INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2008

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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 2007 and 2008. 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 1,600 birth records in the ninth category (less than 1% of the resident births). The nine categories are as follows:

Mother's Category	**Mother's Race**	**Mother's Marital Status**	**Education**
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 category-specific rates were calculated from the 2007 (the latest year for complete matched birth and infant death data) statewide totals, and these rates were used with the 2008 births in each county to calculate the expected LBW births and infant deaths. The county-expected statistics are adjusted for the three demographic characteristics and used to calculate the adjusted rates. 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 equally well 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 = 0.173; p value of 0.161).

Also included in this report are summary tables for the years 2004 through 2008 that show the Hs and Ls 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.

2008 FLORIDA ACTUAL INFANT DEATH RATES PER 1000 BIRTHS COMPARED TO EXPECTED[1] RATES PER 1000 BIRTHS

Mother's Resident County	2008 Births	2008 Expected[1] Infant Deaths	2008 Actual Infant Deaths	2008 Expected Infant Death Rate Per 1000 Births	2008 Actual Infant Death Rate Per 1000 Births	H=Actual Rate Signif.Higher [2] L=Actual Rate Signif.Lower [2] Than Expected
ALACHUA	2,980	22	17	7.38	5.70	
BAKER	399	3	1	7.52	2.51	
BAY	2,371	16	21	6.75	8.86	
BRADFORD	359	2	4	5.57	11.14	
BREVARD	5,467	35	34	6.40	6.22	
BROWARD	22,233	183	130	8.23	5.85	L
CALHOUN	165	1	3	6.06	18.18	
CHARLOTTE	1,216	7	8	5.76	6.58	
CITRUS	1,118	6	6	5.37	5.37	
CLAY	2,274	14	20	6.16	8.80	
COLLIER	3,737	25	24	6.69	6.42	
COLUMBIA	882	6	11	6.80	12.47	H
DADE	33,639	258	174	7.67	5.17	L
DESOTO	469	3	2	6.40	4.26	
DIXIE	173	1	1	5.78	5.78	
DUVAL	13,449	106	131	7.88	9.74	H
ESCAMBIA	4,195	32	44	7.63	10.49	H
FLAGLER	899	6	5	6.67	5.56	
FRANKLIN	118	1	1	8.47	8.47	
GADSDEN	734	8	10	10.90	13.62	
GILCHRIST	198	1	0	5.05	0.00	
GLADES	87	1	0	11.49	0.00	
GULF	140	1	2	7.14	14.29	
HAMILTON	163	1	4	6.13	24.54	H
HARDEE	511	3	4	5.87	7.83	
HENDRY	696	6	3	8.62	4.31	
HERNANDO	1,584	10	9	6.31	5.68	
HIGHLANDS	1,039	7	4	6.74	3.85	
HILLSBOROUGH	17,401	125	139	7.18	7.99	
HOLMES	210	1	2	4.76	9.52	
INDIAN RIVER	1,373	9	11	6.55	8.01	
JACKSON	593	5	3	8.43	5.06	
JEFFERSON	171	2	0	11.70	0.00	
LAFAYETTE	99	1	1	10.10	10.10	
LAKE	3,353	22	29	6.56	8.65	
LEE	7,111	49	42	6.89	5.91	
LEON	3,192	27	24	8.46	7.52	
LEVY	480	3	6	6.25	12.50	
LIBERTY	98	1	2	10.20	20.41	
MADISON	235	2	4	8.51	17.02	
MANATEE	3,885	26	31	6.69	7.98	
MARION	3,681	25	36	6.79	9.78	H
MARTIN	1,280	9	3	7.03	2.34	L
MONROE	717	4	4	5.58	5.58	
NASSAU	820	5	3	6.10	3.66	
OKALOOSA	2,639	16	23	6.06	8.72	
OKEECHOBEE	532	4	4	7.52	7.52	
ORANGE	16,568	120	150	7.24	9.05	H
OSCEOLA	4,046	25	43	6.18	10.63	H
PALM BEACH	15,246	118	84	7.74	5.51	L
PASCO	5,303	31	32	5.85	6.03	
PINELLAS	9,141	63	85	6.89	9.30	H
POLK	7,904	56	59	7.09	7.46	
PUTNAM	1,009	8	8	7.93	7.93	
SAINT JOHNS	1,778	10	11	5.62	6.19	
SAINT LUCIE	3,363	25	22	7.43	6.54	
SANTA ROSA	1,847	10	9	5.41	4.87	
SARASOTA	3,029	18	14	5.94	4.62	
SEMINOLE	4,643	29	29	6.25	6.25	
SUMTER	521	4	4	7.68	7.68	
SUWANNEE	544	4	9	7.35	16.54	H
TAYLOR	299	2	3	6.69	10.03	
UNION	187	1	2	5.35	10.70	
VOLUSIA	5,257	34	51	6.47	9.70	H
WAKULLA	354	2	4	5.65	11.30	
WALTON	743	4	6	5.38	8.08	
WASHINGTON	288	2	2	6.94	6.94	
TOTAL[4]	231,235	1,667	1,667	7.21	7.21	

