

# **The Birth Certificate and Medicaid Data Match Project:**

## **A Comparison of Low Birth Weight Outcomes among Medicaid and Non-Medicaid Funded Births in Minnesota**

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**Minnesota Department of Health**

**Minnesota Department of Human Services**

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The Minnesota Birth Certificate and Medicaid Data Match Project is a collaborative effort between the Minnesota Department of Health and the Minnesota Department of Human Services.

This is the second report produced through the Minnesota Birth Certificate and Medicaid Data Match Project. The first report, *Initial Findings in Infant Mortality*, is available from the Minnesota Department of Health at:  
<http://www.health.state.mn.us/divs/fh/mch/mortality/documents/initialfindings.html>

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# Executive Summary

This report examines the relationship between income and low birth weight (LBW) in Minnesota. Medicaid coverage of the birth was used as an indicator of low income; these births are compared with births that were not covered by Medicaid. Analysts used a matched birth certificate and Medicaid enrollment data set to compare the incidence of LBW between Medicaid and non-Medicaid births. The role of other known risk factors for LBW was also explored.

## ***Comparison of Medicaid and non-Medicaid populations***

Medicaid and non-Medicaid births were compared on LBW, and on several maternal characteristics that previous research has shown to be associated with LBW. Maternal characteristics examined in this report include maternal age, race, Hispanic ethnicity, maternal country of birth, educational attainment, tobacco and alcohol use during pregnancy, and adequacy of prenatal care.

- LBW was significantly more common among births funded by Medicaid than among non-Medicaid births (7.9% vs. 6.0% respectively).
- Several maternal characteristics associated with higher risk of LBW were also more common among Medicaid births than non-Medicaid births. These characteristics were maternal age less than 20 years, African American/Black race, low educational attainment, inadequate or no prenatal care, and reported use of tobacco or alcohol during pregnancy.

## ***LBW comparisons by Medicaid status***

Rates of LBW were compared between Medicaid and non-Medicaid births, after restricting analysis to mothers who share a maternal characteristic. The purpose of these comparisons is to examine whether Medicaid status is associated with a higher risk of LBW after controlling for the effect of other LBW risk factors.

- Within some groups of women sharing a maternal characteristic, the Medicaid population had a higher rate of LBW. These groups were women who were aged 20 to 34, aged 35 and older, White, non-Hispanic, born in the United States, had 12 or

more years of education, had adequate prenatal care, had inadequate or no prenatal care, or who did not report tobacco use during pregnancy.

- However, other LBW comparisons by Medicaid status showed no significant difference in LBW between Medicaid and non-Medicaid births. These groups were women with the following characteristics: under age 20, African American/Blacks, American Indian, Asian/Pacific Islander, Hispanic, born outside the U.S., with fewer than 12 years of education, with intermediate adequacy of prenatal care, or reported tobacco use during pregnancy.
- Medicaid births did not have a significantly lower percentage of LBW compared with non-Medicaid births for any of the groups of women examined.

### ***LBW comparisons by maternal characteristics***

Rates of LBW were compared between groups of mothers who differed by some maternal characteristic, within either the Medicaid population or the non-Medicaid population. These comparisons show how the risk of LBW varies within each population by maternal age, race, educational attainment, or other characteristics. Additionally, whether the patterns of LBW by maternal characteristic differ between the Medicaid and non-Medicaid populations can be examined.

- Comparisons of LBW by maternal characteristics showed similar patterns of association between some maternal characteristics and LBW in both Medicaid and non-Medicaid populations.
  - LBW was significantly lower among births to 20- to 34-year-old women, compared with births to women under 20 or 35 and older, in both populations.
  - Births to African Americans/Blacks were significantly more likely than all other race groups to be LBW in both the Medicaid and non-Medicaid populations. Births to Asian/Pacific Islander women were significantly more likely to be LBW than births to White women in both populations, and significantly less likely to be LBW than births to Black women.

- Births to women who reported tobacco or alcohol use during pregnancy also had significantly higher rates of LBW in both populations.
- Births to women with inadequate or no prenatal care had a significantly higher percentage of LBW than births to women with adequate prenatal care, among both Medicaid and non-Medicaid births.
- However, patterns of association differed between populations for Hispanic ethnicity, educational attainment, and country of birth.
  - In the Medicaid population, LBW does not differ by maternal educational attainment, but LBW is associated with lower educational attainment in the non-Medicaid population.
  - There was no difference in LBW by the mother's Hispanic ethnicity in the non-Medicaid population, but Hispanic ethnicity is associated with a lower rate of LBW in the Medicaid population.
  - The percentage of LBW was significantly higher among births to U.S.-born women compared with births to non-U.S.-born women in the Medicaid population. However, LBW was more common among non-U.S.-born women in the non-Medicaid population.

### ***Discussion and Conclusions***

- The Medicaid population in Minnesota has a disproportionate share of LBW deliveries, and risk factors for LBW, compared with the non-Medicaid population. In other words, low income, measured by Medicaid status, is a risk factor for LBW in Minnesota. This finding is consistent with a large body of previous U.S. and international research that demonstrates a strong association between poverty and poor birth outcomes.
- Some risk factors for LBW that were more prevalent in the Medicaid population - tobacco use, alcohol use, and inadequate prenatal care - are modifiable. These risk factors can be targeted for change during pregnancy through the promotion of and improved access to early and comprehensive prenatal care. Because inadequate

prenatal care is more common in the Medicaid population, efforts should be made to reduce barriers to prenatal care for low-income women, including the consideration and expansion of innovative approaches such as group prenatal care and enhanced prenatal care. Teen pregnancy prevention could also play a role in reducing the disparity in LBW between Medicaid and non-Medicaid births.

- Additionally, improving access to, and quality of, preconception and interconception care for women can reduce risk factors for LBW. Preconception and interconception care refer to preventive counseling and interventions before and between pregnancies to optimize women's health and reproductive outcomes. Minnesota's Medicaid programs offer opportunities to promote preconception and interconception care to low-income women.
- To address risk factors for LBW that cannot be changed, such as African American race, a broader approach, based on the life-course perspective, is needed to reduce persistent disparities in birth outcomes. Such an approach would include components at the individual, family and community, and societal levels.
- Overall, examination of the relationships between specific maternal characteristics, LBW, and Medicaid status revealed a complex interplay of factors. Further research using multivariate analysis techniques is needed.

# Introduction

Low birth weight (LBW), infant mortality, and other poor birth outcomes are strongly associated with socioeconomic status in the U.S. and around the world.(1,2,3) Factors that increase the risk of adverse birth outcomes among low income women include poor health status, unhealthy behaviors before and during pregnancy, and exposure to stressful social and environmental conditions. This report compares the incidence of LBW among births funded by Medicaid with that among non-Medicaid births in Minnesota. The goal of this comparison is to examine the association between income, as indicated by Medicaid status, and LBW.

The incidence of LBW, defined by the World Health Organization as a birth weight of less than 2500 grams,(4) is gradually increasing in Minnesota. In 2007, 4,980 LBW infants were born to Minnesota residents, accounting for 6.8% of all births, compared with 5.1% of births in 1990(5). This trend is of concern because LBW has both immediate and long-term impacts on health. LBW is a significant predictor of infant mortality, particularly during the first month after birth.(1,6) Additionally, the consequences of LBW may extend well beyond infancy. Children who were LBW infants are more likely to have disabilities and hospitalizations, and as adults they may have an increased risk of heart disease, type 2 diabetes, hypertension, and other chronic diseases.(2,7)

Research suggests many factors that may explain the relationship between low socioeconomic status and LBW. Low income women are more likely to have poor nutritional status, low weight gain during pregnancy, infections, and chronic health conditions.(3,8) Behavioral factors associated with both LBW and low socioeconomic status include tobacco, alcohol, and other drug use, and late timing of prenatal care initiation.(3,8) Maternal stress caused by occupational environments characterized by strenuous work and prolonged standing, and negative psychosocial environments that include racism and discrimination, lack of social and intimate partner support, and domestic violence, may lead to poor birth outcomes.(8,9,10)

To examine the association between income and LBW in this report, a dataset linking birth certificate data and Medicaid enrollment data was used. In Minnesota, income data is not available on birth certificates, so the relationship between LBW and income could not be studied directly. Instead, the mother's enrollment in Medicaid at the time of birth was used as a proxy for low income, enabling the study of the relationship between LBW and socioeconomic status. In this report, we have compared LBW, and several maternal characteristics associated with LBW, between Medicaid and non-Medicaid funded births.

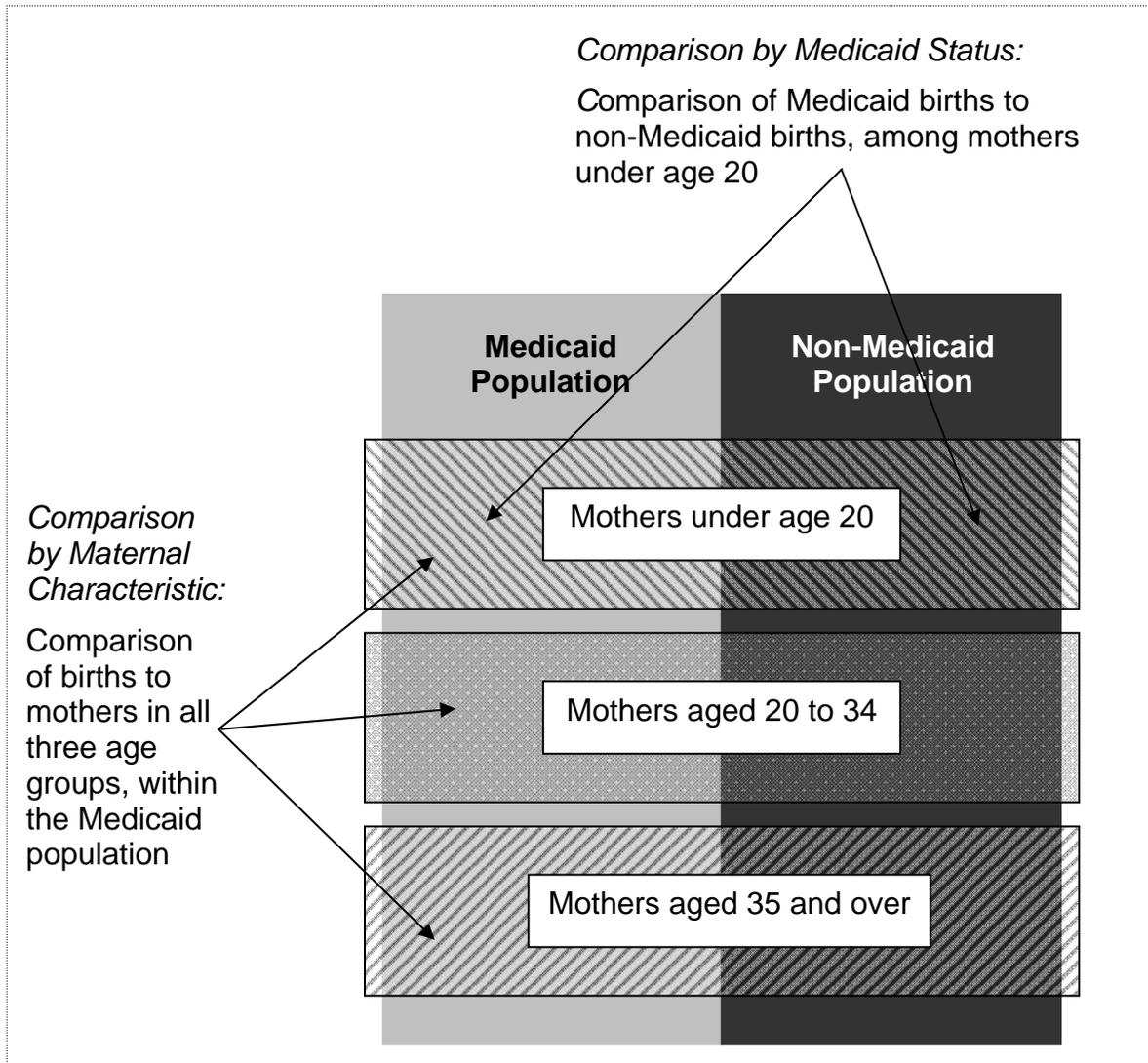
# Structure of report

The analyses in the Results section are presented in three sections.

- 1) First, a *comparison of the Medicaid and non-Medicaid populations* is presented. The Medicaid and non-Medicaid populations are compared on LBW, and on several maternal characteristics that previous research has shown to be associated with LBW. The goal of this analysis is to examine risk factors for LBW that may differ between the Medicaid and non-Medicaid populations. The maternal characteristics examined include maternal demographic characteristics (age, race, Hispanic ethnicity, country of birth, educational attainment), maternal behaviors (tobacco use and alcohol use during pregnancy), and maternal health care utilization (adequacy of prenatal care). Previous research has shown young maternal age (less than 20 years), older maternal age (35 years or older), African American race, low educational attainment, tobacco and alcohol use during pregnancy, and inadequate prenatal care to be risk factors for LBW (3, 6, 8, 11).
- 2) Second, *LBW comparisons by Medicaid status* are presented. In these comparisons, LBW rates in the Medicaid and non-Medicaid populations are compared among groups of women that share one of the maternal characteristics listed above. For example, we compare Medicaid births to women under age 20 with non-Medicaid births to women under age 20 (Figure 1). The goal of these comparisons is to determine if there is an association between income and LBW when analysis is restricted to a group of women that is similar based on a certain characteristic or risk factor.
- 3) Third, *LBW comparisons by maternal characteristic* are presented. In these comparisons, LBW rates are compared between groups of women that differ by one of the maternal characteristics listed above, within both the Medicaid and non-Medicaid populations. For example, we compare LBW among Medicaid births to mothers in three different age groups (under 20, 20 to 34, and 35 and over; Figure 1). We also compare LBW among births to mothers in the three age groups within the non-Medicaid population. The goal of these comparisons is to examine whether the

relationship between LBW and a given maternal characteristic differs between the Medicaid and non-Medicaid populations.

Figure 1. Illustration of the two types of LBW comparisons used in this report.



