Tallevast Cancer Review

Manatee County, Florida

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Division of Environmental Health
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Background:

The American Beryllium Company began manufacturing machine parts from beryllium-containing metals in 1962 on a site in Tallevast, Florida in Manatee County. Disposal of solvents primarily used to degrease the machined metal components resulted in groundwater contamination (both onsite and in the neighboring Tallevast community). Contaminants were discovered in 2004 in 13 private drinking water wells near the plant; exposure at up to 80-85 homes (200 to 250 individuals) may have occurred via drinking, showering and through other home and garden water uses. The actual date that contamination began is unknown but may have begun as early as 1962 shortly after the plant began operation at this site. Risk for exposure has changed over the decades: many residents received municipal water in 1984/1985 and in 1986 nearly 50 tons of sediment from an old evaporation pond was removed from the site. Most importantly, in 2004 all residents were provided municipal drinking water thus eliminating drinking water and showering as a source of exposure from this date forward. The plant ceased operation in 1996 when Lockheed Martin acquired the site as part of a national purchase of American Beryllium sites. The community exposures are complicated by the fact that an unknown number of residents were also plant workers and possibly constitute the most highly exposed group.

Contaminants found at the site include a number of solvents and degreasers primarily used in the cleaning of metal components and these include tetrachloroethylene (aka perchloroethylene or PCE), trichloroethylene (TCE), cis and trans 1,2-dichloroethylene (1,2-DCE), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA) and 1,4-dioxane with TCE being found in highest quantities. Past exposure to beryllium for workers and to the community (as airborne dust) has also been noted as a concern.

The FDOH Public Health Assessment on this site has been completed and provides details about the site, the site history, contamination levels and sampling results, the estimated plume and other detailed information (http://www.myfloridaeh.com/community/SUPERFUND/ph.htm). In response to community concerns of increased cancer risk and increased cancer deaths, the FDOH agreed to review cancer data for the community as a first step in assessing community health.

FDOH agreed to provide the Tallevast community with a review of cancer cases in their community during the time period of concern. For this project, FDOH agreed to utilize existing data sets to accomplish the review: the Florida Cancer Data System FCDS (records available for 1981-2006) and Florida Vital Statistics Death data (records available for 1970-2006 electronically). Data sources and references are provided in Appendix A.

FCDS Data Review:

The Florida Cancer Data System (FCDS) was established in 1981 and contains information on cancers diagnosed since 1981 through 2006[1]. Hospitals, freestanding ambulatory centers, radiation therapy facilities, pathology laboratories, physicians' offices and dermatopathologists' offices are required to report incidence data to FCDS. The FCDS is an award winning cancer registry, receiving the highest level of National certification possible which reflects meeting or exceeding national standards for data accuracy, completeness and timeliness of reporting. As with any state cancer registry, it serves as a repository of cancer data as reported for state residents. Over the years, numerous steps have been taken to improve the completeness of the data set, the timeliness of the data and to expand the number of facilities required to report as well as the types of cancer reported. There are exceptions to the broad reporting requirements for cancer in Florida and those exceptions that are relevant to the Tallevast situation are listed below.

a. **Exceptions: Prior to 1991 death certificates were not used as a resource by the FCDS for identifying cancer diagnoses. From 1981 to 1991 cancer cases only identified at the time of death were not included in the registry. In response to this possible gap in data, FDOH searched vital statistics death data records for the period 1981 to 1991 for cancer deaths in Tallevast residents. Additionally to identify cancer deaths in Tallevast residents, FDOH searched death records for the 10 year period (1970-1980) prior to the registry start date.**

b. **Exceptions: In 1995, FCDS began sweeping hospital discharge records to identify potentially missed cases. For the years 1981 through 1994 all cancer diagnoses were required to be reported to the FCDS. The FCDS estimates a small number of cancer cases, less than 5 percent may have been missed.**

c. **Exceptions: Beginning in 1997, radiation therapy and free standing ambulatory/surgery clinics were required to report to FCDS. Prior to this time period, most cancers were seen in hospitals and are most likely in the data base. However a few cases diagnosed and treated only in a free standing clinic may have been missed. FCDS estimates this to be minimal as the use of free standing clinics in the cancer treatment process was minimal prior to 1997.**

d. **Exceptions: Data on non-melanoma skin cancers are generally not reportable to FCDS. This is not a cancer of concern for TCE/beryllium exposure in Tallevast. Reporting of some early stage in situ cancers, such as early stage**

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[1] ***At the time of this report the FCDS had provisionally closed 2006 data. Meaning that all but one data source was accounted for and a few cases could still be added to the final 2006 count.***

cervical cancer, is also not thought to be complete and is therefore excluded.

e. Exceptions: VA hospitals are not required to report to FCDS. FDOH does routinely receive records from military facilities (military bases). Tallevast residents who received health care solely through a VA facility (not through military base care) may not be represented in FCDS records.

Other Facts about the Registry:

FCDS contains data on Florida residents only and thus former Florida residents who move out of state and are then diagnosed with cancer may not present in the registry (some states do reciprocate and provide data on Florida residents receiving care in other states). People diagnosed who still live in Florida do get reported,

Persons with multiple primary cancer diagnoses contribute multiple records to the data base. Meaning that there is an individual record for each instance of primary cancer diagnoses and one individual could contribute more than one record.

All records contain the date of initial diagnosis for that primary cancer.

All records contain the address at the time of initial diagnosis as well as the current or last known address of the case. Residence history (time lived in a community or at a residence) is not found in the FCDS records nor other vital statistics records.

Records are unduplicated (only one record for each individual primary cancer regardless of the number of sources that report the case).

Determination of Area of Concern, Data Extraction Area and Definition of Tallevast Resident:

For the FDOH review of cancer data for the Tallevast area a determination of geographical area of concern was made based on the extent of the contamination, referred to as the plume area (see Map 1 and 2). The registry was searched by zip code of cancer case, thus residents who move out and are then diagnosed will be missed and not counted as a Tallevast cancer case. Residents who resided elsewhere but moved to Tallevast and were then diagnosed will be counted as a Tallevast case even though their exposures were most likely related to some other geographic area and time frame. This limitation is also referred to as an inability to account for in- and out-migration. This is a common limitation of registries and data bases maintained at the state or national level.

In order to geographically place cases in relation to the plume, addresses and zip codes are critical pieces of information. Zip codes have changed in the Tallevast area over the last 40 or more years. In general, zip codes have changed in most areas

around Florida over this long time span. FDOH has determined that zip codes for the Tallevast area are as follows:

> **34270 (Post office box for Tallevast but serves other areas and individuals as well)**
>
> **33588 (Tallevast specific zip code prior to 1987)**
>
> **34243 (The geographic area that is primarily around, but not including, Tallevast. Some residents may use this zip code particularly when a physical address is needed for delivery; however residents say this zip code is rarely or never used. Nevertheless a few cases of cancer with this zip code as their current address were geocoded to Tallevast using a commercial software package. This means that the nationally accepted software program used by FDOH assigned that particular address with the 34243 zip code as being within the Tallevast plume area).**
>
> **33580 (Geographic area that is primarily around but not including Tallevast prior to 1985)**

FDOH consulted with the regional post office serving Tallevast, with the state level postal office, and obtained records from the Florida State Library and Archives related to zip code changes in the general Tallevast area. As an exhaustive search and based on information provided by the US Postal Service, zip codes initially examined were 33588 and 34270. Surrounding area zip codes (33508, 34203, 33580, 34243 and 34234) were also searched in order to locate any records slightly miscoded. The zip codes 34270, 33588, 33580, and 34243 contained records of potential Tallevast residents. In addition, data was searched by 2000 census tract, as determined by the geocoded street address. The census tracts searched were 8.05 and 9.02 which contained the plume area. Again, this was done in order to locate any miscoded records.

The following criteria were used to categorize a record, regardless of race, as a Tallevast resident:

> **The street address was geocoded to the plume area defined using 2000 census geography (tract 8.05 block 1038 or 1039; or tract 9.02 block 4000, 4021, 4022, or 4023)**
>
> **The zip code was 34270 or 33588**
>
> **The city name was Tallevast or a potential misspelling (e.g Talevast)**

It is important to note that a number of non-black individuals were categorized as Tallevast residents because their zip code was listed as 34270 (Table 1). Since this zip code is a post office, as noted above, it is impossible to separate true Tallevast residents from those individuals using the post office but not residing in the area.

The majority of cancer cases found had a PO Box listed as their address. A few cases had the zip code 34270 or 33588 listed. Both the PO Boxes and the aforementioned zip codes mapped to a specific post office and most did not map to individual residential homes. In other words, without an actual street address, there is not a physical place of residence in the records to map the cancer case to and geocoding software cannot place a PO Box address on a map. In order to map cancer cases, a study protocol would need to reconstruct the residence patterns noting specific individuals and actual homes.

FCDS Search and Data Issues:

FCDS was searched for cancer cases related to the Tallevast area (using zip code and city name) for the period 1981 through 2006 (corresponding to the date of FCDS inception through the last year that complete data are available). FDOH is able to provide information on the number and types of cases found in the registry search. Interpretation of the number of cases is a more difficult undertaking. The small number of residents and the 40 or more years under review makes assessment of cancer excess statistically complex and the results unstable. In the time period since the 1960's, the ability to diagnose various cancers has changed dramatically, the treatment of cancers and their survival rates have changed, the manner and place of treatment and diagnosis have changed (less hospital based now), and risk factors and behaviors related to cancer incidence have changed over time (diets, smoking rates have changed, etc). All of these factors make assessments of cancer rates over time more complex and make assessments of an increase or decrease in the number of cases of cancer in a community more complex.

Residents whose cancers were diagnosed after leaving the Tallevast area, who were diagnosed and treated solely at VA facilities, or who did not receive a confirmed diagnosis and treatment for their cancers would not be present in the data base. This report does not attempt to estimate the number or types of cancers not present in the FCDS data due to these reasons.

