FLORIDA DEPARTMENT OF HEALTH

Jeb Bush
Governor

Robert Brooks, M.D.
Secretary

July 17, 2001

Dear Interested Parties:

Much concern has been related to us about statements made by Radiation and Public Health Project, Inc. (RPHP) in a March 28, 2001 announcement. RPHP has implied that there are large increases over time in cancer rates in southeastern Florida counties and they attribute these increases to radiation exposure from the Turkey Point and St. Lucie power plants.

The Florida Department of Health takes these assertions seriously and has reviewed the data used by RPHP regarding cancer rates in southeast Florida. Using this data to reconstruct calculations and graphing the results, we have not been able to identify any unusually high rates of cancers in these counties. Attached is the Bureau of Environmental Epidemiology report addressing the data and the RPHP findings.

Should you need any further clarification, please feel free to contact me at (850) 245-4299.

Sincerely,

David R. Johnson, M.D., M.S.
Bureau Chief of Environmental Epidemiology

Cc: Bill Parizek, DOH Communications

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DIVISION OF
Environmental Health

Tallahassee, FL 32399-1708

Report Concerning Cancer Rates in Southeastern Florida

By

Bureau of Environmental Epidemiology
Division of Environmental Health
Florida Department of Health

This report addresses statements made by the Radiation and Public Health Project, Inc. (RPHP) in a March 28, 2001 announcement regarding cancer rates in southeast Florida. These statements implied that there are large increases over time in cancer rates in Southeastern Florida counties and attributes these increases to radiation exposure from the Turkey Point and St. Lucie power plants. Each power plant has 2 nuclear reactors on site. The first Turkey Point reactor began operation in December 1972. The second Turkey Point reactor started operating in September 1973. The first St. Lucie reactor began operating in December 1976; the second in August 1983.

Members of the Bureau of Environmental Epidemiology, Division of Environmental Health, Florida Department of Health discussed with a representative from RPHP the manner in which RPHP analyzed data as a basis for the statements. From this discussion, members of the Bureau of Environmental Epidemiology reconstructed the RPHP calculations of cancer rates using the data and data sources provided by the RPHP. These sources included Cancer Mortality Statistics as made available through CDC Wonder, the Florida Cancer Data System (FCDS), and the National Cancer Institute (NCI). Data from the Surveillance, Epidemiology, and End Results (SEER) based within the NCI was also used in evaluating incidence rates. The data and calculations were then reviewed and interpreted by epidemiologists in the bureau.

In the following sections, statements made by the RPHP regarding cancer rates are followed by DOH findings and interpretations. Because health statistics data are often expressed as units per thousand population or in the case of cancer, per hundred thousand population, one has to be careful in interpreting trends. Changes in rates look larger in smaller counties due to the lower population figures (in some counties, less than 100,000). In these cases, the rates are greatly influenced by the lower population counts. When the changes in rates are expressed as percentages, these changes will appear to be even more magnified.

RPHP Statement 1: "In 1983-84, the first two years that the St. Lucie 2 reactor operated, infant deaths in St. Lucie rose 35.3%."

Bureau of Environmental Epidemiology Calculations and Interpretations:
Our analysis does not confirm this statement. Figure 1 shows that the infant death rates decreased after the time that the second St. Lucie reactor started operating. The rates fluctuated in the following years and a general declining trend is observable. These fluctuations in rates are often simply a result of very low counts both in the numerator and denominator when rates are being computed. A comparison between the trend plot of St. Lucie and U.S. infant mortality rates which is smoother because of the larger numbers in involved confirms this statement. Overall, this data does not support the alleged relationship between the operation of the second St. Lucie reactor and an increase in infant mortality rates.

RPHP Statement 2: "In 1983-84, when the Turkey Point reactors were mostly closed for repairs, infant deaths in Broward and Dade Counties fell 19.1% compared to only 6.4 in the U.S. The following two years, when Turkey Point returned to full power, the local infant death rose 1.2%".

Bureau of Environmental Epidemiology Calculations and Interpretations:
The two-year average infant mortality rate fell from 13.32 per 1,000 in 1981-82 to 10.78 per 1,000 in 1983-84 (for a decrease of 19%). From 1983-84 to1985-86 it increased to 10.91 per 1,000 (or an increase of 1.2%). But in 1987-89, it decreased by 1.2%. Figure 2 indicates that while the reactors continue to operate, the infant mortality rate has declined in these counties. The decline follows a similarly declining pattern in the state and the country.

RPHP Statement 3: "Since 1950, (white female) breast cancer mortality rose significantly in the counties near Turkey Point and St. Lucie reactors (up 26% near Turkey Point, up 55% near St. Lucie, compared to a 1% US increase)."

