

# **INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2010**

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## **Introduction**

Infant mortality and birth weight statistics are used extensively in public health. These statistics are especially useful because of relevance as maternal and child health indicators, ease of availability and reliability due to a relatively high level of completeness.

The purpose of this annual analysis is to identify geographic areas in the state where low birth weight (LBW) rates and infant mortality (IM) rates are statistically significantly higher than would be expected considering the unique demographics of each area. These identified areas should become the focus of further detailed analyses to investigate reasons for the higher than expected rates and to develop intervention strategies for improving the outcomes.

IM and LBW rates will vary across counties. This variation is due, in part, to the unique demographic characteristics of the county populations. In this analysis, adjustments are made to account for the differences in demographic characteristics. Three demographic characteristics are accounted for when calculating the adjusted and expected statistics: maternal race, marital status, and maternal education. These variables are used because of known associations with risk of LBW and IM, and because adjusting for these characteristics provide a way to make valid comparisons among counties with different demographic characteristics.

Other demographic characteristics, such as young maternal age and smoking status, are not used in this adjustment, because there are public health interventions directed at addressing these factors and adjustment would eliminate differences that may be due to the effects of public health interventions. For example, if a county has an actual LBW percentage significantly lower than the expected LBW percentage, the difference could be due to the success of a smoking cessation program in the county. If adjustments were made for smoking status, differences between actual and expected statistics would not be apparent. In another example, births to women of young maternal age can be influenced by teen pregnancy prevention interventions and by the same logic; adjustments are not made for maternal age.

IM and LBW rates can also vary due to random variation or chance. In this analysis, statistical methods are used to separate random variation from non-random variation, so rates that are reported as significantly higher or lower are most likely a result of non-random influences. Likewise, rates that are higher or lower than expected, but not significantly, are likely to be the result of random variation.

## **Methods**

The data used in this analysis were extracted from the birth records for residents of Florida, born in calendar years 2009 and 2010. Births were classified as LBW if the birth weight on the

birth record was in the range of 1 to 2499 grams. Three demographic variables obtained from the birth record were used in this analysis: mother's race, marital status, and educational attainment. For the purposes of this analysis, two categories were used for each variable. Mother's race was classified as Black or non-Black, marital status was classified as married or not married, and mother's education was classified as 12th grade or higher completed or less than 12th grade completed. These three variables were used to classify the births into eight mutually exclusive categories. Birth records with unknown values for any of the three variables were placed in a ninth category. There were approximately 1,000 birth records in the ninth category (less than 1% of the resident births). The nine categories are as follows:

<b><u>Mother's Category</u></b>	<b><u>Mother's Race</u></b>	<b><u>Mother's Marital Status</u></b>	<b><u>Mother's Education</u></b>
1	Non-Black	Married	High School or More
2	Non-Black	Married	Less than High School
3	Non-Black	Not Married	High School or More
4	Non-Black	Not Married	Less than High School
5	Black	Married	High School or More
6	Black	Married	Less than High School
7	Black	Not Married	High School or More
8	Black	Not Married	Less than High School
9*	Unknown	Unknown	Unknown

\* This includes records with unknown values in any of the three categories.

***Calculating Expected Rates:***

Using this classification, the nine category-specific IM rates were calculated from the 2009 (the latest year for complete matched birth and infant death data) statewide totals. These statewide rates were then multiplied by the number of births in each of the nine categories for each county, using county specific birth data for 2010, to obtain the number of expected infant deaths for each of the nine categories for each county for 2010. The sum of the nine category-specific expected infant deaths for each county was then calculated as the total number of expected infant deaths for each county. The expected number of infant deaths was then used as the numerator, and the total number of births was used as the denominator, to compute the expected infant death rate for each county. Since all of the above calculations were done on a category-specific basis, the expected number of infant deaths and expected infant death rates reflect the unique maternal race, marital status and education characteristics of the births in each county. The county-specific expected statistics are thereby adjusted for the influence of differing proportions of births in the nine categories.

These methods were applied in the same way to calculate the expected statistics for LBW, except the nine category-specific LBW rates were calculated from 2010 birth data instead of 2009 birth data. The term for this adjustment technique is "indirect adjustment."

