INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2009

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<u>**Introduction**</u>

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.

<u>**Methods**</u>

The data used in this analysis were extracted from the birth records for residents of Florida born in calendar years 2008 and 2009. 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 1,200 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 2008 (the latest year for complete matched birth and infant death data) statewide totals, and these rates were used with the 2009 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 = 0.201; p value of 0.106).

Also included in this report are summary tables for the years 2005 through 2009 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.

Mother's Resident County	2009 Births	2009 Expected[1] Infant Deaths	2009 Actual Infant Deaths	2009 Expected Infant Death Rate Per 1000 Births	2009 Actual Infant Death Rate Per 1000 Births	H=Actual Rate Signif.Higher[2] L=Actual Rate Signif.Lower[2] Than Expected
ALACHUA	2,925	21	31	7.20	10.60	H
BAKER	378	2	7	5.92	18.52	H
BAY	2,310	15	17	6.46	7.36	
BRADFORD	322	2	4	6.90	12.42	
BREVARD	5,172	32	36	6.21	6.96	
BROWARD	21,394	166	129	7.74	6.03	L
CALHOUN	176	1	0	6.67	0.00	
CHARLOTTE	991	6	4	6.02	4.04	
CITRUS	1,091	6	6	5.79	5.50	
CLAY	2,208	13	9	6.02	4.08	
COLLIER	3,537	22	26	6.22	7.35	
COLUMBIA	860	6	6	6.85	6.98	
DADE	32,341	232	188	7.18	5.81	L
DESOTO	452	3	2	6.69	4.42	
DIXIE	197	1	0	5.96	0.00	
DUVAL	13,176	99	111	7.55	8.42	
ESCAMBIA	4,166	31	41	7.40	9.84	H
FLAGLER	869	5	4	6.15	4.60	
FRANKLIN	128	1	0	6.86	0.00	
GADSDEN	692	7	6	10.03	8.67	
GILCHRIST	188	1	2	5.60	10.64	
GLADES	88	1	0	6.77	0.00	
GULF	138	1	0	6.31	0.00	
HAMILTON	185	2	3	8.15	16.22	
HARDEE	485	3	3	6.19	6.19	
HENDRY	667	5	6	7.14	9.00	
HERNANDO	1,613	10	8	5.99	4.96	
HIGHLANDS	1,011	7	12	6.63	11.87	H
HILLSBOROUGH	16,729	116	159	6.93	9.50	H
HOLMES	225	1	1	5.53	4.44	
INDIAN RIVER	1,278	8	6	6.37	4.69	
JACKSON	548	4	7	7.38	12.77	
JEFFERSON	155	1	3	8.78	19.35	
LAFAYETTE	77	0	0	5.98	0.00	
LAKE	3,121	19	16	6.16	5.13	
LEE	6,596	44	35	6.67	5.31	
LEON	3,122	26	24	8.25	7.69	
LEVY	445	3	1	6.32	2.25	
LIBERTY	86	1	1	5.89	11.63	
MADISON	229	2	1	9.21	4.37	
MANATEE	3,658	23	36	6.42	9.84	H
MARION	3,584	24	24	6.74	6.70	
MARTIN	1,163	7	4	6.38	3.44	
MONROE	707	4	4	5.86	5.66	
NASSAU	778	4	8	5.61	10.28	
OKALOOSA	2,651	15	20	5.82	7.54	
OKEECHOBEE	564	4	2	6.44	3.55	
ORANGE	15,393	106	94	6.92	6.11	
OSCEOLA	3,863	23	24	6.08	6.21	
PALM BEACH	14,177	103	87	7.27	6.14	
PASCO	4,945	28	26	5.65	5.26	
PINELLAS	8,772	58	73	6.60	8.32	H
POLK	7,735	52	62	6.75	8.02	
PUTNAM	971	7	10	7.29	10.30	
SAINT JOHNS	1,791	10	10	5.43	5.58	
SAINT LUCIE	3,142	22	22	7.12	7.00	
SANTA ROSA	1,835	10	7	5.27	3.81	
SARASOTA	2,931	17	17	5.90	5.80	
SEMINOLE	4,470	27	31	6.03	6.94	
SUMTER	483	3	4	6.99	8.28	
SUWANNEE	484	3	3	6.50	6.20	
TAYLOR	285	2	2	7.62	7.02	
UNION	155	1	0	6.50	0.00	
VOLUSIA	5,099	34	27	6.57	5.30	
WAKULLA	317	2	4	6.33	12.62	
WALTON	659	4	6	5.56	9.10	
WASHINGTON	263	2	2	6.65	7.60	
TOTAL[4]	221,246	1,524	1,524	6.89	6.89	