Bureau of Environmental Epidemiology Calculations and Interpretations:
To support this statement, the RPHP presented a table of age-adjusted white female breast cancer mortality rates of 10 selected counties, the state of Florida and the U.S. The RPHP table is appended as Table 1. These 10 counties are part of 18 counties that RPHP has stated to be within a range of exposure to emission from two power plants that are located in Turkey Point and St. Lucie. The 10 counties were divided into two groups: the St. Lucie group and the Turkey Point group. We assume that this grouping is in accordance with their proximity to the power plants. The St. Lucie group was composed of the following counties: St. Lucie, Brevard, Indian River, Okeechobee, and Oceola. The Turkey Point group was composed of Dade, Monroe, Broward, Palm Beach and Collier counties.

When accessing the data provided by the RPHP we found that CDC Wonder only provides mortality rates starting from1979. The RPHP representative then informed us that the data for calculating the mortality rate for earlier time periods (1950-1954) was obtained separately from the National Cancer Institute (NCI). We asked RPHP for a copy of their data or a copy of their data request from NCI so we could make a similar request. We did not receive either from RPHP and were told to deal directly with NCI. The data we obtained from NCI was composed of rates in five-year increments (1950-54, 1955-59, etc. until 1990-1994). Although requested, NCI did not provide rates for counties that had less than 6 breast cancer deaths over a five-year period. We therefore did not receive cancer rates for St. Lucie for 1950-54; Okechoobee from 1950-54 to 1960-69; and Collier from 1950-54, to 1960-64. We also requested but did not receive the combined rates of the St. Lucie group and the Turkey Point group.

Using data from NCI, we recalculated the percentage changes in breast cancer mortality rates in those counties in the St. Lucie group and the Turkey Point group for the various five-year time periods. We could not recalculate the RPHP claim of 221% and 263% increases in the breast cancer mortality rate in St. Lucie from 1950-54 to 1980-84 and from1950-54 to 1985-89, respectively, due to inadequate data as described above. We also could not recalculate the RCHP claims of a 55% increase for the St. Lucie group and a 26% increase for the Turkey Point group for the same reason. For counties where we had data, our recalculated percentage results did not significantly differ. However, RPHP assumed that breast cancer mortality rates increased in a linear pattern from 1950 to the present time. To verify this assumption, we plotted the breast cancer mortality rates in each of the 10 counties over time. Figures 3-12 show that the rates in these 10 counties actually fluctuate over time rather than increasing in a linear manner. The fluctuations in smaller counties are wider than those in larger counties suggesting

that these rates are influenced by the size of the underlying denominator. In other words, percent changes become magnified in smaller counties due to the small number of cases and population being analyzed. Since rates for cancer are reported per 100,000, in age groups or counties with smaller populations (less than 100,000) even one case will make a big difference in the rates, magnifying the fluctuations in trend plots. Figures 3 -12 also show that, for most time periods, the rates of each individual county (for the periods which we have data) are consistently lower than U. S. rates. Generally, the rates in the 10 counties appear to fluctuate around Florida rates and increase at about the same pace as the overall Florida state rates.

It is important to note that Table 1 shows that the breast cancer age-adjusted mortality rates in southeastern Florida (as summarized by 18 counties) for the time period 1950-54 to 1985-89 are comparable to the rest of the state of Florida and consistently lower than the U.S. rates.

RPHP Statement 4: "In the 1990s, the cancer mortality rate in young adults age 15-34 in these five southeastern counties has risen, in contrast to a decline in the US. Increases were particularly large for breast cancer, bone and blood cancer each especially sensitive to radioactivity."

Bureau of Environmental Epidemiology Calculations and Interpretations:

Breast Cancer:

Breast cancer mortality rates among all women aged 15-34 were graphed by year in Figure 13. Observation of this graph does not confirm the statement regarding rising breast cancer mortality in this age group. In 1990, the breast cancer mortality rate in the 15-34 age group in these five counties was 2.71 per 100,000. In 1998, it was 2.05 per 100,000. In between these years, the rates fluctuated from 2.39 per 100,000 (1991) to 1.28 per 100,000 (1993). In 1990, the US rate was 1.62 per 100,000 and in 1998, it was 1.36 per 100,000. Between these years, the rates have fluctuated from 1.68 per 100, 000 (1991) to 1.41 per 100,000 (1997).

Bone Cancer

Figure 14 shows an annual fluctuating pattern in the mortality rate for bone cancer in the 15-34 age group in these counties. Observation of this graph does not confirm the statement regarding rising bone cancer mortality in this age group. In 1990, the bone cancer mortality rate in the 15-34 age group in these five counties was 0.16 per 100,000. In 1998, it was 0.40 per 100,000. In between these years, the rates fluctuated from .08 per 100,000 (1991) to 0.64 per 100,000 (1997). In 1990, the US rate was .29 per 100,000. In 1998 it was 0.34 per 100,000. Between these years, the U.S. rates have fluctuated from 0.31 per 100,000 (1993) to 0.36 per 100,000 (1997). Bone cancer deaths in this age group are quite rare and expressing changes as percentages masks the low numbers involved.

