospitalizations, United States, 1991–2003,” *American Journal of Obstetrics and Gynecology* 199, no. 2 (Feb. 18, 2008): 133.e1–133.e8; and Premier, *Bundle of Joy: Maternal & Infant Health Trends Series — Report 2: The Added Cost of Complications During and After Delivery* (Premier, n.d.), accessed Oct. 14, 2021.

<sup>5</sup> Donna L. Hoyert, “Maternal Mortality Rates in the United States, 2019,” *NCHS Health E-Stats*, Centers for Disease Control and Prevention, Apr. 1, 2021.

<sup>6</sup> Maria J. Small et al., “Near-Miss Maternal Mortality: Cardiac Dysfunction as the Principal Cause of Obstetric Intensive Care Unit Admissions,” *Obstetrics and Gynecology* 119, no. 2, pt. 1 (Feb. 2012): 250–55; American College of Obstetricians and Gynecologists and the Society for Maternal–Fetal Medicine, Sarah K. Kilpatrick, and Jeffrey L. Ecker, “Severe Maternal Morbidity: Screening and Review,” *American Journal of Obstetrics and Gynecology* 215, no. 3 (Sept. 2016): B17–B22; and Eugene Declercq and Laurie Zephyrin, *Severe Maternal Morbidity in the United States: A Primer* (Commonwealth Fund, Oct. 2021).

<sup>7</sup> Patrick S. Moran et al., “Economic Burden of Maternal Morbidity — A Systematic Review of Cost-of-Illness Studies,” *PLoS One* 15, no. 1 (Jan. 16, 2020): e0227377

<sup>8</sup> The 31 maternal morbidity conditions found in the literature include: adult respiratory distress syndrome, air embolism/thrombotic embolism/pulmonary embolism, amniotic fluid embolism/complications, aneurysm, asthma, blood clotting disorders, blood transfusion, cardiovascular conditions, diabetes, disseminated intravascular coagulation, dyspareunia, hemorrhage, hyperemesis gravidarum, hypertensive disorders, hysterectomy, obesity/gestational weight gain, obstetric anal sphincter injury, pelvis floor disorder, perinatal mood anxiety disorder/stress, pre-eclampsia/eclampsia, puerperal cerebrovascular disorders, renal disease, sepsis, severe anesthesia complications, severe maternal morbidity, shock, sickle cell disease with crisis, temporary tracheostomy, thyroid disorders, urinary incontinence, and ventilation.

<sup>9</sup> American Diabetes Association, “Economic Costs of Diabetes in the U.S. in 2017,” *Diabetes Care* 41, no. 5 (May 2018): 917–28.

<sup>10</sup> Jiajia Chen et al., “Assessment of Incidence and Factors Associated with Severe Maternal Morbidity After Delivery Discharge Among Women in the U.S.,” *JAMA Network Open* 4, no. 2 (Feb. 2, 2021): e2036148.

<sup>11</sup> Louise B. Murphy et al., “Medical Expenditures and Earnings Losses Among U.S. Adults with Arthritis in 2013,” *Arthritis Care & Research* 70, no. 6 (June 2018): 869–76.

<sup>12</sup> These six conditions include amniotic fluid embolism, cardiac arrest, hypertensive disorders, renal disease, sepsis, and venous thromboembolism. This model defines hypertensive disorders and renal disease more broadly than the CDC severe maternal morbidity indicators of eclampsia and acute renal failure.

<sup>13</sup> Timothy Wen et al., “Fragmentation of Postpartum Readmissions in the United States,” *American Journal of Obstetrics and Gynecology* 223, no. 2 (Jan. 18, 2020): 252.e1–252.e14; Aleha Aziz et al., “Maternal Outcomes by Race During Postpartum Readmissions,” *American Journal of Obstetrics and Gynecology* 220, no. 5 (May 2019): 484.e1–484.e10; Timothy Wen et al., “816: Economic Impact of Postpartum Readmissions Complicated by Severe Maternal Morbidity,” *American Journal of Obstetrics and Gynecology* 218, no. 1 (Jan. 1, 2018): S486–S487; and Elizabeth M. Harvey et al., “Severe Maternal Morbidity at Delivery and Risk of Hospital Encounters Within 6 Weeks and 1 Year Postpartum,” *Journal of Women’s Health* 27, no. 2 (Feb. 1, 2018): 140–47.

<sup>14</sup> Elizabeth A. Howell, “Reducing Disparities in Severe Maternal Morbidity and Mortality,” *Clinical Obstetrics and Gynecology* 61, no. 2 (June 2018): 387–99; Roy Ahn et al., “Initiatives to Reduce Maternal Mortality and Severe Maternal Morbidity in the United States: A Narrative Review,” *Annals of Internal Medicine* 173, no. 11 (Suppl., Dec. 1, 2020): S3–S10; Laurie Zephyrin et al., *Community-Based Models to Improve Maternal Health Outcomes and Promote Health Equity* (Commonwealth Fund, Mar. 2021), note 36; and Laurie Zephyrin et al., *Transforming Primary Health Care for Women — Part 1: A Framework for Addressing Gaps and Barriers* (Commonwealth Fund, July 2020).

<sup>15</sup> National Quality Forum, *Maternal Morbidity and Mortality Measurement Recommendations Final Report* (NQF, Aug. 2021).

<sup>16</sup> Zephyrin et al., *Community-Based Models*, 2021.

<sup>17</sup> Cheri Pies et al. and the Best Babies Zone Initiative Team, “Growing a Best Babies Zone: Lessons Learned from the Pilot Phase of a Multi-Sector, Place-Based Initiative to Reduce Infant Mortality,” *Maternal and Child Health Journal* 20, no. 5 (May 2016): 968–73. In addition, the St. David’s Foundation supported the establishment of a Perinatal Safe Zone in central Texas. More about the initiative can be found at [stdavidsfoundation.org](http://stdavidsfoundation.org).