



Prematurity

One in eight babies are born prematurely¹ in the United States and Michigan, with serious consequences for infant morbidity and mortality. Premature babies experience a variety of medical problems, resulting in more doctor visits and hospitalizations. Having a premature baby takes an enormous emotional toll on a family. Medical care for premature infants can cost over \$100,000, and preterm births have been estimated to cost the U.S. more than \$26 billion annually. While significant medical and technological advances in the treatment of preterm babies have allowed more babies to survive, preterm birth is still the leading cause of infant death. Preterm birth disproportionately affects blacks and contributes to the disparity between blacks and other races in infant mortality.

In our January 2010 issue brief, *The Cost Burden of Disease*, we presented the most common reasons for hospitalization, along with the most expensive conditions. We noted that among the costliest diagnoses per hospital stay in 2007 were those related to newborns. The average charge per discharge for premature birth and low birth weight was \$119,389 in the U.S. and \$102,103 in Michigan. This is approximately 14 times higher than the average charge of \$7,182 per discharge for a healthy infant birth in Michigan. In this issue brief, we focus on the extent of the problem of prematurity and examine what we know about risk factors and disparities in premature birth.

¹ Premature and preterm are defined as less than 37 weeks of completed gestation

The Center for Healthcare Research & Transformation (CHRT) sponsors research and public information to promote evidence based care delivery, improve population health, and expand access to care. Housed at the University of Michigan, CHRT is a partnership between U-M and Blue Cross Blue Shield of Michigan to test the best ideas for improving the effectiveness and efficiency of the health care system.



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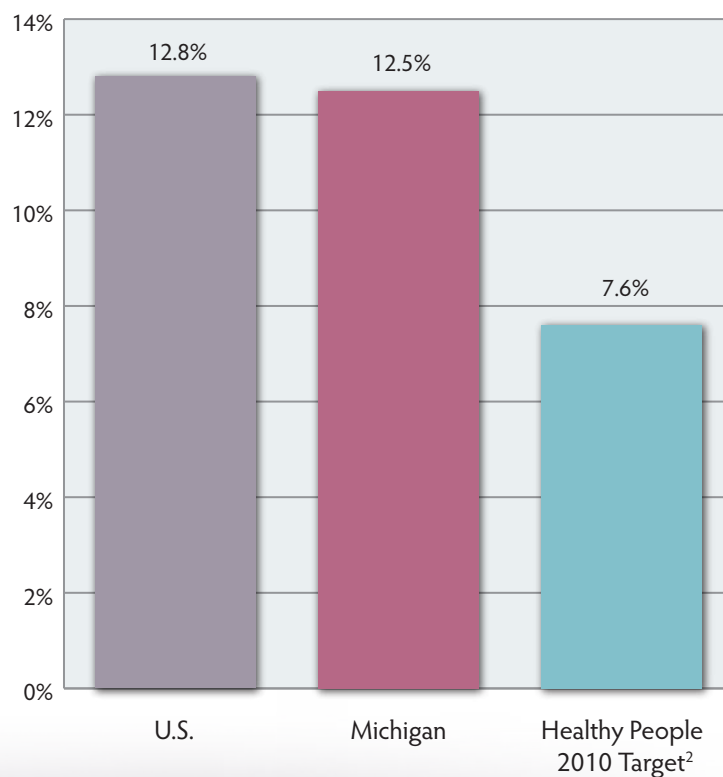
Preterm Birth: Trends

In 2006, 12.8 percent of U.S. births—one in eight—were preterm (less than 37 weeks). This represents a 16 percent increase in premature births over 1996 (at 11 percent).

In 2006, 12.5 percent of births in Michigan were preterm, similar to the national average of 12.8 percent. Michigan ranked 27th highest in the nation on the percentage of births that were preterm. Rates of prematurity ranged from a high of 18.8 percent in Mississippi to a low of 9.6 percent in Vermont.

