



**Commonwealth of Kentucky  
Department for Medicaid Services  
Division of Quality and Population Health**

**Focus Study: Prevalence and Risk Factors for Cesarean Delivery**

FINAL  
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## Introduction

### Background

Cesarean birth rates are rising nationwide, with some hospital rates over 50%.<sup>1</sup> Primary and repeat Cesarean rates are prioritized measures for the Kentucky Medicaid managed care (MMC) quality strategy;<sup>2</sup> however, Kentucky ranks among the lowest-performing states for low-risk Cesarean delivery.<sup>3,4</sup> Less recognized is the prevalence of Cesarean delivery in maternal requests, which is estimated to account for 2.5% of all births in the United States.<sup>5</sup>

Conditions that put women at risk for medically indicated Cesarean delivery include maternal factors, such as human immunodeficiency virus (HIV), eclampsia, and hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome; fetal factors, such as multiple gestation and malpresentation; uterine/placenta factors, such as vasa previa and rupture of uterus; and conduct of labor, such as failed attempted vaginal birth after previous Cesarean delivery and attempted application of vacuum extraction and forceps.<sup>6</sup> Reducing low-risk primary Cesarean deliveries has been identified as an area for improvement, given the increase in Cesarean delivery rates.<sup>7</sup> To refine and enhance measures identifying low-risk Cesarean deliveries developed by the Joint Commission<sup>1</sup> and the Agency for Healthcare Research and Quality (AHRQ),<sup>8</sup> the Society for Maternal-Fetal Medicine (SMFM) developed an alternative low-risk Cesarean delivery definition that accounts for clinical indications for Cesarean delivery.<sup>6</sup> Low-risk Cesarean delivery, as defined by SMFM, includes all term, singleton, vertex, live birth deliveries without prior Cesarean delivery and without high-risk diagnoses. The SMFM identified the International Code of Diseases, Tenth Revision (ICD-10) codes corresponding to the high-risk diagnoses and organized the codes into the following categories: maternal factors, preterm birth, stillborn, malpresentation, fetal factors, uterine/placental factors, conduct of labor, and multiple gestation.<sup>9</sup> Diabetes, hypertensive disorders (e.g., pre-eclampsia), and obesity are not included in the SMFM's listing of ICD-10 codes that represent high-risk conditions for Cesarean delivery, although Ouyang et al.<sup>10</sup> found them associated with a higher odds of low-risk Cesarean delivery.

Risk factors for Cesarean delivery that may be managed with alternative and/or preventive approaches include psychiatric illness,<sup>11</sup> induction of labor,<sup>12</sup> and obesity.<sup>13,14</sup> High rates of Cesarean delivery on Fridays suggest provider work schedules may play a role.<sup>15</sup> Findings from a systematic review of the scientific literature<sup>16</sup> reported the following nonmedical reasons for elective Cesarean section (C-section) on maternal request: fear of labor pain, anxiety for fetal injury or death, fear of childbirth, urinary incontinence, pelvic floor and vaginal trauma, doctor's suggestion, time of birth, experience of prior bad delivery, previous infertility, anxiety for gynecologic examination, anxiety for loss of control, avoidance of long labor, anxiety for lack of support from the staff, fear of fecal incontinence, emotional aspects, body weight of the infant at birth, and abnormal prenatal examination. Jenabi et al.<sup>16</sup> recommended that health promotion interventions be developed to reduce nonmedically indicated C-sections and improve the vaginal delivery process.

### Findings from the Preliminary Review of Pilot Charts

Findings from IPRO's preliminary review of 24 pilot charts, which were based on Current Procedural Terminology (CPT®) code 59510 (as specified in the Kentucky 2022 quality strategy draft), showed that only 8 (31%) Cesarean deliveries were primary C-sections and that the remaining 16 (69%) were repeat Cesarean deliveries. Findings from the preliminary administrative study of the 26,502 deliveries in the Kentucky MMC universe found only one observation with CPT code 59618 for repeat C-section (as specified in the Kentucky 2022 quality strategy draft). Therefore, IPRO and the Kentucky Department for Medicaid Services (DMS) discussed these findings on December 28, 2022, and agreed that CPT codes 59510 and 59618 were not valid codes for the specification of primary and repeat C-section deliveries. Accordingly, the objectives and methodology were revised to evaluate risk factors for the outcome of any Cesarean delivery, rather than the outcomes of primary and repeat Cesarean deliveries. In addition, to facilitate interpretation of C-section risk factors independent of prior C-sections, variables for the following two SMFM indications for C-section were specified and added as separate covariates in multiple logistic regression: maternal care for scar from previous Cesarean delivery and failed attempted vaginal birth after previous Cesarean delivery.

Rather than utilize administrative data to evaluate conditions associated with primary versus repeat C-section outcomes, the study design was revised to utilize hospital record data to evaluate documented indications for primary C-section. In addition, the chart review was modified to include variables pertinent to repeat Cesarean delivery (e.g., trial of labor after C-section [TOLAC], multiple prior C-sections).

## Revised Objectives and Methodology

The revised focus study addresses the following objectives:

- Administrative study: use Kentucky MMC encounter/claims data to quantify C-section prevalence and risk factors using multiple logistic regression (e.g., race/ethnicity, age, geographic area of residence, social determinants of health [SDoH] issues, disabled enrollment status, obesity, diabetes, hypertension, serious mental illness [SMI], substance use disorders [SUD], and medical induction of labor). The eligible population is specified as Kentucky MMC enrollees with a live or stillborn delivery during calendar year 2021. **Appendix A** lists codes used to identify all deliveries and Cesarean deliveries. Live births and still births were included. Evaluate associations between possible risk factors and the outcome of Cesarean delivery, independent of prior Cesarean delivery, using the following ICD-10 codes as proxies for prior Cesarean delivery:
  - O34.21 Maternal care for scar from previous Cesarean delivery, or
  - O66.41 Failed attempted vaginal birth after previous Cesarean delivery.
- Chart review study – delivery stay hospital chart review by MCO: select a random sample of 68 low-risk Cesarean deliveries charts per MCO, plus an oversample of five per MCO (with a lower number of charts for MCOs who have less than 73 enrollees in the eligible population). The low-risk sample was selected by excluding the ICD-10 codes identified by the SMFM.<sup>9</sup> Procure delivery hospital stay admission orders, history and physical (H&P), admission note, labor and delivery operative note, discharge summary, and social work notes. Conduct a chart document review to assess whether there were medical indications/justifications for primary Cesarean delivery not identified by ICD-10 codes, as well as to identify nonmedical reasons for primary Cesarean delivery. Information on hospital practices that have been shown to affect the likelihood of Cesarean delivery are also assessed (e.g., induction of labor,<sup>12</sup> intermittent versus continuous fetal monitoring,<sup>17</sup> and external cephalic version for breech presentation<sup>18</sup>). Summarize the overall chart review sample by type of delivery (e.g., primary C-section, repeat C-section).
- Chart review study – analysis of primary Cesarean deliveries by highest volume hospitals.

## Supplemental Analysis: Low-Risk Primary Cesarean Deliveries, 2021

The Centers for Medicare and Medicaid (CMS) Child Core Set measure Low-Risk Cesarean Delivery (LRCD-CH) uses vital records data to calculate this measure for states.<sup>19</sup> Vital records are a reliable source of data to identify nulliparous (first) deliveries that is not otherwise available from standardized coding sources. Therefore, this measure provides a valid and standardized method to identify low-risk Cesarean deliveries for the Kentucky Medicaid population. The Centers for Disease Control and Prevention (CDC) WONDER database<sup>20</sup> is a public database that IPRO used to identify low-risk (nulliparous, term, singleton, vertex [NTSV]) live birth deliveries and NTSV Cesarean deliveries (live births), as well as to calculate the LRCD-CH rate for Kentucky Medicaid, stratified by demographic factors, clinical factors, and healthcare system factors related to Cesarean delivery.

Armstrong et al.<sup>9</sup> provides a summary of conditions excluded in the SMFM definition for low-risk Cesarean delivery:

- maternal factors,
- preterm birth,
- stillbirth,
- malpresentation,
- fetal factors,
- uterine/placental factors,
- conduct of labor, and
- multiple gestation.

## Results

### Administrative Study: Prevalence of Cesarean Delivery by Member Characteristics

This narrative and the following subsections summarize data for statistically significant findings regarding associations between Cesarean delivery and each member characteristic, unadjusted for all other member characteristics and with all data reported in **Table 1**. The total eligible population includes all enrollees with either a live or stillborn delivery (vaginal or Cesarean), including all primary and repeat cesarean deliveries and all gestational ages at delivery. Subset proportions were evaluated among the total Kentucky MMC population of enrollees with any delivery and among the subpopulation of enrollees with low-risk deliveries (i.e., absence of the risk conditions identified by SMFM).<sup>9</sup> Of note, clinical conditions categorized as high-risk by the SMFM do not apply to low-risk Cesarean deliveries because enrollees with these conditions were excluded from the low-risk delivery subpopulation. Overall, the Cesarean delivery rate among the total eligible population was 35.32% and among the low-risk delivery subpopulation was 13.23%.

#### Demographic Factors

- Age group was significantly associated with Cesarean delivery among all deliveries but not with Cesarean delivery among low-risk deliveries. For all deliveries, the highest proportion of Cesarean deliveries was observed among enrollees aged 35 years and older (45.22%), followed by enrollees aged 19–34 years (35.13%) and enrollees younger than 19 years of age (20.90%).
- Race/ethnicity was significantly associated with Cesarean delivery among all deliveries but not with Cesarean delivery among low-risk deliveries. For all deliveries, the proportions of each race/ethnicity subset with Cesarean delivery were as follows: American Indian or Alaska/Hawaiian Native (50.68%), other (36.62%), Black (36.15%), White (35.77%), not reported (32.62%), Hispanic (31.13%), and Asian or Pacific Islander (29.35%).
- Geographic area of residence was associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. For all deliveries and for low-risk deliveries, the highest rates were observed among enrollees residing in rural counties (37.86% and 15.45%, respectively) and Appalachian counties (36.50% and 13.60%, respectively).

#### Social Determinants of Health

- Foster care status was significantly associated with Cesarean delivery among all deliveries but not with Cesarean delivery among low-risk deliveries. A higher rate was observed among enrollees not in foster care (35.40%) compared to those in foster care (22.78%).
- Disability enrollment status was significantly associated with Cesarean delivery among all deliveries but not with Cesarean delivery among low-risk deliveries. A higher rate was observed among enrollees with disability status (39.94%) compared to those without disability status (35.22%).

#### Clinical Factors – General

- SMI and/or SUD was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. Dual diagnosis of SMI/SUD showed the highest rate (39.28%) for all deliveries. For low-risk deliveries, the dual diagnosis subgroup showed the lowest rate (11.04%), with the highest rate observed among enrollees with only SMI (15.45%).
- Tobacco use was significantly associated with Cesarean delivery among all deliveries but not with Cesarean delivery among low-risk deliveries. The Cesarean delivery rate among tobacco users was 38.64% compared to a rate of 34.04% among nonsmokers.
- Excessive weight gain during pregnancy or obesity was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 44.34% was observed among enrollees with excessive weight gain or obesity compared to a rate of 29.70% among those without excessive weight gain or obesity. Corresponding rates in the low-risk delivery subpopulation were 18.83% and 10.52%, respectively.
- Hypertensive disorders were significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 45.87% was observed among enrollees with hypertensive disorders compared to a rate of 31.42% among those without hypertensive disorders. Corresponding rates in the low-risk delivery subpopulation were 21.48% and 10.88%, respectively.

- Diabetes was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 59.19% was observed among enrollees with diabetes compared to a rate of 34.54% among those without diabetes. Corresponding rates in the low-risk delivery subpopulation were 28.50% and 12.95%, respectively.
- Post-term delivery was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. Whereas a higher Cesarean delivery rate was observed in the low-risk delivery subpopulation among enrollees who delivered post-term (16.54%) compared to those without post-term delivery (12.84%), the inverse was observed in the total delivery population, which showed a higher Cesarean delivery rate among enrollees without a post-term delivery (36.50%) compared to those with a post-term delivery (22.64%).
- Sterilization was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 92.78% was observed among enrollees who underwent sterilization compared to a rate of 31.02% among those who did not. Corresponding rates in the low-risk delivery subpopulation were 49.62% and 12.80%, respectively.

### **Clinical Factors Related to Labor Challenges/Fetal Heart Rate Abnormalities Not Categorized as High-Risk**

- Arrested labor was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries, as well as showed the highest Cesarean delivery rates of all member characteristics in both delivery groups. In the total delivery population, a Cesarean rate of 95.05% was observed among enrollees with arrested labor compared to a rate of 33.42% among those without arrested labor. Corresponding rates in the low-risk delivery subpopulation were 94.86% and 10.48%, respectively.
- Uterine inertia was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 55.64% was observed among enrollees with uterine inertia compared to a rate of 34.42% among those without uterine inertia. Corresponding rates in the low-risk delivery subpopulation were 43.43% and 11.93%, respectively.
- Primary inadequate contractions was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 79.68% was observed among enrollees with primary inadequate contractions compared to a rate of 33.93% among those without primary inadequate contractions. Corresponding rates in the low-risk delivery subpopulation were 77.29% and 10.66%, respectively.
- Abnormal fetal heart rate was significantly associated with Cesarean delivery among all deliveries and with Cesarean delivery among low-risk deliveries. In the total delivery population, a Cesarean rate of 47.28% was observed among deliveries with abnormal fetal heart rate compared to a rate of 33.17% among those without an abnormal fetal heart rate. Corresponding rates in the low-risk delivery subpopulation were 40.34% and 8.93%, respectively.

### **Clinical Factors Categorized as High-Risk – Not Applicable to the Low-Risk Subpopulation**

- Prior C-section scar (maternal care due to uterine scar from previous Cesarean delivery) was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 90.58% among enrollees with a prior Cesarean delivery compared a rate of 20.77% among those without prior Cesarean delivery.
- Failed vaginal birth after Cesarean (VBAC) delivery was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 100.00% among enrollees with failed VBAC (per this measure's definition) compared to a rate of 35.17% among those without failed VBAC.
- Preterm birth was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 46.17% among deliveries with preterm birth compared to a rate of 33.06% among those without preterm birth.
- Stillbirth was significantly associated with Cesarean delivery among all deliveries; however, an inverse relationship was observed, with a greater proportion of Cesarean deliveries among non-stillbirth deliveries (35.41%) compared to 27.04% among stillbirth deliveries.
- Malpresentation was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 84.67% among deliveries with malpresentation compared to a rate of 32.61% among those without malpresentation.
- Fetal factors were significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 50.00% among deliveries with fetal factors compared to a rate of 35.28% among those without fetal factors.



- Uterine/placental factors were significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 79.53% among deliveries with uterine/placental factors compared to a rate of 34.72% among those without uterine/placental factors.
- Multiple gestation was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 46.64% among deliveries with multiple gestation compared to a rate of 33.83% among those without multiple gestation.
- Any SMFM high-risk condition was significantly associated with Cesarean delivery among all deliveries, with a Cesarean delivery rate of 48.21% among deliveries with any SMFM high-risk condition compared to a rate of 13.26% among those without any SMFM high-risk condition.

