

Legislative Brief: Investigating Maternal Mortality in Texas

September 2017

Introduction

Over the last year, policymakers, researchers, and the public have focused considerable attention to the number of Texas maternal deaths and severe health outcomes resulting from pregnancy and delivery. This attention has led to the passage of new legislation and research findings to help address the issues driving maternal mortality and morbidity.

The 85th Texas Legislature instituted several new legislative charges that will build upon past and current efforts to curb maternal mortality and severe morbidity. The Department of State Health Services (DSHS), Maternal Mortality Task Force (Task Force), and Health and Human Services Commission (HHSC) are poised to collaboratively implement the new duties established through those pieces of legislation.¹

Because accurate and actionable data is integral for the success of efforts to curb maternal deaths, DSHS has worked in recent months to complement Task Force and legislative efforts through continued analysis of available maternal mortality data. This has included, but is not limited to, an analysis that breaks down causes of maternal death along a pregnancy and postpartum timeline.² The timeline analysis will also support the work of DSHS and other agencies to identify opportunities within existing programs to prevent maternal deaths and severe morbidity outcomes.

This paper details the results of the timeline analysis. Further, it discusses opportunities for prevention efforts going forward. The data analysis and prevention efforts discussed below are integral to implementing Task Force recommendations and new legislation to improve maternal health outcomes.

Timeline Analysis

One constraint for maternal death prevention efforts has been the amount of data available for analysis. As an example, the Task Force's 2016 biennial report was limited to analyzing vital records trends in confirmed maternal deaths that occurred in 2011 and 2012, along with a limited number of detailed individual clinical record reviews for selected 2012 deaths. While the report established important findings for policymakers, analysis of more comprehensive and detailed data will allow the Task Force to further hone its recommendations for maternal death prevention.

¹ Senate Bill 1599, House Bill 2466, DSHS Rider 36, HHSC Rider 164, HHSC Rider 212, and SB 17 passed during the 85th regular and 1st called legislative sessions.

² For information on other maternal mortality and morbidity efforts, visit <https://www.dshs.texas.gov/mch/>

To that end in this report, DSHS has undertaken a timeline analysis of maternal deaths possible only by combining multiple years of data. DSHS drilled down into data for a four-year period, 2012 through 2015, which supplied sufficient numbers of cases to come up with meaningful interpretations.

The timeline analysis used death and birth data in order to distinguish those maternal deaths that were directly related to pregnancy from those that were not. Deaths were categorized by timing and cause of death.

Timing and Cause of Death

To distinguish those maternal deaths directly related to pregnancy from those not directly related, DSHS examined the timing and cause of all 382 confirmed maternal deaths that took place between 2012 and 2015. Death during pregnancy or 0-7 days postpartum was used as a proxy for inpatient hospital stay.

Table 1 shows the number of confirmed maternal deaths for 2012 to 2015 according to the timing and cause of death. Key points derived from this table include:

- **Almost 80% of maternal deaths occurred after 7 days postpartum.**
 - Of these, drug overdose was the most frequent cause of death, followed by cardiac event, homicide, and suicide.
- **21% occurred during pregnancy or within 7 days postpartum.**
 - Of these, the most common causes of maternal death included hemorrhage, cardiac event, and amniotic embolism.
 - Of note, cardiac events were also quite frequent after the 0-7 day window.

Table 1: Confirmed Maternal Deaths by Timing and Cause of Death, Texas, Over a Four-Year Period, 2012-2015³

<i>Cause of Death</i>	<i>While Pregnant</i>	<i>0-7 Days Post-partum</i>	<i>8-42 Days Post-partum</i>	<i>43-60 Days Post-partum</i>	<i>61+ Days Post-partum</i>	<i>Total</i>
<i>Amniotic Embolism</i>	1	9	0	0	0	10
<i>Cardiac Event</i>	2	12	9	5	27	55
<i>Cerebrovascular Event</i>	0	8	9	1	9	27
<i>Drug Overdose</i>	0	3	7	5	50	65
<i>Hemorrhage</i>	3	12	2	0	3	20
<i>Homicide</i>	2	1	5	2	32	42
<i>Hypertension/Eclampsia</i>	0	7	4	0	7	18
<i>Infection/Sepsis</i>	1	3	14	3	11	32
<i>Pulmonary Embolism</i>	2	3	4	2	2	13
<i>Substance Use Sequelae (e.g., liver cirrhosis)</i>	0	0	2	0	3	5
<i>Suicide</i>	0	1	2	2	28	33
<i>Other</i>	5	5	6	3	43	62
<i>Total</i>	16	64	64	23	215	382

