

**CHILDHOOD CANCER INCIDENCE UPDATE:**  
**A REVIEW AND ANALYSIS of**  
**CANCER REGISTRY DATA, 1979-2000,**  
**FOR**  
**DOVER TOWNSHIP (OCEAN COUNTY), NEW JERSEY**

**Technical Report**

**January 2003**



**Division of Epidemiology, Environmental and Occupational Health  
Consumer and Environmental Health Services**

**In Cooperation with the Agency for Toxic Substances and Disease Registry**

---

**James E. McGreevey**  
Governor

**Clifton R. Lacy, M.D.**  
Commissioner

# **CHILDHOOD CANCER INCIDENCE UPDATE:**

## **A REVIEW AND ANALYSIS OF CANCER REGISTRY DATA, 1979-2000,**

**FOR**

## **DOVER TOWNSHIP (OCEAN COUNTY), NEW JERSEY**

Final Technical Report prepared by:

Michael Berry  
Patricia Haltmeier  
Jerald Fagliano

New Jersey Department of Health and Senior Services  
Division of Epidemiology, Environmental and Occupational Health  
Consumer and Environmental Health Services

**January 2003**

This activity was partially funded by the federal Agency for Toxic Substances and Disease Registry, Grant Number U50/ATU200012-15.

**TABLE OF CONTENTS**

BACKGROUND AND STATEMENT OF ISSUES . . . . .	1
METHODS . . . . .	3
Study time period and case definition . . . . .	3
Cancers to be evaluated . . . . .	3
Cancer incidence data . . . . .	4
Data analysis . . . . .	5
RESULTS . . . . .	9
Dover Township SIR Analyses . . . . .	10
Toms River SIR Analyses . . . . .	12
Census Tract SIR Analyses . . . . .	13
Time Trends . . . . .	13
CONCLUSIONS . . . . .	15
RECOMMENDATIONS . . . . .	17
REFERENCES . . . . .	19
FIGURES . . . . .	21
TABLES . . . . .	29
APPENDIX I . . . . .	51

# CHILDHOOD CANCER INCIDENCE UPDATE

## BACKGROUND AND STATEMENT OF ISSUES

This report is an update to the 1997 *Childhood Cancer Incidence Health Consultation: A Review and Analysis of Cancer Registry Data, 1979-1995 for Dover Township (Ocean County), New Jersey*<sup>1</sup> assembled by the New Jersey Department of Health and Senior Services (NJDHSS) in cooperation with the federal Agency for Toxic Substances and Disease Registry (ATSDR). The results of the 1997 Health Consultation demonstrated that childhood cancer incidence for selected cancer groupings was significantly higher than expected for Dover Township and the Toms River section of the Township. This was true for leukemia and brain and central nervous system (CNS) cancer, especially for female children under five years of age. These results, in conjunction with other Health Assessments and Consultations, which evaluated potential exposure to environmental contamination in the community, provided the basis for the recently completed case-control study to evaluate potential risk factors for childhood cancer in Dover Township.

This Health Consultation updates childhood cancer statistics for Dover Township. It was a recommendation from the public comment draft of the report, *Case-control Study of Childhood Cancers in Dover Township (Ocean County), New Jersey*<sup>2</sup>, to review an additional five years<sup>2</sup> of cancer incidence data (1996-2000) in order to determine if there are any changes in incidence rates or time trends in the Township.

## **METHODS**

### **Study Time Period and Case Definition**

The period evaluated for the updated Health Consultation was January 1, 1979, through December 31, 2000, with a primary focus on the most recent five years of observation (1996-2000). Incidence data from 1979-1995 (the original Health Consultation time period) were also re-evaluated using population census data from 1980, 1990 and 2000. State incidence rates were recalculated to ensure the accuracy of the re-analysis. In addition, time trends were evaluated over the 22 years of available State cancer information.

A "case" was defined as an individual diagnosed with a new primary cancer or reportable condition during the evaluation period, who was under age 20 and was a resident of Dover Township at the time of diagnosis.

### **Cancers to be Evaluated**

All childhood cancers combined and groupings of selected childhood cancer types as defined by the International Classification of Childhood Cancer<sup>3,4</sup> using the International Classification of Diseases for Oncology, Second Edition<sup>5</sup> (ICD-O-2) were evaluated and include: total childhood cancer, brain and central nervous system (CNS) cancers, astrocytoma, sympathetic nervous system tumors, neuroblastoma, Wilms' tumor, malignant bone cancer, soft tissue sarcomas, total leukemia, acute lymphocytic leukemia, lymphoma and other reticuloendothelial neoplasms, Hodgkin's disease, and non-Hodgkin's lymphoma. A list of the ICD-O-2 codes used for the groups can be found in the original Health Consultation<sup>1</sup>.

## **Cancer Incidence Data**

Cancer cases were identified through the New Jersey State Cancer Registry (NJSCR). The NJSCR, operated by the NJDHSS, is a population-based cancer incidence registry covering the entire state of New Jersey. New Jersey regulations require reporting of all primary malignant and in-situ neoplasms, except for certain carcinomas of the skin and, since 1995, carcinoma in-situ of the cervix. The NJSCR collects and analyzes data in accordance with the standards set by the North American Association of Central Cancer Registries and the National Cancer Institute. Reports are filed by hospitals, diagnosing physicians, dentists, and independent clinical laboratories. In addition, the NJSCR has reporting agreements with the states of New York, Pennsylvania, Delaware, and Florida where information on New Jersey residents who are diagnosed in those states is supplied to the NJSCR. The Registry has been in operation since October 1, 1978.

