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INFANT MORTALITY AND LOW BIRTH WEIGHT ACTUAL RATES COMPARED TO EXPECTED RATES BY COUNTY FOR FLORIDA 2012

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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 2011 and 2012. 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 1,300 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	Mother's 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 nine category-specific IM rates were calculated from the 2011 (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 2012, to obtain the number of expected infant deaths for each of the nine categories for each county for 2012. 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 2012 birth data instead of 2011 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 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 = 0.147; p value of 0.085).

Also included in this report are summary tables for the years 2008 through 2012 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.

2012 FLORIDA ACTUAL INFANT DEATH RATES PER 1000 BIRTHS COMPARED TO EXPECTED[1] RATES PER 1000 BIRTHS

Mother's Resident County	2012 Births[3]	2012 Expected[1] Infant Deaths	2012 Actual Infant Deaths	2012 Expected Infant Death Rate Per 1000 Births	2012 Actual Infant Death Rate Per 1000 Births	H=Actual Rate Signif.Higher [2] L=Actual Rate Signif.Lower [2] Than Expected
ALACHUA	2,879	18	20	6.10	6.95	
BAKER	341	2	3	5.50	8.80	
BAY	2,300	14	17	6.09	7.39	
BRADFORD	317	2	4	5.97	12.62	
BREVARD	4,978	27	33	5.43	6.63	
BROWARD	21,169	144	111	6.79	5.24	L
CALHOUN	148	1	0	5.61	0.00	
CHARLOTTE	1,036	5	3	5.22	2.90	
CITRUS	1,040	5	3	5.02	2.88	
CLAY	2,077	11	11	5.21	5.30	
COLLIER	3,148	17	13	5.39	4.13	
COLUMBIA	773	5	10	5.92	12.94	H
DADE	30,479	184	149	6.05	4.89	L
DESOTO	366	2	1	6.18	2.73	
DIXIE	161	1	2	5.05	12.42	
DUVAL	12,456	85	104	6.79	8.35	H
ESCAMBIA	3,929	25	31	6.38	7.89	
FLAGLER	802	4	6	5.46	7.48	
FRANKLIN	109	1	1	6.17	9.17	
GADSDEN	526	5	5	9.54	9.51	
GILCHRIST	207	1	2	4.89	9.66	
GLADES	69	0	1	6.06	14.49	
GULF	118	1	1	5.23	8.47	
HAMILTON	138	1	1	6.99	7.25	
HARDEE	392	2	2	5.76	5.10	
HENDRY	591	4	3	6.15	5.08	
HERNANDO	1,387	7	9	5.28	6.49	
HIGHLANDS	907	5	11	5.84	12.13	H
HILLSBOROUGH	16,404	98	124	5.98	7.56	H
HOLMES	191	1	4	5.04	20.94	H
INDIAN RIVER	1,247	7	12	5.82	9.62	
JACKSON	501	3	3	6.37	5.99	
JEFFERSON	139	1	1	7.37	7.19	
LAFAYETTE	72	0	0	5.09	0.00	
LAKE	3,052	17	19	5.52	6.23	
LEE	6,401	37	39	5.78	6.09	
LEON	3,007	21	28	7.09	9.31	
LEVY	379	2	2	5.46	5.28	
LIBERTY	66	0	0	5.57	0.00	
MADISON	212	2	2	7.93	9.43	
MANATEE	3,429	19	23	5.66	6.71	
MARION	3,267	19	20	5.89	6.12	
MARTIN	1,126	7	8	6.65	7.10	
MONROE	709	4	1	5.42	1.41	
NASSAU	753	4	6	4.93	7.97	
OKALOOSA	2,600	13	12	4.88	4.62	
OKEECHOBEE	524	3	2	5.72	3.82	
ORANGE	15,729	97	109	6.17	6.93	
OSCEOLA	3,825	20	17	5.23	4.44	
PALM BEACH	13,936	87	63	6.25	4.52	L
PASCO	4,736	23	20	4.94	4.22	
PINELLAS	8,446	51	41	6.01	4.85	
POLK	7,257	44	59	6.01	8.13	H
PUTNAM	819	5	4	6.44	4.88	
SAINT JOHNS	1,896	9	3	4.66	1.58	L
SAINT LUCIE	2,950	19	15	6.58	5.08	
SANTA ROSA	1,859	8	9	4.56	4.84	
SARASOTA	2,912	16	13	5.36	4.46	
SEMINOLE	4,415	24	30	5.34	6.80	
SUMTER	467	3	0	6.09	0.00	
SUWANNEE	445	3	3	5.64	6.74	
TAYLOR	221	1	1	6.17	4.52	
UNION	179	1	2	5.30	11.17	
VOLUSIA	4,706	27	18	5.84	3.82	L
WAKULLA	333	2	0	5.39	0.00	
WALTON	666	3	11	4.92	16.52	H
WASHINGTON	229	1	2	6.16	8.73	
TOTAL[4]	212,948	1,283	1,283	6.02	6.02	

