Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Impact of doulas on healthy birth outcomes	Gruber, K. J., Cupito, S. H., & Dobson, C. F.	2013	The Journal of Perinatal Education	226	Mothers in childbirth education program in Greensboro who attended at least three childbirth classes: participants were mostly low income and living in neighborhoods characterized by poverty, high rates of unemployment, crime, substance abuse, interpersonal violence, and lack of educational attainment.	Data were collected as a routine part of program services	• Receipt of prebirth assistance from a certified doula (via the Healthy Beginnings Doula Program)	• Birth complications involving the mother • Birth outcomes	• Mothers without doula support were four times more likely to have an LBW baby than mothers who were assisted by a doula • Rates of complications relating to either the mother or baby for doula versus non-doula-assisted mothers were not statistically significant • Breast-feeding initiation rates were higher among women with doulas vs. those without doulas	Not an experimental or quasi-experimental design; studied only one program and location, so results may be difficult to generalize; participants self-selected into program	
Medicaid Coverage of Doula Services in Minnesota: Preliminary findings from the first year [Interim Report to the Minnesota Department of Human Services]	Kozhimannil, K. B., Vogelsang, C. A., & Hardeman, R. R.	2015	Minnesota Department of Human Services/ University of Minnesota	Not reported	4 different samples included for the 4 components of the interim report: (1) pregnant women, (2) doulas, (3) doula program administrators, and (4) managed care organizations	Interviews with 12 doulas from doula training, 8 doulas from overall experience, 4 doula program administrators, and several pregnant women from focus groups (number not specified)	• Implementation of Medicaid coverage of Doula services in Minnesota	• Knowledge of Doula care • Access to services • Barrier to access •Provider experiences under the new legislation • Comments and feedback from managed care organizations (MCOs) • Among other policy outcomes	• Challenges and barriers related to the following: low reimbursement rates; difficulty doulas face in becoming enrolled providers with managed care organizations; lack of awareness of doula coverage; high cost of doula training, certification, and registration; limited representativeness of communities of color; insufficient coverage of topics that are crucial to doula care for Medicaid beneficiaries in doula certification courses	Limited data on program outcomes; not an experimental or quasi-experimental design; evaluation is only preliminary	Limited data on outcomes related to maternal mortality and morbidity
Doula care, birth outcomes, and costs among Medicaid beneficiaries	Kozhimannil, K. B., Hardeman, R. R., Attanasio, L. B., Blauer-Peterson, C., & O'Brien, M.	2013	American Journal of Public Health	280,087	1,079 births supported by doula care in Minneapolis, Minnesota in 2010 to 2012; compared to 279,008 Medicaid-funded births nationally (from the 2009 Nationwide inpatient sample)	2009 Nationwide Inpatient Sample (NIS), Healthcare Cost and Utilization Project (HCUP) Agency for Healthcare Research and Quality - HCUP NIUS and HCUPNet; Data on doula-supported births came from de-identified reports of routinely collected client services utilization information for women served by Everyday Miracles doulas.	• Implementation of doula supports for Medicaid recipients	• Birth outcomes • Rates of caesarean delivery	• Doula-supported, Medicaid-funded births had a cesarean rate significantly lower than the cesarean rate in the general Medicaid population • After controlling for clinical and sociodemographic factors, odds of caesarian delivery were lower for doula-supported births • Modelling suggests cost-savings for doula reimbursement might depend on the number of Medicaid funded births, the cesarean delivery rate, and reimbursement rates for childbirth services	Data sources were not in the same period, difficult to generalize across the country, potential selection bias	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Doula services within a Healthy Start program: Increasing access for an underserved population	Thomas, M.-P., Ammann, G., Brazier, E., Noyes, P., & Maybank, A.	2017	Maternal and Child Health Journal	35,401	489 infants born to women enrolled in the By My Side Birth Support program from 2010 to 2015, compared to 34,912 infants born in the program area between 2010-2014	Birth record data from the New York City Department of Health's Department of Vital Statistics	• Implementation of By My Side Birth Support Program	• Birth outcomes • Rates of cesarean delivery	• Participants had lower rates of preterm birth and low birth weight compared to the project area • Rates of c-sections did not differ significantly • Participants reported that they valued doula support and gave them a voice in consequential birth decisions	Not an experimental or quasi-experimental design; studied only one program and location, so results may be difficult to generalize; participants self-selected into program	