[1] *The expected number of infant deaths is calculated based on the maternal race, marital status and education characteristics of the births in each county*

[2] *The significance level used is .05*

[4] *Total excludes 182 births with county unknown*

2008 FLORIDA ACTUAL LOW BIRTH WEIGHT[1] PERCENTAGES COMPARED TO EXPECTED[2] PERCENTAGES

Mother's Resident County	2008 Births	2008 Expected[2] LBW Births	2008 Actual LBW Births	2008 Expected LBW Percent	2008 Actual LBW Percent	H=Actual Rate Signif.Higher[3] L=Actual Rate Signif.Lower[3] Than Expected
ALACHUA	2,980	275	278	9.23%	9.33%	
BAKER	399	33	30	8.27%	7.52%	
BAY	2,371	196	204	8.27%	8.60%	
BRADFORD	359	31	36	8.64%	10.03%	
BREVARD	5,467	453	447	8.29%	8.18%	
BROWARD	22,233	2,131	2,168	9.58%	9.75%	
CALHOUN	165	13	10	7.88%	6.06%	
CHARLOTTE	1,216	96	89	7.89%	7.32%	
CITRUS	1,118	85	81	7.60%	7.25%	
CLAY	2,274	180	177	7.92%	7.78%	
COLLIER	3,737	306	272	8.19%	7.28%	L
COLUMBIA	882	76	76	8.62%	8.62%	
DADE	33,639	3,029	3,031	9.00%	9.01%	
DESOTO	469	40	29	8.53%	6.18%	L
DIXIE	173	14	9	8.09%	5.20%	
DUVAL	13,449	1,284	1,247	9.55%	9.27%	
ESCAMBIA	4,195	393	450	9.37%	10.73%	H
FLAGLER	899	74	65	8.23%	7.23%	
FRANKLIN	118	10	7	8.47%	5.93%	
GADSDEN	734	85	82	11.58%	11.17%	
GILCHRIST	198	15	22	7.58%	11.11%	
GLADES	87	7	11	8.05%	12.64%	
GULF	140	11	19	7.86%	13.57%	H
HAMILTON	163	16	17	9.82%	10.43%	
HARDEE	511	40	37	7.83%	7.24%	
HENDRY	696	61	60	8.76%	8.62%	
HERNANDO	1,584	125	122	7.89%	7.70%	
HIGHLANDS	1,039	90	91	8.66%	8.76%	
HILLSBOROUGH	17,401	1,525	1,613	8.76%	9.27%	H
HOLMES	210	16	13	7.62%	6.19%	
INDIAN RIVER	1,373	115	80	8.38%	5.83%	L
JACKSON	593	54	68	9.11%	11.47%	H
JEFFERSON	171	18	14	10.53%	8.19%	
LAFAYETTE	99	7	7	7.07%	7.07%	
LAKE	3,353	277	272	8.26%	8.11%	
LEE	7,111	594	578	8.35%	8.13%	
LEON	3,192	317	301	9.93%	9.43%	
LEVY	480	40	34	8.33%	7.08%	
LIBERTY	98	8	10	8.16%	10.20%	
MADISON	235	26	25	11.06%	10.64%	
MANATEE	3,885	322	312	8.29%	8.03%	
MARION	3,681	316	297	8.58%	8.07%	
MARTIN	1,280	105	80	8.20%	6.25%	L
MONROE	717	56	52	7.81%	7.25%	
NASSAU	820	63	58	7.68%	7.07%	
OKALOOSA	2,639	208	223	7.88%	8.45%	
OKEECHOBEE	532	43	51	8.08%	9.59%	
ORANGE	16,568	1,492	1,551	9.01%	9.36%	
OSCEOLA	4,046	325	344	8.03%	8.50%	
PALM BEACH	15,246	1,390	1,381	9.12%	9.06%	
PASCO	5,303	407	436	7.67%	8.22%	
PINELLAS	9,141	785	809	8.59%	8.85%	
POLK	7,904	689	641	8.72%	8.11%	L
PUTNAM	1,009	91	95	9.02%	9.42%	
SAINT JOHNS	1,778	137	112	7.71%	6.30%	L
SAINT LUCIE	3,363	304	288	9.04%	8.56%	
SANTA ROSA	1,847	138	142	7.47%	7.69%	
SARASOTA	3,029	241	221	7.96%	7.30%	
SEMINOLE	4,643	380	366	8.18%	7.88%	
SUMTER	521	45	49	8.64%	9.40%	
SUWANNEE	544	45	28	8.27%	5.15%	L
TAYLOR	299	28	33	9.36%	11.04%	
UNION	187	16	17	8.56%	9.09%	
VOLUSIA	5,257	441	460	8.39%	8.75%	
WAKULLA	354	29	28	8.19%	7.91%	
WALTON	743	58	60	7.81%	8.08%	
WASHINGTON	288	24	28	8.33%	9.72%	
TOTAL[4]	231,235	20,344	20,344	8.80%	8.80%	