FIGURE IB5:1

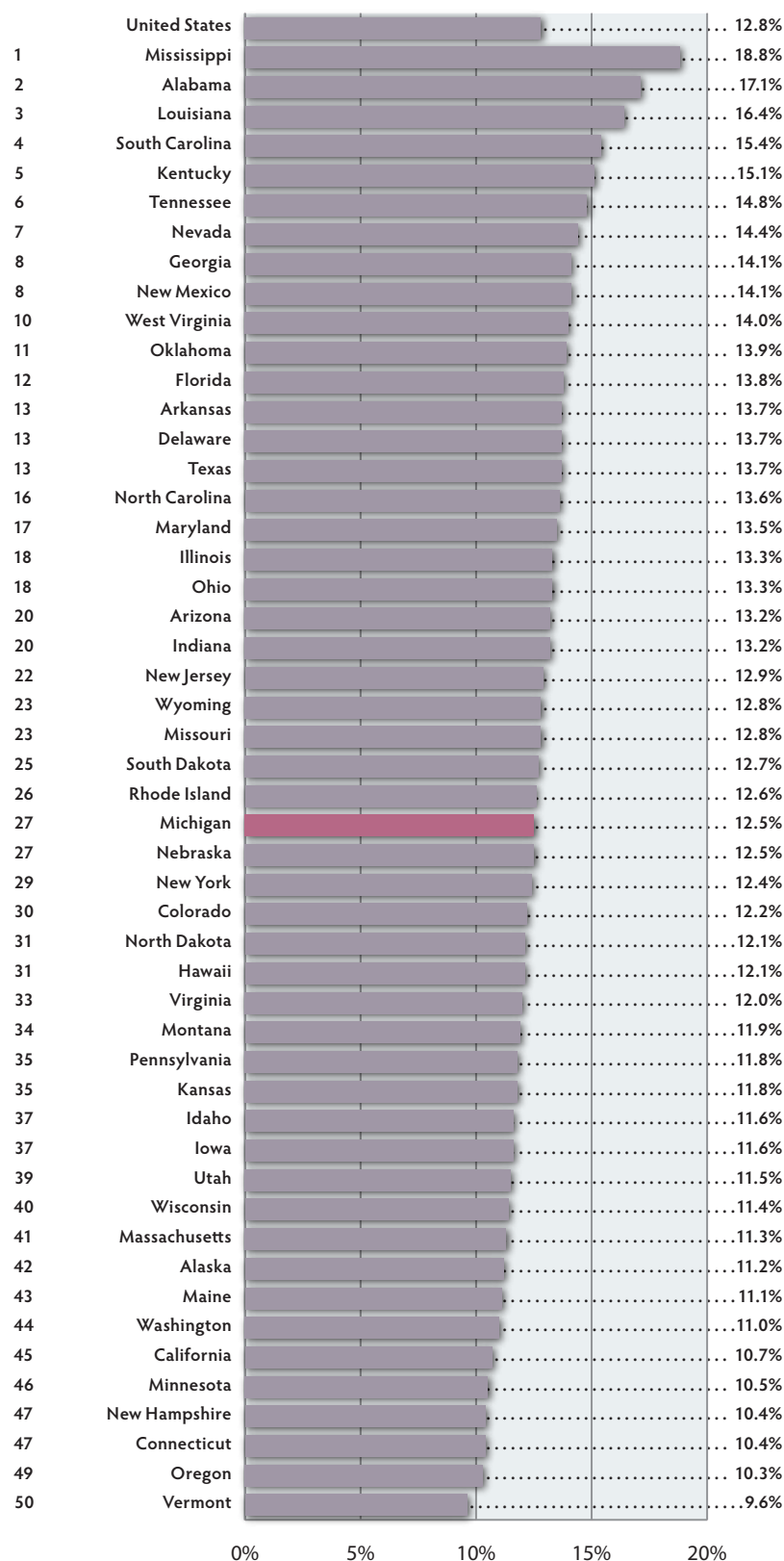
Percent of Live Births that are Preterm, U.S. and Michigan, 2006



SOURCE: National Center for Health Statistics, final natality data. Retrieved from www.marchofdimes.com/peristats.

² Healthy People 2010, www.healthypeople.gov

FIGURE IB5:2

State Comparisons: Percent of Births that are Preterm, 2006

SOURCE: Child Trends analysis of 1990-2006 Natality MicroData files from Centers for Disease Control and Prevention, National Center for Health Statistics. Retrieved from Kids Count.

Characteristics of Preterm Births

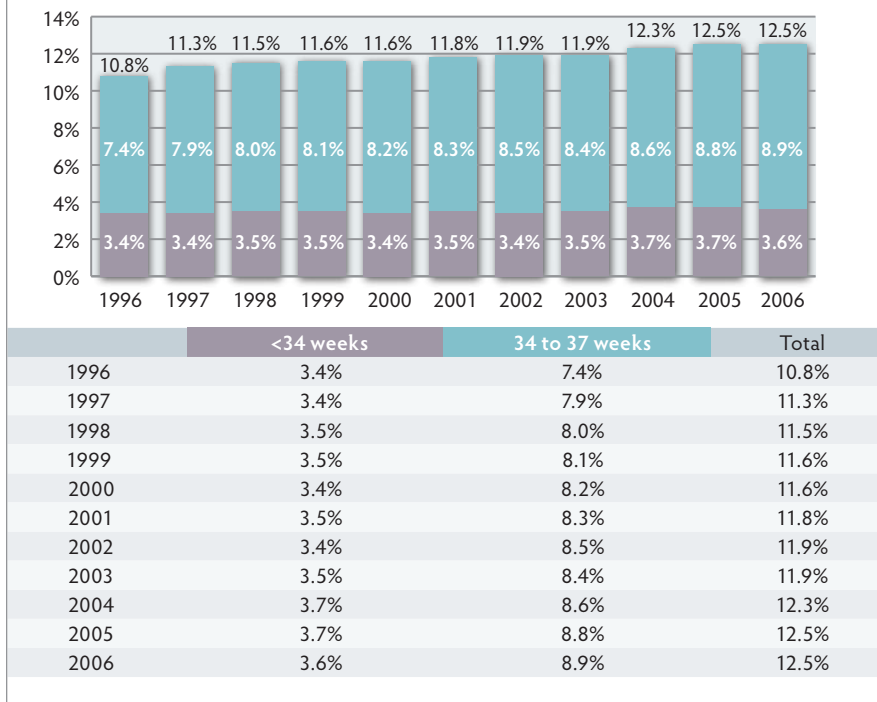
The increase in births in the late preterm period, (between 34 and 37 weeks of gestation), was primarily responsible for the increase in overall preterm births from 1996 to 2006. These late preterm births represented 7.4 percent of live births in 1996 and 8.9 percent of live births in 2006—a 20 percent increase. During the same time period, preterm births occurring at less than 34 weeks have remained steady.

