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Multiple Deliveries in North Carolina: Trends and Outcomes

by

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ABSTRACT

Objectives: The purpose of this study is to examine trends and patterns in multiple deliveries in North Carolina and to estimate the impact of increased multiple births upon the state's low birthweight rate.

Methods: Data are for white and minority deliveries (or live births) categorized by plurality, maternal age, birthweight, and age at death. A method for partitioning differences in rates is used to estimate the percentage contributions of 1) maternal age groups to the increase in multiple deliveries and 2) multiple live births to the increase in low birthweight.

Results: Between 1980 and 1997, the state's multiple delivery rate rose 40 percent, from 20.5 to 28.7 multiple deliveries per 1,000 total deliveries. The increase was particularly high among whites above age 30. A shift towards older childbearing appears to account for about one-third of the overall increase in multiple deliveries. An estimated 70 percent of the 1980-1997 increase in the state's low birthweight rate appears to be due to increased multiple births. In 1997, almost 20 percent of all low birthweight births were multiple births, compared to 14 percent in 1980. Low birthweight and infant mortality are much higher among multiples than among single-born infants.

Conclusion: Babies born of multiple gestations are far more likely than single-born babies to be of low birthweight, to have serious health problems, and to die. Older childbearing and increased use of infertility therapies have resulted in more multiple deliveries. The increase in these high-risk infants appears to account for about 70 percent of the 1980-1997 increase in the state's low birthweight rate.

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Introduction

The rate of multiple births in the United States has been increasing since the early 1970s.¹ This trend, which has been especially pronounced for triplets and higher-order multiple births, has been attributed to increased use of fertility-stimulating therapy and assisted conception.²⁻⁴ Because infants born of multiple gestation are at increased risk for low birthweight and infant death compared with single-born infants, the rise in the number and rate of multiple births has important public health implications. The purpose of this report is to examine this issue for North Carolina and to assess the outcomes of multiple pregnancies with respect to low birthweight, stillbirth, and infant mortality.

Methods

In this report, the term **delivery** refers to the live birth or stillbirth of **each** product of conception. The multiple delivery rate is the number of multiple deliveries per 1,000 total deliveries. The higher order multiple delivery rate is the number of triplets, quadruplets, and quintuplets per 100,000 total deliveries.

A method for partitioning differences in rates⁵ is used to determine the percentage of the 1980-1997 increase in multiple births that was attributable to different maternal age groups. The overall percentage increase in multiple deliveries that was attributable to a shift to older childbearing was obtained by use of the age-adjusted multiple delivery rate, as described later.

The low birthweight rate is measured as the percentage of total live births that weigh under 2,500 grams (5 pounds 8 ounces or less). The partitioning method referenced above⁵ is used to determine the percentage of the 1980-1997 increase in low birthweight that was attributable to multiple births.

Infants born of multiple gestations are at increased risk of death. In order to quantify and compare mortality for multiple and single live births, infant death certificates have been linked to the corresponding birth certificates where plurality is reported. Based upon the resulting data, we examine the age-specific components of infant mortality. Neonatal deaths are those occurring during the first 28 days of life; postneonatal deaths are those occurring between 28 days and one year of age. The calculated death rates are for infants **born during the period of study** (1992-96). We also examine the stillbirth (fetal death) rates for infants born of single and multiple gestations. In North Carolina, a stillbirth is reportable for pregnancies of 20 or more weeks gestation,

provided the stillbirth does not qualify as a therapeutic abortion. All live births are reportable, regardless of gestational age.

Results

Trends

In 1997, there were 3,026 live births and 69 stillbirths among multiple deliveries to North Carolina women: 2,946 twins, 137 triplets, and 12 quadruplets. The multiple delivery rate was 28.7 per 1,000 deliveries in total, 28.4 for whites and 29.3 for minorities. These rates primarily measure twinning, which is about 8 percent more prevalent among minorities than whites. Higher order multiples, on the other hand, are now 2 ½ times more prevalent among whites than minorities, primarily due to the greater likelihood for white women to seek infertility services.⁶

As shown in Figure 1, the state's multiple delivery rate began to climb in the early seventies with accelerated increases after 1990. For the entire period 1970-1997, the multiple delivery rate increase was more than twice as high for whites (67%) as for minorities (28%). The increase in the delivery rate for triplets and higher order multiples was three times as high for whites (700%) as for minorities (240%).