[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 145 births with county unknown

Mother's Resident County	2009 Births	2009 Expected [2] LBW Births	2009 Actual LBW Births	2009 Expected LBW Percent	2009 Actual LBW Percent	H=Actual Rate Signif.Higher [3] L=Actual Rate Signif.Lower [3] Than Expected
ALACHUA	2,925	270	274	9.23%	9.37%	
BAKER	378	30	32	7.93%	8.47%	
BAY	2,310	189	185	8.19%	8.01%	
BRADFORD	322	28	38	8.80%	11.80%	H
BREVARD	5,172	424	398	8.19%	7.70%	
BROWARD	21,394	2,029	2,078	9.48%	9.71%	
CALHOUN	176	14	14	8.14%	7.95%	
CHARLOTTE	991	78	65	7.89%	6.56%	
CITRUS	1,091	84	74	7.66%	6.78%	
CLAY	2,208	177	187	8.02%	8.47%	
COLLIER	3,537	287	254	8.11%	7.18%	L
COLUMBIA	860	75	77	8.70%	8.95%	
DADE	32,341	2,869	2,898	8.87%	8.96%	
DESOTO	452	37	32	8.29%	7.08%	
DIXIE	197	16	8	7.90%	4.06%	L
DUVAL	13,176	1,244	1,290	9.44%	9.79%	
ESCAMBIA	4,166	387	407	9.28%	9.77%	
FLAGLER	869	70	61	8.05%	7.02%	
FRANKLIN	128	10	13	8.09%	10.16%	
GADSDEN	692	78	79	11.31%	11.42%	
GILCHRIST	188	14	11	7.62%	5.85%	
GLADES	88	8	6	8.57%	6.82%	
GULF	138	11	7	8.09%	5.07%	
HAMILTON	185	18	15	9.74%	8.11%	
HARDEE	485	39	33	7.95%	6.80%	
HENDRY	667	55	54	8.32%	8.10%	
HERNANDO	1,613	125	147	7.77%	9.11%	H
HIGHLANDS	1,011	86	82	8.47%	8.11%	
HILLSBOROUGH	16,729	1,459	1,432	8.72%	8.56%	
HOLMES	225	17	15	7.49%	6.67%	
INDIAN RIVER	1,278	107	92	8.35%	7.20%	
JACKSON	548	50	52	9.18%	9.49%	
JEFFERSON	155	16	14	10.36%	9.03%	
LAFAYETTE	77	6	6	8.11%	7.79%	
LAKE	3,121	254	252	8.13%	8.07%	
LEE	6,596	545	514	8.26%	7.79%	
LEON	3,122	307	302	9.83%	9.67%	
LEVY	445	37	33	8.22%	7.42%	
LIBERTY	86	7	9	7.87%	10.47%	
MADISON	229	24	26	10.56%	11.35%	
MANATEE	3,658	305	277	8.33%	7.57%	L
MARION	3,584	307	278	8.57%	7.76%	L
MARTIN	1,163	94	91	8.08%	7.82%	
MONROE	707	55	45	7.84%	6.36%	
NASSAU	778	60	75	7.69%	9.64%	H
OKALOOSA	2,651	211	226	7.95%	8.53%	
OKEECHOBEE	564	45	45	8.02%	7.98%	
ORANGE	15,393	1,365	1,428	8.87%	9.28%	H
OSCEOLA	3,863	308	313	7.98%	8.10%	
PALM BEACH	14,177	1,280	1,324	9.03%	9.34%	
PASCO	4,945	379	416	7.67%	8.41%	H
PINELLAS	8,772	745	706	8.49%	8.05%	
POLK	7,735	666	662	8.62%	8.56%	
PUTNAM	971	87	92	8.98%	9.47%	
SAINT JOHNS	1,791	138	118	7.70%	6.59%	L
SAINT LUCIE	3,142	281	256	8.94%	8.15%	
SANTA ROSA	1,835	137	136	7.48%	7.41%	
SARASOTA	2,931	232	198	7.92%	6.76%	L
SEMINOLE	4,470	363	383	8.13%	8.57%	
SUMTER	483	42	44	8.71%	9.11%	
SUWANNEE	484	40	43	8.36%	8.88%	
TAYLOR	285	25	22	8.93%	7.72%	
UNION	155	13	12	8.43%	7.74%	
VOLUSIA	5,099	428	429	8.39%	8.41%	
WAKULLA	317	26	30	8.14%	9.46%	
WALTON	659	50	50	7.54%	7.59%	
WASHINGTON	263	22	20	8.31%	7.60%	
TOTAL [4]	221,246	19,285	19,285	8.72%	8.72%	

