

MATERNAL MORBIDITY IN ALLEGHENY COUNTY

2019-2020



Maternal Morbidity In Allegheny County 2019-2020

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SUMMARY

Maternal morbidity (MM) is defined as short- or long-term pregnancy and postpartum complications (NIH, 2021). Maternal Morbidity adversely affects the life of both mother and infant, and can be used as an indicator for the overall health of a community.

This data brief examines maternal morbidity among Allegheny County residents based on both 2019 Pennsylvania state birth records and 2020 hospital discharge data from the Pennsylvania Health Care Cost Containment Council (PHC4). Given that the inpatient hospital records capture the majority of births in the county (98 percent), both sources were used to provide a robust understanding of MM in the county, as local rates of MM are not currently understood. This report examines severe MM, defined as an unintended outcome of the process of labor and delivery that results in significant short- or long-term consequences to a pregnant person’s health (CDC, 2021).

Table 1: 2019 Allegheny County Birth Certificate Maternal Morbidity Data

Maternal Morbidity Category	N (Percent of total births)
Perineal laceration	209 (1.6%)
Admission to intensive care	134 (1.1%)
Maternal transfusion	19 (0.2%)
Unplanned operation	10 (0.1%)
Unplanned hysterectomy	ND*
Ruptured Uterus	0 (0%)
Total births with MM	366 (2.9%)**
Total births	12,747 (100%)

Note: In 2019 there were 0 occurrences of the morbidity ruptured uterus in Allegheny County

*ND = Not Displayed; Observations with fewer than 10 events are not statistically reliable, so they are censored.

**A pregnant person may have more than one morbidity.

Table 2: 2020 Allegheny County PHC4 Maternal Morbidity Data

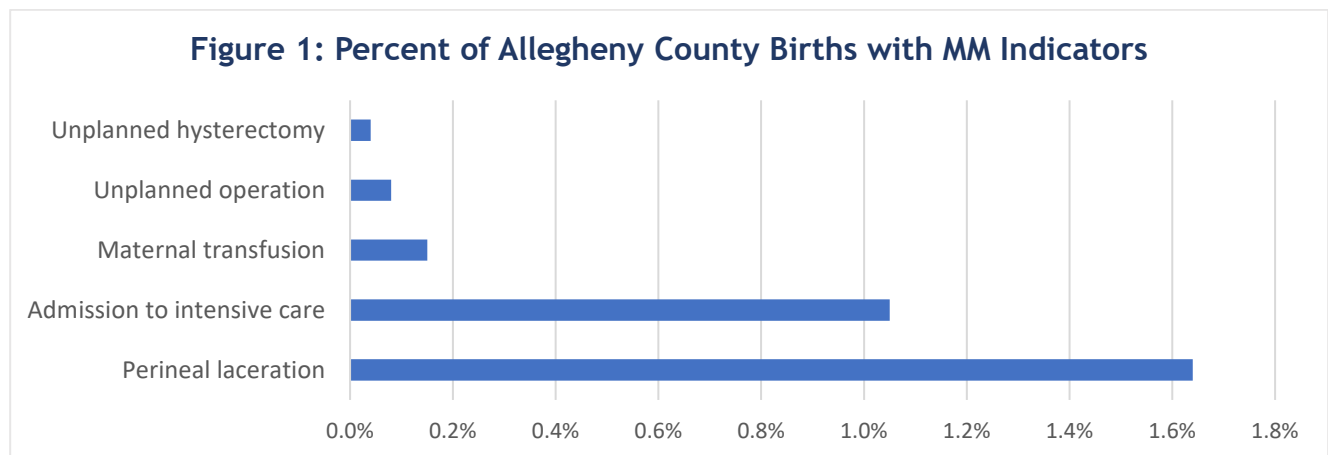
Maternal Morbidity Category	N (Percent of maternal hospitalizations)
Acute renal failure	50 (0.4%)
Sepsis	25 (0.2%)
Disseminated intravascular coagulation	23 (0.2%)
Adult respiratory distress syndrome	16 (0.1%)
Puerperal cerebrovascular disorders	16 (0.1%)
Sickle cell disease with crisis	14 (0.1%)
Air and thrombotic embolism	11 (0.1%)
Shock	11 (0.1%)
Pulmonary edema / Acute heart failure	ND*
Eclampsia	ND
Acute myocardial infarction	ND
Aneurysm	ND
Total observations of MM	155 (1.2%)
Total maternal hospitalizations	12,483 (100%)

Note: There were 0 occurrences of the following MM conditions in 2020: Cardiac arrest / Ventricular fibrillation, Heart failure / arrest during surgery or procedure, Conversion of cardiac rhythm, Severe anesthesia complications, Blood product transfusion, Hysterectomy, Temporary tracheostomy, and Ventilation.

*ND = Not Displayed; Observations with fewer than 10 events are not statistically reliable, so they are censored.

