



**A NEW VISION FOR CALIFORNIA'S HEALTHCARE SYSTEM:
Integrated Care with Aligned Financial Incentives**

**Appendix XI. Preterm Births
(Initiative Memorandum)**

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See “Appendix IV: Introduction to Appendices V-XI” for brief background on this Appendix.

Executive Summary

Preterm births, defined as babies born before 37 weeks of gestation, occur in about 12% of all U.S. pregnancies and are one of the leading causes of infant death. The U.S. preterm birth rate peaked in 2006 at 12.8%, and dropped to less than 12% in 2010. California’s 2011 preterm rate of 9.8% was already one of the lowest in nation. In this appendix, we estimate the effect of implementing an initiative to reduce it even further.

We estimate that the initiative will target about 20% of all births in California, in order to reach high-risk pregnancies and provide medical and social services to improve prenatal health and birth outcomes. With the initiative, at-risk mothers will be given access to a variety of services and initiatives, including medical and mental healthcare as well as education programs warning of the dangers of smoking, alcohol and illicit drug use during pregnancy.

Under the “Current Developments” scenario, the cumulative reduction in spending is about \$20 million by 2022 in current-year dollars, but only under the lower initiative cost assumption. The cost of the initiative exceeds the reduction in spending under the higher initiative cost assumption. This scenario assumes the initiative will either prevent preterm births entirely, or else increase the gestational age, in 4% of California births in 10 years. Under the “Forum Vision” scenario, the cumulative reduction in spending through 2022 is estimated to be about \$130 million in current-year dollars, but only under the lower initiative cost assumption. This scenario estimates that the initiative will prevent preterm births or increase the gestational age in about 6% of births in 10 years. The cost of these initiatives are modeled at \$150 and \$400 per woman.

The Underlying Situation

Premature infants may have health complications such as low birth weight, breathing problems and increased susceptibility to life threatening infections.¹ Premature babies often spend weeks or even months in a neonatal intensive care unit.² And they face a greatly increased risk for such lifelong challenges as intellectual disabilities, cerebral palsy, vision and hearing loss and digestive problems.³

Common risk factors that can increase the chance of preterm birth include a history of preterm births, multiple births, smoking during pregnancy, inadequate prenatal care, short inter-pregnancy intervals, and births to either adolescents or women over age 35.⁴ African American infants are 1.5 times more

¹ National Institute of Child Health & Human Development (2011).

² Centers for Disease Control and Prevention (2012).

³ Ibid.

⁴ California Department of Health Care Services (2010).



likely to be born prematurely than infants who are not African-American.⁵ Higher preterm rates also have been associated with a lack of high school education in mothers, and with mothers who have had two or more previous births.⁶

The U.S. preterm birth rate peaked in 2006 at 12.8%, but dropped to less than 12% in 2010.⁷ The March of Dimes attributes the improvement to better hospital practices that discourage the sorts of early, non-medically indicated elective deliveries that can result in premature births. The March of Dimes set a goal of lowering the national preterm birth to 9.6% of all births by 2020.⁸ They hope to achieve this by increasing healthcare access to women of childbearing age, implementing effective initiatives such as preconception and early prenatal care, providing progesterone treatments for women who are medically eligible, encouraging pregnant women to stop smoking, and discouraging elective Cesarean-sections and induction before 39 weeks of pregnancy.⁹

Recently, there has been a focus on preventing late preterm births, defined as those three to six weeks early or after 34 to 36 weeks of gestation. Despite the evidence that even babies born late preterm are less healthy, the number of births and induction of labor preterm has been increasing.¹⁰ Induced labor preterm births increased from 7.5% to 17.3% between 1990 and 2006; and late preterm births delivered through C-section rose from 23.5% to 34.3% during the same period.¹¹ The change in preterm rates from 2000 to 2010 is mainly due to the number of late preterm deliveries between 34 to 39 weeks. Although the percentage of babies born full-term (40 weeks) has remained steady from 2000 to 2010 in California, births between 34 to 39 weeks gestation has increased from 53% to 62% during this time.¹² Currently there is an emphasis on preventing induction and C-sections prior to 39 weeks without a medical reason. An increase in elective C-section or elective induction of labor between 34 and 36 weeks, which are not recommended under any circumstances, may have partly contributed to the increase of late preterm births.¹³