[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 6 births with county unknown*

2012 FLORIDA ACTUAL LOW BIRTH WEIGHT[1] PERCENTAGES COMPARED TO EXPECTED[2] PERCENTAGES

Mother's Resident County	2012 Births[4]	2012 Expected[2] LBW Births	2012 Actual LBW Births	2012 Expected LBW Percent	2012 Actual LBW Percent	H=Actual Rate Signif.Higher[3] L=Actual Rate Signif.Lower[3] Than Expected
ALACHUA	2,879	254	259	8.83%	9.00%	
BAKER	341	28	20	8.15%	5.87%	
BAY	2,300	191	172	8.30%	7.48%	
BRADFORD	317	27	47	8.63%	14.83%	H
BREVARD	4,978	404	396	8.11%	7.96%	
BROWARD	21,169	1,970	1,953	9.31%	9.23%	
CALHOUN	148	12	8	8.01%	5.41%	
CHARLOTTE	1,036	81	93	7.85%	8.98%	
CITRUS	1,040	80	67	7.69%	6.44%	
CLAY	2,077	163	169	7.86%	8.14%	
COLLIER	3,148	253	207	8.03%	6.58%	L
COLUMBIA	773	66	75	8.53%	9.70%	
DADE	30,479	2,642	2,683	8.67%	8.80%	
DESOTO	366	31	21	8.53%	5.74%	L
DIXIE	161	12	16	7.72%	9.94%	
DUVAL	12,456	1,158	1,222	9.30%	9.81%	H
ESCAMBIA	3,929	354	402	9.00%	10.23%	H
FLAGLER	802	65	56	8.06%	6.98%	
FRANKLIN	109	9	13	7.98%	11.93%	
GADSDEN	526	58	56	11.06%	10.65%	
GILCHRIST	207	16	14	7.64%	6.76%	
GLADES	69	6	3	8.37%	4.35%	
GULF	118	9	7	7.81%	5.93%	
HAMILTON	138	13	10	9.47%	7.25%	
HARDEE	392	32	33	8.06%	8.42%	
HENDRY	591	50	38	8.45%	6.43%	L
HERNANDO	1,387	109	109	7.86%	7.86%	
HIGHLANDS	907	76	81	8.40%	8.93%	
HILLSBOROUGH	16,404	1,404	1,441	8.56%	8.78%	
HOLMES	191	15	9	7.71%	4.71%	
INDIAN RIVER	1,247	105	110	8.42%	8.82%	
JACKSON	501	45	45	8.94%	8.98%	
JEFFERSON	139	14	17	9.75%	12.23%	
LAFAYETTE	72	6	7	7.87%	9.72%	
LAKE	3,052	249	274	8.15%	8.98%	
LEE	6,401	527	549	8.24%	8.58%	
LEON	3,007	284	280	9.45%	9.31%	
LEVY	379	31	19	8.13%	5.01%	L
LIBERTY	66	5	2	7.95%	3.03%	
MADISON	212	21	22	10.03%	10.38%	
MANATEE	3,429	282	259	8.23%	7.55%	
MARION	3,267	278	258	8.51%	7.90%	
MARTIN	1,126	93	82	8.22%	7.28%	
MONROE	709	56	44	7.96%	6.21%	L
NASSAU	753	58	54	7.68%	7.17%	
OKALOOSA	2,600	201	197	7.71%	7.58%	
OKEECHOBEE	524	42	44	8.04%	8.40%	
ORANGE	15,729	1,374	1,325	8.74%	8.42%	
OSCEOLA	3,825	304	321	7.96%	8.39%	
PALM BEACH	13,936	1,234	1,229	8.85%	8.82%	
PASCO	4,736	362	389	7.65%	8.21%	
PINELLAS	8,446	710	742	8.40%	8.79%	
POLK	7,257	621	591	8.56%	8.14%	
PUTNAM	819	72	77	8.79%	9.40%	
SAINT JOHNS	1,896	142	124	7.51%	6.54%	L
SAINT LUCIE	2,950	264	300	8.96%	10.17%	H
SANTA ROSA	1,859	138	141	7.40%	7.58%	
SARASOTA	2,912	230	194	7.90%	6.66%	L
SEMINOLE	4,415	356	340	8.06%	7.70%	
SUMTER	467	40	33	8.62%	7.07%	
SUWANNEE	445	37	31	8.25%	6.97%	
TAYLOR	221	19	27	8.72%	12.22%	
UNION	179	14	19	8.04%	10.61%	
VOLUSIA	4,706	393	366	8.35%	7.78%	
WAKULLA	333	26	26	7.87%	7.81%	
WALTON	666	51	53	7.66%	7.96%	
WASHINGTON	229	19	20	8.29%	8.73%	
TOTAL[4]	212,948	18,291	18,291	8.59%	8.59%	