2019 PENNSYLVANIA STATE BIRTH RECORDS

A case of maternal morbidity (MM) from the 2019 birth records was defined as an Allegheny County birth with an MM indicator reported. The six MM indicators used are listed in Fig. 1.



Note: In 2019 there were 0 occurrences of the morbidity ruptured uterus in Allegheny County

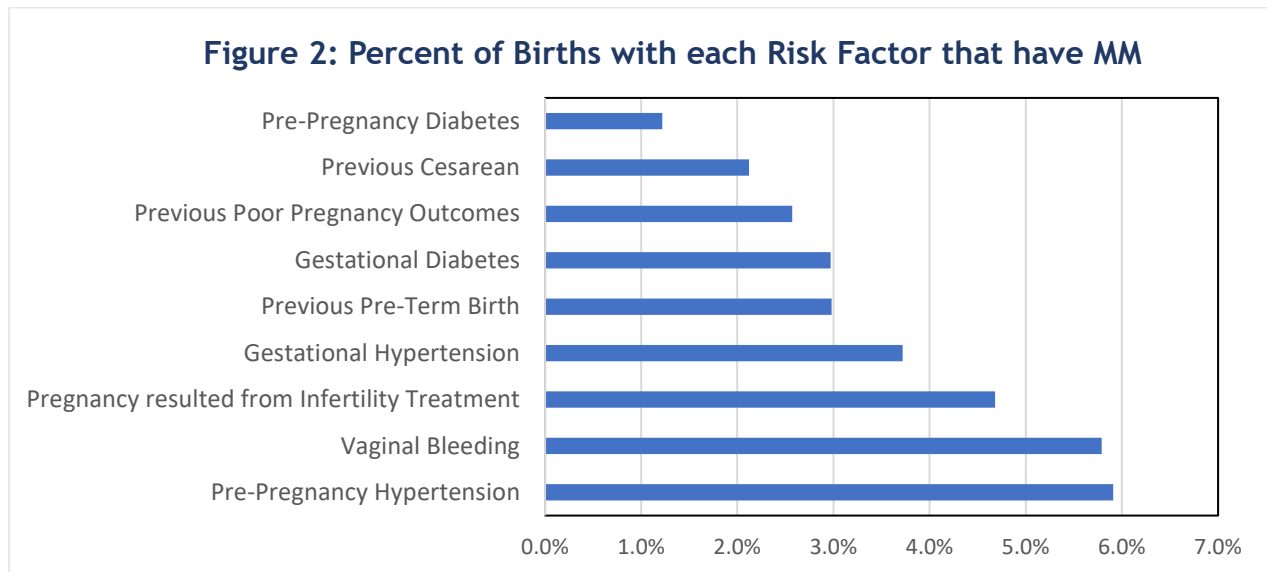
- In 2019, there were a total of 12,747 births in Allegheny County. Of those births, 366 (2.9 percent) had an MM indicator reported
 - 11 pregnant people had multiple morbidities
- The most common MM indicator was perineal laceration (1.6 percent of total births), followed by pregnant person’s admission to intensive care (1.0 percent of total births) (Fig. 1)

DELIVERY METHODS

- Among births delivered vaginally, 3.0 percent had an MM indicator reported
- Among births delivered via cesarean, 2.7 percent had an MM indicator reported

RISK FACTORS DURING PREGNANCY

- 28.4 percent of births with an MM indicator also had at least one of the reported risk factors during their pregnancy
- Among births with an MM indicator (n=366), previous poor pregnancy outcomes (7.9 percent), gestational hypertension (7.4 percent), and previous cesarean (7.4 percent) were the most common risk factors
- Conversely, 5.9 percent of births involving pre-pregnancy hypertension, 5.8 percent of births involving vaginal bleeding, and 4.7 percent of births that resulted from infertility treatment also had an MM indicator (Fig. 2)