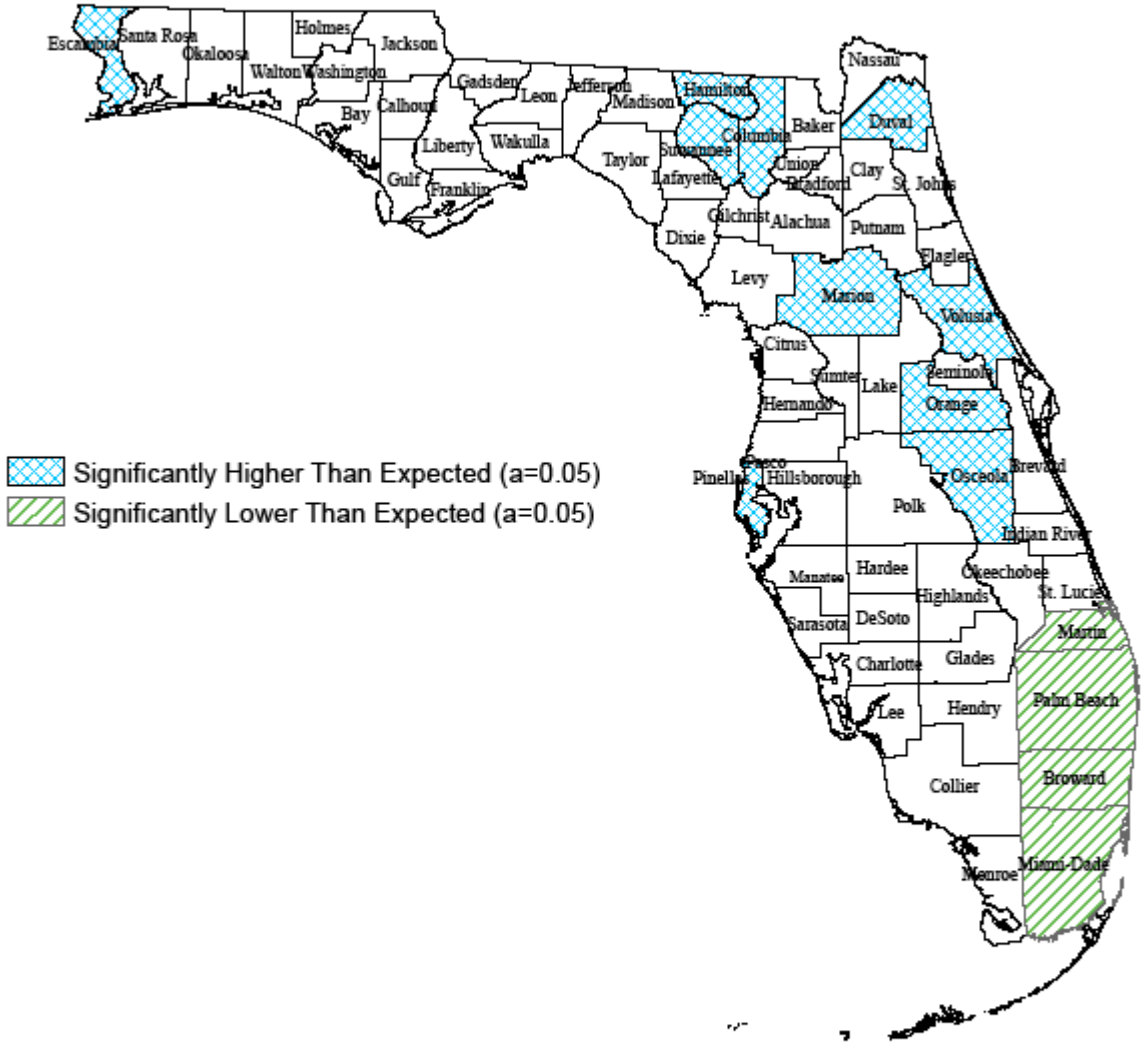
[1] LBW = Low birth Weight, defined as birth weight below 2500 grams.