### Factors Related to Healthcare System

- Medical induction of labor was inversely associated with Cesarean delivery in the total delivery population and the low-risk delivery subpopulation. For all enrollees, a higher Cesarean rate was observed among enrollees without medical induction (50.25%) compared to those with medical induction (15.71%). Corresponding rates for low-risk deliveries were 14.36% and 12.39%, respectively.
- Lack of prenatal care (per absence of ICD-10 coding for insufficient prenatal care) was inversely associated with Cesarean delivery in the total delivery population and the low-risk delivery subpopulation. For all deliveries, a higher Cesarean rate was observed among those with sufficient prenatal care (35.82%) compared to those without sufficient prenatal care (31.23%). Corresponding rates for low-risk deliveries were 13.60% and 10.21%, respectively.
- Managed care organization (MCO) of enrollment was significantly associated with Cesarean delivery in the total delivery population, with the highest rate observed among Humana Healthy Horizon enrollees (36.87%) and the lowest rate observed among Aetna Better Health of Kentucky enrollees (32.89%).
- Continuous enrollment was significantly associated with Cesarean delivery among the total delivery population, with a higher rate observed among enrollees with continuous enrollment (35.78%) compared to those without continuous enrollment (32.90%).

**Table 1: Analysis of Member Subset Proportions – Cesarean Delivery Prevalence, All and Low-Risk Deliveries**

Group Subset	All Kentucky MMC Enrollees with a Live or Stillborn Delivery (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among All Deliveries		Kentucky MMC Enrollees with Low-Risk Deliveries <sup>1</sup> (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Count	% Total	Count	% Subset	Count	% Total	Count	% Subset
Total Kentucky MMC enrollees	28,788	100.00%	10,169	35.32%	10,616	100.00%	1,408	13.26%
Demographic factors								
Age group <sup>2</sup>								
Aged < 19 years	1,445	5.02%	302	20.90%	681	6.41%	98	14.39%
Aged 19–34 years	24,740	85.94%	8,690	35.13%	9,248	87.11%	1,219	13.18%
Aged 35+ years	2,603	9.04%	1,177	45.22%	687	6.47%	91	13.25%
Race/Ethnicity <sup>2</sup>								
White	19,984	69.42%	7,149	35.77%	7,529	70.92%	1,004	13.34%
Black	3,958	13.75%	1,431	36.15%	1,267	11.93%	172	13.58%
Asian or Pacific Islander	368	1.28%	108	29.35%	136	1.28%	16	11.76%
Hispanic	758	2.63%	236	31.13%	278	2.62%	31	11.15%
American Indian or Alaska/Hawaiian Native	73	0.25%	37	50.68%	28	0.26%	7	25.00%
Other	456	1.58%	167	36.62%	149	1.40%	26	17.45%
Not reported	3,191	11.08%	1,041	32.62%	1,229	11.58%	152	12.37%

Group Subset	All Kentucky MMC Enrollees with a Live or Stillborn Delivery (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among All Deliveries		Kentucky MMC Enrollees with Low-Risk Deliveries <sup>1</sup> (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Count	% Total	Count	% Subset	Count	% Total	Count	% Subset
Geographic area of residence <sup>2,3</sup>								
Urban	14,585	50.66%	4,920	33.73%	4,806	45.27%	583	12.13%
Rural	4,998	17.36%	1,892	37.86%	1,883	17.74%	291	15.45%
Appalachian	9,150	31.78%	3,340	36.50%	3,904	36.77%	531	13.60%
Unknown	55	0.19%	17	30.91%	23	0.22%	3	13.04%
Maternity desert <sup>4</sup>								
Yes	7,222	25.09%	2,576	35.67%	2,752	25.92%	357	12.97%
No	21,566	74.91%	7,593	35.21%	7,864	74.08%	1,051	13.36%
Social determinants of health								
Special enrollment status – children in foster care								
Yes <sup>2</sup>	180	0.63%	41	22.78%	104	0.98%	12	11.54%
No	28,608	99.37%	10,128	35.40%	10,512	99.02%	1,396	13.28%
Special enrollment status – disabled								
Yes <sup>2</sup>	656	2.28%	262	39.94%	221	2.08%	38	17.19%
No	28,132	97.72%	9,907	35.22%	10,395	97.92%	1,370	13.18%
Housing issues								
Yes	93	0.32%	34	36.56%	39	0.37%	7	17.95%
No	28,695	99.68%	10,135	35.32%	10,577	99.63%	1,401	13.25%
Food insecurity								
Yes	19	0.07%	9	47.37%	4	0.04%	1	25.00%
No	28,769	99.93%	10,160	35.32%	10,612	99.96%	1,407	13.26%
Social connectivity issues								
Yes	475	1.65%	174	36.63%	156	1.47%	20	12.82%
No	28,313	98.35%	9,995	35.30%	10,460	98.53%	1,388	13.27%
Abuse, perinatal								
Yes	99	0.34%	26	26.26%	38	0.36%	3	7.89%
No	28,689	99.66%	10,143	35.36%	10,578	99.64%	1,405	13.28%
Adverse childhood experience								
Yes	157	0.55%	61	38.85%	57	0.54%	9	15.79%
No	28,631	99.45%	10,108	35.30%	10,559	99.46%	1,399	13.25%
Clinical factors								
SMI/SUD <sup>2,3</sup>								
SMI, only	5,457	18.96%	2,118	38.81%	1,910	17.99%	295	15.45%
SUD, only	1,781	6.19%	665	37.34%	602	5.67%	82	13.62%
Both	1,871	6.50%	735	39.28%	589	5.55%	65	11.04%
Neither	19,679	68.36%	6,651	33.80%	7,515	70.79%	966	12.85%
Tobacco use								
Yes <sup>2</sup>	8,027	27.88%	3,102	38.64%	2,744	25.85%	368	13.41%
No	20,761	72.12%	7,067	34.04%	7,872	74.15%	1,040	13.21%



Group Subset	All Kentucky MMC Enrollees with a Live or Stillborn Delivery (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among All Deliveries		Kentucky MMC Enrollees with Low-Risk Deliveries <sup>1</sup> (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Count	% Total	Count	% Subset	Count	% Total	Count	% Subset
Excessive weight gain during pregnancy or obesity (pregnancy, childbirth, or prior)								
Yes <sup>2,3</sup>	11,061	38.42%	4,904	44.34%	3,499	32.96%	659	18.83%
No	17,727	61.58%	5,265	29.70%	7,117	67.04%	749	10.52%
Hypertensive disorders								
Yes <sup>2,3</sup>	7,783	27.04%	3,570	45.87%	2,388	22.49%	513	21.48%
No	21,005	72.96%	6,599	31.42%	8,228	77.51%	895	10.88%
Diabetes								
Yes <sup>2,3</sup>	919	3.19%	544	59.19%	214	2.02%	61	28.50%
No	27,869	96.81%	9,625	34.54%	10,402	97.98%	1,347	12.95%
Post-term delivery								
Yes <sup>2,3</sup>	2,443	8.49%	553	22.64%	1,215	11.44%	201	16.54%
No	26,345	91.51%	9,616	36.50%	9,401	88.56%	1,207	12.84%
Arrested labor <sup>2,3,5</sup>								
Yes	889	3.09%	845	95.05%	350	3.30%	332	94.86%
No	27,899	96.91%	9,324	33.42%	10,266	96.70%	1,076	10.48%
Uterine inertia <sup>2,3,6</sup>								
Yes	1,224	4.25%	681	55.64%	449	4.23%	195	43.43%
No	27,564	95.75%	9,488	34.42%	10,167	95.77%	1,213	11.93%
Primary inadequate contractions <sup>2,3,7</sup>								
Yes	876	3.04%	698	79.68%	414	3.90%	320	77.29%
No	27,912	96.96%	9,471	33.93%	10,202	96.10%	1,088	10.66%
Abnormal fetal heart rate								
Yes <sup>2,3,8</sup>	4,393	15.26%	2,077	47.28%	1,465	13.80%	591	40.34%
No	24,395	84.74%	8,092	33.17%	9,151	86.20%	817	8.93%
Long-term use anticoagulants								
Yes	260	0.90%	105	40.38%	77	0.73%	6	7.79%
No	28,528	99.10%	10,064	35.28%	10,539	99.27%	1,402	13.30%
Sterilization								
Yes <sup>2,3</sup>	2,008	6.98%	1,863	92.78%	133	1.25%	66	49.62%
No	26,780	93.02%	8,306	31.02%	10,483	98.75%	1,342	12.80%
HIV								
Yes <sup>9</sup>	51	0.18%	17	33.33%	N/A	N/A	N/A	N/A
No	28,737	99.82%	10,152	35.33%	N/A	N/A	N/A	N/A
Repeat Cesarean section proxy								
Yes <sup>2,10</sup>	6,001	20.85%	5,436	90.58%	N/A	N/A	N/A	N/A
No	22,787	79.15%	4,733	20.77%	N/A	N/A	N/A	N/A
Failed VBAC								
Yes <sup>2,11</sup>	68	0.24%	68	100.00%	N/A	N/A	N/A	N/A
No	28,720	99.76%	10,101	35.17%	N/A	N/A	N/A	N/A

Group Subset	All Kentucky MMC Enrollees with a Live or Stillborn Delivery (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among All Deliveries		Kentucky MMC Enrollees with Low-Risk Deliveries <sup>1</sup> (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Count	% Total	Count	% Subset	Count	% Total	Count	% Subset
SMFM: maternal factors								
Yes <sup>12</sup>	460	1.60%	171	37.17%	N/A	N/A	N/A	N/A
No	28,328	98.40%	9,998	35.29%	N/A	N/A	N/A	N/A
SMFM: preterm birth								
Yes <sup>2</sup>	4,975	17.28%	2,297	46.17%	N/A	N/A	N/A	N/A
No	23,813	82.72%	7,872	33.06%	N/A	N/A	N/A	N/A
SMFM: stillborn								
Yes <sup>2</sup>	307	1.07%	83	27.04%	N/A	N/A	N/A	N/A
No	28,481	98.93%	10,086	35.41%	N/A	N/A	N/A	N/A
SMFM: malpresentation								
Yes <sup>2</sup>	1,500	5.21%	1,270	84.67%	N/A	N/A	N/A	N/A
No	27,288	94.79%	8,899	32.61%	N/A	N/A	N/A	N/A
SMFM: fetal factors								
Yes <sup>2</sup>	88	0.31%	44	50.00%	N/A	N/A	N/A	N/A
No	28,700	99.69%	10,125	35.28%	N/A	N/A	N/A	N/A
SMFM: uterine/placental factors								
Yes <sup>2,13</sup>	386	1.34%	307	79.53%	N/A	N/A	N/A	N/A
No	28,402	98.66%	9,862	34.72%	N/A	N/A	N/A	N/A
SMFM: conduct of labor								
Yes <sup>14</sup>	593	2.06%	214	36.09%	N/A	N/A	N/A	N/A
No	28,195	97.94%	9,955	35.31%	N/A	N/A	N/A	N/A
SMFM: multiple gestation								
Yes <sup>2</sup>	3,351	11.64%	1,563	46.64%	N/A	N/A	N/A	N/A
No	25,437	88.36%	8,606	33.83%	N/A	N/A	N/A	N/A
Any SMFM high-risk ICD-10 code								
Yes <sup>2</sup>	18,172	63.12%	8,761	48.21%	N/A	N/A	N/A	N/A
No	10,616	36.88%	1,408	13.26%	N/A	N/A	N/A	N/A
Factors related to healthcare system								
Medical induction of labor								
Yes <sup>2,3</sup>	12,441	43.22%	1,954	15.71%	5,908	55.65%	732	12.39%
No	16,347	56.78%	8,215	50.25%	4,708	44.35%	676	14.36%
Delivery day								
Friday	4,592	15.95%	1,661	36.17%	1,654	15.58%	247	14.93%
Weekend delivery	7,246	25.17%	2,489	34.35%	2,612	24.60%	329	12.60%
All else	16,950	58.88%	6,019	35.51%	6,350	59.82%	832	13.10%
Lack of prenatal care								
Yes <sup>2,3</sup>	3,100	10.77%	968	31.23%	1,048	9.87%	107	10.21%
No	25,688	89.23%	9,201	35.82%	9,568	90.13%	1,301	13.60%

Group Subset	All Kentucky MMC Enrollees with a Live or Stillborn Delivery (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among All Deliveries		Kentucky MMC Enrollees with Low-Risk Deliveries <sup>1</sup> (Vaginal and Cesarean)		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Count	% Total	Count	% Subset	Count	% Total	Count	% Subset
MCO of enrollment <sup>2</sup>								
Aetna Better Health of Kentucky	4,080	14.17%	1,342	32.89%	1,592	15.00%	193	12.12%
Anthem BCBS Medicaid	3,346	11.62%	1,215	36.31%	1,204	11.34%	159	13.21%
Humana Healthy Horizons	2,973	10.33%	1,096	36.87%	1,018	9.59%	141	13.85%
Passport by Molina	6,342	22.03%	2,307	36.38%	1,894	17.84%	233	12.30%
WellCare of Kentucky	8,836	30.69%	3,145	35.59%	3,586	33.78%	496	13.83%
UnitedHealthcare Community Plan	3,211	11.15%	1,064	33.14%	1,322	12.45%	186	14.07%
Continuous enrollment								
Yes <sup>2</sup>	24,220	84.13%	8,666	35.78%	8,791	82.81%	1,176	13.38%
No	4,568	15.87%	1,503	32.90%	1,825	17.19%	232	12.71%

<sup>1</sup> Excluding enrollees with SMFM risk factors for Cesarean delivery and/or the repeat Cesarean section proxy measure.

<sup>2</sup> Statistically significant association with Cesarean delivery, among all deliveries (*chi-square* < 0.05)

<sup>3</sup> Statistically significant association with Cesarean delivery, among low-risk deliveries (*chi-square* < 0.05).

<sup>4</sup> Maternity desert is classified as a county without a hospital with an obstetric service and without any obstetricians.

<sup>5</sup> Arrested active phase of labor; ICD-10 code O62.1.

<sup>6</sup> Uterine inertia; ICD-10 code O62.2.

<sup>7</sup> Primary inadequate contractions; ICD-10 code O62.0.

<sup>8</sup> Abnormal fetal heart rate; ICD-10 code O76.

<sup>9</sup> Subset of SMFM maternal factors.

<sup>10</sup> Subset of uterine/placental factors.

<sup>11</sup> Subset of SMFM conduct of labor.

<sup>12</sup> Includes HIV.

<sup>13</sup> Excluding maternal care due to uterine scar from previous Cesarean delivery.

<sup>14</sup> Excluding failed attempted vaginal birth after previous Cesarean delivery.

MMC: Medicaid managed care; SMI: serious mental illness; SUD: substance use disorder; HIV: human immunodeficiency disorder; VBAC: vaginal birth after Cesarean; SMFM: Society for Maternal-Fetal Medicine; ICD-10: International Classification of Diseases, Tenth Revision; MCO: managed care organization; BCBS: Blue Cross Blue Shield; N/A: not applicable, high-risk conditions excluded from the low-risk cesarean delivery eligible population.

## Administrative Study: Multiple Logistic Regression Results

This narrative and the following subsections summarize data for statistically significant multiple logistic regression findings regarding possible risk factors for Cesarean delivery among all deliveries and among low-risk deliveries, adjusted for all other member characteristics and with all data reported in **Table 2**. Of note, clinical conditions categorized as high-risk by the SMFM do not apply to low-risk Cesarean deliveries because enrollees with these conditions were excluded from the low-risk delivery subpopulation.

### Demographic Factors

- Compared to enrollees aged 19–34 years, older maternal age (35+ years) was inversely associated with Cesarean delivery among all deliveries (odds ratio [OR] = 0.802; 95% confidence interval [CI] = 0.696, 0.923) but was not associated with low-risk Cesarean delivery.
- Compared to White enrollees, enrollees of American Indian or Alaska/Hawaiian Native race/ethnicity showed more than twice the odds for Cesarean delivery among all deliveries (OR = 2.239; 95% CI = 1.105, 4.535) but was not associated with low-risk Cesarean delivery.

