South Carolina Birth Outcomes Initiative (BOI) Data Committee

BOI Statewide Report

October 2019

Institute for Families in Society
Improving Policy. Advancing Practice.
Strengthening Communities and Family Well-Being.

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ABOUT THIS REPORT

AUTHORS

This South Carolina Birth Outcomes Initiative (SC BOI) Report was developed under contract with the South Carolina Department of Health & Human Services by the following Institute for Families in Society (IFS) staff:

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ACKNOWLEDGMENTS

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FOR ADDITIONAL INFORMATION

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ABOUT THIS REPORT (continued)

BACKGROUND

The SC BOI Data Team releases statewide reports at least twice a year to help track statewide progress on key maternal and infant health measures. This report is a companion document to the newly released SC BOI interactive report online dashboard.
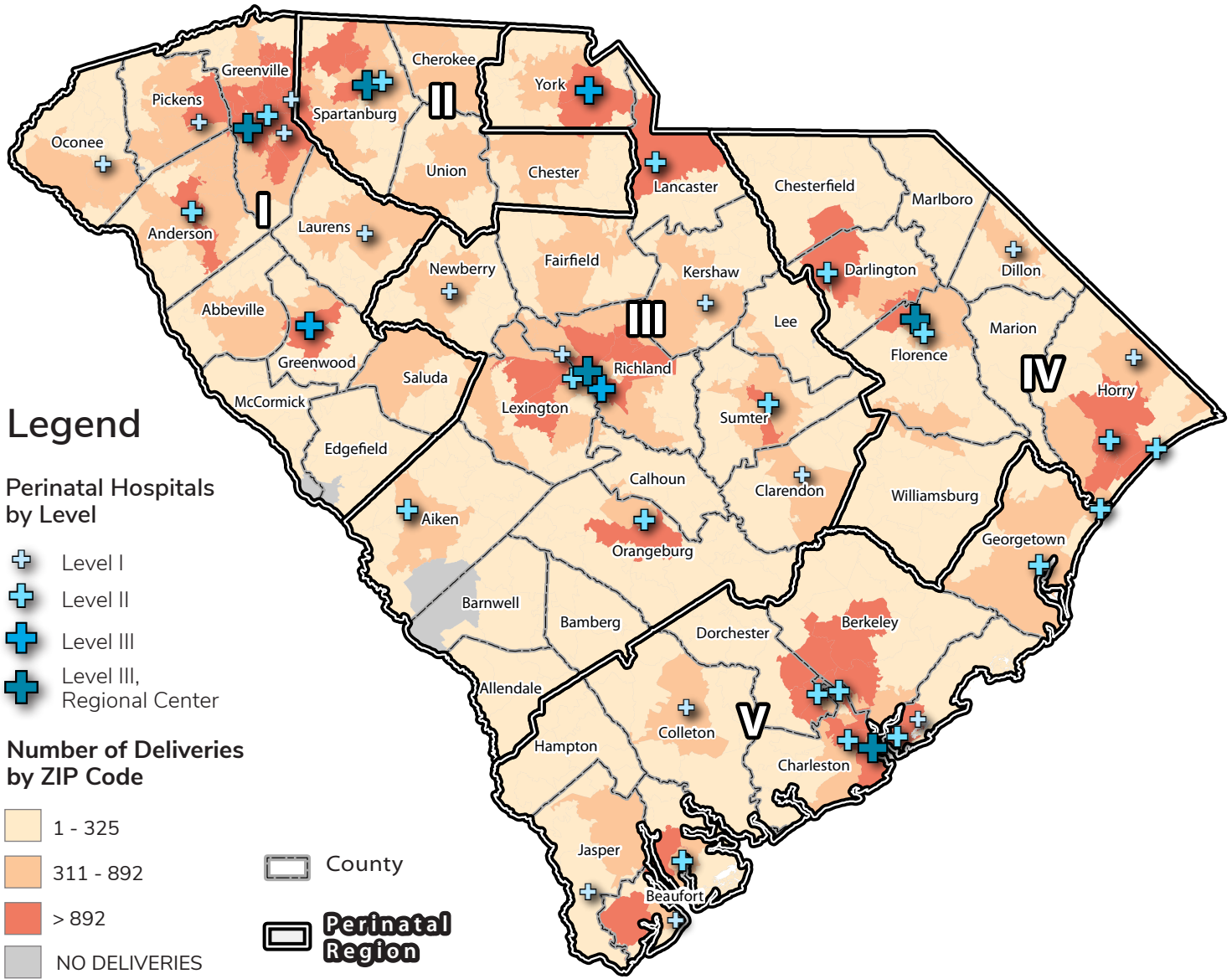
REPORT CONTENT

- A summary of state-level information provided via the dashboard, which includes maternal and newborn characteristics and quality measures. This includes several new characteristics including plurality, parity, newborn length of stay, newborn hospital charges, and maternal age, race, and residence, as well as previously reported SC BOI outcomes.
- Statistical testing results that identifies whether perinatal level or statewide newborn and maternal health quality measures are increasing or decreasing over time.
- The data in this report represents the linkage of UB-04, birth, and Medicaid recipient records. Further information about the data and methods may be read on pages 14-16.

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Statewide Data

South Carolina Birth Outcomes Initiative (BOI)

State Geographic Profile

This map represents all deliveries at Perinatal Hospitals in South Carolina
to mothers located in South Carolina.

Legend

Perinatal Hospitals by Level

- ✚ Level I
- ✚ Level II
- ✚ Level III
- ✚ Level III, Regional Center

Number of Deliveries by ZIP Code

- 1 - 325
- 311 - 892
- > 892
- NO DELIVERIES

- County
- **Perinatal Region**

Maternal and Newborn Data Sources
1. SC RFA, Health and Demographics, all-payer uniformed billing data for inpatient discharges (UB-04).
2. SC DHEC, Division of Biostatistics, Vital Records.
3. SC DHHS, Medicaid Member Records.