In 1970, only 1 of about 53 deliveries was a multiple; by 1997, this ratio was 1 of 35 deliveries. The ratio changed from 1 of 59 to 1 of 35 for whites and from 1 of 44 to 1 of 34 for minorities.

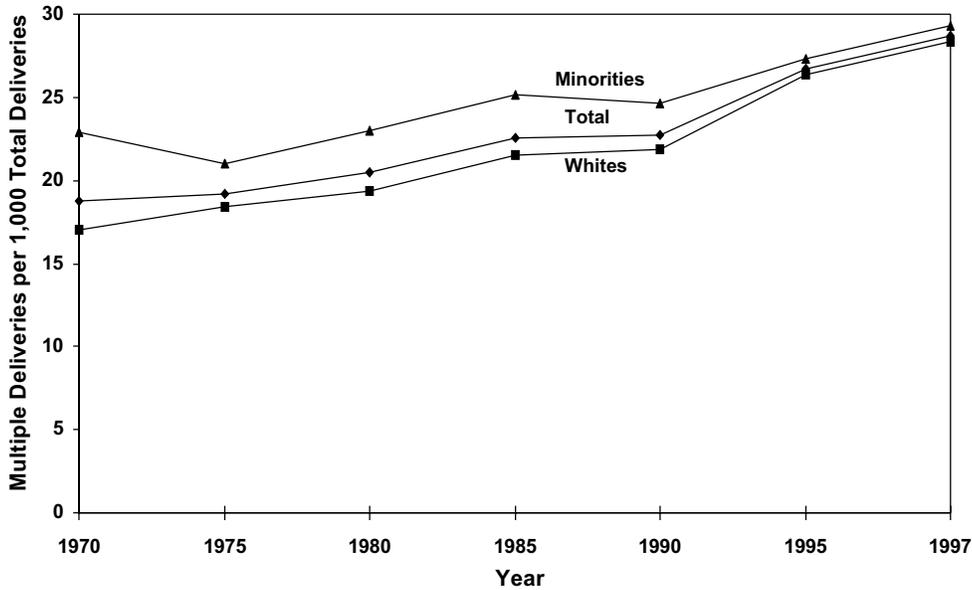
Table 1 below shows the actual numbers of deliveries by plurality for the years depicted in Figure 1.

Table 1
Numbers of Deliveries by Plurality*
North Carolina, Selected Years 1970-1997

Year	Singles	Plurality		
		Twins	Triplets	Quadruplets
1970	98,202	1,854	24	
1975	80,330	1,555	18	
1980	83,606	1,728	24	
1985	88,126	1,998	30	12
1990	102,934	2,340	56	
1995	99,642	2,592	136	4
1997	104,703	2,946	137	12

*Note: Excludes cases of unspecified plurality.

Figure 1
Multiple Delivery Rates by Race
North Carolina, Selected Years 1970-1997

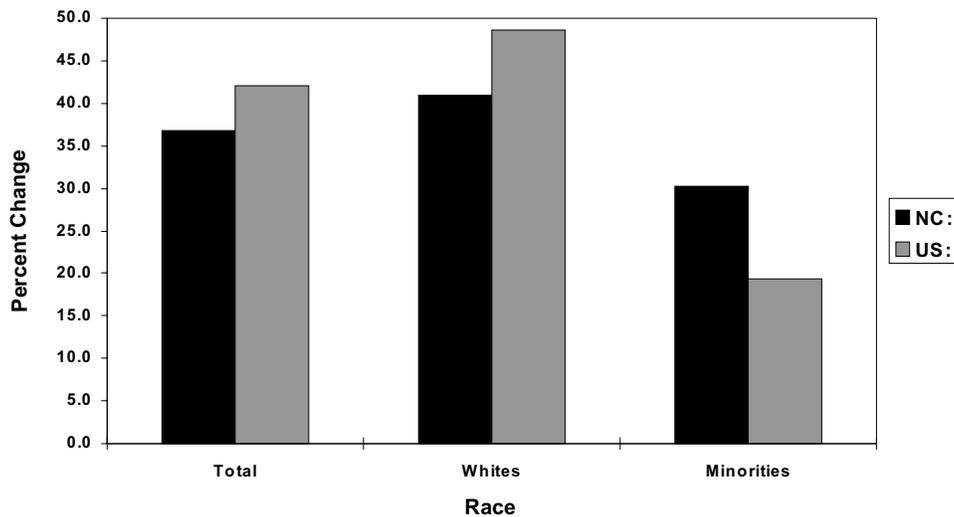


Comparisons to the United States

Since most of the increase in the state’s multiple delivery rate has occurred since 1980, comparisons to the United States are for 1980 and 1996 (latest United States data). Comparisons use live births only since United States data for stillbirths are subject to variations in state reporting requirements and are not included in United States plurality figures.

