



# Statistical Brief

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## Trends in Cesarean Delivery Rates for North Carolina Live Births

by  
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A Cesarean delivery is a live birth resulting from a surgical procedure known as a Cesarean section, or C-section. This report examines trends in the rates, or percentages, of Cesarean deliveries for North Carolina resident live births.

Data in this report were obtained from the birth certificate computer files and birth certificate data matched to Medicaid records. The method of delivery was included on North Carolina birth certificates beginning in 1988. The rate of Cesarean deliveries is calculated as a percentage of total births. The formula is the number of Cesarean deliveries, divided by the total number of live births, multiplied by 100. Live births where the method of delivery is unknown are excluded from the rates.

Reducing the rate of Cesarean deliveries has been a long-standing objective of the national Healthy People initiative, a program developed to improve the health and quality of life in the United States. The Healthy People 2000 goal was to reduce the overall Cesarean delivery rate to no more than 15 per 100 deliveries.<sup>1</sup> The goals of Healthy People 2010 and 2020 have narrowed the focus to reducing the rates for low risk mothers.<sup>2,3</sup> Despite these objectives, C-section rates

have been increasing rather than decreasing since 1996. In fact, Cesarean rates increased significantly in every state from 1996 to 2007.<sup>4</sup>

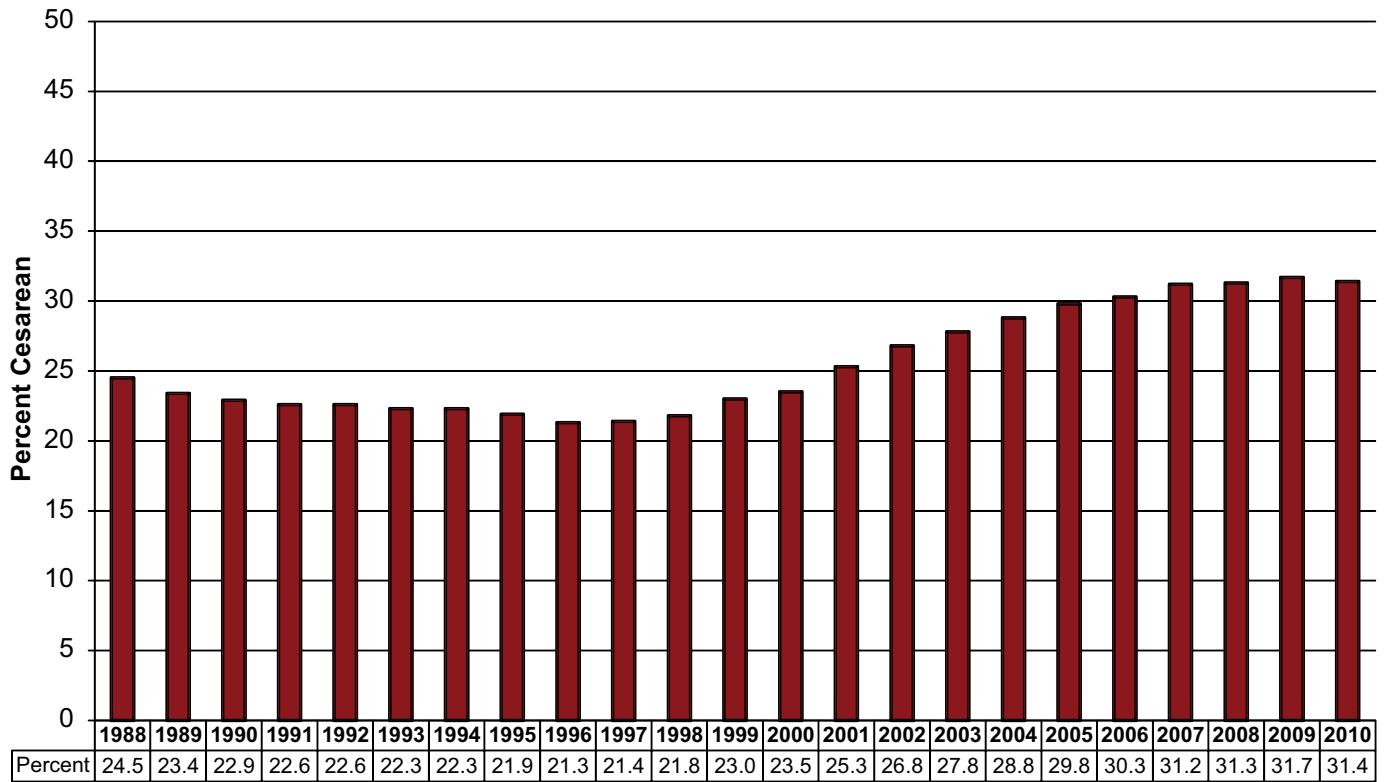
**Chart 1** presents the rate of Cesarean deliveries in North Carolina each year from 1988, the first year of available data, through 2010. The rate of Cesarean deliveries in North Carolina decreased from 1988 to 1996, and then increased each year from 1997 to 2009. The first decline in Cesarean rates since 1996 was seen in 2010. From 1996 to 2009, the rate increased from 21.3 percent of all North Carolina resident live births to 31.7 percent, an upward change of 49 percent.