While babies born in the late preterm period generally have less severe problems than those born before 34 weeks, they still have significant risk of respiratory problems following birth and are at increased risk for developmental and behavioral problems during childhood.³

The drivers behind the increase in late preterm births are not clear. While nearly all of the increase in late preterm births was among women who have delivered by Cesarean section (C-section), available data do not show if these C-sections were medically indicated or elective. It may be that advances in neonatal care have allowed doctors to deliver high-risk babies sooner, reducing complications for the mother and baby;⁴ another possibility is that the increase in elective C-sections has resulted in a higher number of babies being delivered in the preterm period.⁵

FIGURE IB5:3

Percent of Live Births that are Preterm, by Weeks of Completed Gestation, Michigan, 1996-2006

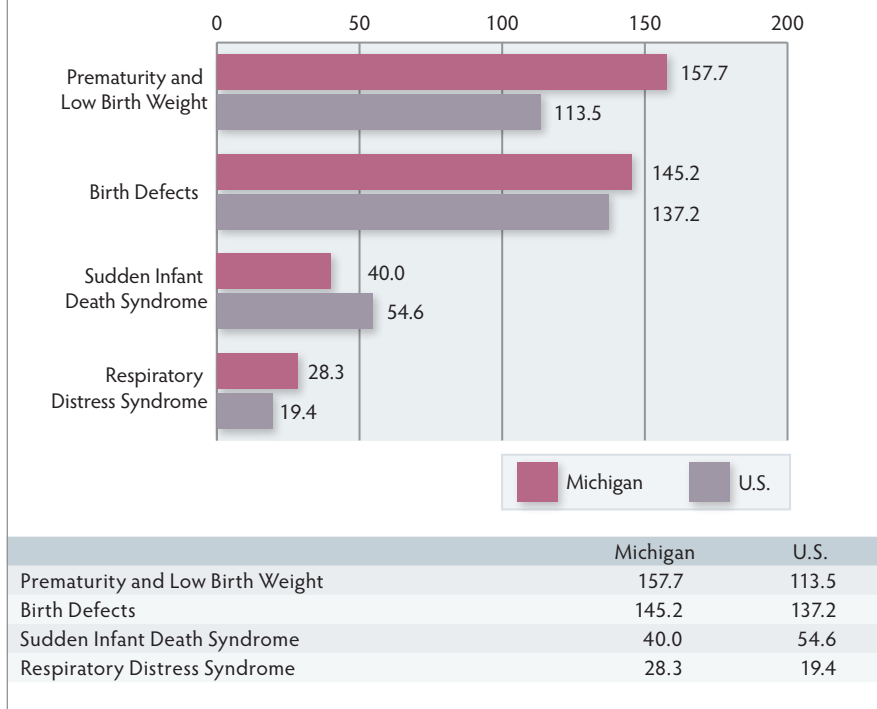


SOURCE: National Center for Health Statistics, final natality data. Retrieved from www.marchofdimes.com/peristats.

Despite the fact that the increase in preterm births was primarily in the 34 to 37 week preterm period, where the chances of survival are better than for very preterm births, prematurity/low birth weight was still the single largest cause of infant mortality in Michigan. In 2006, the rate of infant mortality due to prematurity and low birth weight in Michigan was 157.7 per 100,000 live births, compared to 113.5 per 100,000 for the United States.

FIGURE IB5:4

Selected Causes of Infant Mortality, Rates per 100,000 Live Births, U.S. and Michigan, 2006



SOURCE: National Center for Health Statistics, period linked birth/infant death data. Retrieved from www.marchofdimes.com/peristats.

³ Engle, W. A., Tomashek, K. M., Wallman, C., & the Committee on Fetus and Newborn. (2007). "Late-Preterm" Infants: A Population at Risk.

⁴ Ananth, C. V., Joseph, K. S., Oyelese, Y., Demissie, K., & Vintzileos, A. M. (2005). Trends in Preterm Birth and Perinatal Mortality among Singletons: U.S., 1989 through 2000. *Obstetrics & Gynecology*, 105(5, Part 1).