Blood Cancers

Blood cancers as defined by the RPHP include all leukemias and lymphomas (ICD-9 codes 200.0 to 208.9). In 1990, blood cancer mortality rate in the 15-34 age group in these five counties was 2.63 per 100,000. In 1998, it was 3.19 per 100,000. Between these years, the rates fluctuated from 2.81 per 100,000 (1994) to 4.38 per 100,000 (1997).). In 1990, the US rate was 2.92 per 100,000. In 1998 it was 2.37 per 100,000. In between these years, the rates have fluctuated from 2.52 per 100,000 (1997) to 2.95 per 100,000 (1992).

Figure 15 shows that starting in 1994, the appearance of a slight upward trend can be noted in the age specific blood cancer mortality rates in the five counties. During the same period, the U.S. rates appear to be declining. Since this is relatively recent, we cannot be certain if this increase will be sustained or if it represents expected fluctuations in rate amplified by the relatively small underlying population. Based on currently available data, epidemiologists in the Bureau of Environmental Epidemiology calculated the age specific mortality rate in 1999 to be 2.83 per 100,000, a decrease in the rate from 1998.

RPHP Statement 5: "From the early 1980s to the late 1990s (actually "early 1990" in the RPHP statement but corrected to "late 1990" by the RPHP representative), cancer incidence in children under 10 rose 35.2% in five southeastern counties (Broward, Dade, Martin, Palm Beach, and St. Lucie), compared to a 10% rise in the US."

Bureau of Environmental Epidemiology Calculations and Interpretations:
Figure 16 shows that from early 1980 (defined by the RPHP representative as 1981 to 1983) to late 1990 (defined as 1996 to 1998) the childhood cancer incidence rates for southeast Florida rose from 15.35 to 20.27 per 100,000 or 32%, when comparing just these two time periods. A simple comparison between the two time periods is misleading due to the apparent annual fluctuations. For the SEER regions, incidence rate for the same two time periods rose 14.6% (from 14.05 to 16.1). Although the incidence rates in these 5 counties in southeast Florida are slightly higher than the SEER rates, they are not higher than the incidence rates for the rest of Florida, rather, they are consistent with childhood cancer incidence for 0-9 year olds in the rest of the state of Florida. This data does not suggest an increased incidence of childhood cancer unique to southeast Florida.

Additionally, based on currently available data, epidemiologists in the Bureau of Environmental Epidemiology calculated the 1999 cancer incidence rate for age 0-9 year-olds for these 5 southeastern counties to be 16.4 cases per 100,000, a rate that is lower than 1998. The most recent available U.S. cancer data is for 1998, which shows that the cancer incidence rate for this age group is 16.6 cases per 100,000.

RPHP Statement 6: "In the same period, from the early 1980s to the late 1990 (actually "early 1990" in the RPHP statement but corrected to "late 1990" by the RPHP representative), an enormous 325.3% increase in childhood cancer took place in St. Lucie County increasing the current rate in this area to more than double the national average."

Bureau of Environmental Epidemiology Calculations and Interpretations:
It appears that the RPHP is basing their statement of an increase by comparing only two points in time, the aggregate rates from 1981-83 to those of 1996-98. However such a comparison is only valid if the relationship of rates and time from 1980 to late 1990 is linear. Figure 17 shows that an assumption of a linear relationship is not tenable. Rather, there are large fluctuations in rates at different points in time. The childhood cancer rates in St. Lucie fluctuate by year with some years showing lower rates than the Florida and national rates, and some years higher. A simple comparison between two points in time is misleading.

As previously indicated, wider fluctuations in rates are observed in smaller counties due to smaller underlying populations. In this case, the population is even smaller than the county population since only children ages 0 to 9 in St. Lucie are being examined.

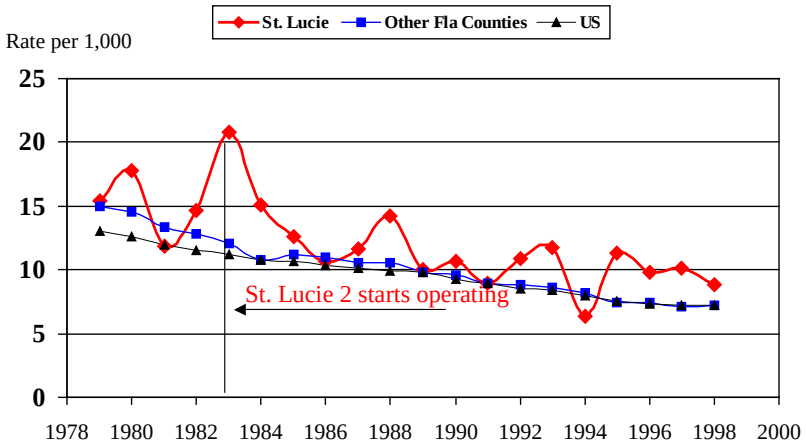
Fluctuations in annual cancer rates, rather than a sustained increase, occur in St. Lucie County after a second reactor was added to the St. Lucie plant in 1983. Consistently higher rates would have been expected if the assumption of increased risk with an additional reactor were true. In this case, no sustained increased rate is observed.

