



INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2011

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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 2010 and 2011. 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 2,000 birth records in the ninth category (less than 1% of the resident births). The nine categories are as follows:

<u>Mother’s Category</u>	<u>Mother’s Race</u>	<u>Mother’s Marital Status</u>	<u>Mother’s Education</u>
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 2010 (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 2011, to obtain the number of expected infant deaths for each of the nine categories for each county for 2011. 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 2011 birth data instead of 2010 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 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 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.

There is a statistically significant correlation between the actual to expected LBW ratios and the actual to expected infant death ratios. This means that counties with high actual to expected LBW ratios have a tendency to have high actual to expected infant death ratios and vice versa (Kendall's rank correlation coefficient = 0.196; p value of 0.021).

Also included in this report are summary tables for the years 2007 through 2011 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.

**2011 FLORIDA ACTUAL INFANT DEATH RATES PER 1000 BIRTHS
COMPARED TO EXPECTED¹ RATES PER 1000 BIRTHS**

Mother's Resident County	2011 Births³	2011 Expected¹ Infant Deaths	2011 Actual Infant Deaths	2011 Expected Infant Death Rate Per 1000 Births	2011 Actual Infant Death Rate Per 1000 Births	H=Actual Rate Signif.Higher² L=Actual Rate Signif.Lower² Than Expected
ALACHUA	2,960	19	16	6.57	5.41	
BAKER	341	2	5	5.72	14.66	H
BAY	2,156	13	20	5.91	9.28	H
BRADFORD	324	2	1	6.46	3.09	
BREVARD	5,178	31	35	5.90	6.76	
BROWARD	21,075	152	129	7.22	6.12	L
CALHOUN	151	1	0	5.56	0.00	
CHARLOTTE	987	6	5	5.74	5.07	
CITRUS	1,085	6	8	5.46	7.37	
CLAY	2,093	12	10	5.49	4.78	
COLLIER	3,197	18	16	5.74	5.00	
COLUMBIA	770	5	3	6.32	3.90	
DADE	31,349	204	147	6.50	4.69	L
DESOTO	387	2	0	6.46	0.00	
DIXIE	150	1	2	5.64	13.33	
DUVAL	12,402	87	90	7.05	7.26	
ESCAMBIA	3,836	26	29	6.81	7.56	
FLAGLER	787	5	6	5.83	7.62	
FRANKLIN	100	1	0	6.17	0.00	
GADSDEN	595	5	6	9.10	10.08	
GILCHRIST	179	1	0	5.48	0.00	
GLADES	73	0	0	5.88	0.00	
GULF	138	1	1	5.65	7.25	
HAMILTON	155	1	3	7.26	19.35	
HARDEE	390	2	2	5.61	5.13	
HENDRY	615	4	3	6.58	4.88	
HERNANDO	1,552	9	14	5.76	9.02	
HIGHLANDS	920	6	3	6.29	3.26	
HILLSBOROUGH	16,456	105	142	6.37	8.63	H
HOLMES	191	1	2	5.26	10.47	
INDIAN RIVER	1,277	8	16	6.21	12.53	H
JACKSON	464	3	5	6.92	10.78	
JEFFERSON	126	1	1	8.37	7.94	
LAFAYETTE	85	0	1	5.54	11.76	
LAKE	2,944	18	20	5.98	6.79	
LEE	6,270	38	42	6.13	6.70	
LEON	3,053	23	18	7.52	5.90	
LEVY	380	2	0	6.02	0.00	
LIBERTY	89	1	3	6.39	33.71	H
MADISON	214	2	3	8.47	14.02	
MANATEE	3,362	21	31	6.14	9.22	H
MARION	3,353	21	23	6.39	6.86	
MARTIN	1,185	8	5	6.81	4.22	
MONROE	720	4	3	5.55	4.17	
NASSAU	760	4	3	5.07	3.95	
OKALOOSA	2,637	14	14	5.29	5.31	
OKEECHOBEE	532	3	1	5.84	1.88	
ORANGE	15,392	102	119	6.62	7.73	
OSCEOLA	3,775	22	25	5.76	6.62	
PALM BEACH	13,797	91	81	6.56	5.87	
PASCO	4,699	25	29	5.35	6.17	
PINELLAS	8,289	52	55	6.31	6.64	
POLK	7,197	46	48	6.33	6.67	
PUTNAM	840	6	7	6.81	8.33	
SAINT JOHNS	1,811	9	6	5.02	3.31	
SAINT LUCIE	2,995	20	14	6.84	4.67	
SANTA ROSA	1,858	9	11	4.91	5.92	
SARASOTA	2,943	18	10	5.95	3.40	L
SEMINOLE	4,441	26	28	5.79	6.30	
SUMTER	427	3	5	6.46	11.71	
SUWANNEE	484	3	3	6.26	6.20	
TAYLOR	242	2	3	7.08	12.40	
UNION	170	1	1	5.60	5.88	
VOLUSIA	4,654	29	30	6.24	6.45	
WAKULLA	305	2	2	5.88	6.56	
WALTON	630	3	3	5.38	4.76	
WASHINGTON	237	2	1	6.35	4.22	
TOTAL⁴	213,229	1,368	1,368	6.42	6.42	