Figure 2 compares 1980-1996 state and national percent increases in multiple live birth rates by race. The state’s increase has been lower for whites but higher for minorities.

Figure 2
Percent Increase in Multiple Live Birth Rates* by Race
North Carolina and United States, 1980 to 1996



*Multiple live births per 1,000 total live births.

Table 2 compares multiple live birth rates for North Carolina to those of the United States in 1996. It is seen that twinning occurs about as often in North Carolina as in the nation. Higher order multiple births occur about one-third less often in North Carolina, however. Differences in maternal age and race distributions as well as differential use of fertility therapies may be factors.

Maternal Age as a Factor

The rate of multiple pregnancy increases with maternal age, and it has been estimated that about one-third of the national increase in multiple births is the result of the shift towards older childbearing.⁶ To examine the case for North Carolina, data year 1980 is again used as the base.

**Table 2
Multiple Live Birth Rates
North Carolina and United States, 1996**

Multiple Live Births	North Carolina	United States
All Multiple Births*	26.2	27.4
Twin Births*	26.2	25.9
Higher Order Multiple Births†	95.8	152.6

*Per 1,000 live births.
†Per 100,000 live births.

**Table 3
Total and Multiple Deliveries by Maternal Age and Race
North Carolina 1980 and 1997**

Maternal Age	1980				1997				Percent Contribution to Increase in Multiple Rate
	Total Deliveries	Percent of all Deliveries	Multiple Deliveries	Multiple Rate*	Total Deliveries	Percent of all Deliveries	Multiple Deliveries	Multiple Rate*	
Total	85,358	100.0	1,752	20.5	107,814	100.0	3,095	28.7	100.0
Under 20	16,371	19.2	258	15.8	15,505	14.4	207	13.4	-13.5
20-24	29,992	35.1	542	18.1	29,181	27.1	690	23.6	0.6
25-29	24,606	28.8	591	24.0	30,071	27.9	896	29.8	16.9
30-34	11,297	13.2	281	24.9	21,981	20.4	825	37.5	53.3
35-39	2,642	3.1	70	26.5	9,458	8.8	417	44.1	37.3
40 and older	439	0.5	10	22.8	1,611	1.5	60	37.2	5.4
Whites									
Total	57,758	100.0	1,118	19.4	76,246	100.0	2,169	28.4	100.0
Under 20	8,898	15.4	131	14.7	8,709	11.4	93	10.7	-11.5
20-24	19,998	34.6	331	16.6	19,053	25.0	414	21.7	-3.3
25-29	18,222	31.5	411	22.6	22,471	29.5	628	27.9	12.3
30-34	8,532	14.8	193	22.6	17,404	22.8	643	36.9	56.0
35-39	1,822	3.2	46	25.2	7,411	9.7	343	46.3	40.7
40 and older	277	0.5	6	21.7	1,193	1.6	48	40.2	5.8
Minorities									
Total	27,600	100.0	634	23.0	31,561	100.0	926	29.3	100.0
Under 20	7,473	27.1	127	17.0	6,795	21.5	114	16.8	-15.5
20-24	9,994	36.2	211	21.1	10,125	32.1	276	27.3	17.3
25-29	6,384	23.1	180	28.2	7,599	24.1	268	35.3	30.9
30-34	2,765	10.0	88	31.8	4,576	14.5	182	39.8	40.5
35-39	820	3.0	24	29.3	2,047	6.5	74	36.2	23.2
40 and older	162	0.6	4	24.7	418	1.3	12	28.7	3.7

*Per 1,000 Deliveries

Table 3 shows total and multiple deliveries by race and maternal age for 1980 and 1997. For whites, the percentages of deliveries to mothers under age 30 have declined while the percentages to older mothers have increased. For minorities, there was a slight increase in the percentage of deliveries to women ages 25-29 but large increases for women ages 30 and over.

Between 1980 and 1997, the state's multiple delivery rate increased 40 percent, from 20.5 to 28.7 multiples per 1,000 deliveries. The increase was 46 percent for whites and 27 percent for minorities.

For both race groups, the rate of multiple delivery increased in all age groups above 20. The increases for whites are especially notable at ages 30-34 (+ 63%), 35-39 (+ 84%), and 40 and older (+ 85%).