- Compared to White enrollees, Black enrollees were inversely associated with Cesarean delivery among all deliveries (OR = 0.808; 95% CI = 0.713, 0.915) but was not associated with low-risk Cesarean delivery.
- Compared to White enrollees, Hispanic ethnicity was inversely associated with Cesarean delivery among all deliveries (OR = 0.525; 95% CI = 0.405, 0.682) but was not associated with low-risk Cesarean delivery.
- Compared to urban county residents, rural county residents showed 41% greater odds (OR = 1.409 95% CI = 1.260, 1.577) for Cesarean delivery among all deliveries and 69% greater odds (OR = 1.692; 95% CI = 1.372, 2.088) for low-risk Cesarean delivery.
- Compared to urban county residents, Appalachian County residents showed 38% greater odds (OR = 1.378; 95% CI = 1.247, 1.524) for Cesarean delivery among all deliveries and 25% greater odds (OR = 1.245; 95% CI = 1.034, 1.500) for low-risk Cesarean delivery.

### **Social Determinants of Health**

- Compared to enrollees not in foster care, foster care enrollees showed 67% greater odds (OR = 1.669; 95% CI = 1.027, 2.714) for Cesarean delivery among all deliveries but was not associated with low-risk Cesarean delivery.
- Compared to enrollees without adverse childhood experiences (ACEs), those with ACEs showed 69% greater odds (OR = 1.686; 95% CI = 1.031, 2.757) for Cesarean delivery among all deliveries but was not associated with low-risk Cesarean delivery.<sup>1</sup>

### **Clinical Factors – General**

- Compared to enrollees without excessive weight gain or obesity, those with excessive weight gain/obesity showed 67% greater odds (OR = 1.668; 95% CI = 1.536, 1.812) for Cesarean delivery among all deliveries and 74% greater odds (OR = 1.739; 95% CI = 1.490, 2.028) for low-risk Cesarean delivery.
- Compared to enrollees without hypertensive disorders, those with hypertensive disorders showed twice the odds (OR = 2.005; 95% CI = 1.833, 2.193) for Cesarean delivery among all deliveries and twice the odds (OR = 2.198; 95% CI = 1.867, 2.588) for low-risk Cesarean delivery.
- Compared to enrollees without diabetic disorders, those with diabetic disorders showed more than twice the odds (OR = 2.304; 95% CI = 1.868, 2.843) for Cesarean delivery among all deliveries and twice the odds (OR = 2.081; 95% CI = 1.387, 3.123) for low-risk Cesarean delivery.
- Compared to enrollees without post-term delivery, those with post-term delivery showed 50% greater odds (OR = 1.498; 95% CI = 1.199, 1.872) for low-risk Cesarean delivery but was not associated with Cesarean delivery among all deliveries.
- Compared to enrollees who did not undergo sterilization, those who underwent sterilization showed almost 11 times greater odds (OR = 10.874; 95% CI = 8.663, 13.650) for Cesarean delivery among all deliveries and almost 12 times greater odds (OR = 11.965; 95% CI = 7.862, 18.209) for low-risk Cesarean delivery.

### **Clinical Factors Related to Labor Challenges/Fetal Heart Rate Abnormalities Not Categorized As High-Risk**

- Compared to enrollees without arrested labor, those with arrested labor showed greater than 100 times the odds (OR = 134.825; 95% CI = 96.581, 188.214) for Cesarean delivery among all deliveries, as well as for low-risk Cesarean deliveries (OR = 164.523; 95% CI = 98.680, 274.299).
- Compared to enrollees without uterine inertia, those with uterine inertia showed more than three times the odds (OR = 3.567; 95% CI = 3.004, 4.219) for Cesarean delivery among all deliveries and more than four times the odds (OR = 4.575; 95% CI = 3.481, 6.014) for low-risk Cesarean delivery.
- Compared to enrollees without primary inadequate contractions, those with primary inadequate contractions showed almost 20 times greater odds (OR = 18.956; 95% CI = 15.356, 23.400) for Cesarean delivery among all deliveries and almost 25 times greater odds (OR = 24.507; 95% CI = 18.262, 32.888) for low-risk Cesarean delivery.
- Compared to deliveries without abnormal fetal heart rate, deliveries with abnormal fetal heart rate showed almost six times greater odds (OR = 5.635; 95% CI = 5.107, 6.217) for Cesarean delivery among all deliveries and more than 10 times greater odds (OR = 10.532; 95% CI = 8.970, 12.367) for low-risk Cesarean delivery.

### **Clinical Factors Categorized as High-Risk – Not Applicable to the Low-Risk Subpopulation**

- Repeat C-section proxy (maternal care due to uterine scar from previous Cesarean delivery or VBAC) was associated with almost 60 times greater odds (OR = 58.216; 95% CI = 51.951, 65.236) for Cesarean delivery among all deliveries.
- SMFM-defined maternal factors were associated with two times greater odds (OR = 2.063; 95% CI = 1.590, 2.676) for Cesarean delivery among all deliveries.

- SMFM-defined preterm birth was associated with 50% greater odds (OR = 1.491; 95% CI = 1.346, 1.652) for Cesarean delivery among all deliveries.
- SMFM-defined malpresentation was associated with almost 30 times greater odds (OR = 28.796; 95% CI = 24.179, 34.294) for Cesarean delivery among all deliveries.
- SMFM-defined fetal factors were associated with more than twice the odds (OR = 2.506; 95% CI = 1.364, 4.602) for Cesarean delivery among all deliveries.
- SMFM-defined uterine/placental factors were associated with more than 12 times greater odds (OR = 12.821; 95% CI = 9.285, 17.702) for Cesarean delivery among all deliveries.
- SMFM-defined conduct of labor factors were inversely associated with Cesarean delivery among all deliveries (OR = 0.426; 95% CI = 0.325, 0.558).
- SMFM-defined multiple gestation was associated with almost twice the odds (OR = 1.904; 95% CI = 1.691, 2.144) for Cesarean delivery among all deliveries.

### Factors Related to Healthcare System

- Medical induction of labor was inversely associated with Cesarean delivery among all deliveries (OR = 0.241; 95% CI = 0.220, 0.263) and low-risk Cesarean delivery (OR = 0.509; 95% CI = 0.437, 0.593).
- Compared to delivery Monday through Thursday (all else), delivery on a weekend was associated with approximately 12% lower odds (OR = 0.878; 95% CI = 0.800, 0.964) for Cesarean delivery among all deliveries but was not associated with low-risk Cesarean delivery.
- Compared to enrollees with (an ICD-10 code for) sufficient prenatal care, those without sufficient prenatal care showed almost 40% lower odds (OR = 0.609; 95% CI = 0.532, 0.698) for Cesarean delivery among all deliveries and 46% lower odds (OR = 0.542; 95% CI = 0.406, 0.724) for low-risk Cesarean delivery.
- Compared to enrollees without continuous enrollment, those with continuous enrollment showed 20% lower odds (OR = 0.800; 95% CI = 0.705, 0.908) for Cesarean delivery among all deliveries.

**Table 2: Multiple Logistic Regression Results – Risk Factors for Cesarean Delivery, All and Low-Risk Deliveries**

Group Subset	Outcome: Cesarean Delivery Among All Deliveries		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Odds Ratio	95% CI	Odds Ratio	95% CI
<b>Demographic factors</b>				
<b>Age group</b>				
Aged < 19 years	1.056	(0.880, 1.267)	1.200	(0.886, 1.624)
Aged 19–34 years	Referent	Referent	Referent	Referent
Aged 35+ years <sup>2</sup>	0.802	(0.696, 0.923)	0.812	(0.599, 1.100)
<b>Race/Ethnicity</b>				
White	Referent	Referent	Referent	Referent
Black <sup>2</sup>	0.808	(0.713, 0.915)	0.918	(0.712, 1.183)
Asian or Pacific Islander	0.834	(0.577, 1.206)	0.921	(0.456, 1.858)
Hispanic <sup>2</sup>	0.525	(0.405, 0.682)	0.630	(0.371, 1.069)
American Indian or Alaska/Hawaiian Native <sup>2</sup>	2.239	(1.105, 4.535)	2.018	(0.606, 6.714)
Other	0.883	(0.645, 1.209)	1.157	(0.623, 2.149)
Not reported	0.962	(0.839, 1.102)	1.002	(0.773, 1.300)
<b>Geographic area of residence</b>				
Urban	Referent	Referent	Referent	Referent
Rural <sup>2,3</sup>	1.409	(1.260, 1.577)	1.692	(1.372, 2.088)
Appalachian <sup>2,3</sup>	1.378	(1.247, 1.524)	1.245	(1.034, 1.500)
Maternity desert <sup>4</sup>	1.069	(0.974, 1.173)	0.983	(0.827, 1.169)

Group Subset	Outcome: Cesarean Delivery Among All Deliveries		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Odds Ratio	95% CI	Odds Ratio	95% CI
<b>Social determinants of health</b>				
Special enrollment status – children in foster care <sup>2</sup>	1.669	(1.026, 2.714)	0.954	(0.446, 2.040)
Special enrollment status – disabled	1.027	(0.791, 1.333)	1.405	(0.896, 2.203)
Housing issues	0.613	(0.307, 1.223)	1.041	(0.358, 3.027)
Food insecurity	0.814	(0.177, 3.736)	0.821	(0.007, 98.635)
Social connectivity issues	1.075	(0.793, 1.459)	0.941	(0.508, 1.743)
Abuse, perinatal	0.772	(0.388, 1.537)	0.477	(0.107, 2.127)
Adverse childhood experiences <sup>2</sup>	1.686	(1.031, 2.757)	1.496	(0.574, 3.898)
<b>Clinical factors</b>				
<b>SMI/SUD</b>				
SMI, only	1.084	(0.978, 1.105)	1.159	(0.958, 1.402)
SUD, only	1.003	(0.844, 1.192)	1.365	(0.994, 1.875)
Both	0.931	(0.783, 1.105)	0.832	(0.578, 1.198)
Neither	Referent	Referent	Referent	Referent
Tobacco use	1.020	(0.926, 1.124)	1.034	(0.862, 1.241)
Excessive weight gain during pregnancy or obesity (pregnancy, childbirth, or prior) <sup>2,3</sup>	1.668	(1.536, 1.812)	1.739	(1.490, 2.028)
Hypertensive disorders <sup>2,3</sup>	2.005	(1.833, 2.193)	2.198	(1.867, 2.588)
Diabetes <sup>2,3</sup>	2.304	(1.868, 2.843)	2.081	(1.387, 3.123)
Post-term delivery <sup>3</sup>	1.061	(0.914, 1.231)	1.498	(1.199, 1.872)
Arrested labor <sup>2,3,5</sup>	134.825	(96.581, 188.214)	164.523	(98.680, 274.299)
Uterine inertia <sup>2,3,6</sup>	3.567	(3.004, 4.219)	4.575	(3.481, 6.014)
Primary inadequate contractions <sup>2,3,7</sup>	18.956	(15.356, 23.400)	24.507	(18.262, 32.888)
Abnormal fetal heart rate <sup>2,3,8</sup>	5.635	(5.107, 6.217)	10.532	(8.970, 12.367)
Long-term use anticoagulants	0.719	(0.474, 1.089)	0.244	(0.069, 0.867)
Sterilization <sup>2,3</sup>	10.874	(8.663, 13.650)	11.965	(7.862, 18.209)
Repeat Cesarean section proxy <sup>2,9</sup>	58.216	(51.951, 65.236)	N/A	N/A
SMFM: maternal factors <sup>2,10</sup>	2.063	(1.590, 2.676)	N/A	N/A
SMFM: preterm birth <sup>2</sup>	1.491	(1.346, 1.652)	N/A	N/A
SMFM: stillborn	0.139	(0.093, 0.207)	N/A	N/A
SMFM: malpresentation <sup>2</sup>	28.796	(24.179, 34.294)	N/A	N/A
SMFM: fetal factors <sup>2</sup>	2.506	(1.364, 4.602)	N/A	N/A
SMFM: uterine/placental factors <sup>2,11</sup>	12.821	(9.285, 17.702)	N/A	N/A
SMFM: conduct of labor <sup>2</sup>	0.426	(0.325, 0.558)	N/A	N/A
SMFM: multiple gestation <sup>2</sup>	1.904	(1.691, 2.144)	N/A	N/A
<b>Factors related to healthcare system</b>				
Medical induction of labor <sup>2,3</sup>	0.241	(0.220, 0.263)	0.509	(0.437, 0.593)
<b>Delivery day</b>				
Friday	1.062	(0.951, 1.186)	1.193	(0.977, 1.458)
Weekend delivery <sup>2</sup>	0.878	(0.800, 0.964)	0.865	(0.721, 1.039)
All else	Referent	Referent	Referent	Referent
Lack of prenatal care <sup>2,3</sup>	0.609	(0.532, 0.698)	0.542	(0.406, 0.724)



Group Subset	Outcome: Cesarean Delivery Among All Deliveries		Outcome: Cesarean Delivery Among Low-Risk Deliveries <sup>1</sup>	
	Odds Ratio	95% CI	Odds Ratio	95% CI
MCO of enrollment				
Aetna Better Health of Kentucky	Referent	Referent	Referent	Referent
Anthem BCBS Medicaid	0.956	(0.806, 1.066)	0.847	(0.625, 1.148)
Humana Healthy Horizons	1.071	(0.911, 1.259)	1.098	(0.810, 1.489)
Passport by Molina	0.927	(0.806, 1.066)	0.918	(0.701, 1.204)
WellCare of Kentucky	1.112	(0.978, 1.265)	1.119	(0.889, 1.410)
UnitedHealthcare Community Plan	0.927	(0.773, 1.112)	0.962	(0.691, 1.343)
Continuous enrollment <sup>2</sup>	0.800	(0.705, 0.908)	0.871	(0.687, 1.104)

<sup>1</sup> Excluding enrollees with SMFM risk factors for Cesarean delivery and/or the repeat Cesarean section proxy measure.

<sup>2</sup> Statistically significant association with Cesarean delivery, among all deliveries (95% CI does not contain "1.00")

<sup>3</sup> Statistically significant association with Cesarean delivery, among low-risk deliveries (95% CI does not contain "1.00").

<sup>4</sup> Maternity desert is classified as a county without a hospital with an obstetric service and without any obstetricians. The statistics presented represent the results using a logistic regression model that substituted maternity desert county designation for geographic area county designation (urban county, rural county, Appalachian county).

<sup>5</sup> Arrested active phase of labor; ICD-10 code O62.1.

<sup>6</sup> Uterine inertia; ICD-10 code O62.2.

<sup>7</sup> Primary inadequate contractions; ICD-10 code O62.0.

<sup>8</sup> Abnormal fetal heart rate; ICD-10 code O76.

<sup>9</sup> Subset of SMFM uterine/placental factors.

<sup>10</sup> Includes HIV.

<sup>11</sup> Excluding maternal care due to uterine scar from previous Cesarean delivery.

Note: Blue shading represents subheadings for characteristics with multiple subsets shown, as well as characteristics without multiple subsets; for the latter, the subset not shown includes enrollees without the characteristic (referent).

CI: confidence interval; SMI: serious mental illness; SUD: substance use disorder; SMFM: Society for Maternal-Fetal Medicine; MCO: managed care organization; BCBS: Blue Cross Blue shield; ICD-10: International Classification of Diseases, Tenth Revision; HIV: human immunodeficiency disorder; N/A: not applicable, high-risk conditions excluded from the low-risk cesarean delivery eligible population.