California's preterm birth rate was 9.8% in 2011, lower than the national rate of 11.7%.¹⁴ In 2011, both the national and California preterm birth rate fell for the fifth straight year.¹⁵ Figure 1 shows the rate of preterm births for California and the United States from 1999 to 2011.¹⁶ Since 2006, the preterm rate for Hispanic infants has declined more slowly than it has for non-Hispanic white and black infants (a 5%

⁵ March of Dimes Foundation (2010).

⁶ California Department of Health Care Services (2010).

⁷ Centers for Disease Control and Prevention (2010).

⁸ March of Dimes Foundation (2010).

⁹ Ibid.

¹⁰ National Business Group on Health (2012).

¹¹ Ibid.

¹² Centers for Disease Control and Prevention (2010).

¹³ Bettegowda, et al. (2008); Fuchs, et al. (2006).

¹⁴ Hamilton, et al. (2012).

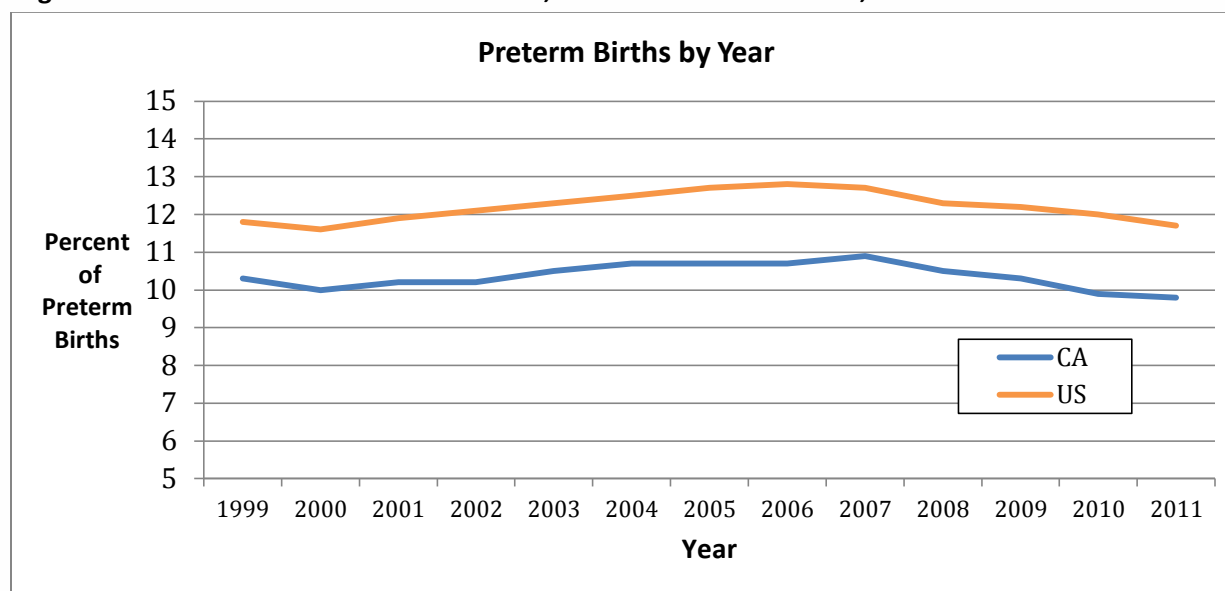
¹⁵ Martin, et al. (2012).