# Background

## ***Medicaid births in Minnesota***

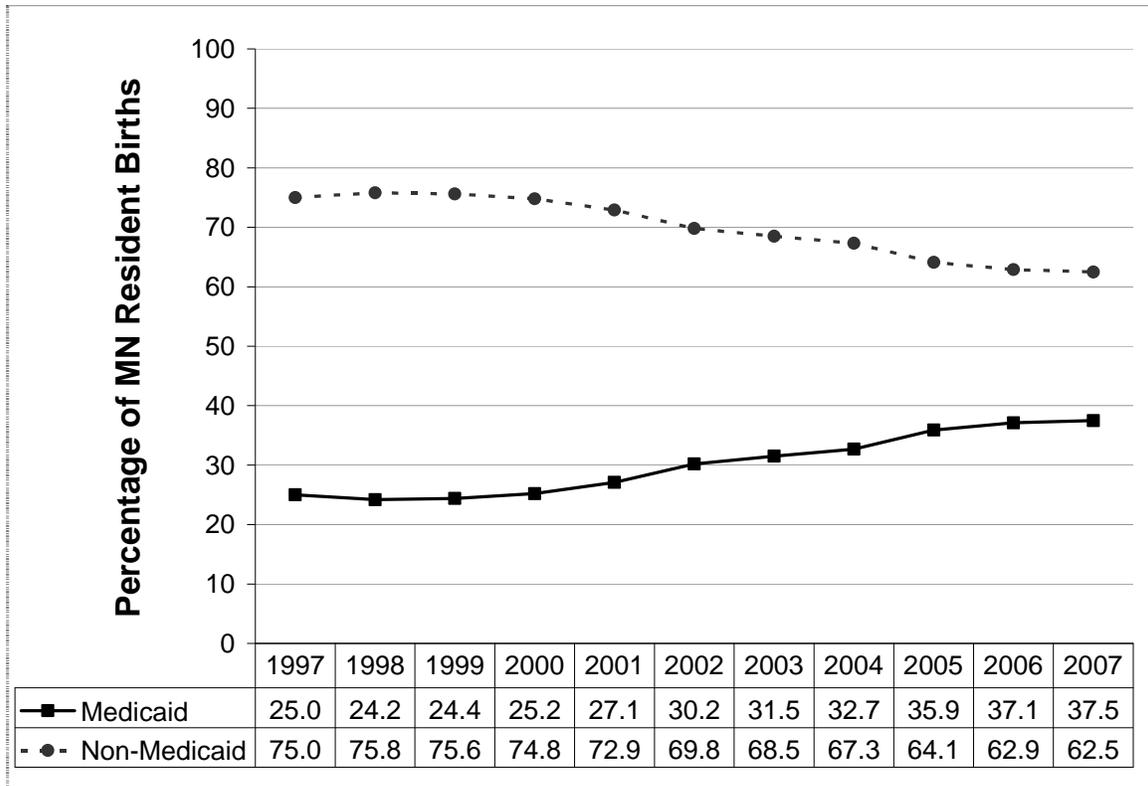
The federal Medicaid program as administered in Minnesota includes both Medical Assistance (MA) and MinnesotaCare. Both of these programs provide comprehensive health care coverage for pregnant women with a family income that is 275% of the federal poverty guideline (FPG) or lower; from July 2006 to June 2007 this income limit equaled \$4,586 per month for a family of four. For the purposes of this report, “Medicaid births” include any birth to a Minnesota resident that was covered by either MA or MinnesotaCare.

The percentage of births to Minnesotans financed by Medicaid has increased over time (Figure 2). In 2007, over one-third of live births to Minnesota residents matched with Medicaid data, compared with one-fourth of live births in 1997. During the time period examined in this report (2005-2007), there were 218,110 births to Minnesota residents, of which 80,357 (36.8%) matched with Medicaid enrollment data.

## ***Non-Medicaid births in Minnesota***

The non-Medicaid population in this report includes women who were covered by private insurance, self-insured, or uninsured at the time of the birth of their child. Because the non-Medicaid population includes the uninsured, Medicaid status of the birth may not be a perfect proxy for low income. That is, the difference between the Medicaid and non-Medicaid populations may not reflect the true difference between births to low income women and births to higher-income women.

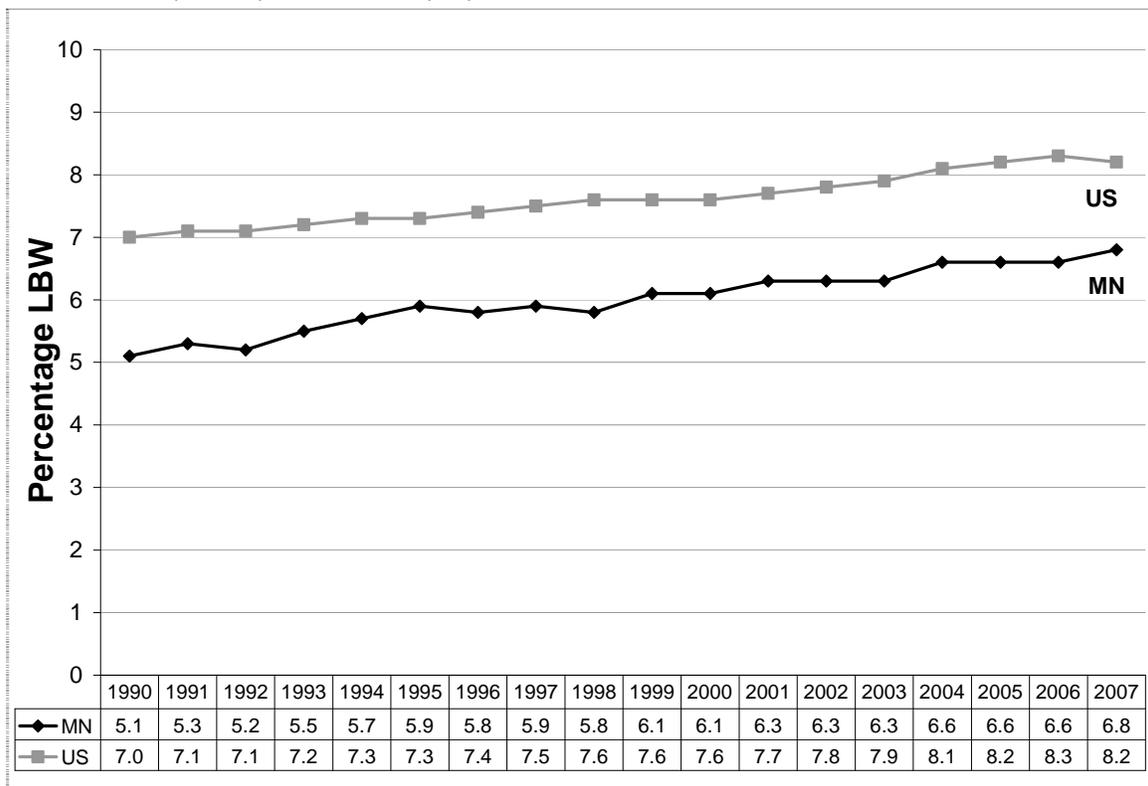
Figure 2. Percentage of Minnesota resident birth certificates that matched with Medicaid data, Minnesota Birth Certificate and Medicaid Data Match Project, 1997-2007.



## Low birth weight trends in the U.S. and Minnesota

LBW in the U.S. has been steadily increasing since the mid-1980s. In 2006, LBW occurred in 8.3% of U.S. births, compared with 6.7% in 1984.(11) Although the LBW rate in Minnesota has been consistently lower than the national rate, the trend in Minnesota parallels the national trend (Figure 3). In 2007, the percentage of LBW in Minnesota was 6.8%, an increase of one-third over the 1990 LBW percentage of 5.1%.(12)

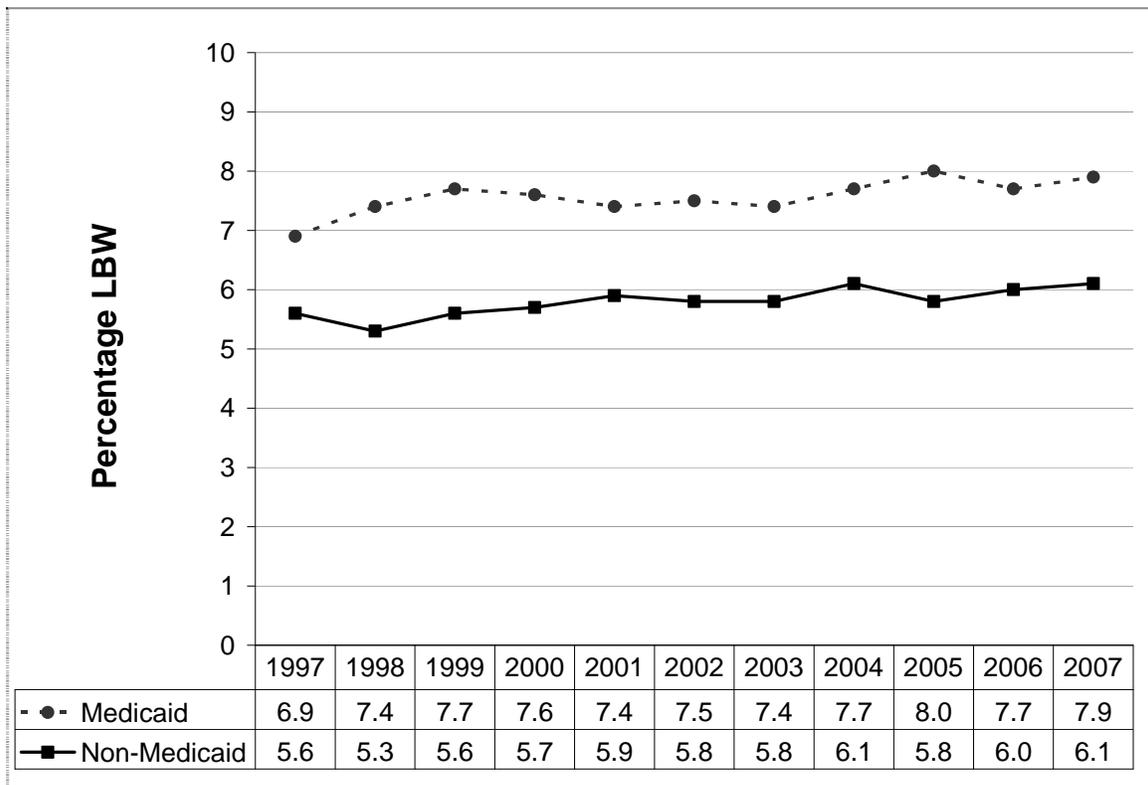
Figure 3. Percentage of LBW births, Minnesota and U.S., 1990 – 2007. (Note: 2007 U.S. birth data is preliminary.) Sources: Centers for Disease Control and Prevention (11,13) and MDH.(12)



## ***LBW among Medicaid and non-Medicaid births***

From 1997 to 2007, the rate of LBW has increased gradually for both the Medicaid and non-Medicaid populations (Figure 4). These trends are consistent with the overall trend in LBW among Minnesota resident births (Figure 3). Additionally, the percentage of LBW births in the Medicaid population has been consistently higher than the percentage of the non-Medicaid population during this time period.

Figure 4. Percentage of LBW births in Medicaid and non-Medicaid populations, Minnesota Birth Certificate and Medicaid Data Match Project, 1997-2007.



# Methods

## ***Data sources***

The dataset used in this report was produced through a data sharing agreement between the Minnesota Department of Health (MDH) and the Minnesota Department of Human Services (DHS). Medicaid data for women with birth-related claims were matched with birth certificate data through an iterative process using the name of the mother, the child's date of birth, and other identifiers.<sup>(14)</sup> The main analyses in this report were performed using births in calendar years 2005-2007 combined. Analyses of trends over time used data from 1997 to 2007.

Birth certificate data compiled at MDH include all live births occurring in Minnesota as well as live births to Minnesota residents occurring in other states. Medicaid claims data and enrollment files from DHS include data from fee-for-service (FFS) claims submitted to DHS for payment, and from managed care encounter data as submitted by contracted health plans for enrollees in the Prepaid Medical Assistance Program (PMAP).

## ***Variable definitions***

Medicaid-supported births were defined as birth records that matched to Medicaid data; non-matched birth records were defined as the non-Medicaid population. Aside from Medicaid status of the birth, all data used in this report originated from birth certificates. Maternal age, race, Hispanic ethnicity, country of birth, educational attainment, prenatal care use, and tobacco and alcohol use during pregnancy were reported by the mother at the time of birth.

Race and ethnicity categories are based on the race and ethnicity of the mother as reported on the birth certificate. On the birth certificate, race and Hispanic ethnicity were obtained from the mother separately, and were analyzed separately for this report. Hispanic ethnicity includes anyone indicating they are of Hispanic/Latino descent irrespective of race.

Adequacy of prenatal care is measured using the GINDEX, which uses an algorithm that includes the trimester of initiation of prenatal care, the number of prenatal care visits

received during pregnancy, and gestational age at birth.(15) Prenatal care that began during the first trimester and included at least an adequate number of prenatal visits (9 or more visits during a pregnancy of at least 36 weeks) is categorized as “adequate.” Prenatal care that began in the first trimester and included an intermediate number of visits (5 to 8 visits during a  $\geq 36$  week pregnancy), or began in the second trimester and included at least an intermediate number of visits, is categorized as “intermediate.” Prenatal care that began in the first or second trimester and included fewer than 4 visits, or began in the third trimester with any number of visits, is categorized as “inadequate.” Births for which no prenatal care was reported are combined with the inadequate category to create the “inadequate or no care” category.

### ***Statistical testing***

Differences in proportions of LBW and of maternal characteristics between the Medicaid and non-Medicaid populations were assessed using the chi-square test. A p-value less than 0.05 was considered statistically significant.

For the comparisons by Medicaid status and by maternal characteristics, the percentage of LBW births in each stratum was calculated, and a 95% confidence interval was calculated for each percentage of LBW births to identify statistical differences. Groups with non-overlapping confidence intervals were considered to have significantly different percentages of LBW births.

Confidence intervals were calculated using the formula for the binomial proportion confidence interval:(16)

$$P \pm 1.96 * \sqrt{(PQ/N)}$$

P = proportion of LBW births in group

= (number of LBW births in group  $\div$  total number of births in group)

Q = 1 – P

N = total number of births in group

Tables containing detailed results, including p-values and confidence intervals, are located in the Appendix.