[2] 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

[3] The significance level used is .05

[4] Total excludes 182 births with county unknown

Florida 2008
Actual County Infant Deaths per 1,000 Live Births
Compared to Expected County Infant Deaths per 1,000 Live Births



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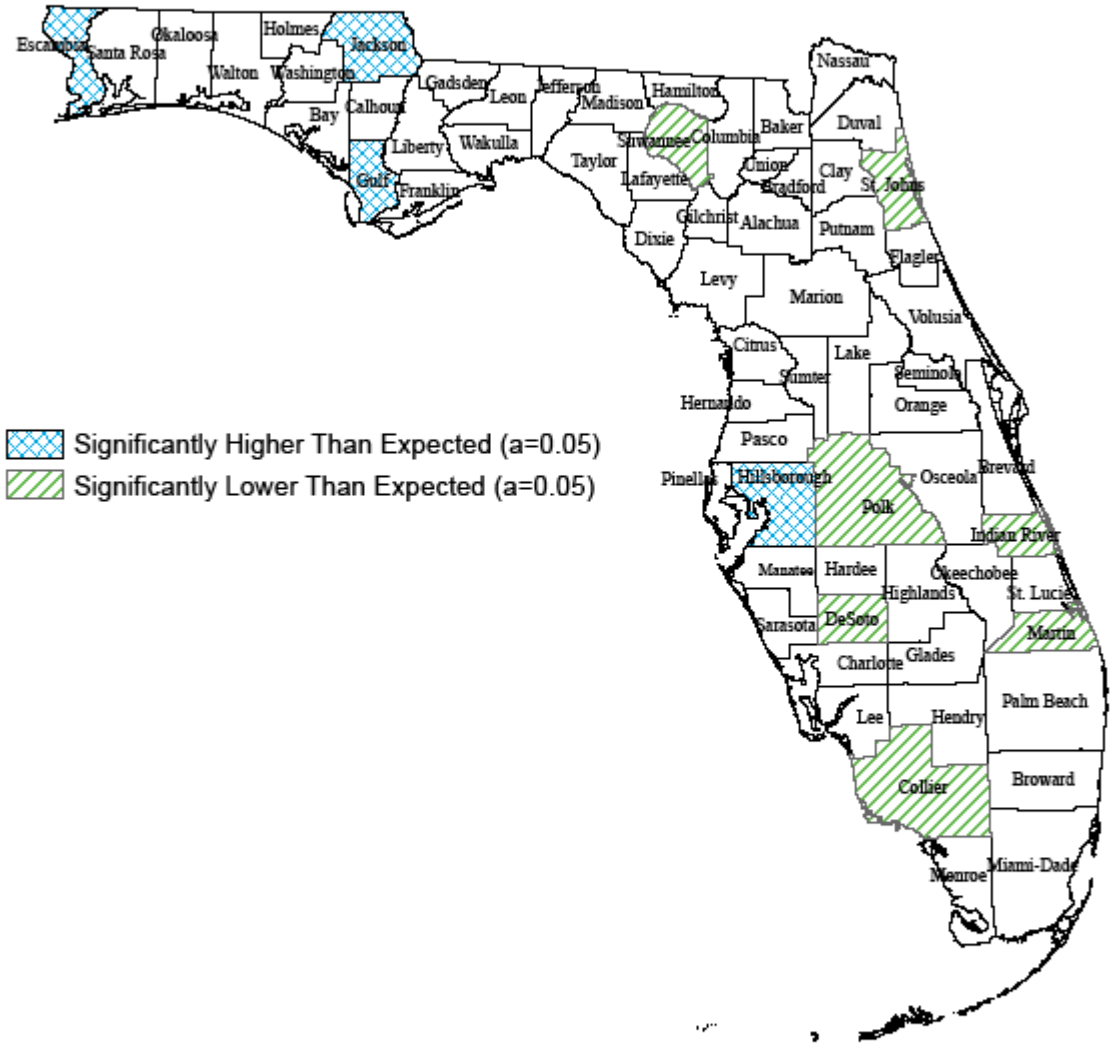
Florida 2008
Actual County Low Birth Weight Percentage
Compared to Expected County Low Birth Weight Percentage