¹⁶ Not shown in Figure 1, but there was a growth in preterm rates due to increase in multiple births associated with the use of Assisted Reproductive Technology (ART) in the 1980's. This affected preterm rates across the entire range of preterm births. While the use of ART continues to grow, this trend of multiple births, especially high-order multiples, has leveled off in recent years due to improvement in treatment technology; National Institute of Child Health & Human Development (2012).



decline compared to declines of 8% and 9%, respectively).¹⁷ The preterm rates in 2011 for non-Hispanic black infants were lower than they have been for 30 years.¹⁸

Figure 1: Percent of Births that are Preterm, in the U.S. and California, 1999-2011



Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System

There are several reasons for California's lower-than-average preterm birth rate. Perhaps most importantly, the prenatal care rate in California is higher than it is in most other states, with most women receiving prenatal care starting in the first or second trimester.¹⁹ California extends Medicaid coverage eligibility to all pregnant women with incomes 200% or below the federal poverty level, a more generous eligibility standard than in most states. There is an additional state program, Access for Infants and Mothers that extends coverage to women with incomes between 200%-300% of the federal poverty level.²⁰ About 47% of all births in California are covered under Medicaid (Medi-Cal), compared to about 40% nationally.²¹ Lack of access to insurance coverage was cited by several studies as the single most important barrier to prenatal care.²² Medi-Cal and other state and local programs encourage prenatal care and there are special programs directed at populations at high risk for preterm labor who lack adequate insurance. All of these factors contribute to more Californians receiving prenatal care than the U.S. average. While the Healthy People 2020 goal is for 77.9% of women to receive prenatal care beginning in the first trimester, California has already exceeded that goal (80% of California women got

¹⁷ Hamilton, et al. (2012).

¹⁸ Ibid.

¹⁹ Braveman, et al. (2003); Centers for Disease Control and Prevention (2010).

²⁰ The State of California's Access for Infants & Mothers program; <http://www.aim.ca.gov/Home/default.aspx>.

²¹ Johnson (2012).

²² Braveman, et al. (2003).



first trimester prenatal care in 2010²³). Another reason for low rates of preterm birth in California involves demographics; about half of all births in California are to Hispanics, who tend to have low preterm birth rates.²⁴ Also, smoking rates for pregnant women in California are lower than the U.S. average.²⁵

Previous Studies

Various studies have identified several risk factors for preterm births that may be addressed by appropriate interventions. They include smoking (about 5% to 7% of preterm births)²⁶, lack of prenatal care (about 3%) and inter-pregnancy intervals of insufficient duration. However, other risk factors are more complex and thus far more difficult to address. They include being African-American (about 17% of preterm births), having multiple pregnancies (about 15% to 20%),²⁷ becoming pregnant under the age of 17 or over the age 35 (about 25% to 29%),²⁸ and having had a previous preterm birth. Obesity in women of childbearing-age is also associated with poor perinatal outcomes, as is excessive maternal weight at the onset of pregnancy and excessive weight gain during pregnancy.²⁹ However, about 50% of preterm births are to women with no identified risk factors.³⁰

Although prenatal care is usually regarded as extremely important, studies show only a weak association between prenatal care and decreased risk for preterm birth. Various models of prenatal care are continually being examined to assess their effectiveness in improving perinatal outcomes. For example, the Comprehensive Perinatal Services Program in California, which is part of the Medi-Cal program, provides a wide range of culturally competent services to pregnant women from conception through 60 days postpartum, including psychosocial, nutrition and health education.³¹ An evaluation of home visiting programs found that women who were visited had fewer low birth weight newborns compared to those who were not.³² There is also some evidence of the efficacy of programs that target substance abuse, smoking cessation and teen pregnancy, and as well as programs targeted at African American women.

According to a March of Dimes report on preterm births during 2005, the average first-year medical costs for preterm infants were \$32,325, or ten times the expense associated with full-term infants (\$3,325).³³ A 2007 estimate showed that the average cost of medical care in the first year of life for a premature baby was \$49,000, compared to \$4,551 for a full-term baby.³⁴ Most of the higher cost for

²³ Centers for Disease Control and Prevention (2010).

²⁴ Ibid.

²⁵ Ibid.

²⁶ Goldenberg, et al. (2000).