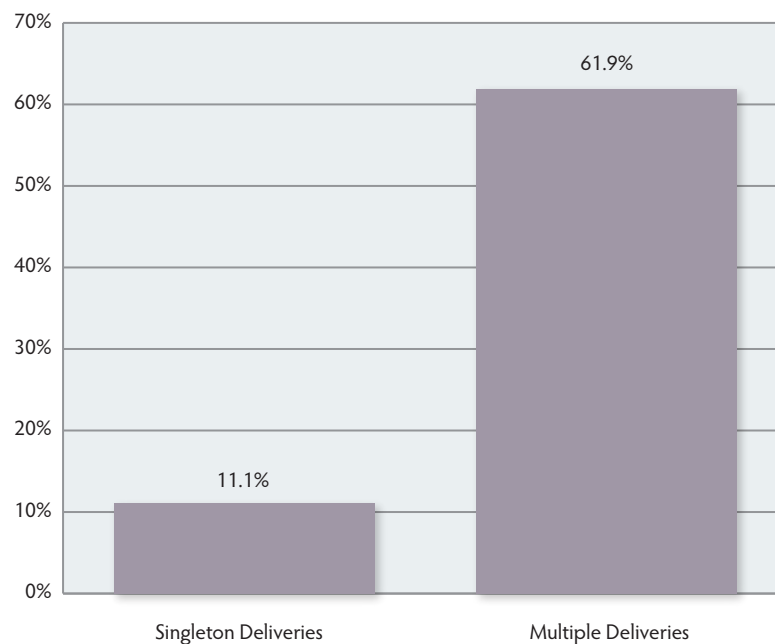
⁵ Bettegowda, V. R., Dias, T., Davidoff, M. J., Damus, K., Callaghan, W. M., & Petrini, J. R. (2008). The relationship between cesarean delivery and gestational age among US singleton births. *Clinics in Perinatology*, 35(2), 309-323, v-vi.

Risk Factors for Preterm Delivery

The causes of preterm birth are complex and not fully understood, but a number of common risk factors increase the chance that a baby will be born preterm. For example, a history of preterm birth in a previous pregnancy is a major risk factor for having another.

Another major risk factor for preterm birth is being pregnant with multiple fetuses. Twins and other multiples made up only 3.4 percent of births in 2006, but accounted for 16.3 percent of premature births. As shown in Figure IB5:5, infants who are multiples are six times more likely to be premature than singletons. Part of the increase in premature births can be attributed to an increase in multiple gestations associated with assisted reproductive technologies. In addition, use of in vitro fertilization is a risk factor for premature birth, even in singleton births.⁶

FIGURE IB5:5
Percentage of Births that are Premature, Singleton and Multiple Deliveries, U.S., 2006



SOURCE: National Center for Health Statistics, final natality data. Retrieved August 10, 2010, from www.marchofdimes.com/peristats.

Other risk factors for premature birth include smoking during pregnancy, inadequate prenatal care, and being a relatively younger or older mother.

FIGURE IB5:6
Proportion of Births with Selected Risk Factors, U.S. and Michigan, 2006

	U.S.	Michigan
Births to Mothers Who Smoked During Pregnancy ⁷	10.0%	13.8%
Births to Teens ⁸	10.4%	9.8%
Births to Mothers over 35 ⁹	14.2%	n/a
Births that are Multiples ⁸	3.4%	3.7%
Births to women receiving late or no prenatal care ⁷	3.6%	3.1%

⁶ Jackson, R. A., Gibson, K. A., Wu, Y. W., & Croughan, M. S. (2004). Perinatal Outcomes in Singletons Following In Vitro Fertilization: A Meta-Analysis. *Obstetrics & Gynecology*, 103(3).

⁷ Child Trends analysis of 1990-2006 Natality MicroData files from Centers for Disease Control and Prevention, National Center for Health Statistics.

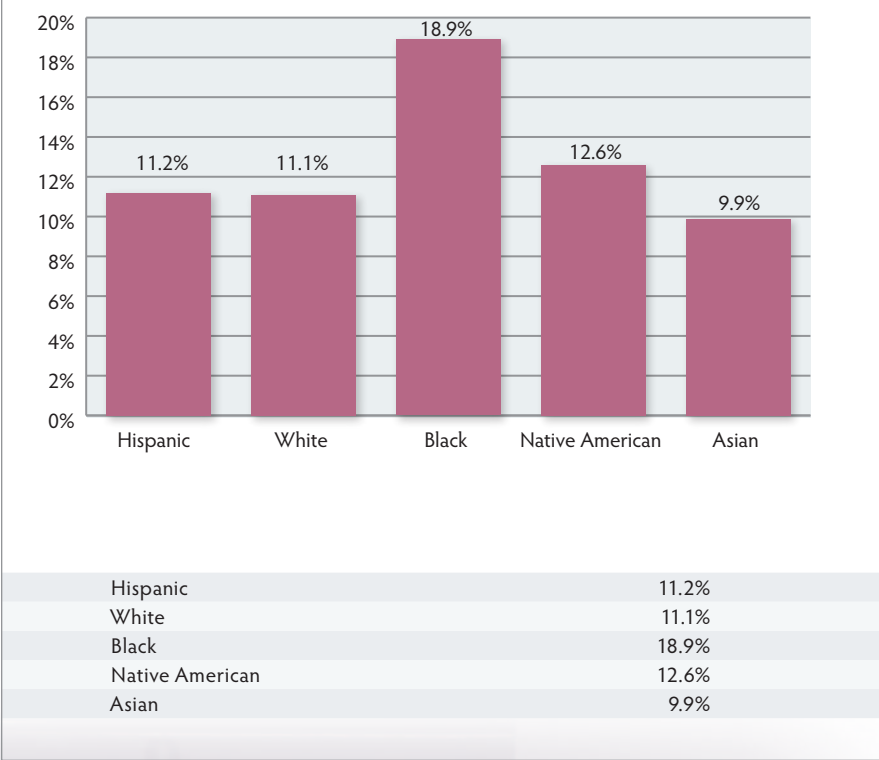
⁸ National Center for Health Statistics, final natality data. Retrieved from www.marchofdimes.com/peristats.