Notes
- Maternal data were inclusive of events from October 1, 2015 to June 30, 2018.
- All data records were pulled by SC RFA as of February 27, 2019.
- These data were restricted to only deliveries and births occuring in SC birthing facilities.
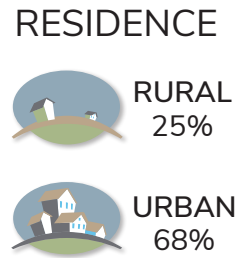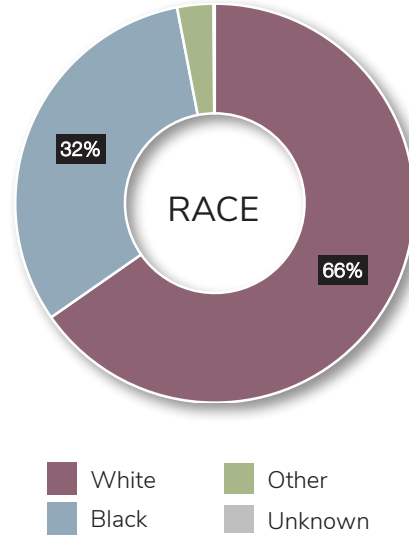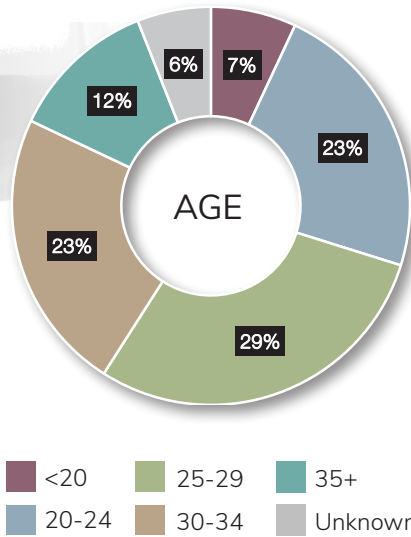
Map Notes
Mapped deliveries were restricted to those with a SC ZIP Code.
Deliveries are mapped as natural breaks.

Perinatal Hospitals Source: SC DHEC, March 2019.

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South Carolina

Maternal Characteristics

AGE

- 7% <20
- 23% 20-24
- 29% 25-29
- 23% 30-34
- 12% 35+
- 6% Unknown

Legend:
- <20
- 25-29
- 35+
- 20-24
- 30-34
- Unknown

RACE

- 66% White
- 32% Black
- Other

Legend:
- White
- Black
- Other
- Unknown
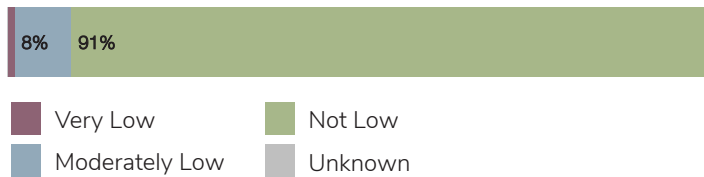
RESIDENCE

RURAL 25%

URBAN 68%

NOTE:
Percentages may not add to 100% due to unknown or missing data.

DELIVERIES

	Total	Number of Babies	First-Time Moms	Inductions	C-Sections
	51,409	53,161	39%	34%	34%

Birthweight
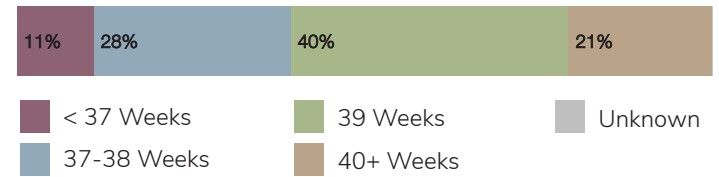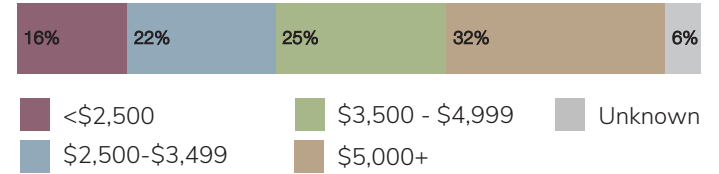
8% | 91%

- Very Low
- Moderately Low
- Not Low
- Unknown

Gestational Age

11% | 28% | 40% | 21%

- < 37 Weeks
- 37-38 Weeks
- 39 Weeks
- 40+ Weeks
- Unknown

Newborn Length of Stay (Days)

13% | 56% | 15% | 11% | 5%

- ≤1 Day
- 2 Days
- 3 Days
- 4+ Days
- Unknown

Newborn Hospital Charges

16% | 22% | 25% | 32% | 6%

- <$2,500
- $2,500-$3,499
- $3,500 - $4,999
- $5,000+
- Unknown

Multiples

97%

- Multiples
- Singletons
- Unknown

Newborn Payment Source

58% | 28% | 14%

- Medicaid
- Private Insurance
- Other/Unknown

NOTE: Chart pieces with 3% or less are not labeled; however, they are shown.