We will now examine trends in Cesarean deliveries by various demographic categories for the years 1998 through 2010.

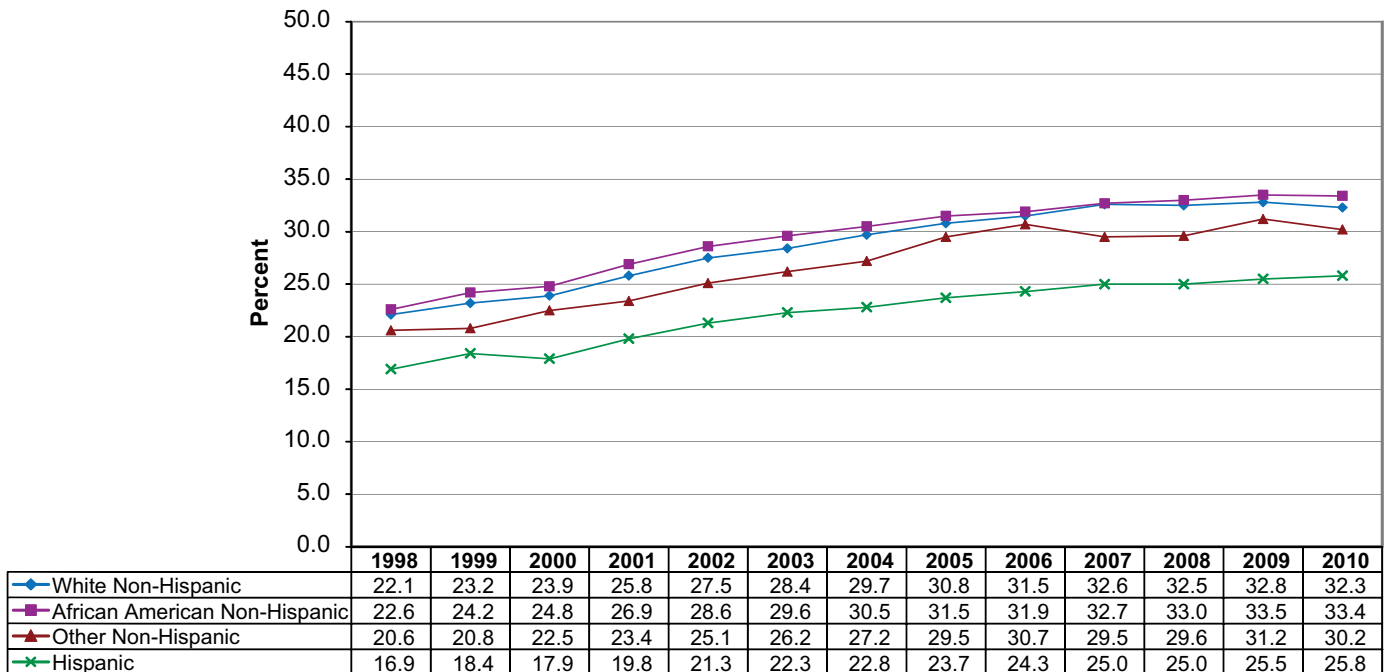
### Race and Ethnicity

Cesarean rates have increased for all races of mothers in North Carolina since 1998. Non-Hispanic African American mothers have the highest rate of Cesarean deliveries, and Hispanic mothers have the lowest percentage. From 1998 to 2010, the rate of Cesareans for non-Hispanic African American mothers went

**Chart 1.**  
**Percentage of Cesarean Section Deliveries**  
**North Carolina Resident Live Births, 1988–2010**



**Chart 2.**  
**Cesarean Rates by Race and Ethnicity of Mother, 1998–2010**



from 22.6 to 33.4, a 48 percent increase. Hispanic rates went from 16.9 to 25.8, an increase of almost 53 percent. The rate for non-Hispanic white mothers rose from 22.1 to 32.3 (46% increase) and other non-Hispanic races increased from 20.6 to 30.2, up 46 percent. **Chart 2** displays the rates for these racial and Hispanic origin categories from 1998 through 2010.