## Hospital Chart Review

### Total Chart Review Sample

Of the total 404 hospital records requested, 354 (87.62%) were received, with MCO rates of record receipt ranging from 68.49% (UnitedHealthcare Community Plan) to 97.26% (Anthem Blue Cross Blue Shield Medicaid; **Table 3**). Two records were ineligible for review due to vaginal delivery rather than Cesarean delivery, for a total of 352 records eligible for review. Of the 352 Cesarean delivery records reviewed, 164 (46.59%) documented primary Cesarean deliveries and 188 (53.41%) documented repeat Cesarean deliveries. Approximately two-thirds (66.49%) of the repeat Cesarean deliveries were for enrollees with one prior Cesarean delivery, and one-third (33.51%) of the repeat Cesarean deliveries were for enrollees with more than one prior Cesarean delivery (**Table 3**). Almost one-fifth (18.75%) of the records reviewed documented enrollees who underwent tubal ligation.

**Table 3: Frequency and Proportions of Delivery Type by MCO**

Delivery Type <sup>1</sup>	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total records requested: #	47	73	65	73	73	73	404
Records received: #	45	71	61	57	70	50	354
% of total requested	95.74%	97.26%	93.85%	78.08%	95.89%	68.49%	87.62%



Delivery Type <sup>1</sup>	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Records excluded from review due to vaginal delivery: #	0	1	0	1	0	0	2
% of total received	0.00%	1.41%	0.00%	1.75%	0.00%	0.00%	0.56%
# records eligible for review	45	70	61	56	70	50	352
% of records requested	95.74%	95.89%	93.85%	76.71%	95.89%	68.49%	87.13%
Primary C-sections: #	14	34	29	26	28	33	164
% of total reviewed	31.11%	48.57%	47.54%	46.43%	40.00%	66.00%	46.59%
Primary – scheduled: #	3	10	10	3	6	12	44
% of primary C-sections	21.43%	29.41%	34.48%	11.54%	21.43%	36.36%	26.83%
Primary – emergency: #	1	3	2	1	2	1	10
% of primary C-sections	7.14%	8.82%	6.90%	3.85%	7.14%	3.03%	6.10%
Repeat C-sections: #	31	36	32	30	42	17	188
% of total reviewed	68.89%	51.43%	52.46%	53.57%	60.00%	34.00%	53.41%
TOLAC: #	1	2	1	0	3	0	7
% of repeat C-sections	3.23%	5.56%	3.13%	0.00%	7.14%	0.00%	3.72%
Repeat – scheduled: #	20	33	28	24	37	14	156
% of repeat C-sections	64.52%	91.67%	87.50%	80.00%	88.10%	82.35%	82.98%
One prior C-section: #	22	25	20	15	31	12	125
% of repeat C-sections	70.97%	69.44%	62.50%	50.00%	73.81%	70.59%	66.49%
More than one prior C-section: #	9	11	12	15	11	5	63
% of repeat C-sections	29.03%	30.56%	37.50%	50.00%	26.19%	29.41%	33.51%
Tubal ligation: #	9	10	10	10	19	8	66
% of records reviewed	20.00%	14.29%	16.39%	17.86%	27.14%	16.00%	18.75%

<sup>1</sup> This sample represents used the original selection criteria based upon CPT code 59510, which was intended to select only those enrollees with primary C-section but also included enrollees with repeat C-section.

MCO: managed care organization; BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; C-section: Cesarean section; TOLAC; trial of labor after C-section; CPT: Current Procedural Terminology.

### Primary Cesarean Delivery Chart Review Sample: Demographic Factors

- Age: most (92.07%) of the 164 enrollees with a primary Cesarean delivery were 19–34 years of age, followed by those aged 35 years and older (4.27%) and those aged younger than 19 years of age (3.66%; **Table 4**).
- Race: most hospital records did not document race/ethnicity (53.05%; **Table 4**). The greatest proportion with documented race/ethnicity was comprised of White enrollees (41.46%), followed by Black enrollees (3.66%).
- Ethnicity: most hospital records documented non-Hispanic ethnicity (27.44%).
- Education: only 10.37% of hospital records documented educational level (**Table 4**). The greatest proportion with documented educational level was comprised of enrollees with a high school diploma or GED (4.27%); the same proportion was found among those with some college education but no degree.
- Living situation: only 4.88% of hospital records documented that the enrollee lives alone (**Table 4**).
- Number of children: most (67.07%) of the hospital records documented that the enrollee had no children, followed by 15.24% with one child, 4.88% with two children, and 3.05% with three or more children (**Table 4**).

**Table 4: Primary Cesarean Delivery Chart Review Sample – Demographic Factors**

Demographic Factors <sup>1</sup>	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
<b>Age group</b>							
Aged < 19 years: #	1	0	1	1	2	1	6
% total	7.14%	0.00%	3.45%	3.85%	7.14%	3.03%	3.66%
Aged 19–34 years: #	12	31	28	25	25	30	151
% total	85.71%	91.18%	96.55%	96.15%	89.29%	90.91%	92.07%
Aged 35+ years: #	1	3	0	0	1	2	7
% total	7.14%	8.82%	0.00%	0.00%	3.57%	6.06%	4.27%
<b>Race</b>							
White: #	0	12	12	15	16	13	68
% total	0.00%	35.29%	41.38%	57.69%	57.14%	39.39%	41.46%
Black: #	0	1	2	2	1	0	6
% total	0.00%	2.94%	6.90%	7.69%	3.57%	0.00%	3.66%
Asian: #	0	0	0	0	1	0	1
% total	0.00%	0.00%	0.00%	0.00%	3.57%	0.00%	0.61%
American Indian: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Multiple categories: #	1	0	0	0	0	0	1
% total	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.61%
Other: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Not reported: #	13	20	15	9	10	20	87
% total	92.86%	58.82%	51.72%	34.62%	35.71%	60.61%	53.05%
<b>Ethnicity</b>							
Hispanic: #	0	0	0	2	0	2	4
% total	0.00%	0.00%	0.00%	7.69%	0.00%	6.06%	2.44%
Non-Hispanic: #	0	4	10	13	11	7	45
% total	0.00%	11.76%	34.48%	50.00%	39.29%	21.21%	27.44%
<b>Maternal educational level</b>							
Less than high school: #	0	0	0	1	1	0	2
% total	0.00%	0.00%	0.00%	3.85%	3.57%	0.00%	1.22%
High school diploma/GED: #	0	0	0	2	4	1	7
% total	0.00%	0.00%	0.00%	7.69%	14.29%	3.03%	4.27%
Business/technical school: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Some college, no degree: #	0	1	2	1	2	1	7
% total	0.00%	2.94%	6.90%	3.85%	7.14%	3.03%	4.27%
College degree or higher: #	0	0	0	0	1	0	1
% total	0.00%	0.00%	0.00%	0.00%	3.57%	0.00%	0.61%
Lives alone: #	0	0	6	0	0	2	8
% total	0.00%	0.00%	20.69%	0.00%	0.00%	6.06%	4.88%

Demographic Factors <sup>1</sup>	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Number of children							
No children: #	8	25	18	16	21	22	110
% total	57.14%	73.53%	62.07%	61.54%	75.00%	66.67%	67.07%
One child: #	2	6	7	3	3	4	25
% total	14.29%	17.65%	24.14%	11.54%	10.71%	12.12%	15.24%
Two children: #	1	0	3	1	2	1	8
% total	7.14%	0.00%	10.34%	3.85%	7.14%	3.03%	4.88%
Three or more children: #	1	1	1	1	1	0	5
% total	7.14%	2.94%	3.45%	3.85%	3.57%	0.00%	3.05%

<sup>1</sup> This chart review sample represents used the original selection criteria based upon CPT code 59510, which was intended to select only those enrollees with primary Cesarean section but also included enrollees with repeat Cesarean section. Therefore, for this table, the original sample was restricted to enrollees with a primary Cesarean delivery as documented in the hospital record. BCBS: Blue Cross Blue Shield, UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; GED: General Educational Development; CPT: Current Procedural Terminology.

### Primary Cesarean Delivery Chart Review Sample: Obstetric Profile

- Pregnancy term status: most (57.93%) of the 164 enrollees with a primary Cesarean delivery delivered at term (37–39 weeks gestation), followed by 23.17% who delivered post-term and 18.29% who delivered preterm (< 37 weeks gestation; **Table 5**).
- Infant birth weight: most infants (63.41%) weighed 2,500–4,000 grams at birth, followed by infants weighing 1,000–2,499 grams (14.02%), infants weighing greater than or equal to 4,000 grams (5.49%), and one infant weighing less than or equal to 999 grams (0.61%; **Table 5**).
- Parity: of the 164 enrollees, there were 99 enrollees (60.37%) who were nulliparous, followed by 24.39% who were primiparous, 12.20% who were multiparous, and 1.83% who were of grand multiparous status (**Table 5**).
- Late prenatal care: there were only 4 (2.44%) of the 164 primary Cesarean delivery charts that documented late prenatal care (**Table 5**).

**Table 5: Primary Cesarean Delivery Chart Review Sample – Obstetric Profile**

Obstetric Profile	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
37–39 weeks gestation at delivery: #	9	19	17	11	17	22	95
% total	64.29%	55.88%	58.62%	42.31%	60.71%	66.67%	57.93%
< 37 weeks gestation at delivery: #	1	9	5	2	6	7	30
% total	7.14%	26.47%	17.24%	7.69%	21.43%	21.21%	18.29%
Post-term: #	4	5	7	13	5	4	38
% total	28.57%	14.71%	24.14%	50.00%	17.86%	12.12%	23.17%

Obstetric Profile	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Birth weight							
≤ 999 grams: #	0	1	0	0	0	0	1
% total	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	0.61%
1,000–2,499 grams: #	2	6	5	1	4	5	23
% total	14.29%	17.65%	17.24%	3.85%	14.29%	15.15%	14.02%
2,500–4,000 grams: #	9	21	20	20	17	17	104
% total	64.29%	61.76%	68.97%	76.92%	60.71%	51.52%	63.41%
≥ 4,000 grams: #	2	1	1	2	1	2	9
% total	14.29%	2.94%	3.45%	7.69%	3.57%	6.06%	5.49%
Nulliparous: #	8	25	0	19	21	26	99
% total	57.14%	73.53%	0.00%	73.08%	75.00%	78.79%	60.37%
Primiparous: #	3	6	18	3	4	6	40
% total	21.43%	17.65%	62.07%	11.54%	14.29%	18.18%	24.39%
Multiparous: #	2	1	11	2	3	1	20
% total	14.29%	2.94%	37.93%	7.69%	10.71%	3.03%	12.20%
Grand multiparous: #	1	0	0	2	0	0	3
% total	7.14%	0.00%	0.00%	7.69%	0.00%	0.00%	1.83%
Late prenatal care: #	0	0	0	2	1	1	4
% total	0.00%	0.00%	0.00%	7.69%	3.57%	3.03%	2.44%

BCBS: Blue Cross Blue Shield, UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care.

### Primary Cesarean Delivery Chart Review Sample: Medical Conditions Documented as Indications for Primary Cesarean Delivery

- Any of the SMFM-identified high-risk factors for Cesarean delivery were documented as indications for Cesarean delivery for 33.54% of the 164 primary Cesarean delivery charts reviewed (**Table 6**).
- Of the conditions not identified by the SMFM as risk factors for Cesarean delivery, arrest of labor was the most frequently documented (35.37%), followed by abnormal fetal heart tracing (28.66%) and suspected fetal macrosomia (10.98%; **Table 6**).
- Maternal request was documented as the indication for primary Cesarean delivery for 7.93% of the 164 hospital records reviewed (**Table 6**).
- Other indications documented included intrauterine growth restriction (IUGR; n = 7), hypertensive disorder (n = 7), history of shoulder dystocia (n=4), and malpresentation other than breech (n = 3; **Table 6**).

**Table 6: Primary Cesarean Delivery Chart Review Sample – Medical Conditions Documented as Indications for Primary Cesarean Delivery**

Medical Conditions Documented as Indications for Primary Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Health Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
Any SMFM factor: #	1	13	16	5	9	11	55
% total	7.14%	38.24%	55.17%	19.23%	32.14%	33.33%	33.54%
Arrest of labor: #	6	10	4	12	12	14	58
% Total	42.86%	29.41%	13.79%	46.15%	42.86%	42.42%	35.37%
Abnormal fetal heart tracing: #	4	12	6	10	10	5	47
% total	28.57%	35.29%	20.69%	38.46%	35.71%	15.15%	28.66%
Suspected fetal macrosomia: #	2	4	2	4	2	4	18
% total	14.29%	11.76%	6.90%	15.38%	7.14%	12.12%	10.98%
Maternal request: #	0	4	1	1	3	4	13
% total	0.00%	11.76%	3.45%	3.85%	10.71%	12.12%	7.93%
Other: #	2	12	5	4	7	4	34
% total	14.29%	35.29%	17.24%	15.38%	25.00%	12.12%	20.73%
<b>Other indications</b>							
Other indication A: #	IUGR x 1	IUGR x 5	Congenital fetal heart disease x 1	History perinatal laceration x 2	IUGR and pre-eclampsia x 1	Fetal head size > 99th percentile, patient desires to prevent laceration x 1	N/A
Other indication B: #	History shoulder dystocia and neonatal brachial plexus injury x 1	Gestational hypertension x 2; chronic hypertension x 1	History shoulder dystocia x 2	Pre-eclampsia x 1	History shoulder dystocia x 1	Pre-eclampsia x 2; gestational hypertension x 1	N/A

Medical Conditions Documented as Indications for Primary Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Health Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Other indication C: #	N/A	Diabetes x 1	Marginal cord insertion x 1	Intractable abdominal pain and UTI x 1	Asynclitic forehead presentation x 1; incomplete rotation fetal head x 1; right occiput transverse fetal position x 1	N/A	N/A
Other indication D: #	N/A	Lupus, anticoagulant x 1	Lupus, history x 1	Cephalopelvic disproportion x1	N/A	N/A	N/A
Other indication E: #	N/A	Post-date x 2	N/A	N/A	AV (heart) block x 1; suspected herpes simplex virus exposure/ infection x 1	N/A	N/A

BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; SMFM: Society for Maternal-Fetal Medicine; IUGR: intrauterine growth restriction; UTI: urinary tract infection; AV: atrioventricular; N/A: not applicable.

**Primary Cesarean Delivery Chart Review Sample: Documented Conditions, Not Restricted to Those Documented as Indications for Primary Cesarean Delivery**

- Any of the SMFM-identified high risk factors for Cesarean delivery were documented in the hospital record for 34.76% of the 164 primary Cesarean delivery charts reviewed (**Table 7**). The most documented SMFM factor was malpresentation (17.07%), followed by preterm birth (10.37%), maternal factors (9.15%), uterine/placental factors (3.05%), and multiple gestation (2.44%).
- Labor abnormalities other than SMFM factors were documented in 35.37% of the primary Cesarean delivery charts (**Table 7**). The most documented labor abnormality was primary inadequate contractions, latent phase (19.51%), followed by arrest of active labor (12.80%), other uterine inertia (2.44%), and only one record that documented secondary hypotonic uterine dysfunction, especially during the active phase.
- Non-reassuring fetal heart tracking was documented in 29.88% of the primary Cesarean delivery charts (**Table 7**).
- Fetal macrosomia or suspected fetal macrosomia was documented in 12.80% of the primary Cesarean delivery charts (**Table 7**).
- Among the hypertensive conditions, gestational hypertension was documented in 35.37% of the primary Cesarean delivery charts, followed by pre-eclampsia (18.90%) and pre-existing hypertension (6.71%; **Table 7**).
- Among the diabetes conditions, gestational diabetes was documented in 12.80% of the primary Cesarean delivery charts, and pre-existing diabetes was documented in 5.49% of primary Cesarean delivery charts (**Table 7**).
- Obesity was documented in 31.10% of the primary Cesarean delivery charts (**Table 7**).
- Maternal infection other than HIV was documented in 9.15% of the primary Cesarean delivery charts (**Table 7**).