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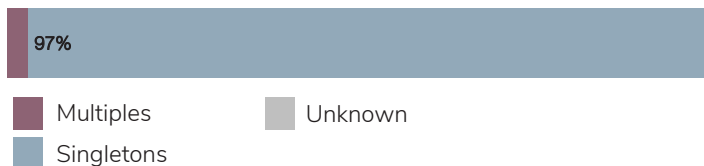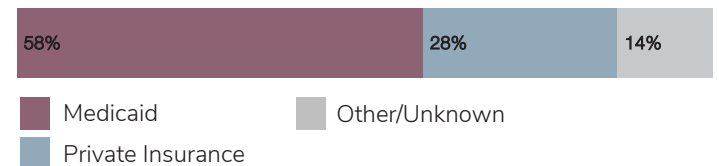
Perinatal Level I

Maternal Characteristics
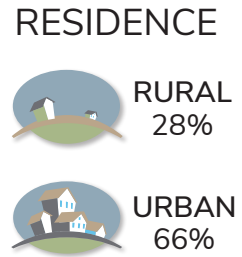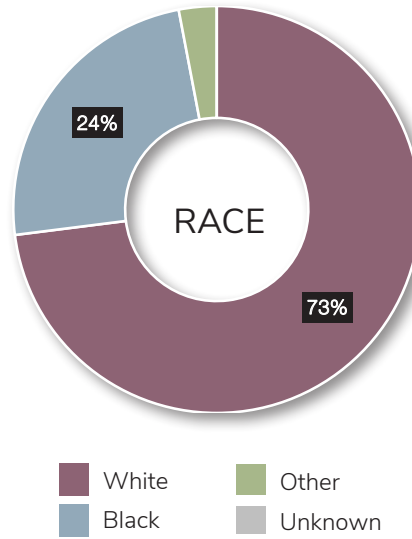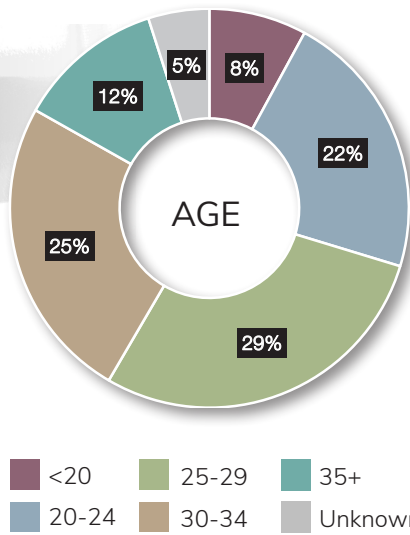
AGE

8%
22%
29%
25%
12%
5%

- <20
- 20-24
- 25-29
- 30-34
- 35+
- Unknown

RACE

24%
73%

- White
- Black
- Other
- Unknown

RESIDENCE

RURAL 28%

URBAN 66%

NOTE:
Percentages may not add to 100% due to unknown or missing data.

DELIVERIES

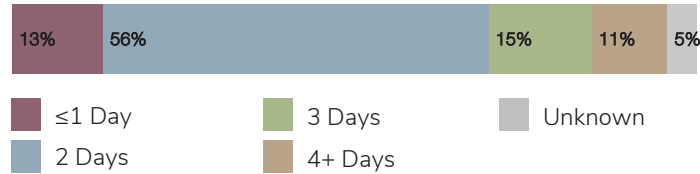|	Total	Number of Babies	First-Time Moms	Inductions	C-Sections
	7,400	7,606	39%	29%	30%

Birthweight
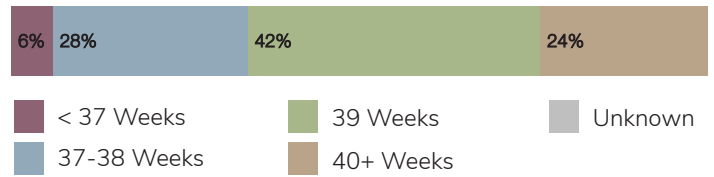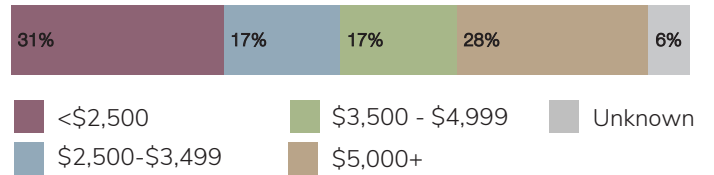
5% | 95%

- Very Low
- Moderately Low
- Not Low
- Unknown

Gestational Age

6% | 28% | 42% | 24%

- < 37 Weeks
- 37-38 Weeks
- 39 Weeks
- 40+ Weeks
- Unknown

Newborn Length of Stay (Days)

18% | 57% | 13% | 5% | 7%

- ≤1 Day
- 2 Days
- 3 Days
- 4+ Days
- Unknown

Newborn Hospital Charges

31% | 17% | 17% | 28% | 6%

- <$2,500
- $2,500-$3,499
- $3,500 - $4,999
- $5,000+
- Unknown

Multiples

98%

- Multiples
- Singletons
- Unknown

Newborn Payment Source

54% | 32% | 14%

- Medicaid
- Private Insurance
- Other/Unknown

NOTE: Chart pieces with 3% or less are not labeled; however, they are shown.