⁹ National Vital Statistics System, Births: Final Data for 2006. Data are not available for Michigan.

Disparities in Preterm Birth

Black infants are 70 percent more likely to be born prematurely than white infants, reflecting a significant disparity in rates of premature birth and contributing to disparities between whites and blacks in rates of infant mortality. Eleven percent of white infants are born prematurely, while almost 19 percent of black infants are born prematurely. This disparity is not seen in other racial groups.

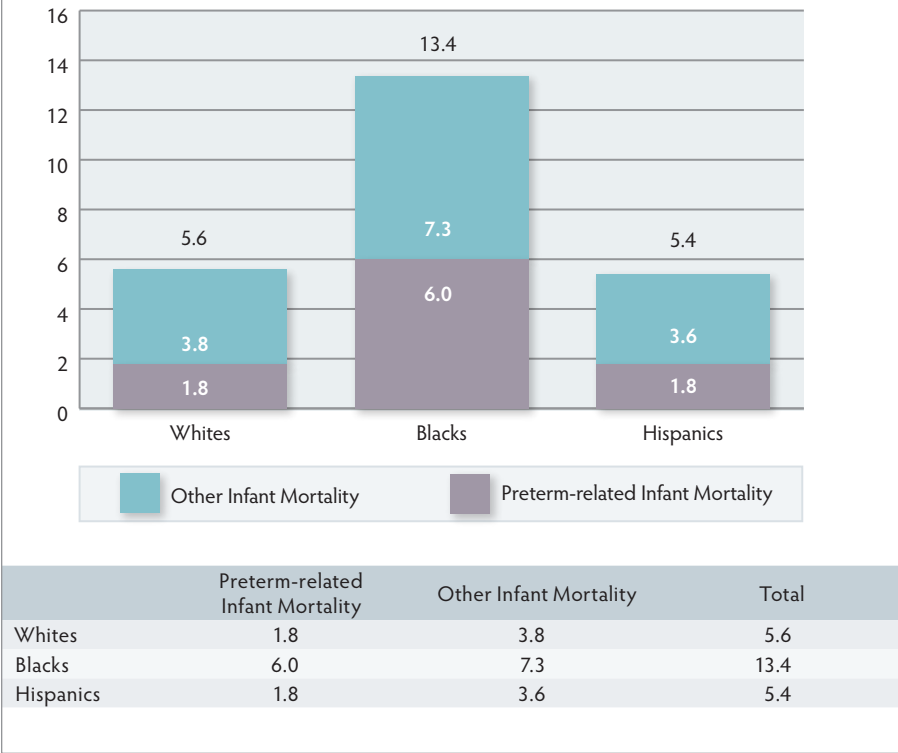
FIGURE IB5:7
Percent of Births that are Preterm by Mother's Race/Ethnicity, Michigan, 2006



SOURCE: National Center for Health Statistics, final natality data.
Retrieved August 10, 2010, from www.marchofdimes.com/peristats.

Preterm infants born to black mothers are also more likely to die in the perinatal period¹⁰ than those born to white mothers.¹¹ Consequently, preterm birth contributes more to infant mortality for black infants than it does for white infants. Figure IB5:8 shows the large gap in infant mortality rates between blacks and whites, and the larger contribution of preterm birth to infant mortality among blacks.

FIGURE IB5:8
Preterm-related Infant Mortality and Overall Infant Mortality Rates per 1,000 Births, by Race, U.S., 2006



Source: Infant Mortality Statistics From the 2006 Period Linked Birth/Infant Death Data Set, National Vital Statistics System. Numbers may not sum to totals due to rounding.

The cause of this disparity is not well understood. Black mothers are statistically more likely to experience certain risk factors for preterm birth, such as smoking or teen pregnancy, but even accounting for those differences in risk factors, black women still have a much higher rate of preterm birth than whites or Hispanics.¹²

Another theory suggests that black mothers experience more stress during pregnancy than mothers of other races, leading to more premature births. But while research shows racial-ethnic disparity in the experience of stressful life events during pregnancy, it has not shown this to account for the racial-ethnic disparity in preterm births.¹³

Improvements in medical technology may contribute to the difference in rates of premature births. For example, major gains have been made in treating respiratory distress syndrome, a condition that tends to be more severe in white preterm infants than in black preterm infants.¹⁴ But again, this factor does not fully explain the differential.

More studies are needed to better understand the complex issues behind racial disparities in preterm births.

