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## **INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2014**

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### **Introduction**

Infant mortality and birth weight statistics are used extensively in public health. These statistics are especially useful as maternal and child health indicators because of relevance, 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 these 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 2013 and 2014. Births were classified as LBW if the birth weight on the birth record was in the range of 1 to 2,499 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 high school graduation or above, or less than high school graduation. 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 3,200 (1.5%) birth records in the ninth category. 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 IM and LBW Expected Rates:***

Using this classification, the nine category-specific IM rates were calculated from the 2013 statewide totals, which is the latest year for complete linked birth and infant death data. 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 2014, to obtain the number of expected infant deaths for each of the nine categories for each county for 2014. 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. However, the births for 2014 were used for the LBW calculations since birth weight is recorded on the birth records at the time of the birth. Infant death data is not recorded on the birth record

until up to one year after the birth which precludes using 2014 birth data, hence 2013 data were used for the infant IM calculations. The term used 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 the actual to expected ratios for IM and LBW 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 could 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 an “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.

There is not a statistically significant correlation between the actual to expected LBW ratios and the actual to expected infant death ratios (Kendall’s rank correlation coefficient = 0.104; p value of 0.221).

Also included in this report are summary tables for the years 2010 through 2014 that show the Hs and Ls for the counties for each of the past five 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 as well. 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.

**2014 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>2014 Births<sup>3</sup></i>	<i>2014 Expected<sup>1</sup> Infant Deaths</i>	<i>2014 Actual Infant Deaths</i>	<i>2014 Expected Infant Death Rate Per 1000 Births</i>	<i>2014 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></i>
ALACHUA	2,916	18	28	6.19	9.60	H
BAKER	365	2	2	5.45	5.48	
BAY	2,328	14	25	6.22	10.74	H
BRADFORD	282	2	2	5.90	7.09	
BREVARD	5,259	29	29	5.55	5.51	
BROWARD	22,213	147	111	6.62	5.00	L
CALHOUN	131	1	1	5.68	7.63	
CHARLOTTE	1,007	6	4	5.53	3.97	
CITRUS	1,016	5	7	5.31	6.89	
CLAY	2,083	11	13	5.43	6.24	
COLLIER	3,288	18	15	5.37	4.56	
COLUMBIA	832	5	7	6.06	8.41	
DADE	31,990	194	145	6.05	4.53	L
DESOTO	384	2	3	6.06	7.81	
DIXIE	169	1	0	5.49	0.00	
DUVAL	12,514	83	110	6.62	8.79	H
ESCAMBIA	3,880	25	30	6.42	7.73	
FLAGLER	833	5	7	5.57	8.40	
FRANKLIN	100	1	1	6.22	10.00	
GADSDEN	535	5	5	8.75	9.35	
GILCHRIST	167	1	2	5.37	11.98	
GLADES	60	0	1	6.12	16.67	
GULF	117	1	2	6.36	17.09	
HAMILTON	145	1	2	7.10	13.79	
HARDEE	414	2	3	5.67	7.25	
HENDRY	569	3	1	6.04	1.76	
HERNANDO	1,488	8	13	5.50	8.74	
HIGHLANDS	937	6	8	5.94	8.54	
HILLSBOROUGH	16,846	100	119	5.94	7.06	H
HOLMES	207	1	3	5.07	14.49	
INDIAN RIVER	1,282	7	6	5.82	4.68	
JACKSON	514	3	3	6.63	5.84	
JEFFERSON	127	1	1	7.87	7.87	
LAFAYETTE	76	0	0	5.37	0.00	
LAKE	3,166	18	28	5.60	8.84	H
LEE	6,352	37	33	5.82	5.20	
LEON	3,085	22	22	7.07	7.13	
LEVY	409	2	1	5.41	2.44	
LIBERTY	92	0	0	5.32	0.00	
MADISON	191	1	4	7.16	20.94	
MANATEE	3,545	21	20	5.87	5.64	
MARION	3,417	20	34	5.92	9.95	H
MARTIN	1,263	7	9	5.45	7.13	
MONROE	749	4	3	5.32	4.01	
NASSAU	745	4	4	5.02	5.37	
OKALOOSA	2,827	15	13	5.22	4.60	
OKEECHOBEE	553	3	5	5.61	9.04	
ORANGE	16,221	100	84	6.16	5.18	L
OSCEOLA	4,195	23	20	5.42	4.77	
PALM BEACH	14,433	91	69	6.33	4.78	L
PASCO	4,826	26	31	5.31	6.42	
PINELLAS	8,519	51	60	6.01	7.04	
POLK	7,608	45	52	5.98	6.83	
PUTNAM	831	5	10	6.28	12.03	H
SAINT JOHNS	2,148	11	14	4.90	6.52	
SAINT LUCIE	2,969	19	18	6.29	6.06	
SANTA ROSA	1,822	9	8	4.83	4.39	
SARASOTA	2,955	16	15	5.53	5.08	
SEMINOLE	4,515	25	22	5.54	4.87	
SUMTER	494	3	7	5.95	14.17	H
SUWANNEE	440	3	5	5.84	11.36	
TAYLOR	217	1	0	6.63	0.00	
UNION	154	1	0	5.70	0.00	
VOLUSIA	4,767	28	21	5.92	4.41	
WAKULLA	335	2	1	5.48	2.99	
WALTON	725	4	2	5.04	2.76	
WASHINGTON	243	1	3	6.09	12.35	
TOTAL <sup>4</sup>	219,885	1,327	1,327	6.03	6.03	