Based on currently available data, epidemiologists in the Bureau of Environmental Epidemiology calculated the 1999 cancer incidence rate for age 0-9 year- olds in St Lucie County to be 4.4 cases per 100,000, showing a marked decreased rate and continuing the pattern of fluctuation of rates from 1998 to 1999.

Summary:
In summary, we reconstructed the calculations made by the RPHP using the same data from which they base their claims. RPHP claims that there are striking increases in cancer rates in southeastern Florida counties and attributes these increases to radiation exposure from nuclear reactors. Using this data to reconstruct calculations and graphing our findings, we have not been able to identify unusually high rates of cancers in these counties. As we would expect, just by chance, some county rates appear higher than state and national trends and some appear lower. These rates fluctuate from year to year and in some situations, large fluctuations occur with a small number of cases and small underlying county populations. One has to use careful scientific and objective evaluation of these fluctuations to avoid misinterpretation. Careful analysis and observation of the data presented here does not support the alarming claims made by the RPHP regarding cancer mortality rates and trends in southeastern Florida counties when compared with the rest of the state of Florida and the nation.

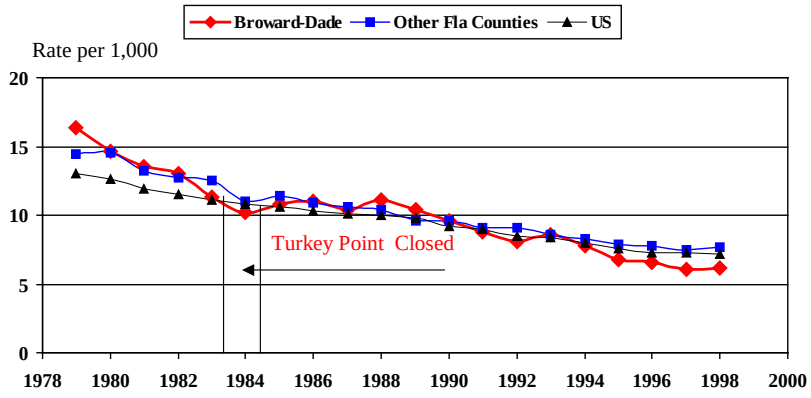
Appendix

Figure 1. Infant Mortality Rates in St. Lucie County, Other Florida Counties and the US, 1979-1998



St.Lucie 1: 12/76; Turkey Point 3: 12/72; Turkey Point 4: 9/73
Source: CDC Wonder Infant Mortality

Figure 2. Infant Mortality Rates in Broward-Dade, Other Florida Counties and the US, 1979-1998



St.Lucie 1: in operation since12/76; St. Lucie 2: since 8/83; Turkey Point 3: since12/72; Turkey Point 4: since 9/73
Source: CDC Wonder Infant Mortality

Table 1. Age Adjusted Breast Cancer Mortality Data Provided to DOH By the Radiation and Public Health Project Inc.