DEMOGRAPHICS

PRIMARY PAYER

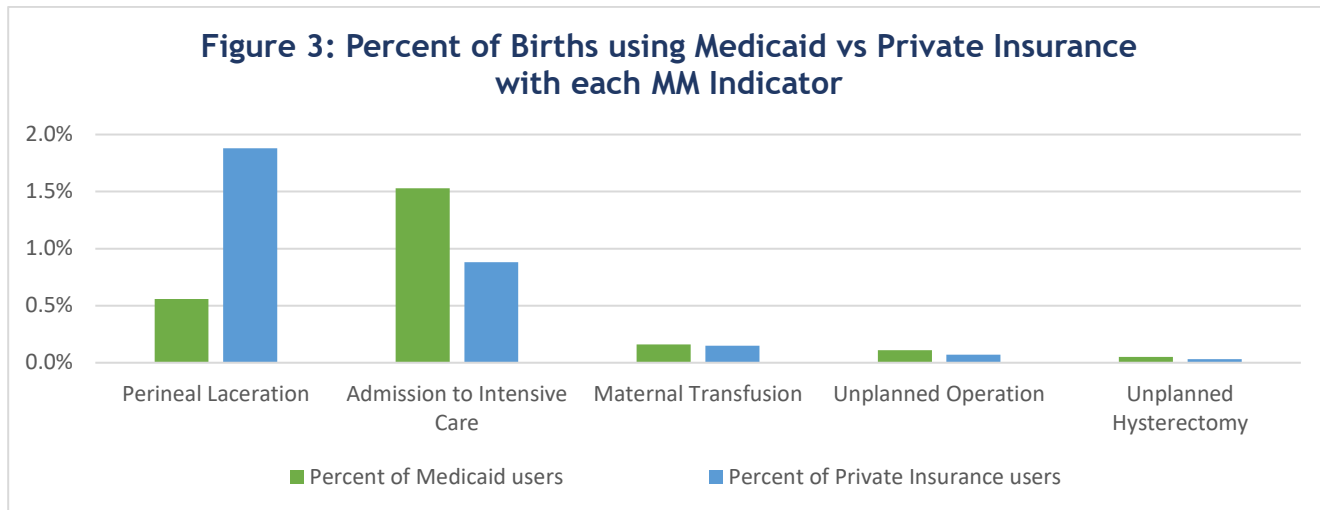
- 2.3 percent of births for which Medicaid was the primary payer and 2.9 percent of births for which private insurance was the primary payer had an MM indicator
- 1.9 percent of private insurance users and 0.6 percent of Medicaid users had perineal laceration ($p < 0.0001$)
- 0.9 percent of private insurance users and 1.5 percent of Medicaid users were admitted to intensive care ($p = 0.02$) (Fig. 3)

Table 3: Maternal Morbidity by Payment Type

Maternal Morbidity Indicator	Medicaid Count (percent of Medicaid users n=3717)	Private Insurance Count (percent of private insurance users n=8649)
Perineal laceration	21 (0.6%)	163 (1.9%)
Admission to intensive care	57 (1.5%)	76 (0.9%)
Maternal transfusion	ND*	13 (0.2%)
Unplanned operation	ND	ND
Unplanned hysterectomy	ND	ND

Note: In 2019 there were 0 occurrences of the morbidity ruptured uterus in Allegheny County

*ND = Not Displayed; Observations with fewer than 10 events are not statistically reliable, so they are censored.



Note: In 2019 there were 0 occurrences of the morbidity ruptured uterus in Allegheny County

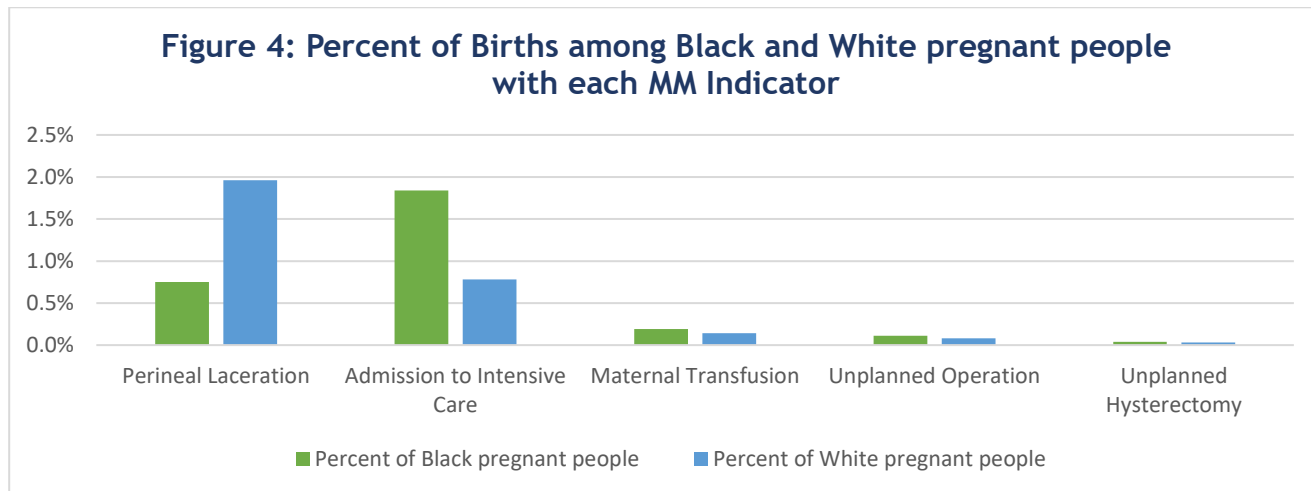
RACE

- 2.9 percent of births among White (n=8683) pregnant people and 2.9 percent of births among Black (n=2668) pregnant people had a maternal morbidity
- 2.0 percent of White pregnant people and 0.8 percent of Black pregnant people had perineal laceration (p<0.0001)
- 1.8 percent of Black pregnant people and 0.8 percent of White pregnant people were admitted to intensive care (p<0.0001) (Fig. 4)
- The rest of the maternal morbidity categories were not significantly different between races