[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 145 births with county unknown

Florida 2009
Actual County Infant Deaths per 1,000 Live Births
Compared to Expected County Infant Deaths per 1,000 Live Births

Significantly Higher Than Expected
Significantly Lower Than Expected
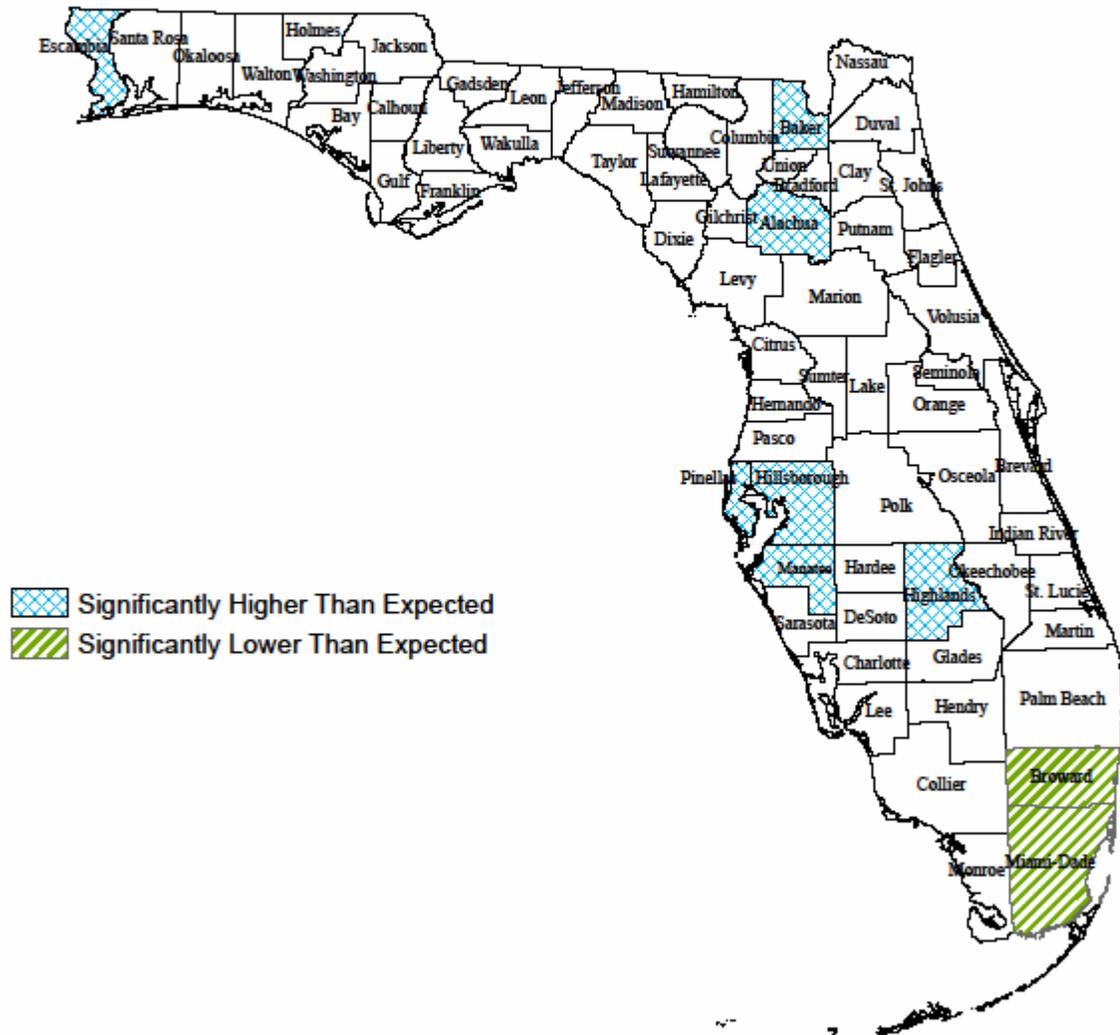
FLDOH/FHS/FCH/Thompson & Clark/Dec 2010