For example, if a county existed where all the births were in category 1, then the expected statistics for the county would be the same as the statewide statistics for category 1. Another county might have had births that were all in category 8. For this county, the expected statistics would be the same as the statewide statistics for category 8. These two hypothetical counties would have different expected statistics because they have populations with different demographic characteristics. If both counties had actual rates equal to the expected rates, they would be considered equal regarding the rates. Stated differently, both counties are doing as

well as the state at preventing IM and LBW, considering their different demographic characteristics.

The *Normal Approximation to the Binomial Distribution* was used to test for statistically significant differences between actual and expected rates in most of the counties. In instances where the number of infant deaths or number of low birth weight infants was less than 30, the Poisson formula was used. The correlation between IM and LBW rates across the counties was also assessed.

In March 2004, the recording of maternal race on the birth record was changed so that more than one race can be selected. For the purposes of this analysis, births where the only maternal race recorded was Black were classified as Black and all others were classified as non-Black.

## **Results**

The results of this analysis are shown in the following tables and maps for IM and LBW. In the tables, actual statistics are compared to expected statistics. The expected statistics are adjusted for the demographic characteristics in each county, as described above. Counties with statistically significantly higher than expected actual statistics are indicated in the tables with a "H", and "L" indicates significantly lower than expected actual statistics. The maps display the results of the statistical tests for significance. Counties where the actual statistics are significantly higher or lower are shaded, as indicated by the legend on the maps.

For this analysis, the correlation between counties with high LBW percentages and counties with high infant death rates is weak and not statistically significant. This means that counties with high LBW percentages do not have a strong tendency to have high infant death rates or vice versa (rank correlation coefficient = 0.186; p value of 0.138).

Also included in this report are summary tables for the years 2006 through 2010 that show the H's and L's for the counties for each of the past 5 years.

## **Discussion**

This analysis should be considered a preliminary step in the continuing endeavor to reduce risk of infant death and low birth weight in Florida. The rationale is to use the results of this analysis to focus further analysis and efforts on the areas where the risks are significantly high and also analyze factors that contribute to the lower risks seen in some areas.

One limitation of this analysis is the comparatively high level of variability of rates in smaller counties. Consequently, larger differences in rates for small counties may not be statistically significant while the same or smaller differences may be statistically significant in larger counties. Actual rates that are statistically significantly higher than the expected rates are most likely not a result of random fluctuations and are cause for concern; however, higher rates that are not statistically significant may warrant further investigation. Additionally, smaller counties with higher than expected rates for a period of several years may also be cause for concern.

Since adjustments were used to account for the differing demographic composition in each county, further analysis would focus on other factors that were not adjusted for, such as smoking rates and mother's age at birth. Unique factors in each county contribute to infant deaths and low birth weight. Local area analysis of factors associated with these outcomes should be undertaken to better understand the reasons for higher than expected rates with

separate analyses performed for each area of concern. Finally, it should be noted that in this analysis, rates for each county are compared to the statewide rates, after adjustment for maternal race, marital status and education attainment. The issue of whether or not the statewide rates should be used as a baseline in these comparisons is not addressed in this analysis.

