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INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2013

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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 2012 and 2013. 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 2,300 (1.1%) birth records in the ninth category. 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 2012 (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 2013, to obtain the number of expected infant deaths for each of the nine categories for each county for 2013. 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 2013 birth data instead of 2012 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 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.

As shown in the tables below, there were nine counties with an H for infant mortality and four counties with an L for infant mortality. On the table for low birth weight, there were seven counties with an H and six counties with an L. On both tables the counties without an H or an L had rates that were not statistically significantly different from the expected rates.

There is a statistically significant correlation between the actual to expected LBW ratios and the actual to expected infant death ratios (Kendall’s rank correlation coefficient = 0.242; p value of 0.005).

Also included in this report are summary tables for the years 2009 through 2013 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.

**2013 FLORIDA ACTUAL INFANT DEATH RATES PER 1000 BIRTHS
COMPARED TO EXPECTED¹ RATES PER 1000 BIRTHS**

Mother's Resident County	2013 Births³	2013 Expected¹ Infant Deaths	2013 Actual Infant Deaths	2013 Expected Infant Death Rate Per 1000 Births	2013 Actual Infant Death Rate Per 1000 Births	H=Actual Rate Signif.Higher² L=Actual Rate Signif.Lower² Than Expected
ALACHUA	2,823	17	28	6.06	9.92	H
BAKER	349	2	5	5.62	14.33	H
BA Y	2,239	15	18	6.79	8.04	
BRADFORD	312	2	6	6.03	19.23	H
BREVARD	5,076	29	35	5.62	6.90	
BROWARD	21,541	145	114	6.74	5.29	L
CALHOUN	137	1	0	5.98	0.00	
CHARLOTTE	1,021	6	1	5.69	0.98	L
CITRUS	1,021	6	8	5.40	7.84	
CLAY	2,088	11	10	5.51	4.79	
COLLIER	3,154	17	19	5.45	6.02	
COLUMBIA	824	5	6	6.14	7.28	
DADE	31,147	192	138	6.16	4.43	L
DESOTO	363	2	1	6.06	2.75	
DIXIE	156	1	0	5.86	0.00	
DUVAL	12,555	84	111	6.70	8.84	H
ESCAMBIA	3,804	25	28	6.55	7.36	
FLAGLER	783	4	2	5.61	2.55	
FRANKLIN	112	1	2	7.26	17.86	
GADSDEN	561	5	9	9.13	16.04	
GILCHRIST	196	1	0	5.32	0.00	
GLADES	65	0	1	6.04	15.38	
GULF	134	1	1	7.07	7.46	
HAMILTON	160	1	1	7.02	6.25	
HARDEE	387	2	1	5.54	2.58	
HENDRY	569	4	4	6.25	7.03	
HERNANDO	1,484	9	8	6.22	5.39	
HIGHLANDS	855	5	3	5.92	3.51	
HILLSBOROUGH	16,614	100	122	6.02	7.34	H
HOLMES	174	1	2	6.26	11.49	
INDIAN RIVER	1,217	7	8	5.79	6.57	
JACKSON	495	3	4	6.60	8.08	
JEFFERSON	135	1	4	7.81	29.63	H
LA FAYETTE	81	0	0	4.97	0.00	
LAKE	3,077	17	23	5.66	7.47	
LEE	6,399	38	38	5.88	5.94	
LEON	3,011	21	16	7.10	5.31	
LEVY	390	2	2	5.88	5.13	
LIBERTY	88	0	1	4.94	11.36	
MADISON	221	2	0	7.77	0.00	
MANATEE	3,375	20	15	5.86	4.44	
MARION	3,338	21	26	6.20	7.79	
MARTIN	1,169	6	8	5.53	6.84	
MONROE	741	4	4	5.74	5.40	
NASSAU	741	4	1	4.96	1.35	
OKALOOSA	2,768	14	21	4.96	7.59	H
OKEECHOBEE	522	3	4	5.75	7.66	
ORANGE	15,829	99	119	6.23	7.52	H
OSCEOLA	3,909	22	20	5.51	5.12	
PALM BEACH	14,198	91	65	6.38	4.58	L
PASCO	4,789	25	37	5.32	7.73	H
PINELLAS	8,576	53	48	6.23	5.60	
POLK	7,253	44	49	6.12	6.76	
PUTNAM	845	5	6	6.43	7.10	
SAINT JOHN'S	1,988	10	14	4.91	7.04	
SAINT LUCIE	2,990	19	13	6.39	4.35	
SANTA ROSA	1,797	8	11	4.64	6.12	
SARASOTA	2,803	15	15	5.35	5.35	
SEMINOLE	4,416	24	24	5.49	5.43	
SUMTER	461	3	2	6.13	4.34	
SUWANNEE	486	3	5	5.81	10.29	
TAYLOR	247	2	0	6.68	0.00	
UNION	183	1	1	5.63	5.46	
VOLUSIA	4,632	28	21	6.04	4.53	
WAKULLA	305	2	3	5.52	9.84	
WALTON	758	4	6	5.03	7.92	
WASHINGTON	246	2	0	6.61	0.00	
TOTAL⁴	215,183	1,318	1,318	6.13	6.13	