The information collected by the NJSCR includes basic patient identification, demographic characteristics of the patient (date of birth, race, sex, age at diagnosis, address at diagnosis), medical information on each cancer diagnosis (including anatomical site, histological type and summary stage of disease), and annual follow-up status (alive/deceased). Information is collected and defined in accordance with the National Cancer Institute's SEER (Surveillance, Epidemiology, and End Results) Program. These data, along with the date and underlying cause of death (where applicable) are incorporated into the basic source data set.

All records meeting case definitions for this analysis were verified by NJSCR

staff for accuracy and edited for errors using standardized edit routines provided by the North American Association of Central Cancer Registries.

The NJSCR prepared a final data set of cases meeting the case definition and provided that file to the Consumer and Environmental Health Services (CEHS). CEHS staff evaluated all Ocean County cases to ensure accurate assignment to the appropriate municipality using county street maps. Dover Township cases were further geo-coded to their correct census tract (see Figure 1).

### **Data Analysis**

Standardized Incidence Ratios (SIR) were used for the quantitative analysis of childhood cancer incidence in the evaluation areas.<sup>6</sup> The SIR is calculated by dividing the observed number of cases (from the NJSCR) by an expected number for the study population over the time period reviewed.

$$\text{SIR} = \text{Observed cases} \div \text{Expected cases}$$

SIRs were calculated for Dover Township and the Toms River section of the Township. For purposes of analysis, Toms River was defined as the population residing within four census tracts: 228, 231, 232, and 236 (see Figure 1). This designation of Toms River was developed prior to review of any cancer data, was meant to approximate the historical area of this section of Dover Township, and is identical to the area used to define Toms River in the 1997 Health Consultation.

In order to parallel the earlier Health Consultation, SIRs were calculated for each cancer grouping by all age groups combined (0-19) and the youngest age group (0-4) separately. In addition, SIRs were calculated for males, females, and the total

childhood population.

The expected numbers were calculated using average annual State of New Jersey age-sex-specific incidence rates for the cancer site groupings based on statewide NJSCR data from 1979 to 1995, and from 1996 to 1999. At the time this analysis was initiated, these years of NJSCR data were considered the most complete for calculation of State rates. The size and age structure of the population was estimated using U.S. Census data<sup>7-9</sup> for each study area. Annual population estimates for each of four 5-year age groups (0-4, 5-9, 10-14, and 15-19) were derived by linear interpolation and extrapolation of the 1980, 1990, and 2000 population data. Person-time estimates were made by summing the age-group specific populations over the 17-year (1979-1995) and 5-year (1996-2000) periods. The formula for deriving the expected number of cases is shown below.

$$\sum_{i=1}^4 (\text{age-specific rate}_i) \times (\text{age group person-time}_i)$$

Evaluation of the observed and expected numbers was accomplished by interpreting the ratio (i.e., SIR) of these numbers. If the observed number of cases equals the expected number of cases, the SIR will equal one (1.0). When the SIR is less than one, we conclude that fewer cases were observed than expected. Should the SIR be greater than one, more cases than expected were observed.

Random fluctuations may account for some SIR deviations from 1.0. The statistical significance of deviations from SIR=1.0 was evaluated using a 95% confidence interval<sup>9</sup> (C.I.). The 95% C.I. was used to evaluate the probability that the

SIR may be greater or less than 1.0 due to chance alone. The upper and lower limits were calculated as follows using computational formulas which accurately approximate the exact test for the Poisson distribution.<sup>10,11</sup>

Lower limit of the SIR:

$$\frac{\text{Obs} \times [1 - (1 \div (9 \times \text{Obs})) - (Z_{\alpha/2} \div (3 \times \text{Obs}^{0.5}))]}{\text{Exp}}]^3$$

Upper limit of the SIR:

$$\frac{(\text{Obs} + 1) \times [1 - (1 \div (9 \times (\text{Obs} + 1))) + (Z_{\alpha/2} \div (3 \times (\text{Obs} + 1)^{0.5}))]}{\text{Exp}}]^3$$

If the 95% confidence interval includes 1.0, then the SIR is not considered to be significantly different from 1.0. The analysis was facilitated using customized data management files designed by NJDHSS for this application.

Variation in cancer incidence over time was also evaluated using three-year running average rates calculated for all cancers combined, leukemia, and brain and central nervous system cancers. For comparison purposes, this analysis was also conducted for the State as a whole. Twenty three-year running average rates were computed for the State, Dover Township, and Toms River by dividing the number of cases by the person-time of observation in each three-year interval beginning with 1979-1981 and ending with 1998-2000.

## RESULTS

According to the Census data (Appendix I), the total childhood population in Dover Township remained stable in Dover Township from 1980 to 1990 (20,840 to 20,857) and increased ten percent (to 22,933) from 1990 to 2000. In the Toms River section of the Township, the total childhood population decreased over 16 percent from 1980 to 1990 (4,927 to 4,119) and then increased nearly 12 percent (to 4,599) from 1990 to 2000. As a comparison, the New Jersey childhood population decreased 11 percent from 1980 to 1990 (2,248,242 to 1,996,796) and then increased about 15 percent (to 2,284,107) from 1990 to 2000.