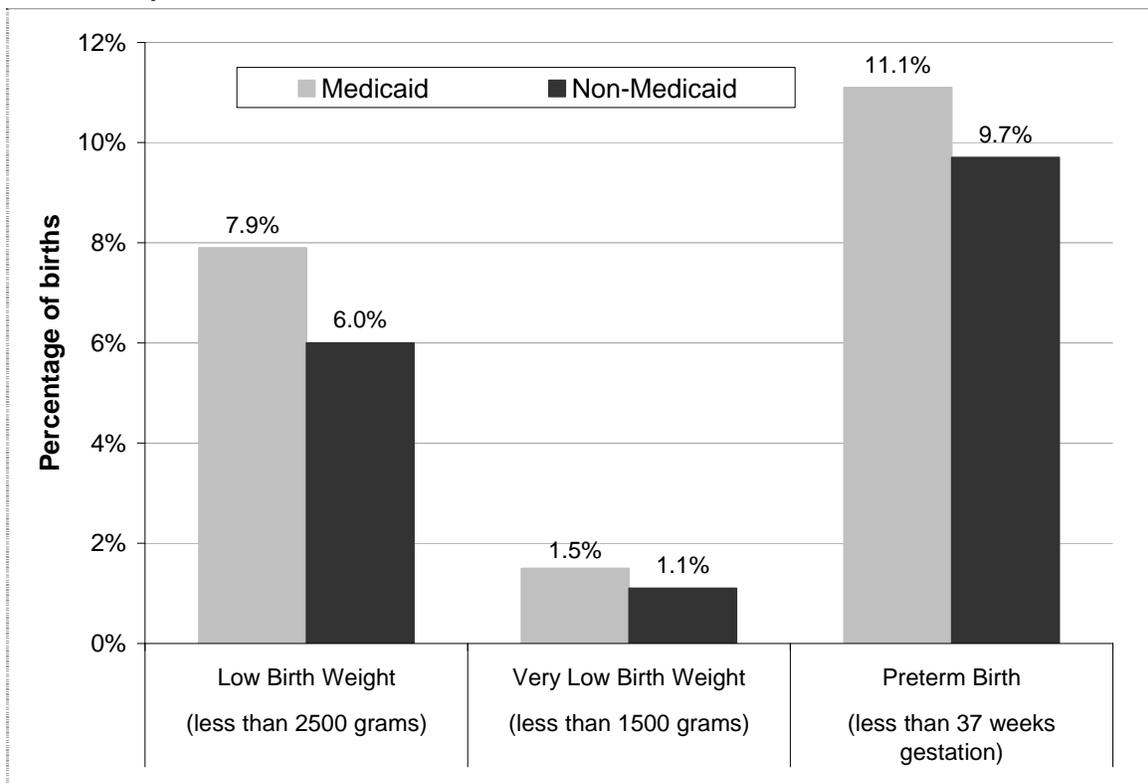
# Results

## *Comparison of Medicaid and non-Medicaid populations*

### **Birth weight and gestational age**

In 2005-2007, LBW births were more common among Medicaid births (7.9 percent) than non-Medicaid births (6.0 percent), consistent with the trends described previously (Figure 5). Very low birth weight (VLBW), defined as a birth weight of less than 1500 grams, was also more common in the Medicaid population (1.5 percent) compared with the non-Medicaid population (1.1 percent). Medicaid births (11.1 percent) were also more likely to be preterm deliveries (defined as less than 37 weeks gestation) compared with the non-Medicaid population (9.7 percent).

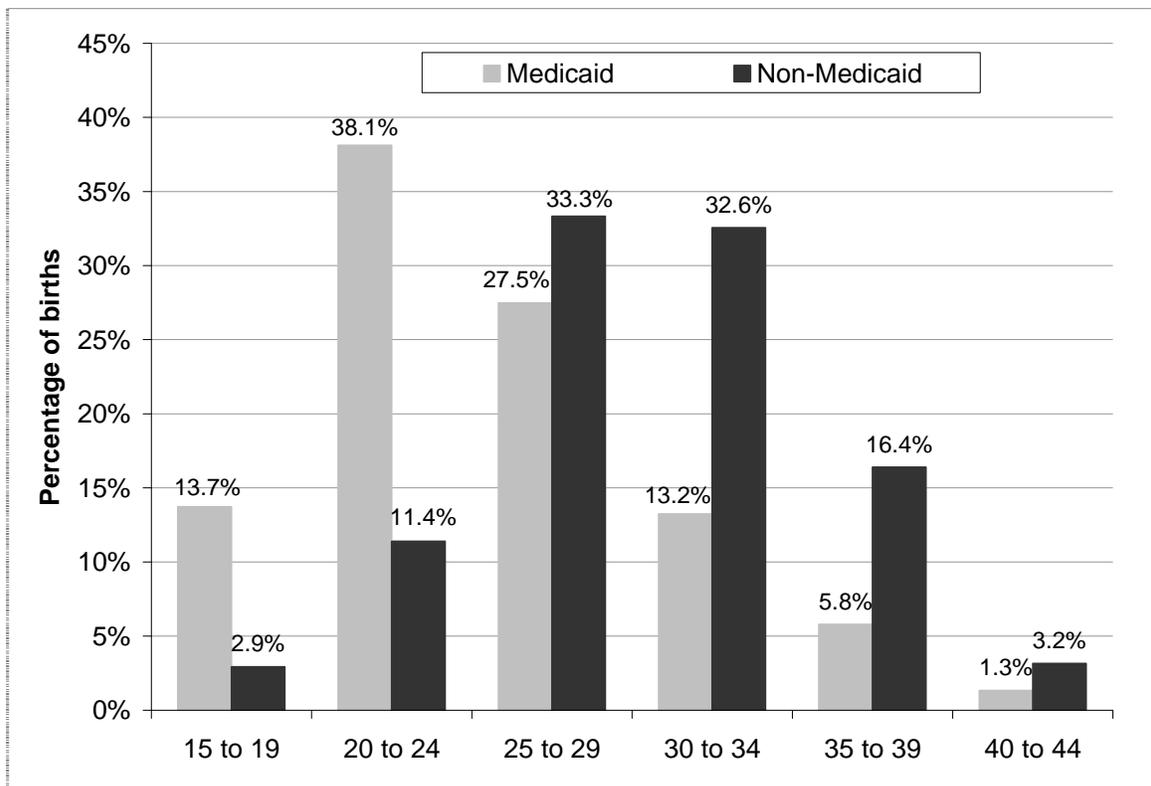
Figure 5. Comparison of birth weight and gestational age outcomes between Medicaid and non-Medicaid births, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Maternal age

Mothers enrolled in Medicaid at the time of giving birth tend to be younger than mothers of non-Medicaid births. Figure 6 illustrates the difference in maternal age distribution of Medicaid and non-Medicaid births. The peak of the Medicaid maternal age distribution was in the 20-24 year age interval, while the majority of mothers of non-Medicaid births were between 25 and 35 years old. Notably, 13.7% of births in the Medicaid population were to adolescent mothers (aged 15-19), compared with 2.9% of non-Medicaid births.

Figure 6. Distribution of Medicaid and non-Medicaid births by maternal age, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Maternal race and Hispanic ethnicity

A breakdown of the two populations by maternal race indicates that the majority of mothers of both Medicaid births (57.1 percent) and non-Medicaid births (86.7 percent) were White (Figure 7). Births to mothers who were African American/Black, American Indian, and Asian represented 28.3 percent of the Medicaid population and 10.5 percent of the non-Medicaid population. Unknown race also made up a larger proportion of Medicaid births (14.7 percent) than of non-Medicaid births (2.7 percent); the majority of these mothers also reported Hispanic ethnicity. Also, Medicaid mothers (16.9 percent) were more likely than non-Medicaid mothers (2.9 percent) to be Hispanic (Figure 8).

Figure 7. Distribution of Medicaid and non-Medicaid births by maternal race, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

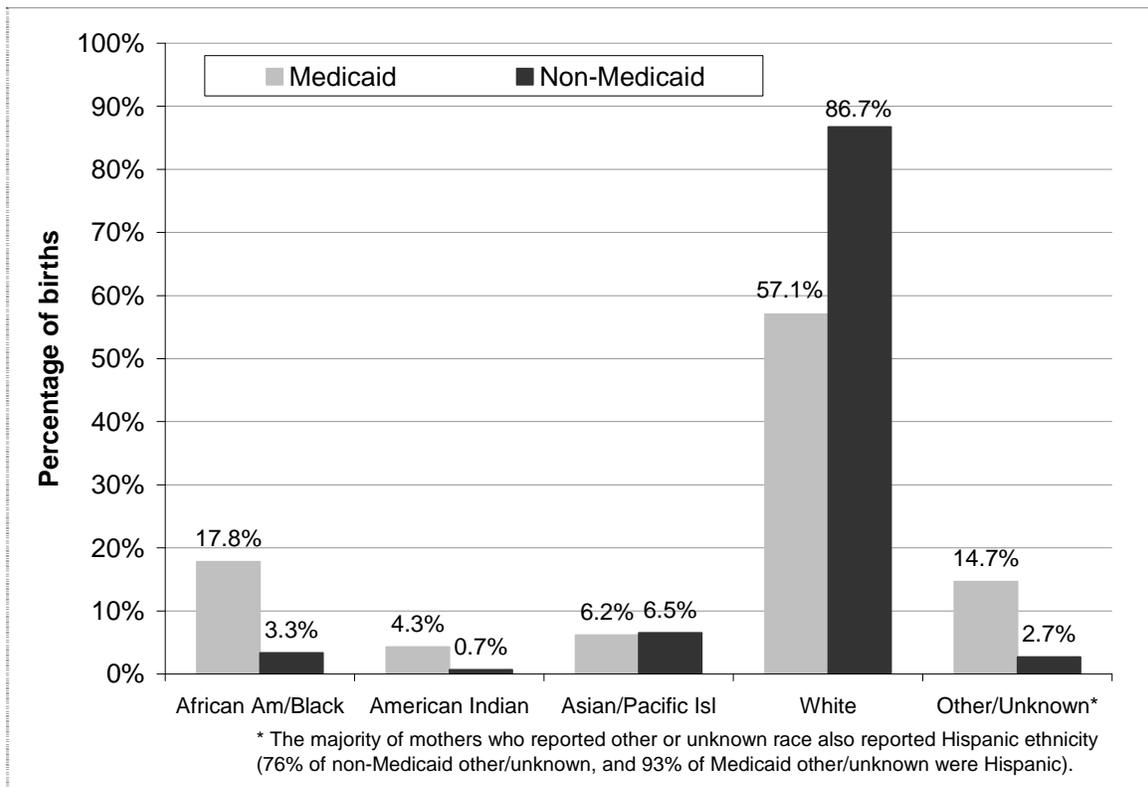
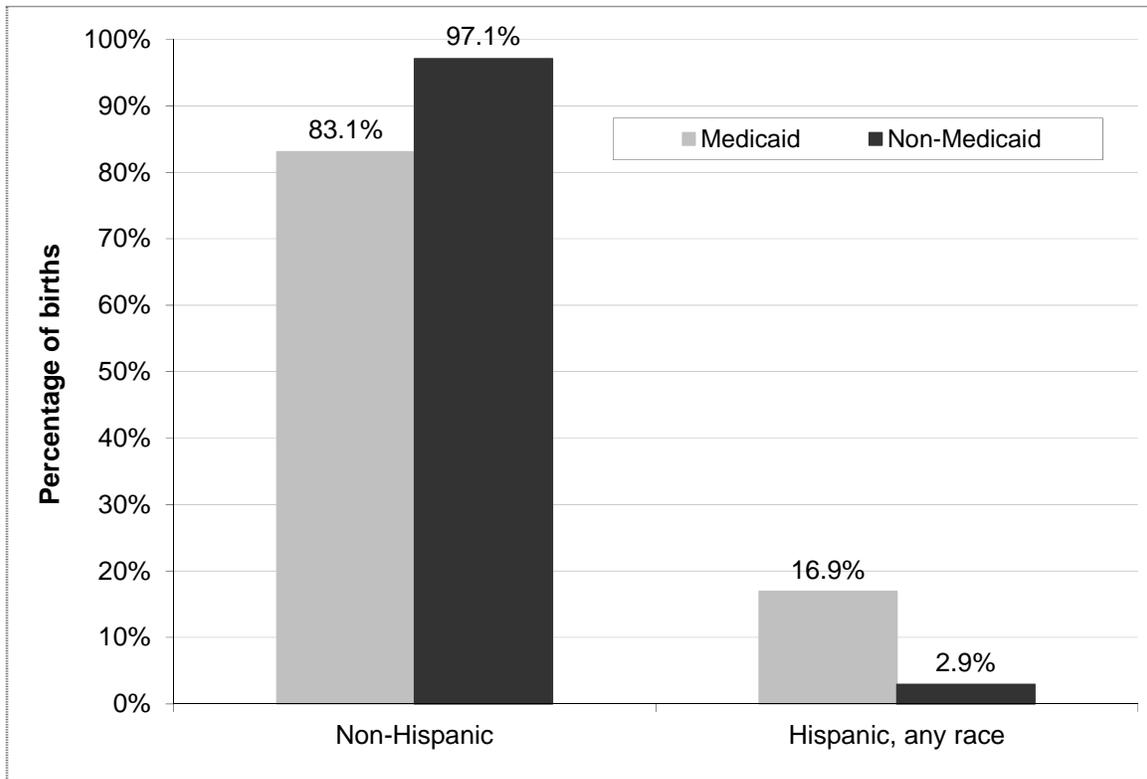


Figure 8. Distribution of Medicaid and non-Medicaid births by maternal Hispanic ethnicity, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