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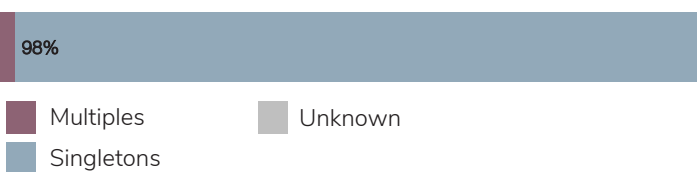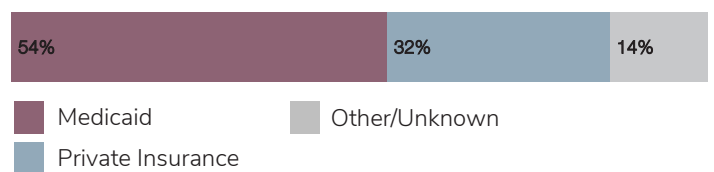
Perinatal Level II

Maternal Characteristics
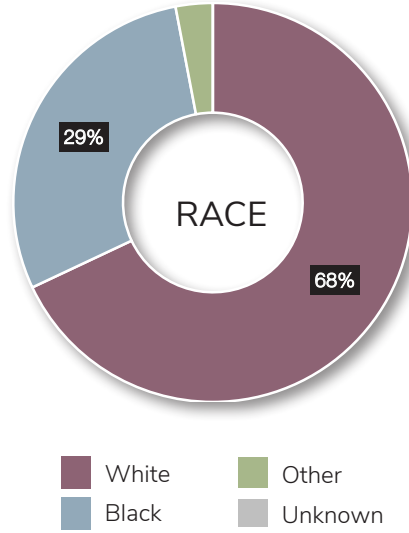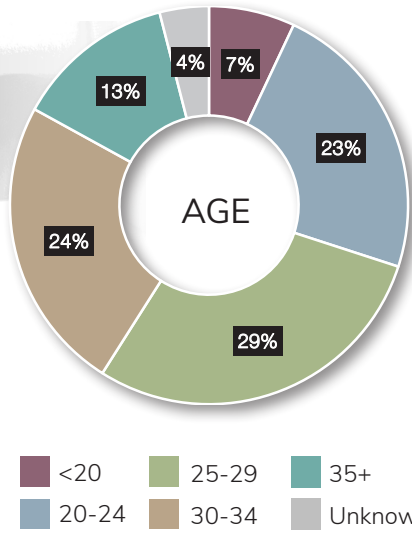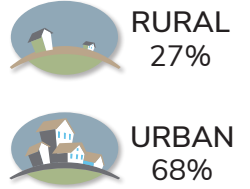
AGE

- 7% <20
- 23% 20-24
- 29% 25-29
- 24% 30-34
- 13% 35+
- 4% Unknown

Legend:
- <20
- 25-29
- 35+
- 20-24
- 30-34
- Unknown

RACE

- 29% Black
- 68% White
- Other

Legend:
- White
- Black
- Other
- Unknown

RESIDENCE
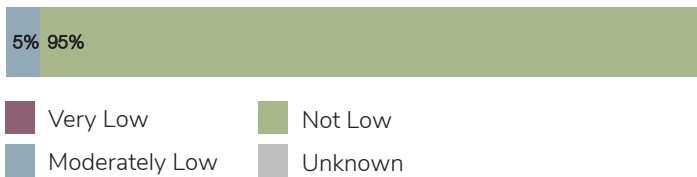
RURAL 27%

URBAN 68%

NOTE:
Percentages may not add to 100% due to unknown or missing data.

DELIVERIES

	Total	Number of Babies	First-Time Moms	Inductions	C-Sections
	23,765	24,393	39%	37%	35%

Birthweight
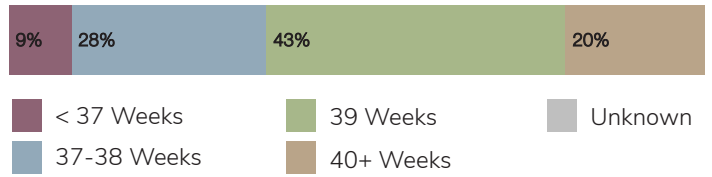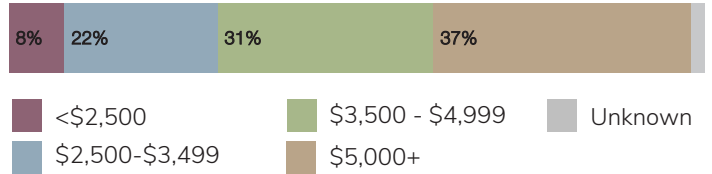
7% | 93%

- Very Low
- Moderately Low
- Not Low
- Unknown

Gestational Age

9% | 28% | 43% | 20%

- < 37 Weeks
- 37-38 Weeks
- 39 Weeks
- 40+ Weeks
- Unknown

Newborn Length of Stay (Days)

12% | 61% | 15% | 9%

- ≤1 Day
- 2 Days
- 3 Days
- 4+ Days
- Unknown

Newborn Hospital Charges

8% | 22% | 31% | 37%

- <$2,500
- $2,500-$3,499
- $3,500 - $4,999
- $5,000+
- Unknown

Multiples

98%

- Multiples
- Singletons
- Unknown

Newborn Payment Source

57% | 30% | 13%

- Medicaid
- Private Insurance
- Other/Unknown

NOTE: Chart pieces with 3% or less are not labeled; however, they are shown.

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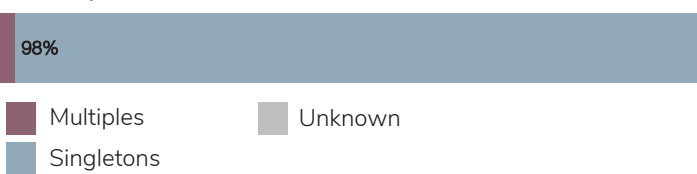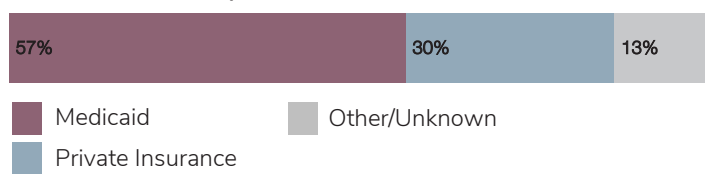
Perinatal Level III