Pregnancy-Related and Pregnancy-Associated Deaths

To make better sense of these data, DSHS categorized each confirmed maternal death as either pregnancy-related or pregnancy-associated. This distinction can only formally be made after detailed case review by the Task Force, and so as used in this report those categorizations only reflects DSHS’s approximation.

For the analysis in this report, a maternal death was categorized as *pregnancy-related* (directly due to the pregnancy) when it occurred during pregnancy or soon after delivery, or when the cause of death was related to pregnancy complications. All other maternal deaths were categorized as *pregnancy-associated* (not solely due to the pregnancy). Deaths categorized as

³ Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to cancer or motor vehicle crashes were excluded from these analyses. Timing of death was determined using a combination of pregnancy status on the death record and days elapsed between delivery and death. If a woman was identified as pregnant at time of death and 0 days elapsed between delivery and death, then this was counted as death while pregnant. All other deaths were identified as postpartum maternal deaths, and were further categorized based on the number of days that elapsed between delivery and death. Note that 1 death due to fatal, ruptured, ectopic pregnancy had 295 days elapsed between delivery and death because of a previous delivery, but this death was counted as death while pregnant. Cause of death was taken directly from the death record.

pregnancy-associated still occurred within 365 days following the end of pregnancy, and could have been affected by pregnancy. Yet, these deaths were from causes not solely related to pregnancy, such as drug overdose, homicide, or suicide.⁴

Table 2 shows the categorization of pregnancy-related vs. pregnancy-associated maternal deaths for 2012-2015, based on the timing and cause of death.

- **Of the 382 total confirmed maternal deaths, DSHS categorized 48% (182) as pregnancy-related.**
 - For nearly 70% of pregnancy-related deaths, prevention efforts before 60 days postpartum may be crucial.
- **Of the 382 deaths, DSHS categorized 52% (200) as pregnancy-associated.**
 - In contrast, prevention activities after 60 days postpartum may be critical for addressing nearly 80% of pregnancy-associated deaths.
 - The number of drug overdoses and suicides show the need for behavioral health services during and after pregnancy.

⁴ Analyses suggest that deaths from drug overdose, homicide, and suicide do not disproportionately affect women of childbearing age; rather, they impact the entire Texas population.

Table 2: Categorization of Pregnancy-Related vs. Pregnancy-Associated Death by Timing and Cause of Death, Texas, Over a Four-Year Period, 2012-2015⁵

Category and Cause of Death	While Pregnant	0-7 Days Post-partum	8-42 Days Post-partum	43-60 Days Post-partum	61+ Days Post-partum	Total
PREGNANCY-RELATED DEATH	11	58	42	12	59	182
<i>Amniotic Embolism</i>	1	9	0	0	0	10
<i>Cardiac Event</i>	2	12	9	5	27	55
<i>Cerebrovascular Event</i>	0	8	9	1	9	27
<i>Hemorrhage</i>	3	12	2	0	3	20
<i>Hypertension/Eclampsia</i>	0	7	4	0	7	18
<i>Infection/Sepsis</i>	1	3	14	3	11	32
<i>Pulmonary Embolism</i>	2	3	4	2	2	13
<i>Other Obstetric Causes</i>	2	4	0	1	0	7
PREGNANCY-ASSOCIATED DEATH	5	6	22	11	156	200
<i>Drug Overdose</i>	0	3	7	5	50	65
<i>Homicide</i>	2	1	5	2	32	42
<i>Substance Use Sequelae (e.g. liver cirrhosis)</i>	0	0	2	0	3	5
<i>Suicide</i>	0	1	2	2	28	33
<i>Other Non-Obstetric Causes</i>	3	5	6	3	43	59
Total of Both Categories	16	64	64	23	215	382