¹⁰ Perinatal mortality is defined as stillbirths occurring after 22 weeks plus infant death within 7 days of birth.

¹¹ Ananth, C. V., Joseph, K. S., Oyelese, Y., Demissie, K., & Vintzileos, A. M. (2005). Trends in Preterm Birth and Perinatal Mortality among Singletons: U.S., 1989 through 2000. *Obstetrics & Gynecology*, 105(5, Part 1).

¹² Kistka, Z. A., Palomar, L., Lee, K. A., Boslaugh, S. E., Wangler, M. F., Cole, F. S., DeBaun, M. R., et al. (2007). Racial disparity in the frequency of recurrence of preterm birth. *American Journal of Obstetrics and Gynecology*, 196(2), 131.e1-131.e6.

¹³ Lu, M. C., & Chen, B. (2004). Racial and ethnic disparities in preterm birth: The role of stressful life events. *American Journal of Obstetrics and Gynecology*, 191(3), 691-699.

¹⁴ Cutler, D. M., Meara, E., & Richards, S. (2009). Induced Innovation and Social Inequality: Evidence from Infant Medical Care. National Bureau of Economic Research Working Paper Series, No. 15316.

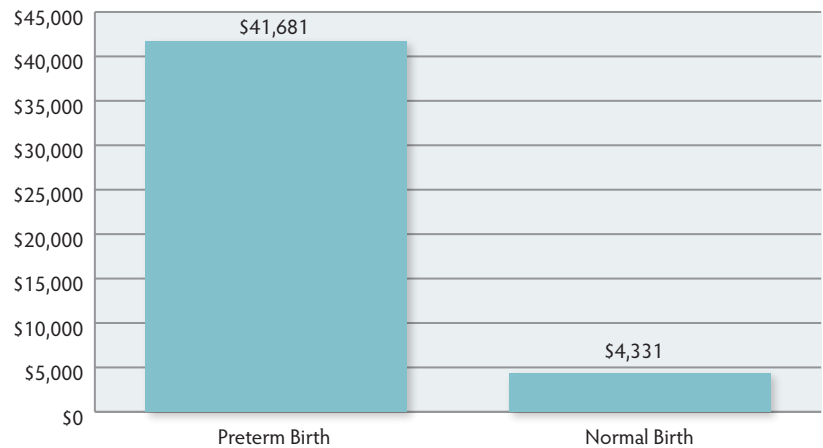
Costs of Preterm Birth

Preterm birth is a serious health problem that costs the nation more than \$26 billion annually, according to a report from the Institute of Medicine.¹⁵

Data from BCBSM reveal that in 2008 to 2009,¹⁶ the average cost of medical care for a premature baby in its first year of life is \$41,681, compared to the average cost of medical care for a full term baby at \$4,331. This is comparable to national figures in a study done by the March of Dimes Foundation, which found that in 2007, the average cost for a premature baby in the first year was about \$49,000, while a newborn without complications costs \$4,551.¹⁷

FIGURE IB5:9

Average Costs in the First Year of Life, Preterm and Full Term Infants, BCBSM, 2008 to 2009



SOURCE: Special Data Request, BCBSM , April 2010

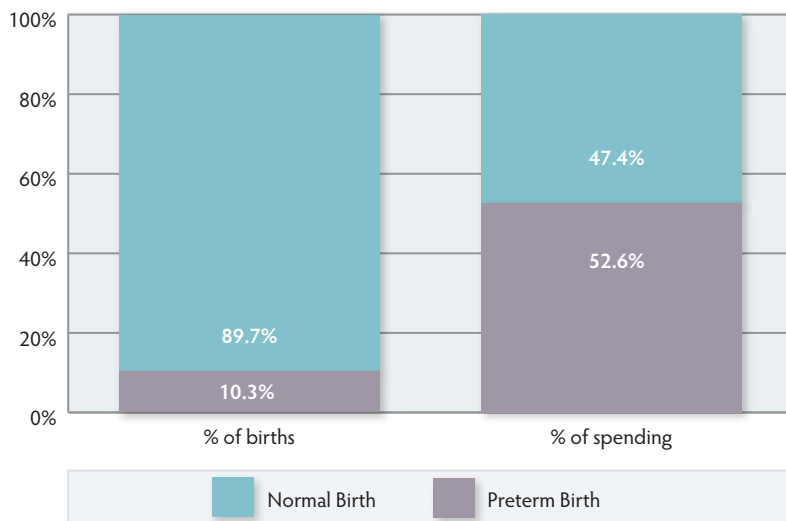
¹⁵ Richard E. Behrman, Adrienne Stith Butler, Editors, Committee on Understanding Premature Birth and Assuring Healthy Outcomes. (2007). *Preterm Birth: Causes, Consequences, and Prevention*. Washington, D.C.: The National Academies Press.

¹⁶ Data include infants born December 1, 2007 to October 31st, 2008. The time period of analysis includes claims that extend up to one year after birth.

¹⁷ March of Dimes Foundation. (2008). *The Cost of Prematurity to Employers*.

Overall, spending on premature babies in 2008 to 2009 made up over half of all spending on infants in the first year of life. Specifically, although they only made up 10.3 percent of births in the BCBSM population, premature babies accounted for 52.6 percent of medical spending for infants.