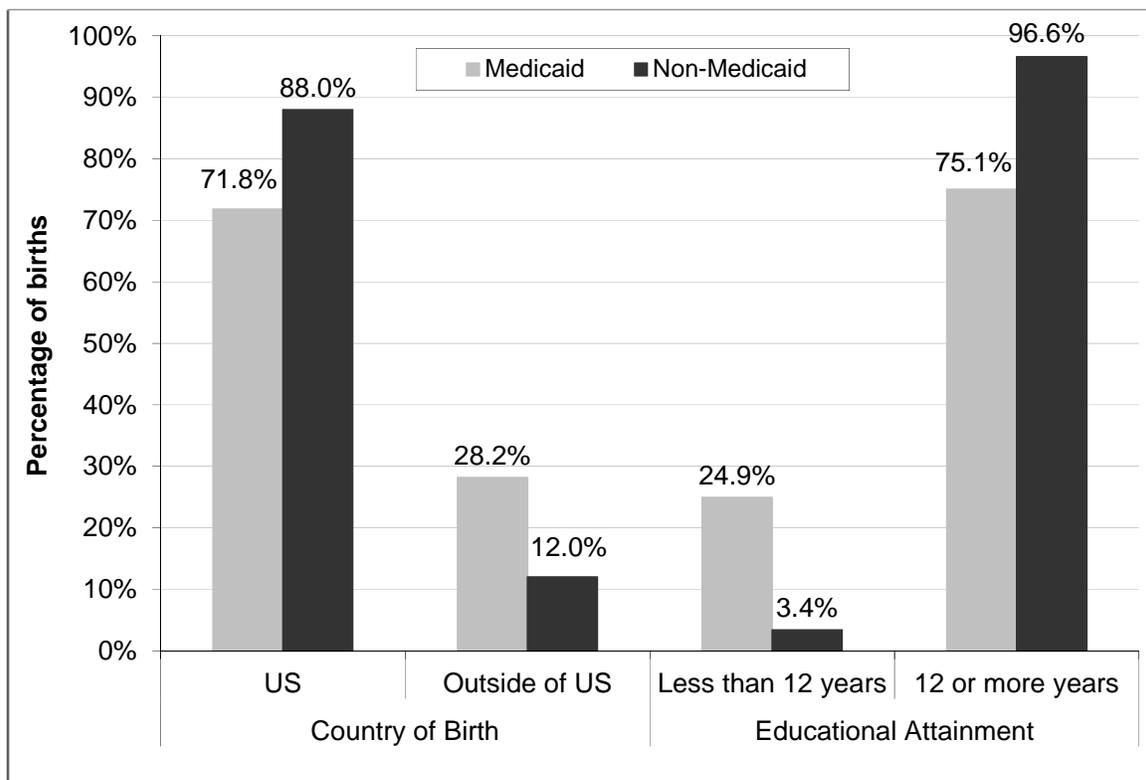
## Maternal country of birth

The percentage of births to mothers born outside of the U.S. was significantly different between the Medicaid and non-Medicaid populations. In the Medicaid population, 28.2 percent of births were to mothers born outside of the U.S., compared with 12.0 percent in the non-Medicaid population (Figure 9).

## Maternal educational attainment

Medicaid and non-Medicaid births also differed significantly in maternal years of education. In the Medicaid population, 75.1 percent of births were to mothers who indicated they had completed 12 or more years of education, compared with 96.6 percent of non-Medicaid births (Figure 9). Part of this difference may be because of the greater proportion of adolescent mothers in the Medicaid population (Figure 6).

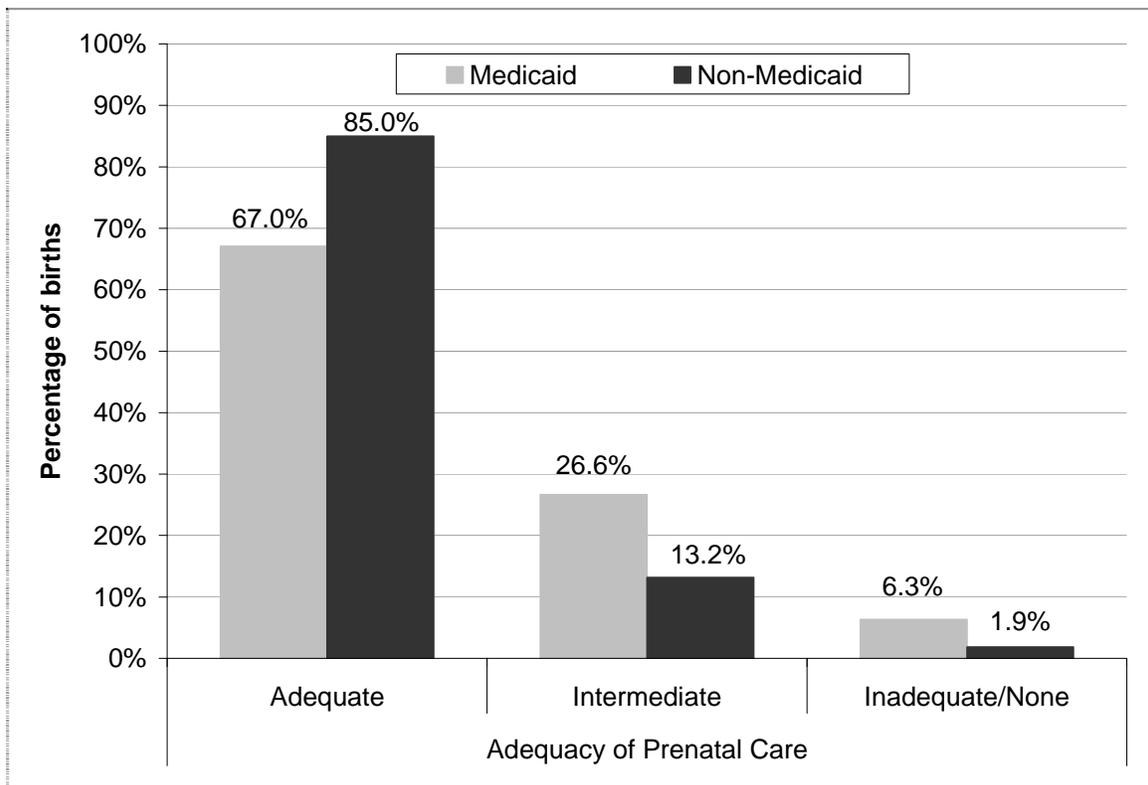
Figure 9. Distribution of Medicaid and non-Medicaid births by maternal country of birth and educational attainment, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Prenatal care adequacy

While the majority of mothers in both populations reported adequate prenatal care (that is, prenatal care beginning during the first trimester and including an adequate number of visits), non-Medicaid mothers (85.0 percent) were more likely than Medicaid mothers (67.0 percent) to have adequate prenatal care (Figure 10). In fact, Medicaid mothers (6.3 percent) were more than three times as likely as non-Medicaid mothers (1.9 percent) to report inadequate or no prenatal care.

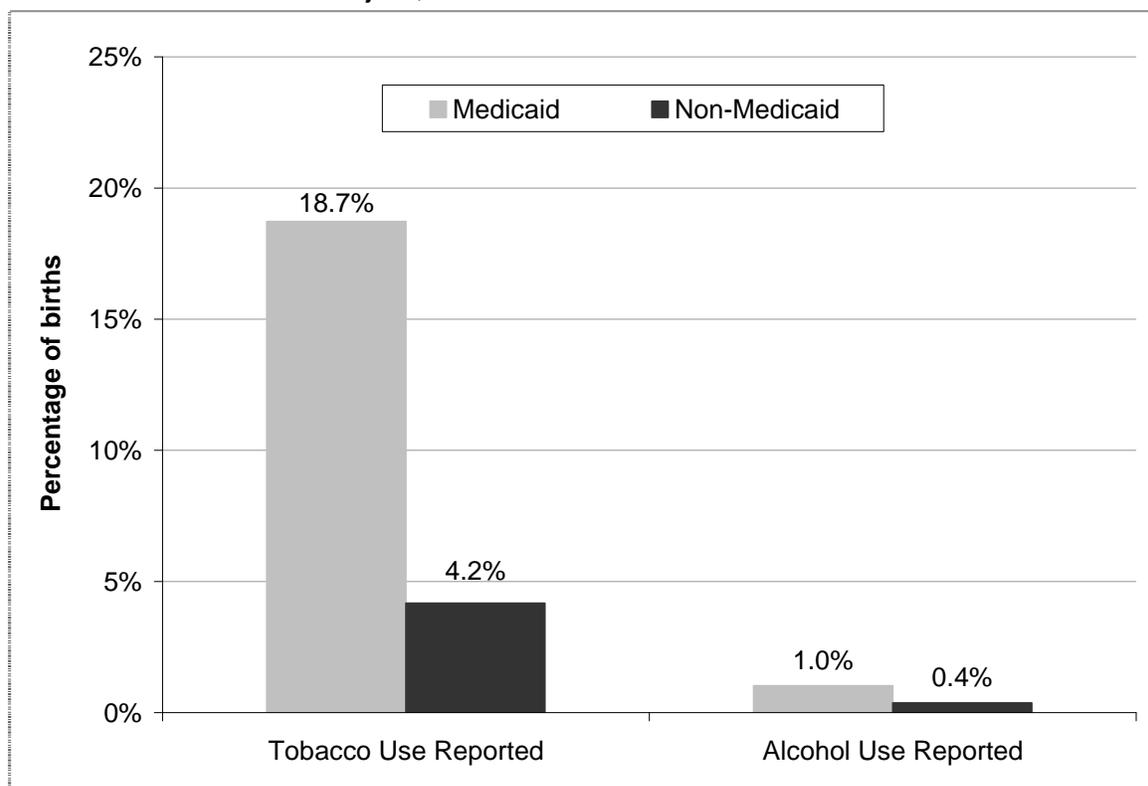
Figure 10. Distribution of Medicaid and non-Medicaid births by adequacy of prenatal care, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Tobacco and alcohol use during pregnancy

Mothers of Medicaid births (18.7 percent) were more likely than mothers of non-Medicaid births (4.2 percent) to report tobacco use during pregnancy (Figure 11). Alcohol use during pregnancy was also reported more frequently in the Medicaid population (1.0 percent) than in the non-Medicaid group (0.4 percent), although the percentage reporting alcohol use was small for both populations.

Figure 11. Percentage of mothers reporting tobacco and alcohol use during pregnancy for Medicaid and non-Medicaid births, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## **Summary:**

### **Comparison of Medicaid and non-Medicaid populations**

In summary, births funded by Medicaid differ significantly from non-Medicaid births on LBW and several maternal characteristics associated with LBW.

The incidence of LBW has been consistently higher in the Medicaid population compared with the non-Medicaid population. Rates of very low birthweight and preterm births were also higher in the Medicaid population.

Comparison of the maternal demographic characteristics showed that mothers of Medicaid births were more likely to be young mothers, from a racial group other than White, Hispanic, born outside of the U.S., and to have less than 12 years of education. Mothers of Medicaid births were also more likely to receive inadequate/no prenatal care compared with non-Medicaid births. Comparison of maternal behaviors showed that mothers of Medicaid births more often reported tobacco and alcohol use during pregnancy.

The characteristics of the Medicaid population are consistent with those that would be expected for a low income population, supporting the use of Medicaid status as a proxy for socioeconomic status.

## ***LBW comparisons by Medicaid status***

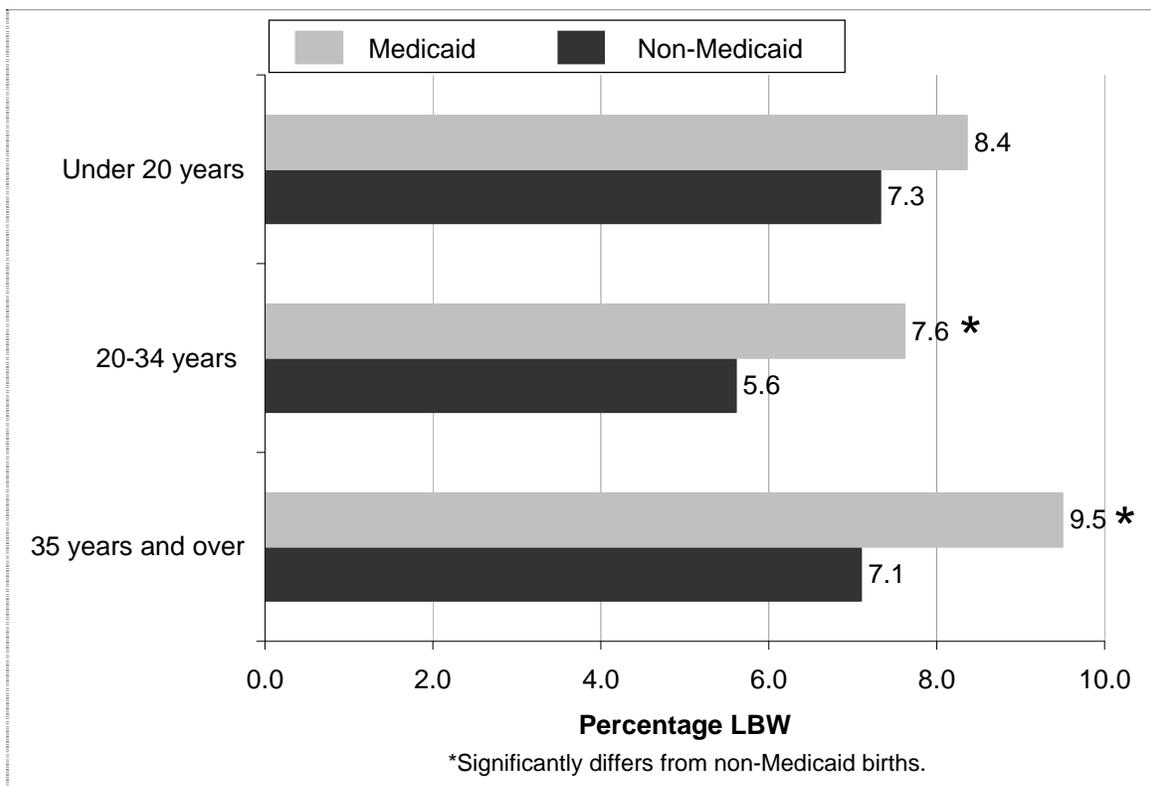
This section presents comparisons of LBW between the Medicaid and non-Medicaid populations, after restricting analysis to births to mothers who share a maternal characteristic. For example, we compare the percentage of LBW in births to women under age 20 in the Medicaid population to the percentage of LBW in births to women under age 20 in the non-Medicaid population.