¹ 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

² The significance level used is .05

³ Total excludes 8 births with county unknown

2011 FLORIDA ACTUAL LOW BIRTH WEIGHT ¹ PERCENTAGES COMPARED TO EXPECTED ² PERCENTAGES						
Mother's Resident County	2011	2011	2011	2011	2011	H=Actual Rate Signif.Higher ³
	Births ⁴	Expected ² LBW Births	Actual LBW Births	Expected LBW Percent	Actual LBW Percent	L=Actual Rate Signif.Lower ³ Than Expected
ALACHUA	2,960	267	257	9.01%	8.68%	
BAKER	341	27	38	8.04%	11.14%	H
BAY	2,156	176	200	8.17%	9.28%	H
BRADFORD	324	28	28	8.64%	8.64%	
BREVARD	5,178	425	370	8.20%	7.15%	L
BROWARD	21,075	1,999	1,962	9.49%	9.31%	
CALHOUN	151	12	12	7.87%	7.95%	
CHARLOTTE	987	78	76	7.92%	7.70%	
CITRUS	1,085	84	74	7.74%	6.82%	
CLAY	2,093	165	168	7.89%	8.03%	
COLLIER	3,197	260	248	8.13%	7.76%	
COLUMBIA	770	66	51	8.61%	6.62%	L
DADE	31,349	2,756	2,723	8.79%	8.69%	
DESOTO	387	33	32	8.63%	8.27%	
DIXIE	150	12	10	7.98%	6.67%	
DUVAL	12,402	1,162	1,120	9.37%	9.03%	
ESCAMBIA	3,836	349	394	9.11%	10.27%	H
FLAGLER	787	64	70	8.12%	8.89%	
FRANKLIN	100	8	7	8.20%	7.00%	
GADSDEN	595	66	62	11.06%	10.42%	
GILCHRIST	179	14	10	7.78%	5.59%	
GLADES	73	6	7	8.11%	9.59%	
GULF	138	11	16	8.03%	11.59%	
HAMILTON	155	14	15	9.30%	9.68%	
HARDEE	390	31	26	8.02%	6.67%	
HENDRY	615	54	70	8.77%	11.38%	H
HERNANDO	1,552	123	136	7.91%	8.76%	
HIGHLANDS	920	79	81	8.60%	8.80%	
HILLSBOROUGH	16,456	1,428	1,544	8.67%	9.38%	H
HOLMES	191	14	16	7.57%	8.38%	
INDIAN RIVER	1,277	109	122	8.54%	9.55%	
JACKSON	464	42	50	9.14%	10.78%	
JEFFERSON	126	13	9	10.05%	7.14%	
LA FAYETTE	85	7	8	7.86%	9.41%	
LAKE	2,944	243	254	8.27%	8.63%	
LEE	6,270	523	497	8.34%	7.93%	
LEON	3,053	297	313	9.74%	10.25%	
LEVY	380	31	35	8.17%	9.21%	
LIBERTY	89	7	7	8.23%	7.87%	
MADISON	214	22	29	10.43%	13.55%	
MANATEE	3,362	283	280	8.42%	8.33%	
MARION	3,353	290	261	8.64%	7.78%	L
MARTIN	1,185	100	93	8.47%	7.85%	
MONROE	720	57	52	7.90%	7.22%	
NASSAU	760	57	55	7.56%	7.24%	
OKALOOSA	2,637	205	207	7.79%	7.85%	
OKEECHOBEE	532	43	42	8.02%	7.89%	
ORANGE	15,392	1,373	1,363	8.92%	8.86%	
OSCEOLA	3,775	303	320	8.02%	8.48%	
PALM BEACH	13,797	1,235	1,251	8.95%	9.07%	
PASCO	4,699	362	377	7.71%	8.02%	
PINELLAS	8,289	701	727	8.46%	8.77%	
POLK	7,197	622	548	8.64%	7.61%	L
PUTNAM	840	76	83	9.02%	9.88%	
SAINT JOHNS	1,811	137	108	7.54%	5.96%	L
SAINT LUCIE	2,995	270	243	9.02%	8.11%	L
SANTA ROSA	1,858	139	141	7.48%	7.59%	
SARASOTA	2,943	237	236	8.06%	8.02%	
SEMINOLE	4,441	363	406	8.17%	9.14%	H
SUMTER	427	36	32	8.51%	7.49%	
SUWANNEE	484	41	45	8.52%	9.30%	
TAYLOR	242	22	22	8.90%	9.09%	
UNION	170	13	11	7.94%	6.47%	
VOLUSIA	4,654	391	404	8.40%	8.68%	
WAKULLA	305	25	22	8.07%	7.21%	
WALTON	630	49	59	7.71%	9.37%	
WASHINGTON	237	20	23	8.59%	9.70%	
TOTAL ⁴	213,229	18,558	18,558	8.70%	8.70%	