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

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

<sup>3</sup> Total excludes 20 births with county unknown

**2014 FLORIDA ACTUAL LOW BIRTH WEIGHT<sup>1</sup> PERCENTAGES  
COMPARED TO EXPECTED<sup>2</sup> PERCENTAGES**

<b>Mother's Resident County</b>	<b>2014</b>		<b>2014</b>	<b>2014</b>	<b>2014</b>	<b>H=Actual Rate Signif.Higher<sup>3</sup></b>
	<b>2014 Births<sup>4</sup></b>	<b>Expected<sup>2</sup> LBW Births</b>	<b>Actual LBW Births</b>	<b>Expected LBW Percent</b>	<b>Actual LBW Percent</b>	<b>L=Actual Rate Signif.Lower<sup>3</sup> Than Expected</b>
ALACHUA	2,916	263	286	9.02%	9.81%	
BAKER	365	29	32	7.96%	8.77%	
BAY	2,328	197	179	8.44%	7.69%	
BRADFORD	282	24	21	8.57%	7.45%	
BREVARD	5,259	432	430	8.21%	8.18%	
BROWARD	22,213	2,108	2,147	9.49%	9.67%	
CALHOUN	131	11	15	8.16%	11.45%	
CHARLOTTE	1,007	80	73	7.98%	7.25%	
CITRUS	1,016	79	91	7.77%	8.96%	
CLAY	2,083	165	182	7.91%	8.74%	
COLLIER	3,288	263	229	8.00%	6.96%	L
COLUMBIA	832	72	85	8.63%	10.22%	
DADE	31,990	2,779	2,818	8.69%	8.81%	
DESOTO	384	32	27	8.42%	7.03%	
DIXIE	169	13	6	7.93%	3.55%	L
DUVAL	12,514	1,178	1,181	9.42%	9.44%	
ESCAMBIA	3,880	357	400	9.21%	10.31%	H
FLAGLER	833	68	63	8.19%	7.56%	
FRANKLIN	100	8	8	8.36%	8.00%	
GADSDEN	535	61	81	11.41%	15.14%	H
GILCHRIST	167	13	11	7.84%	6.59%	
GLADES	60	5	3	8.52%	5.00%	
GULF	117	10	9	8.42%	7.69%	
HAMILTON	145	14	11	9.72%	7.59%	
HARDEE	414	33	27	8.00%	6.52%	
HENDRY	569	48	33	8.36%	5.80%	L
HERNANDO	1,488	118	126	7.95%	8.47%	
HIGHLANDS	937	80	79	8.56%	8.43%	
HILLSBOROUGH	16,846	1,448	1,495	8.60%	8.87%	
HOLMES	207	16	17	7.55%	8.21%	
INDIAN RIVER	1,282	108	89	8.46%	6.94%	L
JACKSON	514	47	46	9.23%	8.95%	
JEFFERSON	127	13	15	10.49%	11.81%	
LAFAYETTE	76	6	3	7.87%	3.95%	
LAKE	3,166	259	285	8.17%	9.00%	
LEE	6,352	531	507	8.36%	7.98%	
LEON	3,085	301	299	9.77%	9.69%	
LEVY	409	33	41	8.09%	10.02%	
LIBERTY	92	7	8	7.79%	8.70%	
MADISON	191	19	26	10.11%	13.61%	
MANATEE	3,545	295	249	8.32%	7.02%	L
MARION	3,417	293	310	8.56%	9.07%	
MARTIN	1,263	100	83	7.93%	6.57%	L
MONROE	749	60	43	7.98%	5.74%	L
NASSAU	745	57	51	7.60%	6.85%	
OKALOOSA	2,827	222	224	7.85%	7.92%	
OKEECHOBEE	553	44	36	8.01%	6.51%	
ORANGE	16,221	1,443	1,398	8.90%	8.62%	