⁵ A woman's death was categorized as **pregnancy-related** when it occurred during pregnancy or within 7 days postpartum. (This timeframe was used as a proxy for inpatient hospital stay.) A woman's death was categorized as **pregnancy-associated** when it occurred after 7 days postpartum, from a cause not solely related to pregnancy. If several women died from a cause of death known to be related to pregnancy both within and after 7 days postpartum, we erred on the side of caution and categorized all deaths from this cause as **pregnancy-related**, which health care systems and providers can impact using evidence-based practices. However, 3 deaths occurring during pregnancy or within 7 days postpartum due to homicide were still categorized as pregnancy-associated, as were 8 deaths due to other non-obstetric causes, because the causes were clearly not related to pregnancy.

Data-Driven Prevention Opportunities

The timeline analysis suggests that there is no single all-purpose solution for improving maternal health and preventing maternal mortality in Texas. Rather, clinical and population-based prevention methods will be needed at different points in time, in multiple locations, both within and outside the hospital setting. These findings, together with required activities outlined in this legislation, will lead to a matrix of solutions to improve maternal health outcomes.

Based on current findings, there are three key prevention opportunities for improving maternal health and decreasing maternal mortality:

- *Maternal Safety Bundles:* There is an opportunity for Texas's perinatal quality collaborative to implement evidence-based maternal safety bundles, including bundles by the Alliance for Innovation in Maternal Health (AIM), to prevent deaths due to hemorrhage or hypertension, typically occurring during a labor and delivery hospital inpatient stay. Obstetric hemorrhage and severe hypertension during pregnancy are among the most preventable causes of maternal death.⁶ As required by SB 17, the maternal safety initiative is geared towards this type of prevention effort.
- *Behavioral Health Services:* There is also an opportunity to focus on the role of behavioral health services in the prevention of maternal death. To this end, HHSC has plans underway to assess and treat postpartum depression up to a year after delivery through referral from the Healthy Texas Women program. Additionally, HHSC has clinical services to prevent and treat opioid use in Texas, with a focus on pregnant women and reducing the incidence of neonatal abstinence syndrome.
- *Chronic Disease:* The opportunity is also ripe for addressing chronic disease risk factors that complicate pregnancy, including obesity, diabetes, hypertension, and smoking during pregnancy. DSHS has begun work to collaborate with HHSC, community partners, and stakeholder organizations to identify feasible and effective solutions. For example, DSHS is partnering with the Texas Medical Association to hold a Maternal Mortality and Morbidity Forum on September 30th, where stakeholders will come together to develop concrete work plans for reducing maternal mortality and morbidity in Texas. This forum includes a public health workgroup.

⁶ Berg CJ, et al. Preventability of pregnancy-related deaths: Results of a state-wide review. *Obstet Gynecol* 2005;106(6):1228-34.

Next Steps for Data Analysis

This timeline analysis has revealed opportunity for further analysis in order to identify more clearly where the greatest opportunity exists for clinical services and public health programs to institute prevention efforts. This work will complement with recently-passed legislation.

- *Health Insurance Status:* DSHS will work to hone in on insurance status at the time of death, in order to better identify prevention options. DSHS and HHSC are finalizing a Data Use Agreement to begin matching health insurance at time of death. For those enrolled in Medicaid at death, DSHS will then look at the rate of maternal death by timing.
- *Geographic Region:* DSHS will perform a timeline analysis and hone in on most common causes of death by region to better inform delivery and focus of clinical services and public health programs in each area of the state.
- *Race and Ethnicity:* As described in the 2016 biennial report, Black women continue to bear the greatest risk for maternal death, particularly for pregnancy-related death. DSHS will perform additional analysis on the 2012-2015 data set to better inform the reason behind disparities evident in maternal death data.