Table 4: Maternal Morbidity by Race

Maternal Morbidity Indicator	White	Black
	Count (Percent of White pregnant people n=8683)	Count (Percent of Black pregnant people n=2668)
Perineal laceration	170 (1.96%)	20 (0.75%)
Admission to intensive care	68 (0.78%)	49 (1.84%)
Maternal transfusion	12 (0.14%)	ND*
Unplanned operation	ND	ND
Unplanned hysterectomy	ND	ND

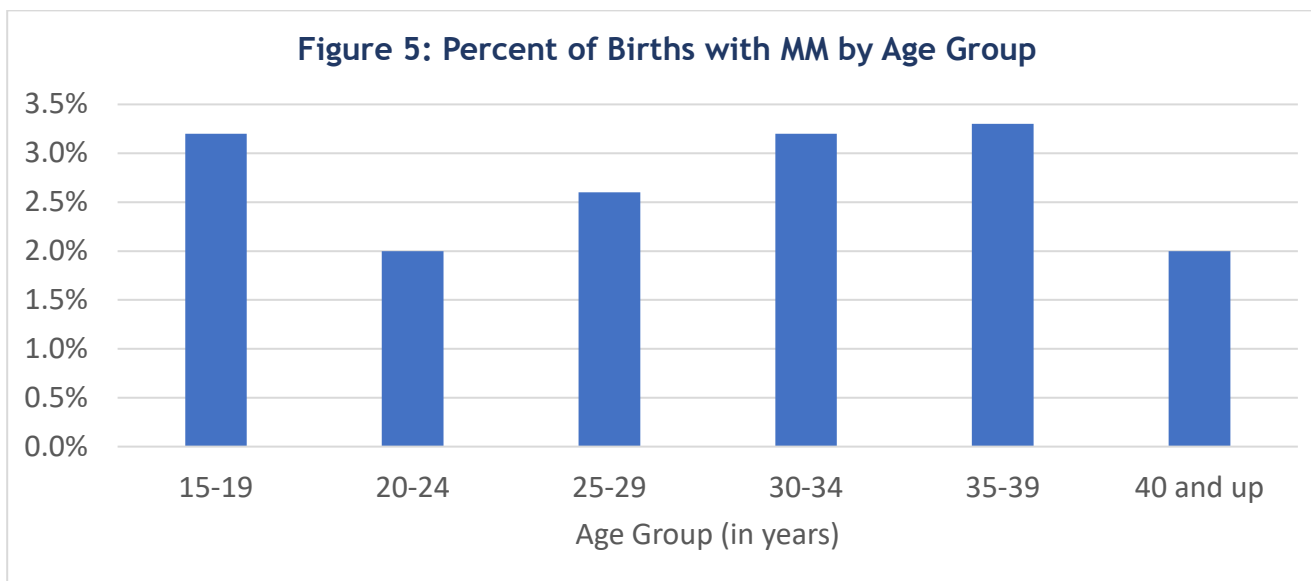
*ND = Not Displayed; Observations with fewer than 10 events are not statistically reliable, so they are censored.



Note: In 2019 there were zero occurrences of the morbidity ruptured uterus in Allegheny County

AGE GROUPS

- 3.3 percent of births among pregnant people in the 35-39 years age group, 3.2 percent of births among pregnant people aged 15-19 years, and 3.2 percent of births among pregnant people aged 30-34 years had an MM (Fig. 5)