²⁷ Goldenberg, et al. (2010).

²⁸ Hamilton, et al. (2012).

²⁹ Abrams, et al. (1989); Dietz, et al. (2006); Schieve, et al. (2000); Viswanathan, et al. (2008).

³⁰ Centers for Disease Control and Prevention (2012).

³¹ California Department of Public Health (2012).

³² Olds, et al. (2004); Lee, et al. (2009).

³³ March of Dimes Foundation (2008).

³⁴ Ibid.



preterm babies is the result of longer and thus more expensive hospital care. Their average length of stay is about 14 days, compared to two to five days for full-term births.³⁵

The Institute of Medicine has calculated the annual costs associated with preterm birth at more than \$26 billion, or \$51,600 for every infant born prematurely in the United States.³⁶ The components of that care are as follows³⁷:

- \$16.9 billion (65%) for medical care
- \$1.9 billion (7%) for maternal delivery
- \$611 million (2%) for early intervention services
- \$1.1 billion (4%) for special education services
- \$5.7 billion (22%) for lost household and labor market productivity

Proposed Initiative

We propose additional funding to implement initiatives that may reduce preterm births in California. We assume that the initiative will be modeled after existing programs in California that have been successful at preventing preterm births and improving prenatal health and birth outcomes. The initiative may be comprised of comprehensive prenatal care, or programs aimed at reducing barriers to prenatal care, reducing multiple gestation, increasing inter-pregnancy intervals and improving inter-conceptional care for women with medical problems. At-risk mothers can be given access to a variety of services to help prepare for healthy pregnancies as well as improve birth outcomes.

Although more than 95% of pregnant women in California reported receiving at least four prenatal visits,³⁸ there is room for improvement in the quality of that care. It is possible that if women receive prenatal care earlier in their pregnancies, healthcare providers may be better able to identify women at higher risk for preterm deliveries or adverse birth outcomes. Because smoking and drug use during pregnancy have been associated with preterm deliveries and low birth weight,³⁹ providers can identify and enroll women with these risks. The initiative may also provide necessary services for maternal depression or stress. Women who suffer from depression or stress during pregnancy are likely to exhibit behaviors that further increase the risk of preterm births and low birth weight babies, such as lack of prenatal care, smoking, substance abuse, inadequate nutrition and unhealthy weight gain.⁴⁰

There are examples of successful programs in California that serve pregnant women to promote healthy birth outcomes. For example, 31 counties participate in the Adolescent Family Life Program, which provides services to pregnant teens. This program provides approximately 3,000 adolescents each year

³⁵ Ibid.

³⁶ Institute of Medicine (2007).

³⁷ Almost two-thirds of the cost associated with preterm births was for medical care.

³⁸ Centers for Disease Control and Prevention (2010).

³⁹ Horta, et al. (1997); Kelly, et al. (2002); Robison, et al. (2012); Taylor-Robinson, et al. (2011).

⁴⁰ Bonari, et al. (2004).



with a comprehensive case management program, including prenatal and postpartum medical care, mental health care and substance abuse services.⁴¹ California's Black Infant Health (BIH) program is a group support program of 10 prenatal and 10 postnatal sessions located in the 15 areas of the state that account for 75% of African-American births.⁴²

Modeling Approach and Assumptions

The goal of the initiative is to provide the preventive services that have been shown to reduce preterm births.⁴³ In 2010, the state average percent of preterm births ranged from 8.4% to 17.6%. California at 9.8% had the fifth lowest percent, behind Vermont, New Hampshire, Alaska and Maine.⁴⁴ Without the implementation of an initiative program, it is estimated that the rate of preterm births will remain at 9.8%, the figure from 2011.

Targeted population

The initiative will target 20% of all pregnancies in California, focusing on high risk pregnancies. We assume that there will be prevention of preterm births in some cases and an increase in gestational age in others.