Person-year estimates by sex for Dover Township and Toms River are summed over the two evaluation periods (1979-1995 and 1996-2000) and presented in Table 1. The proportion of Toms River person-years remained similar over each of the study periods, representing about 20 percent of the overall Dover Township study person-time.

Table 2 provides an enumeration of total childhood cancer incidence by year of diagnosis for Dover Township and Toms River. The total number of incident cancers reported to the NJSCR for Dover Township during each time period, 1979-1995 and 1996-2000, was 87 (an average of 5.1 cases per year) and 25 (an average of 5.0 cases per year), respectively. The total number of incident cancers reported for Toms River during each time period was 24 (an average of 1.4 cases per year) and 5 (an average of 1.0 cases per year), respectively.

Table 3 provides an enumeration of total childhood cancer cases by age group,

race, and sex for Dover Township and Toms River. Of note, for Dover Township the number of cases in the youngest age group (0-4) dropped from 26 percent to 16 percent respectively for the 1979-1995 and the 1996-2000 time periods. The drop in cases in the youngest age group was more notable for the Toms River section changing from 50 percent during the 1979-1995 period to zero in the most recent (1996-2000) time period. For each of the time periods, cases tended to be white and fairly evenly split by sex.

### **Dover Township SIR Analyses**

Table 4 presents the Dover Township cases by cancer grouping and analysis period. A total of 87 cases of cancer (41 males and 46 females) were diagnosed for Dover Township during the 1979-1995 period. The most frequently diagnosed cancers for the Township over this period include leukemia (21 total, including 17 acute lymphocytic leukemia), brain and CNS cancers (12 total, including 5 astrocytoma), and soft tissue sarcomas (7).

The 87 cases (Table 4) diagnosed for Dover Township over the 17-year period, 1979-1995, is three less than reported in the 1997 Health Consultation. The drop in case numbers was due to a subsequent change of status of four cases, two of which actually were diagnosed while resident of another municipality and two of which were found to be over age 20 at the time of their diagnosis, and the addition of one case which was not identified in the earlier report.

Table 5 presents a summary of select SIRs for Dover Township during each period of analysis. For the 17-year period (1979-1995), the newly recalculated SIRs

were virtually the same as the those presented in the 1997 Health Consultation. Consequently, only these select SIRs are presented in this report for comparison purposes. As in the earlier Health Consultation, all cancers combined for the total childhood population, all cancers combined in females, and acute lymphocytic leukemia in females were statistically elevated for the period 1979-1995 with SIRs ranging from 1.3 to 3.3.

For the 1996-2000 period of analysis, 25 cases of cancer (12 males and 13 females) were diagnosed for Dover Township (Table 4). The most frequently diagnosed cancers for the Township over this period include leukemia (7 total, including 5 acute lymphocytic leukemia), brain and CNS cancers (4 total, including 3 astrocytoma), malignant bone cancer (3), and soft tissue sarcomas (3).

Tables 6 and 7 present the results of the Dover Township SIR analysis for the time period 1996-2000. While none of the SIRs for the most recent time period were statistically significant, several SIRs with more than one case were elevated two-fold or higher. For all ages combined, the elevated SIRs include astrocytoma in females (3 cases; SIR = 4.4; 95% CI = 0.88, 12.8), bone cancer in females (2 cases; SIR = 3.7; 95% CI = 0.42, 13.5), non-Hodgkin's lymphoma in males (2 cases; SIR = 3.0; 95% CI = 0.34, 10.8), Hodgkin's disease in females (2 cases; SIR = 2.1; 95% CI = 0.23, 7.42), and acute lymphocytic leukemia in females (3 cases; SIR = 2.0; 95% CI = 0.40, 5.83). For children diagnosed under age five, acute lymphocytic leukemia in females was elevated more than two-fold (2 cases; SIR = 2.9; 95% CI = 0.32, 10.4).

A comparison between the statistically elevated SIRs for Dover Township for the 1979-1995 period and the SIRs for the 1996-2000 period shows that the SIRs have decreased. However, the magnitude of the SIRs are similar between the two periods, especially for acute lymphocytic leukemia in females (Table 5).

### **Toms River SIR Analyses**

Table 8 presents the Toms River section of the Township cases by cancer grouping and period of analysis. A total of 24 cases of cancer (12 males and 12 females) were diagnosed for Toms River during the 1979-1995 period. The most frequently diagnosed cancers over this period include leukemia (6 total, including 5 acute lymphocytic leukemia) and brain and CNS cancers (6 total, including 3 astrocytoma).

Table 9 presents a summary of select SIRs for Toms River during each period. For the 17-year period, 1979-1995, the newly recalculated SIRs were virtually the same as the those presented in the 1997 Health Consultation. Consequently, only these select SIRs are presented in this report for comparison purposes. As in the earlier Health Consultation, all cancers combined for the total childhood population, brain/CNS cancer in female children under age five, astrocytoma in the total childhood population under age five, and acute lymphocytic leukemia in females under age five remained statistically elevated for the period 1979-1995 with SIRs ranging from 1.7 to 11.3.

Tables 10 and 11 present the results of the Toms River SIR analysis for the time period 1996-2000. While none of the SIRs for this time period were statistically

significant, one SIR with more than one case was elevated more than two-fold: all leukemia in males, all ages combined (2 cases; SIR = 3.4; 95% CI = 0.38, 12.2). As indicated in Table 11, no children under age five were diagnosed with cancer in Toms River for this time period.