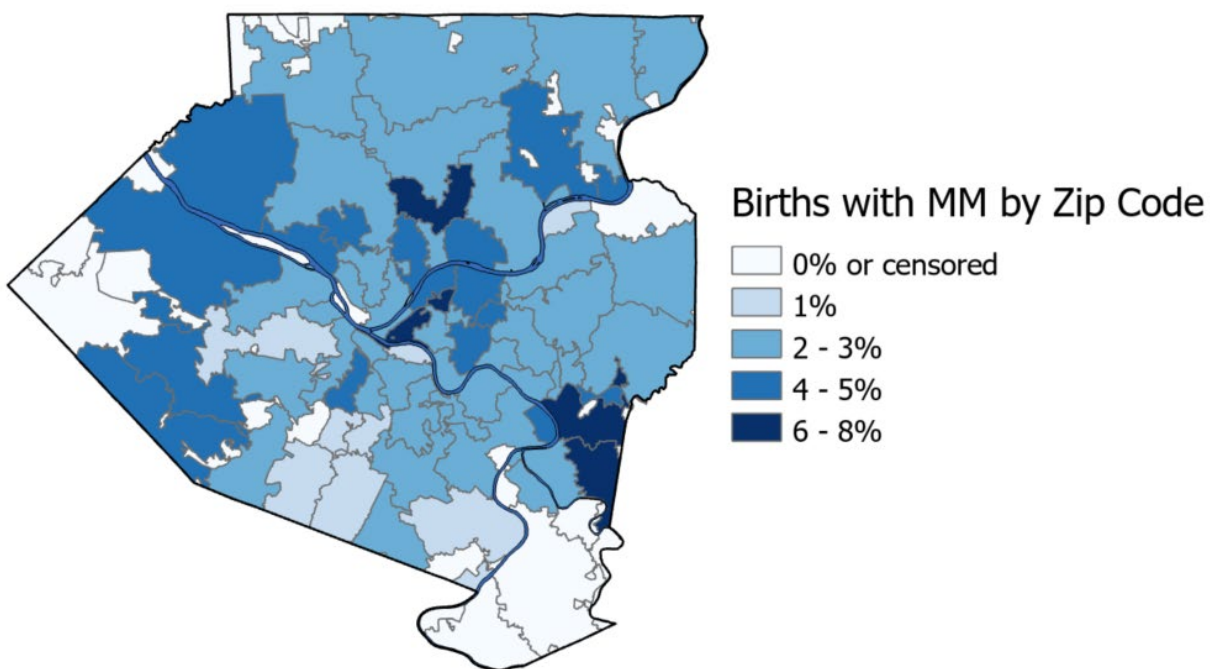


ZIP CODE

Zip Code	Percent of births with MM
15219	8.1%
15140	7.9%
15131	7.7%
15116	7.0%
15224	5.8%
15137	5.7%
15201	5.3%
15144	4.9%
15216	4.8%
15024	4.8%

- The 10 zip codes with the highest percent of births with MM are included in the table (left)
- 8.1 percent of births among pregnant people from zip code 15219, which includes Pittsburgh’s Crawford-Roberts, Hill District, Bedford Dwellings, Middle Hill and Upper Hill neighborhoods, had an MM indicator.

Figure 6:

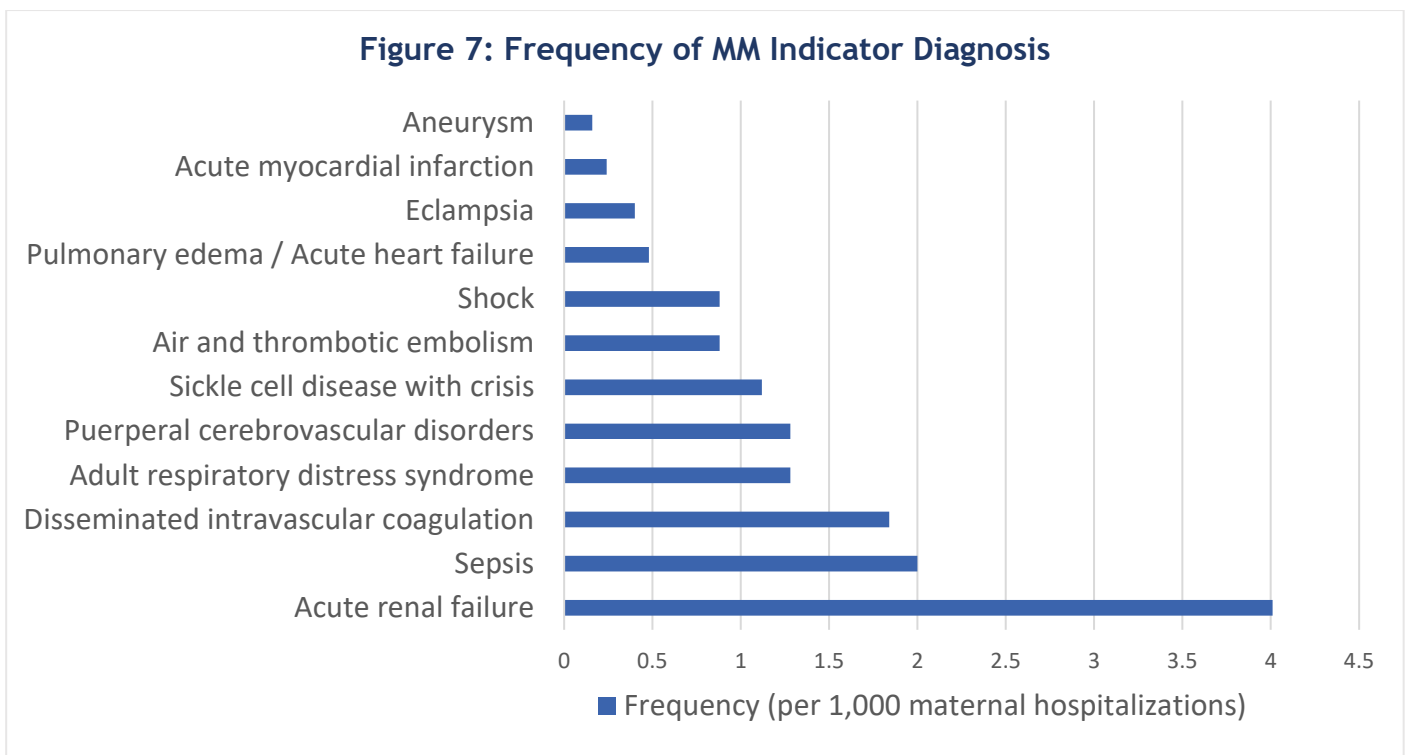


Note: Some zip codes are censored due to having a low number of total births or due to a lack of data.