In the first year (2013), about 103,000 women will be receiving the initiative, a figure that increases steadily to about 110,000 women by 2022. These numbers are based on California's birth projections for the next 10 years.⁴⁵

Cost of the initiative

The cost of the initiative is estimated to be \$150 per enrolled woman under the upper bound reduction in spending estimate and \$400 for the lower bound reduction in spending estimate⁴⁶, resulting in a cost of the initiative of \$16 million and \$43 million in 2013, respectively.⁴⁷ We project that the cost of the initiative will increase at the same rate as healthcare expenditures, with the result that by 2022, the cost will be \$28 million for the lower estimate and \$74 million for the higher estimate.

Reduction in preterm births

The initiatives assume that the current downward trend of preterm birth rate will continue. Based on data from 2010, we estimate that under the Current Developments scenario analysis, 9.7% of California births will be between 24 to 36 weeks gestation in 2013. We estimate the reduction in healthcare expenditure if the number of preterm births decreases. We estimate that annually through 2022, 0.2%

⁴¹ California Department of Public Health (2012).

⁴² California Department of Public Health (2012).

⁴³ Modeling births prior to 39 weeks resulting from elective C-section or induction of labor is not the scope of this analysis. The data on costs associated with these deliveries are difficult to estimate and are different from costs associated with other preterm deliveries.

⁴⁴ Centers for Disease Control and Prevention (2010).

⁴⁵ California Department of Finance (2012).

⁴⁶ The estimate of the cost to provide healthcare to a pregnant woman is derived from the cost of managing a patient with a chronic condition and multiple needs. It is assumed that a physician or a healthcare staff would serve as a care manager, ensuring that pregnant women receive all necessary services. "Lower bound" estimates assumes a higher intervention cost, and therefore result in lower savings.

⁴⁷ Cost of intervention multiplied by targeted 20% of all births for each year.



of preterm births will be prevented and another 0.2% of preterm births will be delayed by one week. The result is an approximately 2% reduction in the number of preterm births in 10 years, bringing the rate of preterm births in 2022 to 9.5%.

Under the Forum Vision scenario, reduction in preterm deliveries will occur more quickly, decreasing at 0.3% annually and reaching 9.4% in 2022. We also estimate that annually, 0.3% of the preterm births from 24 to 36 weeks will be delayed by one week.

Targeted healthcare expenditure

We estimate the reduction in spending that will occur when preterm births are prevented as well as when they are delayed by one week.⁴⁸ For example, under the Current Developments scenario, in 2013, we estimate that 100 preterm births will be prevented and another 100 will be delayed by one gestational week. The total reduction in spending will be the sum of the estimated reduction in spending associated with each development. We estimate the costs associated with preterm births at 24 to 36 gestational weeks. To estimate the reduction in expenditure from preventing a preterm birth, we examined the cost associated with births occurring at each gestational week (24 to 36 weeks) and the proportion of preterm births that occur during those weeks. A weighted average cost per preterm birth was then estimated to be approximately \$23,000 in 2013, increasing to \$36,000 by 2022.⁴⁹

To estimate the reduction in expenditure that would result from increasing pregnancies by one gestational week, we estimated the number of preterm births that would occur at 24 to 36 weeks, and then applied the savings associated with increasing the gestational age by one week.

The cost associated with each increasing gestational week is not linear.⁵⁰ For example, delaying a preterm birth from 24 to 25 weeks is actually associated with an increase in average cost. This is because a birth at 24 weeks is less viable than a birth that occurs at 25 weeks. But delaying a birth from 29 to 30 weeks is associated with a savings of about \$23,000.⁵¹ The savings become much lower after 33 weeks of gestation; by 35 to 36 weeks, the figure is just \$2,563.⁵²

⁴⁸ Delaying preterm births will result in a change to the gestational age distribution. We assume that changes in the rates will be uniform across the entire gestational age spectrum.

⁴⁹ Projection is based on California's healthcare expenditure growth rate through 2022.

⁵⁰ Phibbs, et al. (2006).

⁵¹ Ibid.

⁵² Ibid.