**2010 FLORIDA ACTUAL INFANT DEATH RATES PER 1000 BIRTHS  
COMPARED TO EXPECTED<sup>1</sup> RATES PER 1000 BIRTHS**

<i>Mother's Resident County</i>	<i>2010 Births</i>	<i>2010 Expected<sup>1</sup> Infant Deaths</i>	<i>2010 Actual Infant Deaths</i>	<i>2010 Expected Infant Death Rate Per 1000 Births</i>	<i>2010 Actual Infant Death Rate Per 1000 Births</i>	<i>H=Actual Rate Signif.Higher<sup>2</sup> L=Actual Rate Signif.Lower<sup>2</sup> Than Expected</i>
ALACHUA	2,866	19	29	6.77	10.12	H
BAKER	350	2	4	5.79	11.43	
BAY	2,207	13	8	6.02	3.62	
BRADFORD	342	2	0	6.94	0.00	
BREVARD	4,966	29	32	5.84	6.44	
BROWARD	21,342	157	135	7.37	6.33	L
CALHOUN	156	1	1	5.98	6.41	
CHARLOTTE	1,012	6	5	5.72	4.94	
CITRUS	1,043	5	7	5.26	6.71	
CLAY	2,137	12	8	5.48	3.74	
COLLIER	3,339	19	20	5.77	5.99	
COLUMBIA	820	5	6	6.22	7.32	
DADE	31,335	206	138	6.59	4.40	L
DESOTO	435	3	2	6.23	4.60	
DIXIE	159	1	0	5.71	0.00	
DUVAL	12,616	93	102	7.34	8.08	
ESCAMBIA	3,922	28	40	7.24	10.20	H
FLAGLER	875	5	6	5.78	6.86	
FRANKLIN	112	1	1	5.86	8.93	
GADSDEN	672	7	7	10.23	10.42	
GILCHRIST	190	1	1	5.10	5.26	
GLADES	75	1	2	6.83	26.67	
GULF	115	1	1	5.87	8.70	
HAMILTON	179	1	1	7.77	5.59	
HARDEE	435	3	6	5.90	13.79	H
HENDRY	609	4	0	6.53	0.00	L
HERNANDO	1,461	8	9	5.29	6.16	
HIGHLANDS	938	6	8	6.29	8.53	
HILLSBOROUGH	16,409	110	122	6.68	7.43	
HOLMES	206	1	2	5.05	9.71	
INDIAN RIVER	1,305	8	11	6.19	8.43	
JACKSON	497	3	2	6.85	4.02	
JEFFERSON	127	1	1	8.61	7.87	
LAFAYETTE	90	0	0	5.16	0.00	
LAKE	3,123	18	16	5.88	5.12	
LEE	6,316	39	27	6.14	4.27	L
LEON	3,087	25	29	7.96	9.39	
LEVY	431	3	2	6.24	4.64	
LIBERTY	74	0	0	5.34	0.00	
MADISON	211	2	4	7.61	18.96	
MANATEE	3,350	21	23	6.17	6.87	
MARION	3,399	22	33	6.38	9.71	H
MARTIN	1,226	7	2	6.00	1.63	L
MONROE	696	4	3	5.34	4.31	
NASSAU	775	4	7	5.21	9.03	
OKALOOSA	2,531	14	17	5.36	6.72	
OKEECHOBEE	549	3	6	5.74	10.93	
ORANGE	15,186	101	117	6.66	7.70	
OSCEOLA	3,709	21	22	5.54	5.93	
PALM BEACH	13,822	96	77	6.94	5.57	L
PASCO	4,802	25	30	5.29	6.25	
PINELLAS	8,469	54	73	6.43	8.62	H
POLK	7,416	48	55	6.50	7.42	
PUTNAM	896	6	4	7.06	4.46	
SAINT JOHNS	1,815	9	8	5.12	4.41	
SAINT LUCIE	3,076	21	22	6.89	7.15	
SANTA ROSA	1,713	8	8	4.86	4.67	
SARASOTA	2,817	16	14	5.58	4.97	
SEMINOLE	4,373	25	34	5.73	7.77	
SUMTER	445	3	2	6.77	4.49	
SUWANNEE	507	3	5	6.09	9.86	
TAYLOR	271	2	5	7.09	18.45	H
UNION	175	1	0	5.60	0.00	
VOLUSIA	4,714	29	31	6.21	6.58	
WAKULLA	327	2	2	5.58	6.12	
WALTON	621	3	4	5.44	6.44	
WASHINGTON	245	1	1	6.11	4.08	
TOTAL <sup>4</sup>	214,509	1,400	1,400	6.53	6.53	

<sup>1</sup> The expected number of infant deaths is calculated based on the maternal race, marital status and education characteristics of the births in each county