A comparison between the statistically elevated SIRs for Toms River for the 1979-1995 period and the SIRs for the 1996-2000 period shows a substantial decrease in the magnitude of the SIRs, primarily due to the drop in cases under age five (Table 9).

### **Census Tract SIR Analyses**

Table 12 presents SIR results for all cancers combined by the 17 full census tracts of the Township (see Figure 1) and the remainder of the population outside those census tracts, primarily Ortley Beach and Pelican Island. Although none of the individual tracts were statistically elevated, census tract 228 (part of the Toms River section of the Township) had the highest ratio (8 cases; SIR = 1.9; 95% CI = 0.82, 3.75). Census tract 227 had the most cases (19), 50 percent higher than expected (SIR = 1.5; 95% CI = 0.89, 2.30).

### **Time Trends**

The three-year running average rates for all childhood cancers combined, leukemia, and brain/CNS cancer are presented in Tables 13 through 15 and Figures 2 through 4. For comparison, similarly derived rates for the State are also presented. For all cancers combined, the State rate rose slightly over most of the 22 year period and then dropped slightly in the late-1990s (Table 13 and Figure 2).

Dover Township rates begin rising above the State rates from the 1985 midpoint through the 1995 midpoint. The Dover Township rates appear to again rise above the state rates in the late-1990s. The Toms River rates display the most variability over the 22 years (due to the smaller number of cases) with the highest rates in the late-1980s.

Leukemia incidence (Table 14 and Figure 3) remained relatively constant for the State over the 22 year period. Because of the smaller numbers, leukemia rates in Dover Township displayed the most variability, with higher incidence during the mid to late 1980s and the most recent three-year period.

State brain and CNS cancer rates (Table 15 and Figure 4) rose slightly at the beginning of the study period, then remained stable through the rest of the time period. Dover Township again displayed much variability for brain and CNS cancer over the 22-year period with wide swings in the 3-year average rates above and below the state average rates.

## CONCLUSIONS

Excess childhood cancer incidence over the earlier period of analysis (1979-1995) was reconfirmed in Dover Township for all cancers combined and leukemia (specifically acute lymphocytic leukemia), and in Toms River for all cancers combined, brain and CNS cancer (including astrocytoma), and leukemia (specifically acute lymphocytic leukemia). The excess cases in Toms River occurred almost entirely in children under five years of age. Toms River had a higher proportion of cases in younger children than all of Dover Township combined or Ocean County.

While none of the SIRs for Dover Township were statistically significant during the later period of analysis (1996-2000), the magnitude of those SIRs were similar to many of the statistically elevated SIRs during the earlier study period (1979-1995). Because of the small number of cases (25) diagnosed in the last five-year period, it is difficult at this time to determine with a reasonable degree of accuracy whether or not the incidence of childhood cancer in the Township is declining.

For the Toms River section of the Township during the 1996-2000 period, the small number of childhood cancer cases (5, with no cases in children under age five) is an indication that childhood cancer incidence rates, especially for the youngest age group, may be declining.

The time trend analyses provide evidence of the variability in cancer incidence when evaluated in relatively small populations. While cancer incidence rate peaks were found for Dover Township during certain periods, especially the mid to late 1980s, it is not clear whether the elevation in the most recent three-year period

(1998-2000) represents random variability or continued elevated risk. However, interpretation of these data should be done cautiously, especially because of the small number of cases diagnosed in any given year.

## **RECOMMENDATIONS**

1. The NJDHSS should continue its childhood cancer surveillance in Dover Township, updating this report when an additional five years of cancer incidence data (2001-2005) is available from the New Jersey State Cancer Registry.
  2. ATSDR and NJDHSS should continue their educational and outreach efforts in Dover Township.
-

## REFERENCES

1. Berry, M and Haltmeier, P: Childhood Cancer Incidence Health Consultation: A Review and Analysis of Cancer Registry Data, 1979-1995, for Dover Township (Ocean County), New Jersey. New Jersey Department of Health and Senior Services, Trenton, New Jersey, 1997.
2. NJDHSS and ATSDR: Case-control Study of Childhood Cancers in Dover Township (Ocean County), New Jersey. Public Comment Draft Technical Report, Trenton, New Jersey, 2001.
3. Kramarova, E., Stiller, C.A., Ferlay, J., Parkin, D.M., Draper, G.J., Michaelis, J., Neglia, J., Qureshi, S. (eds.): International Classification of Childhood Cancer 1996. IARC Technical Report No. 29, International Agency for Research on Cancer, Lyon, 1996.
4. Kramarova, E. and Stiller, C.A.: The International Classification of Childhood Cancer. *Int. J. Cancer*: 68, 759-765, 1996.
5. World Health Organization: International Classification of Diseases for Oncology, Second Edition, 1990.
6. Kelsey, J.L., Thompson, W.D., and Evans, A.S.: *Methods in Observational Epidemiology*, B. MacMahon, ed. Monographs in Epidemiology and Biostatistics Vol. 10, Oxford University Press, Oxford, 1986.
7. United States Department of Commerce, Bureau of the Census: Population Census Report, General Population Characteristics, 1980.
8. United States Department of Commerce, Bureau of the Census: Population Census Report, General Population Characteristics, 1990.
9. United States Department of Commerce, Bureau of the Census: Population Census Report, General Population Characteristics, 2000.
10. Breslow, N.E. and Day, N.E.: *Statistical Methods in Cancer Research: Vol II- The Design and Analysis of Cohort Studies*, E. Heseltine, ed. IARC Scientific Publication No. 82, International Agency for Research on Cancer, Lyon, 1987.
11. Checkoway, H., Pearce, N.E., and Crawford-Brown, D.J.: *Research Methods in Occupational Epidemiology*, B. MacMahon, ed. Monographs in Epidemiology and Biostatistics Vol. 13, Oxford University Press, Oxford, 1989.