The community has asked the question 'are there more cancers in Tallevast than there should be?' This type of question is commonly and understandably asked in the situation where a community has been exposed to contaminants over time. Researchers typically attempt to examine this question by estimating the number of cancers that would have occurred in that community if they had experienced the same rates of cancers that a similar but unexposed population had. This involves choosing the unexposed population most similar to the community and also considering that this unexposed population must have published rates for the time period under review. Researchers call this step choosing a reference population.

Alternatively, data from a 'reference population' can be derived by doing a similar study in a second community that is very similar to the community under study (but without the exposure or contamination present) and thus using the health outcomes values from the second site as the reference. This second site option is rarely done in practice, primarily due to the greater costs and time involved.

Regardless of the method in choosing the population, from this reference population certain calculations are made and a number called the expected number of cancers is produced. This represents the estimated number of cancers that would have been expected to occur in the community had they experienced cancer rates similar to the unexposed community (the reference population). The expected number of cases is then statistically compared to the observed number of cases seen in the community and some assessments are made as to whether the number of cancer cases seen in the community is greater or less than expected. There are many assumptions that go into an estimate of the number of 'expected' versus the number of 'seen or observed' cases in a population. The small number of people in Tallevast and the large number of years being examined will make this 'expected' number a much less accurate number. The choice of a reference population is critical and efforts should be made to use a population that is similar to the study population in demographic characteristics, is not exposed to the contaminant in question, and wherein the diagnoses, treatment and case ascertainment are similar to the study population. In practice an identical study population is not usually available and researchers often use values available for the relevant state or county as reference.

This type of assessment can never be used to link an exposure to a health outcome such as cancer; in other words, causality cannot be established. Studies or reviews such as the one done by FDOH are not able to show a link between specific cancers and specific contaminants such as TCE.

Other General Cancer Facts in Florida:

Any assessment of cancer concerns in a community, especially where the concern is related to contamination issues, involves heightened citizen concern and awareness of adverse health outcomes. In this type of situation, it is important to understand that cancer is not considered a rare disease when viewed over an individual's lifetime. The American Cancer Society estimates that one in three individuals will be diagnosed with cancer in their life time. In 2003, there were over 90,000 new cases of cancer reported in the state, roughly 1,800 reported in Manatee County.

The four most common types of cancer in the United States are lung and bronchus, prostate, breast and colorectal cancers. In Florida, the four most common types of cancer are also lung and bronchus, prostate, breast and colorectal. In general, whites have a higher incidence of most types of cancers than blacks; however, black males have a higher incidence of prostate cancer than white males and until recently black males had a higher incidence of lung cancer than white males as well. Cancer rates, age at diagnosis, stage of cancer at diagnosis, survival rates and types of

cancer vary by age, by gender and by race and all these components have changed over the last decades with changes in medical practices and treatments. Cancer mortality rates can also vary by cancer type, age at diagnosis, stage at diagnosis, race, gender, and by other factors that have changed over time. Over 60% of cancers are diagnosed in people age 65 or older, this age group is approximately 18% of Florida's population. These percentages clearly show that cancer is mostly a disease of increasing age.

Most cancer cases are not able to be linked to an environmental contaminant; the contaminant most linked to cancer is cigarette smoking, which affects cancer rates of many different anatomic sites.

Tallevast Cancers of Concern:

The report focuses on trichloroethylene (TCE) because its concentrations and theoretical increased cancer risk were higher than any other contaminant. Tallevast residents who for 42 years drank and showered with Tallevast ground water with the highest TCE concentration--6,000 micrograms per liter (ug/L)--are at a "moderate" to " very high" (60 to 20,000 in 100,000) increased theoretical risk of liver cancer, kidney cancer, leukemia, and lymphoma.

The concentrations of 1,4-dioxane were lower--1,200 ug/L--as was the increased theoretical cancer risk (100 in 100,000). Oral exposure to 1,4-dioxane increases the incidence of nasal cavity squamous cell carcinomas, liver adenomas, and hepatocellular carcinomas in rats. 1,4-dioxane also increases the incidence of gall bladder carcinomas and liver hepatomas in guinea pigs. Human studies are inadequate to estimate the cancer risk.

The highest concentrations of other chemicals found in Tallevast wells were less than that of TCE: tetrachloroethylene 2,000 ug/L; 1,1-dichloroethene 1,800 ug/L; 1,1-dichloroethane 1,200 ug/L; cis-1,2-dichloroethene 350 ug/L; and trans-1,2-dichloroethene 10 ug/L. Too little is known about the toxicity of these chemicals to estimate the cancer risk.

TCE is most strongly linked to liver cancers based on toxicology data and occupational studies. Less strongly linked have been kidney cancers, non-Hodgkin's lymphoma, and leukemia in children. Very weak links have been suggested for TCE and prostate and cervical cancer, the evidence for these is not strong. FDOH looked at lung cancers because of earlier concerns in the community regarding beryllium dust exposure. Many of the other contaminants have limited information on carcinogenicity at the level found or are most strongly linked to cancers similar to those of TCE. FDOH reviewed a number of published documents and reports before establishing the list of cancers of concern for Tallevast (Appendix A).

As in any environmental assessment involving limited sampling over time and multiple contaminants, there is some uncertainty in the choice of cancers of concern

associated with the Tallevast site. FDOH reviewed information from a number of sources, including animal toxicological studies, and the cancers of concern chosen may represent a broader list than would be chosen if the exact exposure doses for Tallevast residents over time were known. FDOH considered the presence of a particular contaminant as the primary criteria, rather than choosing cancers based solely on individual contaminant concentration, because past contamination levels are unknown. In determining cancers of concern, FDOH weighed the relative contribution of the contaminant to the overall contamination problem (TCE being the main contaminant) and the available toxicological information (relevant to assessing cancer risks). The following cancers were identified as cancers of concern: liver, kidney, non-Hodgkin's lymphoma, leukemia, bladder, prostate, lung and bronchus, and cervical cancer.

Results of the FCDS Search:

The FCDS search found 83 total cancer cases in the Tallevast area over the period 1974 to 2006. For 4 of the 83 cases the original date of primary cancer diagnosis was prior to 1981 (prior to registry inception). Each of the 4 cases was seen in a health care facility after 1981 for cancer related treatment and subsequently recorded in FCDS based on the type and timing of the primary cancer diagnosis. The registry was searched by zip codes as well as by city name including potential misspellings of Tallevast to capture as many resident cases as possible. Table 1 provides these findings.

Table 2 provides cancer types by race as found in FCDS for the period 1974-2006. 38 cases occurred among blacks and 45 among whites within these zip codes. Cancers of interest include 11 cases of lung cancer (6 among blacks), 4 cases of kidney cancer (0 among blacks), 3 cases of non-Hodgkin's lymphoma (1 among blacks), 17 cases of prostate cancer (11 among blacks), 0 cases of cervical cancer and 3 cases of bladder cancer (1 among blacks). No cases of liver cancer, the cancer with the greatest causal association with TCE exposure, were found in FCDS data during this time period for the above listed zip codes. In addition, no cases of leukemia, and most importantly, childhood leukemia, were found in FCDS records for this area.

The majority of cancer cases occurred after 1995 for both black and whites (see Table 3) with few of the cases appearing prior to 1990. For blacks, most cancers were among males (see Table 4), whereas for whites the numbers were evenly divided.

Death Certificate Data Search and Issues:

FDOH reviewed death certificate data for the period 1970 to 1981 (pre FCDS) for cases of deaths in the Tallevast area with cancer as the cause of death or a contributing cause of death. FDOH also extended the review of death data for the period 1981-1991 (FCDS was active at this time but was not routinely searching

death records to identify cancer cases only recorded at death). Death data for the period 1970 to 1991 are available electronically. Death data for the period 1962 to 1969 are only available in Jacksonville via manual search of microfiche records and are not being reviewed by FDOH at this time. Manual review of these records was deferred and was planned to occur if a number of cancer cases were identified in the 1970's, if a rare cancer of concern was seen in the 1970's, or if any childhood cancer cases were identified in the 1970's. Any of these conditions may indicate a shortened latency period or very high level of exposure of contaminants during the 1960's which would warrant a closer review of the period from 1962 to 1969.

There are similar analysis and interpretation issues with death data as for FCDS data. Issues include zip code changes over time, cases are recorded by address at time of death (inability to address in- and out-migration), changes in cancer diagnostics over time, changes in cancer mortality rates over time, and the inability to provide mapping of cancer cases given the predominant use of PO Boxes as mailing addresses in Tallevast.

An additional issue that came to light is that electronic death records do not contain information related to contributory causes of death for the period 1970 through 1990; i.e., only cause of death and not any underlying causes are picked up on the electronic record despite being listed on the actual death certificate. This raised the possibility that some cancer cases would be missed if they were considered as a contributing cause of death but not the main cause of death should FDOH search only electronic records. In order to assure that all potential cases of cancer were found, FDOH requested copies of the actual death certificates for all Tallevast resident deaths identified through death record searches based on zip code and city name. FDOH manually reviewed these certificates in order to identify and include any cases where cancer was a contributing but not main cause of death.

Results Based on Electronic Death Record Review:

Review of electronic records and manual review of death certificates was completed for the period 1970-2006. Records were searched (based on the zip code search of 33588 and 34270 as well as by city including potential misspellings of Tallevast). The review found 28 cancer cases among Tallevast residents represented in the death data; 15 of these deaths were already represented in the FCDS records. In other words, review of death records data found 13 cases of cancer which were only represented in death records and not found in FCDS (see Table 5). Also of note, 8 of the 13 cases occurred prior to 1981 before the registry began and the remainder occurred in the early years of the registry (one in 1981, two in 1982, one in 1989 and one in 1990). Thus all of these cases occurred before FCDS began or before FCDS began passively sweeping death records for cancer cases (see Table 5).

As seen in Table 6, of these 13 additional cancer cases (deaths), 4 were among whites and 9 occurred among blacks. The cancer type noted at death among blacks included the following: 1 kidney cancer, 1 case of leukemia, 1 lung cancer and 1

prostate cancer. There were no cancer cases among whites that are linked to TCE or other contaminants at Tallevast (Table 6) as found in this death data review. These additional cancer cases identified solely through death data review identified more male cases of cancer than female (8 versus 5) as noted in Table 7.