<sup>2</sup> The significance level used is .05

<sup>4</sup> Total excludes 10 births with county unknown

2010 FLORIDA ACTUAL LOW BIRTH WEIGHT <sup>1</sup> PERCENTAGES COMPARED TO EXPECTED <sup>2</sup> PERCENTAGES						
Mother's Resident County	2010	2010	2010	2010	H=Actual Rate Signif.Higher <sup>3</sup>	L=Actual Rate Signif.Lower <sup>3</sup> Than Expected
	2010 Births	Expected <sup>2</sup> LBW Births	Actual LBW Births	Expected LBW Percent	Actual LBW Percent	
ALACHUA	2,866	260	223	9.07%	7.78%	L
BAKER	350	28	39	8.06%	11.14%	H
BAY	2,207	181	181	8.22%	8.20%	
BRADFORD	342	31	35	9.00%	10.23%	
BREVARD	4,966	404	374	8.14%	7.53%	
BROWARD	21,342	2,039	1,932	9.56%	9.05%	L
CALHOUN	156	13	11	8.20%	7.05%	
CHARLOTTE	1,012	80	87	7.94%	8.60%	
CITRUS	1,043	79	86	7.60%	8.25%	
CLAY	2,137	168	173	7.88%	8.10%	
COLLIER	3,339	268	255	8.02%	7.64%	
COLUMBIA	820	69	80	8.45%	9.76%	
DADE	31,335	2,771	2,858	8.84%	9.12%	H
DESOTO	435	36	32	8.17%	7.36%	
DIXIE	159	12	18	7.85%	11.32%	
DUVAL	12,616	1,197	1,175	9.49%	9.31%	
ESCAMBIA	3,922	366	423	9.33%	10.79%	H
FLAGLER	875	71	68	8.14%	7.77%	
FRANKLIN	112	9	8	8.01%	7.14%	
GADSDEN	672	78	81	11.65%	12.05%	
GILCHRIST	190	14	15	7.46%	7.89%	
GLADES	75	7	11	8.83%	14.67%	
GULF	115	9	10	8.03%	8.70%	
HAMILTON	179	17	14	9.53%	7.82%	
HARDEE	435	34	36	7.84%	8.28%	
HENDRY	609	51	42	8.35%	6.90%	
HERNANDO	1,461	112	121	7.70%	8.28%	
HIGHLANDS	938	79	90	8.38%	9.59%	
HILLSBOROUGH	16,409	1,435	1,490	8.75%	9.08%	
HOLMES	206	15	21	7.39%	10.19%	
INDIAN RIVER	1,305	110	103	8.46%	7.89%	
JACKSON	497	45	44	8.99%	8.85%	
JEFFERSON	127	13	13	10.44%	10.24%	
LAFAYETTE	90	7	4	7.55%	4.44%	
LAKE	3,123	255	241	8.16%	7.72%	
LEE	6,316	524	495	8.29%	7.84%	
LEON	3,087	307	267	9.95%	8.65%	L
LEVY	431	36	39	8.32%	9.05%	
LIBERTY	74	6	8	7.78%	10.81%	
MADISON	211	20	24	9.68%	11.37%	
MANATEE	3,350	277	266	8.27%	7.94%	
MARION	3,399	291	269	8.58%	7.91%	
MARTIN	1,226	99	86	8.05%	7.01%	
MONROE	696	54	47	7.74%	6.75%	
NASSAU	775	59	53	7.56%	6.84%	
OKALOOSA	2,531	198	197	7.81%	7.78%	
OKEECHOBEE	549	43	55	7.80%	10.02%	H
ORANGE	15,186	1,350	1,386	8.89%	9.13%	
OSCEOLA	3,709	293	302	7.90%	8.14%	
PALM BEACH	13,822	1,250	1,235	9.05%	8.94%	
PASCO	4,802	366	404	7.61%	8.41%	H
PINELLAS	8,469	728	770	8.60%	9.09%	
POLK	7,416	638	605	8.60%	8.16%	
PUTNAM	896	81	88	9.03%	9.82%	
SAINT JOHNS	1,815	138	122	7.63%	6.72%	
SAINT LUCIE	3,076	278	274	9.04%	8.91%	
SANTA ROSA	1,713	126	127	7.36%	7.41%	
SARASOTA	2,817	223	216	7.90%	7.67%	
SEMINOLE	4,373	356	343	8.13%	7.84%	
SUMTER	445	39	47	8.70%	10.56%	
SUWANNEE	507	42	46	8.21%	9.07%	
TAYLOR	271	25	31	9.09%	11.44%	
UNION	175	14	19	7.92%	10.86%	
VOLUSIA	4,714	397	396	8.43%	8.40%	
WAKULLA	327	26	37	8.01%	11.31%	H
WALTON	621	48	44	7.69%	7.09%	
WASHINGTON	245	20	23	8.31%	9.39%	
TOTAL <sup>4</sup>	214,509	18,715	18,715	8.72%	8.72%	