Maternal Characteristics
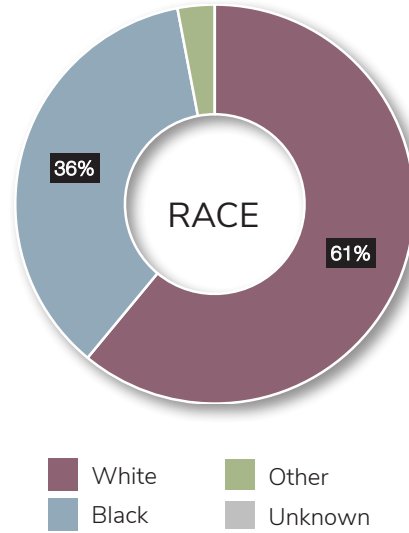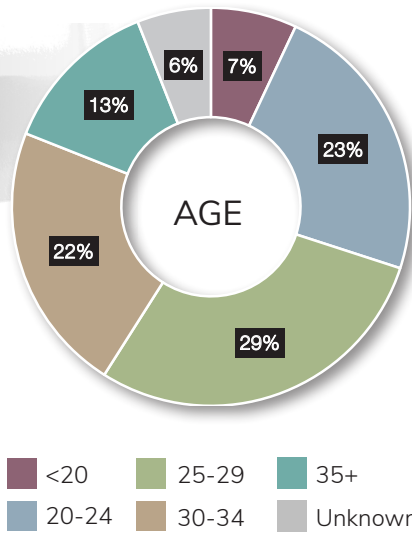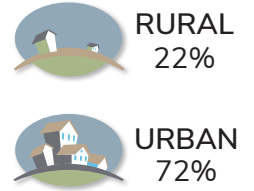
AGE

- 7%
- 23%
- 29%
- 22%
- 13%
- 6%

Legend:
- <20
- 20-24
- 25-29
- 30-34
- 35+
- Unknown

RACE

- 36%
- 61%

Legend:
- White
- Black
- Other
- Unknown

RESIDENCE

RURAL 22%

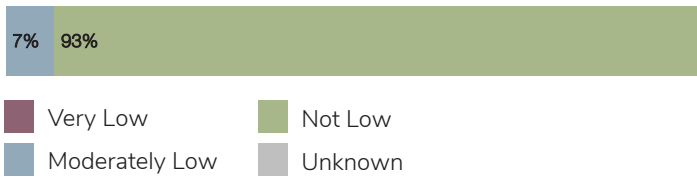**URBAN** 72%

NOTE:
Percentages may not add to 100% due to unknown or missing data.

DELIVERIES

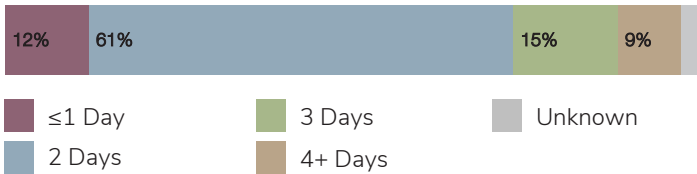|	Total	Number of Babies	First-Time Moms	Inductions	C-Sections	NICU
	19,537	20,377	38%	31%	35%	13%

Birthweight
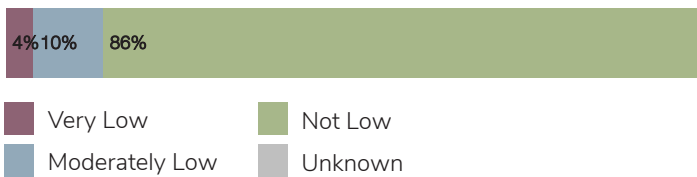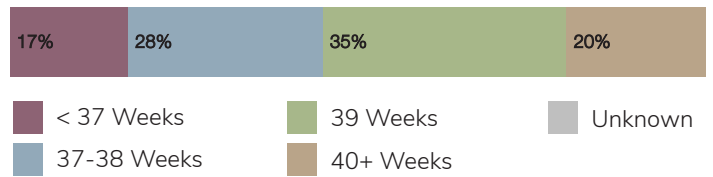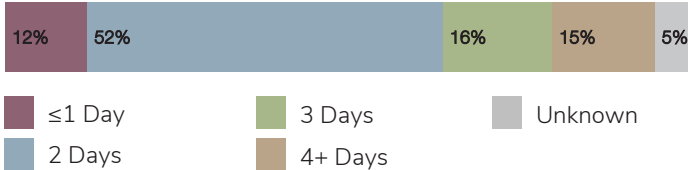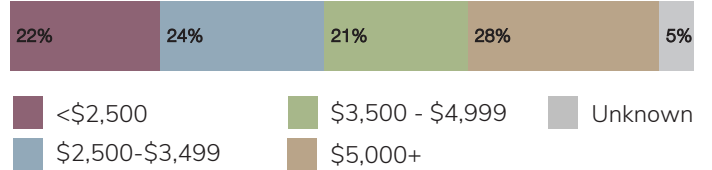
4% | 10% | 86%

- Very Low
- Moderately Low
- Not Low
- Unknown

Gestational Age

17% | 28% | 35% | 20%

- < 37 Weeks
- 37-38 Weeks
- 39 Weeks
- 40+ Weeks
- Unknown

Newborn Length of Stay (Days)

12% | 52% | 16% | 15% | 5%

- ≤1 Day
- 2 Days
- 3 Days
- 4+ Days
- Unknown

Newborn Hospital Charges

22% | 24% | 21% | 28% | 5%

- <$2,500
- $2,500-$3,499
- $3,500 - $4,999
- $5,000+
- Unknown

Multiples

5% | 95%

- Multiples
- Singletons
- Unknown

Newborn Payment Source

63% | 25% | 12%

- Medicaid
- Private Insurance
- Other/Unknown

NOTE: Chart pieces with 3% or less are not labeled; however, they are shown.