Potential benefits of increased access to doula support during childbirth	Kozhimannil, K. B., Attanasio, L. B., Jou, J., Joarnt, L. K., Johnson, P. J., & Gjerdingen, D. K.	2014	The American Journal of Managed Care	2,400	Nationally representative sample of women ages 18-45 who delivered a singleton baby in a U.S. hospital in 2011-2012	Listening to Mothers III survey data (self-reported information)	• Use of doula support	• Caesarian delivery rates • Desire for doula support	• Women with doula support have lower odds of non-indicated c-sections than those who did not have a doula (and the latter group included those who desired a doula but didn't get one) • Support from a doula may facilitate decreases in non-indicated cesarean rates • There appears to be large unmet demand for doula care among • American women, some of whom might benefit from benefits associated with continuous labor-support. Having doula support did not vary significantly by race/ethnicity, but desire for doula support was highest among non-white women	Not experimental or quasi experimental design (retrospective analysis); much of the data was self-reported, and there's risk of social desirability bias; data does not include diagnostic or clinical data	
Modeling the cost-effectiveness of doula care associated with reductions in preterm birth and cesarean delivery	Kozhimannil, K., Hardeman, K., Alarid-Escudero, F., Vogelsang, C., Blauer-Peterson, C., & Howell, E	2016	Birth: Issues in Perinatal Care	67,082	Two samples: 1) all Medicaid-funded, singleton births at hospitals in the West North Central and East North Central US in the 2012 Nationwide Impatient sample (65,147) 2) all Medicaid-funded singleton births supported by a community-based doula organization in the Upper Midwest from 2010-2014 (1,935)	Routinely collected, de-identified administrative data	• Implementation of community-based doula program	• Maternal/infant outcomes • Cost-effectiveness outcomes	• Women who received doula support had lower preterm and cesarean birth rates than Medicaid beneficiaries regionally • Cost-effectiveness analysis indicated potential cost-savings associated with doula support	Not experimental design; not randomized, so risk of selection bias and unmeasured confounding; merges two samples; lack of data on whether Medicaid beneficiaries in NIS data may have received doula care	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Randomized controlled trial of doula-home-visiting services: Impact on maternal and infant health	Hans, S.L., Edwards, R.C. & Zhang, Y.	2018	Maternal and Child Health Journal	312	Mothers from four communities in Illinois, identified by four programs offering doula home visiting services; 156 receiving case management, 156 receiving doula home-visiting	Data collected from structured interviews with program participants, before the program and at 37-weeks of pregnancy, 3-weeks post-partum, and 3-months post-partum.	• Use of doula home-visiting program	• Maternal health • Newborn health • Newborn care outcomes	• Those with the intervention were more likely to attend child-birth preparation classes; less likely to use epidural/pain medication during labor; and more likely to initiate breast-feeding (but breastfeeding impact was not sustained over time) • There were no differences on Caesarean delivery, birthweight, prematurity, or post-partum depression • The intervention was associated with positive infant-care behaviors	Uses self-reported interview data; includes both home visiting and doula services: the independent contribution of the two different providers cannot be determined; sample size is small	Does not directly measure maternal morbidity or mortality
Outcomes of care for 1,892 doula-supported adolescent births in the United States: The DONA International Data Project, 2000 to 2013	Everson, C. L., Cheyney, M., & Bovbjerg, M. L.	2018	The Journal of Perinatal Education	1,892	National sample of doula-supported adolescent births, 2000 to 2013	Data collected through surveys between 2000 and 2013 by the DONA International birth doula project	• Use of doula support during birth	• Health outcomes (preterm birth rates, low birth weight rates) • Rates of intervention (cesarean surgery)	• Rates of cesarean delivery were substantially lower than rates reported nationally for adolescent women of childbearing age • Prematurity rates are markedly lower than national rates for adolescents (additional findings relate to infant health outcomes)	Does not provide in-depth information about maternal mortality and morbidity rates; no comparison group; data was reported voluntarily, and the data project is not a formal research database; comparison group is national statistics (not a matched cohort study)	