Table 1: Target Reduction of Preterm Births

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Projected # of California births	515,029	519,969	523,178	525,455	535,534	543,601	545,351	547,845	549,304	551,218
Current Developments										
# of Preterm births reduced or delayed	200	403	607	813	1,034	1,259	1,472	1,688	1,902	2,119
Forum Vision										
# of Preterm births reduced or delayed	300	604	910	1,217	1,548	1,883	2,201	2,523	2,842	3,164

Estimated Impact

Table 2 and 3 show that under both the Current Developments and Forum Vision scenarios, the reduction in spending is insufficient to offset the cost of the initiative in 2013. Our estimates show only a modest reduction in spending under the upper bound scenario by 2022.

For the Current Developments scenario, which aims to prevent or increase the gestational age of 4% of preterm births, the cost of the initiative exceeds the reduction in spending through 2022. The cost exceeds the reduction in spending by \$340 million in current-year dollars under the higher initiative cost assumption (lower bound). The reduction in spending by 2022 is about \$20 million under the lower initiative cost assumption (upper bound).

Under the Forum Vision, there is cumulative reduction in spending of \$130 million from 2013 to 2022 for the upper bound estimate. The assumptions for this scenario are that the cost of the initiative is \$150 per enrollee. When the initiative cost is increased to \$400 per enrollee, the cost exceeds the reduction in spending by \$230 million. The results show that by 2022, there is about \$50 million reduction in spending under the upper bound assumption.

Table 2: Healthcare Expenditure Reduction Estimates Under the Current Developments Scenario, 2013-2022

	2013		2022		2013 - 2022		
	Lower	Upper	Lower	Upper	Lower	Mid	Upper
Status Quo Expenditures (billions)	\$327.6		\$572.2		\$4,387.1		
Expenditure Reduction (billions)	-\$0.04	-\$0.01	-\$0.02	\$0.02	-\$0.34	-\$0.16	\$0.02
Expenditure Reduction (%)	-0.012%	-0.004%	-0.004%	0.004%	-0.008%	0.004%	0.0004%



Table 3: Healthcare Expenditure Reduction Estimates Under the Forum Vision Scenario, 2013-2022

	2013		2022		2013 - 2022		
	Lower	Upper	Lower	Upper	Lower	Mid	Upper
Status Quo Expenditures (billions)	\$327.6		\$572.2		\$4,387.1		
Expenditure Reduction (billions)	-\$0.04	-\$0.01	\$0.00	\$0.05	-\$0.23	-\$0.05	\$0.13
Expenditure Reduction (%)	-0.012%	-0.004%	0.0001%	0.008%	-0.005%	-0.001%	0.003%

Discussion

The rates of preterm births have been declining in the past few years, and the rate for California is lower than the national average. The proposed initiative aims to achieve an even lower rate of preterm births during the next ten years. However, previous studies and the current estimates indicate that it is challenging to implement cost-effective strategies to improve birth outcomes. There is a lack of evidence about the effectiveness of enhanced prenatal care in preventing preterm births. And the fact that nearly half of all preterm births are not associated with any known risk factors adds to the difficulty involved in designing an initiative to significantly reduce their number.

In estimating our model, we considered the reduction in spending associated with delaying preterm births. There are differences in costs associated with gestational age at birth, and delaying preterm births even by couple of weeks can result in a significant reduction in expenditures. For example, a birth at 24 weeks can cost more than 100 times a birth at 37 weeks. At 34 weeks, the cost is about triple the cost at 37 weeks. The challenge is that the earliest births are the most difficult to prevent. Therefore, we estimate the reduction in spending not only from preventing preterm births, but also from delaying births until later in the gestation period.

There are several limitations in modeling the initiative. First, we do not specify the details of the initiative, but we assume it will include strategies that focus on both medical and social services. Second, our models are based on only one set of cost estimates from one source. Third, we consider only hospital costs, and do not include other costs associated with preterm births, such as those associated with long-term health and developmental effects. All of these factors can affect the accuracy of our estimates.

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