2020 PHC4 HOSPITALIZATION DATA

A case of maternal morbidity (MM) from the 2020 Pennsylvania Health Care Cost Containment Council (PHC4) data was defined as an Allegheny County female patient, aged 12 to 55 years, where an ICD-10 code pertaining to maternity (pregnancy, labor, delivery, and/or the puerperium) (ICD-10 codes: O000-O9A53, Z0371-Z7681) was used (n=12,483), in addition to an ICD-10 code related to MM. The CDC’s 21 severe MM indicators and corresponding ICD-10 codes were used (n=155) (Appendix Table 1).

Figure 7: Frequency of MM Indicator Diagnosis



- In 2020, there were a total of 12,483 maternal hospitalizations in Allegheny County, and 155 MM indicator diagnoses were reported (1.2 percent)
- The most common MM indicator was acute renal failure, which occurred in 4.0/1,000 maternal hospitalizations
- Sepsis (2.0/1,000) disseminated intravascular coagulation (1.8/1,000), adult respiratory distress syndrome (1.3/1,000), sickle cell disease with crisis (1.1/1,000), air and thrombotic embolism (0.9/1,000), and shock (0.9/1,000) were also prevalent (Fig. 7)

- Some of the CDC’s severe MM indicators were not diagnosed in any maternal hospitalizations in Allegheny County in 2020 (Cardiac arrest / Ventricular fibrillation, Heart failure / arrest during surgery or procedure, Conversion of cardiac rhythm, Severe anesthesia complications, Blood product transfusion, Hysterectomy, Temporary tracheostomy, and Ventilation)

DEMOGRAPHICS

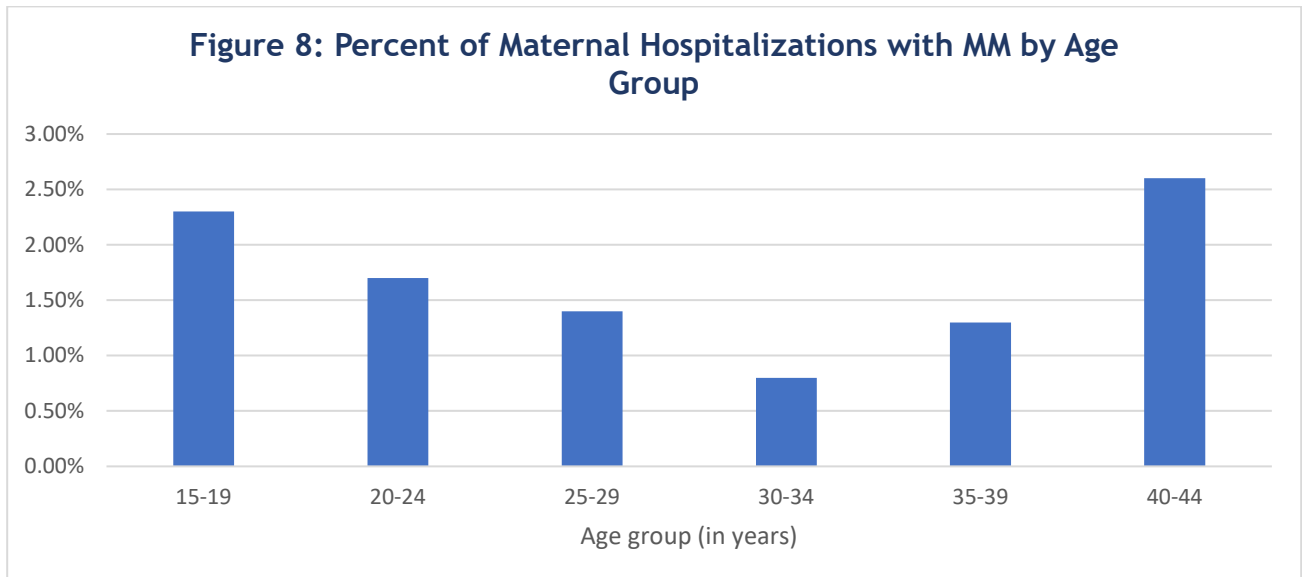
PRIMARY PAYER

- 2.0 percent of patients who used Medicare/Medicaid as their primary payer and 0.9 percent of patients who used commercial insurance as their primary payer were diagnosed with an MM indicator