An economic model of the benefits of professional doula labor support in Wisconsin births	Chapple, W., Gilliland, A., Li, D., Shier, E., & Wright, E.	2013	Wisconsin Medical Journal	9,042	Wisconsin birth statistics from 2010, low-risk cesarean deliveries from singleton, full-term deliveries	Wisconsin Interactive Statistics on Health database (WISH) for 2010, Cochrane review, US Department of Health and Human Services' Healthcare Cost and Utilization Project (HCUP).	• Delivery costs in Wisconsin, 2010	• Estimated costs and savings (estimated by applying results derived from Cochrane review)	• Based on the study analysis, savings could have been achieved if every low-risk birth were attended in-hospital by a professional Doula • Additionally, a professional doula providing only in-hospital labor support would yield cost savings	Estimated cost-savings by using data from outside sources and applying it to Wisconsin birth cases; study outcomes rely on assumption that every woman may desire doula labor support in WI	

Bold studies indicate strong causal evidence.

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Translating maternal mortality review into quality improvement opportunities in response to pregnancy-related deaths in California	Morton, C.H., VanOtterloo, L.R., Seacrist, M.J., Main, E.K.	2019	Journal of Obstetric, Gynecologic & Neonatal Nursing	907	907 quality improvement opportunities (QIOs) identified from 203 cases of pregnancy-related death	Coded QIO data using 4R Framework collected from CA maternal mortality review database	3 domains of quality improvement: • Readiness • Recognition • Response	• Themes among the leading causes of death	• Identified the need for standardized approaches for maternal complications, having trained clinicians and educating women about postpartum warning signs	Limited information on practices/policies at institutions, retrospective study, not experimental or quasi-experimental	
Comparing two review processes for determination of preventability of maternal mortality in Illinois	Geller, S.E., Koch, A.R., Martin, N.J., Prentice, P., Rosenberg, D.	2015	Maternal and Child Health Journal	76	Maternal Mortality Review Committee (MMRC) records for 76 maternal deaths	Compared MMRC and perinatal centers maternal death review processes 2002-2012	• Implementation of maternal mortality review (state or regional system)	• Identified causes of death	• The statewide MMRC disagreed with the regional center in 85% of cases, most commonly related to cause of death and potential preventability • Over half of cases deemed either not preventable or undetermined by regional perinatal centers were determined to be potentially preventable by statewide MMRC • The state-level maternal mortality review found more potential preventability than hospital-level review and determined that preventability was associated with provider and systems factors • Overall the state MMRC found preventability to be more likely due to provider factors and the regional perinatal centers to patient factors	Small sample sizes; not an experimental or quasi-experimental design; reviewed cases were not randomly selected	
Implementing statewide severe maternal morbidity review: The Illinois experience	Koch, A.R., Roesch, P.T., Garland, C.E., Geller, S.E.	2018	Journal of Public Health Management and Practice	1,100	All 1,110 cases of severe maternal morbidity (SMM) from Jul 1, 2016 - June 30, 2017; reviews conducted on 142	Statewide surveillance data in Illinois	• Implementation of statewide severe morbidity review	• Identified causes of death	• Most cases occurred during delivery hospitalization; more than half were delivered by c-section; hemorrhage was primary cause • Facility-level SMM review is feasible for a statewide implementation	Not experimental or quasi-experimental; generalizability is difficulty to determine	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Reducing maternal mortality and severe maternal morbidity through state-based quality improvement initiatives	Main, E.K.	2018	Clinical Obstetrics and Gynecology	337,630 births; 174 hospitals	126 hospitals in California Maternal Quality Care Collaborative, 48 not in collaborative; total 256,541 births in collaborative hospitals, 81,809 in non-collaborative hospitals	Hospital-level electronic medical record data	• Implementation of 'safety bundle' on hemorrhage • Participation in collaborative	• SMM	• SMM among hemorrhage patients was reduced after implementation of the safety bundle and participation in the collaborative	Not a randomized controlled trial; included comparison group, but it was not randomly selected; difficult to determine how generalizable the results are	