Overall, cancer related deaths appeared spread across the years in question (Table 5). FDOH also noted other causes of death (non-cancer related) and these included heart disease, stroke, injuries and other. Tables 8 and 9 present cause of death for the total number of recorded deaths among Tallevast residents. A total of 110 deaths occurred during the period 1970 through 2006 of which 87 deaths were among black residents.

As would be expected, the largest category of cause of death was for diseases of the circulatory system (primarily deaths noted to be related to heart disease and strokes) representing 40% of deaths among blacks. Cancer related deaths account for nearly 21% of all deaths among blacks and injuries and poisonings were 7%. Of note, of the 4 respiratory related deaths among blacks, 3 deaths were recorded to be related to emphysema. When mortality data for all black Floridians are considered, a similar pattern is also seen. Based on 2000 data, diseases of the circulatory system accounted for nearly 37% of all deaths and neoplasms for 21%. Certain infectious and parasitic diseases (9%) and injury and poisoning related deaths (8%) were the other major contributors to cause of death on a state level. The contributions of various causes of deaths among Tallevast residents appears to be similar to state patterns for blacks, with the exception of the category of 'symptoms, signs and ill-defined conditions' which is higher among Tallevast residents (9%) than the state level (less than 1%).

Results Based on Combined FCDS and Death Record Review:

Table 10 presents morbidity and mortality combined data for all known cases of cancer (unduplicated, electronic death records and manual review of death records and FCDS) for the time period 1970 through 2006. This combined review found 96 cases of cancer in the zip codes of interest (47 occur among blacks). The most common cancers found in Tallevast were prostate, lung and bronchus, and breast which are also the three most common cancers in the U.S. and in Florida, regardless of race.

When considered from all data sources, cancers of interest among blacks include 1 kidney cancer, 1 leukemia, 1 non-Hodgkin's lymphoma, 12 prostate cancers, 7 lung cancers, and 1 bladder cancer (23 total cancers of concern among blacks).

For the purposes of the analysis, total counts for black cancer cases have been assumed to be among black Tallevast residents. However, members outside of the community, both white and black, have used these zip codes and thus cancer cases cannot be positively identified as residents in the community unless personal interview confirms a Tallevast street address to accompany the PO Box.

There was not a preponderance of cases occurring in the early years, as determined through death certificate review or through review of FCDS (see Table 11). There was some community concern mentioned that heaviest exposure and contamination may have occurred in the early years of the plants operation. Assuming a 15 to 20 year latency for cancers, cases associated with a hypothesized exposure in the period beginning in 1962 would begin showing up in records in the mid to late 1970's through the early 1980's. This review found most cancer cases as having been recorded since the early 1990's.

As discussed earlier, only certain cancers are considered to be potentially related to the contaminants found at Tallevast. For the purposes of this review the cancers considered are liver, kidney, leukemia particularly among children, non-Hodgkin's lymphoma, bladder, lung, prostate, and cervical cancer. Of the 47 cases of cancer found among black Tallevast residents in the period 1970-2006 only 23 were types of cancer considered related to the contaminants of concern. A breakdown of year of diagnosis by cancer type is shown in Table 12. Most of these cancers occurred among males (21 of the 23 cancers) as seen by cancer type in Table 13. The higher number of males is partly to be expected as prostate cancer is one of the cancers of concern (a male only cancer) and lung cancer is more common among black males than black females. Nevertheless, the possibility that some of the males may have been exposed occupationally as well as residentially (and thus at greater risk) cannot be evaluated from these data.

A significant negative finding was that there were no childhood cancers and no cancers among young adults. Most cancer cases were age 60 or older at the time of diagnosis (or death). Table 14 presents age at the time of diagnosis (or death if not noted until death) by cancer type. Only two cancer cases appeared in the age group 30-39. One case of bladder cancer and one of non-Hodgkin's lymphoma occurred among individuals age 30-39; the number of cancer cases is too small to assess variations from the normal age at diagnosis by cancer type.

Discussion and Limitations of Results:

Graphs 1 through 8 provide some comparison of age adjusted cancer rates for blacks for the various cancers of interest for the years 1970 through 2005 or 2006. One standard reference comparison involves SEER data (SEER is the Surveillance, Epidemiology, and End Results Program based with the National Cancer Institute). SEER data provides national cancer incidence rates based on cancer cases provided from across the nation. Graphs 1 through 8 also provide similar data for black Florida residents (as well as Manatee County values) for a similar time period (Florida specific data are only available from 1981 on). These three sources of cancer data were considered as possible comparison populations for the discussion and analysis below. The cancer incidence data for Manatee County is very variable given the small number of residents; a three year rolling average is shown in all graphs for Manatee County in order to allow for a more smooth comparison. Use of

three year rolling averages is a common presentation method for county level morbidity data. Even with a three year rolling average approach, the rate for Manatee County vary considerably across time.

Presentation of cancer data for Tallevast in a format that allows assessment of an increased or decreased number of cancer cases over what might be expected is problematic for a number of reasons. It is the nature of most statistical comparisons and estimates that a larger sample size provides a more stable and better estimate of the various population parameters (such as the expected number of cancers). The very small population size of Tallevast (approximately 50-80 households, roughly 200-250 residents in any given year since 1962) produces unstable estimates and wide confidence intervals (a statistical term used to assess how much uncertainty surrounds the estimated result and is related in large part to sample size; the confidence intervals are similar to the 'margin of error' reported for national polling results).

In addition to the statistical problem of sample size there are some additional assumptions that must be discussed that underlie the analysis. All cancer cases found through the FCDS search and death data search among blacks in the zip codes and/or city of interest (Tallevast) are assumed for the purposes of this analysis to have occurred in a Tallevast resident. Some of the cases among blacks may be among former workers or individuals in Manatee or Sarasota County who used the Tallevast PO Box as a convenient postal stop. The amount to which actual Tallevast cases are inflated by this number cannot be assessed without a resident survey/interview which considers retrospective resident patterns.

Also, the number of cancer cases found, as mentioned earlier in the document, is not the same number of cases that would be found through a community interview and survey of residents that reconstructed the community and their health problems. It is assumed that some cancer cases known to Tallevast residents could not be attributed to a Tallevast resident based on state data base searches as they were diagnosed after the resident had moved out of the neighborhood and recorded with a non-Tallevast address. Conversely, the cases listed here also may include individuals who moved into Tallevast with cancer or were diagnosed shortly after moving in; these cancers would be more correctly associated with exposures at prior residences. The extent to which in- and out-migration has over or under estimated cases assigned to Tallevast cannot be assessed from this data set.

In order to provide an estimate of the expected number of these cancer cases of interest for the Tallevast community, the population of Tallevast stratified by age and gender had to be estimated. Table 15 provides a population breakdown by age and gender of Tallevast residents (assumed to be all black) based on the 2000 census. The 2000 census data was used as this is the only stratified estimate available that provided data for a geographical area that most closely matched the geographical area of Tallevast. Earlier census reports provided population data based on a much larger geographic area: these areas surrounded Tallevast and

included many thousands of people. Also, these earlier census reports included an area that was not primarily black nor did it have a similar age structure as in Tallevast (based on the 2000 census data) and therefore could not be used to extrapolate to the Tallevast community in order to provide a population breakdown for earlier decades.

Table 16 provides the observed to expected number of cases in the Tallevast community for the period 1981 through 2006 among blacks. A reference population was chosen to estimate the expected number of cases. Manatee county data were judged to be too unstable for use as a reference population, particularly as analysis was done among blacks only. National data, SEER, is produced from reports from all over the country and although this would provide stable values it would introduce an added complexity related to all the regional variations in cancer diagnostics and treatment. Florida specific (among black only) data was chosen as the reference population used for analysis and comparisons.

For Table 16 the observed number of cancer cases reflects all cases found in the FCDS and death records among all blacks with a zip code of 34270, 33588 and those with Tallevast as the city or residence or those addresses that geocoded to the Tallevast area. All values are age adjusted, Tallevast was assumed to have a stable population over the entire period of 223 residents, and all 223 residents were assumed to be black for the purposes of this analysis (see Table 15).

All ratios of observed to expected number of cases (termed the SIR or Standard Incidence Ratios) are slightly over 1, indicating a somewhat elevated ratio. However, the 95% confidence intervals used to assess the stability of this ratio are very wide (as anticipated and discussed earlier), highlighting that the small numbers involved impaired the ability to assess these increases. All confidence intervals include 1, indicating that the SIR estimated from the data cannot be assured to be over 1 and that the elevated ratios seen may not be real. The cancer most clearly linked to TCE contamination is liver cancer and no cases were found in this review. No cases of leukemia in children were found, and only one each of non-Hodgkin's lymphoma, kidney cancer, and bladder cancer were found. The most frequently found cancers were lung (6) and prostate cancer (10) and these cancers are also among the most common cancers nationally.

Summary of Limitations of the Analysis and Assumptions in the Analysis:

- **Causality cannot be assessed.**

- **Sample size issues makes estimates very unstable and confidence intervals wide, for statistical purposes the community was assumed to be of stable size with 223 residents throughout the time period.**

- **Without resident verification, counts of cancer cases presented in this review of state data bases may have overstated the true number of cancer cases that occurred among Tallevast residents as all cancer cases among blacks found in the zipcodes used were assumed to be among Tallevast residents.**

- **Without a residence reconstruction, cancer cases were missed when residents moved away and thus counts of cancer cases are understood to be incomplete.**

- **Cases diagnosed and treated solely at VA hospitals are not in the data bases available to FDOH and thus counts of cancer cases are thought to be incomplete.**

- **Exposure to TCE and beryllium has only been assumed and exposure level is assumed to be the same for all individuals. There are no biomarkers to assess exposure to TCE and other contaminants (beryllium testing has been completed and reported on in prior documents) and therefore all residents are assumed to be equally exposed. Certainly some residents would have been more highly exposed, and some were exposed for more years than others but these differences were not assessed in this cancer data review. There may have been periods in the earlier years under scrutiny that involved higher levels of exposure for some residents; unfortunately there is no environmental monitoring data to document this assumption.**

- **The methods used in this review have limited ability to detect increased illness in a small population.**
- **Another underlying assumption is that the boundaries for geographic exposure have remained the same for the entire time period. The plume as measured and documented in the Health Assessment Report represents the best available scientific representation of the scope of the exposure. FDOH has no ability to assess if the plume has increased or lessened in the years to date, and all analyses presented describes the population of concern (in terms of census blocks, zip codes, etc.) as matching the plume area in the FDOH report (http://www.myfloridaeh.com/community/SUPERFUND/ph.htm).**

- **The Tallevast population numbers used in this report are based on the 2000 census data. Census data are usually established for a community based on a small sample of the community and then subsequent extrapolations are made. For the 2000 census, each household was contacted and could provide data, although a 100% response rate was not achieved. To the extent that the 2000 census does not exactly represent the current Tallevast population, the estimates of expected number of cancers could be slightly off as well.**

- **Some Tallevast residents were also employed with American Beryllium and would have had far greater exposures than residents not employed at the**

plant. Any assessment of additional exposures or disease related to employment at America Beryllium is outside the scope of this data review.