OSCEOLA	4,195	337	378	8.03%	9.01%	H
PALM BEACH	14,433	1,304	1,221	9.04%	8.46%	L
PASCO	4,826	376	428	7.78%	8.87%	H
PINELLAS	8,519	724	713	8.50%	8.37%	
POLK	7,608	657	651	8.63%	8.56%	
PUTNAM	831	74	93	8.86%	11.19%	H
SAINT JOHNS	2,148	162	160	7.53%	7.45%	
SAINT LUCIE	2,969	268	237	9.02%	7.98%	L
SANTA ROSA	1,822	135	155	7.43%	8.51%	H
SARA SOTA	2,955	234	201	7.93%	6.80%	L
SEMINOLE	4,515	368	339	8.16%	7.51%	L
SUMTER	494	42	63	8.52%	12.75%	H
SUWANNEE	440	37	40	8.39%	9.09%	
TAYLOR	217	19	17	8.91%	7.83%	
UNION	154	13	18	8.26%	11.69%	
VOLUSIA	4,767	404	417	8.47%	8.75%	
WAKULLA	335	27	24	7.95%	7.16%	
WALTON	725	55	51	7.58%	7.03%	
WASHINGTON	243	20	17	8.35%	7.00%	
TOTAL <sup>4</sup>	219,885	19,102	19,101	8.69%	8.69%	

<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 with adjusting for 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 20 births with county unknown

**INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE <sup>1</sup> SUMMARY  
BY COUNTY 2010 - 2014**

<b>Mother's Resident County</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Total L</b>	<b>Total H</b>
ALACHUA	H			H	H		3
BAKER		H		H			2
BAY		H			H		2
BRADFORD				H			1
BREVARD							
BROWARD	L	L	L	L	L	5	
CALHOUN							
CHARLOTTE				L		1	
CITRUS							
CLAY							
COLLIER							
COLUMBIA			H				1
DADE	L	L	L	L	L	5	
DESOTO							
DIXIE							
DUVAL			H	H	H		3
ESCAMBIA	H						1
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF							
HAMILTON							
HARDEE	H						1
HENDRY	L					1	
HERNANDO							
HIGHLANDS			H				1
HILLSBOROUGH		H	H	H	H		4
HOLMES			H				1
INDIAN RIVER		H					1
JACKSON							
JEFFERSON				H			1
LA FAYETTE							
LAKE					H		1
LEE	L					1	
LEON							
LEVY							
LIBERTY		H					1
MADISON							
MANATEE		H					1
MARION	H				H		2
MARTIN	L					1	
MONROE							
NASSAU							
OKALOOSA				H			1
OKEECHOBEE							
ORANGE				H	L	1	1
OSCEOLA							
PALM BEACH	L		L	L	L	4	
PASCO				H			1
PINELLAS	H						1
POLK			H				1
PUTNAM					H		1
SAINT JOHNS			L			1	
SAINT LUCIE							
SANTA ROSA							
SARASOTA		L				1	
SEMINOLE							
SUMTER					H		1
SUWANNEE							
TAYLOR	H						1
UNION							
VOLUSIA			L			1	
WAKULLA							
WALTON			H				1
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