Improving maternal safety at scale with mentor model of collaborative improvement	Main, E.K., Dhurjati, R., Cape, V., Vasher, J., Abreo, A., Chang, S.C. & Gould, J.B.	2018	The Joint Commission Journal on Quality and Patient Safety	126	California Maternal Quality Care Collaborative participating hospitals	Survey data on implementation measures (mentor and hospital surveys)	• Use of external mentor model to implement obstetric safety bundle	• Adoption rates for recommended practices • Respondent-reported experience	• Most mentors strongly/somewhat agreed appropriate model for large-scale implementation • Most participants strongly agreed that the mentor model was better for scaling the initiative	Not an experimental or quasi-experimental study	Does not link to intermediate MMM outcomes
Improving outcomes of preeclampsia in California: From review of maternal death to quality care collaboratives	Morton, C.H. & Peterson, N.	2014	Journal of Obstetric, Gynecologic & Neonatal Nursing	145	145 cases of pregnancy-related deaths from preeclampsia/ eclampsia from 26 hospitals in a statewide learning collaborative between 2002-2004	Maternal death data from surveillance system, retrieved from hospital administrative data	• Implementation of maternal mortality review (state-level) with an enhanced surveillance method	• Rates of pre-eclampsia	• Women who died from preeclampsia in CA from 2002 to 2004 were more likely to be Hispanic, multiparous, and have a normal BMI compared to women who died of other pregnancy-related causes • Nearly all deaths were determined to have a some degree of preventability, with half having a good-to-strong chance • Analysis revealed themes related to need for recognition and response to clinical triggers in clinical status and care coordination	Sample size smaller; not experimental or quasi-experimental; unclear what the impact of the maternal review is on MMM outcomes down the line	
Reduction of severe maternal morbidity from hemorrahage using a state perinatal quality collaborative	Main, E.K., Cape, V., Abreao, A., Vasher, J., Woods, A., Carpenter, A. & Gould, J.B.	2017	American Journal of Obstetrics and Gynecology	147	99 California Maternal Quality Care Collaborative participating hospitals (74 without prior HEM experience, 25 with prior HEM experience), 48 non-collaborative comparison hospitals	Administrative data sets from all hospitals in the study	• Use of external mentor model to implement obstetric safety bundle	• Composite severe maternal morbidity measure for women with hemorrhage and overall delivery population	• Found a reduction in severe maternal morbidity (SMM) among hemorrhage patients over baseline in a before/after comparison • Stronger effect for hospitals with experience in HEM • SMM reduction among all women giving birth, not just hemorrhage patients	Not an experimental or quasi-experimental design; studied hospitals in only one state; no randomization	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Reducing time to treatment for severe maternal hypertension through statewide quality improvement	King, P.L., Keenan-Develin, L., Gordon, C., Goel, S. & Borders, A.	2018	American Journal of Obstetrics and Gynecology	9,818	Cases of severe maternal hypertension (HTN) reported at 102 hospitals in Illinois that participated in the initiative	Data on key process measures for all cases of new onset severe HTN recorded in the data system; electronic medical records	• Implementation of a Severe Maternal Hypertension (HTN) Quality Improvement (QI) initiative	• Time to treat HTN cases • Rates of new HTN cases treated within 60 minutes	• The state QI effort reduced time to treatment of severe HTN, and increased provider-nurse debriefs and patient education and follow-up appointments at discharge • The percentage of new onset severe HTN cases treated within 60 minutes increased • The percentage of hospitals with 75-100% of women treated within 60 minutes increased	Only looks at initiative in one state; not an experimental or quasi-experimental design; publication does not include study info on statistical significance	