- **Cancer is a disease that takes a number of years to develop between initial exposure time and diagnosis or signs and symptoms. The latency period may be effected by the type of cancer under question, the age, gender and race of the individual, other contributing factors such as smoking status, and the level of exposure. Many cancers have a latency period of 15-20 years (30 years in some), although pediatric cancers can have a shorter latency period. Ideally, it would be best if cancer incidence data were available in the registry from 1962 forward so that there was no gap in follow-up from plant start up and potential contamination date to development of cancer. However, given the plant start date of 1962, there appears to be a gap time between plant start up (and the date of the actual start of TCE spills is unknown but may assume to have been post 1962) and the cancer registry beginning in 1981. This gap between plant start up date and registry beginning is 19 years, and in order to shorten this gap, death records were reviewed beginning in 1970. This produces only an 8 year gap between the potential contamination date of 1962 and the start of record review for cancers (1970). This 8 year period is generally considered too short of a time period to allow most cancers to develop and be diagnosed (insufficient latency period). Manual review of Micofiche records of death certificates was not undertaken for the period 1962-1970 partly because this 8 year span is considered too short a period for most cancers to have developed especially as actual contamination of the drinking water had to have begun some time after 1962 (further shortening this period to less than 8 years or considerably less than 8 years). Manual review was also not undertaken as the death record review of the 1970's identified no childhood cancers, no rare cancers related to the contaminant and no cluster of early cancer cases; any of which may have prompted a review of the death certificate data for 1962 through 1969.**

- **Examination of cancer incidences and mortality over a 36 year time period is a challenging undertaking. Clinical medicine has undergone tremendous changes in this time period. Changes in clinical diagnostic techniques have increased the ability to detect certain cancers, changes in diagnostics and testing have increased the ability to detect early stages of certain cancers, advancements in cancer research have altered the classification of some types of cancers (leukemias and lymphomas in particular), changes in the treatment methods over time, and changes in the stage of disease the cancer is routinely diagnosed (more cancers diagnosed earlier) have all lead to increased survivorship and decreased mortality for many cancers.**

- **As this initial data search involved no interviews or collections of personal history there is no ability to address the other factors that may contribute to disease status. Genetics, diet, smoking status, alcohol consumption, physical**

activity level, and access to preventive health care/screening tests would all be factors that may be relevant in a community assessment of cancer or other health issues.

- **This analysis utilized more than one methodology to determine cancer cases in Tallevast, a combined review of FCDS data as well as death records review. Florida state and County specific incidence data, as well as SEER data, used to calculate the expected number of cases are based on incidence rates determined from cancer registries (and not death certificate review as well). It is unknown what the cancer incidence rates for SEER, Florida or Manatee county would have been if the numbers were also compiled using this more intensive records searching approach but this additional scrutiny would most likely have resulted in a higher annual number of cancer cases and thus produced a higher incidence rate. By using comparison incidence rates for a reference population based only on registry data for calculation of expected numbers and comparing those to observed numbers in Tallevast which were based on both FCDS and death certificate review data may have produced a small bias. This bias may have resulted in a higher observed number of cases (and a lower expected number of cases). This may serve to inflate the resulting ratio and over emphasize the difference between what was expected in Tallevast versus what was actually observed.**

- **For the purposes of this state level review, cancer diagnoses were not verified via medical records review. Cancers are considered to be as recorded in the data bases. Death certificate data in particular may have incorrect or incomplete cancer diagnoses or may have ignored the distinction between primary cancer site versus metastasized cancers, particularly in the earlier time periods under study.**

Other Findings:

Cause of death via manual review for the period 1970-1991 noted a number of deaths among black Tallevast residents 60 years of age or less coded as being due to natural causes with no other cause or contributing condition listed and with no autopsy noted. This finding is considered unusual as deaths due to natural causes with no causal or contributing factors noted in this age group is not particularly common. This may reflect an environmental justice and health disparity situation wherein deaths among black residents were not thoroughly recorded or investigated.

A number of cancers of interest among whites were noted searching the Tallevast zip codes. Based on the community's comments, these individuals may be prior workers at American Beryllium (see Table 10). There were 4 kidney cancers, 2 non-Hodgkin's lymphoma, 6 prostate cancers, and 2 bladder cancer among the white cases with a Tallevast zip code. However, there is no way to determine the appropriate denominator for these cases, limiting any analysis.

Most cases among black residents during the years 1981 to 2006 were represented in FCDS; thus 5 cases were only found through a death record search during the years that FCDS was in operation and three of these were in the first 2 years of FCDS operation. It appears, at least from this review, that FCDS does contain a majority of cancer cases for Tallevast residents that would be normally referred to the registry.

Review of death certificates indicates that overall contributions for the major cause of deaths categories among Tallevast residents is similar to the contributions of major cause of deaths categories for black Floridians overall.

Review of FCDS indicates that the three most common cancer types found among Tallevast residents are the same three most common cancer types seen in for all Floridians (as well as for black Floridians). Prostate, lung and bronchus and breast cancer are the three most common cancers.

Recommendations:

It is important to continue ongoing environmental monitoring and sampling particularly during the time period that Lockheed Martin remediation work is underway to assure that residents are not exposed to TCE or other contaminants now or in the future. At this time, Lockheed-Martin continues to monitor ground water and ambient (outdoor) air in the Tallevast community around the former American Beryllium site.

Residents should continue to use municipal water, residents should not use well water for any purposes that allows for human exposure.

FDOH recommends that the community continue to pursue a health study that involves interview and survey methods to more accurately capture cases of cancer and account for in- and out-migration. FDOH believes that other heath outcomes and concerns (not available in state data bases) would be best identified through a health study process involving personal interviews. A health study survey should also include information on behaviors and risk factors that may affect disease risk (i.e., occupational history and potential exposures, historical access to health care, smoking status, alcohol consumption, and other factors). A review and verification of medical records is also recommended particularly for diseases not represented in a registry such as a possible increase in residents with lupus, with asthma, or with adverse reproductive outcomes. A community based health survey may attempt to assess some of these concerns.

Residents should obtain age appropriate screenings for cancer and other disease issues in order to detect existing disease and potentially reduce morbidity. Residents are encouraged to discuss with their primary care physicians any concerns they may have regarding their overall health, changes in lifestyle and the

adoption of behaviors that could reduce their risks for cancer, and other questions related to the link between contaminants and morbidity.

APPENDIX A (REFERENCES)

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APPENDIX B (TABLES)

Table 1. Cancer morbidity by race and residential zip code at time of diagnosis for Tallevast residents as recorded in the Florida Cancer Data System (1974-2006)*

Zip Code	*Race*		Total
	White	*Black*	
33580	*1*	*0*	1
33588	*3*	*5*	8
34243	*2*	*0*	2
34270	*38*	*32*	70
Unknown[†]	*1*	*1*	2
Total	45	38	83

**FCDS did not officially start collecting statewide data until 1981. The 2006 data is considered provisionally closed.*
[†]*Both individuals had "unknown" listed for their address at time of diagnosis, however, the address at the last follow-up indicated their residence to be within zip code 34270.*

Table 2. Cancer morbidity by cancer type and race for Tallevast residents as recorded in the Florida Cancer Data System (1974 – 2006)*			
Type of Cancer	*Race*		Total
	White	*Black*	
Anus, Anal Canal and Anorectum	*2*	*2*	4
Ascending Colon	*0*	*2*	2
Bones and Joints	*1*	*0*	1
Breast	*9*	*4*	13
Cecum (part of colon)	*0*	*1*	1
Corpus Uteri	*0*	*1*	1
Esophagus	*1*	*0*	1
Eye and Orbit	*1*	*0*	1
Kidney and Renal Pelvis	*4*	*0*	4
Larynx	*2*	*1*	3
Lung and Bronchus	*6*	*6*[†]	12
Melanoma of the Skin	*1*	*0*	1
Miscellaneous	*5*	*0*	5
Non Hodgkin's Lymphoma Extra Nodal	*1*	*0*	1
Non Hodgkin's Lymphoma Nodal	*1*	*1*	2
Other Nervous System	*0*	*1*	1
Ovary	*0*	*1*	1
Pancreas	*0*	*1*	1
Prostate Gland	*6*	*11*	17
Rectum	*0*	*1*	1
Salivary Glands	*1*	*0*	1
Sigmoid Colon	*1*	*0*	1
Thyroid Gland	*1*	*1*	2
Tongue	*0*	*1*	1
Transverse Colon	*0*	*2*	2
Urinary Bladder	*2*	*1*	3
Total	45	38	83

**FCDS did not officially start collecting statewide data until 1981. The 2006 data is considered provisionally closed.*

[†]For one case the primary site was listed as miscellaneous/unknown in the FCDS data however the individual's death certificate listed the cause of death as lung and bronchus cancer so this case was counted as a lung and bronchus cancer instead of miscellaneous.