RACE

- Among Black pregnant people, 2.4 percent were diagnosed with an MM indicator
- Among White pregnant people, 0.9 percent were diagnosed with an MM indicator

AGE GROUPS



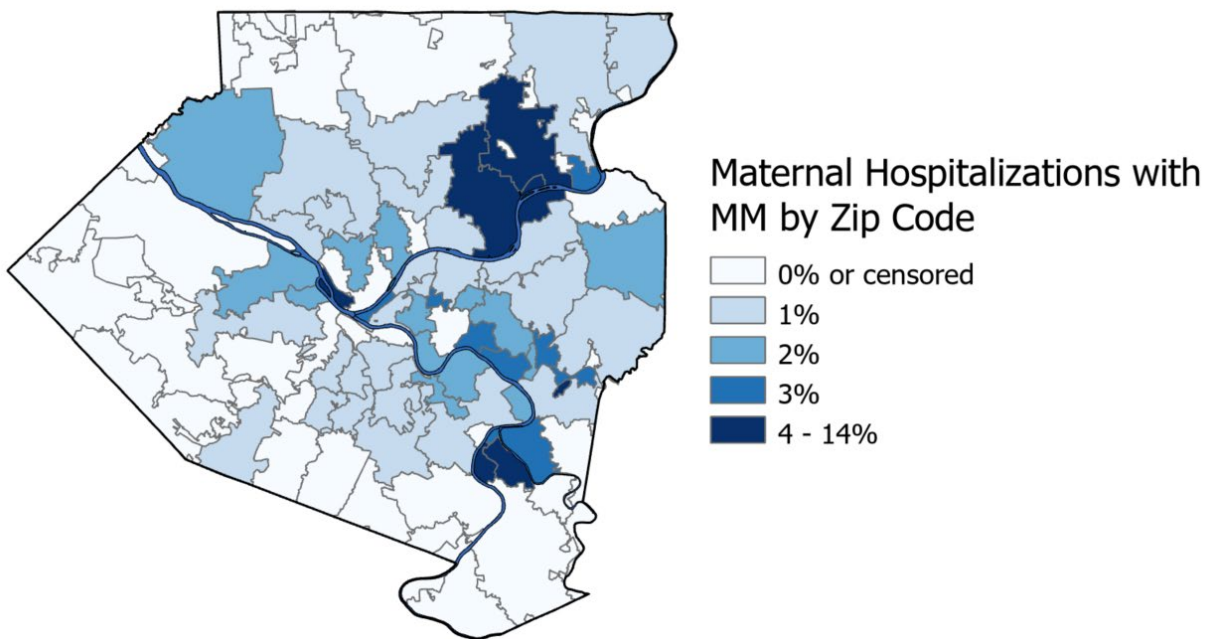
- 2.6 percent of maternal hospitalizations of pregnant people in the 40-44 years age group had an MM diagnosis
- 0.7 percent of maternal hospitalizations of pregnant people in the 30-34 years age group had an MM diagnosis (Fig. 8)

ZIP CODE

Zip Code	Percent of maternal hospitalizations with MM
15045	14.1%
15233	7.4%
15133	7.0%
15024	4.5%
15035	4.2%
15238	3.6%
15139	3.5%
15145	3.5%
15104	3.5%
15132	3.4%

- The 10 zip codes with the highest percent of maternal hospitalizations with an MM diagnosis are included in the table (left)
- 14.1 percent of the maternal hospitalizations involving pregnant people from zip code 15045, or the Glassport Borough, had an MM diagnosis

Figure 9:



Note: Some zip codes are censored due to having a low number of total births or due to a lack of data.

CONCLUSIONS

Maternal morbidity (MM) is a significant public health issue in Allegheny County. Disparities are apparent by race, age group, zip code and payment type. The rate of MM is higher among pregnant people with risk factors such as pre-pregnancy hypertension and vaginal bleeding compared to the total birthing population (females aged 12 to 55 years).

A strength of this report is the use of data from two different years and two different sources (birth records and hospitalization records). Each dataset identified a case of MM in a different way, thus complementing one another in understanding MM in Allegheny County. The birth records define MM using a list of six MM outcomes, while the CDC's 21 severe MM indicators were used to define MM in the PHC4 hospitalization data. The outcomes measured by the birth records were observed more frequently than those measured by the PHC4 data (366/12,747 compared to 155/12,483, respectively). So, the birth records appear to measure more common MM outcomes while the PHC4 data appears to measure more severe and less common MM outcomes.

The different outcomes measured by each data source resulted in different groups being affected. Particularly the age groups and zip codes most affected were different. The age groups most affected by the outcomes measured in the birth records were 30-34 and 35-39. The age groups most affected by the outcomes measured in the PHC4 data were 40-44 and 15-19. The outcomes measured in the birth records affect more areas of high need, while the outcomes measured in the PHC4 data affect fewer areas of high need and instead affect more affluent areas. Including both data sources helped to broaden our understanding of MM in the county.