Improving obstetric hemorrhage morbidity by a checklist-based management protocol; a quality improvement initiative	Smith, R.B., Erickson, L.P., Mercer, L.T., Hermann, C.E. & Foley, M.R.	2019	European Journal of Obstetrics & Gynecology and Reproductive Biology	297	Obstetric patients at Banner University Medical Center Phoenix with an obstetric hemorrhage who were 22 weeks or greater gestational age and no previous diagnosis of or suspicion for invasive placentation (placenta accreta, increta, or percreta). 147 patients in the pre-protocol group, 150 in the post-protocol group.	Electronic medical records with patients' measures of post-partum hemorrhage, collected at segmented re-evaluation time intervals	• Use of an obstetric hemorrhage checklist-based protocol	• Maternal Morbidity Outcomes	• All measures for maternal morbidity decreased after the implementation of the PPH checklist and severe PPH rates improved significantly in the study period • However, only the outcome of severe postpartum hemorrhage reached statistical significance	Small sample size; only looked at one hospital; not experimental or quasi-experimental design	
Comprehensive maternal hemorrhage protocols reduce the use of blood products and improve patient safety	Shields, L. E., Wiesner, S., Fulton, J., & Pelletreau, B.	2015	American Journal of Obstetrics and Gynecology	32,059	Deliveries at 29 Dignity Health System hospitals with maternity units 2-months before implementation, 5-7 months after implementation, and 10-12 months after implementation of the protocol	Data from an approved ongoing clinical patient safety monitoring program and as part the hospital system's continuous quality improvement programs, collected in three time periods	• Implementation of the hemorrhage protocol	• Maternal hemorrhage outcomes • Use of blood products • Hospital compliance with protocols	• The application of a standardized method to address maternal hemorrhage significantly reduced maternal morbidity, based on the need for maternal transfusion and peripartum hysterectomy • Relative to baseline, there was a significant reduction in blood product use per 1000 births and a nonsignificant reduction in the number of patients who required puerperal hysterectomy	Not experimental design; not randomized; doesn't include information on disparities	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Maternal mortality in the United States: predictability and the impact of protocols on fatal postcesarean pulmonary embolism and hypertension-related intracranial hemorrhage	Clark, S.L., Christmas, J.T., Frye, D.R., Meyers, J.A., & Perlin, J.B.	2014	American Journal of Obstetrics and Gynecology	2,717,290	Deliveries within the Hospital Corporation of America, which encompasses 110 maternal/newborn facilities in 21 states and accounts for 5-6% of all births in the U.S.	Maternal death data from hospital system	• Implementation of hospital protocols to reduce maternal morbidity and mortality	• Maternal health outcomes • Rates of maternal morbidity and mortality	• A policy of universal use of pneumatic compression devices for all women who underwent cesarean delivery resulted in a decrease in postoperative pulmonary embolism deaths • A policy that involved automatic and rapid antihypertensive therapy for defined blood pressure thresholds eliminated deaths from in-hospital intracranial hemorrhage and reduced overall deaths from preeclampsia	Not an experimental or quasi-experimental study	
Does a care bundle reduce racial disparities in postcesarean surgical site infections?	Kawakita, T., & Umans, J. G.	2019	American Journal of Perinatology	2,696	All women at >=23 weeks' gestation who underwent cesarean delivery at MedStar Washington Hospital Center between January 2015 and June 2018 (1,384 pre-implementation and 1,312 post-implementation)	Electronic medical record data; relevant outpatient, inpatient, and anesthesia data collected from chart review	• Implementation of care bundle	• Rates of surgical site infections (SSI) following cesarean delivery	• Implementation of the care bundle was associated with decreased odds of post-cesarean SSI in both black and nonblack women • There was no interaction in race, suggesting that the bundle benefited Black and non-Black women similarly but did not reduce racial disparities in surgical site infection • Non-Black women were more likely to receive suture skin closure and azithromycin compared with Black women even after implementation of the care bundle	Not experimental or quasi-experimental	
Successful reduction of massive postpartum haemorrhage by use of guidelines and staff education.	Rizvi, F., Mackey, R., Barrett, T., McKenna, P., & Geary, M.	2004	International Journal of Obstetrics & Gynecology	6,476	Deliveries at Irish hospital in two time periods (1/1/1999-6/30/1999 and 1/1/2002-6/30/2002)	Case identification from delivery suite logbook and data extraction from review of patient charts	• Implementation of new guidelines • Staff education	Maternal morbidity outcomes: • Estimated blood loss from hemorrhage • Rates of blood transfusion • Rates of admission to High Dependency Unit • Peripartum hysterectomy rates	• Found a significant reduction in the incidence of massive postpartum hemorrhage and significant reduction in maternal morbidity	Not experimental or quasi-experimental	

Bold studies indicate strong causal evidence.