# FIGURES

Figure 1 Dover Township and Toms River Section (shaded)

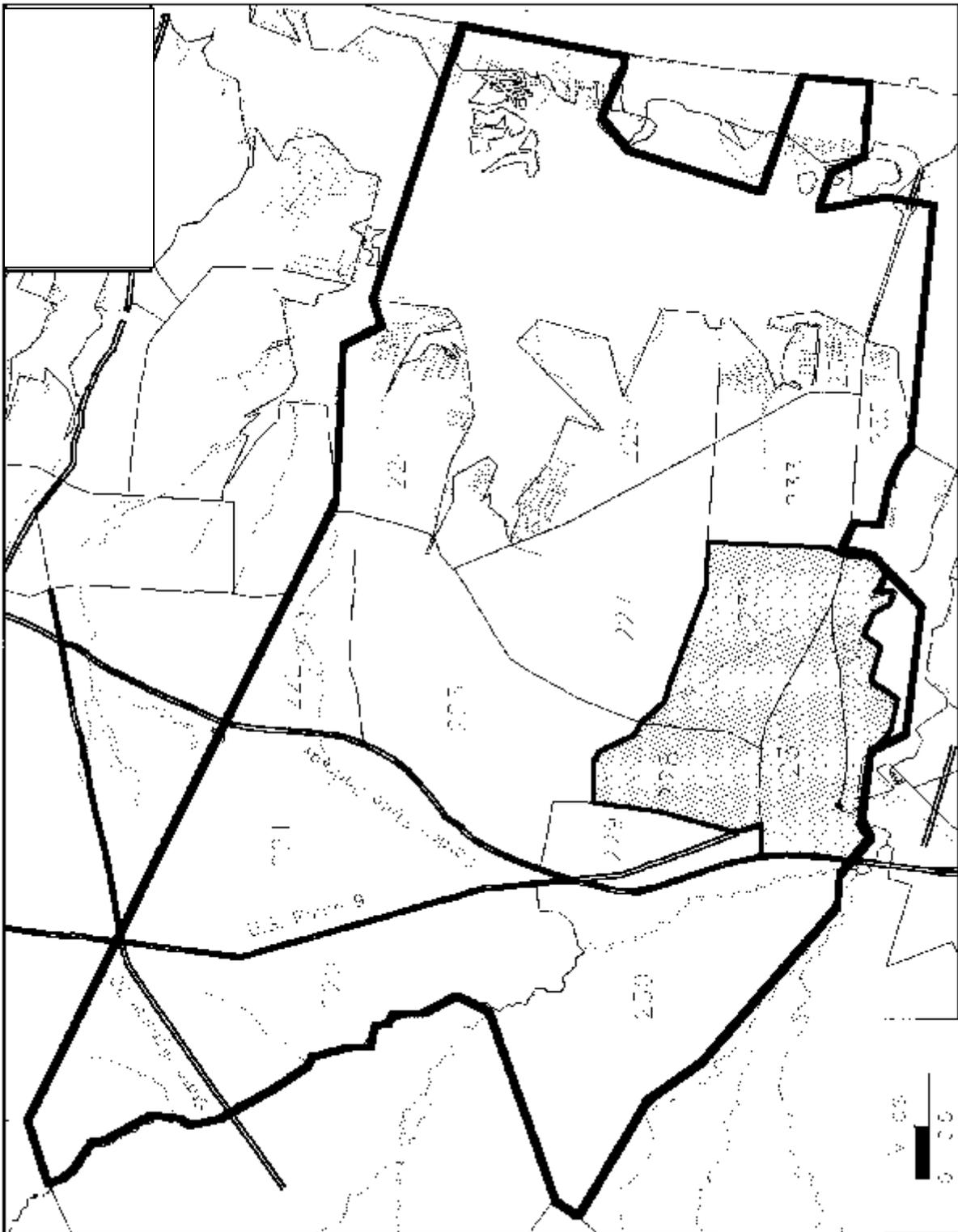