**Table 7: Primary Cesarean Delivery Chart Review Sample – Documented Conditions, Not Restricted to Those Documented as Indications for Primary Cesarean Delivery**

Documented Conditions, Not Restricted to Those Documented as Indications for Primary Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
Any SMFM factor: #	2	12	18	5	9	11	57
% total	14.29%	35.29%	62.07%	19.23%	32.14%	33.33%	34.76%
SMFM – conduct of labor: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SMFM – fetal factors: #	0	0	0	0	0	1	1
% total	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.61%
SMFM – malpresentation: #	1	5	7	3	6	6	28
% total	7.14%	14.71%	24.14%	11.54%	21.43%	18.18%	17.07%
SMFM – maternal factors: #	0	1	13	1	0	0	15
% total	0.00%	2.94%	44.83%	3.85%	0.00%	0.00%	9.15%
SMFM – multiple gestation: #	0	0	2	0	1	1	4
% Total	0.00%	0.00%	6.90%	0.00%	3.57%	3.03%	2.44%
SMFM – preterm birth: #	1	6	0	1	5	4	17
% total	7.14%	17.65%	0.00%	3.85%	17.86%	12.12%	10.37%



Documented Conditions, Not Restricted to Those Documented as Indications for Primary Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
SMFM – stillborn: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SMFM – uterine/placental factors: #	1	1	0	1	1	1	5
% total	7.14%	2.94%	0.00%	3.85%	3.57%	3.03%	3.05%
No SMFM conditions: #	12	21	11	20	18	22	104
% total	85.71%	61.76%	37.93%	76.92%	64.29%	66.67%	63.41%
Arrest of active labor: #	2	1	2	10	1	5	21
% total	14.29%	2.94%	6.90%	38.46%	3.57%	15.15%	12.80%
Secondary hypotonic uterine dysfunction, especially active phase: #	0	0	0	0	0	1	1
% total	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.61%
Primary inadequate contractions, latent phase: #	3	7	3	2	9	8	32
% total	21.43%	20.59%	10.34%	7.69%	32.14%	24.24%	19.51%
Other uterine inertia: #	1	1	0	0	2	0	4
% total	7.14%	2.94%	0.00%	0.00%	7.14%	0.00%	2.44%
Any of the above four labor abnormalities: #	6	9	5	12	12	14	58
% total	42.86%	26.47%	17.24%	46.15%	42.86%	42.42%	35.37%
Non-reassuring fetal heart tracing: #	4	12	8	10	10	5	49
% total	28.57%	35.29%	27.59%	38.46%	35.71%	15.15%	29.88%
Fetal macrosomia or suspected fetal macrosomia: #	2	4	2	7	2	4	21
% total	14.29%	11.76%	6.90%	26.92%	7.14%	12.12%	12.80%
Pre-existing hypertension: #	0	2	3	1	3	2	11
% total	0.00%	5.88%	10.34%	3.85%	10.71%	6.06%	6.71%
Gestational hypertension: #	4	14	13	11	8	8	58
% total	28.57%	41.18%	44.83%	42.31%	28.57%	24.24%	35.37%
Pre-eclampsia: #	3	6	5	6	4	7	31
% total	21.43%	17.65%	17.24%	23.08%	14.29%	21.21%	18.90%
Pre-existing diabetes: #	2	1	2	1	1	2	9
% total	14.29%	2.94%	6.90%	3.85%	3.57%	6.06%	5.49%
Gestational diabetes: #	2	2	1	7	2	7	21
% total	14.29%	5.88%	3.45%	26.92%	7.14%	21.21%	12.80%

Documented Conditions, Not Restricted to Those Documented as Indications for Primary Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Obesity: #	2	12	14	6	9	8	51
% total	14.29%	35.29%	48.28%	23.08%	32.14%	24.24%	31.10%
Maternal infection (other than HIV): #	1	2	4	1	5	2	15
% total	7.14%	5.88%	13.79%	3.85%	17.86%	6.06%	9.15%
None of the above conditions: #	0	2	0	1	1	3	7
% total	0.00%	5.88%	0.00%	3.85%	3.57%	9.09%	4.27%
None – other physical health condition: #	0	0	0	1	0	0	1
% total	0.00%	0.00%	0.00%	3.85%	0.00%	0.00%	0.61%
Other physical health conditions	N/A	N/A	N/A	Intractable abdominal pain, UTI, left kidney HDN	N/A	N/A	N/A
None – other behavioral health conditions: #	0	0	0	0	0	1	1
% total	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.61%
Other behavioral health conditions	N/A	N/A	N/A	N/A	N/A	Anxiety, depression	N/A

BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; SMFM: Society for Maternal-Fetal Medicine; HIV: human immunodeficiency disorder; UTI: urinary tract infection; N/A: not applicable; HDN: hydronephrosis.

### Primary Cesarean Delivery Chart Review Sample: Hospital Practices

- Induction of labor was documented in 54.27% of the primary Cesarean delivery hospital records; however, none of these enrollees' claims contained an ICD-10 code for either failed medical induction of labor or failed other induction of labor (**Table 8**).
- Continuous fetal monitoring during labor was documented in 53.66% of the primary Cesarean delivery hospital records and intermittent fetal monitoring in 2.44% of primary Cesarean delivery hospital records (**Table 8**).
- Slightly over two percent (2.44%) of charts documented external cephalic version for breech presentation during the hospital stay for the primary Cesarean delivery (**Table 8**).
- Documentation of a doula or nurse midwife was present for 13.41% of the primary Cesarean delivery hospital records, with MCO rates ranging from 0.00% (Aetna Better Health of Kentucky and UnitedHealthcare Community Plan) to 35.71% (WellCare of Kentucky; **Table 8**).
- Non-pharmacologic support was documented in 17.07% of the records, with MCO rates ranging from 0.00% (Aetna Better Health of Kentucky and UnitedHealthcare Community Plan) to 32.14% (WellCare of Kentucky; **Table 8**).

**Table 8: Primary Cesarean Delivery Chart Review Sample – Hospital Practices**

Hospital Practices	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
Induction documented in hospital record: #	9	14	15	17	18	16	89
% total	64.29%	41.18%	51.72%	65.38%	64.29%	48.48%	54.27%
ICD-10 code – failed medical induction of labor: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ICD-10 code – failed other induction of labor: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Fetal monitoring during labor – continuous: #	7	19	15	15	20	12	88
% total	50.00%	55.88%	51.72%	57.69%	71.43%	36.36%	53.66%
Fetal monitoring during labor – intermittent: #	0	0	2	1	0	1	4
% total	0.00%	0.00%	6.90%	3.85%	0.00%	3.03%	2.44%
Fetal monitoring method not specified, or patient did not undergo labor: #	5	10	7	5	4	15	46
% total	35.71%	29.41%	24.14%	19.23%	14.29%	45.45%	28.05%
External cephalic version for breech presentation – prior to admission: #	0	0	0	0	1	0	1
% total	0.00%	0.00%	0.00%	0.00%	3.57%	0.00%	0.61%
External cephalic version for breech presentation – during hospital stay: #	2	1	0	1	0	0	4
% total	14.29%	2.94%	0.00%	3.85%	0.00%	0.00%	2.44%
Doula: #	0	3	7	2	10	0	22
% total	0.00%	8.82%	24.14%	7.69%	35.71%	0.00%	13.41%
Non-pharmacologic support: #	0	5	7	7	9	0	28
% total	0.00%	14.71%	24.14%	26.92%	32.14%	0.00%	17.07%

BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; ICD-10: International Classification of Diseases, Tenth Revision.

**Primary Cesarean Delivery Chart Review Sample: Social Determinants of Health**

- Documentation of SDoH in the hospital record was minimal in the hospital record (**Table 9**).
- Of the four enrollees with documented language issues, all were offered and accepted interpreter services (**Table 9**).

**Table 9: Primary Cesarean Delivery Chart Review Sample – Social Determinants of Health**

Social Determinants of Health	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
Housing issues: #	0	0	0	1	0	0	1
% total	0.00%	0.00%	0.00%	3.85%	0.00%	0.00%	0.61%
Food insecurity: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Social connectivity: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Abuse, perinatal: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ACE: #	1	0	0	0	0	0	1
% total	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.61%
Frailty: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Education issues (e.g., literacy): #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Language barriers</b>							
Language barriers: #	0	0	1	1	1	1	4
% total	0.00%	0.00%	3.45%	3.85%	3.57%	3.03%	2.44%
Hearing barriers: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Interpreter services</b>							
Offered and accepted: #	0	0	1	1	1	1	4
% of enrollees with language barriers	N/A	N/A	100%	100%	100%	100%	100%
Financial issues: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care; ACE: adverse childhood experience; N/A: not applicable.

**Primary Cesarean Delivery Chart Review Sample: Reasons for Maternal Request for Cesarean Delivery**

- Doctor’s suggestion was the most documented reason for maternal request for Cesarean delivery (70.12%; **Table 10**). Abnormal prenatal examination was documented in 26.22% of hospital records. Provider concern regarding projected infant body weight was documented in 11.59% of hospital records, with 4.27% of records documenting both provider and maternal concerns about infant body weight.
- The most prevalent time of birth was 7am to noon (31.10%), followed by after 7 pm but before midnight (20.12%) and after midnight but before 7 am (9.15%; **Table 10**).

- Maternal emotional aspects were documented in 4.88% of the primary Cesarean delivery hospital records, followed by experience of prior bad delivery (4.27%), avoidance of long labor (2.44%), prior pelvic floor and vaginal trauma (3.05%), and current pelvic floor and vaginal trauma (1.22%; **Table 10**). Anxiety for fetal injury/death and anxiety for gynecological example were each documented in one record (0.61%).

**Table 10: Primary Cesarean Delivery Chart Review – Reasons for Maternal Request for Cesarean Delivery**

Reasons for Maternal Request for Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Total primary Cesarean delivery charts reviewed	14	34	29	26	28	33	164
Anxiety for fetal injury/death: #	0	0	0	0	0	1	1
% total	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.61%
Pelvic floor and vaginal trauma – prior: #	0	1	0	2	0	2	5
% total	0.00%	2.94%	0.00%	7.69%	0.00%	6.06%	3.05%
Pelvic floor and vaginal trauma – current: #	0	0	0	1	1	0	2
% total	0.00%	0.00%	0.00%	3.85%	3.57%	0.00%	1.22%
Doctor’s suggestion: #	7	29	22	17	25	15	115
% total	50.00%	85.29%	75.86%	65.38%	89.29%	45.45%	70.12%
Time of birth – 7 am to noon: #	7	10	6	9	7	12	51
% total	50.00%	29.41%	20.69%	34.62%	25.00%	36.36%	31.10%
Time of birth – after noon but before 7 pm: #	4	12	11	5	11	4	47
% total	28.57%	35.29%	37.93%	19.23%	39.29%	12.12%	28.66%
Time of birth – after 7 pm but before midnight: #	3	5	10	6	4	5	33
% total	21.43%	14.71%	34.48%	23.08%	14.29%	15.15%	20.12%
Time of birth – after midnight but before 7 am: #	0	4	2	4	3	2	15
% total	0.00%	11.76%	6.90%	15.38%	10.71%	6.06%	9.15%
Experience of prior bad delivery: #	2	1	0	1	1	2	7
% total	14.29%	2.94%	0.00%	3.85%	3.57%	6.06%	4.27%
Anxiety for gynecological exam: #	1	0	0	0	0	0	1
% total	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.61%

Reasons for Maternal Request for Cesarean Delivery	Aetna Better Health of Kentucky	Anthem BCBS Medicaid	Humana Healthy Horizons	Passport by Molina	WellCare of Kentucky	UHC	Total Kentucky MMC
Avoidance of long labor: #	0	0	1	1	2	0	4
% total	0.00%	0.00%	3.45%	3.85%	7.14%	0.00%	2.44%
Emotional aspects: #	0	0	1	3	2	2	8
% total	0.00%	0.00%	3.45%	11.54%	7.14%	6.06%	4.88%
Projected body weight of infant at birth – concerns expressed by mother only: #	0	0	0	0	0	0	0
% total	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Projected body weight of infant at birth – concerns expressed by provider only: #	1	5	3	5	2	3	19
% total	7.14%	14.71%	10.34%	19.23%	7.14%	9.09%	11.59%
Projected body weight of infant at birth – concerns expressed by mother and provider: #	1	0	0	2	1	3	7
% total	7.14%	0.00%	0.00%	7.69%	3.57%	9.09%	4.27%
Abnormal prenatal exam: #	3	8	5	12	4	11	43
% total	21.43%	23.53%	17.24%	46.15%	14.29%	33.33%	26.22%

BCBS: Blue Cross Blue Shield; UHC: UnitedHealthcare Community Plan; MMC: Medicaid managed care.

### Low-Risk Primary Cesarean Delivery Chart Review Subsample: Clinical Factors and Hospital Practices

This subsample represents all the hospital records reviewed that documented NTSV Cesarean deliveries without any of the SMFM high-risk factors (**Table 11**):

- There was a total of 65 enrollees in this low-risk primary Cesarean delivery subsample, representing 39.63% of the 164 primary Cesarean delivery sample. There were 33 delivery hospitals among this subset. The highest volume hospitals included Baptist Health Louisville (n = 8), followed by Norton Women’s and Children’s Hospital (n = 5), Taylor Regional Hospital (n = 4), and T. J. Samson Community Hospital (n = 4).
- Clinical factors: the most prevalent clinical factor among low-risk primary Cesarean deliveries was arrest of labor, with a total rate of 61.54%, primarily documented as primary inadequate contractions (35.38%) and arrested active phase of labor (20.00%). Non-reassuring fetal heart rate comprised 26.15% of low-risk primary Cesarean deliveries.
- Hospital practices: the vast majority of fetal monitoring was conducted using continuous, electronic monitoring (64.62%), with 1.54% documenting intermittent auscultation. More than three-fourths (75.38%) of low-risk primary Cesarean deliveries underwent induction of labor. Only 15.38% of this subsample documented one-on-one emotional support, physical comfort, or instruction on relaxation and coping techniques during labor by a doula, midwife, or nurse.