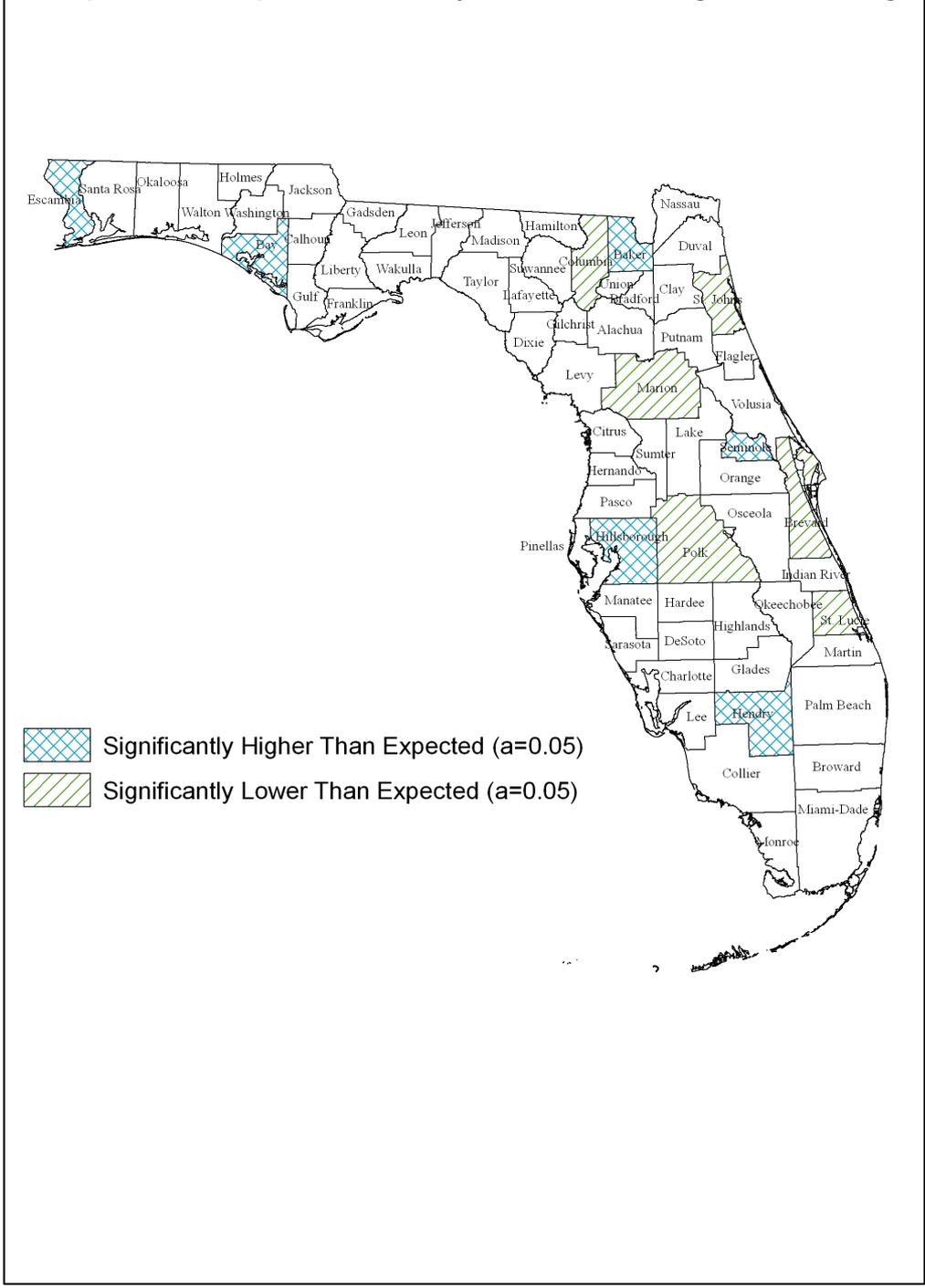
¹ LBW = Low Birth Weight, defined as birth weight below 2500 grams.