The previous section demonstrated that LBW is more common in the Medicaid population overall, and that the Medicaid and non-Medicaid populations differ on several maternal characteristics. One possibility is that the LBW rate is higher in the Medicaid population because the prevalence of LBW risk factors, such as young maternal age, African American race, and inadequate prenatal care is higher in the Medicaid population. The comparisons in this section examine whether or not there is a difference in LBW between Medicaid and non-Medicaid births, when comparing only births to women who share a maternal characteristic (such as young maternal age). These comparisons examine whether or not Medicaid status is associated with a higher risk of LBW after controlling for the effect of other LBW risk factors.

## Maternal age

The percentage of LBW births was significantly higher for Medicaid births than non-Medicaid births among mothers aged 20-34 and mothers aged 35 and over (Figure 12). The percentages of LBW for 20-34 year old mothers were 7.6 percent and 5.6 percent in the Medicaid and non-Medicaid populations respectively; among mothers aged 35 and over 9.5 percent of Medicaid births were LBW compared with 7.1 of non-Medicaid births. There was no significant difference in LBW between Medicaid and non-Medicaid births to mothers under 20 years of age (8.4 percent among Medicaid births and 7.3 percent among non-Medicaid births).

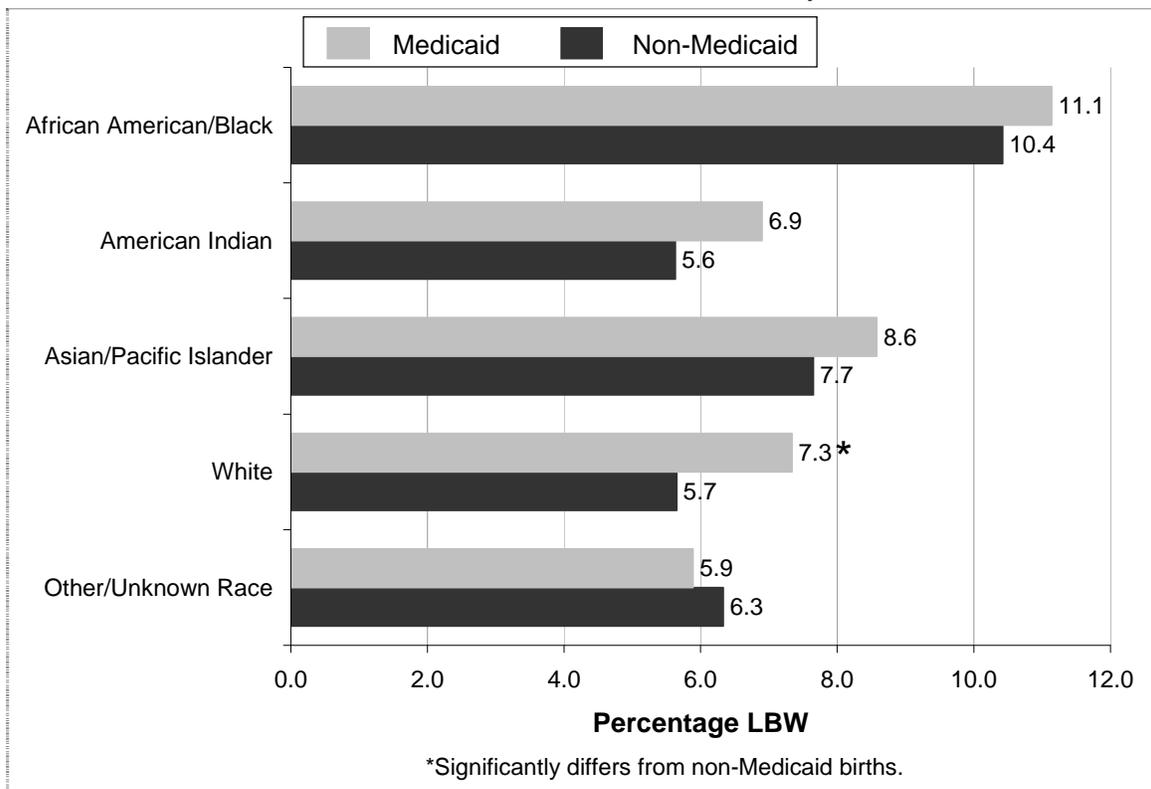
Figure 12. Percentage of LBW births by maternal age and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Maternal race

The percentage of LBW births was significantly higher for Medicaid births than non-Medicaid births only in the White maternal race group (Figure 13). Among Whites, the percentage of LBW in the Medicaid population was 7.3 percent compared with 5.7 percent in the non-Medicaid population. Although there were differences in LBW in other race groups, none of these differences reached statistical significance.

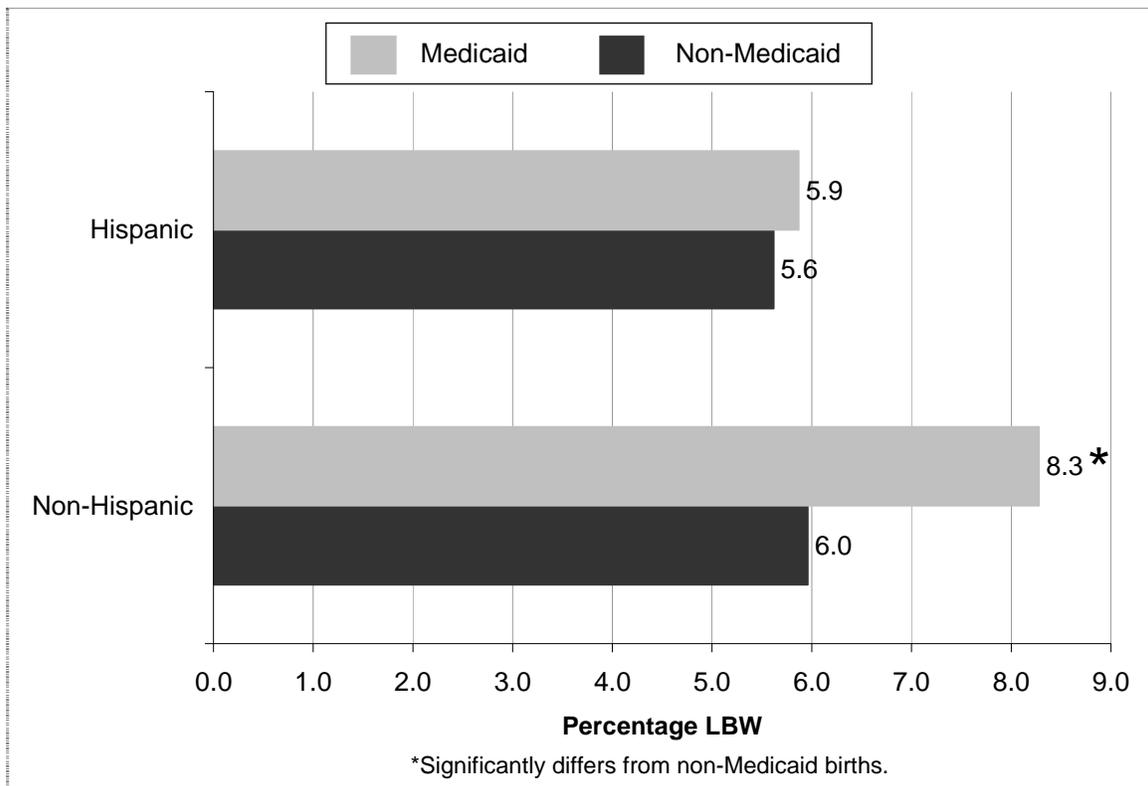
Figure 13. Percent of LBW births by maternal race and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## Maternal Hispanic ethnicity

LBW rates of Medicaid and non-Medicaid births were compared among mothers who identified as Hispanic, and mothers who identified as non-Hispanic (Figure 14). Among Hispanics, the percentage of LBW births did not differ significantly between the Medicaid (5.9 percent) and non-Medicaid populations (5.6 percent). Among non-Hispanics, the percentage of LBW births was significantly higher for Medicaid births (8.3 percent) than non-Medicaid births (6.0 percent).

Figure 14. Percentage of LBW births by maternal Hispanic ethnicity and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



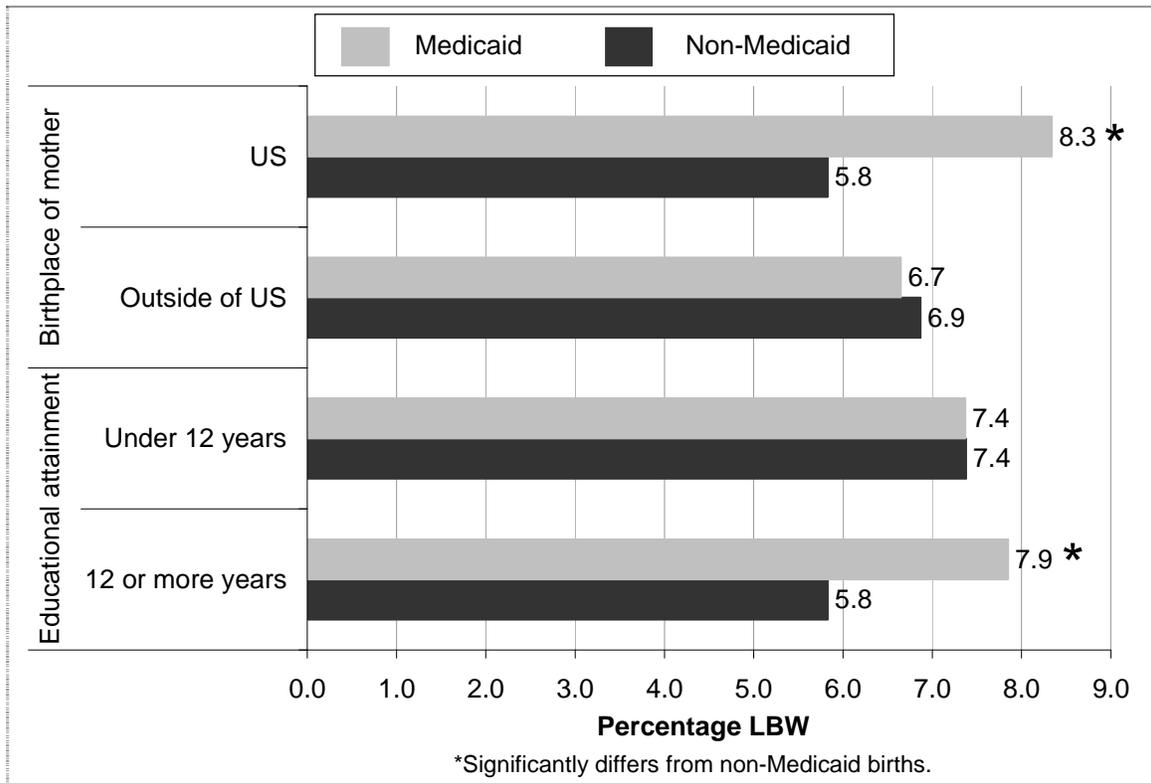
## Maternal country of birth

Among mothers born in the U.S., there was a significantly higher percentage of LBW births among Medicaid births (8.3 percent) than non-Medicaid births (5.8 percent, Figure 15). No significant difference in percentage LBW by Medicaid status was found for mothers born outside of the U.S..

## Maternal educational attainment

Percentage LBW was significantly higher for Medicaid births (7.9 percent) than non-Medicaid births (5.8 percent) among women with 12 or more years of education, but there was no significant difference among births to mothers with less than a high school education (Figure 15).

Figure 15. Percentage of LBW births by maternal country of birth and educational attainment, and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

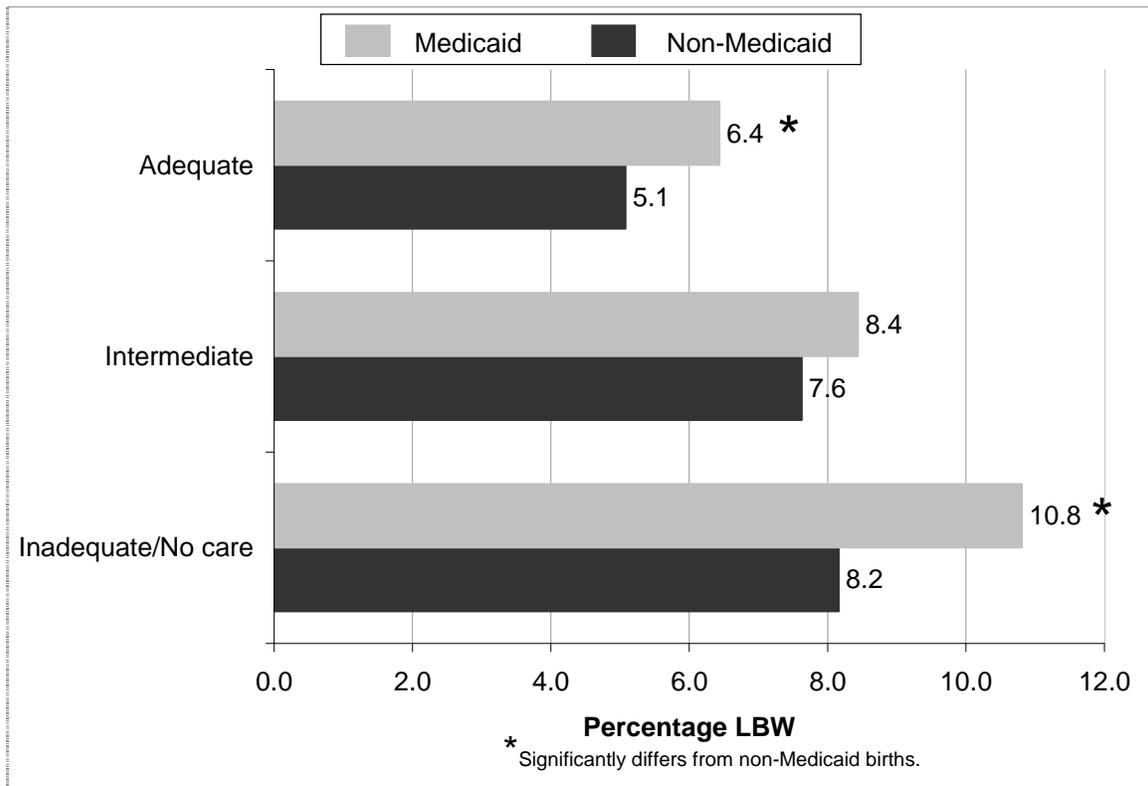


## Prenatal care adequacy

Medicaid and non-Medicaid births were compared within each of three groups defined by adequacy of prenatal care: adequate, intermediate, and inadequate or no prenatal care.