### Mothers' Age

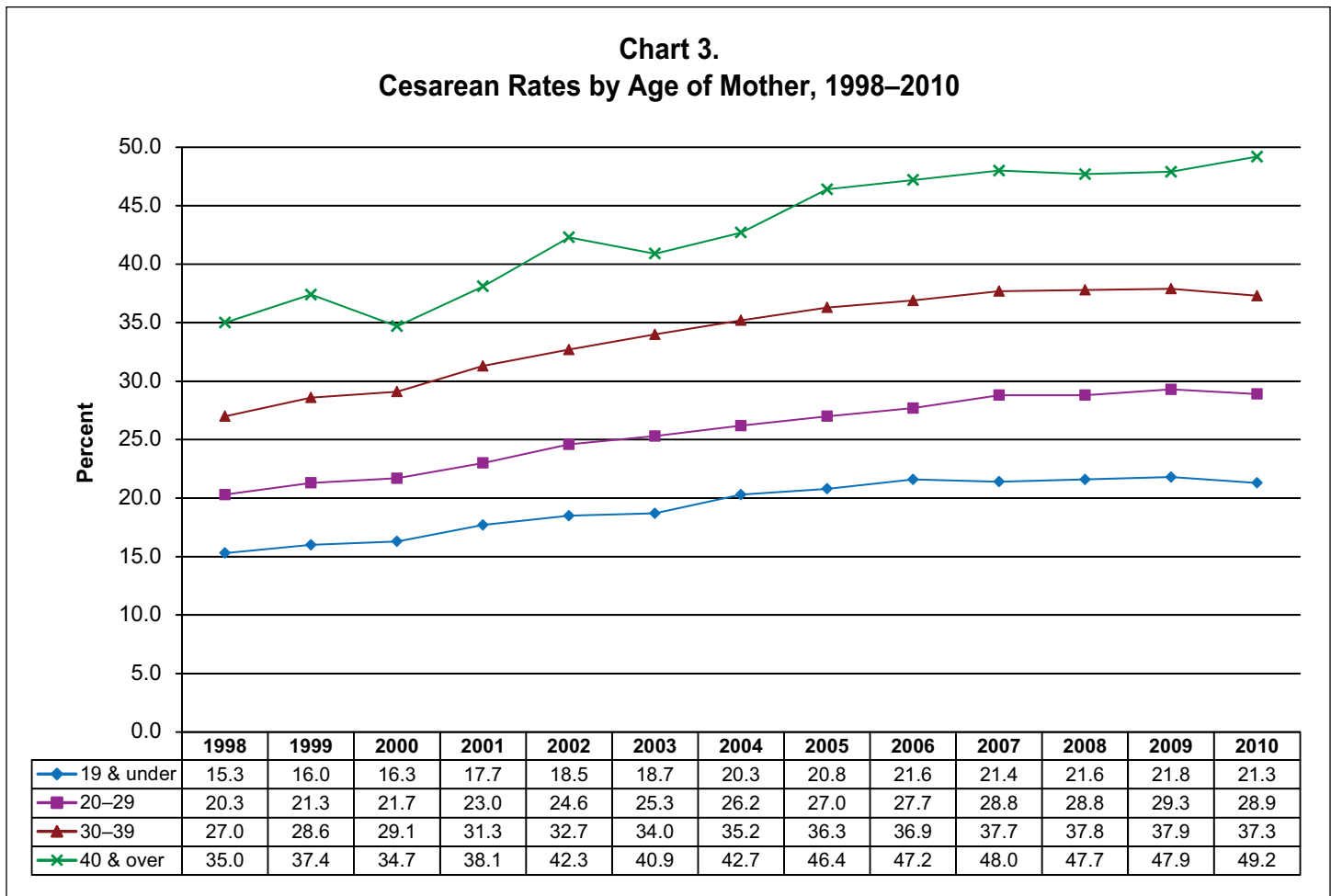
Cesarean delivery rates increase with maternal age.<sup>5</sup> In 2010, 21.3 percent of infants born to teen mothers were delivered by C-section, and approximately half (49.2%) of babies born to mothers 40 years old and over were Cesarean births. For mothers in their 20s, 28.9 percent were delivered by C-section, and for mothers in their 30s, 37.3 percent were Cesarean deliveries. The rates for all age groups have seen an increase over time. From 1998 to 2010, teen Cesarean rates increased by 39 percent (15.3 to 21.3), C-section

rates for mothers ages 20 to 29 increased by 42 percent (20.3 to 28.9), and the rates for mothers ages 30 to 39 went up from 27.0 to 37.3, an increase of 38 percent. For mothers 40 and over, the rate increased by 41 percent (35.0 to 49.2). **Chart 3** displays the trends in Cesarean rates from 1998–2010 by maternal age.