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INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE[1] SUMMARY BY COUNTY 2004 - 2008

Mother's Resident County	2004	2005	2006	2007	2008	Total L	Total H
ALACHUA	H		H				2
BAKER		H	H				2
BAY			H	L		1	1
BRADFORD							
BREVARD							
BROWARD	L	L	L	L	L	5	
CALHOUN							
CHARLOTTE			L			1	
CITRUS		H					1
CLAY							
COLLIER		L				1	
COLUMBIA		H		H	H		3
DADE	L	L	L	L	L	5	
DESOTO				L		1	
DIXIE							
DUVAL	H	H	H		H		4
ESCAMBIA	H				H		2
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES	H						1
GULF							
HAMILTON					H		1
HARDEE							
HENDRY							
HERNANDO							
HIGHLANDS							
HILLSBOROUGH	H	H		H			3
HOLMES			H				1
INDIAN RIVER							
JACKSON		H					1
JEFFERSON							
LAFAYETTE							
LAKE				H			1
LEE							
LEON	H						1
LEVY	H						1
LIBERTY							
MADISON							
MANATEE							
MARION			H		H		2
MARTIN					L	1	
MONROE				L		1	
NASSAU	L					1	
OKALOOSA	L			H		1	1
OKEECHOBEE							
ORANGE			H		H		2
OSCEOLA					H		1
PALM BEACH			L	L	L	3	
PASCO							
PINELLAS		H			H		2
POLK							
PUTNAM		H					1
SAINT JOHNS							
SAINT LUCIE							
SANTA ROSA			H				1
SARASOTA	L			L		2	
SEMINOLE							
SUMTER							
SUWANNEE					H		1
TAYLOR	H						1
UNION				H			1
VOLUSIA					H		1
WAKULLA	H						1
WALTON							
WASHINGTON		H					1

[1] *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[1] SUMMARY BY COUNTY 2004 - 2008

Mother's Resident County	2004	2005	2006	2007	2008	Total L	Total H
ALACHUA							
BAKER							
BAY							
BRADFORD							
BREVARD	H	H	H				3
BROWARD	L		L			2	
CALHOUN		H					1
CHARLOTTE		L				1	
CITRUS							
CLAY				L		1	
COLLIER	L	L	L	L	L	5	
COLUMBIA	L					1	
DADE	L		L			2	
DESOTO				L	L	2	
DIXIE							
DUVAL	H						1
ESCAMBIA	H	H	H	H	H		5
FLAGLER			H				1
FRANKLIN							
GADSDEN							
GILCHRIST				L		1	
GLADES							
GULF					H		1
HAMILTON	H						1
HARDEE							
HENDRY							
HERNANDO							
HIGHLANDS				L		1	
HILLSBOROUGH			H		H		2
HOLMES							
INDIAN RIVER	L		L		L	3	
JACKSON					H		1
JEFFERSON							
LAFAYETTE							
LAKE							
LEE							
LEON							
LEVY	H			L		1	1
LIBERTY							
MADISON		L				1	
MANATEE	L	L	L	L		4	
MARION							
MARTIN					L	1	
MONROE							
NASSAU			H				1
OKALOOSA							
OKEECHOBEE			H				1
ORANGE	H		H				2
OSCEOLA			H				1
PALM BEACH	H			H			2
PASCO	H		H				2
PINELLAS							
POLK			L		L	2	
PUTNAM	H		H				2
SAINT JOHNS	L				L	2	
SAINT LUCIE		L	L			2	
SANTA ROSA							
SARASOTA	L		L			2	
SEMINOLE				L		1	
SUMTER							
SUWANNEE					L	1	
TAYLOR							
UNION							
VOLUSIA			L			1	
WAKULLA							
WALTON		H	H				2
WASHINGTON				L		1	

[1] *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