The percentage of LBW infants was significantly greater in the Medicaid population than the non-Medicaid population for women who received either adequate prenatal care or inadequate/no prenatal care (Figure 16). No significant difference in LBW between Medicaid and non-Medicaid populations was found for women who received an intermediate level of prenatal care.

Figure 16. Percentage of LBW births by adequacy of prenatal care and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

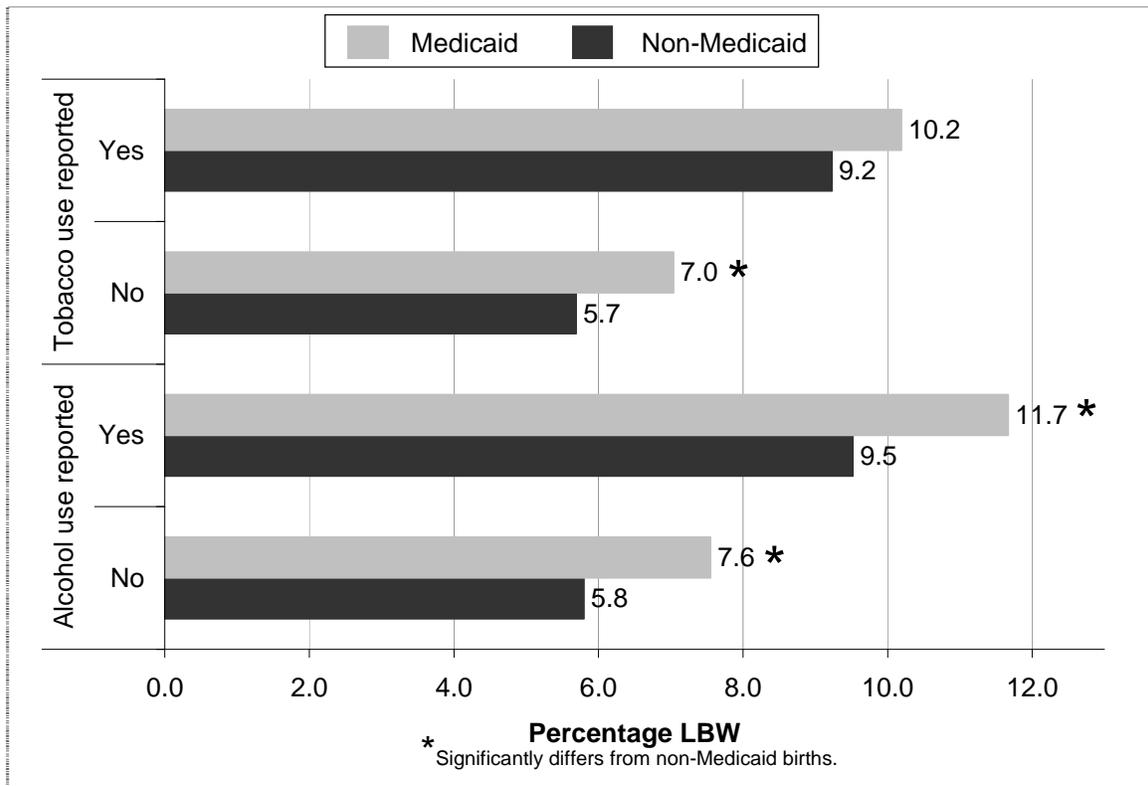


## Tobacco and alcohol use during pregnancy

Percentage LBW was not significantly different by Medicaid status among mothers who reported tobacco use during pregnancy (Figure 17). Among mothers reporting no tobacco use during pregnancy, Medicaid births (7.0 percent) had a significantly higher percentage LBW than non-Medicaid births (5.7 percent).

Medicaid and non-Medicaid births were compared for mothers who reported alcohol use during pregnancy, and for mothers who did not report alcohol use. In both groups, percentage LBW was significantly higher for Medicaid births than for non-Medicaid births (Figure 17). Among mothers reporting alcohol use, 11.7 percent of Medicaid births and 9.5 percent of non-Medicaid births were LBW. Among mothers not reporting alcohol use, 7.6 percent of Medicaid births and 5.8 percent of non-Medicaid births were LBW.

Figure 17. Percentage of LBW births by reported maternal tobacco and alcohol use during pregnancy and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.



## **Summary: LBW comparisons by Medicaid status**

In summary, when Medicaid and non-Medicaid populations are compared on LBW within groups of mothers that share a characteristic, some comparisons, but not all comparisons, show a higher rate of LBW among Medicaid births.

Medicaid births had a significantly higher percentage of LBW among groups of mothers with the following characteristics: age 20 to 34, age 35 and over, White, non-Hispanic, born in the U.S., with 12 or more years of education, with adequate prenatal care, with inadequate or no prenatal care, not reporting tobacco use during pregnancy, and either reporting or not reporting alcohol use during pregnancy.

Medicaid and non-Medicaid births did *not* significantly differ in LBW among groups of mothers with the following characteristics: under age 20, African American/Blacks, American Indian, Asian/Pacific Islander, Hispanic, born outside the U.S., with fewer than 12 years of education, with intermediate adequacy of prenatal care, or reported tobacco use during pregnancy.

Medicaid births were not significantly lower in percentage LBW compared with non-Medicaid births for any of the maternal characteristics examined.

## ***LBW comparisons by maternal characteristics***

This section presents comparisons of LBW between groups of mothers that differ in some maternal characteristic, within either the Medicaid population or the non-Medicaid population. For example, we compare percentage LBW among three different age groups (under 20, 20 to 34, and 35 and over) within the Medicaid population, as well as comparing percentage LBW among the same three age groups within the non-Medicaid population.

These comparisons show how risk of LBW varies by maternal age, race, education, or other characteristics, when the analysis is restricted to either the Medicaid population or the non-Medicaid population. Additionally, we can examine whether the patterns of LBW risk by maternal characteristic may be similar or different between the Medicaid or non-Medicaid populations. That is, a maternal characteristic such as low educational attainment may be associated with higher risk of LBW in the non-Medicaid population, but not in the Medicaid population.

## Maternal age

Percentage LBW for the three maternal age groups was compared within the Medicaid population (Table 1) and within the non-Medicaid population (Table 2). Within both populations, births to mothers aged 20-34 had a significantly lower percentage of LBW than births to women in the youngest and oldest age groups.

Table 1. Percentage of LBW births by maternal age within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Age Group</b>	<b>% LBW</b>	<b>Significant Differences</b>
Under 20 years	8.4	Higher than 20-34
20-34 years	7.6	Lower than under 20, 35+
35 years and over	9.5	Higher than 20-34

Table 2. Percentage of LBW births by maternal age within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Age Group</b>	<b>% LBW</b>	<b>Significant Differences</b>
Under 20 years	7.3	Higher than 20-34
20-34 years	5.6	Lower than under 20, 35+
35 years and over	7.1	Higher than 20-34

## Maternal race

Comparison of percentage LBW for maternal race groups within the Medicaid population showed that African Americans/Blacks had a significantly higher percentage of LBW births than all other groups (Table 3). Asian/Pacific Islanders had significantly more LBW births than Whites. The same findings were present in the non-Medicaid population (Table 4).

Table 3. Percentage of LBW births by maternal race within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Race</b>	<b>% LBW</b>	<b>Significant Differences</b>
African American/Black	11.1	Higher than all other groups
American Indian	6.9	Lower than Black
Asian/Pacific Islander	8.6	Higher than White; Lower than Black
White	7.3	Lower than Black, Asian
Other/Unknown Race	5.9	Lower than Black, White, Asian

Table 4. Percentage of LBW births by maternal race within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Race</b>	<b>% LBW</b>	<b>Significant Differences</b>
African American/Black	10.4	Higher than all other groups
American Indian	5.6	Lower than Black
Asian/Pacific Islander	7.6	Higher than White; Lower than Black
White	5.6	Lower than Black, Asian
Other/Unknown Race	6.3	Lower than Black

## Maternal Hispanic ethnicity

Births to Hispanic and non-Hispanic women were compared within each population. Within the Medicaid population, births to Hispanic women were less likely to have a LBW outcome than births to non-Hispanic women (Table 5); there was no difference by Hispanic ethnicity in the non-Medicaid population (Table 6).

Table 5. Percentage of LBW births by maternal Hispanic ethnicity within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Ethnicity</b>	<b>% LBW</b>	<b>Significant Differences</b>
Hispanic	5.9	Lower than non-Hispanic
Non-Hispanic	8.3	Higher than Hispanic

Table 6. Percentage of LBW births by maternal Hispanic ethnicity within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Ethnicity</b>	<b>% LBW</b>	<b>Significant Differences</b>
Hispanic	5.6	No difference
Non-Hispanic	6.0	No difference

## Maternal country of birth

Births to U.S. born women, and women born outside of the U.S., were compared within each population. The results indicate that the relationship between maternal country of birth and LBW differed by Medicaid status. In the Medicaid population, non-U.S. born mothers had a *lower* percentage of LBW births than U.S. born mothers (Table 7), while in the non-Medicaid population, non-U.S. born mothers had a *higher* percentage of LBW births than U.S. born mothers (Table 8).

Table 7. Percentage of LBW births by maternal country of birth within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal country of birth</b>	<b>% LBW</b>	<b>Significant Differences</b>
U.S. born	8.3	Higher than born outside of U.S.
Born outside of U.S.	6.6	Lower than U.S. born

Table 8. Percentage of LBW births by maternal country of birth within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal country of birth</b>	<b>% LBW</b>	<b>Significant Differences</b>
U.S. born	5.8	Lower than born outside of U.S.
Born outside of U.S.	6.9	Higher than U.S. born

## Maternal educational attainment

Percentage LBW was compared by maternal education level within each population.

Within the non-Medicaid population, women with less than 12 years of education had a significantly higher percentage LBW compared with women with at least 12 years (Table 9); there was no significant difference in LBW by maternal education level within the Medicaid population (Table 10).

Table 9. Percentage of LBW births by maternal educational attainment within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Education</b>	<b>% LBW</b>	<b>Significant Differences</b>
Under 12 years of education	7.4	No difference
12 or more years of education	7.8	No difference

Table 10. Percentage of LBW births by maternal educational attainment within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Maternal Education</b>	<b>% LBW</b>	<b>Significant Differences</b>
Under 12 years of education	7.4	Higher than 12+ years
12 or more years of education	5.8	Lower than under 12 years

## Prenatal care adequacy

The percentage of LBW deliveries for the three prenatal care adequacy groups was compared within each population. Within the Medicaid population, all three groups were significantly different; increasing adequacy of prenatal care was associated with decreasing percentage of LBW (Table 11). In the non-Medicaid population, there was no significant difference between women with intermediate or inadequate/no prenatal care, and women with adequate prenatal care had a significantly lower percentage of LBW than the other two groups (Table 12).

Table 11. Percentage of LBW births by prenatal care adequacy within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Prenatal Care Adequacy</b>	<b>% LBW</b>	<b>Significant Differences</b>
Adequate	6.4	Lower than Intermediate, Inadequate/No care
Intermediate	8.4	Higher than Adequate
Inadequate/No care	10.8	Higher than Adequate, Intermediate

Table 12. Percentage of LBW births by prenatal care adequacy within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Prenatal Care Adequacy</b>	<b>% LBW</b>	<b>Significant Differences</b>
Adequate	5.1	Lower than Intermediate, Inadequate/No care
Intermediate	7.6	Higher than Adequate
Inadequate/No care	8.2	Higher than Adequate

## Tobacco and alcohol use during pregnancy

Births to women reporting and not reporting tobacco use were compared in both Medicaid and non-Medicaid populations. In both populations, mothers reporting tobacco use had significantly higher rates of LBW than non-users (Tables 13 and 14).

Births to women reporting and not reporting alcohol use were compared in both Medicaid and non-Medicaid populations. Within both populations, women reporting alcohol use during pregnancy had significantly higher rates of LBW than non-users (Tables 15 and 16).

Table 13. Percentage of LBW births by reported tobacco use during pregnancy within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Characteristic</b>	<b>% LBW</b>	<b>Significant Differences</b>
Reported tobacco use during pregnancy	10.2	Higher than no tobacco use
No tobacco use during pregnancy	7.0	Lower than tobacco use

Table 14. Percentage of LBW births by reported tobacco use during pregnancy within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Characteristic</b>	<b>% LBW</b>	<b>Significant Differences</b>
Reported tobacco use during pregnancy	9.2	Higher than no tobacco use
No tobacco use during pregnancy	5.7	Lower than tobacco use

Table 15. Percentage of LBW births by reported alcohol use during pregnancy within the *Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Characteristic</b>	<b>% LBW</b>	<b>Significant Differences</b>
Reported alcohol use during pregnancy	11.7	Higher than no alcohol use
No alcohol use during pregnancy	7.6	Lower than alcohol use

Table 16. Percentage of LBW births by reported alcohol use during pregnancy within the *non-Medicaid* population, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

<b>Characteristic</b>	<b>% LBW</b>	<b>Significant Differences</b>
Reported alcohol use during pregnancy	9.5	Higher than no alcohol use
No alcohol use during pregnancy	5.8	Lower than alcohol use

## **Summary: LBW comparisons by maternal characteristics**

In summary, comparisons of LBW between groups of mothers that differ by some maternal characteristic show similar patterns between Medicaid and non-Medicaid births for some maternal characteristics, but not other characteristics.

Maternal characteristics for which the Medicaid and non-Medicaid populations showed similar patterns were maternal age, race, tobacco and alcohol use, and prenatal care adequacy. In both populations, LBW was significantly lower among births to 20-34 year old women, compared with births to women under 20 or 35 and over. Births to African Americans/Blacks were significantly more likely than all other race groups to be LBW in both the Medicaid and non-Medicaid populations. Births to Asian/Pacific Islander women were significantly more likely to be LBW than births to White women in both populations. Births to women who reported tobacco or alcohol use during pregnancy, or inadequate or no prenatal care had a significantly higher percentage of LBW than births to women with adequate prenatal care in both populations.