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South Carolina
Maternal Health Quality Measures
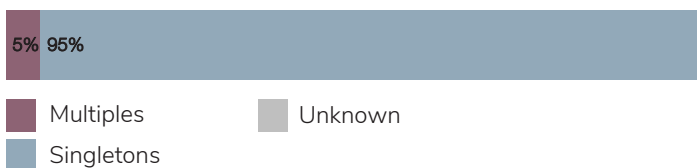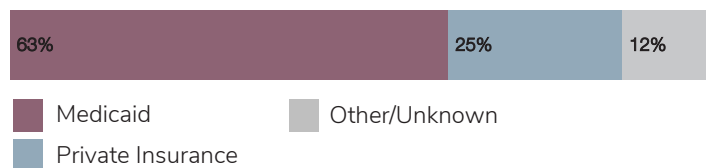
SUMMARY OF RESULTS

MEASURE	State (N = 51,409)				Perinatal Level I (N = 7,400)				Perinatal Level II (N = 23,765)				Perinatal Level III (N = 19,537)			
	Num	Den	%	Over Time	Num	Den	%	Over Time	Num	Den	%	Over Time	Num	Den	%	Over Time
Total C-Section Deliveries	17,419	50,707	34%	⬇	2,249	7,400	30%	⬇	8,249	23,765	35%	⬆	6,921	19,537	35%	⬇
Total Primary C-Section Deliveries	8,636	42,236	20%	⬆	1,036	6,270	17%	⬇	4,103	19,840	21%	⬆	3,497	16,121	22%	⬆
Primary C-Section Deliveries (TJC PC-02, NTSV)	4,342	15,767	28%	⬆	579	2,438	24%	⬇	2,268	7,769	29%	⬆	1,495	5,560	27%	⬆
Early Elective Deliveries (ICD 10)	2,883	5,516	52%	⬆	433	955	45%	⬆	1,495	2,616	57%	⬆	955	1,945	49%	⬆
Early Elective Induced Deliveries (ICD 10)	1,755	5,516	32%	⬆	250	955	26%	⬆	926	2,616	35%	⬆	579	1,945	30%	⬆
Early Elective Induced Deliveries (ICD 9)	206	5,516	4%	⬆	19	955	2%	⬆	101	2,616	4%	⬆	86	1,945	4%	⬆

⬆ ⬇ Arrow direction indicates direction of change.
A filled arrow indicates a statistically significant change.
Green indicates a good change; red indicates a poor change.

⇨ Indicates no change.

✕ Indicates no statistical test could be done.

ABOUT THE STATISTICAL TESTS

Over Time

This is the statistical result of testing whether each measure is increasing or decreasing over time (Q4 2015 - Q2 2018) using a binomial regression generalized linear model with a log link function.

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South Carolina
Newborn Health Quality Measures

SUMMARY OF RESULTS

MEASURE	Statewide (N = 53,161)				Perinatal Level I (N = 7,606)				Perinatal Level II (N = 24,393)				Perinatal Level III (N = 20,377)			
	Num	Den	%	Over Time	Num	Den	%	Over Time	Num	Den	%	Over Time	Num	Den	%	Over Time
Preterm Births	6,034	53,161	11%	⬆	467	7,606	6%	⬇	2,106	24,393	9%	⬇	3,456	20,377	17%	⬆
Low Birthweight Babies	5,058	53,161	10%	⬇	383	7,606	5%	⬇	1,736	24,393	7%	⬇	2,932	20,377	14%	⬆

⬆ ⬇ Arrow direction indicates direction of change.
A filled arrow indicates a statistically significant change.
Green indicates a good change; red indicates a poor change.

➡ Indicates no change.

✖ Indicates no statistical test could be done.

ABOUT THE STATISTICAL TESTS

Over Time

This is the statistical result of testing whether each measure is increasing or decreasing over time (Q4 2015 - Q2 2018) using a binomial regression generalized linear model with a log link function.

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TERMS & MEASURES

KEY TERMS

Age – Maternal age on the day of delivery as identified on the hospital UB-04 record and categorized as ages < 20, 20-24, 25-29, 30-34, and 35+.

Birthweight – Newborn birthweight designated on the birth record and categorized as very low (<1,500 grams), moderately low (1,500-2,499 grams), and not low birthweight (2,500+ grams).

C-Sections – Final route identified as cesarean on the birth record or via ICD-10-PCS codes 10D00Z0, 10D00Z1, or 10D00Z2 present on the maternal hospital UB-04 record (as designated by Appendix A, Table 11.06 of the Specifications Manual for Joint Commission National Quality Measures, v2018B1).

Deliveries – Maternal delivery events were flagged when a linked baby identification number was present from the birth records and one of the below billing codes existed on the maternal hospital UB-04 record:
- ICD-10-CM: Z37.0, Z37.1, Z37.2, Z37.3, Z37.4, Z37.5, Z37.6, Z37.7, O80, O82;
- ICD-10-PCS: 10D00Z0, 10D00Z1, 10D00Z2, 10D07Z3, 10D07Z4, 10D07Z5, 10D07Z6, 10D07Z7, 10D07Z8, 10E0XZZ;
- MS-DRG: 765, 766, 767, 768, 774, 775, 783, 784, 785, 786, 787, 788, 796, 797, 798, 805, 806, 807; or
- APR-DRG: 540, 541, 542, 560.

First-Time Moms – Identified when both previous live and previous dead births from the birth record were zero.

Gestational Age – Identified by the gestation on the birth record as Preterm: <37 weeks, Early-Term: 37-38 weeks, or Term: 39 weeks or 40+ weeks. When gestation was missing, this field was populated using the Z3A codes from the newborn hospital UB-04 record.