### Medicaid

Live births covered by Medicaid, the state and federal health insurance program for low-income individuals and families, have a lower Cesarean rate than births not covered by Medicaid. In 2010, 29.5 percent of Medicaid births were delivered by Cesarean section, whereas 33.6 percent of births not covered by Medicaid were C-section births. However, the rate of Cesarean deliveries has also been increasing for Medicaid births. From 1998 to 2010, the percentage of Medicaid births delivered by Cesarean section increased from 20.5 to 29.5, a rate increase of 44 percent. Non-Medicaid

**Chart 3.**  
**Cesarean Rates by Age of Mother, 1998–2010**



births saw an even greater increase in Cesarean rates, from 22.7 to 33.6, a 48 percent increase. Trends in rates of live births delivered by C-sections by Medicaid status are depicted in **Chart 4**.

### Low-risk Mothers

Cesarean rates for women with low-risk pregnancies have seen sharp increases. “Low-risk” deliveries are defined as singleton live births (not twins or greater), full-term (gestation of at least 37 weeks), vertex presentation (head of fetus facing downward in the birth canal), and no risk factors or complications of labor or delivery reported on the birth certificate.<sup>6</sup>

**Chart 5** shows that the C-section rates for these low-risk births more than doubled from 1998 (11.3%) to 2009 (25.3%). (Note: In 2010, North Carolina instituted a revised birth certificate which incorporates some data variables that are not comparable to the previous version. Therefore, 2010 data are not included in this category).