Table 3. Cancer morbidity by race and year of diagnosis for Tallevast residents as recorded in the Florida Cancer Data System (1974 – 2006)*

Diagnosis Year	*Race*		Total
	White	*Black*	
1974	*0*	*1*	1
1975-1978	*0*	*0*	0
1979	*0*	*1*	1
1980	*1*	*1*	2
1981	*1*	*0*	1
1982	*1*	*2*	3
1983	*0*	*1*	1
1984	*0*	*0*	0
1985	*2*	*0*	2
1986	*0*	*0*	0
1987	*1*	*2*	3
1988	*1*	*0*	1
1989	*1*	*1*	2
1990	*2*	*2*	4
1991	*3*	*0*	3
1992	*1*	*3*	4
1993	*1*	*1*	2
1994	*3*	*1*	4
1995	*1*	*3*	4
1996	*1*	*2*	3
1997	*2*	*0*	2
1998	*0*	*2*	2
1999	*3*	*1*	4
2000	*3*	*1*	4
2001	*3*	*1*	4
2002	*0*	*2*	2
2003	*2*	*1*	3
2004	*4*	*1*	5
2005	*2*	*5*	7
2006	*6*	*3*	9
Total	45	38	83

**FCDS did not officially start collecting statewide data until 1981. The 2006 data is considered provisionally closed.*

Table 4. Cancer morbidity by gender, race, and cancer type for Tallevast residents as recorded in the Florida Cancer Data System (1974 – 2006)*

Gender	Type of Cancer	Race		Total
		White	Black	
Male	Tongue	0	1	1
	Salivary Glands	1	0	1
	Esophagus	1	0	1
	Ascending Colon	0	2	2
	Sigmoid Colon	1	0	1
	Rectum	0	1	1
	Anus, Anal Canal and Anorectum	1	0	1
	Larynx	2	1	3
	Lung and Bronchus	3	4†	7
	Prostate Gland	6	11	17
	Urinary Bladder	1	1	2
	Kidney and Renal Pelvis	4	0	4
	Non Hodgkin's Lymphoma Nodal	0	1	1
	Miscellaneous	2	0	2
	Total	22	22	44
Female	Cecum (part of colon)	0	1	1
	Transverse Colon	0	2	2
	Anus, Anal Canal and Anorectum	1	2	3
	Pancreas	0	1	1
	Lung and Bronchus	3	2	5
	Bones and Joints	1	0	1
	Melanoma of the Skin	1	0	1
	Breast	9	4	13
	Corpus Uteri	0	1	1
	Ovary	0	1	1
	Urinary Bladder	1	0	1
	Eye and Orbit	1	0	1
	Thyroid Gland	1	1	2
	Non Hodgkin's Lymphoma Nodal	1	0	1
	Non Hodgkin's Lymphoma Extra Nodal	1	0	1
	Miscellaneous	3	0	3
	Other Nervous System	0	1	1
	Total	23	16	39

**FCDS did not officially start collecting statewide data until 1981. The 2006 data is considered provisionally closed.*

†For one case the primary site was listed as miscellaneous/unknown in the FCDS data however the individual's death certificate listed the cause of death as lung and bronchus cancer.

Table 5. Cancer mortality* by race and year of death for Tallevast residents whose diagnosis was <u>not</u> recorded in the Florida Cancer Data System (1970 – 2006)

Year of Death	*Race*		Total
	White	*Black*	
1970	*1*	*0*	1
1971	*0*	*1*	1
1972	*0*	*1*	1
1973	*0*	*1*	1
1974	*0*	*1*	1
1975	*0*	*0*	0
1976	*0*	*0*	0
1977	*0*	*0*	0
1978	*0*	*1*	1
1979	*0*	*0*	0
1980	*1*	*1*	2
1981	*0*	*1*	1
1982	*2*	*0*	2
1983	*0*	*0*	0
1984	*0*	*0*	0
1985	*0*	*0*	0
1986	*0*	*0*	0
1987	*0*	*0*	0
1988	*0*	*0*	0
1989	*0*	*1*	1
1990	*0*	*1*	1
1991-2006	*0*	*0*	0
Total	4	9	13

**Data obtained from death certificates*

Table 6. Cancer mortality* by race and cancer type for Tallevast residents whose diagnosis was <u>not</u> recorded in the Florida Cancer Data System (1970 – 1990)

Type of Cancer	*Race*		Total
	White	*Black*	
Brain	*1*	*0*	1
Connective and other soft tissue	*1*	*0*	1
Kidney	*0*	*1*	1
Leukemia	*0*	*1*	1
Lung and Bronchus	*0*	*1*	1
Miscellaneous	*0*	*1*	1
Nasal, Cavities, Middle Ear, and Accessory Sinuses	*1*	*0*	1
Ovary	*1*	*0*	1
Pancreas	*0*	*2*	2
Pelvic Colon	*0*	*1*	1
Prostate	*0*	*1*	1
Rectum	*0*	*1*	1
Total	4	9	13

**Data obtained from death certificates*

Table 7. Cancer mortality* by race, gender, and cancer type for Tallevast residents whose diagnosis was <u>not</u> recorded in the Florida Cancer Data System (1970 – 1990)

Gender	*Type of Cancer*	*Race*		Total
		White	*Black*	
Male	*Brain*	*1*	*0*	1
	Connective and other soft tissue	*1*	*0*	1
	Kidney	*0*	*1*	1
	Leukemia	*0*	*1*	1
	Lung and Bronchus	*0*	*1*	1
	Pancreas	*0*	*1*	1
	Pelvic Colon	*0*	*1*	1
	Prostate	*0*	*1*	1
	Total	2	6	8
Female	*Miscellaneous*	*0*	*1*	1
	Nasal, Cavities, Middle Ear, and Accessory Sinuses	*1*	*0*	1
	Ovary	*1*	*0*	1
	Pancreas	*0*	*1*	1
	Rectum	*0*	*1*	1
	Total	2	3	5

**Data obtained from death certificates*

Table 8. All primary causes of mortality for Tallevast residents as recorded on the death certificate (1970-2006)		
	Frequency	*Percent*
Certain infectious and parasitic diseases	*2*	*2*
*Neoplasm**	*24*	*22*
Endocrine, nutritional and metabolic diseases, and immunity disorders†	*3*	*3*
Diseases of the blood and blood-forming organs	*1*	*1*
Mental disorders‡	*3*	*3*
Diseases of the nervous system and sense organs‡	*2*	*2*
Diseases of the circulatory system†	*46*	*42*
Diseases of the respiratory system	*5*	*4*
Diseases of the digestive system	*3*	*3*
Diseases of the genitourinary system	*2*	*2*
Diseases of the musculoskeletal system and connective tissue	*1*	*1*
Congenital anomalies	*1*	*1*
Symptoms, signs, and ill-defined conditions	*10*	*9*
Injury and poisoning	*9*	*7*
Total	110	*100*

**13 of the 24 cancer related deaths were documented in FCDS*
† 1 individual in this category had cancer listed as a contributing cause of death.
‡ 1 individual in this category had cancer listed as a contributing cause of death. This cancer was not documented in FCDS.

Table 9. All primary causes of mortality by race for Tallevast residents as recorded on the death certificate (1970-2006)

	Race				Total	(percent)
	White	(percent)	Black	(percent)		
Certain infectious and parasitic diseases	*0*	*(0)*	*2*	*(2)*	*2*	*(2)*
*Neoplasms**	*6*	*(26)*	*18*	*(21)*	*24*	*(22)*
Endocrine, nutritional and metabolic diseases, and immunity disorders	*1*	*(4)*	*2*[†]	*(2)*	*3*	*(3)*
Diseases of the blood and blood-forming organs	*0*	*(0)*	*1*	*(1)*	*1*	*(1)*
Mental disorders	*0*	*(0)*	*3*[‡]	*(3)*	*3*	*(3)*
Diseases of the nervous system and sense organs	*0*	*(0)*	*2*[‡]	*(2)*	*2*	*(2)*
Diseases of the circulatory system	*11*[†]	*(48)*	*35*	*(40)*	*46*	*(42)*
Diseases of the respiratory system	*0*	*(0)*	*4*	*(5)*	*4*	*(4)*
Diseases of the digestive system	*0*	*(0)*	*3*	*(3)*	*3*	*(3)*
Diseases of the genitourinary system	*1*	*(4)*	*1*	*(1)*	*2*	*(2)*
Diseases of the musculoskeletal system and connective tissue	*0*	*(0)*	*1*	*(1)*	*1*	*(1)*
Congenital anomalies	*0*	*(0)*	*1*	*(1)*	*1*	*(1)*
Symptoms, signs, and ill-defined conditions	*2*	*(9)*	*8*	*(9)*	*10*	*(9)*
Injury and poisoning	*2*	*(9)*	*6*	*(7)*	*8*	*(7)*
Total	23	(100)	87	(100)	110	(100)

**13 of the 24 cancer related deaths were documented in FCDS*

[†]1 individual in this category had cancer listed as a contributing cause of death.

[‡]1 individual in this category had cancer listed as a contributing cause of death. This cancer was <u>not</u> documented in FCDS.