[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 6 births with county unknown*

INFANT DEATH RATES ACTUAL VERSUS EXPECTED STATISTICAL SIGNIFICANCE[1] SUMMARY BY COUNTY 2008 - 2012

Mother's Resident County	*2008*	*2009*	*2010*	*2011*	*2012*	*Total L*	*Total H*
ALACHUA		H	H				2
BAKER		H		H			2
BAY				H			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							
DIXIE							
DUVAL	H				H		2
ESCAMBIA	H	H	H				3
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF							
HAMILTON	H						1
HARDEE			H				1
HENDRY			L			1	
HERNANDO							
HIGHLANDS		H			H		2
HILLSBOROUGH		H		H	H		3
HOLMES					H		1
INDIAN RIVER				H			1
JACKSON							
JEFFERSON							
LAFAYETTE							
LAKE							
LEE			L			1	
LEON							
LEVY							
LIBERTY				H			1
MADISON							
MANATEE		H		H			2
MARION	H		H				2
MARTIN	L		L			2	
MONROE							
NASSAU							
OKALOOSA							
OKEECHOBEE							
ORANGE	H						1
OSCEOLA	H						1
PALM BEACH	L		L		L	3	
PASCO							
PINELLAS	H	H	H				3
POLK					H		1
PUTNAM							
SAINT JOHNS					L	1	
SAINT LUCIE							
SANTA ROSA							
SARASOTA				L		1	
SEMINOLE							
SUMTER							
SUWANNEE	H						1
TAYLOR			H				1
UNION							
VOLUSIA	H				L	1	1
WAKULLA							
WALTON					H		1
WASHINGTON							