Despite the inclusion of multiple data sources, this data brief has limitations. Data were censored due to low total counts or missing data. Errors in data reporting are possible, especially for hospitalizations, where potential biases and omissions/miscoding cannot be determined. Additionally, Allegheny County has a low proportion of residents of color other than Black and White, so data for other races and ethnicities were not included in the report.

Understanding maternal morbidity is important as its presence may increase the likelihood of maternal death during delivery (Campbell, 2013). Disparities in MM by race also mirror disparities seen in other health and infant outcomes, suggesting factors like social determinants of health and environment may be driving disparate outcomes.

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APPENDIX

Table 1: ICD-10 Codes for the CDC’s 21 Severe Maternal Morbidity Indicators

Maternal Morbidity Indicator	ICD-10 Codes
Acute Myocardial Infarction	I21.xx, I22.x
Aneurysm	I71.xx, I79.0
Acute Renal Failure	N17.x, O90.4
Adult Respiratory Distress Syndrome	J80, J95.1, J95.2, J95.3, J95.82x, J96.0x, J96.2x R09.2
Amniotic Fluid Embolism	O88.1x
Cardiac Arrest / Ventricular Fibrillation	I46.x, I49.0x
Conversion of Cardiac Rhythm	5A2204Z, 5A12012
Disseminated Intravascular Coagulation	D65, D68.8, D68.9, O72.3
Eclampsia	O15. X
Heart Failure / Arrest during Surgery or Procedure	I97.12x, I97.13x, I97.710, I97.711
Puerperal Cerebrovascular Disorders	I60.xx- I68.xx, O22.51, O22.52, O22.53, I97.81x, I97.82x, O87.3
Pulmonary Edema / Acute Heart Failure	J81.0, I50.1, I50.20, I50.21, I50.23, I50.30, I50.31, I50.33, I50.40, I50.41, I50.43, I50.9
Severe Anesthesia Complications	O74.0, O74.1, O74.2, O74.3, O89.0x, O89.1, O89.2
Sepsis	O85, O86.04, T80.211A, T81.4XXA, T81.44xx, or R65.20, or A40.x, A41.x, A32.7
Shock	O75.1, R57.x, R65.21, T78.2XXA, T88.2 XXA, T88.6 XXA, T81.10XA, T81.11XA, T81.19XA
Sickle Cell Disease with Crisis	D57.0x, D57.21x, D57.41x, D57.81x
Air and Thrombotic Embolism	I26.x, O88.0x, O88.2x, O88.3x, O88.8x
Blood Products Transfusion	('30233H1', '30233L1', '30233K1', '30233M1', '30233N1', '30233P1', '30233R1', '30233T1', '30233H0', '30233L0', '30233K0', '30233M0', '30233N0', '30233P0', '30233R0', '30233T0', '30230H1', '30230L1', '30230K1', '30230M1', '30230N1', '30230P1', '30230R1', '30230T1', '30230H0', '30230L0', '30230K0', '30230M0', '30230N0', '30230P0', '30230R0', '30230T0', '30240H1', '30240L1', '30240K1', '30240M1', '30240N1', '30240P1', '30240R1', '30240T1', '30240H0', '30240L0', '30240K0', '30240M0', '30240N0', '30240P0', '30240R0', '30240T0', '30243H1', '30243L1', '30243K1', '30243M1', '30243N1', '30243P1', '30243R1', '30243T1', '30243H0', '30243L0', '30243K0', '30243M0', '30243N0', '30243P0', '30243R0', '30243T0', '30250H1', '30250L1', '30250K1', '30250M1', '30250N1', '30250P1', '30250R1', '30250T1', '30250H0', '30250L0', '30250K0', '30250M0', '30250N0', '30250P0', '30250R0', '30250T0', '30253H1', '30253L1', '30253K1', '30253M1', '30253N1', '30253P1', '30253R1', '30253T1', '30253H0', '30253L0', '30253K0', '30253M0', '30253N0', '30253P0', '30253R0', '30253T0', '30260H1', '30260L1', '30260K1', '30260M1', '30260N1', '30260P1', '30260R1', '30260T1', '30260H0', '30260L0', '30260K0', '30260M0', '30260N0', '30260P0', '30260R0', '30260T0', '30263H1', '30263L1', '30263K1', '30263M1', '30263N1', '30263P1', '30263R1', '30263T1', '30263H0', '30263L0', '30263K0', '30263M0', '30263N0', '30263P0', '30263R0', '30263T0')
Hysterectomy	OUT90ZZ, OUT94ZZ, OUT97ZZ, OUT98ZZ, OUT9FZZ
Temporary Tracheostomy	OB110Z, OB110F, OB113, OB114
Ventilation	5A1935Z, 5A1945Z, 5A1955Z