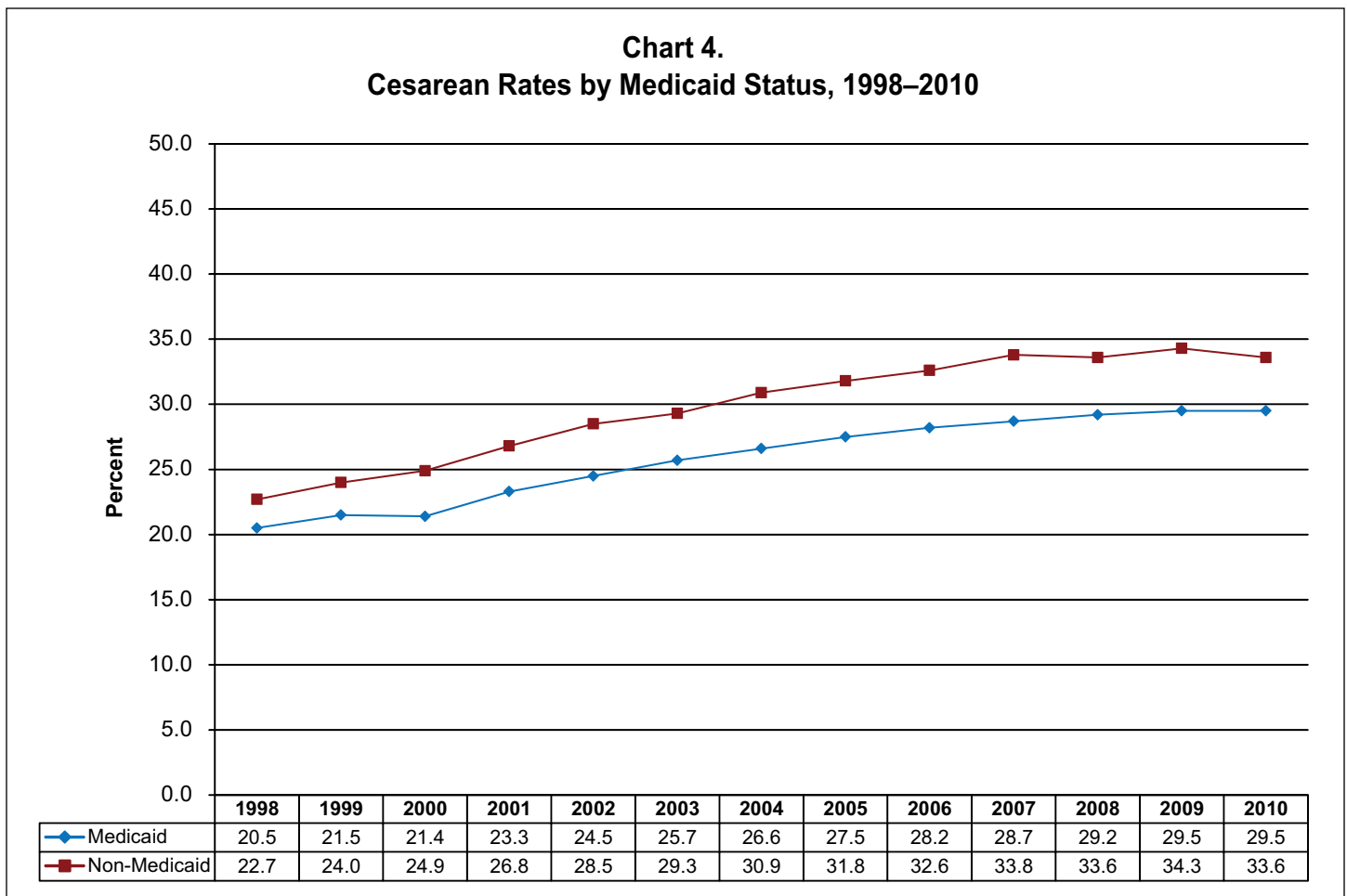
### First Time Mothers

Mothers who delivered their first live births with no previous pregnancies have seen a rise in C-section rates from 22.8 percent in 1998 to 29.8 percent in 2010, a rate increase of slightly over 30 percent. The Cesarean rates for first time mothers during this time period are displayed in **Chart 6**.