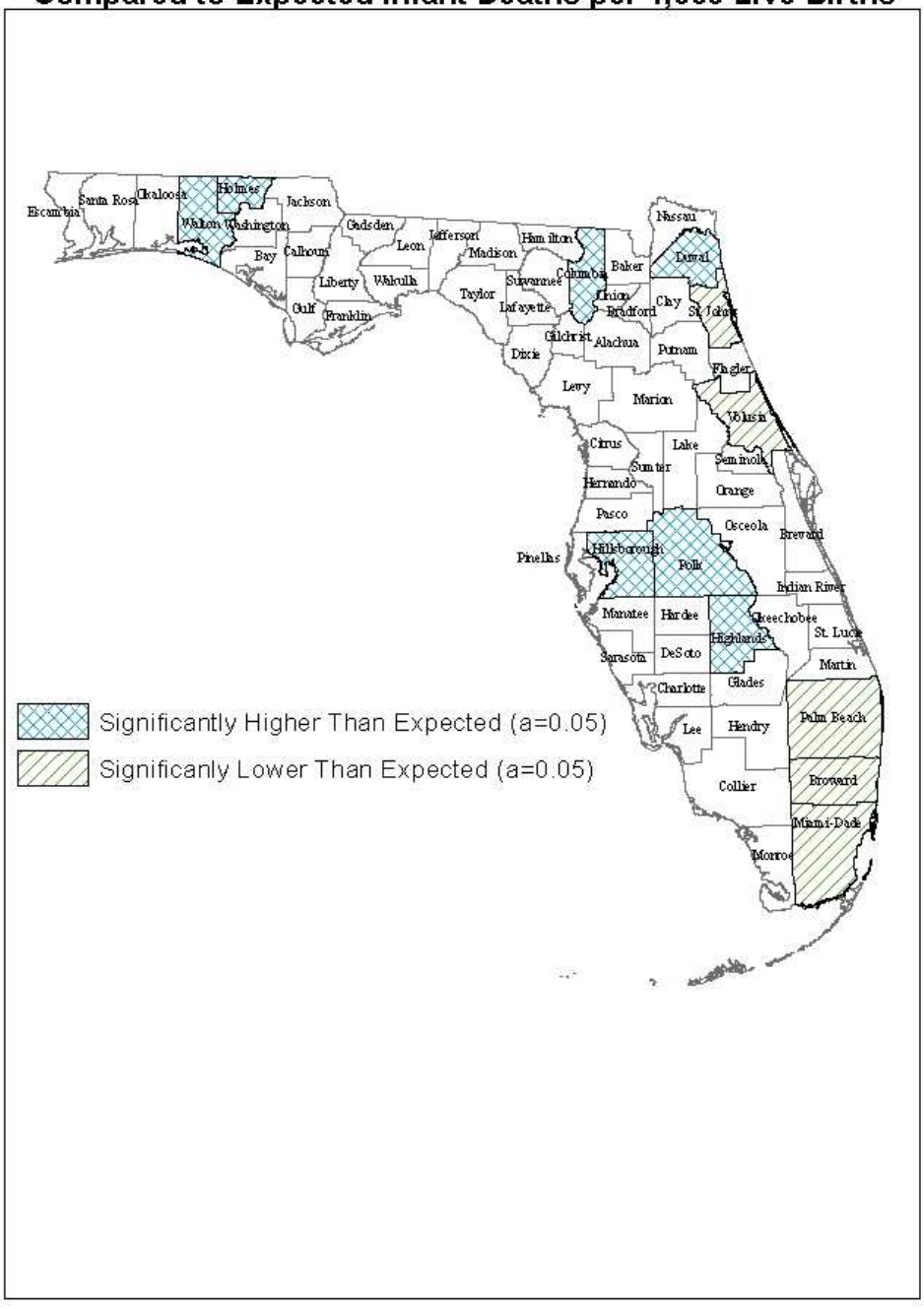
[1] H indicates the actual infant death rate was statistically significantly higher than the expected infant death rate for the county
L indicates the actual infant death rate was statistically significantly lower than the expected infant death rate for the county
after adjusting for the race, marital 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 SIGNIFICANCE[1] SUMMARY BY COUNTY 2008 - 2012

Mother's Resident County	2008	2009	2010	2011	2012	Total L	Total H
ALACHUA			L			1	
BAKER			H	H			2
BAY				H			1
BRADFORD		H			H		2
BREVARD				L		1	
BROWARD			L			1	
CALHOUN							
CHARLOTTE							
CITRUS							
CLAY							
COLLIER	L	L			L	3	
COLUMBIA				L		1	
DADE			H				1
DESOTO	L				L	2	
DIXIE		L				1	
DUVAL					H		1
ESCAMBIA	H		H	H	H		4
FLAGLER							
FRANKLIN							
GADSDEN							
GILCHRIST							
GLADES							
GULF	H						1
HAMILTON							
HARDEE							
HENDRY				H	L	1	1
HERNANDO		H					1
HIGHLANDS							
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				1	
MARION		L		L		2	
MARTIN	L					1	
MONROE					L	1	
NASSAU		H					1
OKALOOSA							
OKEECHOBEE			H				1
ORANGE		H					1
OSCEOLA							
PALM BEACH							
PASCO		H	H				2
PINELLAS							
POLK	L			L		2	
PUTNAM							
SAINT JOHNS	L	L		L	L	4	
SAINT LUCIE				L	H	1	1
SANTA ROSA							
SARASOTA		L			L	2	
SEMINOLE				H			1
SUMTER							
SUWANNEE	L					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

Florida 2012
Actual County Infant Deaths per 1,000 Live Births
Compared to Expected Infant Deaths per 1,000 Live Births



Florida 2012
Actual County Low Birth Weight Percentage
Compared to Expected Low Birth Weight Percentage