Inductions – ICD-10-PCS codes 0U7C7DZ, 0U7C7ZZ, 10907ZC, 3E033VJ, 3E0DXGC, 3E0P3VZ, 3E0P7GC, or 3E0P7VZ present on the maternal hospital UB-04 record (as designated by Appendix A, Table 11.05 of the Specifications Manual for Joint Commission National Quality Measures, v2018B1).

Maternal – Represents all maternal delivery events and not unique mothers.

Newborn Hospital Charges – Newborn hospital charge on the newborn hospital UB-04 record categorized as <$2,500, $2,500-$3,499, $3,500-$4,999, or $5,000+.

Newborn Length of Stay (Days) – Number of days designated on the newborn hospital UB-04 record categorized as <= 1 day, 2 days, 3 days, or 4+ days.

NICU – Neonatal Intensive Care Unit stay as identified by a flag provided by SC RFA, which identifies newborn hospital UB-04 records with stays in nursery level III (revenue code 0173) or IV (revenue code 0174).

Number of Babies (Births) – Represents all newborn birth records.

Over Time – The statistical result of testing whether each measure is increasing or decreasing over time (Q4, 2015 – Q2, 2018).

Parity – Number of previous live or dead births as designated on the birth record and categorized as Nulliparous (zero), One, Two, or Three+.

Payment Source – Payer detailed on the newborn hospital UB-04 record and categorized as Private Insurance (Commercial Insurance or Health Maintenance Organization); Medicaid, and Other (Self-pay, Indigent/Charitable Organization, Medicare, Worker's Compensation, Other Government, Not verified Medicaid, and Not Stated on hospital record). Medicaid delivery payment was adjusted to Medicaid when linking to Medicaid recipient records verified payment was Medicaid.

Perinatal Level – SC DHEC hospital designation as of April, 2019. The level corresponds with the level of services provided: Level I (Basic Care), Level II and IIE (Specialty Care), and Level III (Subspecialty Care) and may vary from the level submitted with the hospital record.

Plurality – Obtained using the birth month, birth year, and parity from the birth records as Singleton (1 newborn) and Multiples (> 1 newborn). Cases of non-live birth identified through hospital records were excluded from this definition.

Race – Maternal race as identified on the birth record as White, Black, Other (which includes Multiple Race), and Unknown.

Residence – Rural or urban status identified by a crosswalk using the zip code provided on the maternal hospital UB-04 record.

State – Represents all deliveries occurring in SC birthing facilities. This excludes out-of-hospital births such as home births and those occurring in freestanding birthing facilities. It includes births for some out-of-state residents.

Year, Quarter – All data reflects post-ICD-10 time periods and is reported using calendar years and quarters (Q4, 2015 – Q2, 2018).

MATERNAL HEALTH QUALITY DELIVERY MEASURES

Total C-Section – Percent of total deliveries identified as cesarean on the birth record or via ICD-10-PCS codes.

Total Primary C-Section – Percent of deliveries without a prior cesarean identified as cesarean on the birth record or via ICD-10-PCS codes.

Primary C-Section (TJC PC-02, NTSV) – This Joint Commission PC-02 Cesarean Birth Measure reflects primary cesareans among deliveries limited to gestations at least 37 weeks, first-time mothers (nulliparous), singleton, ages 10 to 64, length of stay < 120 days, and excluding multiple gestations and other presentations (Appendix A, Table 11.09).

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Early Elective Delivery (TJC PC-01, ICD-10) – The Joint Commission PC-01 Elective Delivery measure identifies the percentage of deliveries that were elective vaginal deliveries or elective cesarean births at 37-38 weeks of gestation completed. This measure is restricted to only those singleton deliveries ages 8-64 with a length of stay <120 days that do not have an ICD-10-CM code for conditions possibly justifying elective delivery prior to 39 weeks gestation (Appendix A, Table 11.07). Exclusions cannot be made for active labor or prior uterine surgery.

Early Elective Induced Delivery (ICD-10) – Among singleton deliveries 37-38 weeks gestation, the percentage of deliveries with a non-medically-indicated induction as defined by induction codes and exclusions provided by The Joint Commission (Appendix A, Tables 11.05 & 11.07, v2018B1). This measure is restricted to only those singleton deliveries ages 8-64 with a length of stay <120 days. Exclusions cannot be made for active labor or prior uterine surgery.

Early Elective Induced Delivery (ICD-9) – Among singleton deliveries 37-38 weeks gestation, the percentage of deliveries with a non-medically-indicated induction as defined by exclusions provided by The Joint Commission (Appendix A, Table 11.07, v2018B1). Induction is defined as ICD-9-CM procedure codes 73.01, 73.1, and 73.4 (Table 11.05, v2014A1).

These three codes are identified from the ICD-10 codes provided on the hospital record that are then crosswalked back to ICD-9, which may result in an underestimate of true rates. All other inclusion and exclusion criteria match the ICD-10 early elective measures.

NEWBORN HEALTH QUALITY MEASURES

Preterm Births – Percentage of babies born less than 37 weeks gestation.

Low Birthweight Babies – Percentage of babies born less than 2,500 grams birthweight.

THE DATA

ABOUT THE DATA

Maternal and newborn data were inclusive of events from October 1, 2015 to June 30, 2018. All data records were pulled by SC RFA as of February 27, 2019. These data were restricted to only deliveries and births occurring in SC birthing facilities (i.e., data for births and deliveries to SC residents occurring outside the state of SC, at home, or in a freestanding birthing center were not included).