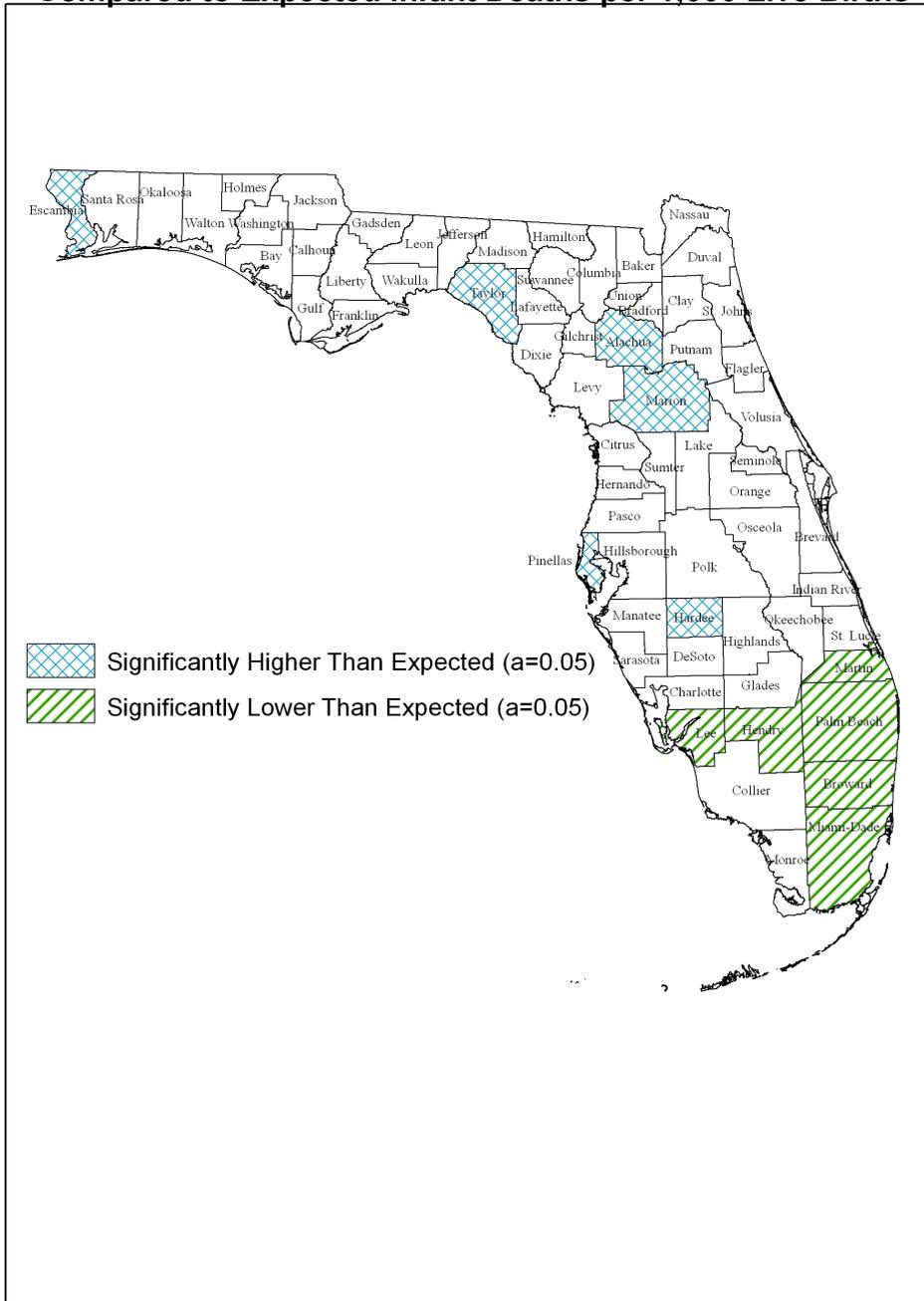
<sup>1</sup> LBW = Low Birth Weight, defined as birth weight below 2500 grams.