Figure 2

3-Year Average Cancer Rates: All Cancer Combined

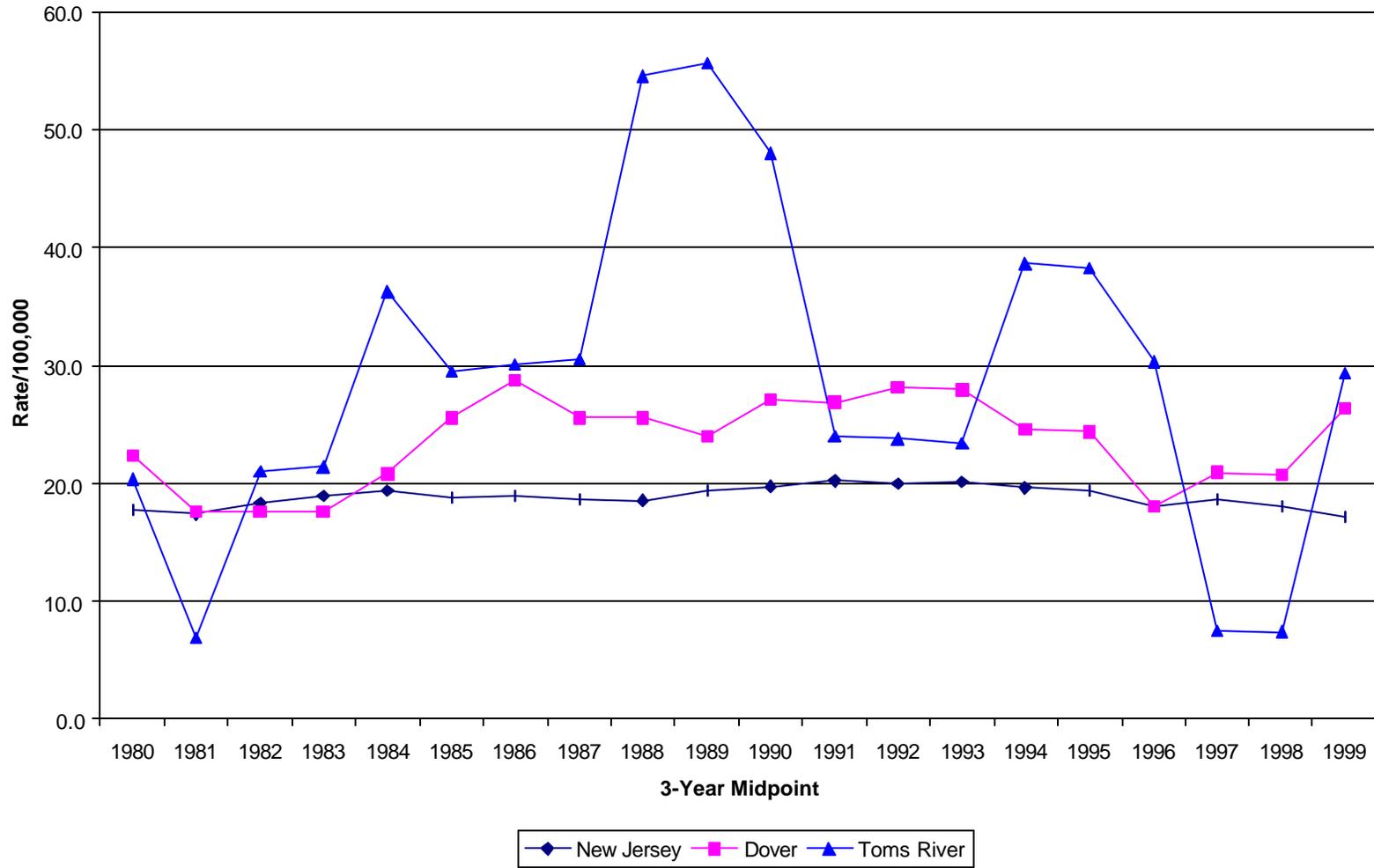


Figure 3