The maternal and newborn data were derived from three sources:

1. **South Carolina Revenue and Fiscal Affairs Office, Health and Demographics, all-payer uniformed billing data for inpatient discharges (UB-04)**
   Used as the base for maternal age and residence, measures of maternal quality, newborn charges, and newborn length of stay as defined by billing codes submitted on the hospital claim.

2. South Carolina Department of Health and Environmental Control, Division of Biostatistics, Vital Statistics

Used to establish maternal race, gestation, birthweight, singleton, parity, and mode of delivery. Based on birth records submitted to DHEC by delivering hospitals in South Carolina.

3. South Carolina Department of Health & Human Services, Medicaid recipient records
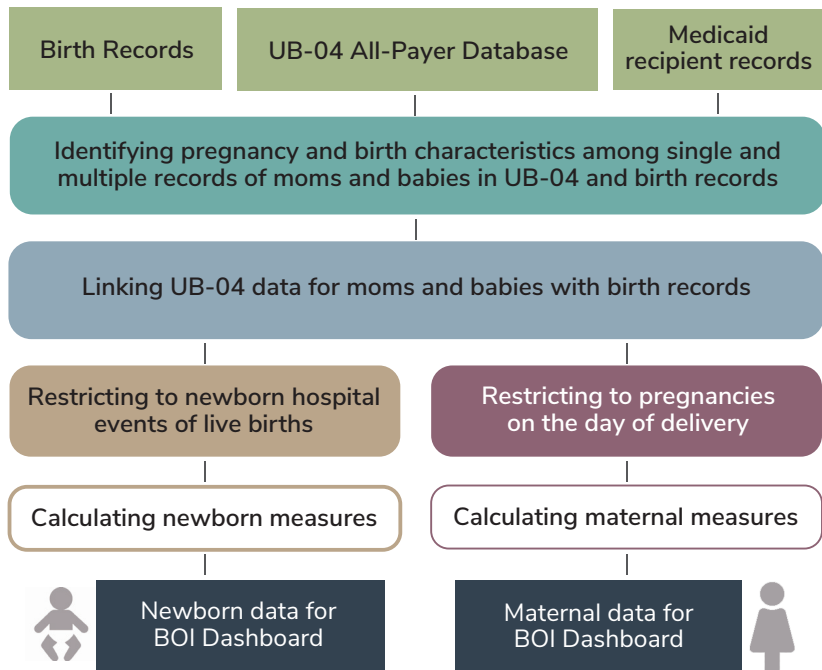
Used to verify Medicaid as the payer.

In this report, all available information of births and pregnancies were retained from UB-04 and birth records data, linking all the data sources, and transforming newborn and maternal hospital encounters, to newborn and pregnancy level, respectively.

The Joint Commission measures do not require this linkage of maternal hospital events with vital statistics, as some states are not set up for this level of data sharing. This three-way linkage in South Carolina, however, is a strength of this report as it allows data to be shared across multiple SC BOI stakeholders, with improved accuracy of results.

BOI DATA PROCESSING FLOWCHART

Events from October 1, 2015—
June 30, 2018, inclusive

Birth Records | UB-04 All-Payer Database | Medicaid recipient records

Identifying pregnancy and birth characteristics among single and multiple records of moms and babies in UB-04 and birth records

Linking UB-04 data for moms and babies with birth records

Restricting to newborn hospital events of live births | Restricting to pregnancies on the day of delivery

Calculating newborn measures | Calculating maternal measures

Newborn data for BOI Dashboard | Maternal data for BOI Dashboard

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METHODS

Over Time Trend Test – For each Perinatal Level and the State, we tested these outcomes (proportions) throughout 11 time periods (Q4 2015 – Q2 2018) by using a binomial regression generalized linear model with a log link function.

When appropriate, tests were conducted in order to determine the direction of change and if the change was statistically significant for each reported outcome. In the report, certain statistical values along with the appropriate interpretation have been provided to you.

A few things to note:
- When statistical results are provided, the direction of the change is indicated by arrows. For this analysis, one would expect to see decreasing/lowering values for all maternal and newborn measures.
- When the arrows are filled, it means the result was statistically significant as defined by a P-value less than 0.0500. (All statistical analyses were tested at alpha = 0.0500.)

DATA CAVEAT FAQs

What do these SC BOI data represent?
The data reflect point-in-time UB-04 data provided by individual hospitals to the SC Revenue and Fiscal Affairs Office (RFA) as of February 27, 2019, and may differ from a review of internal hospital medical records. Data for CY 2015 represent only Quarter 4, and data for CY 2018 represent Quarter 1 and Quarter 2. Data presented for CYs 2017-2018 are preliminary.

What accounts for differences in denominators?
The number of births and pregnancies used to calculate each maternal and newborn measure or characteristic may vary due to missing data and/or measure restrictions. Newborn measures were per neonate live birth. The maternal measures were per pregnancy on the day of delivery.

How were demographic data determined?
Maternal demographics, such as maternal age and residence, were as of the day of delivery.

What does it mean when there is no data for a measure?
0.00% may indicate that there were zero births in the quarter matching the measure criteria, or an actual value of zero for a specific table result. Referring to the numerators and denominators for interpretation is encouraged.

How are the charges in this report defined?
The measure of newborn hospitalization charges represents the total UB-04 charges for the entire neonate event as defined by APR-DRG Neonate codes. Charges are the amount the facility bills for a patient's care, do not reflect final payments, and have not been adjusted for inflation over time. Therefore, increased charges over time should be interpreted with caution.

What measure definitions were used in this report?
The most recent definitions for newborn and maternal measures were used and applied across all time periods. For the early elective measures, exclusions could not be made for active labor and prior uterine surgery, and the underlying induction definition between the ICD-9 and ICD-10 measures varies.

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South Carolina Birth Outcomes Initiative
Data Committee

BOI Statewide Report
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