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 11 births with county unknown

**2013 FLORIDA ACTUAL LOW BIRTH WEIGHT¹ PERCENTAGES
COMPARED TO EXPECTED² PERCENTAGES**

Mother's Resident County	2013		2013		2013		H=Actual Rate Signif.Higher³ L=Actual Rate Signif.Lower³ Than Expected
	2013 Births⁴	Expected² LBW Births	Actual LBW Births	Expected LBW Percent	Actual LBW Percent	Percent	
ALACHUA	2,823	248	239	8.79%	8.47%		
BAKER	349	28	43	8.00%	12.32%	H	
BAY	2,239	188	188	8.40%	8.40%		
BRADFORD	312	26	40	8.39%	12.82%	H	
BREVARD	5,076	409	374	8.05%	7.37%	L	
BROWARD	21,541	2,000	2,026	9.29%	9.41%		
CALHOUN	137	11	13	8.10%	9.49%		
CHARLOTTE	1,021	80	84	7.80%	8.23%		
CITRUS	1,021	78	80	7.64%	7.84%		
CLAY	2,088	164	152	7.88%	7.28%		
COLLIER	3,154	250	233	7.94%	7.39%		
COLUMBIA	824	70	80	8.51%	9.71%		
DADE	31,147	2,666	2,636	8.56%	8.46%		
DESOTO	363	30	22	8.17%	6.06%		
DIXIE	156	13	10	8.10%	6.41%		
DUVAL	12,555	1,155	1,153	9.20%	9.18%		
ESCAMBIA	3,804	343	364	9.01%	9.57%		
FLAGLER	783	63	55	8.03%	7.02%		
FRANKLIN	112	10	5	8.53%	4.46%		
GADSDEN	561	62	66	11.03%	11.76%		
GILCHRIST	196	15	10	7.64%	5.10%		
GLADES	65	5	4	8.40%	6.15%		
GULF	134	11	7	8.27%	5.22%		
HAMILTON	160	15	14	9.42%	8.75%		
HARDEE	387	30	25	7.79%	6.46%		
HENDRY	569	48	45	8.35%	7.91%		
HERNANDO	1,484	119	148	7.99%	9.97%	H	
HIGHLANDS	855	71	57	8.27%	6.67%	L	
HILLSBOROUGH	16,614	1,410	1,493	8.49%	8.99%	H	
HOLMES	174	13	8	7.71%	4.60%		
INDIAN RIVER	1,217	100	85	8.26%	6.98%	L	
JACKSON	495	44	44	8.94%	8.89%		
JEFFERSON	135	13	19	9.91%	14.07%		
LA FAYETTE	81	6	3	7.53%	3.70%		
LAKE	3,077	248	249	8.06%	8.09%		
LEE	6,399	519	578	8.11%	9.03%	H	
LEON	3,011	285	301	9.47%	10.00%		
LEVY	390	32	32	8.15%	8.21%		
LIBERTY	88	6	6	7.33%	6.82%		
MADISON	221	22	33	10.07%	14.93%	H	
MANATEE	3,375	277	244	8.19%	7.23%	L	
MARION	3,338	285	261	8.53%	7.82%		
MARTIN	1,169	91	93	7.80%	7.96%		
MONROE	741	60	67	8.05%	9.04%		
NASSAU	741	56	52	7.50%	7.02%		
OKALOOSA	2,768	212	218	7.66%	7.88%		
OKEECHOBEE	522	41	44	7.91%	8.43%		
ORANGE	15,829	1,380	1,430	8.72%	9.03%		
OSCEOLA	3,909	310	295	7.93%	7.55%		
PALM BEACH	14,198	1,256	1,162	8.84%	8.18%	L	
PASCO	4,789	366	383	7.64%	8.00%		
PINELLAS	8,576	721	720	8.40%	8.40%		
POLK	7,253	617	634	8.50%	8.74%		
PUTNAM	845	74	85	8.73%	10.06%		
SAINT JOHNS	1,988	149	153	7.51%	7.70%		
SAINT LUCIE	2,990	265	248	8.85%	8.29%		
SANTA ROSA	1,797	131	131	7.30%	7.29%		
SARASOTA	2,803	218	173	7.78%	6.17%	L	
SEMINOLE	4,416	355	349	8.03%	7.90%		
SUMTER	461	39	35	8.36%	7.59%		
SUWANNEE	486	40	51	8.13%	10.49%	H	
TAYLOR	247	22	23	8.81%	9.31%		
UNION	183	15	19	7.98%	10.38%		
VOLUSIA	4,632	385	378	8.31%	8.16%		
WAKULLA	305	24	21	7.89%	6.89%		
WALTON	758	57	61	7.52%	8.05%		
WASHINGTON	246	21	16	8.48%	6.50%		
TOTAL⁴	215,183	18,370	18,370	8.54%	8.54%		