FIGURE IB5:10
Percentage of Births and Percentage of Spending in the First Year of Life, BCBSM, 2009

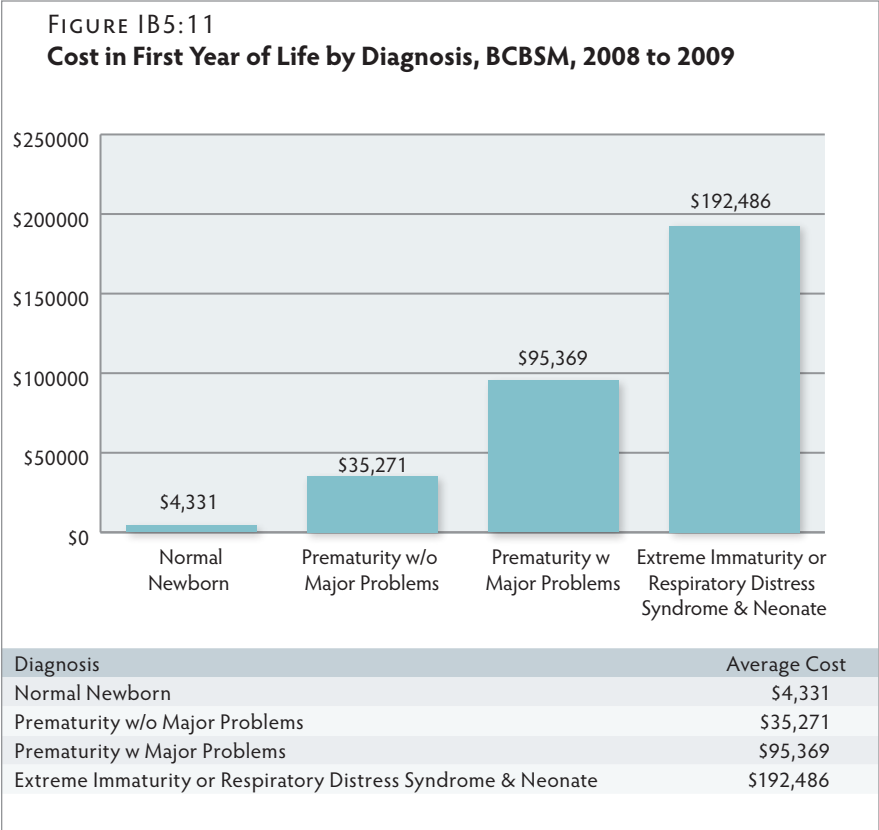


	# of births	% of births	Total Spending	% of spending
Preterm Birth	1,112	10.3%	\$46,348,871	52.6%
Normal Birth	9,639	89.7%	\$41,741,952	47.4%

SOURCE: Special Data Request, BCBSM, April 2010

Costs of Preterm Birth *(continued)*

While average costs for all preterm babies are high, spending on preterm babies with the severest medical problems is the most significant. Infants who were diagnosed with extreme immaturity or respiratory distress syndrome in 2008 to 2009 had an average cost of \$192,486. Babies who were diagnosed with prematurity with major problems¹⁸ cost an average of \$95,369, and babies who were diagnosed with prematurity without major problems cost an average of \$35,271.

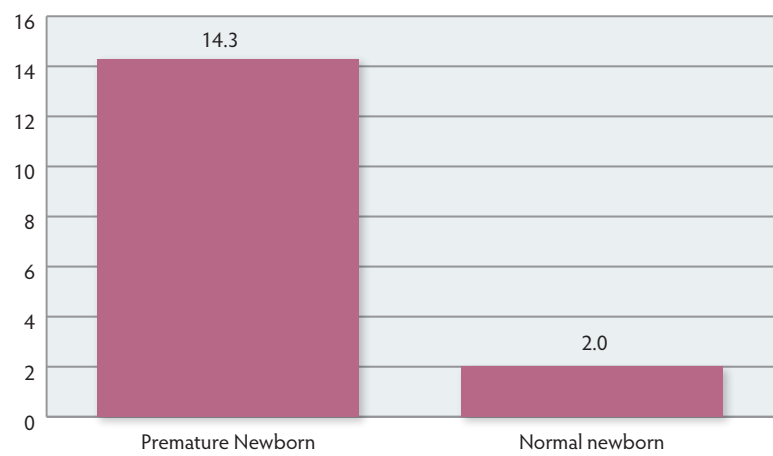


SOURCE: Special Data Request, BCBSM, April 2010

¹⁸ The category “major problems” is defined by the Centers for Medicare and Medicaid Services (CMS), and includes serious complications found in premature infants.

A considerable portion of the higher cost of care for preterm babies is the higher cost of hospital care. Babies who are born prematurely often stay in the hospital for an extended period of time after birth. The average length of stay for a normal birth is just two days, while the average length of stay a premature birth is 14.3 days. For the subset of babies with the most severe problems (extreme immaturity and respiratory distress syndrome), the average length of stay in the hospital following birth was 35.6 days.