St. Lucie 1 and 2 and Turkey Point 3 & 4

WHITE FEMALE BREAST CANCER MORTALITY RATES 1950-89
COUNTIES WITHIN 50 AND 100 MILES OF
ST. LUCIE AND TURKEY POINT

DEATHS PER 100,000

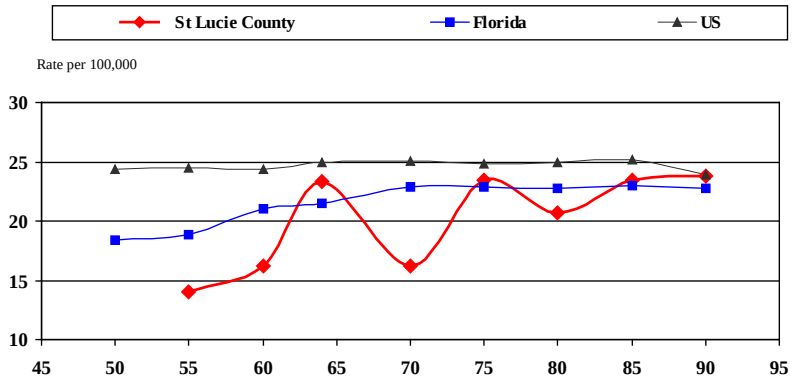
FIPS Code	County	ST	Age-Adjusted Mortality Rates			Percent Change		Number of Deaths		
			1950-54	80-84	85-89	80-84/ 50-54	85-89/ 50-54	50-54	80-84	85-89
ST LUCIE										
12111	ST LUCIE	FL	6.5	20.7	23.5	221%	263%	3	74	112
12009	BREVARD	FL	18.8	24.4	26.9	30%	43%	16	262	361
12061	INDIAN RIVER	FL	17.2	19.3	24.5	12%	42%	6	67	97
12093	OKEECHOBEE	FL	30.1	22.3	13.3	-26%	-56%	2	14	9
12097	OSCEOLA	FL	14.4	27.1	24	89%	67%	10	62	70
TOTAL 5 COUNTIES			**16**	**23.3**	**24.8**	**46%**	**55%****	**37**	**479**	**649**
TURKEY POINT										
12025	DADE	FL	20.1	24	23.3	20%	16%	302	1,447	1,474
12087	MONROE	FL	14.3	21	21.2	47%	49%	7	51	52
12011	BROWARD	FL	15	22.8	24.1	52%	60%	52	1,095	1,293
12099	PALM BEACH	FL	16.6	24	23.9	44%	44%	58	696	913
12021	COLLIER	FL	22.8	23.5	21.5	3%	-6%	3	95	135
TOTAL 4 COUNTIES *(1)*			**18.8**	**23.6**	**23.6**	**26%**	**26%****	**422**	**3,384**	**3,867**
TOTAL 18 COUNTIES			**18.3**	**23.4**	**23.3**	**28%**	**27%****	**531**	**4,395**	**5135**
TOTAL FLORIDA			18.4	22.8	22.8	24%	24%	1,354	9,070	10,783
TOTAL UNITED STATES			24.4	24.9	24.6	2%	1%	91,392	167,803	178,868

**P<001

NOTE: This table was reproduced exactly as provided to the DC

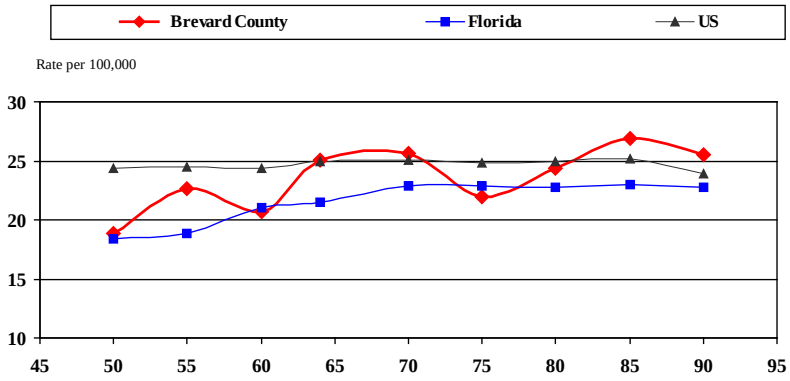
(1) During a conference call, the RPHP representative corrected this as actually including the 5 counties above

Figure 3. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, St. Lucie County, 1950-54 to 1990-94



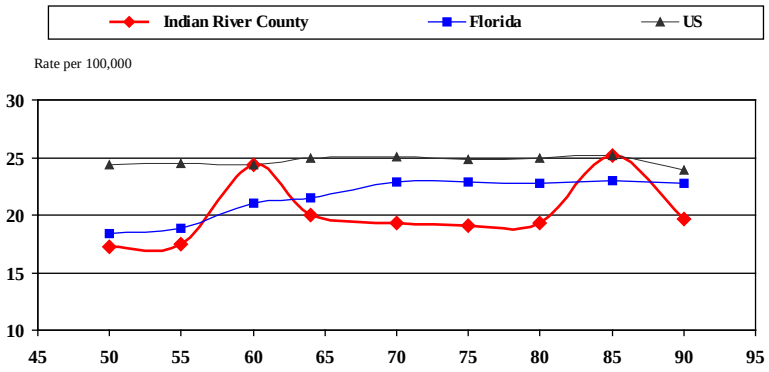
The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

Figure 4. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Brevard County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

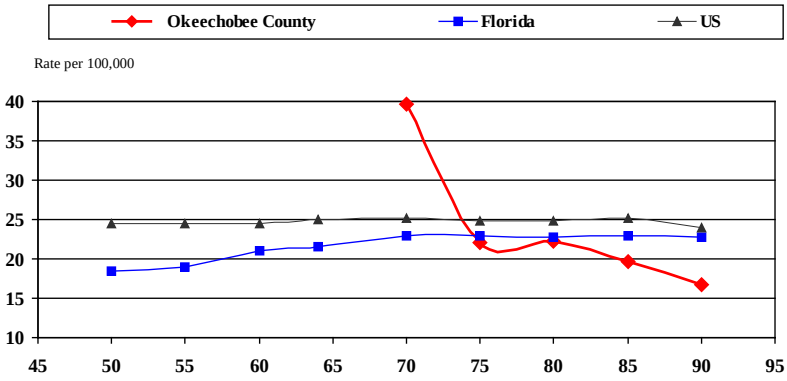
Figure 5. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Indian River County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.