Florida 2009
Actual County Low Birth Weight Percentage
Compared to Expected County Low Birth Weight Percentage

Significantly Higher Than Expected
Significantly Lower Than Expected

FLDOH/FHS/FCH/Thompson & Clark/Dec 2010

Mother's Resident County	2005	2006	2007	2008	2009	Total L	Total H
ALACHUA		H			H		2
BAKER	H	H			H		3
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			3
ESCAMBIA				H	H		2
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF							
HAMILTON				H			1
HARDEE							
HENDRY							
HERNANDO							
HIGHLANDS					H		1
HILLSBOROUGH	H		H		H		3
HOLMES		H					1
INDIAN RIVER							
JACKSON	H						1
JEFFERSON							
LAFAYETTE							
LAKE			H				1
LEE							
LEON							
LEVY							
LIBERTY							
MADISON							
MANATEE					H		1
MARION		H		H			2
MARTIN				L		1	
MONROE			L			1	
NASSAU							
OKALOOSA			H				1
OKEECHOBEE							
ORANGE		H		H			2
OSCEOLA				H			1
PALM BEACH		L	L	L		3	
PASCO							
PINELLAS	H			H	H		3
POLK							
PUTNAM	H						1
SAINT JOHNS							
SAINT LUCIE							
SANTA ROSA		H					1
SARASOTA			L			1	
SEMINOLE							
SUMTER							
SUWANNEE				H			1
TAYLOR							
UNION			H				1
VOLUSIA				H			1
WAKULLA							
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

