

# **Florida Infant Deaths and Low Weight Births Attributable to Absence of Prenatal Care and Tobacco Use of Mother**

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## **Abstract**

Maternal smoking and absence of prenatal care are associated with increased risk of low weight birth and infant death. Using logistic regression methods we found that if all women who gave birth received prenatal care and did not smoke, infant deaths would be reduced by an estimated 12.52% and low weight births would be reduced by an estimated 7.44%. These results are independent of risk associated with maternal marital status, age, education and race.

## **Introduction**

There are many factors associated with increases in the risk of low birth weight and death for infants. Two of these factors are absence of prenatal care and tobacco use by the mother. The objective of this analysis is to estimate the proportion of low birth weight infants (birth weight less than 2500 grams) and infant deaths in Florida that would be prevented if every woman who gave birth had prenatal care and did not smoke.

The prevalence of prenatal care and smoking vary by the race of the mother, so another objective of this analysis is to estimate the change in black to white rate ratios that would occur if every woman who gave birth had prenatal care and did not smoke.

## **Methods**

This analysis used linked birth and death record data. This file included records for all births occurring to Florida residents in 1999 and 2000. In cases where the infant died before one year of age, the death record data was added to the birth record.

Using this data file, and Statistical Package for Social Sciences (SPSS) software, a logistic regression analysis was performed to compute the adjusted odds ratios for 6 known risk factors for infant death. The risk factors used were: mother's marital status, age, education, race, tobacco use, and absence of prenatal care.

The adjusted odds ratios were then used to compute the probability of infant death for each birth record in the file. These probabilities were then summed across all of the births to verify that the sum of the computed probabilities was equal to the sum of the actual infant deaths. The sum was 2762.07 and the actual total for infant deaths was 2762. The difference of 0.07 was deemed to be negligible.

The probability formula was then modified so that all births with no prenatal care were assumed to have had prenatal care. This reduces the probability of infant death for births with no prenatal care to the level of comparable births that had prenatal care. These modified probabilities were then summed to obtain the estimated infant deaths that would have occurred if mothers, who actually did not have prenatal care, did get prenatal care.

To estimate the number of infant deaths attributable to smoking, the probability formula was modified so that all births where the mother smoked were assumed to be births where the mother did not smoke. This reduces the probability of infant death for births with smoking mothers to the level of comparable births with non-smoking mothers. These modified probabilities were then summed to obtain the estimated infant deaths that would have occurred if mothers, who actually smoked, did not smoke.

Estimates of low weight births attributable to absence of prenatal care and maternal smoking were calculated in the same manner as infant deaths, using a probability equation from

logistic regression. The sum of the probabilities for low weight births was 32350 and the actual total for low weight births was 32343. The difference of 7 was deemed to be negligible.

These methods use adjusted odds ratios for mother's marital status, age, education, race, tobacco use, and absence of prenatal care to estimate infant deaths and low weight births attributable to absence of prenatal care and maternal smoking. Since the adjusted odds ratios are used, the estimates of attributable infant deaths and low weight births are not influenced by the association of infant death and low weight birth with maternal marital status, age, education or race.

## **Results**

Table 1 gives the results of the logistic regression and the adjusted odds ratios for infant death for each of the risk factors. All of the risk factors are significantly associated with infant death, except for maternal age greater than 39. The p value in table 1 for this factor is 0.145 which means there is a 14.5% chance this factor is not associated with increased risk of infant death.

In table 1, the absence of prenatal care is associated with the largest increase in risk of infant death with an adjusted odds ratio of 5.19. This means the odds of infant death for infants born to women with no prenatal care are 5.19 times as high as the odds for infants born to women who received prenatal care. The odds ratio is adjusted for differences in the other factors.

Table 2 is similar to table 1 but table 2 addresses risk of low weight birth instead of risk of infant death. The same risk factors are in both tables. Maternal age greater than 39 is not significantly associated with infant death in table 1, but it is significantly associated with low birth weight in table 2. Another difference pertains to the no prenatal care factor. As discussed above in table 1, the adjusted odds ratio for infant death associated with this factor is 5.19. In

table 2, the adjusted odds ratio for low birth weight associated with this factor is lower at 2.44. The rest of the factors in table 2 follow the same pattern for low birth weight as they do in table 1 for infant death.

Tables 3 and 4 give the results of the attributable risk calculations described in the methods section above. As shown in these tables, infant deaths would be an estimated 12.52% lower and low weight births would be 7.44% lower, if all women received prenatal care and did not smoke during pregnancy. Additionally, under this scenario, the black to white infant death rate ratio would be reduced by 5.70% from 2.49 to 2.35, and the black to white low birth weight rate ratio would increase by 2.08% from 1.81 to 1.85. The increase in this ratio is probably a result of higher smoking rates among white women. If white women smoke more, then eliminating smoking would reduce the rates for white women more than for black women and the ratio would then be increased.