However, patterns of association between LBW and maternal characteristics differed between Medicaid and non-Medicaid births for Hispanic ethnicity, educational attainment, and country of birth. In the Medicaid population, LBW does not differ by maternal educational attainment, but LBW is associated with lower educational attainment in the non-Medicaid population. There was no difference in LBW by the mother's Hispanic ethnicity in the non-Medicaid population, but Hispanic ethnicity is associated with a lower rate of LBW in the Medicaid population. Percentage LBW was significantly higher among births to U.S. born women compared with births to non-U.S. born women in the Medicaid population. However, LBW was more common among non-U.S. born women in the non-Medicaid population.

# Discussion

This report compares LBW, and several maternal characteristics associated with LBW, between Medicaid-covered births and non-Medicaid births in Minnesota, using a data set linking birth certificate and Medicaid enrollment data. Because enrollment in Medicaid is an indicator of socioeconomic status, this comparison can be thought of as a comparison between a low income and a higher income population.

## ***Comparison of Medicaid and non-Medicaid populations***

Overall, the Medicaid population had a significantly higher percentage of LBW infants than the non-Medicaid population. The difference in LBW between these populations has been consistent since 1997. There is an upward trend in percentage of LBW in both populations, consistent with the overall rise in LBW in Minnesota and nationwide.

The Medicaid and non-Medicaid populations differed significantly on all maternal characteristics that were examined. These populations differed in a manner consistent with expected differences between a low income population and a higher income population in the U.S..

- The maternal age distribution differed significantly between Medicaid and non-Medicaid births, with a much higher percentage of births to women under age 25 in the Medicaid population, and a greater percentage of births to women 25 and older in the non-Medicaid population.
- Mothers enrolled in Medicaid at the time of their child's birth were more likely to be African American/Black, American Indian, or Hispanic than non-Medicaid mothers.
- Mothers in Medicaid births were more likely to have less than a high school education, and to have a birthplace outside of the U.S., than non-Medicaid mothers.

Some risk factors for LBW were more common among Medicaid mothers, including maternal age less than 20 years, African American/Black race, low educational attainment, inadequate prenatal care, and reported use of tobacco and alcohol during

pregnancy. Maternal age 35 and older was a risk factor for LBW that was more common among non-Medicaid births.

### ***LBW comparisons by Medicaid status***

When births were compared by Medicaid status, some but not all comparisons showed a significant difference in LBW.

- There was a significant difference in LBW between Medicaid and non-Medicaid births to groups of women with the following characteristics: age 20 to 34, age 35 and over, White, non-Hispanic, born in the U.S., with 12 or more years of education, with adequate prenatal care, with inadequate or no prenatal care, or not reporting tobacco use during pregnancy.
- There was *no* significant difference in LBW between Medicaid and non-Medicaid births to groups of women with the following characteristics: under age 20, African American/Blacks, American Indian, Asian/Pacific Islander, Hispanic, born outside the U.S., with fewer than 12 years of education, with intermediate adequacy of prenatal care, or reported tobacco use during pregnancy.

### ***LBW comparisons by maternal characteristics***

LBW rate comparisons between births to women who differ in age, race, tobacco or alcohol use, or prenatal care adequacy showed similar patterns between Medicaid and non-Medicaid births:

- LBW was significantly lower among births to 20-34 year old women, compared with births to women under 20 or 35 and over, in both populations.
- Births to African Americans/Blacks were significantly more likely than all other race groups to be LBW in both the Medicaid and non-Medicaid populations. The rate of LBW for births to Asian/Pacific Islander women was intermediate between the rates for births to Black women and White women in both populations.
- Births to women who reported tobacco or alcohol use during pregnancy also had significantly higher rates of LBW in both populations.

- Births to women with inadequate or no prenatal care had a significantly higher percentage of LBW than births to women with adequate prenatal care in both populations.

However, patterns of association differed between populations for Hispanic ethnicity, educational attainment, and country of birth.

- In the Medicaid population, LBW does not differ by maternal educational attainment, but LBW is associated with lower educational attainment in the non-Medicaid population.
- There was no difference in LBW by the mother's Hispanic ethnicity in the non-Medicaid population, but Hispanic ethnicity is associated with a lower rate of LBW in the Medicaid population.
- Percentage LBW was significantly higher among births to U.S. born women compared with births to non-U.S. born women in the Medicaid population. However, LBW was more common among non-U.S. born women in the non-Medicaid population.

## ***Discussion of specific maternal characteristics***

A review of the scientific literature offers possible explanations for the relationships found between specific maternal characteristics, LBW, and Medicaid status.

### **Maternal age**

Teenage mothers are more likely than older mothers to be low-income,(17) consistent with our finding that the majority of births to teenagers were covered by Medicaid. However, this study finds that adolescents have elevated rates of LBW within both Medicaid and non-Medicaid populations, suggesting that young maternal age is a risk factor for LBW independent of Medicaid status. This finding is consistent with other research.(17, 18)

Several factors contribute to the elevated risk of adverse birth outcomes associated with young maternal age. Four-fifths of teenage pregnancies are unintended,(19) and unintended pregnancies are associated with LBW and other adverse birth outcomes.(20) Pregnant teenagers are more likely than older pregnant women to delay prenatal care, or to not get prenatal care at all.(21,22) Pregnant teenagers are also likely to have poor nutritional status, which can contribute to LBW.(23) Physical immaturity, particularly of younger adolescents, may also increase the risk of adverse birth outcomes.(17,18)

Second births to teenage mothers are at particularly high risk of LBW and preterm birth.(24) In Minnesota, 15.4% of births to teenagers in 2007 were to teens with a previous live birth.(5) Interventions to prevent both initial and subsequent teenage pregnancies should be considered as one strategy to reduce the number of LBW births.

### **Maternal race**

Within both the Medicaid and non-Medicaid populations, there is a large disparity between African Americans/Blacks and all other race groups in LBW (American Indians, Asians/Pacific Islanders, and Whites); a smaller disparity between Asians/Pacific Islanders and Whites exists in both populations. Disparities in birth outcomes between Whites and Populations of Color are persistent in Minnesota and elsewhere in the U.S..(11,25) Low socioeconomic status is an explanation frequently given for these

disparities. However, because African Americans/Blacks and Asians/Pacific Islanders have significantly more LBW deliveries than Whites when analysis is restricted to the Medicaid population, Medicaid status alone does not account for these disparities.

Previous research has attempted to explain the Black-White disparity in birth outcomes by using combinations of known risk and protective factors, such as maternal age, socioeconomic status, prenatal care, substance use during pregnancy, psychosocial stress, and medical conditions. However, the Black-White disparity persists after accounting for these factors.(10, 26) Some researchers suggest that these factors cannot completely explain this disparity because they focus on conditions during pregnancy, and do not take into account conditions before pregnancy that affect birth outcomes. This life-course model suggests that exposures accumulated over the course of a mother's lifetime, even while she herself was *in utero*, affect birth outcomes.(10, 26)

An example of how lifetime exposures may affect LBW is the concept of “weathering,” or premature aging due to the cumulative effects of stress. Research has shown that the risk of LBW and other adverse birth outcomes increases more quickly with advancing maternal age for African American women compared with White women.(27,28,29,30) The weathering hypothesis proposes that chronic stress due to poverty and discrimination results in physical wear and tear and changes to immune and inflammatory responses.(10) Weathering may also occur in women of Mexican origin,(31) although to what extent weathering occurs in groups other than African Americans is largely unexplored.

Neighborhood deprivation is an exposure that may be particularly important in the study of adverse birth outcomes. Because of residential segregation, concentrated poverty in neighborhoods disproportionately affects Populations of Color, and neighborhood-level factors may explain racial disparities in birth outcomes that are not accounted for by individual-level factors.(32, 33) Neighborhood deprivation could affect birth outcomes in several ways: through the stress of a social environment of crime, residential instability, and low social support; through a service environment lacking grocery stores, clinics, recreational facilities, and police and fire protection; and through a physical environment of pollution, noise, and poor housing stock.(33)

Differences in birth outcomes between Whites and American Indians or Asians/Pacific Islanders may differ in cause from those disparities experienced by African Americans.(34, 35) Asians may have higher rates of LBW than Whites partly because of smaller body size. Researchers found that ethnic Chinese and South Asian infants in British Columbia had a lower average birth weight, but this lower weight did not correspond to a higher perinatal mortality risk. In contrast, American Indians had a higher average birth weight compared to the rest of the population, and a greater risk of perinatal mortality.(36) In Minnesota, American Indians experience higher rates of infant mortality than other racial/ethnic groups, despite having rates of LBW similar to those of Whites.(25)

### **Maternal Hispanic ethnicity**

Across-population comparisons show no difference in LBW between Hispanic Medicaid and non-Medicaid births, and a significantly higher rate of LBW for Medicaid births among non-Hispanics. Births to Hispanic women, regardless of Medicaid status, have a rate of LBW comparable to that of non-Medicaid births to non-Hispanic women.

Within-population comparisons show that, when the effect of low income is accounted for by restricting to the Medicaid population, there are fewer LBW births to Hispanic women compared with other women. This is consistent with previous research showing that Hispanics, particularly women of Mexican origin, have lower rates of LBW than expected given high rates of poverty among Hispanics.(37, 38, 39)

However, higher birth weight is not always a better birth outcome. Hispanics are disproportionately affected by macrosomia, or high birth weight.(39) This tendency may influence the overall rate of LBW, but is associated with other problems including birth trauma and increased risk of stillbirth or cesarean delivery. High birth weight is strongly associated with gestational diabetes, type 2 diabetes, maternal obesity, and large pregnancy weight gain. These conditions are more common among Hispanic, American Indian, African American, and Asian/Pacific Islander women.(40)

## **Maternal country of birth**

Several immigrant groups in Minnesota and the U.S. have better birth outcomes than their U.S.-born racial and ethnic counterparts despite their low socioeconomic status.(3, 26, 37, 41, 42, 43) One possible explanation for these observations are immigrants' retention of healthy lifestyles – less tobacco and alcohol use, better nutritional habits, more exercise – that are prevalent among women in their country of birth. Other explanations include strong social support systems among immigrant women, and better health among women who immigrate to the U.S. compared with women who do not immigrate.(26, 38)

The influence of immigrant status on LBW is further supported by studies by Collins and David of the descendants of African-born immigrants compared to U.S.-born African Americans. These researchers found that African-born women gave birth to LBW infants at a rate similar to that of U.S.-born Whites, but the daughters of these women (first-generation African Americans) had elevated rates of LBW deliveries, similar to the rate of LBW among other U.S.-born African Americans.(26) This suggests that acculturation to the U.S., or exposure to social and physical environmental conditions in the U.S., increases LBW risk for women of African origin.

## **Maternal educational attainment**

No across-population difference in LBW was found for women with less than 12 years of education. Also, there was no significant difference in LBW by education level within the Medicaid population. Like Medicaid status, educational attainment can be considered an indicator of socioeconomic status. Our results suggest that being enrolled in Medicaid and having low educational attainment do not have an additive effect on LBW. In other words, women who have both indicators of low income (Medicaid *and* less than a high school education) are not more likely to have LBW outcomes than women who only have one of these indicators of low income.

In the non-Medicaid population, lower educational level is associated with higher rates of LBW. This finding is consistent with other research relating maternal (and paternal) educational level with adverse birth outcomes. However, the relationship between

educational level and birth outcomes varies by race and country of birth; studies have found no association between maternal education level and birth outcomes for non-White and foreign-born women after adjusting for other demographic factors.(35, 44, 45)

### **Prenatal care adequacy**

Across-population comparisons show the largest LBW difference between Medicaid and non-Medicaid births for women with inadequate or no prenatal care. Considering that the percentage of women who received less than adequate prenatal care is more than twice as high in the Medicaid population (32.9%) than in the non-Medicaid population (15.1%, see Figure 10), this is an important risk factor for LBW in the Medicaid population.

There are several potential barriers to timely initiation of prenatal care for low-income women. Difficulty obtaining child care and transportation, ambivalence or unhappiness about pregnancy, late pregnancy recognition, lack of knowledge of the importance of early prenatal care or not feeling that prenatal care is a priority, negative perception of or experience with medical providers, and lack of a regular source of care before pregnancy have been associated with late initiation of prenatal care.(46,47)

The Medicaid population includes births to women who were uninsured before pregnancy as well as births to women who were covered by Medicaid before pregnancy. Women who become eligible for Medicaid during pregnancy may not have been covered by Medicaid until after their first trimester of pregnancy, because of delays in seeking coverage or delays in the application process. Lack of Medicaid coverage early in pregnancy has been associated with later start of prenatal care.(48,49)

### **Tobacco use during pregnancy**

Smoking during pregnancy is well-established as a modifiable cause of LBW. An estimated 20% of LBW in the United States could be prevented if all women were non-smokers during pregnancy.(50) In this study, the difference in LBW rate between tobacco users and non-users was similar in the Medicaid and non-Medicaid populations. However, four times as many women in the Medicaid population reported tobacco use during pregnancy; if the smoking rate in the Medicaid population was reduced to that in

the non-Medicaid population, the disparity in LBW between Medicaid and non-Medicaid births may be significantly narrowed.

### **Alcohol use during pregnancy**

Alcohol use during pregnancy is associated with LBW, other adverse birth outcomes, and long-term developmental problems.(51) However, it is difficult to study the effect of alcohol use on birth outcomes using birth certificate data, because of underreporting.(52) In this study, only 1% of mothers of Medicaid births, and 0.4% of mothers of non-Medicaid births, reported alcohol use during pregnancy in Minnesota. In contrast, a recent report by the Centers for Disease Control and Prevention estimated that 11.2% of U.S. pregnant women had at least one alcoholic beverage in the previous 30 days.(53) Because it is unknown whether or not underreporting of alcohol use during pregnancy differs by Medicaid status of the birth, these results may not reflect the true difference, if any, in alcohol use during pregnancy between the Medicaid and non-Medicaid populations.