<sup>2</sup> The expected number of low birth weight births is calculated based on the maternal race, marital status and education characteristics of the births in each county

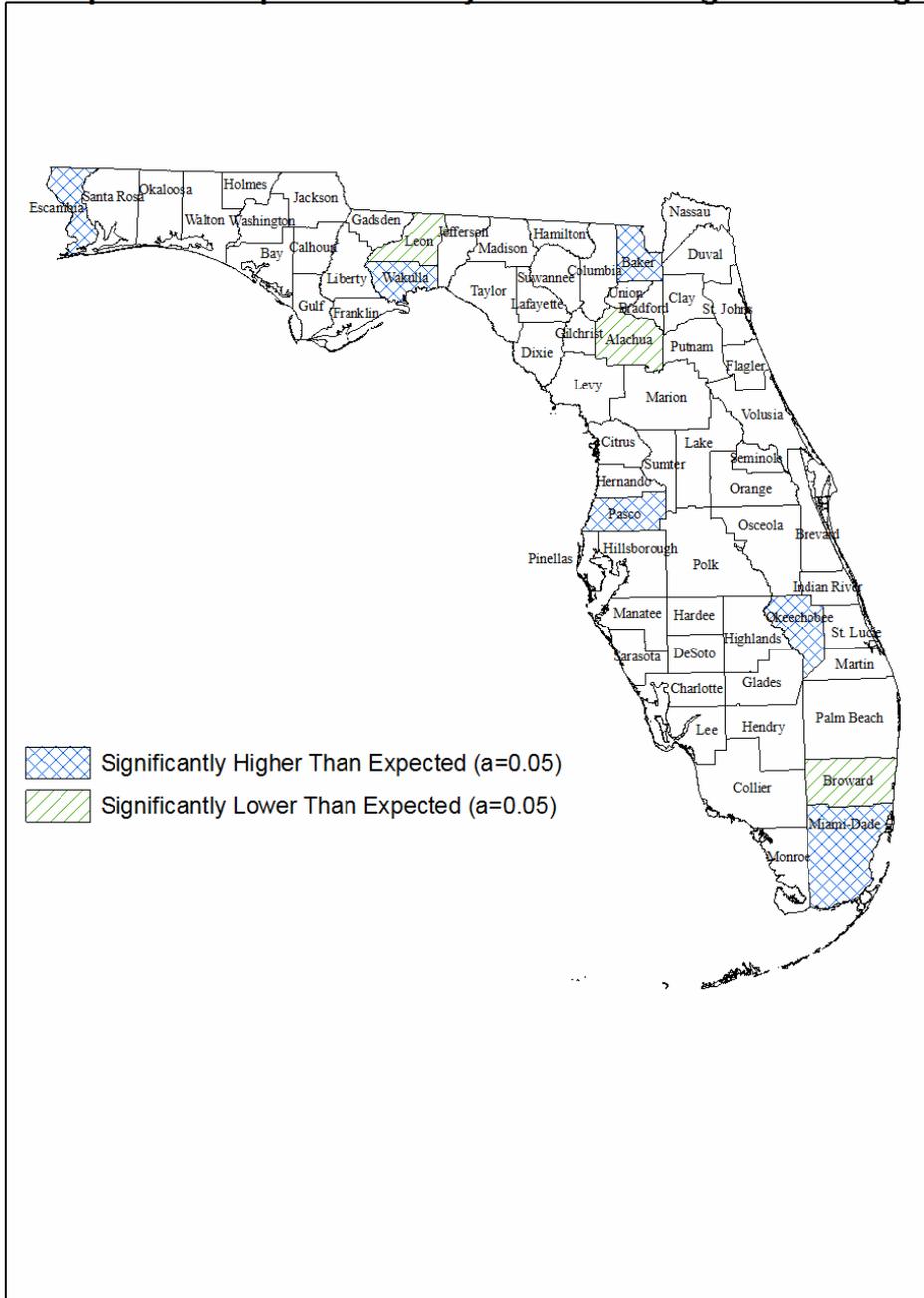
<sup>3</sup> The significance level used is .05

<sup>4</sup> Total excludes 10 births with county unknown

**Florida 2010  
Actual County Infant Deaths per 1,000 Live Births  
Compared to Expected Infant Deaths per 1,000 Live Births**