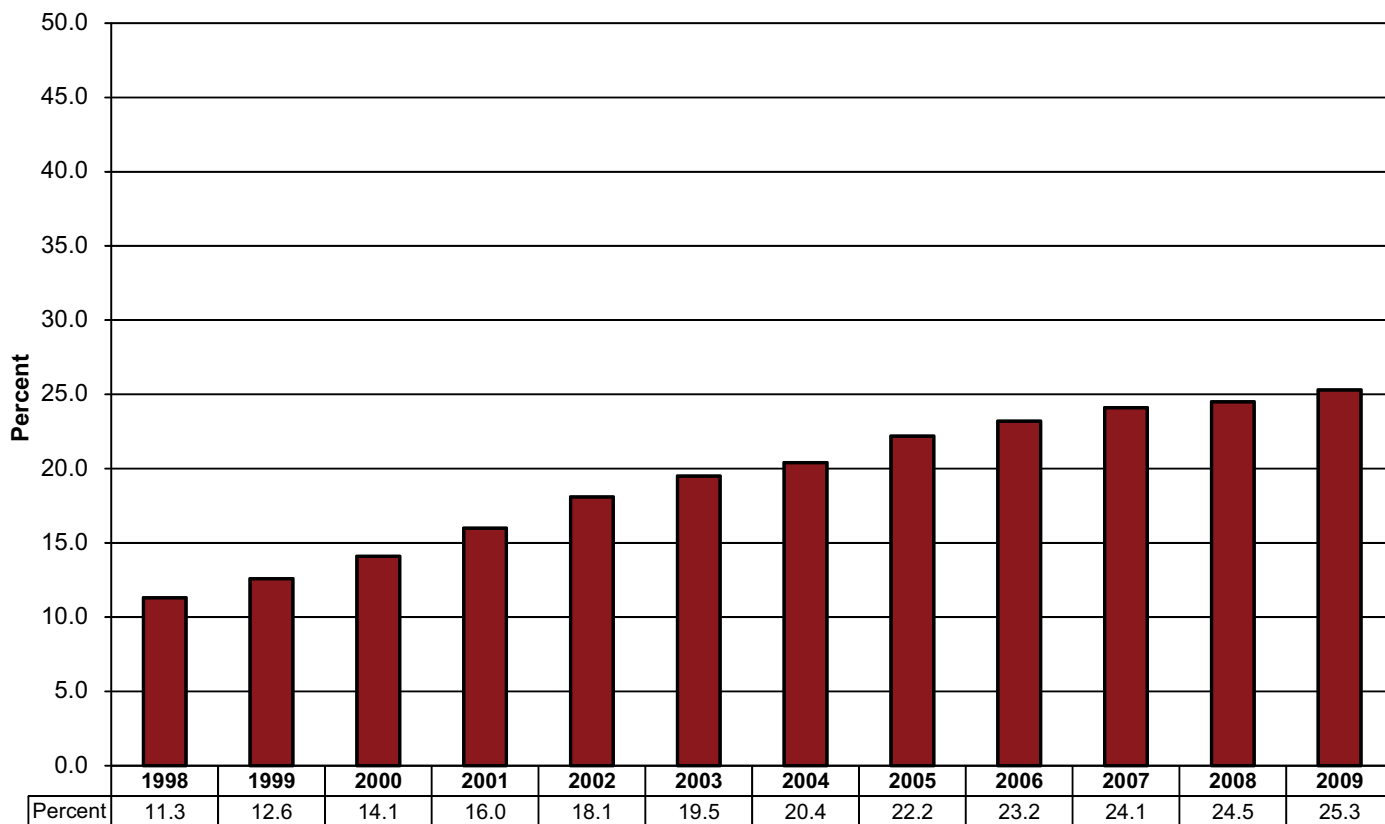
### North Carolina Counties

**Figure 1** displays North Carolina resident Cesarean rates by county for the three-year period 2008–2010.

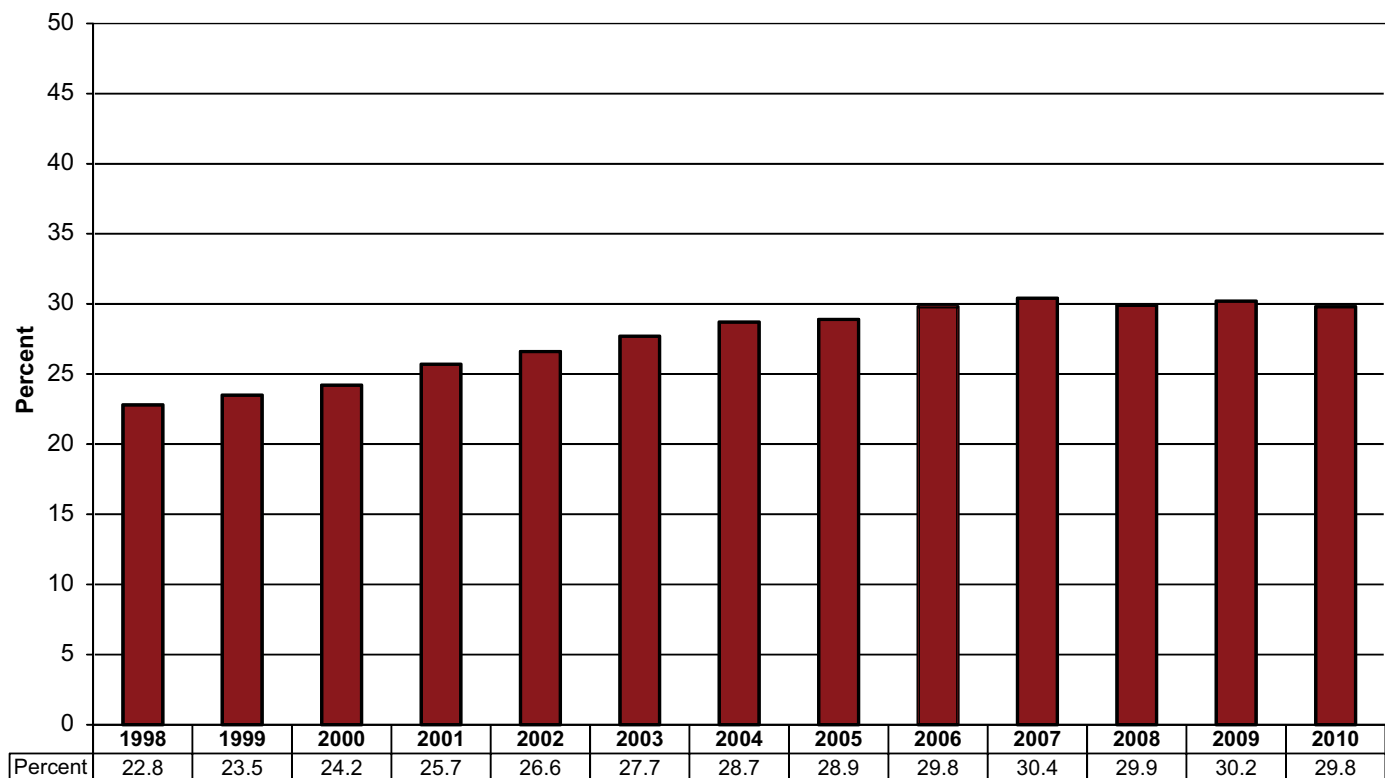
Cesarean delivery rates have risen for residents in 98 of North Carolina’s 100 counties. **Table 1** lists the percent change in C-section rates for each county from the three-year periods 1998–2000 to 2008–2010, ranked in order of change, from highest to lowest. Jones and Perquimans counties were the only counties that experienced a decline in their rates.