FIGURE IB5:12
Average Length of Stay, Premature and Normal Newborns, in Days, Michigan, 2008



SOURCE: HCUPnet, Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality, Rockville, MD. <http://hcupnet.ahrq.gov/>

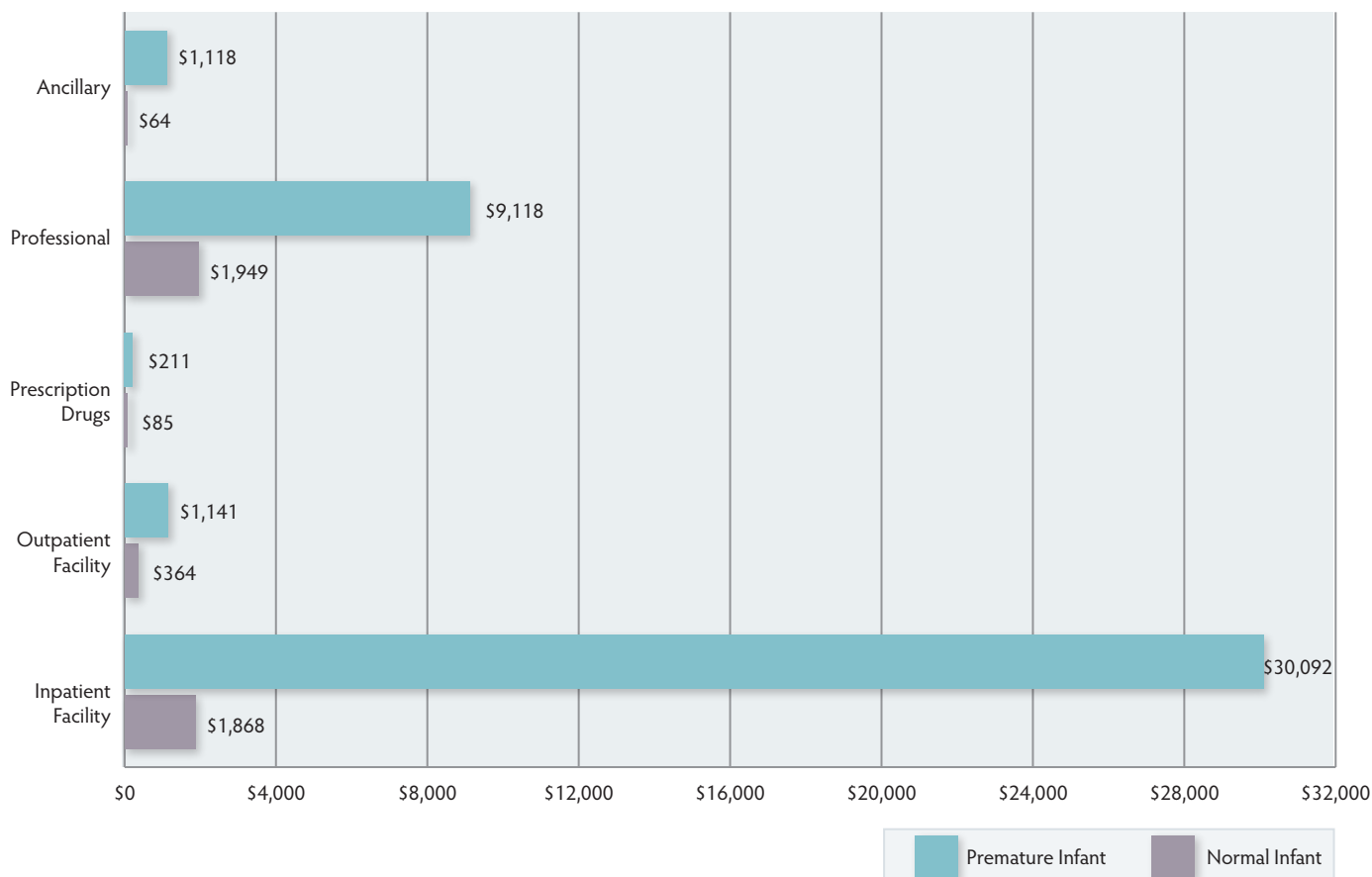


Costs of Preterm Birth *(continued)*

Hospital spending for preterm infants was about 16 times that of normal infants in 2008 to 2009. The cost of care of professional services, outpatient care, and prescription drugs for preterm infants was between two and five times higher than for normal infants.

FIGURE IB5:13

Average Spending in First Year of Life by Type of Service, Premature and Normal Infants, BCBSM, 2009



Condition	Ancillary	Professional	Prescription Drugs	Outpatient Facility	Inpatient Facility
Premature Infant	\$1,118	\$9,118	\$211	\$1,141	\$30,092
Normal Infant	\$64	\$1,949	\$85	\$364	\$1,868

SOURCE: Special Data Request, BCBSM, April 2010



Center for Healthcare Research & Transformation

2929 Plymouth Road, Suite 245 • Ann Arbor, MI 48105-3206
Phone: 734-998-7555 • chrt-info@umich.edu • www.chrt.org