Table 10. Cancer type by race for all cancers diagnosed* among Tallevast residents (1970 - 2006)

Type of Cancer	*Race*		Total
	White	*Black*	
Anus, Anal Canal, and Anorectum	*2*	*2*	4
Ascending Colon	*0*	*2*	2
Bones and Joints	*1*	*0*	1
Brain	*1*	*0*	1
Breast	*9*	*4*	13
Cecum (part of colon)	*0*	*1*	1
Connective and other soft tissue	*1*	*0*	1
Corpus Uteri	*0*	*1*	1
Esophagus	*1*	*0*	1
Eye and Orbit	*1*	*0*	1
Kidney and Renal Pelvis	*4*	*1*	5
Larynx	*2*	*1*	3
Leukemia	*0*	*1*	1
Lung and Bronchus	*6*	*7*	13
Melanoma of the Skin	*1*	*0*	1
Miscellaneous	*5*	*1*	6
Nasal, Cavities, Middle Ear, and Accessory Sinuses	*1*	*0*	1
Non Hodgkin's Lymphoma Extra Nodal	*1*	*0*	1
Non Hodgkin's Lymphoma Nodal	*1*	*1*	2
Other Nervous System	*0*	*1*	1
Ovary	*1*	*1*	2
Pancreas	*0*	*3*	3
Pelvic Colon	*0*	*1*	1
Prostate Gland	*6*	*12*	18
Rectum	*0*	*2*	2
Salivary Glands	*1*	*0*	1
Sigmoid Colon	*1*	*0*	1
Thyroid Gland	*1*	*1*	2
Tongue	*0*	*1*	1
Transverse Colon	*0*	*2*	2
Urinary Bladder	*2*	*1*	3
Total	49	47	96

**Data were obtained from both FCDS and death certificates.*

Table 11. Year of diagnosis by race for all cancers diagnosed* among Tallevast residents (1970 - 2006)			
Diagnosis Year	*Race*		Total
	White	*Black*	
1970	*1*	*0*	*1*
1971	*0*	*1*	*1*
1972	*0*	*1*	*1*
1973	*0*	*1*	*1*
1974	*0*	*2*	*2*
1975	*0*	*0*	*0*
1976	*0*	*0*	*0*
1977	*0*	*0*	*0*
1978	*0*	*1*	*1*
1979	*0*	*1*	*1*
1980	*2*	*2*	*4*
1981	*1*	*1*	*2*
1982	*3*	*2*	*5*
1983	*0*	*1*	*1*
1984	*0*	*0*	*0*
1985	*2*	*0*	*2*
1986	*0*	*0*	*0*
1987	*1*	*2*	*3*
1988	*1*	*0*	*1*
1989	*1*	*2*	*3*
1990	*2*	*3*	*5*
1991	*3*	*0*	*3*
1992	*1*	*3*	*4*
1993	*1*	*1*	*2*
1994	*3*	*1*	*4*
1995	*1*	*3*	*4*
1996	*1*	*2*	*3*
1997	*2*	*0*	*2*
1998	*0*	*2*	*2*
1999	*3*	*1*	*4*
2000	*3*	*1*	*4*
2001	*3*	*1*	*4*
2002	*0*	*2*	*2*
2003	*2*	*1*	3
2004	*4*	*1*	5
2005	*2*	*5*	7
2006	*6*	*3*	9
Total	49	47	96

**Data were obtained from both FCDS and death certificates.*

Table 12. Diagnosis (or death) year by cancer type among black Tallevast residents for cancers* related to the chemicals of concern (1970 - 2006)

Diagnosis Year	*Cancer Type*								
	Prostate	*Kidney*	*non-Hodgkin's Lymphoma*	*Liver (including Biliary)*	*Cervical*	*Leukemia*	*Urinary Bladder*	*Lung and Bronchus*	Total
1973	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1
1974-1978	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1979	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1
1980	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	2
1981	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	1
1982	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	1
1983-1986	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1987	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	2
1988	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1989	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	2
1990	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1991	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1992	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	1
1993	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1994	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1
1995	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1
1996	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	2
1997	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
1998	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	2
1999	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
2000	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	1
2001	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
2002	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
2003	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
2004	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	1
2005	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	3
2006	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	1
Total	12	1	1	0	0	1	1	7	23

**Data were obtained from both FCDS and death certificates.*

Table 13. Cancer type by gender among black Tallevast residents for cancers* related to the chemicals of concern (1970 - 2006)

Type of Cancer	*Gender*		Total
	Male	*Female*	
Leukemia	*1*	*0*	1
Non-Hodgkin's Lymphoma	*1*	*0*	1
Liver	*0*	*0*	0
Kidney and Renal Pelvis	*1*	*0*	1
Urinary Bladder	*1*	*0*	1
Lung and Bronchus	*5*	*2*	7
Cervical	*0*	*0*	0
Prostate	*12*	*0*	12
Total	21	*2*	23

**Data were obtained from both FCDS and death certificates.*

Table 14. Cancer type by age at time of diagnosis (or death) among black Tallevast residents for cancers* related to the chemicals of concern (1970-2006)

Age at time of diagnosis	*Cancer Type*								
	Prostate	*Kidney*	*non-Hodgkin's Lymphoma*	*Liver (including Biliary)*	*Cervical*	*Leukemia*	*Urinary Bladder*	*Lung and Bronchus*	Total
0 to 9	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
10 to 19	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
20 to 29	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0
30 to 39	*0*	*0*	*1*	*0*	*0*	*0*	*1*	*0*	2
40 to 49	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	2
50 to 59	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	3
60 to 69	*4*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	5
70 to 79	*5*	*0*	*0*	*0*	*0*	*1*	*0*	*2*	8
80 to plus	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	3
Total	12	1	1	0	0	1	1	7	23

**Data were obtained from both FCDS and death certificates.*

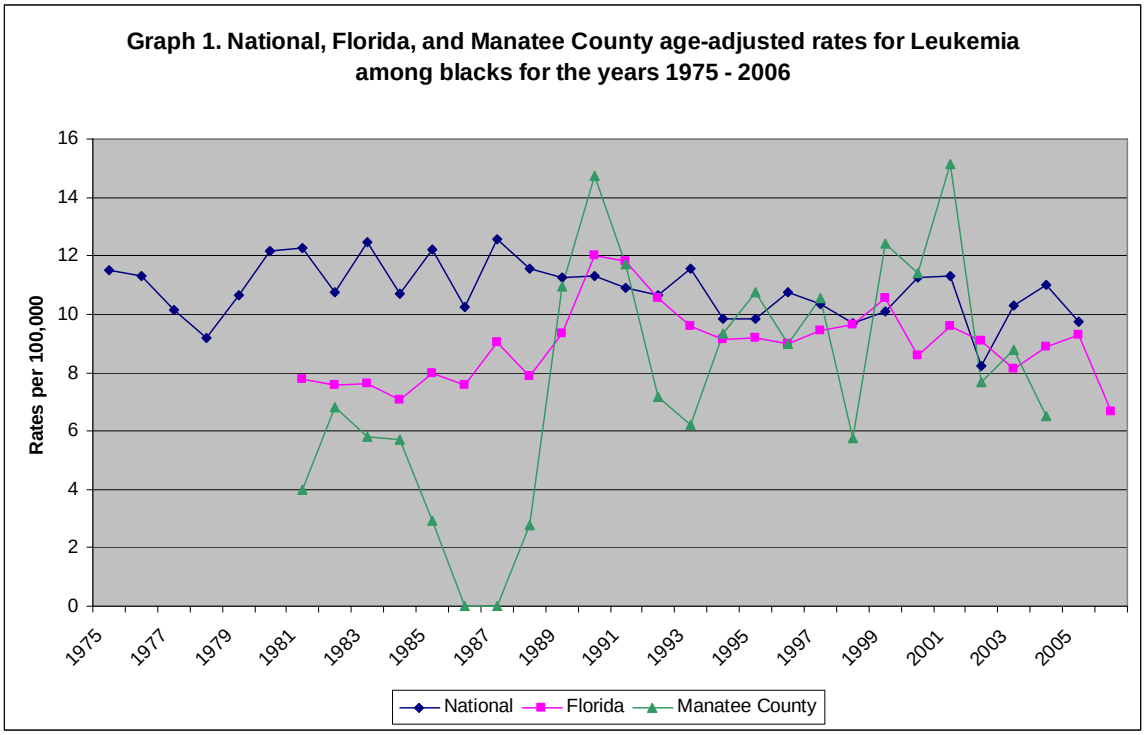
Table 15. Population of black Tallevast* residents according to the 2000 Census by gender and age			
	Males	*Females*	Total
Under 5 years	*12*	*1*	13
5 to 9 years	*4*	*11*	15
10 to 14 years	*11*	*13*	24
15 to 19 years	*10*	*10*	20
20 to 24 years	*5*	*4*	9
25 to 29 years	*0*	*6*	6
30 to 34 years	*5*	*3*	8
35 to 44 years	*14*	*15*	29
45 to 54 years	*18*	*23*	41
55 to 59 years	*8*	*4*	12
60 to 64 years	*8*	*10*	18
65 to 74 years	*9*	*9*	18
75 to 84 years	*2*	*6*	8
85 years and over	*1*	*1*	2
Total	107	116	223

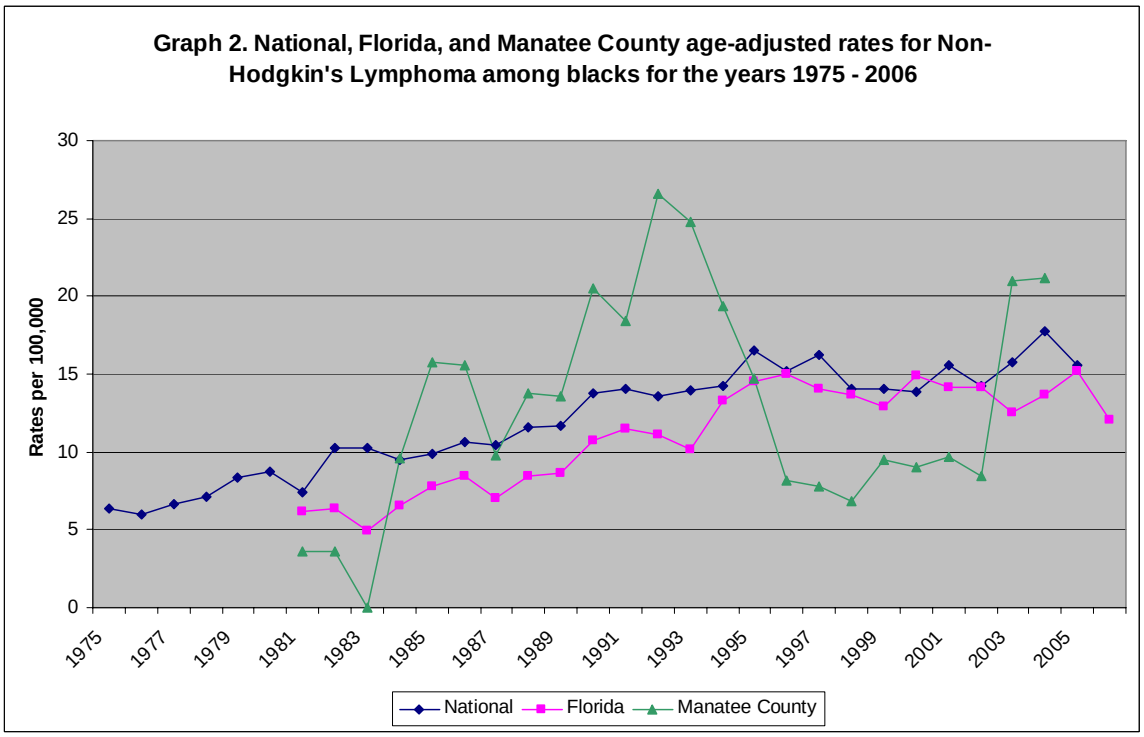
**The Tallevast area was defined using the following 2000 census geography: Tract 8.05 block 1038 and 1039; Tract 9.02 block 4000, 4020, 4021, 4022, and 4023*