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 11 births with county unknown

**INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE¹ SUMMARY
BY COUNTY 2009 - 2013**

**Mother's
Resident
County**

	2009	2010	2011	2012	2013	Total L	Total H
ALACHUA	H	H			H		3
BAKER	H		H		H		3
BAY			H				1
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		2
ESCAMBIA	H	H					2
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF							
HAMILTON							
HARDEE		H					1
HENDRY		L				1	
HERNANDO							
HIGHLANDS	H			H			2
HILLSBOROUGH	H		H	H	H		4
HOLMES				H			1
INDIAN RIVER			H				1
JACKSON							
JEFFERSON					H		1
LAFAYETTE							
LAKE							
LEE		L				1	
LEON							
LEVY							
LIBERTY			H				1
MADISON							
MANATEE	H		H				2
MARION		H					1
MARTIN		L				1	
MONROE							
NASSAU							
OKALOOSA					H		1
OKEECHOBEE							
ORANGE					H		1
OSCEOLA							
PALM BEACH		L		L	L	3	
PASCO					H		1
PINELLAS	H	H					2
POLK				H			1
PUTNAM							
SAINT JOHNS				L		1	
SAINT LUCIE							
SANTA ROSA							
SARASOTA			L			1	
SEMINOLE							
SUMTER							
SUWANNEE							
TAYLOR		H					1
UNION							
VOLUSIA				L		1	
WAKULLA							
WALTON				H			1
WASHINGTON							