**Table 11: Low-Risk Primary Cesarean Delivery Chart Review Subsample – Clinical Factors and Hospital Practices**

Hospital Name <sup>1</sup>	Low-Risk Primary Cesarean Deliveries		Arrest of Labor: Arrested Active Phase of Labor		Arrest of Labor: Primary Inadequate Contractions		Arrest of Labor: Other Uterine Inertia		Subtotal of Arrested Labor		Non-reassuring Fetal Heart Rate		Fetal Monitoring: Continuous/Electronic		Fetal Monitoring: Intermittent/Auscultation		Induction of Labor		Doula, Midwife, or Nurse Provided 1:1 Support	
	#	% of Total	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital
Baptist Health Louisville	8	12.31%	3	37.50%	3	37.50%	0	0.00%	6	75.00%	2	25.00%	5	62.50%	0	0.00%	7	87.50%	0	0.00%
Norton Women’s and Children’s Hospital	5	7.69%	0	0.00%	3	60.00%	0	0.00%	3	60.00%	2	40.00%	3	60.00%	0	0.00%	3	60.00%	0	0.00%
Taylor Regional Hospital	4	6.15%	1	25.00%	1	25.00%	0	0.00%	2	50.00%	1	25.00%	2	50.00%	0	0.00%	3	75.00%	0	0.00%
T. J. Samson Community Hospital	4	6.15%	0	0.00%	3	75.00%	1	25.00%	4	100.00%	0	0.00%	4	100.00%	0	0.00%	4	100.00%	2	50.00%
Baptist Health Lexington	3	4.62%	3	100.00%	0	0.00%	0	0.00%	3	100.00%	0	0.00%	2	66.67%	1	33.33%	2	66.67%	1	33.33%
Medical Center Bowling Green	3	4.62%	1	33.33%	1	33.33%	0	0.00%	2	66.67%	0	0.00%	2	66.67%	0	0.00%	2	66.67%	0	0.00%
Owensboro Health Twin Lakes Medical Center	3	4.62%	2	66.67%	0	0.00%	0	0.00%	2	66.67%	0	0.00%	2	66.67%	0	0.00%	2	66.67%	0	0.00%
Baptist Health Hardin	2	3.08%	1	50.00%	0	0.00%	0	0.00%	1	50.00%	1	50.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%
Baptist Health Richmond	2	3.08%	0	0.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%
Georgetown Community Hospital	2	3.08%	1	50.00%	0	0.00%	0	0.00%	1	50.00%	1	50.00%	0	0.00%	0	0.00%	1	50.00%	0	0.00%
Jackson Purchase Medical Center	2	3.08%	0	0.00%	0	0.00%	2	100.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%	1	50.00%	2	100.00%
Mercy Health Lourdes Hospital	2	3.08%	0	0.00%	1	50.00%	0	0.00%	1	50.00%	1	50.00%	1	50.00%	0	0.00%	2	100.00%	0	0.00%
Norton Hospital	2	3.08%	0	0.00%	1	50.00%	0	0.00%	1	50.00%	2	100.00%	1	50.00%	0	0.00%	1	50.00%	0	0.00%
Owensboro Health Regional Hospital	2	3.08%	0	0.00%	1	50.00%	0	0.00%	1	50.00%	1	50.00%	2	100.00%	0	0.00%	2	100.00%	2	100.00%
Saint Joseph London	2	3.08%	1	50.00%	1	50.00%	0	0.00%	2	100.00%	0	0.00%	1	50.00%	0	0.00%	1	50.00%	0	0.00%
Saint Joseph East	2	3.08%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	50.00%	2	100.00%	0	0.00%	2	100.00%	0	0.00%
Baptist Health Corbin Women’s Health	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Baptist Health Deaconess Madisonville	1	1.54%	0	0.00%	0	0.00%	1	100.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Baptist Health Paducah	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Clark Regional Medical Center	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	1	100.00%	0	0.00%	1	100.00%	1	100.00%



Hospital Name <sup>1</sup>	Low-Risk Primary Cesarean Deliveries		Arrest of Labor: Arrested Active Phase of Labor		Arrest of Labor: Primary Inadequate Contractions		Arrest of Labor: Other Uterine Inertia		Subtotal of Arrested Labor		Non-reassuring Fetal Heart Rate		Fetal Monitoring: Continuous/Electronic		Fetal Monitoring: Intermittent/Auscultation		Induction of Labor		Doula, Midwife, or Nurse Provided 1:1 Support	
	#	% of Total	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital	#	% of Hospital
Deaconess Midtown Campus Hospital	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	1	100.00%
Frankfort Regional Medical Center	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	0	0.00%
Harrison Memorial Hospital	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Jennie Stuart Medical Center	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Lake Cumberland Regional Hospital	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	1	100.00%
Meadowview Regional Medical Center	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Murray Calloway County Hospital	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Norton Healthcare – hospital unknown	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Saint Joseph Mount Sterling Birthing Center	1	1.54%	0	0.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	0	0.00%
Spring View Hospital	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
The Christ Hospital	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
University of Kentucky Healthcare Lexington	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	0	0.00%	0	0.00%	1	100.00%	0	0.00%
University of Louisville Hospital	1	1.54%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	100.00%	1	100.00%	0	0.00%	1	100.00%	0	0.00%
Total low-risk primary Cesarean deliveries	65	100.00%	13	20.00%	23	35.38%	4	6.15%	40	61.54%	17	26.15%	42	64.62%	1	1.54%	49	75.38%	10	15.38%

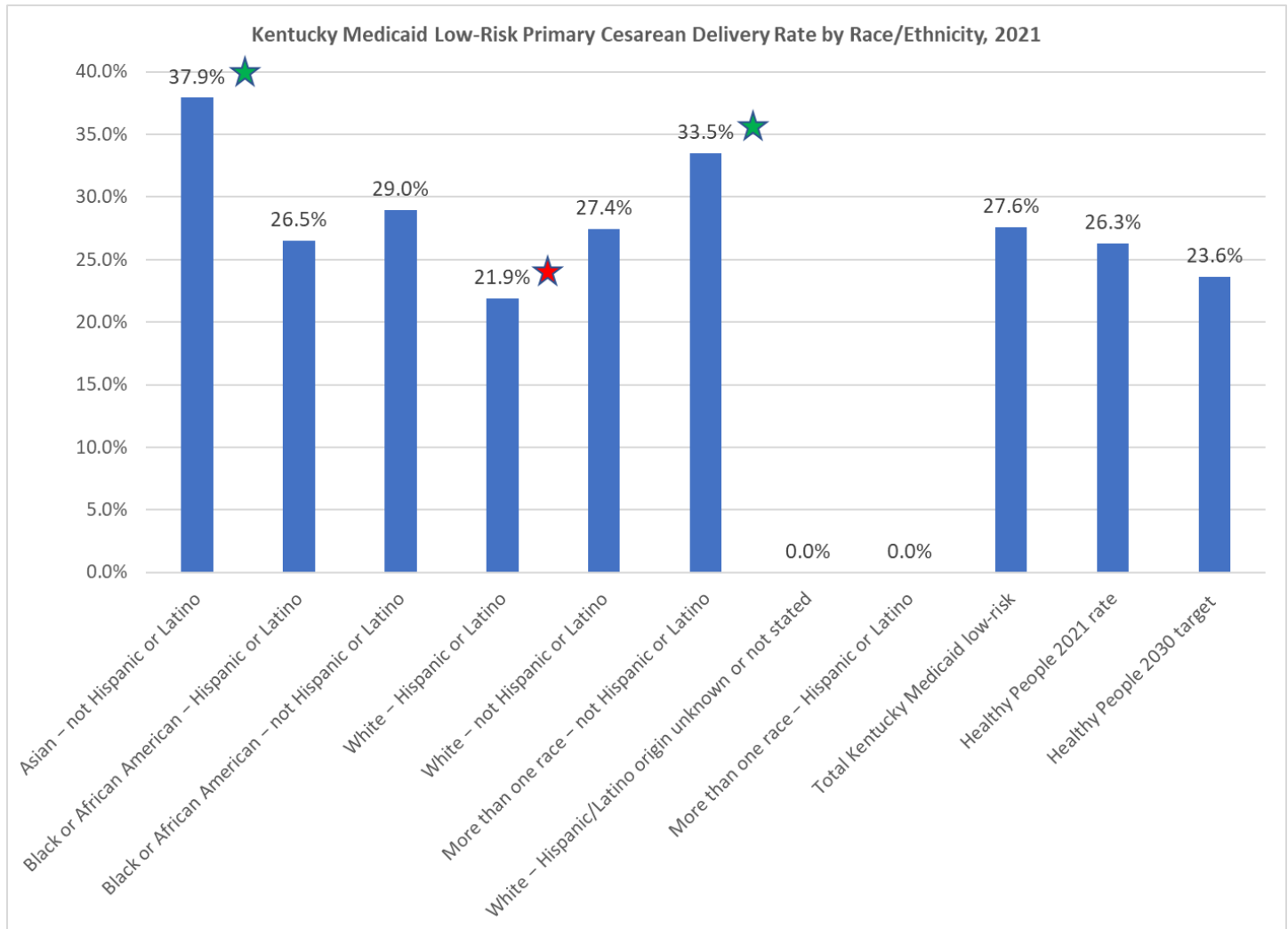
<sup>1</sup> There was a total of 65 enrollees in this low-risk primary Cesarean delivery subsample, representing 39.63% of the 164 primary Cesarean delivery sample.

## Supplemental Analysis: Low-Risk Primary Cesarean Deliveries, 2021

The 2021 Kentucky Medicaid low-risk primary Cesarean delivery rate of 27.6% is four percentage points greater than the Healthy People 2030 target rate of 23.6% (**Figure A**).

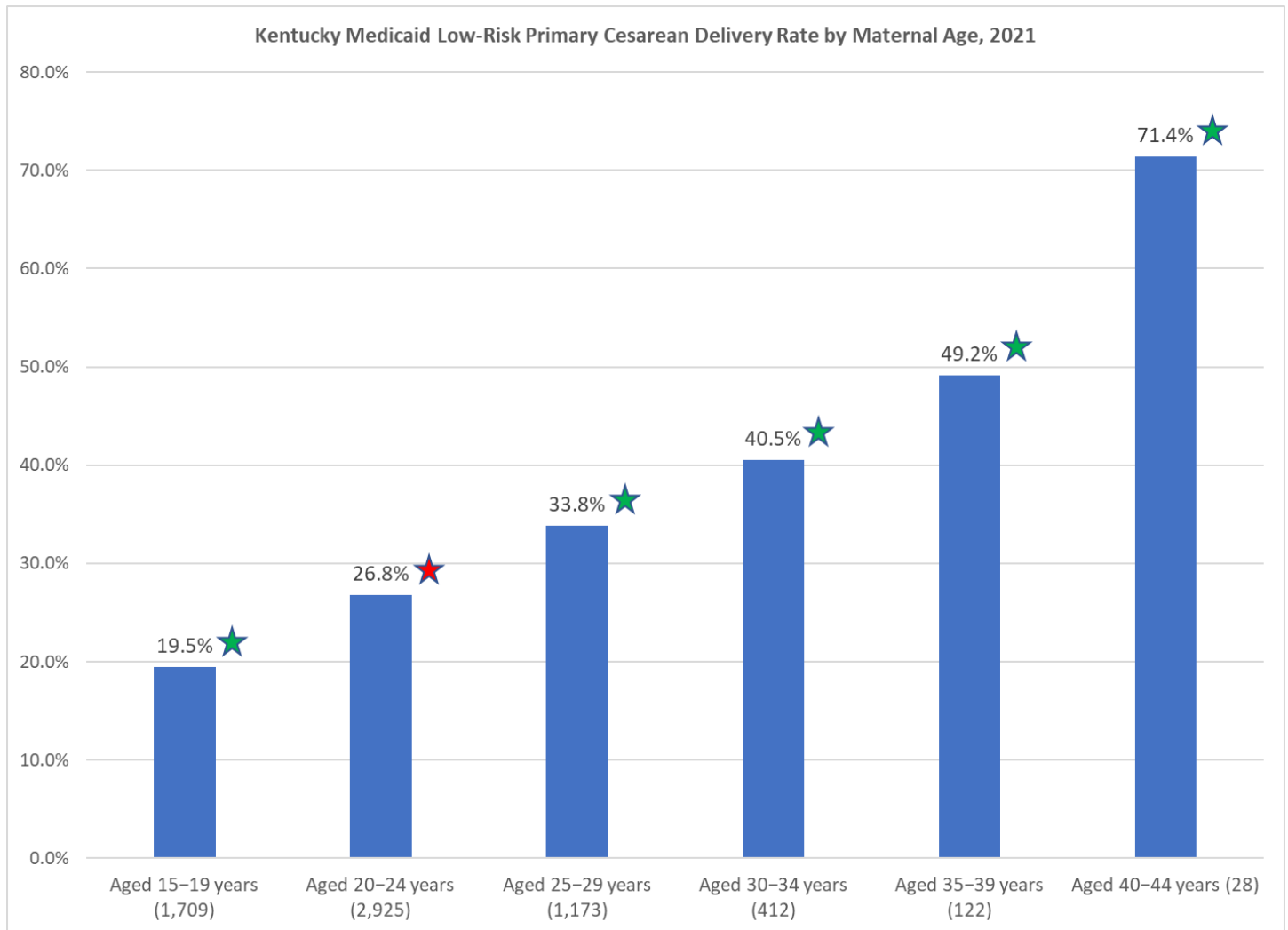
### Demographic Factors

Compared to the low-risk primary Cesarean delivery rate among White Hispanic or Latino Kentucky Medicaid enrollees (21.9%), the rates for Non-Hispanic Asians and Non-Hispanic persons of more than one race are significantly greater (37.9% and 33.5%, respectively; **Figure A**).



**Figure A: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Race/Ethnicity, 2021** Centers for Disease Control and Prevention WONDER data are restricted to live births. Blue bars indicate low-risk primary Cesarean delivery rates by race/ethnicity. Green stars highlight subgroups with rate differences that are statistically significant relative to the reference group, which is highlighted by the red star.

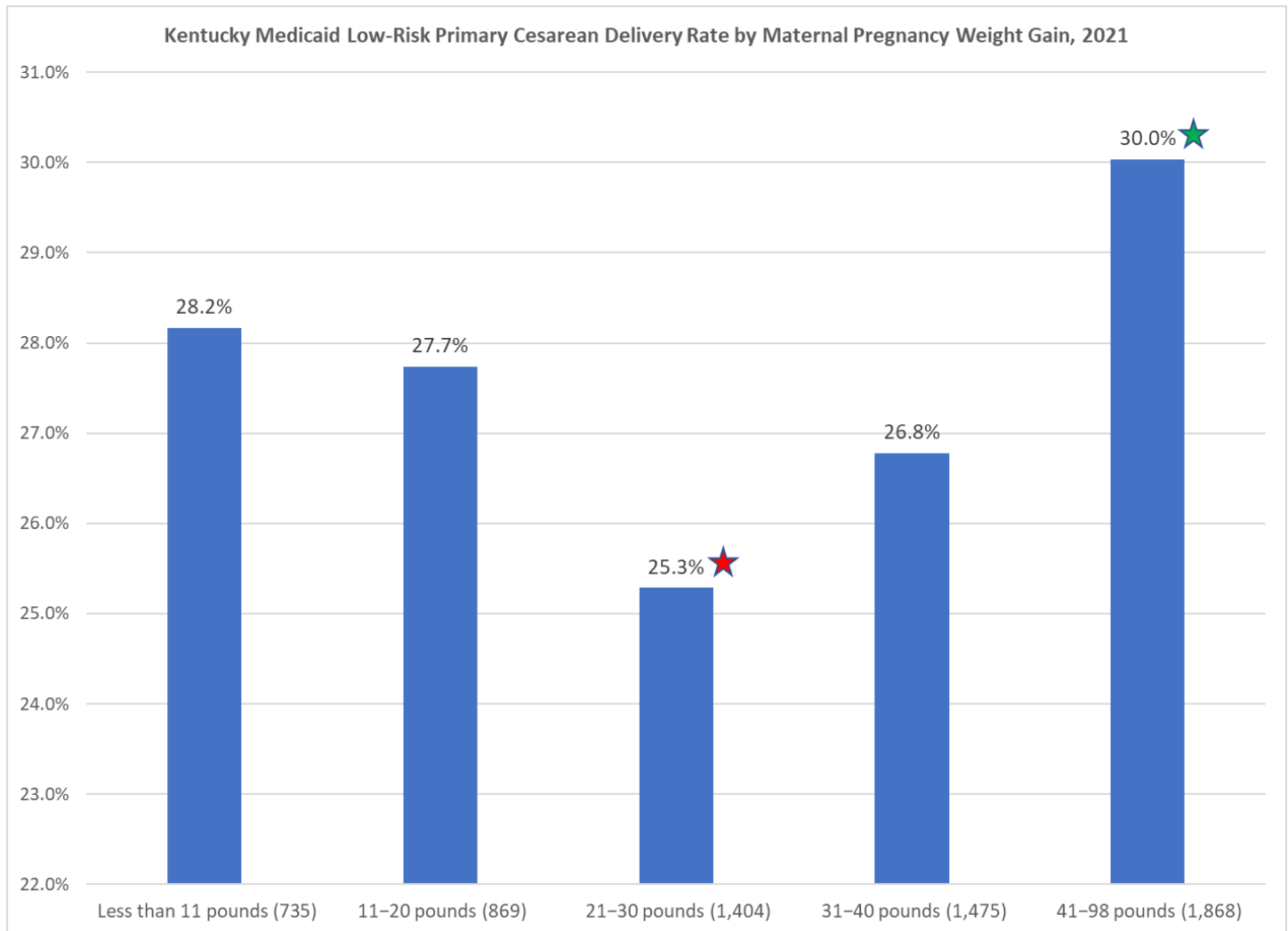
Compared to the low-risk Cesarean delivery rate among Kentucky Medicaid enrollees aged 20–24 years (26.8%), the rate for those aged 15–19 years is significantly lower (19.5%), and the rates for each older age group are significantly greater, with the highest rate among those aged 40–44 years (71.4%; **Figure B**). Overall, the rates show an increasing trend with increasing age.