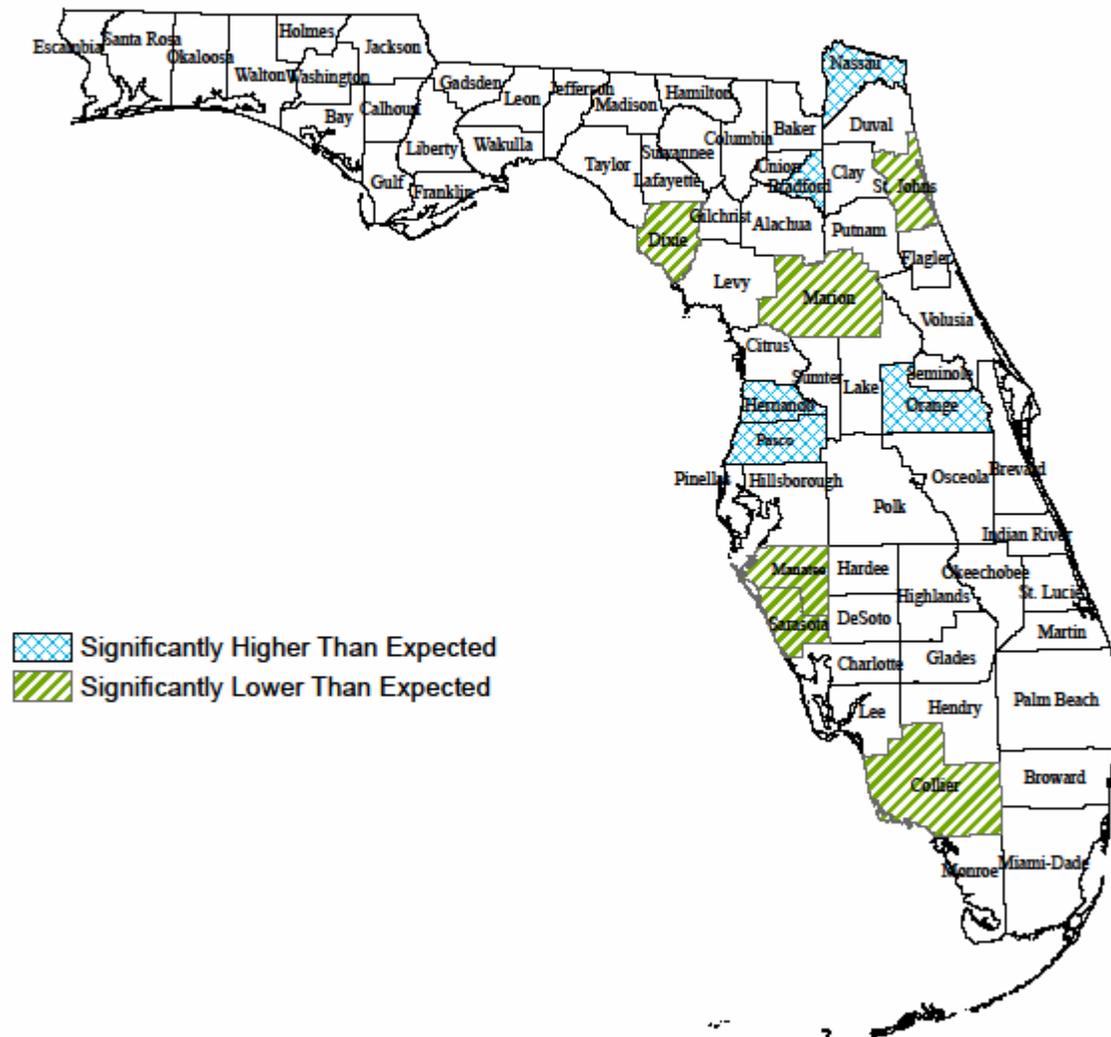| Mother's Resident County	2005	2006	2007	2008	2009	Total L	Total H
ALACHUA							
BAKER							
BAY							
BRADFORD					H		1
BREVARD	H	H					2
BROWARD		L				1	
CALHOUN	H						1
CHARLOTTE	L					1	
CITRUS							
CLAY			L			1	
COLLIER	L	L	L	L	L	5	
COLUMBIA							
DADE		L				1	
DESOTO			L	L		2	
DIXIE					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							
LEVY			L			1	
LIBERTY							
MADISON	L					1	
MANATEE	L	L	L		L	4	
MARION					L	1	
MARTIN				L		1	
MONROE							
NASSAU		H			H		2
OKALOOSA							
OKEECHOBEE		H					1
ORANGE		H			H		2
OSCEOLA		H					1
PALM BEACH			H				1
PASCO		H			H		2
PINELLAS							
POLK		L		L		2	
PUTNAM		H					1
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	

LOW BIRTH WEIGHT (< 2500 grams) PERCENTAGE ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE[1] SUMMARY BY COUNTY 2005 - 2009

[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