Source: NCI Mortality rates.

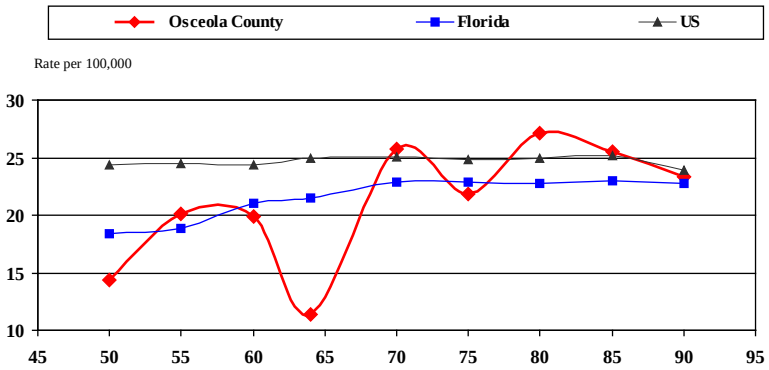
Figure 6. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Okeechobee County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.

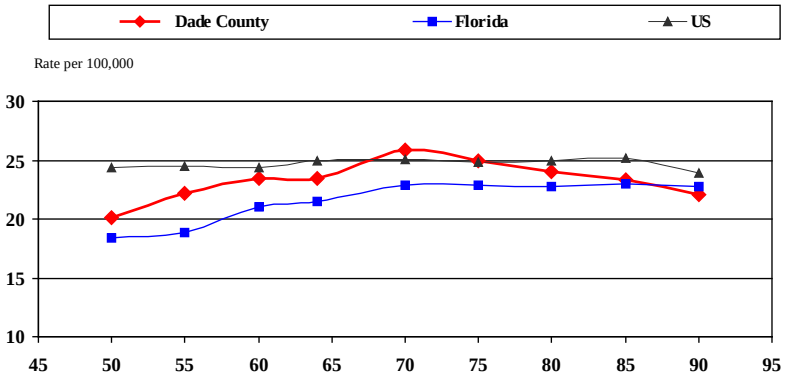
Source: National Cancer Institute

Figure 7. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Osceola County, 1950-54 to 1990-94



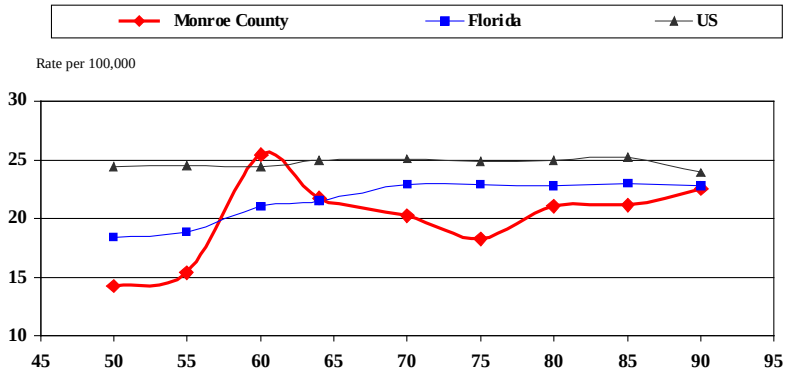
The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

Figure 8. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Dade County, 1950-54 to 1990-94



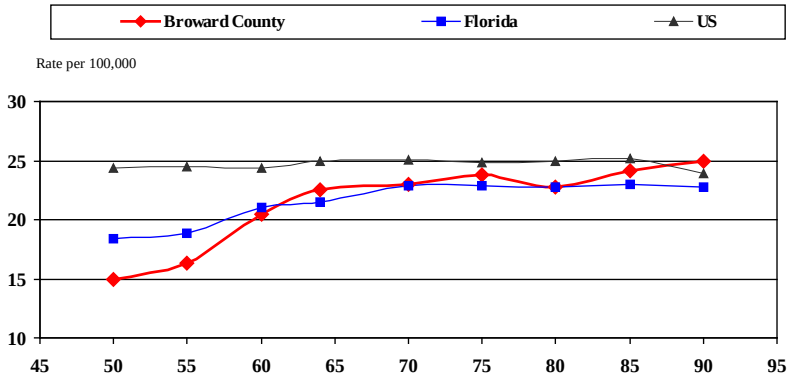
The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

Figure 9. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Monroe County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