**Figure B: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Maternal Age, 2021** Blue bars indicate low-risk primary Cesarean delivery rates by maternal age. Green stars highlight subgroups with rate differences that are statistically significant relative to the reference group, which is highlighted by the red star.

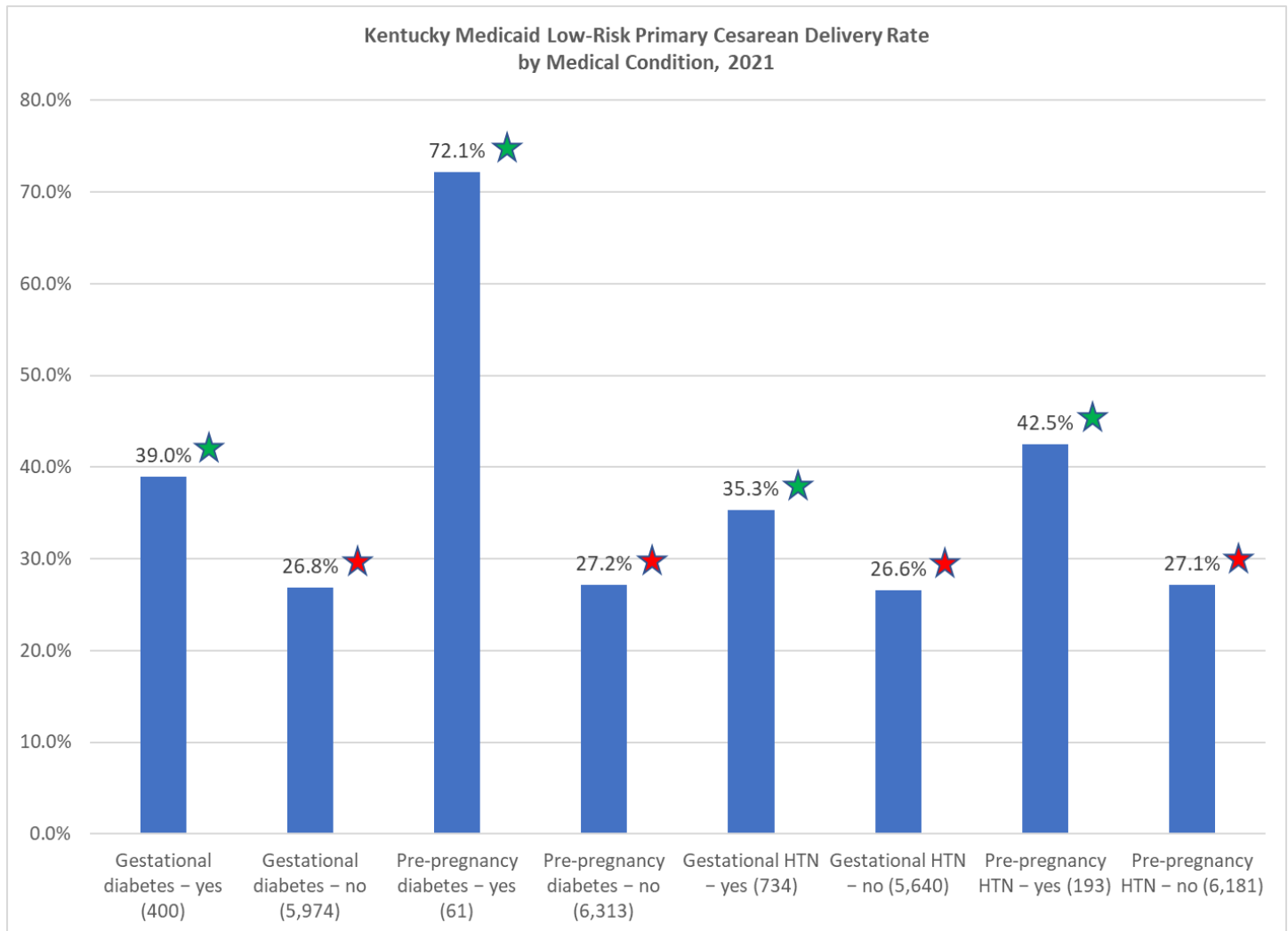
### Clinical Factors

Relative to the low-risk primary Cesarean delivery rate of 25.3% among the Kentucky Medicaid enrollees with a relatively moderate weight gain of 21–30 pounds, those with the greatest weight gain of 41–98 pounds showed the highest rate (30%; **Figure C**).



**Figure C: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Maternal Pregnancy Weight Gain, 2021** Blue bars indicate low-risk primary Cesarean delivery rates by maternal pregnancy weight gain. The green star highlights the subgroup with a rate difference that is statistically significant relative to the reference group, which is highlighted by the red star.

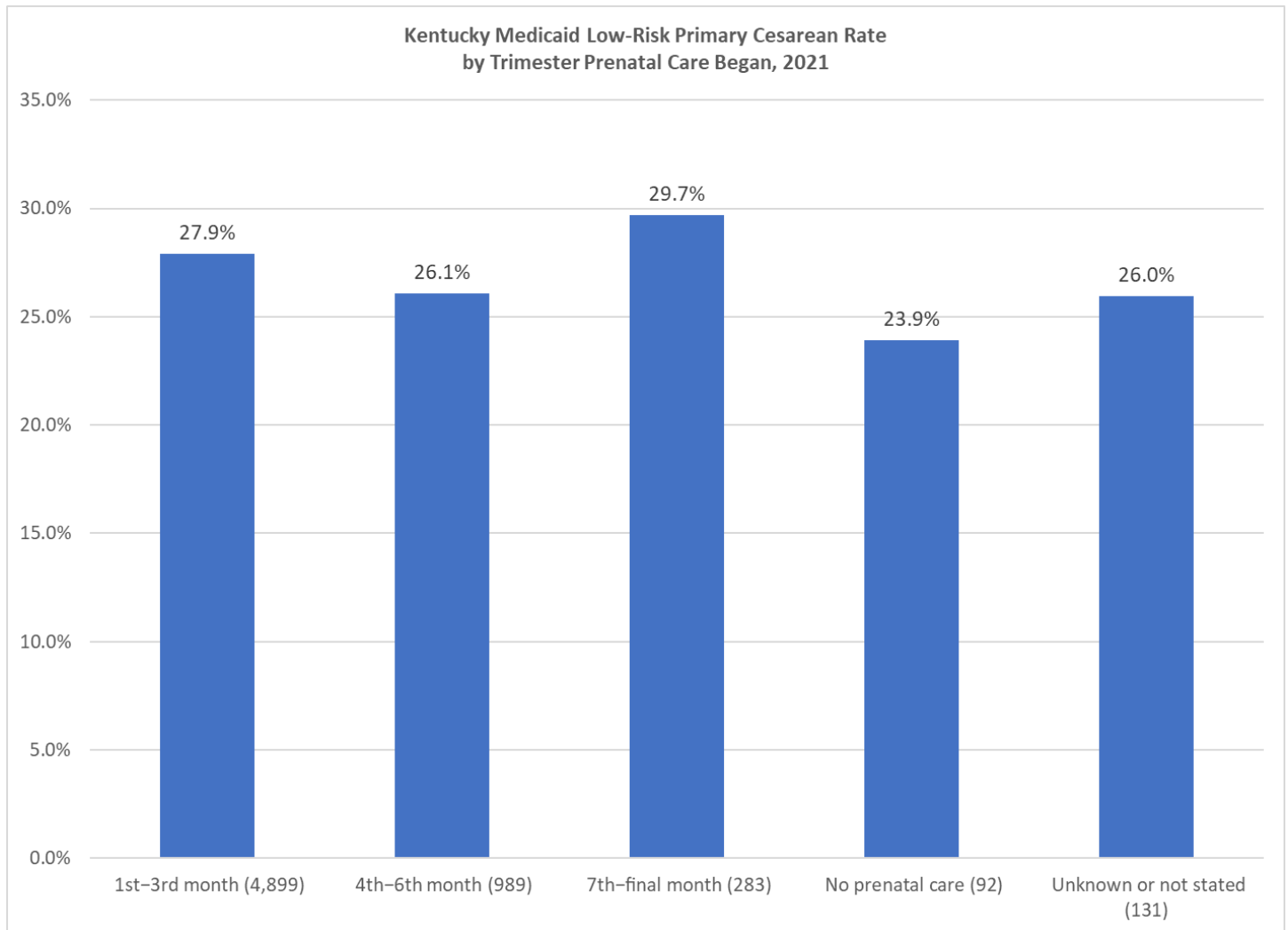
The low-risk primary Cesarean delivery rate was significantly higher for each subgroup with a medical condition (i.e., gestational diabetes, pre-pregnancy diabetes, gestational hypertension, pre-pregnancy hypertension) compared to the subgroup without that same medical condition (**Figure D**). The highest rate was among those with pre-pregnancy diabetes (72.1%).



**Figure D: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Medical Condition, 2021** Blue bars indicate low-risk primary Cesarean delivery rates by medical condition. Green stars highlight the subgroup with the medical condition and with a rate difference that is statistically significant relative to the reference group without the same medical condition, which is highlighted by the red star. HTN: hypertension.

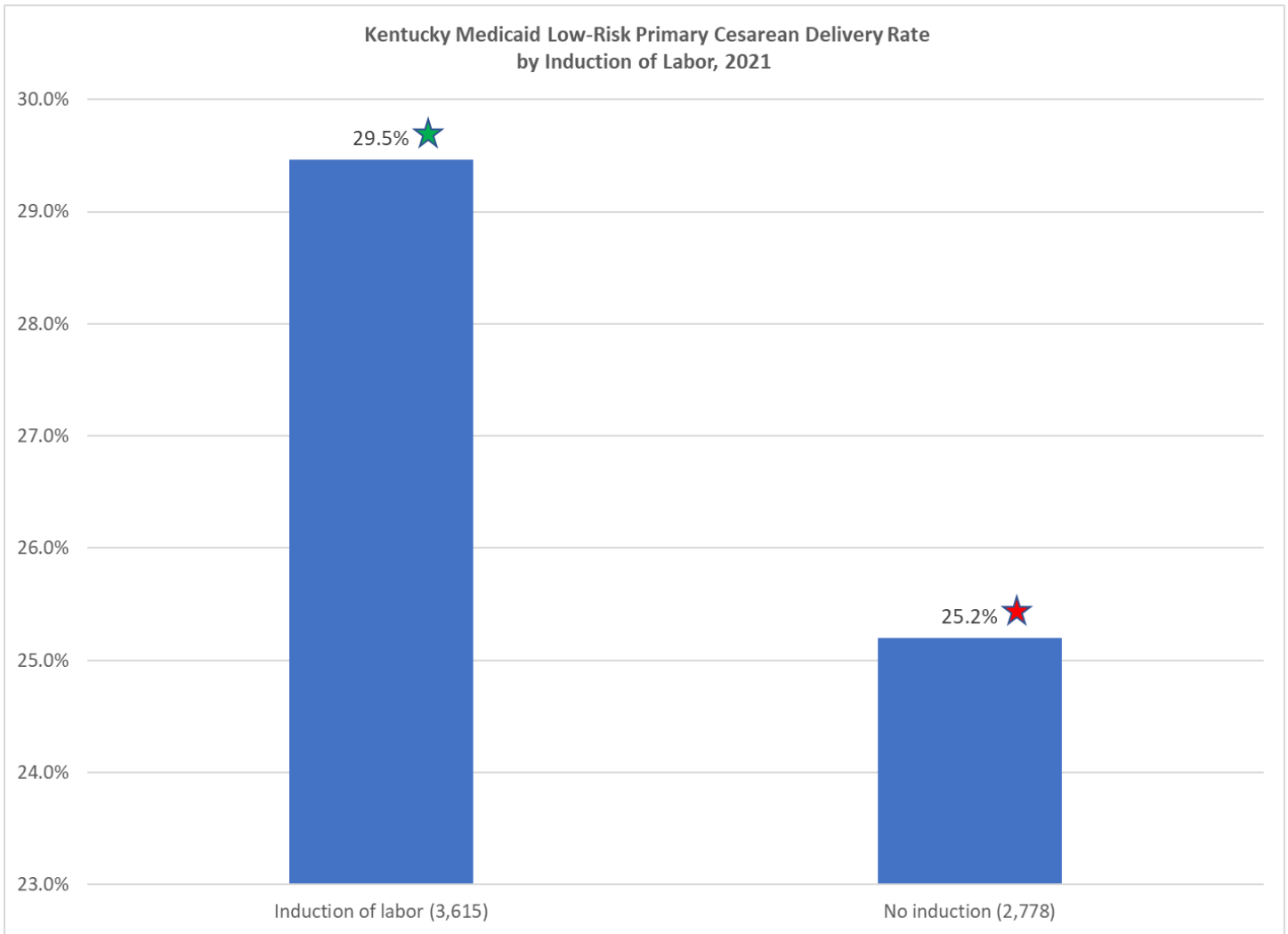
### Factors Related to Healthcare System

There were no statistically significant differences in low-risk primary Cesarean delivery rates for the trimester during which prenatal care began, although the highest rate was for prenatal care that began the latest (i.e., the 7th to the final month [29.7%; **Figure E**]).



**Figure E: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Trimester Prenatal Care Began, 2021** Blue bars indicate low-risk primary Cesarean delivery rates by trimester prenatal care began.

The low-risk primary Cesarean delivery rate was significantly higher for Kentucky Medicaid enrollees who underwent induction of labor (29.5%) compared to those who did not (25.2%; **Figure F**).



**Figure F: Kentucky Medicaid Low-Risk Primary Cesarean Delivery Rate by Induction of Labor, 2021** Blue bars indicate low-risk primary Cesarean delivery rates by induction of labor. The green star highlights the subgroup with a rate difference that is statistically significant relative to the reference group, which is highlighted by the red star.