The rightmost column of Table 3 shows the estimated percentage contributions of each age group to the overall increase in the state's multiple delivery rate. The age groups 30-34 and 35-39 accounted for 91 percent of the overall increase – 97 percent among whites and 64 percent among minorities.

From the above, it appears that two factors are driving the state's increase in multiple deliveries: 1) a shift toward older childbearing where multiple pregnancy is naturally more frequent and 2) increased rates of multiple pregnancy in all age groups above 20, especially ages 30-34 and 35-39.

To quantify the contributions of these factors, the 1997 multiple delivery rate was age-adjusted by the direct method, using the age groups of Table 3 and 1980 deliveries as the standard. Results suggest that, as estimated nationally, about one-third of the increase in the state's multiple delivery rate is due to the shift towards older childbearing. The results for whites and minorities are markedly different, however. The shift towards older childbearing appears to account for 37 percent of the white increase versus 76 percent of the minority increase.

Findings for Birthweight

Between 1980 and 1997, multiple deliveries accounted for an increasing percentage of low birthweight births. In 1980, 13.8 percent of all low-weight births were multiples compared to 19.5 percent in 1997.

Table 4 displays the birthweight distributions of singles, twins, and triplets/quadruplets in 1997. Eight percent of singles, 60 percent of twins, and 97 percent of triplets/quadruplets weighed under 2,500 grams. Computed from the grouped data, the average birthweights

were 2,899 grams for singles, 2,239 grams for twins, and 1,515 grams for triplets/quadruplets.

Table 4
Percent Distributions of Single and Multiple Deliveries by Birthweight North Carolina 1997

Birthweight (grams)	Plurality		
	Singles	Twins	Triplets/Quadruplets
Total	100.0	100.0	100.0
Under 500	0.5	2.0	10.1
500-749	0.4	3.3	4.0
750-999	0.4	2.6	5.4
1000-1499	0.7	7.3	29.5
1500-2499	5.9	44.5	47.7
2500 and above	92.0	40.0	2.7

Between 1980 and 1997, the state's low birthweight rate rose 11.4 percent, from 7.9 to 8.8 percent of live births. In order to estimate the impact of increased multiple births on the state's low birthweight rate, Table 5 uses live births only rather than total deliveries.

As shown in Table 5, both whites and minorities experienced a rise in their low birthweight rates between 1980 and 1997, especially among multiple births. For all races combined, the low birthweight rate rose four percent for singles and ten percent for multiples.

The rightmost column of Table 5 gives the percentage of the total increase in low birthweight attributable to single and multiple live births. Multiples accounted for 70 percent of the total increase, 66 percent among whites and 47 percent among minorities.

Stillbirths and Infant Deaths

Table 6 details the mortality experience of infants born of single and multiple gestations during the five years 1992-96. In general, mortality is much higher among multiples, especially neonatal mortality. This is primarily due to the much higher percentage of multiple births that are low birthweight. However, multiples exhibit some survival advantage at low birthweights, especially at weights of 1500-2499 grams. Compared to whites, the survival advantage of both single and multiple minority neonates at 1500-2499 grams is also in evidence.

**Table 5
Total and Low Birthweight Live Births by Plurality and Race
North Carolina 1980 and 1997**

Plurality	1980				1997				Percent Contribution to Increase in Low Birthweight Rate
	Live Births	Percent of Live Births	Low Birthweight	Low Birthweight Rate*	Live Births	Percent of Live Births	Low Birthweight	Low Birthweight Rate*	
Total	84,481	100.0	6,709	7.9	106,949	100.0	9,449	8.8	100.0
Singles	82,801	98.0	5,780	7.0	103,922	97.2	7,604	7.3	30.0
Multiples	1,680	2.0	929	55.3	3,026	2.8	1,845	61.0	70.0
Whites									
Total	57,286	100.0	3,488	6.1	75,789	100.0	5,385	7.1	100.0
Singles	56,210	98.1	2,915	5.2	73,662	97.2	4,122	5.6	34.5
Multiples	1,076	1.9	573	53.3	2,126	2.8	1,263	59.4	65.5
Minorities									
Total	27,195	100.0	3,221	11.8	31,160	100.0	4,064	13.0	100.0
Singles	26,591	97.8	2,865	10.8	30,260	97.1	3,482	11.5	53.4
Multiples	604	2.2	356	58.9	900	2.9	582	64.7	46.6

*Live births under 2,500 grams as a percent of total live births.