**Chart 5.  
Cesarean Rates for Low Risk Mothers, 1998–2009**

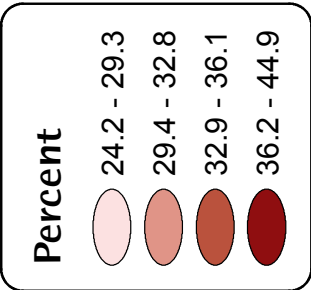
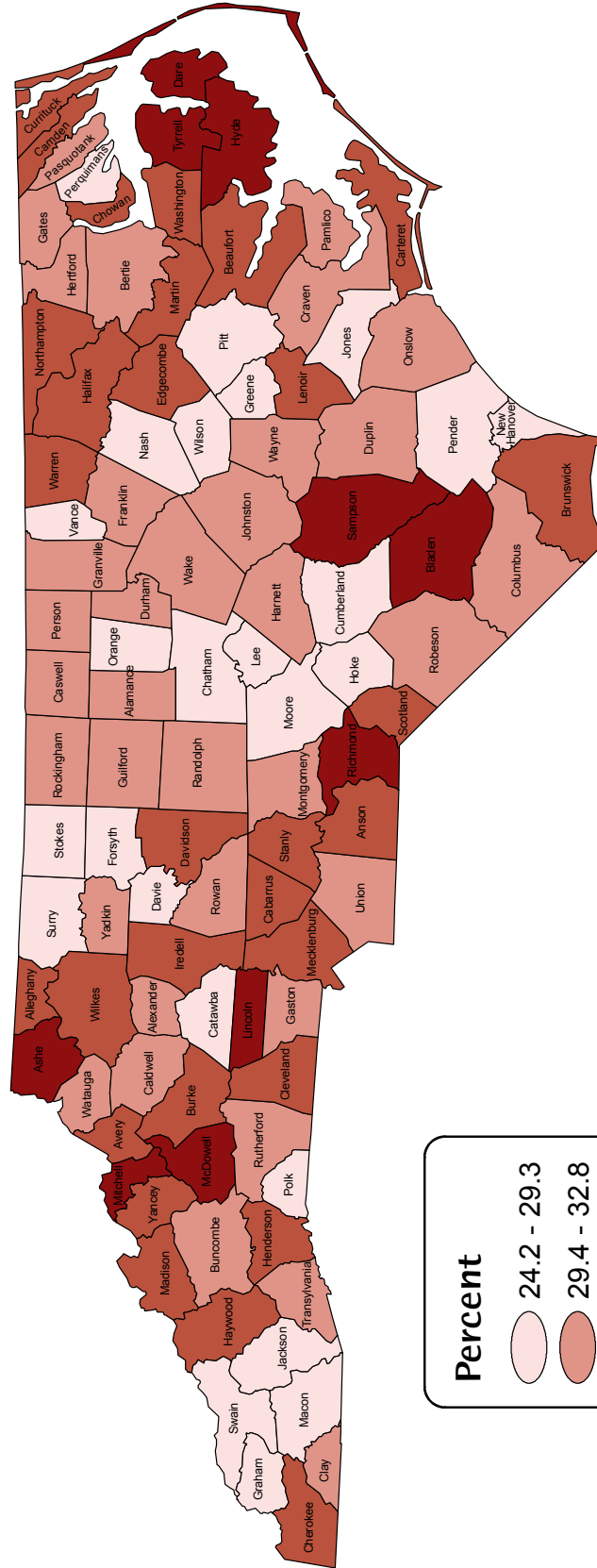