## Limitations

Several factors should be considered in interpreting the results of this study. First, the non-Medicaid population includes the uninsured as well as the privately insured, and therefore is likely to include both low income and higher income persons. The difference between the Medicaid and non-Medicaid populations may not reflect the true difference between births to low income women and births to higher-income women. However, the number of births not covered by insurance in Minnesota is likely to be small, because retroactive eligibility for Medical Assistance enables uninsured women to enroll at the time of birth and have coverage for the birth and a six-week postnatal period.

The birth certificate-Medicaid matched data set used in this study does not have information on whether women had health insurance (either Medicaid or private insurance) before pregnancy, or at what point during the pregnancy they might have obtained Medicaid coverage or insurance. As previously discussed, timing of insurance coverage has been shown to be associated with initiation of prenatal care,(48,49) potentially affecting birth outcomes.

The Medicaid population in this study is not homogeneous; because Medicaid in Minnesota covers pregnant women with a family income of 275% of the federal poverty guideline (FPG) or lower, this population includes both women below the poverty line and low income women that qualify for Medicaid but do not qualify for other programs such as the Minnesota Family Investment Program (MFIP) or Food Support. Because of this, using Medicaid status of birth as a proxy for low income may mask variation in birth outcomes among women with different levels of income.

Most (>95%) birth-related Medicaid claims were successfully matched to a birth record, but some Medicaid data did not match. There was more unmatched data for women residing in border counties in northwestern and southeastern Minnesota, and for Hispanic women.(14) Misclassification of the Medicaid status of some births could affect the results of this study.

Data on birth certificates is not collected for purposes of this type of research, and some birth certificates will have incomplete or inaccurate data. In particular, data on prenatal

care, tobacco use, and alcohol use are known to have data quality issues. Tobacco use and alcohol use have been shown to be underreported in birth certificate data validation studies.<sup>(52)</sup> Adequacy of prenatal care is determined using data on when during the pregnancy prenatal care began, the number of prenatal visits, and gestational age at birth; all of these variables may be either misreported or missing. In this study, adequacy of prenatal care could not be calculated for 14.5% of births because of missing data. Births with missing prenatal care data may differ in risk factors for LBW from the rest of the population, so not having this data could affect results.

Finally, this study should not be interpreted as a comprehensive evaluation of all factors that can affect LBW. Other variables, such as medical risk factors and whether or not the pregnancy was planned, are known to be associated with LBW, but were not examined in this report.

## Conclusions and Implications

The Medicaid population in Minnesota has a disproportionate share of LBW deliveries, and risk factors for LBW, compared with the non-Medicaid population. In other words, low income, measured by Medicaid status, is a risk factor for LBW in Minnesota. This finding is consistent with a large body of previous research that demonstrates a strong association between poverty and poor birth outcomes.

While the overall rate of LBW is elevated in the Medicaid population, analyses that are restricted to births to mothers with particular characteristics (e.g. teenage births, non-white race, smoking during pregnancy) do not always show an elevated rate of LBW among Medicaid births compared with non-Medicaid births. These findings suggest that multiple factors contribute to LBW in addition to Medicaid status. For example, the finding that LBW is significantly higher among births to teenaged mothers in both Medicaid and non-Medicaid populations suggests that young maternal age is a risk factor for LBW independent of Medicaid status. Further research using multivariate analysis techniques is needed to examine the complex interplay of these LBW risk factors.

Some of the risk factors for LBW that were more prevalent in the Medicaid population - tobacco use, alcohol use, and inadequate prenatal care - are modifiable. These risk factors can be targeted for change during pregnancy through the promotion of and improved access to early and comprehensive prenatal care. Prenatal care that starts in the first trimester and continues at recommended intervals throughout pregnancy has been shown to reduce the risk of adverse birth outcomes such as LBW.(49, 54) Innovative approaches to prenatal care may be needed to address the barriers encountered by low income women when seeking this care. Some non-standard approaches to prenatal care have shown promise for high-risk populations, such as group prenatal care (55), prenatal care with enhanced psychosocial support and care coordination (56), and focused prenatal home visiting (57, 58).

Additionally, improving access to, and quality of, preconception and interconception care for women can reduce risk factors for LBW. Preconception and interconception care refer to preventive counseling and interventions before and between pregnancies to optimize

women's health and reproductive outcomes.(59) By providing access to health care, Minnesota's Medicaid programs offer an opportunity to promote preconception and interconception care for low-income women, which may be a critical intervention to reduce disparities in birth outcomes between low-income and higher-income populations.(60)

Teen pregnancy, which is significantly more common in the Medicaid population, can also be considered a modifiable risk factor for LBW, in that childbearing can be delayed until after the adolescent years. Efforts to prevent teen pregnancy based on evidence-based research should be supported.(61)

However, some LBW risk factors, such as African American race, cannot be changed. To address both modifiable and non-modifiable risk factors for LBW, a broader approach is needed. The life-course perspective is one such approach. This perspective conceptualizes disparities in birth outcomes as the result of differential exposures to risk and protective factors over the entire life course of the mother, and not just exposures during pregnancy. These exposures include socioeconomic factors, as well as behavioral risk factors. The key implication of the life-course perspective is that a broader focus on the social determinants of health, with emphasis on systems change, will be needed to completely close the gap in birth outcomes between the Medicaid and non-Medicaid populations.(10,62,63)

A 12-point plan to reduce disparities in birth outcomes based on the life-course approach has been described by Lu and colleagues.(63) This plan addresses the individual, family and community, and societal levels. At the individual level, initiatives include improving the quality of prenatal care, providing preconception and interconception care, and expanding healthcare access throughout the life course. Family and community level initiatives include enhancing coordination and integration of family support services, strengthening father involvement, and investment in community building. At the societal level, attention should be focused on closing the racial gap in educational achievement, reducing poverty, improving support for working families, and identifying and addressing institutional racism. Current efforts in Minnesota to accomplish several of these objectives, such as providing preconception care, improving the quality of and access to

prenatal care, and supporting maternal and family behavior change, should continue and be expanded to the extent possible. In addition to these efforts, initiatives such as those in the plan described above that go beyond prenatal care to address the root causes of disparities in birth outcomes deserve consideration by policymakers. This report provides data regarding the role socioeconomic factors play in maternal and child health, and suggests areas of improvement around which collaborative efforts to reduce the risk of poor birth outcomes in Minnesota can be focused.

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## Appendix: Detailed Tables

Table A1. Birth weight and gestational age of MN resident births by Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

	Number of births (percent of total)			Chi-Square p-value
	Total	Medicaid	Non-Medicaid	
<b>Birth Weight</b>				
Very low birth weight (less than 1500 grams)	2,649 (1.2%)	1,189 (1.5%)	1,460 (1.1%)	<0.0001
Low birth weight* (1500-2499 grams)	11,867 (5.4%)	5,126 (6.4%)	6,741 (4.9%)	
Birth weight 2500 grams or more	203,530 (93.3%)	74,025 (92.1%)	129,505 (94.0%)	
<b>Gestational Age</b>				
Preterm birth (gestation less than 37 weeks)	19,479 (10.2%)	7,453 (11.1%)	12,026 (9.7%)	<0.0001
Term birth (37 or more weeks gestation)	171,217 (89.8%)	59,545 (88.9%)	111,672 (90.3%)	

\* Low birth weight in this table excludes very low birth weight for the purpose of statistical testing.

Table A2. Selected maternal characteristics of MN resident births by Medicaid status, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

	Number of births (percent)			Chi-Square p-value
	Total	Medicaid	Non-Medicaid	
<b>Age Group</b>				
Under 20	15,244 (7.0%)	11,160 (13.9%)	4,084 (3.0%)	<0.0001
20 – 34 years	169,839 (77.9%)	63,363 (78.8%)	106,476 (77.3%)	
35 years and over	33,027 (15.1%)	5,834 (7.3%)	27,193 (19.7%)	
<b>Race</b>				
African American/Black	18,924 (8.7%)	14,314 (17.8%)	4,610 (3.4%)	<0.0001
American Indian	4,388 (2.0%)	3,447 (4.3%)	941 (0.7%)	
Asian/Pacific Islander	13,935 (6.4%)	4,966 (6.2%)	8,969 (6.5%)	
White	165,349 (75.8%)	45,852 (57.1%)	119,497 (86.8%)	
Other/Unknown	15,514 (7.1%)	11,778 (14.7%)	3,736 (2.7%)	
<b>Hispanic Ethnicity</b>				
Hispanic, any race	17,403 (8.1%)	13,416 (16.9%)	3,987 (2.9%)	<0.0001
Non-Hispanic, any race	197,703 (91.9%)	65,932 (83.1%)	131,771 (97.1%)	
<b>Country of Birth</b>				
U.S.	178,928 (82.0%)	57,713 (71.8%)	121,215 (88.0%)	<0.0001
Outside of U.S.	39,182 (18.0%)	22,644 (28.2%)	16,538 (12.0%)	
<b>Educational Attainment</b>				
Less than 12 years	23,797 (11.2%)	19,196 (24.9%)	4,601 (3.4%)	<0.0001
12 years or more	188,912 (88.8%)	57,765 (75.1%)	131,147 (96.6%)	
<b>Adequacy of Prenatal Care (GINDEX)</b>				
Adequate	146,703 (78.7%)	43,679 (67.0%)	103,024 (85.0%)	<0.0001
Intermediate	33,311 (17.9%)	17,351 (26.6%)	15,960 (13.2%)	
Inadequate/No Care	6,386 (3.4%)	4,119 (6.3%)	2,267 (1.9%)	
<b>Reported Tobacco Use During Pregnancy</b>				
Yes	20,310 (9.5%)	14,696 (18.7%)	5,614 (4.2%)	<0.0001
No	192,737 (90.5%)	63,792 (81.3%)	128,945 (95.8%)	
<b>Reported Alcohol Use During Pregnancy</b>				
Yes	1,302 (0.6%)	797 (1.0%)	505 (0.4%)	<0.0001
No	210,547 (99.4%)	77,165 (99.0%)	133,382 (99.6%)	

Table A3. Percentage of LBW births by maternal demographic characteristics, and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

Medicaid Status	Characteristic	Percent LBW	95% Confidence Interval		Significant Difference:	
			Lower Bound	Upper Bound	By Medicaid Status	By Maternal Characteristic
<b>Age of Mother</b>						
Medicaid	Under 20 years	8.36	7.85	8.89		Higher than 20-34
	20-34 years	7.62	7.41	7.83	✓	Less than under 20, 35+
	35 years and over	9.50	8.75	10.25	✓	Higher than 20-34
Non-Medicaid	Under 20 years	7.33	6.53	8.13		Higher than 20-34
	20-34 years	5.61	5.47	5.75	✓	Less than under 20, 35+
	35 years and over	7.10	6.79	7.40	✓	Higher than 20-34
<b>Race of Mother</b>						
Medicaid	African American/Black	11.14	10.62	11.67		Higher than all other groups
	American Indian	6.90	6.06	7.80		Lower than Black
	Asian/Pacific Islander	8.58	7.80	9.36		Higher than White; lower than Black
	White	7.34	7.10	7.58	✓	Lower than Black, Asian
	Other/Unknown	5.89	5.47	6.32		Lower than Black, White, Asian
Non-Medicaid	African American/Black	10.42	9.53	11.30		Higher than all other groups
	American Indian	5.63	4.16	7.11		Lower than Black
	Asian	7.65	7.10	8.20		Higher than White; lower than Black
	White	5.65	5.52	5.78	✓	Lower than Black, Asian
	Other/Unknown	6.33	5.55	7.11		Lower than Black
<b>Ethnicity of Mother</b>						
Medicaid	Hispanic	5.87	5.47	6.27		Lower than non-Hispanic
	Non-Hispanic	8.28	8.07	8.49	✓	Higher than Hispanic
Non-Medicaid	Hispanic	5.62	4.90	6.33		No difference
	Non-Hispanic	5.96	5.83	6.09	✓	No difference
<b>Educational Attainment of Mother</b>						
Medicaid	Under 12 years	7.37	7.00	7.74		No difference
	12 or more years	7.85	7.63	8.07	✓	No difference
Non-Medicaid	Under 12 years	7.38	6.62	8.13		Higher than 12+ years
	12 or more years	5.83	5.71	5.96	✓	Lower than under 12 years
<b>Mother's Country of Birth</b>						
Medicaid	U.S.	8.34	8.11	8.56	✓	Higher than outside of U.S.
	Outside of U.S.	6.65	6.32	6.97		Lower than U.S.-born
Non-Medicaid	U.S.	5.83	5.70	5.96	✓	Lower than outside of U.S.
	Outside of U.S.	6.87	6.49	7.26		Higher than U.S.-born

Table A4. Percentage of LBW births by maternal health and behavioral characteristics, and Medicaid status of birth, Minnesota Birth Certificate and Medicaid Data Match Project, 2005-2007.

Medicaid Status of Birth	Characteristic	Percent LBW	95% Confidence Interval		Significant Difference:	
			Lower Bound	Upper Bound	By Medicaid Status	By Maternal Characteristic
<b>Adequacy of Prenatal Care (GINDEX)</b>						
Medicaid	Adequate	6.44	6.21	6.67	✓	Lower than other two groups
	Intermediate	8.44	8.03	8.86		Higher than Adequate
	Inadequate/No care	10.81	9.86	11.75	✓	Higher than other two groups
Non-Medicaid	Adequate	5.08	4.94	5.21	✓	Lower than other two groups
	Intermediate	7.63	7.21	8.04		Higher than Adequate
	Inadequate/No care	8.16	7.04	9.29	✓	Higher than Adequate
<b>Reported Tobacco Use During Pregnancy</b>						
Medicaid	Yes	10.19	9.70	10.68		Higher than no use
	No	7.04	6.84	7.24	✓	Lower than tobacco use
Non-Medicaid	Yes	9.23	8.47	9.99		Higher than no use
	No	5.69	5.56	5.82	✓	Lower than tobacco use
<b>Reported Alcohol Use During Pregnancy</b>						
Medicaid	Yes	11.67	9.44	13.90	✓	Higher than no use
	No	7.55	7.36	7.73	✓	Lower than alcohol use
Non-Medicaid	Yes	9.52	6.96	12.09	✓	Higher than no use
	No	5.80	5.68	5.93	✓	Lower than alcohol use