## **Discussion**

This analysis adjusts for some of the factors associated with infant death and low birth weight, but there are other risk factors for these outcomes that are not taken into account in this analysis. For example, women who smoke may be more likely to have poor nutritional status, independently of their smoking habit. Eliminating the smoking would not do anything for the nutritional problems so these women would still have greater risks after they quit smoking. In this analysis, the effects of nutritional status (and other factors not used to compute the adjusted odds ratios) are not reflected in the estimates.

On the other hand, adjusted odds ratios are used for maternal marital status, age, education, and race so the estimated attributable outcomes are not influenced by differences in these factors. In effect, birth outcomes are compared for women with the same maternal marital status, age, education, and race.

In conclusion, based on this analysis, a substantial proportion of infant deaths and low weight births would be prevented if all prenatal women received prenatal care and did not smoke.

**Table 1**

## Infant Death Adjusted Odds Ratios\*

Maternal Risk Factor	Logistic Regression Coefficient	p Value	Adjusted Infant Death Odds Ratio	95% C. I. Lower Limit	95% C. I. Upper Limit
Marital Status Unmarried	0.1570	0.000	1.17	1.07	1.28
Education < 12th Grade	0.3415	0.000	1.41	1.28	1.54
Age < 18	0.4348	0.000	1.55	1.34	1.79
Age > 39	0.1694	0.145	1.19	0.94	1.49
Tobacco Use	0.2995	0.000	1.35	1.20	1.52
No Prenatal Care	1.6465	0.000	5.19	4.60	5.86
Black Race	0.7279	0.000	2.07	1.90	2.25
Constant	-5.4992	0.000			

\* Based on 400,185 Florida resident births occurring in 1999 and 2000 linked to 2762 infant deaths.

**Table 2**

## Low Birth Weight (&lt; 2500 grams) Adjusted Odds Ratios\*

Maternal Risk Factor	Logistic Regression Coefficient	p Value	Adjusted Infant Death Odds Ratio	95% C. I. Lower Limit	95% C. I. Upper Limit
Marital Status Unmarried	0.1522	0.000	1.16	1.13	1.20
Education < 12th Grade	0.0441	0.004	1.05	1.01	1.08
Age < 18	0.1591	0.000	1.17	1.12	1.23
Age > 39	0.4344	0.000	1.54	1.45	1.65
Tobacco Use	0.4958	0.000	1.64	1.59	1.70
No Prenatal Care	0.8910	0.000	2.44	2.30	2.58
Black Race	0.6049	0.000	1.83	1.78	1.88
Constant	-2.7788	0.000	0.06	0.00	0.00

\* Based on 400,078 Florida resident births occurring in 1999 and 2000  
107 Records with unknown birth weights were excluded

**Table 3**

ACTUAL AND ESTIMATED INFANT DEATHS AND RATES

	Black Infant Deaths	White and Other Infant Deaths	Total Infant Deaths	Decrease From Actual	Percent Decrease From Actual
Table 3 a					
Actual in 2001	635	859	1494		
Assuming All Mothers Receive Prenatal Care	546	804	1350	144	9.67%
Assuming All Mothers Receive Prenatal Care and Do not Smoke	537	770	1307	187	12.52%

	Black Infant Death Rate	White and Other Infant Death Rate	Total Infant Death Rate	Decrease From Actual	Percent Decrease From Actual
Table 3 b					
Actual in 2001	13.49	5.42	7.26		
Assuming All Mothers Receive Prenatal Care	11.60	5.07	6.56	0.70	9.67%
Assuming All Mothers Receive Prenatal Care and Do not Smoke	11.41	4.86	6.35	0.91	12.52%

	Black to White and Other Rate Ratio	Percent Decrease From Actual	Percent Decrease From Actual
Table 3 c			
Actual in 2001	2.49		
Assuming All Mothers Receive Prenatal Care	2.28	0.20	8.14%
Assuming All Mothers Receive Prenatal Care and Do not Smoke	2.35	0.14	5.70%

**Table 4**

## ACTUAL AND ESTIMATED LOW WEIGHT BIRTHS (&lt; 2500 grams) AND PERCENTAGES

	Black LBW Births	White and Other LBW Births	Total LBW Births	Decrease From Actual	Percent Decrease From Actual
Table 4 a					
Actual in 2001	5889	10923	16812		
Assuming All Mothers Receive Prenatal Care	5656	10723	16379	433	2.57%
Assuming All Mothers Receive Prenatal Care and Do not Smoke	5524	10037	15562	1250	7.44%
Table 4 b					
Actual in 2001	12.5%	6.9%	8.2%		
Assuming All Mothers Receive Prenatal Care	12.0%	6.8%	8.0%	0.21%	2.57%
Assuming All Mothers Receive Prenatal Care and Do not Smoke	11.7%	6.3%	7.6%	0.61%	7.44%
Table 4 c					
Actual in 2001	1.81				
Assuming All Mothers Receive Prenatal Care	1.77	0.04	2.17%		
Assuming All Mothers Receive Prenatal Care and Do not Smoke	1.85	-0.04	-2.08%		