Conclusion

Initial analysis presented thus far has focused on statewide metrics, and further work will be done to pinpoint the roots of maternal death in Texas. DSHS continues to diligently analyze confirmed maternal deaths in Texas. These new data improve our understanding of maternal mortality in Texas. DSHS will work collaboratively with its partners this biennium to use these findings to effectively implement new legislative requirements, and to assist the Task Force with its recommendations for the 2018 Joint Biennial Report.

Appendix

Overall, Pregnancy-Related, and Pregnancy-Associated Maternal Death Rates by Demographic Characteristics, Health Factors, and Birth Outcomes, Texas, Over a Four-Year Period (2012-2015)⁷

Table A1: Overall, Pregnancy-Related, and Pregnancy-Associated Maternal Death Rates by Demographic Characteristics, Texas, Over a Four-Year Period, 2012-2015

Demographic Characteristic	Number of Live Births	MATERNAL DEATH OVERALL		PREGNANCY-RELATED DEATH		PREGNANCY-ASSOCIATED DEATH	
		Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)
RACE/ETHNICITY							
Black	180,714	77	42.6	44	24.3	33	18.3
White	539,177	149	27.6	62	11.5	87	16.1
Hispanic	748,644	144	19.2	66	8.8	78	10.4
Other	103,934	12	11.5	10	9.6	2	1.9
AGE							
<20	218,240	20	9.2	9	4.1	11	5.0
20-24	322,975	77	23.8	24	7.4	53	16.4
25-29	443,547	100	22.5	42	9.5	58	13.1
30-34	376,051	113	30.0	60	16.0	53	14.1
35-39	171,533	50	29.1	35	20.4	15	8.7
40+	40,029	22	55.0	12	30.0	10	25.0
MARITAL STATUS							
Married	911,004	184	20.2	99	10.9	85	9.3
Not married	661,227	196	29.6	82	12.4	114	17.2
Unknown	-	2	-	1	-	1	-
HIGHEST EDUCATION LEVEL							
No High School Diploma	328,710	95	28.9	39	11.9	56	17.0
High School Diploma	417,864	149	35.7	66	15.8	83	19.9
Some College, No Degree	352,068	61	17.3	25	7.1	36	10.2
Associate's Degree	89,385	24	26.9	11	12.3	13	14.5
Bachelor's Degree	264,256	33	12.5	26	9.8	7	2.6
Master's Degree/PhD	118,016	15	12.7	12	10.2	3	2.5
Unknown	-	5	-	3	-	2	-

⁷ All data analyses for this document were conducted by Maternal & Child Health Epidemiology Unit, Department of State Health Services, 2017, using Death Files, and Live Birth and Fetal Death Files from the DSHS Center for Health Statistics.

Table A1 (continued): Overall, Pregnancy-Related, and Pregnancy-Associated Maternal Death Rates by Demographic Characteristics, Texas, Over a Four-Year Period, 2012-2015

Demographic Characteristic	Number of Live Births	MATERNAL DEATH OVERALL		PREGNANCY-RELATED DEATH		PREGNANCY-ASSOCIATED DEATH	
		Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)
HEALTH INSURANCE AT DELIVERY							
Medicaid	728,359	219	30.1	90	12.4	129	17.7
Self-Pay/No Insurance	125,599	31	24.7	23	18.3	8	6.4
Private Insurance	596,330	86	14.4	49	8.2	37	6.2
Unknown	-	46	-	20	-	26	-
GEOGRAPHIC LOCATION							
Region 1 (Texas Panhandle)	49,955	17	34.0	8	16.0	9	18.0
Region 2/3 (includes Dallas-Fort Worth)	437,165	111	25.4	48	11.0	63	14.4
Region 4/5N (East Texas)	76,674	19	24.8	11	14.3	8	10.4
Region 6/5S (includes Houston)	418,686	91	21.7	51	12.2	40	9.6
Region 7 (Central Texas)	177,643	45	25.3	20	11.3	25	14.1
Region 8 (includes San Antonio)	158,531	47	29.6	19	12.0	28	17.7
Region 9/10 (West Texas)	96,633	20	20.7	10	10.3	10	10.3
Region 11 (South Texas)	157,182	28	17.8	12	7.6	16	10.2
Unknown	-	4	-	3	-	1	-

PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, DSHS.