Note: 1997 white and grand live birth totals include one case of unknown plurality.

**Table 6
Infant Loss Among Single and Multiple Deliveries by Race and Birthweight
North Carolina 1992-96**

Race and Birthweight	Stillbirth Rate ¹		Neonatal Death Rate ²		Postneonatal Death Rate ³	
	Singles	Multiples	Singles	Multiples	Singles	Multiples
All Races						
Total	7.8	30.1	5.8	41.5	2.7	8.4
Under 1500 grams	244.0	142.6	272.2	278.6	40.8	81.6
1500-2499	21.3	7.5	11.3	5.5	8.2	7.6
2500+	1.6	1.8	1.2	1.2	1.9	3.5
Whites						
Total	5.7	23.5	4.2	35.3	2.2	6.3
Under 1500 grams	253.6	144.4	268.4	268.1	34.5	31.7
1500-2499	21.2	7.3	13.4	6.0	8.3	5.8
2500+	1.5	1.7	1.1	1.7	1.6	1.9
Minorities						
Total	12.7	40.2	9.5	54.5	4.0	13.0
Under 1500 grams	236.5	139.9	275.0	293.7	47.8	33.7
1500-2499	21.4	7.8	9.0	4.4	8.1	10.9
2500+	2.0	2.0	1.4	0.0	2.6	8.0

¹Stillbirths per 1,000 deliveries (live births plus stillbirths).

²Neonatal deaths per 1,000 live births.

³Postneonatal deaths per 1,000 neonatal survivors (live births minus neonatal deaths).

Comment

Between 1980 and 1997, the state's multiple delivery rate rose 40 percent, with the rate of increase being twice as high for white mothers as for minorities. About one-third of the overall increase in multiple deliveries appears to be related to a shift towards older child-bearing. These patterns are generally consistent with similar data for the United States.^{1,7} Although this study could not specifically examine the issue, it is likely that a substantial proportion of the increase in multiple births is related to the increasing use of infertility treatment and assisted conception, which have now become widespread.^{3,4}

The increasing rate of multiple births accounted for an estimated 70 percent of the overall increase in North Carolina's low birthweight rate from 1980 to 1997. This may have masked any successes of programs aimed at preventing prematurity and low birthweight. A recent study from Canada⁸ suggests that an increase in the frequency of multiple births was an important factor contributing to the increasing rate of preterm births in that country. Although it is evident that the rise in the number of multiple births has played a major role in the increasing rate of low birthweight in North Carolina, the fact that low birthweight has also been steadily increasing among single-born infants indicates that much work remains to be done in identifying the causes and means of preventing preterm birth.

Multiple deliveries, which represent less than three percent of all live births, account for nearly one in five low weight births and one in seven infant deaths in North Carolina. The continuing rise in the number of multiple births combined with their disproportionate contribution to low birthweight and infant mortality is a situation that warrants greater attention by the medical and public health communities.

References

- ¹Mushinski M. Trends in multiple births. *Stat Bull Metropol Insur Co* 75:28-35, 1994.
- ²Luke B. The changing pattern of multiple births in the United States: maternal and infant characteristics, 1973 and 1990. *Obstet Gynecol* 84:101-106, 1994.
- ³Jewell SE, Yip R. Increasing trends in plural births in the United States. *Obstet Gynecol* 85:229-232, 1995.
- ⁴Dunn A, MacFarlane A. Recent trends in the incidence of multiple births and associated mortality in England and Wales. *Arch Dis Child Fetal Neonat Ed* 75:F10-19, 1996.
- ⁵Kitawaga EM. Components of a difference between two rates. *J Am Stat Assoc* 50:1168-1194, 1955.
- ⁶Ventura SJ, Martin JA, Curtin SC, Mathews TJ. Report of final natality statistics, 1996. *Monthly Vital Statistics Report*: vol 46, no. 11, supp. Hyattsville, Maryland: National Center for Health Statistics, 1998.
- ⁷Martin JA, Taffel SM. Current and future impact of rising multiple birth ratios on low birthweight. *Stat Bull Metropol Insur Co* 76:10-18, 1995.
- ⁸Joseph KS, Kramer MS, Marcoux S, Ohlsson A, Wen SW, Allen A, Platt R. Determinants of preterm birth rates in Canada from 1981 through 1983 and from 1992 through 1994. *New Engl J Med* 339:1434-1439, 1998.



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