Table 16. Age-adjusted standard incidence ratio for cancers* related to the chemicals of concern diagnosed in black Tallevast residents compared to the rest of the Florida black population (1981-2006)					
Cancer Type	*Observed # Cases*	*Expected # Cases*	*SIR*	*95% Confidence Limit*	
				Lower	*Upper*
Leukemia	*1*	*0.55*	*1.83*	*0.02*	*10.18*
Non-Hodgkin's Lymphoma	*1*	*0.74*	*1.35*	*0.02*	*7.53*
Liver Cancer [C22.0]	*0*	*0.30*	*0*	*---*	*---*
Kidney Cancer [C64.9, C65.9]	*0*	*0.64*	*0*	*---*	*---*
Urinary Bladder [C67.0-C67.9]	*1*	*0.61*	*1.65*	*0.02*	*9.16*
Lung and Bronchus [C34.0-C34.9]	*6*	*4.53*	*1.32*	*0.48*	*2.88*
Cervical [C53.0-C53.9]	*0*	*0.63*	*0*	*---*	*---*
Prostate [C61.9]	*10*	*6.16*	*1.62*	*0.78*	*2.99*

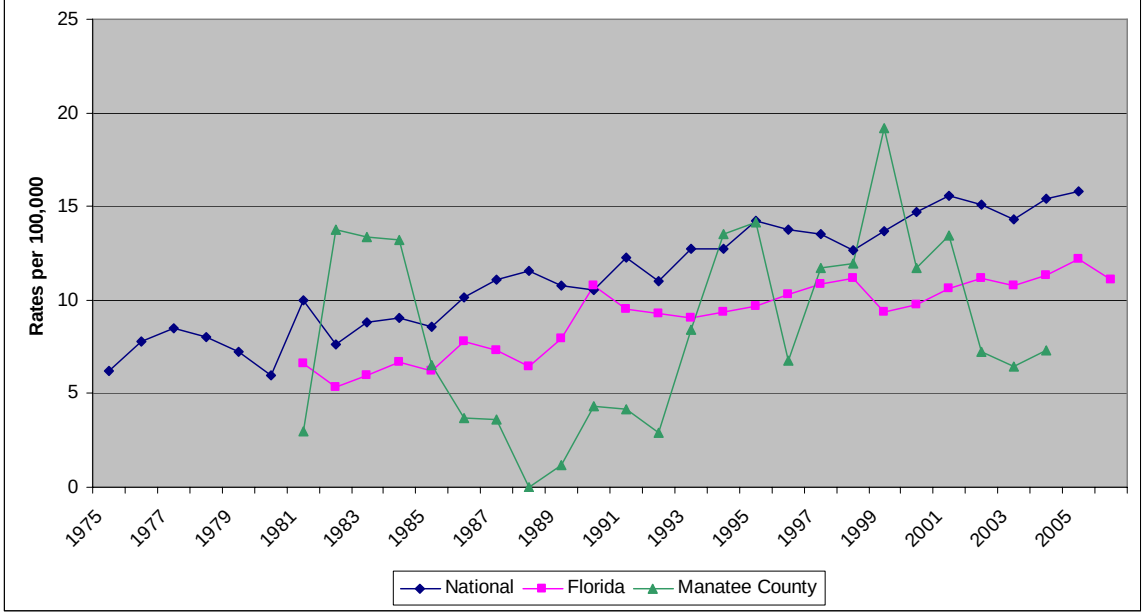
**Data sources included both the FCDS and Vital Statistics*

APPENDIX C (GRAPHS)

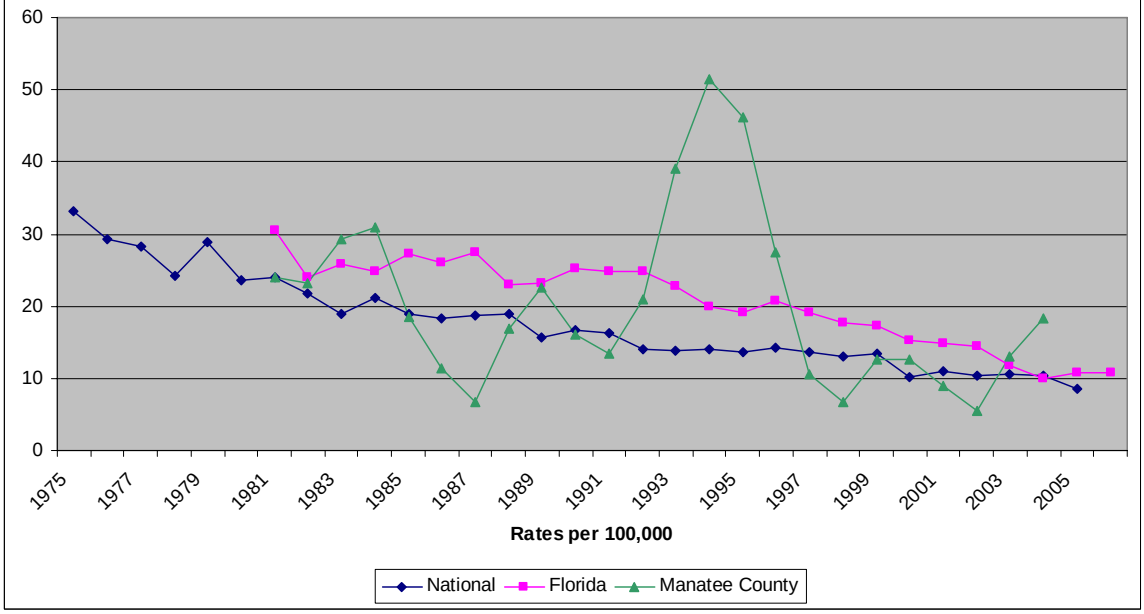




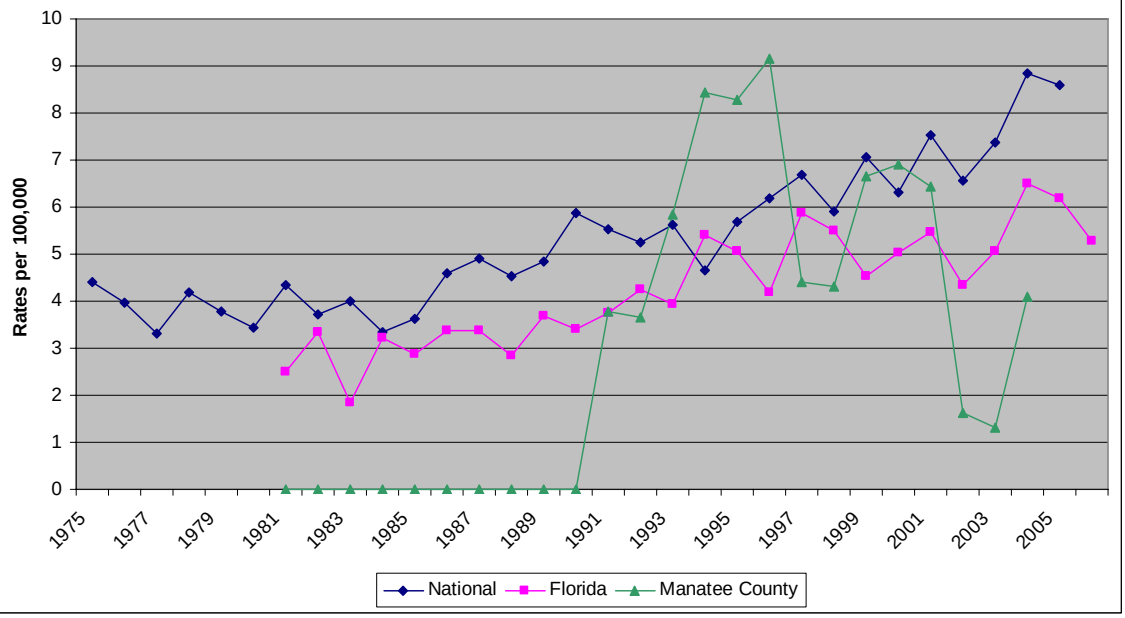
Graph 3. National, Florida, and Manatee County age-adjusted rates for Kidney cancer among blacks for the years 1975 - 2006