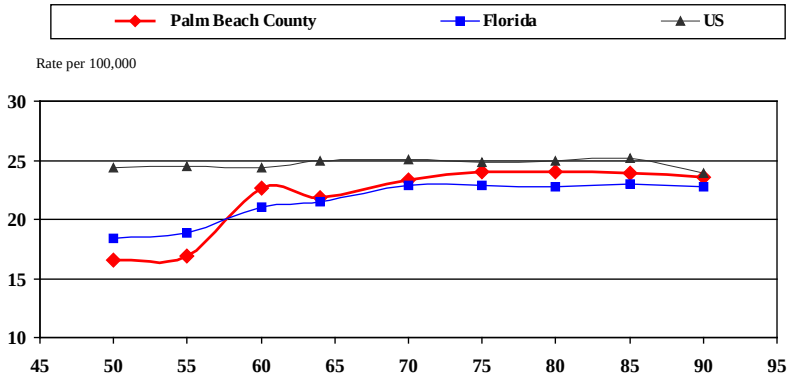
Figure 10. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Broward County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.

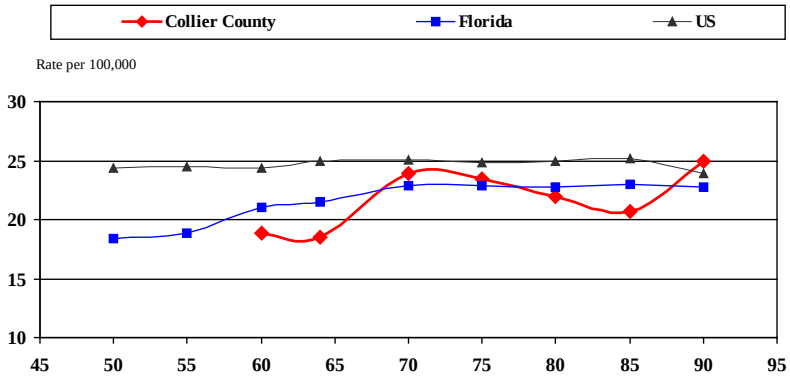
Source: National Cancer Institute

Figure 11. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Palm Beach County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.
Source: National Cancer Institute

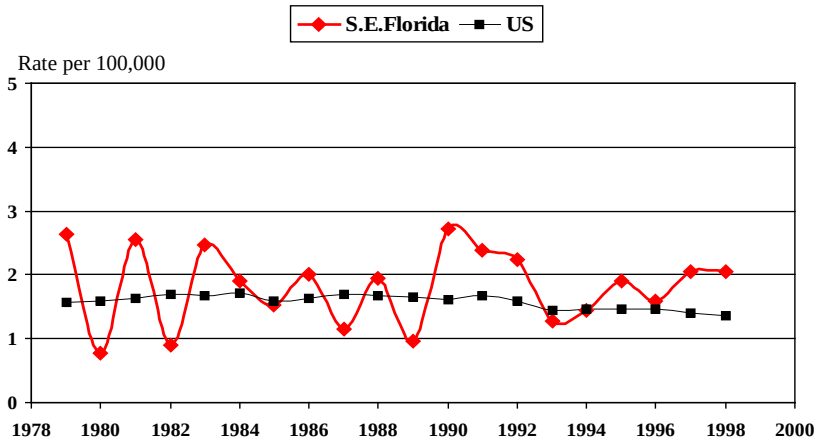
Figure 12. Five-year Age Adjusted Mortality Rates for Breast Cancer in White Women, Collier County, 1950-54 to 1990-94



The numbers on the time axis represent the beginning of the periods. Thus, 50 stands for the period 1950-54, …,90 stands for the period 1990-94.

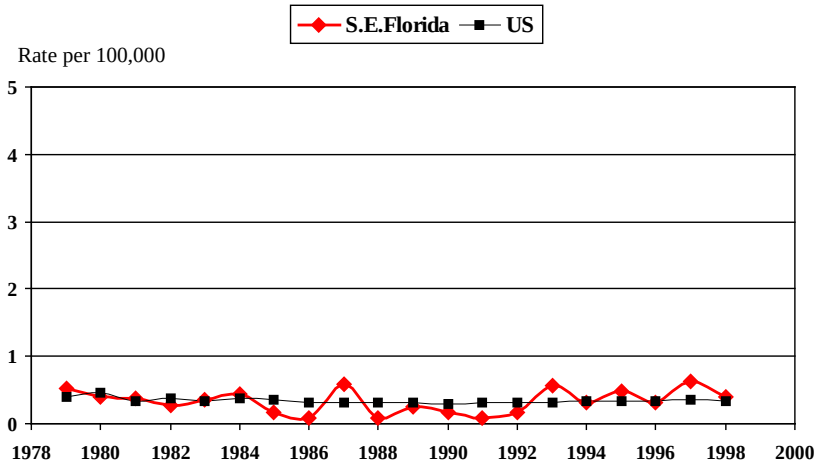
Source: National Cancer Institute

Figure 13. Breast Cancer Age-Specific Mortality Rates in All Women Age 15-34, 1981-1998