Evidence reviewed as of 03/31/2020

The University of Texas at Austin | LBJ School of Public Affairs | Child Family Research Partnership
pn3policy.org

Strategies to Reduce Maternal Mortality and Morbidity

Title	Author(s)	Year	Publication Source	Sample Size (N)	Sample Composition	Data Source	Independent Variable(s)	Dependent Variable(s)	Summary of Findings	Limitations to Causal Inference	Exclusion Criteria
Institution of a comprehensive postpartum hemorrhage bundle at a large academic center does not immediately reduce maternal morbidity	Hamm, R.F., Wang, E., O'Rourke, K., Romanos, A., & Srinivas, S.K.	2019	American Journal of Perinatology	1,175	Deliveries at the Hospital of the University of Pennsylvania 10/15/13-12/15/13 and 10/20/15-12/20/15; 592 pre-intervention and 583 post-intervention deliveries	Electronic medical record pre- and post-intervention delivery data from all deliveries in the study time frames	• Implementation of postpartum hemorrhage (PPH) bundle, including a "hemorrhage cart"	• Rates of PPH by estimated blood loss • Hemoglobin drop • Transfusion rate	• Data from the study show that improvements following the institution from a postpartum hemorrhage (PPH) bundle within 6 months of implementation did not occur • Changes in the rates of PPH by estimated blood loss and hemoglobin drop were not statistically significant • No significant change in the transfusion rate • Only use of uterotonics was significantly reduced	Only looks at initiative in one hospital; not an experimental or quasi-experimental design; assessed morbidities at only one data point	
Implementation and impact of a maternal-fetal medicine telemedicine program	Leighton, C., Conroy, M., Bilderback, A., Kalocay, W., Henderson, J. K., & Simhan, H. N.	2019	American Journal of Perinatology	6,757	Women who delivered in the Magee-Women's Hospital of University of Pittsburgh Medical Center (UPMC) system and their babies from Jan 1, 2012 to Dec 31, 2015; 6,302 in-person consults, 455 telemedicine consults	Outpatient electronic medical record data and inpatient claims data; survey-based patient satisfaction data	• Use of maternal fetal medicine (MFM) telemedicine program	• Maternal health outcomes • Child health outcomes	• Found no negative impacts in the use of a telemedicine maternal fetal medicine (MFM) consultation as compared with an in-person visit • Patients receiving telemedicine experienced cost savings, time savings (from driving), and increased likelihood to have a loved one present at the delivery • The UPMC MFM telemedicine program appeared to be an appropriate substitute for face-to-face MFM visits in underserved areas	Not experimental or quasi-experimental; looks at only one hospital system/area; cost-savings estimates are build on assumptions not actual costs	No direct analysis of maternal mortality and morbidity outcomes
State scope of practice laws, nurse-midwifery workforce, and childbirth procedures and outcomes	Yang, Y. T., Attanasio, L. B., & Kozhimannil, K. B.	2016	Women's Health Issues	12,010,330	Births occurring from 2009 to 2011 in natality detail file data with no missing values	2009-2011 Natality Detail File data	• State scope of practice laws related to autonomy of midwifery practice	• Maternal health outcomes • Child health outcomes	• Women in states with autonomous practice had lower odds of cesarean delivery, preterm birth, and low birth weight compared with women in states without such practice • Correlation between autonomous practice laws (and larger nurse-midwifery workforce) and better birth outcomes	Not experimental or quasi-experimental	No direct analysis of maternal mortality and morbidity outcomes

Bold studies indicate strong causal evidence.