**Florida 2010  
Actual County Low Birth Weight Percentage  
Compared to Expected County Low Birth Weight Percentage**



**INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE<sup>1</sup> SUMMARY  
BY COUNTY 2006 - 2010**

<b>Mother's Resident County</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total L</b>	<b>Total H</b>
ALACHUA	H			H	H		3
BAKER	H			H			2
BAY	H	L				1	1
BRADFORD							
BREVARD							
BROWARD	L	L	L	L	L	5	
CALHOUN							
CHARLOTTE	L					1	
CITRUS							
CLAY							
COLLIER							
COLUMBIA		H	H				2
DADE	L	L	L	L	L	5	
DESOTO		L				1	
DIXIE							
DUVAL	H		H				2
ESCAMBIA			H	H	H		3
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF							
HAMILTON			H				1
HARDEE					H		1
HENDRY					L	1	
HERNANDO							
HIGHLANDS				H			1
HILLSBOROUGH		H		H			2
HOLMES	H						1
INDIAN RIVER							
JACKSON							
JEFFERSON							
LAFAYETTE							
LAKE		H					1
LEE					L	1	
LEON							
LEVY							
LIBERTY							
MADISON							
MANATEE				H			1
MARION	H		H		H		3
MARTIN			L		L	2	
MONROE		L				1	
NASSAU							
OKALOOSA		H					1
OKEECHOBEE							
ORANGE	H		H				2
OSCEOLA			H				1
PALM BEACH	L	L	L		L	4	
PASCO							
PINELLAS			H	H	H		3
POLK							
PUTNAM							
SAINT JOHN'S							
SAINT LUCIE							
SANTA ROSA	H						1
SARASOTA		L				1	
SEMINOLE							
SUMTER							
SUWANNEE			H				1
TAYLOR					H		1
UNION		H					1
VOLUSIA			H				1
WAKULLA							
WALTON							
WASHINGTON							

<sup>1</sup> H indicates the actual infant death rate was statistically significantly higher than the expected infant death rate for the county  
L indicates the actual infant death rate was statistically significantly lower than the expected infant death rate for the county  
after adjusting for the race, marital status and education characteristics of the births in each county.  
The significance level used is .05

**LOW BIRTH WEIGHT (< 2500 grams) PERCENTAGE ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE<sup>1</sup> SUMMARY  
BY COUNTY 2006 - 2010**

<b>Mother's Resident County</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total L</b>	<b>Total H</b>
ALACHUA					L	1	
BAKER					H		1
BAY							
BRADFORD				H			1
BREVARD	H						1
BROWARD	L				L	2	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY		L				1	
COLLIER	L	L	L	L		4	
COLUMBIA							
DADE	L				H	1	1
DESOTO		L	L			2	
DIXIE				L		1	
DUVAL							
ESCAMBIA	H	H	H		H		4
FLAGLER	H						1
FRANKLIN							
GADSDEN							
GILCHRIST		L				1	
GLADES							
GULF			H				1
HAMILTON							
HARDEE							
HENDRY							
HERNANDO				H			1
HIGHLANDS		L				1	
HILLSBOROUGH	H		H				2
HOLMES							
INDIAN RIVER	L		L			2	
JACKSON			H				1
JEFFERSON							
LAFAYETTE							
LAKE							
LEE							
LEON					L	1	
LEVY		L				1	
LIBERTY							
MADISON							
MANATEE	L	L		L		3	
MARION				L		1	
MARTIN			L			1	
MONROE							
NASSAU	H			H			2
OKALOOSA							
OKEECHOBEE	H				H		2
ORANGE	H			H			2
OSCEOLA	H						1
PALM BEACH		H					1
PASCO	H			H	H		3
PINELLAS							
POLK	L		L			2	
PUTNAM	H						1
SAINT JOHNS			L	L		2	
SAINT LUCIE	L					1	
SANTA ROSA							
SARASOTA	L			L		2	
SEMINOLE		L				1	
SUMTER							
SUWANNEE			L			1	
TAYLOR							
UNION							
VOLUSIA	L					1	
WAKULLA					H		1
WALTON	H						1
WASHINGTON		L				1	

<sup>1</sup> H indicates the actual infant death rate was statistically significantly higher than the expected infant death rate for the county  
L indicates the actual infant death rate was statistically significantly lower than the expected infant death rate for the county  
after adjusting for the race, marital status and education characteristics of the births in each county.  
The significance level used is .05