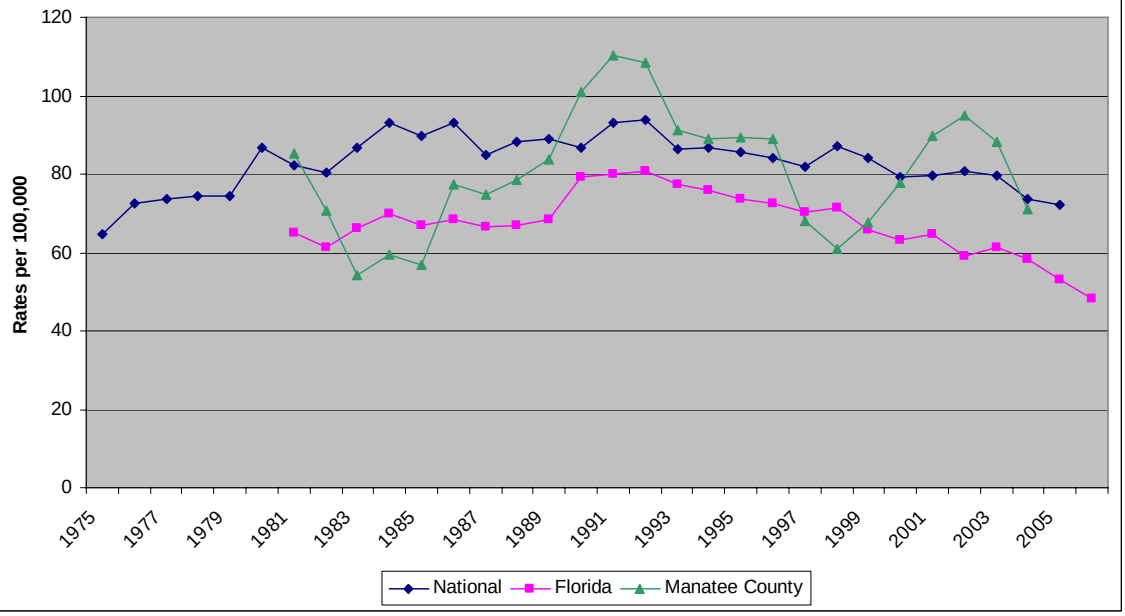
Graph 4. National, Florida, and Manatee County age-adjusted rates for Cervical cancer among blacks for the years 1975 - 2006



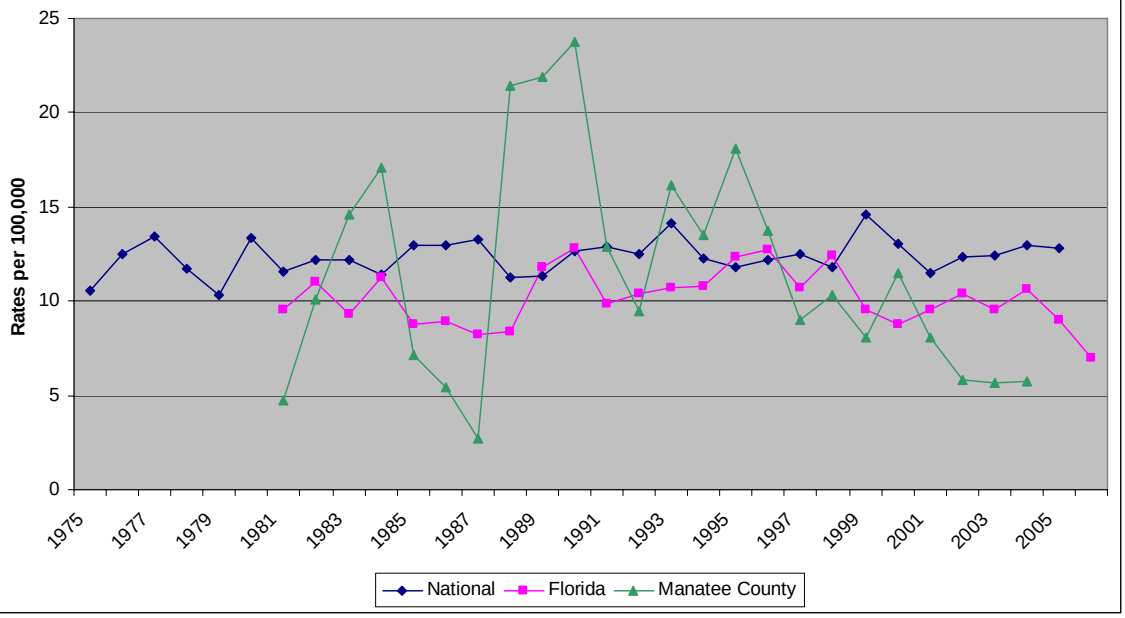
Graph 5. National, Florida, and Manatee County age-adjusted rates for Liver cancer among blacks for the years 1975 - 2006



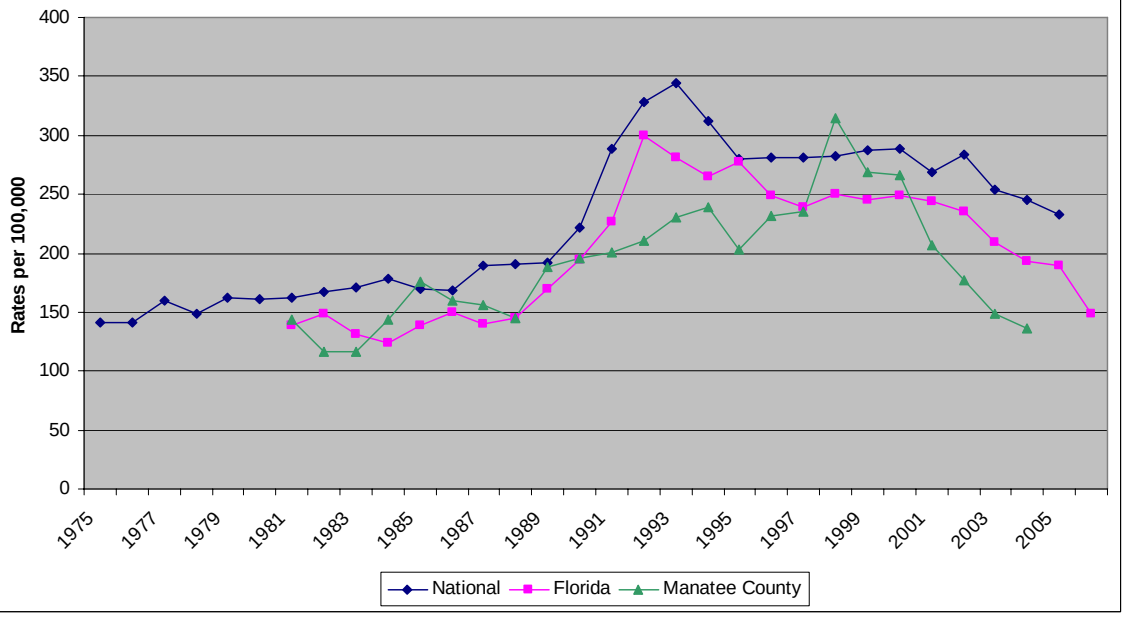
Graph 6. National, Florida, and Manatee County age-adjusted rates for Lung and Bronchus cancer among blacks for the years 1975 - 2006



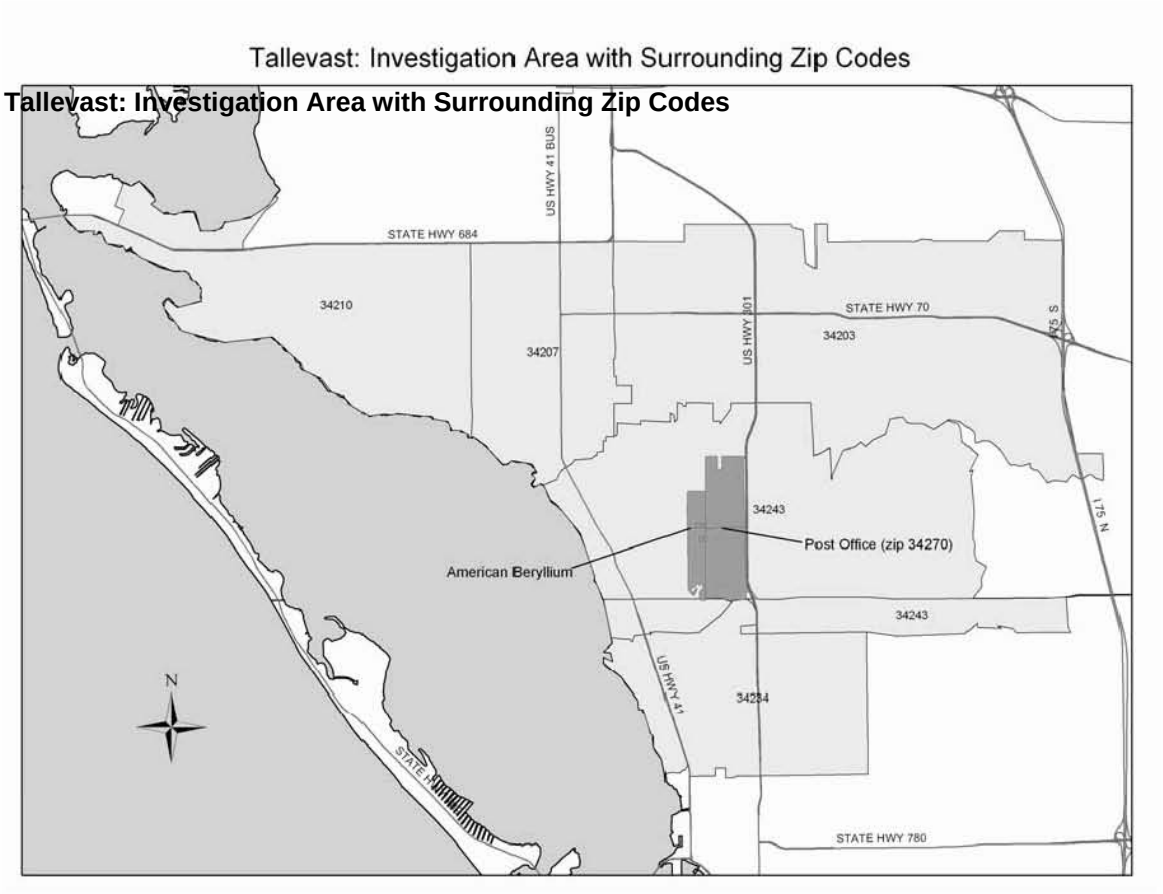
Graph 7. National, Florida, and Manatee County age-adjusted rates for Bladder cancer among blacks for the years 1975 - 2006



Graph 8. National, Florida, and Manatee County age-adjusted rates for Prostate cancer among blacks for the years 1975 - 2006



APPENDIX D (MAPS)



Tallevast: Investigation Area with Surrounding Zip Codes

Tallevast: Investigation area defined by 2000 census blocks