² 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

³ The significance level used is .05

⁴ Total excludes 8 births with county unknown

**Florida 2011
Actual County Low Birth Weight Percentage
Compared to Expected County Low Birth Weight Percentage**



**INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE¹ SUMMARY
BY COUNTY 2007 - 2011**

Mother's Resident County	2007	2008	2009	2010	2011	Total L	Total H
ALACHUA			H	H			2
BAKER			H		H		2
BAY	L				H	1	1
BRADFORD							
BREVARD							
BROWARD	L	L	L	L	L	5	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY							
COLLIER							
COLUMBIA	H	H					2
DADE	L	L	L	L	L	5	
DESOTO	L					1	
DIXIE							
DUVAL		H					1
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		H		3
HOLMES							
INDIAN RIVER					H		1
JACKSON							
JEFFERSON							
LAFAYETTE							
LAKE	H						1
LEE				L		1	
LEON							
LEVY							
LIBERTY					H		1
MADISON							
MANATEE			H		H		2
MARION		H		H			2
MARTIN		L		L		2	
MONROE	L					1	
NASSAU							
OKALOOSA	H						1
OKEECHOBEE							
ORANGE		H					1
OSCEOLA		H					1
PALM BEACH	L	L		L		3	
PASCO							
PINELLAS		H	H	H			3
POLK							
PUTNAM							
SAINT JOHNS							
SAINT LUCIE							
SANTA ROSA							
SARASOTA	L				L	2	
SEMINOLE							
SUMTER							
SUWANNEE		H					1
TAYLOR				H			1
UNION	H						1
VOLUSIA		H					1
WAKULLA							
WALTON							
WASHINGTON							

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 SIGNIFICANCE¹ SUMMARY
BY COUNTY 2007 - 2011**

Mother's Resident County	2007	2008	2009	2010	2011	Total L	Total H
ALACHUA				L		1	
BAKER				H			2
BAY					H		1
BRADFORD			H				1
BREVARD					L	1	
BROWARD				L		1	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY	L					1	
COLLIER	L	L	L			3	
COLUMBIA					L	1	
DADE				H			1
DESOTO	L	L				2	
DIXIE			L			1	
DUVAL							
ESCAMBIA	H	H		H	H		4
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST	L					1	
GLADES							
GULF		H					1
HAMILTON							
HARDEE							
HENDRY					H		1
HERNANDO			H				1
HIGHLANDS	L					1	
HILLSBOROUGH		H			H		2
HOLMES							
INDIAN RIVER		L				1	
JACKSON		H					1
JEFFERSON							
LAFAYETTE							
LAKE							
LEE							
LEON				L		1	
LEVY	L					1	
LIBERTY							
MADISON							
MANATEE	L		L			2	
MARION			L		L	2	
MARTIN		L				1	
MONROE							
NASSAU			H				1
OKALOOSA							
OKEECHOBEE				H			1
ORANGE			H				1
OSCEOLA							
PALM BEACH	H						1
PASCO			H	H			2
PINELLAS							
POLK		L			L	2	
PUTNAM							
SAINT JOHNS		L	L		L	3	
SAINT LUCIE					L	1	
SANTA ROSA							
SARASOTA			L			1	
SEMINOLE	L				H	1	1
SUMTER							
SUWANNEE		L				1	
TAYLOR							
UNION							
VOLUSIA							
WAKULLA				H			1
WALTON							
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