## Discussion

**The administrative study identified clinical risk factors for low-risk Cesarean delivery that represent opportunities for enhanced MCO care management for women of childbearing age with chronic or pregnancy-related conditions, from preconception through prenatal care.**

Consistent with findings reported in the scientific literature,<sup>10</sup> the current study identified diabetes, hypertensive disorders, obesity, and/or excessive pregnancy weight gain as risk factors for low-risk Cesarean delivery (not restricted to primary Cesarean delivery). Case managers and care coordinators can enhance care management to better engage women of childbearing age to ensure they receive chronic condition management, preventive health care, and healthy lifestyle education before, between, and during pregnancies. A specific recommendation by the American College of Obstetricians and Gynecologists (ACOG) for the safe prevention of the primary Cesarean delivery is to counsel women on the Institute of Medicine maternal weight guidelines to avoid excessive weight gain.<sup>7</sup>

**Focus study findings highlight opportunities to partner with hospitals and obstetrics providers to address clinical factors related to labor challenges and fetal heart rate abnormalities.**

The administrative portion of the focus study identified arrested labor, uterine inertia, and primary inadequate contractions as risk factors for low-risk Cesarean delivery and was supported by the chart review finding that more than 60% of the low-risk primary Cesarean delivery hospital records documented arrest of labor; the latter was attributable to primary inadequate contractions. The SMFM does not include these labor abnormalities in the list of conditions that are established risk factors for medically indicated Cesarean delivery. Of note, multiple logistic regression findings did show that the following SMFM Cesarean high-risk categories were risk factors for any Cesarean delivery among Kentucky MMC enrollees: preterm birth, malpresentation, fetal factors, uterine/placental factors, multiple gestation, maternal factors, and a proxy measure for prior C-section. The ACOG/SMFM Obstetric Care Consensus on Safe Prevention of the Primary Cesarean Delivery<sup>7</sup> provides guidance on managing labor dystocia based on standard diagnostic criteria and algorithms. Implementation through effective clinical teamwork and communication is key; therefore, tools such as the Pre-Cesarean Communication Tool for Labor Dystocia or the Failed Induction and the Labor Dystocia Checklist (ACOG/SMFM criteria) are recommended.<sup>21</sup>

Fetal heart rate abnormalities were also demonstrated by the administrative study to be a risk factor for low-risk Cesarean delivery and, like labor dystocia, are not included among the SMFM-identified risk factors for medically indicated Cesarean delivery. Of note, chart review findings showed that non-reassuring fetal heart rate was documented in more than one-fourth of the low-risk primary Cesarean delivery hospital records. As with labor dystocia, clinical management of fetal heart abnormalities is amenable to standard diagnostic criteria and algorithms. The California Maternal Quality Care Collaborative (CMQCC) *Toolkit to Support Primary Vaginal Birth and Reduce Cesareans*<sup>21</sup> includes decision aid tools such as the Algorithm for Management of Category II Fetal Heart Rate Tracings and the Algorithm for the Management of Intrapartum Fetal Heart Rate Tracings, both of which provide a flowchart of clinical decision-making. The ACOG and the American College of Nurse-Midwives advise intermittent auscultation rather than continuous, electronic monitoring for low-risk laboring women;<sup>17</sup> however, nearly two-thirds of the low-risk primary Cesarean delivery sample records documented using continuous, electronic monitoring. Kentucky's Norton Women's and Children's Hospital established a multidisciplinary system team to develop and implement improvement efforts to safely reduce primary C-section rates and, using the CMQCC toolkit as a resource, achieved a reduction of primary Cesarean rates from 28.1% in 2018 to 22.8% in 2019.<sup>22</sup>

The supplemental analysis of Kentucky Medicaid births (using statewide CDC Wonder data<sup>20</sup>) showed a significantly higher rate for low-risk primary Cesarean delivery among enrollees who underwent induction of labor. Moreover, the review of hospital records showed that more than three-fourths of women with a low-risk primary Cesarean delivery underwent induction of labor. The conflicting results from the administrative portion of this focus study might be due to inconsistencies in provider use of ICD-10 codes. The ACOG/SMFM Obstetric Care Consensus on Safe Prevention of the Primary Cesarean Delivery<sup>7</sup> offers providers evidence-based guidance for the selection of appropriate candidates for induction of labor, and the CMQCC toolkit<sup>21</sup> provides tools for implementation that MCOs can activate in collaboration with hospitals.

### **Geographic barriers to care merit further exploration by MCOs.**

Current focus study findings that rural county and Appalachian county residents were at greater risk for any Cesarean delivery and for low-risk Cesarean delivery suggest geographic disparities in care. Further research is merited by MCOs to identify barriers to quality and appropriate care among women of childbearing age, from preconception through prenatal care to labor and delivery.

### **SDoH influence Cesarean delivery outcomes overall.**

Foster care enrollment and ACEs were both identified by the current focus study as risk factors for Cesarean delivery among all deliveries but not for low-risk Cesarean delivery. Again, further research is merited by MCOs to identify and address root causes among these vulnerable subpopulations, in collaboration with social workers, primary care providers, and obstetric providers.

### **Findings from the supplemental analysis of the Kentucky Medicaid vital statistics data support an opportunity to reduce the low-risk primary Cesarean delivery rate among Kentucky MMC enrollees by four percentage points to reach the Healthy People 2030 goal of 23.6%.**

Racial disparities highlight the importance of culturally insightful and sensitive approaches informed by Kentucky MMC enrollee feedback about cultural, language, and yet-to-be-discovered barriers. Among conditions amenable to early management and/or prevention, the highest primary Cesarean delivery rates were among Kentucky Medicaid enrollees with pre-pregnancy diabetes and the greatest pregnancy weight gain of 41–98 pounds. These findings shine a spotlight on opportunities to strengthen care coordination for wellness and disease prevention and to improve disease management programs for women of childbearing age, as well as to enhance obstetric case management. In addition, the administrative study showed that diabetes and excessive weight gain/obesity were risk factors for low-risk Cesarean delivery (not restricted to primary Cesarean).

### **There is an opportunity to improve integration of nurse midwife and doula services into maternity care.**

The scientific literature supports the benefits of care provided by nurse midwives. A retrospective cohort study of term, singleton, vertex deliveries in patients without a history of Cesarean delivery found a Cesarean delivery rate of 20.7% among obstetrician-led service compared to 13.1% among the nurse midwife service.<sup>23</sup> Souter et al.<sup>24</sup> reported an approximately 30% lower risk of Cesarean delivery in nulliparous patients and an approximately 40% lower risk in multiparous patients among low-risk births who received intrapartum care by nurse midwives compared to obstetricians. Yet, a minority of the low-risk primary Cesarean delivery hospital records reviewed for the current focus study documented nurse midwife services.

The current study's hospital record review findings merit further investigation by Kentucky MCOs to identify opportunities for greater integration of nurse midwife services into maternity care, consistent with DMS's commitment to implementing midwifery-led models of care.<sup>25</sup> The CMQCC toolkit<sup>21</sup> outlines key strategies for integrating midwifery care. It would be informative for MCOs to discern underlying differences in practices between obstetricians and nurse midwives pertinent to evidence-based recommendations for the ACOG/SMFM Obstetric Care Consensus on Safe Prevention of the Primary Cesarean Delivery, such as allowing longer durations of the latent phase of labor before deeming the induction a failure.<sup>7</sup>

### **Study Limitations and Strengths**

Administrative study limitations include the potential for residual confounding, as in any observational study, as well as the cross-sectional study design, which precludes determinations of causality; therefore, MCO findings should be interpreted with caution. In addition, multiple logistic regression effect estimate (OR) sizes with 95% CIs of greater than a 20-point spread should be interpreted with caution. Inaccurate and/or incomplete data obtained from MCO enrollment files is a potential study limitation. Kentucky Medicaid race/ethnicity data quality reporting was ranked as of "medium concern" among states with rankings ranging from "low concern" to "unusable data."<sup>26</sup> Another study limitation is that, without vital statistics data to identify nulliparous (first) deliveries, the specificity of low-risk Cesarean

deliveries was limited due to IPRO's inability to exclude prior Cesarean deliveries; consequently, IPRO was unable to accurately specify primary Cesarean deliveries in the administrative study. As a result, the 13.26% low-risk delivery rate underestimates the low-risk primary Cesarean rate, which the supplemental analysis based on a standardized measure reported as 27.6% for Kentucky Medicaid enrollees (including FFS enrollees). Variability in provider coding practices is a related study limitation, particularly for CPT coding to document primary and repeat Cesarean delivery, as well as SDoH coding, which a prior focus study showed is not reliably utilized.<sup>27</sup> However, a strength of this study is the use of multiple logistic regression analysis to statistically adjust for a proxy for repeat Cesarean delivery (i.e., maternal care for scar from previous Cesarean delivery, which is an SMFM-identified risk factor for Cesarean delivery). Administrative study strengths also include using sufficient sample size to detect statistically significant differences in associations between possible risk factors and outcomes, as well as conducting a supplemental analysis of Kentucky Medicaid primary Cesarean deliveries using the CDC WONDER database; although the dataset included both Medicaid FFS and MMC enrollees, this enabled IPRO to show significant differences in primary Cesarean delivery rates by demographic factors, clinical factors, and factors related to healthcare system.

“Internal validity” is the extent to which the study measures what it intends to measure. In the current study, internal validity was maximized by utilizing multivariable logistic regression analysis to statistically control for potential confounders and thus to identify risk factors independent of the influence of other demographic factors, clinical factors, and factors related to healthcare system. The supplemental analysis enhanced internal validity by providing a validated, standardized measure of primary Cesarean delivery for Medicaid enrollees. “External validity” is the extent to which findings may be generalized to the population of interest. In the current study, external validity was maximized by utilizing a study population that is representative of the Kentucky MMC population with a live or stillborn delivery and, more specifically, Cesarean delivery.

A chart review study limitation includes the possibility that the services were undocumented, rather than not rendered. There is limited interpretation of the events solely based on the documentation. Another limitation is that the chart review sample was selected based on the CPT code specified for primary Cesarean delivery by the Kentucky quality strategy draft; however, IPRO's pilot chart review found a considerable number of repeat Cesarean deliveries that were coded as primary. Key strengths of the chart review study are that the sample selection methodology did accurately identify Cesarean deliveries using ICD-10 procedure codes, as well as that IPRO was able to accurately document primary Cesarean deliveries by chart review. Further, methodological strengths of the chart review process address both internal and external validity. Internal validity was enhanced by using a standardized chart abstraction tool and reviewer training, as well as by conducting an ongoing systematic inter-rater reliability (IRR) review process. External validity was enhanced by the random selection of the chart review samples that are representative of the Kentucky MMC population with Cesarean delivery.

## Conclusion

The current focus study findings provide evidence to support an opportunity to reduce the low-risk primary Cesarean delivery rate among Kentucky MMC enrollees by four percentage points to reach the Healthy People 2030 goal of 23.6%. Key strategies call for interventions (1) to enhance care management (a) for preventing and managing obesity, pregnancy weight gain, and pregestational or gestational diabetes and hypertension among women of childbearing age from preconception through prenatal care and (b) for addressing disparities among racial/ethnic, nonurban, and foster care subpopulations; (2) to collaborate with hospitals and obstetric providers to foster evidence-based labor and delivery practices to address labor challenges and fetal heart rate abnormalities; and (3) to integrate nurse midwife services into maternity care.

## Recommendations

The following subsections present recommendations for DMS and the MCOs.

### Recommendations for DMS

- Engage Kentucky MCOs in quality improvement by initiating a collaborative performance improvement project (PIP) to safely reduce low-risk Cesarean deliveries.
- Encourage MCO collaboration with the Kentucky Perinatal Quality Collaborative (KyPQC), as well as with hospital and provider partners, on a statewide basis for the PIP to safely reduce low-risk Cesarean deliveries.

- Consider the feasibility of providing MCOs with vital statistics data on nulliparous status to facilitate MCO calculation of the CMS Child Core Set LRCO-CH measure. Alternative MCO-specific measures would be those used in this focus study (i.e., total Cesarean delivery rate and low-risk Cesarean delivery rate based upon exclusion of SMFM high-risk conditions). In addition, the Kentucky statewide Medicaid primary Cesarean delivery rate could be calculated using the CDC WONDER database; however, this measure is not MCO-specific and includes Medicaid FFS enrollees.

### Recommendations for MCOs

- Conduct a PIP with the aim for safe reduction of low-risk Cesarean deliveries. Key strategies call for interventions (1) to enhance care management (a) for preventing and managing obesity, pregnancy weight gain, and chronic or gestational diabetes and hypertension among women of childbearing age from preconception through prenatal care and (b) for addressing disparities among racial/ethnic, nonurban, and foster care subpopulations; (2) to collaborate with hospitals and obstetric providers to foster evidence-based labor and delivery practices to address labor challenges and fetal heart rate abnormalities; and (3) to integrate nurse midwife services into maternity care.
- Create a multidisciplinary committee tasked with PIP implementation.
- Collaborate with the KyPQC, as well as with hospital and provider partners, on a statewide basis for the PIP to safely reduce low-risk Cesarean deliveries.
- Educate hospital and provider partners on evidence-based guidelines (i.e., safe prevention of the primary Cesarean delivery).<sup>7</sup>
- Use the CMQCC toolkit<sup>21</sup> as a resource for implementing interventions to safely reduce primary Cesarean deliveries in collaboration with statewide partners. Examples of checklists and algorithms that MCOs can endorse include the following:
  - Pre-Cesarean Communication Tool for Labor Dystocia or Failed Induction;
  - Labor Dystocia Checklist;
  - Algorithm for Management of Category II Fetal Heart Rate Tracings; and
  - Algorithm for the Management of Intrapartum Fetal Heart Rate Tracings.
- Continue working to improve data collection on SDoH by care management and, until Logical Observation Identifier Names and Codes (LOINC<sup>®</sup>) codes are regularly coded by providers, consider augmenting ICD-10 SDoH codes with county level rankings on social/economic factors (for example, as found in the *2023 County Health Rankings National Findings Report*<sup>28</sup>.)

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## Appendix A: Codes Used to Specify All Deliveries and Cesarean Deliveries

Table A1: Codes Used to Specify All Deliveries and Cesarean Deliveries

Code	Definition	Code System	Any C-section	Delivery
59400	Vaginal delivery, including antepartum and postpartum care	CPT	0	1
59409	Vaginal delivery, only	CPT	0	1
59410	Vaginal delivery, including postpartum care	CPT	0	1
59510	Primary Cesarean delivery, DMS numerator primary	CPT	1	1
59514	Cesarean delivery only, assistant at delivery	CPT	1	1
59515	Cesarean delivery only, including postpartum care	CPT	1	1
59610	Vaginal delivery after C-section, with antepartum and postpartum care	CPT	0	1
59612	Vaginal delivery, only, after previous C-section	CPT	0	1
59614	Vaginal delivery, including postpartum care	CPT	0	1
59618	Repeat Cesarean delivery, DMS numerator repeat	CPT	1	1
59620	Cesarean delivery only, following attempted vaginal delivery after previous Cesarean delivery	CPT	1	1
59622	Cesarean delivery only, following attempted vaginal delivery after previous Cesarean delivery, including postpartum care	CPT	1	1
10D00Z0	Extraction of Products of Conception, High, Open Approach	ICD-10-PCS	1	1
10D00Z1	Extraction of Products of Conception, Low, Open Approach	ICD-10-PCS	1	1
10D00Z2	Extraction of Products of Conception, Extraperitoneal, Open Approach	ICD-10-PCS	1	1
10D07Z3	Extraction of Products of Conception, Low Forceps, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10D07Z4	Extraction of Products of Conception, Mid Forceps, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10D07Z5	Extraction of Products of Conception, High Forceps, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10D07Z6	Extraction of Products of Conception, Vacuum, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10D07Z7	Extraction of Products of Conception, Internal Version, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10D07Z8	Extraction of Products of Conception, Other, Via Natural or Artificial Opening	ICD-10-PCS	0	1
10E0XZZ	Delivery of Products of Conception, External Approach	ICD-10-PCS	0	1

C-section: Cesarean section; CPT: Current Procedural Terminology; DMS: Department for Medicaid Services; ICD-10-PCS: International Classification of Diseases, Tenth Revision, Procedure Coding System.