3-Year Average Leukemia Rates

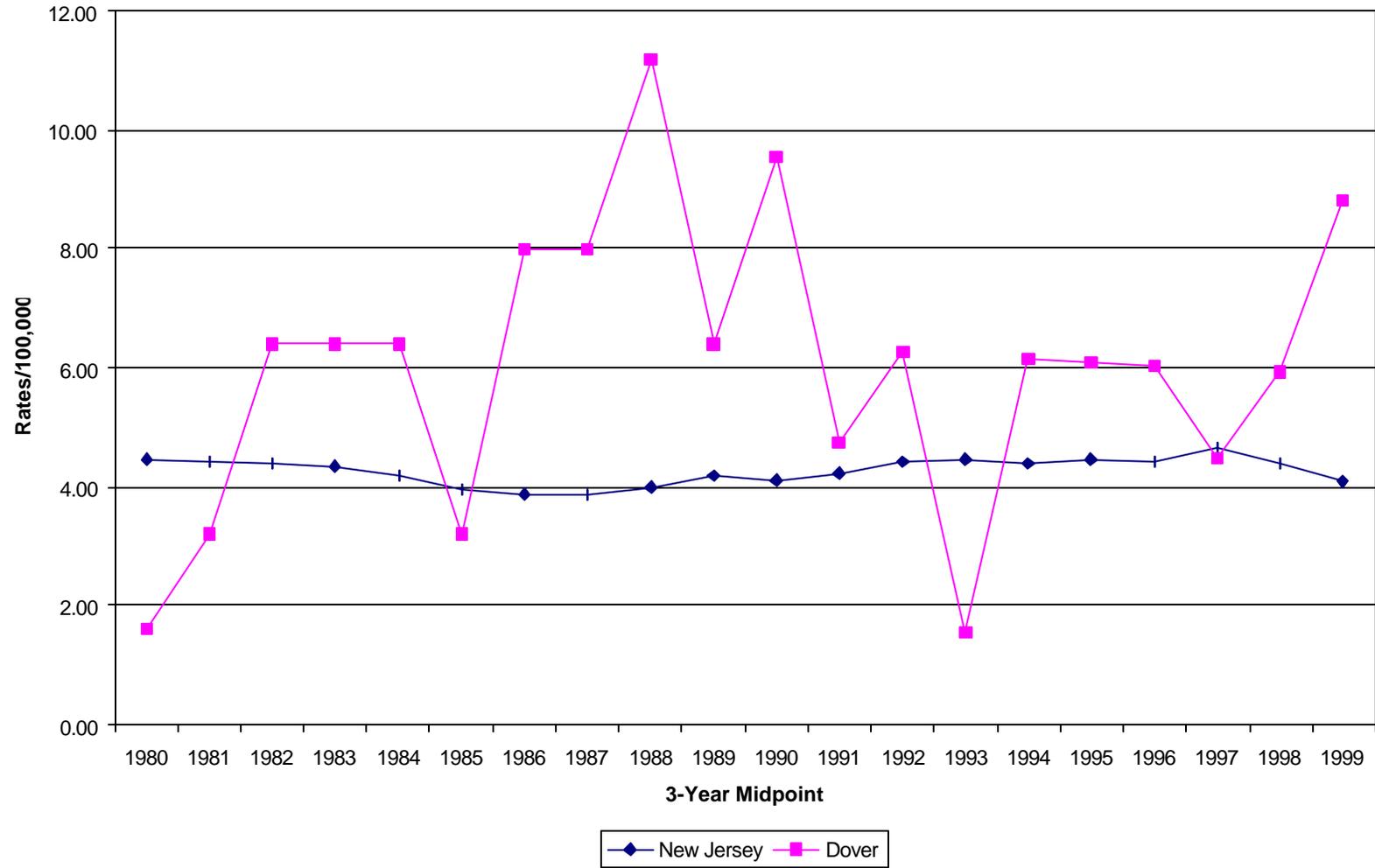
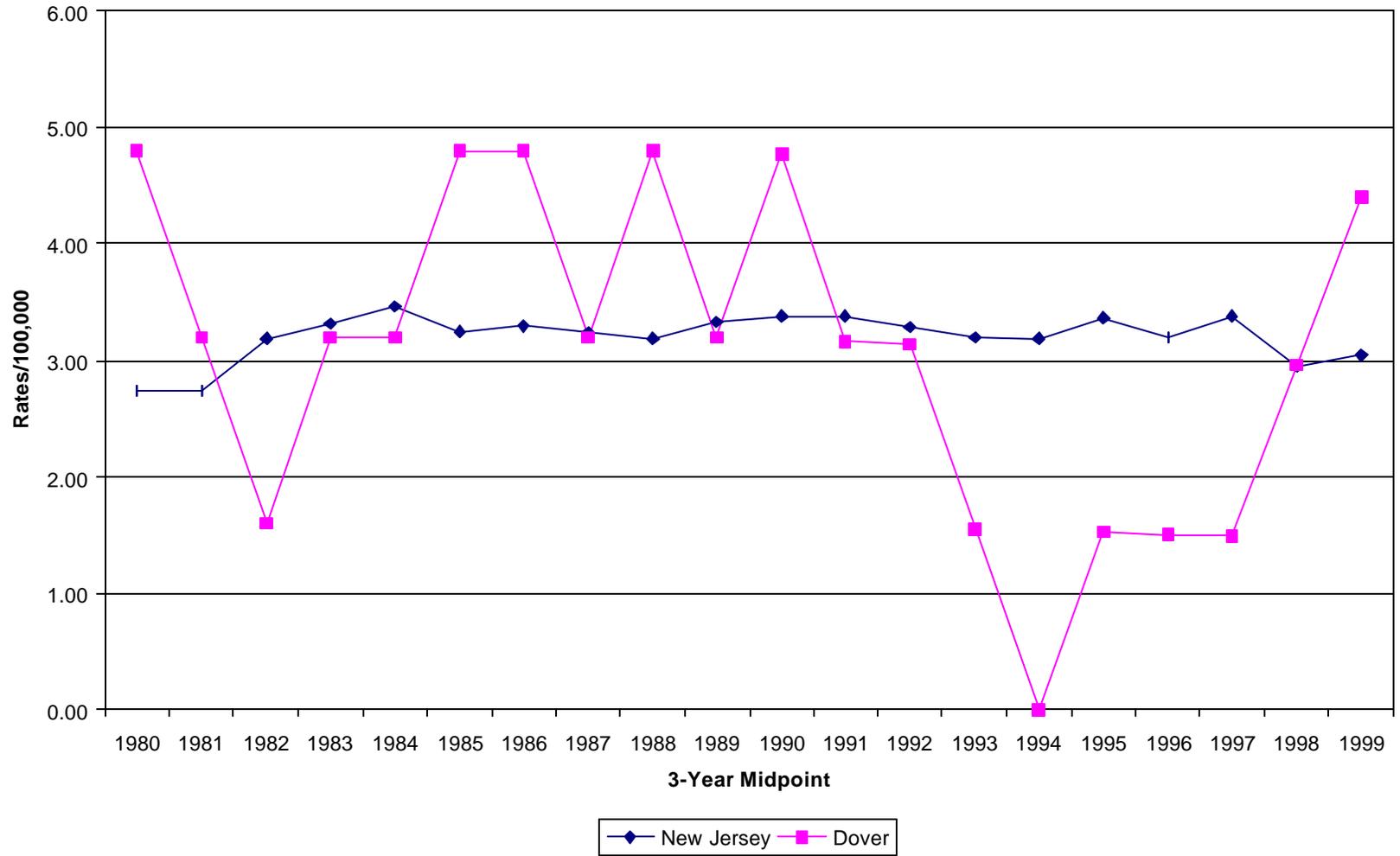