**Chart 6.  
Cesarean Rates for First Time Mothers, 1998–2010**



**Figure 1**

# North Carolina Percent Cesarean Delivery Births 2008-2010



**Table 1.**  
**Percent Change in Cesarean Rates by County of Residence,**  
**1998–2000 to 2008–2010, Ranked**

County	Cesarean Rates		Percent Change	County	Cesarean Rates		Percent Change
	1998–2000	2008–2010			1998–2000	2008–2010	
Alleghany	17.0	34.7	104.1	Camden	24.5	33.2	35.5
Madison	18.6	34.5	85.5	Cleveland	24.4	33.0	35.2
Yancey	19.5	36.0	84.6	Iredell	25.4	34.3	35.0
Hyde	24.6	44.9	82.5	Pitt	20.9	28.1	34.4
Tyrrell	22.1	40.3	82.4	Rockingham	23.7	31.6	33.3
Edgecombe	18.7	33.5	79.1	Durham	23.4	31.1	32.9
Hertford	18.0	32.1	78.3	Columbus	23.0	30.5	32.6
Onslow	17.7	30.4	71.8	Chowan	27.2	35.9	32.0
Cherokee	20.9	35.5	69.9	Beaufort	27.3	36.0	31.9
Mitchell	24.3	40.4	66.3	Pamlico	24.5	32.1	31.0
Yadkin	18.0	29.5	63.9	Alexander	25.0	32.4	29.6
Haywood	20.9	34.2	63.6	Ashe	30.2	39.1	29.5
Transylvania	18.7	30.5	63.1	Martin	26.8	34.7	29.5
Bertie	18.8	30.1	60.1	Randolph	24.1	31.2	29.5
Buncombe	19.3	30.9	60.1	Halifax	25.9	33.5	29.3
Dare	25.4	40.3	58.7	Gates	24.9	31.9	28.1
Clay	19.8	31.3	58.1	Wilkes	27.8	35.6	28.1
Bladen	25.0	39.2	56.8	Pasquotank	25.5	32.5	27.5
McDowell	24.3	37.7	55.1	Granville	24.8	31.6	27.4
Cabarrus	21.7	33.5	54.4	Franklin	24.5	31.2	27.3
Henderson	21.5	33.0	53.5	Northampton	26.3	33.3	26.6
Hoke	18.6	28.2	51.6	Greene	20.0	25.1	25.5
Davidson	23.8	35.5	49.2	Brunswick	26.5	33.2	25.3
Gaston	21.3	31.5	47.9	Swain	20.2	25.3	25.2
Forsyth	18.4	27.2	47.8	Chatham	23.0	28.7	24.8
Lincoln	27.2	40.1	47.4	Stanly	29.0	36.1	24.5
Caldwell	21.7	31.8	46.5	Johnston	26.4	32.8	24.2
Richmond	27.1	39.7	46.5	Harnett	25.9	31.9	23.2
Rowan	20.9	30.6	46.4	Nash	20.9	25.6	22.5
Mecklenburg	22.7	33.2	46.3	Catawba	22.8	27.9	22.4
Davie	20.1	29.3	45.8	Person	25.0	30.6	22.4
Cumberland	19.1	27.8	45.5	Moore	23.3	28.5	22.3
Wake	22.2	32.3	45.5	Watauga	26.9	32.6	21.2
Montgomery	21.7	31.4	44.7	Surry	22.2	26.8	20.7
Caswell	21.4	30.8	43.9	Orange	23.4	28.2	20.5
Burke	23.3	33.5	43.8	Macon	24.3	29.1	19.8
Rutherford	21.1	30.1	42.7	Vance	24.7	29.3	18.6
Union	21.9	30.7	40.2	Graham	20.5	24.2	18.0
Alamance	23.0	32.2	40.0	Craven	25.1	29.5	17.5
Carteret	25.7	35.9	39.7	Polk	23.3	27.1	16.3
Stokes	20.7	28.8	39.1	New Hanover	23.6	27.4	16.1
Scotland	24.3	33.7	38.7	Lenoir	29.7	34.3	15.5
Warren	24.3	33.6	38.3	Avery	30.4	34.8	14.5
Anson	25.9	35.6	37.5	Duplin	27.0	30.8	14.1
Guilford	23.4	32.0	36.8	Lee	23.8	27.1	13.9
Jackson	20.1	27.5	36.8	Robeson	28.6	31.6	10.5
Sampson	28.6	39.1	36.7	Washington	30.6	33.8	10.5
Currituck	25.5	34.7	36.1	Pender	22.9	25.2	10.0
Wayne	23.3	31.7	36.1	Jones	29.9	28.9	-3.3
Wilson	19.5	26.5	35.9	Perquimans	31.0	28.0	-9.7



## Conclusion

Among North Carolina residents, primary (19.3%) and repeat (12.1%) Cesarean sections represented 31.4 percent of all deliveries in 2010. From 1998 to 2010, C-section rates increased for women of all age groups and races and ethnicities. Even among women with low risk pregnancies, C-section rates have increased during this time period. However, after years of steady increases in the rate of Cesareans, there was a slight decline in the rate in 2010.

Recently, state efforts have focused on reducing C-section deliveries among low risk pregnancies. The Perinatal Quality Collaborative of North Carolina (PQCNC)'s *Eliminating Elective Deliveries Under 39 Weeks Gestation* initiative aims to decrease C-section rates statewide by reducing scheduled C-sections between 36–38 weeks gestation among first time mothers that are not for medical reasons. Between October 2009 and June 2010, PQCNC reported a 43 percent decrease in the rate of elective deliveries (both inductions and C-sections) under 39 weeks gestation.<sup>7</sup>

Additionally, the North Carolina Division of Public Health, the North Carolina Division of Medical Assistance, and Community Care of North Carolina (CCNC) are now collaborating on the *Pregnancy Medical Home* initiative. The initiative is designed to improve birth outcomes in North Carolina by providing evidence-based, high quality maternity care to North Carolina's Medicaid patients. Two of CCNC's four performance measures relate to the reduction of Cesarean section rates: 1) no elective deliveries prior to 39 weeks gestation and 2) reduction in primary C-section rate.<sup>8</sup>

The North Carolina State Center for Health Statistics will continue to monitor C-section rates in order to determine if these, and other state efforts, result in tangible decreases in Cesarean section deliveries in the future.

## Acknowledgements

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