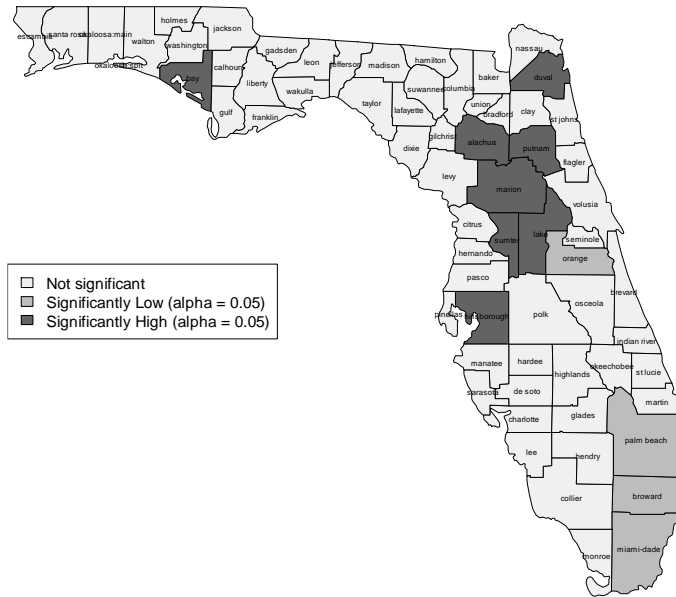
**LOW BIRTH WEIGHT (< 2500 grams) PERCENTAGE ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE <sup>1</sup> SUMMARY  
BY COUNTY 2010 - 2014**

<b>Mother's Resident County</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Total L</b>	<b>Total H</b>
ALACHUA	L					1	
BAKER	H	H		H			3
BAY		H					1
BRADFORD			H	H			2
BREVARD		L		L		2	
BROWARD	L					1	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY							
COLLIER			L		L	2	
COLUMBIA		L				1	
DADE	H						1
DESOTO			L			1	
DIXIE					L	1	
DUVAL			H				1
ESCAMBIA	H	H	H		H		4
FLAGLER							
FRANKLIN							
GADSDEN					H		1
GILCHRIST							
GLADES							
GULF							
HAMILTON							
HARDEE							
HENDRY		H	L		L	2	1
HERNANDO				H			1
HIGHLANDS				L		1	
HILLSBOROUGH		H		H			2
HOLMES							
INDIAN RIVER				L	L	2	
JACKSON							
JEFFERSON							
LAFAYETTE							
LAKE							
LEE				H			1
LEON	L					1	
LEVY			L			1	
LIBERTY							
MADISON				H			1
MANATEE				L	L	2	
MARION		L				1	
MARTIN					L	1	
MONROE			L		L	2	
NASSAU							
OKALOOSA							
OKEECHOBEE	H						1
ORANGE							
OSCEOLA					H		1
PALM BEACH				L	L	2	
PASCO	H				H		2
PINELLAS							
POLK		L				1	
PUTNAM					H		1
SAINT JOHN'S		L	L			2	
SAINT LUCIE		L	H		L	2	1
SANTA ROSA					H		1
SARASOTA			L	L	L	3	
SEMINOLE		H			L	1	1
SUMTER					H		1
SUWANNEE				H			1
TAYLOR							
UNION							
VOLUSIA							
WAKULLA	H						1
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



**Actual County Infant Deaths per 1,000 Live Births Compared to Expected Infant Deaths per 1,000 Live Births: Florida 2014**



**Actual County Low Birth Weight Percentage Compared to Expected Low Birth Weight Percentage: Florida 2014**