DATA SOURCES: 2012-2015 Death Files, 2011-2015 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.

NOTES: Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to cancer or motor vehicle crashes were excluded from these analyses. Timing of death was determined using a combination of pregnancy status on the death record and days elapsed between delivery and death. If a woman was identified as pregnant at time of death and 0 days elapsed between delivery and death, then this was counted as death while pregnant. All other deaths were identified as postpartum maternal deaths, and were further categorized based on the number of days that elapsed between delivery and death. Note that 1 death due to fatal, ruptured, ectopic pregnancy had 295 days elapsed between delivery and death because of a previous delivery, but this death was counted as death while pregnant. Cause of death was taken directly from the death record.

A woman's death was categorized as **pregnancy-related** when it occurred during pregnancy or within 7 days postpartum. (This timeframe was used as a proxy for inpatient hospital stay.) A woman's death was categorized as **pregnancy-associated** when it occurred after 7 days postpartum, from a cause not solely related to pregnancy. If several women died from a cause of death known to be related to pregnancy both within and after 7 days postpartum, we erred on the side of caution and categorized all deaths from this cause as **pregnancy-related**, which health care systems and providers can impact using evidence-based practices. However, 3 deaths occurring during pregnancy or within 7 days postpartum due to homicide were still categorized as pregnancy-associated, as were 8 deaths due to other non-obstetric causes, because the causes were clearly not related to pregnancy.

Rates were suppressed for unknown/missing values for each variable.

Table A2: Overall, Pregnancy-Related, and Pregnancy-Associated Maternal Death Rates by Health Factor, Texas, Over a Four-Year Period, 2012-2015

Health Factor	Number of Live Births	MATERNAL DEATH OVERALL		PREGNANCY-RELATED DEATH		PREGNANCY-ASSOCIATED DEATH	
		Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)
PRE-PREGNANCY WEIGHT							
Underweight (BMI: less than 18.5)	61,184	12	19.6	2	3.3	10	16.3
Normal weight (BMI: 18.5-24.9)	721,208	159	22.0	68	9.4	91	12.6
Overweight (BMI: 25.0-29.9)	401,025	80	19.9	39	9.7	41	10.2
Obese (BMI: 30.0 or greater)	380,077	111	29.2	58	15.3	53	13.9
Unknown	-	20	-	15	-	5	-
DIABETES							
Yes	82,779	33	39.9	21	25.4	12	14.5
No	1,489,690	349	23.4	161	10.8	188	12.6
HYPERTENSION							
Yes	106,612	60	56.3	35	32.8	25	23.4
No	1,465,857	322	22.0	147	10.0	175	11.9
SMOKING DURING PREGNANCY							
Yes	63,919	55	86.0	17	26.6	38	59.5
No	1,508,550	327	21.7	165	10.9	162	10.7
TRIMESTER PRENATAL CARE BEGAN							
First Trimester	1,001,704	187	18.7	95	9.5	92	9.2
Second Trimester	389,492	111	28.5	50	12.8	61	15.7
Third Trimester	102,971	21	20.4	5	4.9	16	15.5
Unknown	-	63	-	32	-	31	-
LABOR AND DELIVERY PRACTITIONER							
Medical Doctor	1,496,777	364	24.3	175	11.7	189	12.6
Certified Nurse-Midwife/Certified Midwife	48,830	4	8.2	1	2.0	3	6.1
Other	23,055	11	47.7	4	17.3	7	30.4
Unknown	-	3	-	2	-	1	-
MODE OF DELIVERY							
Vaginal	1,022,608	195	19.1	75	7.3	120	11.7
Cesarean	549,528	183	33.3	107	19.5	76	13.8
Unknown	-	4	-	0	-	4	-

PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, DSHS.

DATA SOURCES: 2012-2015 Death Files, 2011-2015 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.