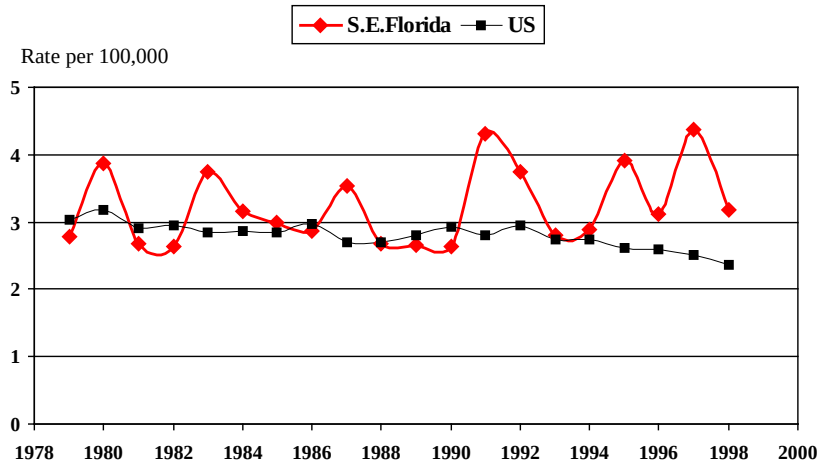
Note:S.E. Florida include: Broward, Dade,Palm Beach, Martin and St. Lucie Counties.
Source: CDC Wonder Mortality rate for US and S.E. Florida.

Figure 14. Bone Cancer Age-Specific Mortality Rates in All People Age 15-34, 1981-1998



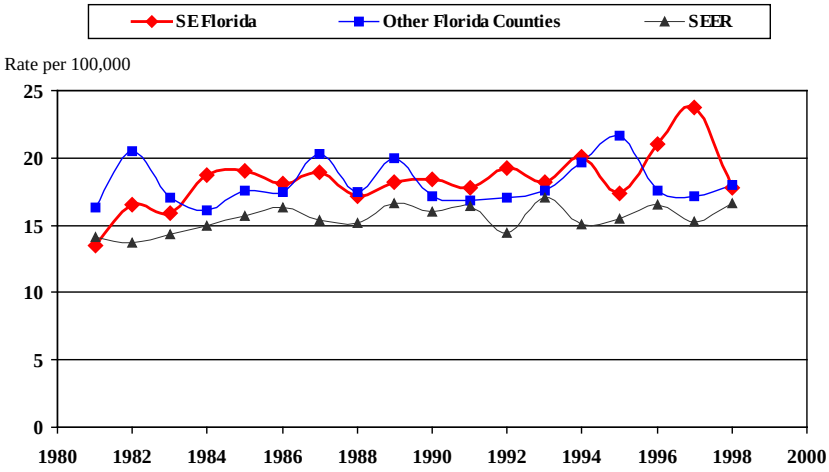
Note:S.E. Florida include: Broward, Dade,Palm Beach, Martin and St. Lucie Counties.
Source: CDC Wonder Mortality rate for US and S.E. Florida.

Figure 15. Blood Cancer Age-Specific Mortality Rates in All People Age 15-34, 1981-1998



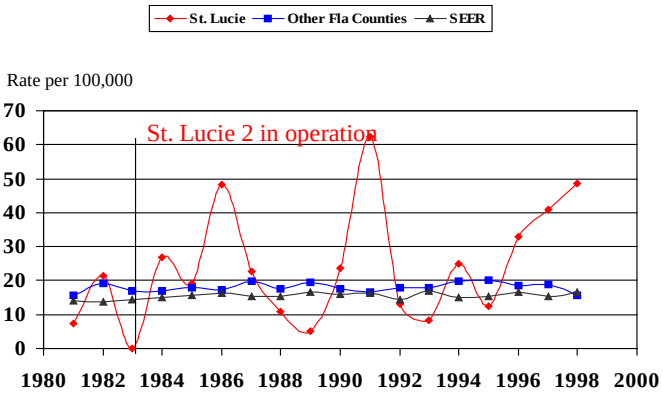
Note:S.E. Florida include: Broward, Dade,Palm Beach, Martin and St. Lucie Counties.
Source: CDC Wonder Mortality rate for US and S.E. Florida.

Figure 16. All Cancers Age-Specific Incidence Rates in Children Age 0-9, 1981-1998



SE Florida includes: Dade, Broward, Palm Beach, Martin and St. Lucie Counties.
Source: FCDS incidence data released to J.Mangano and CDC population estimates.

Figure 17. All Cancers Age-Specific Incidence Rates in Children Age 0-9, 1981-1998



Source: CDC Wonder Mortality rate for US and S.E. Florida.