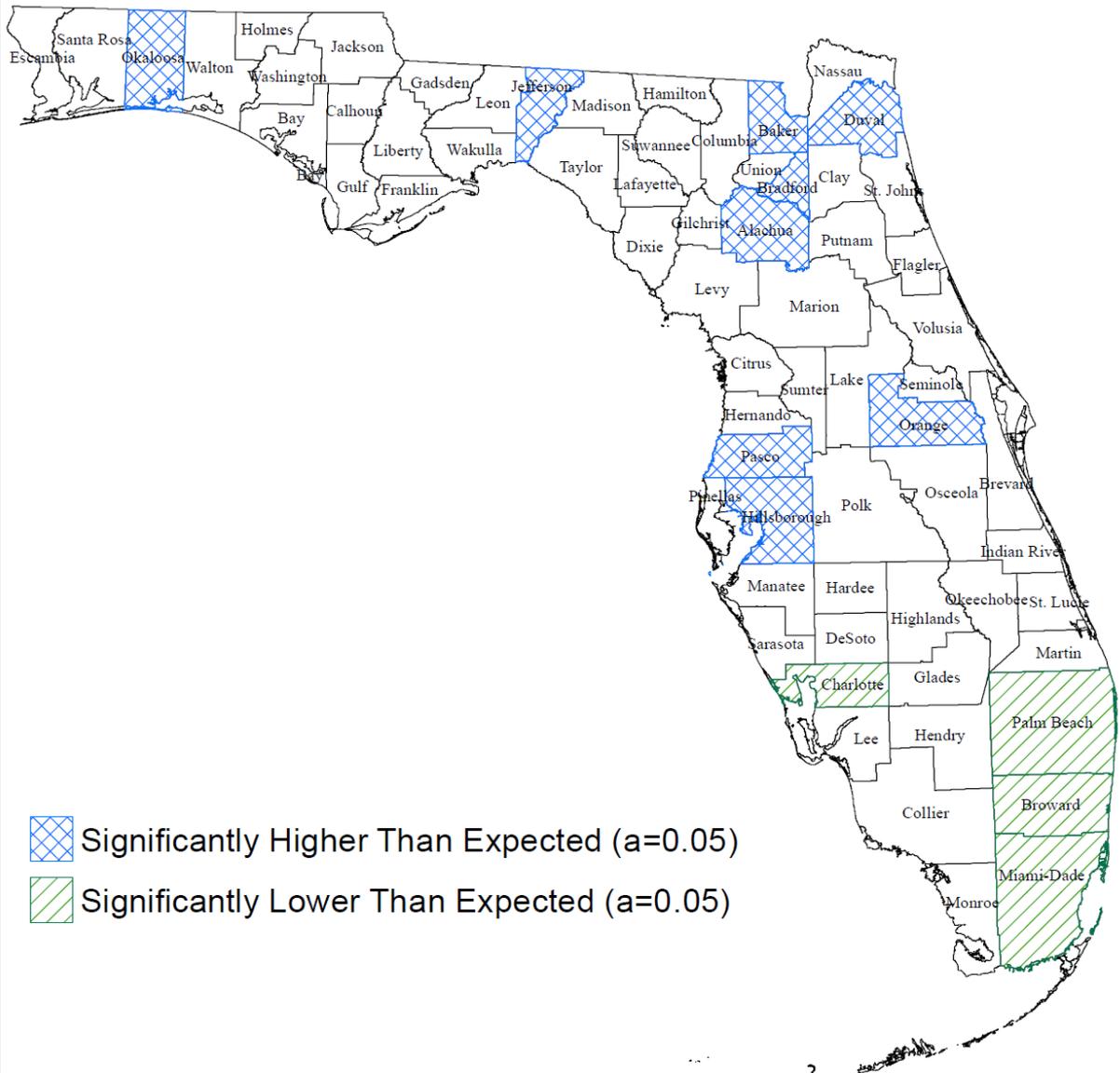
¹ H indicates the actual infant death rate was statistically significantly higher than the expected infant death rate for the county
L indicates the actual infant death rate was statistically significantly lower than the expected infant death rate for the county after adjusting for the race, marital 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 2009 - 2013**

Mother's Resident County	2009	2010	2011	2012	2013	Total L	Total H
ALACHUA		L				1	
BAKER		H			H		3
BAY			H				1
BRADFORD				H	H		3
BREVARD			L		L	2	
BROWARD		L				1	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY							
COLLIER	L			L		2	
COLUMBIA			L			1	
DADE		H					1
DESOTO	L			L		1	
DIXIE						1	
DUVAL				H			1
ESCAMBIA	H	H	H	H			3
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF	H						
HAMILTON							
HARDEE							
HENDRY			H	L		1	1
HERNANDO					H		2
HIGHLANDS					L	1	
HILLSBOROUGH	H		H		H		2
HOLMES							
INDIAN RIVER	L				L	1	
JACKSON	H						
JEFFERSON							
LAFAYETTE							
LAKE							
LEE					H		1
LEON		L				1	
LEVY				L		1	
LIBERTY							
MADISON					H		1
MANATEE					L	2	
MARION			L			2	
MARTIN	L						
MONROE				L		1	
NASSAU							1
OKALOOSA							
OKEECHOBEE		H					1
ORANGE							1
OSCEOLA							
PALM BEACH					L	1	
PASCO		H					2
PINELLAS							
POLK	L		L			1	
PUTNAM							
SAINT JOHNS	L		L	L		3	
SAINT LUCIE			L	H		1	1
SANTA ROSA							
SARASOTA				L	L	3	
SEMINOLE			H				1
SUMTER							
SUWANNEE	L				H		1
TAYLOR							
UNION							
VOLUSIA							
WAKULLA		H					1
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

Actual County Infant Deaths per 1,000 Live Births Compared to Expected County Infant Deaths per 1,000 Live Births: Florida 2013



Actual County Low Birth Weight Percentage
 Compared to Expected County Low Birth Weight Percentage:
 Florida 2013