NOTES: Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to cancer or motor vehicle crashes were excluded from these analyses. Timing of death was determined using a combination of pregnancy status on the death record and days elapsed between delivery and death. If a woman was identified as pregnant at time of death and 0 days elapsed between delivery and death, then this was counted as death while pregnant. All other deaths were identified as postpartum maternal deaths, and were further categorized based on the number of days that elapsed between delivery and death. Note that 1 death due to fatal, ruptured, ectopic pregnancy had 295 days elapsed between delivery and death because of a previous delivery, but this death was counted as death while pregnant. Cause of death was taken directly from the death record. A woman's death was categorized as **pregnancy-related** when it occurred during pregnancy or within 7 days postpartum. (This timeframe was used as a proxy for inpatient hospital stay.) A woman's death was categorized as **pregnancy-associated** when it occurred after 7 days postpartum, from a cause not solely related to pregnancy. If several women died from a cause of death known to be related to pregnancy both within and after 7 days postpartum, we erred on the side of caution and categorized all deaths from this cause as **pregnancy-related**, which health care systems and providers can impact using evidence-based practices. However, 3 deaths occurring during pregnancy or within 7 days postpartum due to homicide were still categorized as pregnancy-associated, as were 8 deaths due to other non-obstetric causes, because the causes were clearly not related to pregnancy. Rates were suppressed for unknown/missing values for each variable.

Table A3: Overall, Pregnancy-Related, and Pregnancy-Associated Maternal Death Rates by Birth Outcome, Texas, Over a Four-Year Period, 2012-2015

Birth Outcome	Number of Live Births	MATERNAL DEATH OVERALL		PREGNANCY-RELATED DEATH		PREGNANCY-ASSOCIATED DEATH	
		Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)	Number of Deaths	Rate (per 100,000 live births)
GESTATIONAL AGE							
Pre-Term (less than 37 weeks)	188,469	151	80.1	89	47.2	62	32.9
Early-Term (37-38 weeks)	429,936	76	17.7	29	6.7	47	10.9
Full-Term (39-40 weeks)	739,002	147	19.9	59	8.0	88	11.9
Late-Term (41 weeks)	103,217	7	6.8	4	3.9	3	2.9
Post-Term (42 weeks or greater)	75,197	1	1.3	1	1.3	0	-
BIRTH WEIGHT							
<1,500 grams (very low)	22,401	30	133.9	21	93.7	9	40.2
1,500 - 2,499 grams (low)	107,260	66	61.5	37	34.5	29	27.0
2,500 grams or greater (normal)	1,440,985	280	19.4	121	8.4	159	11.0
Unknown	-	6	-	3	-	3	-

PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, DSHS.

DATA SOURCES: 2012-2015 Death Files, 2011-2015 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.

NOTES: Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to cancer or motor vehicle crashes were excluded from these analyses. Timing of death was determined using a combination of pregnancy status on the death record and days elapsed between delivery and death. If a woman was identified as pregnant at time of death and 0 days elapsed between delivery and death, then this was counted as death while pregnant. All other deaths were identified as postpartum maternal deaths, and were further categorized based on the number of days that elapsed between delivery and death. Note that 1 death due to fatal, ruptured, ectopic pregnancy had 295 days elapsed between delivery and death because of a previous delivery, but this death was counted as death while pregnant. Cause of death was taken directly from the death record.

A woman's death was categorized as **pregnancy-related** when it occurred during pregnancy or within 7 days postpartum. (This timeframe was used as a proxy for inpatient hospital stay.) A woman's death was categorized as **pregnancy-associated** when it occurred after 7 days postpartum, from a cause not solely related to pregnancy. If several women died from a cause of death known to be related to pregnancy both within and after 7 days postpartum, we erred on the side of caution and categorized all deaths from this cause as **pregnancy-related**, which health care systems and providers can impact using evidence-based practices. However, 3 deaths occurring during pregnancy or within 7 days postpartum due to homicide were still categorized as pregnancy-associated, as were 8 deaths due to other non-obstetric causes, because the causes were clearly not related to pregnancy. Rates were suppressed for unknown/missing values for each variable.