Figure 4

3-Year Average Brain/CNS Rates



# TABLES

**TABLE 1**

**Person-years for the Time Periods 1979-1995 and 1996-2000  
Dover Township and Toms River (Census Tracts 228, 231, 232, and 236)  
Using 1980, 1990 and 2000 U.S. Census Bureau Data**

	<b>Age Range</b>	<b>Dover Township</b>	<b>Toms River</b>
<b>1979-1995 Total:</b>	0 - 4	77,036	15,778
	5 - 9	88,550	18,627
	10 - 14	95,966	19,964
	<u>15 - 19</u>	<u>96,019</u>	<u>21,706</u>
	Total	357,571	76,076
<b>1979-1995 Male:</b>	0 - 4	38,561	7,930
	5 - 9	44,308	9,286
	10 - 14	48,164	10,004
	<u>15 - 19</u>	<u>47,945</u>	<u>10,804</u>
	Total	178,978	38,023
<b>1979-1995 Female:</b>	0 - 4	38,214	7,574
	5 - 9	44,201	9,171
	10 - 14	48,423	9,763
	<u>15 - 19</u>	<u>47,659</u>	<u>10,385</u>
	Total	178,498	36,891
<b>1996-2000 Total:</b>	0 - 4	24,604	5,005
	5 - 9	28,382	5,673
	10 - 14	30,523	5,844
	<u>15 - 19</u>	<u>29,080</u>	<u>5,993</u>
	Total	112,589	22,515
<b>1996-2000 Male:</b>	0 - 4	12,746	2,661
	5 - 9	14,411	2,891
	10 - 14	15,705	3,115
	<u>15 - 19</u>	<u>14,761</u>	<u>3,149</u>
	Total	57,623	11,816
<b>1996-2000 Female:</b>	0 - 4	11,858	2,344
	5 - 9	13,971	2,782
	10 - 14	14,818	2,729
	<u>15 - 19</u>	<u>14,319</u>	<u>2,844</u>
	Total	54,966	10,699

**TABLE 2**

**Childhood Cancer Incident Cases (0 to 19 Years)  
 Dover Township and Toms River (Census Tracts 228, 231, 232, and 236)  
 Year of Diagnosis 1979 Through 2000**

	<b>Dover Township</b>	<b>Toms River (part of Dover)</b>
<b>Diagnosis Year:</b>		
1979	7	2
1980	4	0
1981	3	1
1982	4	0
1983	4	2
1984	3	1
1985	6	2
1986	7	1
1987	5	1
1988	4	2
1989	7	4
1990	4	1
1991	6	1
1992	7	1
1993	5	1
1994	6	1
1995	5	3
<b>Total</b>	<b>87</b>	<b>24</b>
1996	5	1
1997	2	0
1998	7	0
1999	5	1
2000	6	3
<b>Total</b>	<b>25</b>	<b>5</b>

**TABLE 3**

**Childhood Cancer Incident Cases (0 to 19 Years)  
 Dover Township and Toms River (Census Tracts 228, 231, 232, and 236)  
 Age Group, Race, and Sex  
 1979 Through 2000**

	<b>Dover Township</b>	<b>Toms River (part of Dover)</b>
<b>Age Group (1979-1995):</b>		
0 - 4	23	12
5 - 9	13	4
10 - 14	14	2
15 - 19	37	6
<b>Race (1979-1995):</b>		
White	85	24
Black	1	0
Other/Unknown	1	0
<b>Sex (1979-1995):</b>		
Male	41	12
Female	46	12
<b>Age Group (1996-2000):</b>		
0 - 4	4	0
5 - 9	2	1
10 - 14	8	2
15 - 19	11	2
<b>Race (1996-2000):</b>		
White	25	5
Black	0	0
Other/Unknown	0	0
<b>Sex (1996-2000):</b>		
Male	12	4
Female	13	1

TABLE 4

Dover Township Childhood Cancer Incident Cases (0 to 19 Years)

Disease Grouping	1979 - 1995		1996 - 2000	
	Male	Female	Male	Female
Malignant Bone Tumors	3	1	1	2
Brain/Central Nervous System (Astrocytoma)	8 (4)	4 (1)	1 (0)	3 (3)
Retinoblastoma	0	0	0	0
Sympathetic Nervous System (Neuroblastoma)	3 (3)	1 (1)	0 (0)	1 (1)
Hodgkin's Disease	4	2	0	2
Non-Hodgkin's Lymphoma	3	2	2	0
Other Lymphomas	2	0	1	0
Leukemia (Acute Lymphocytic Leukemia)	8 (5)	13 (12)	3	4 (3)
Melanoma	0	3	0	0
Skin	0	0	0 (2)	0
Hepatic Tumors	0	0	0	0
Renal Tumors (Wilms' Tumor)	1 (1)	2 (1)	0	0 (0)
Thyroid	1	0	1	0
Nasopharyngeal Carcinomas	3	4	2 (0)	1
Soft Tissue Sarcomas	3	2	1	0
Germ Cell/Trophoblastic	0	1	0	0
Other Benign/Borderline	0	5	0	0
In Situ Cancers	1	4	0	0
Other/Unspecified				
<b>Total</b>	<b>41</b>	<b>46</b>	<b>12</b>	<b>13</b>

**Note:** The parenthetical numbers are a subset of the rows directly above them.

**TABLE 5**

**Dover Township: Summary of Select SIRs**

Cancer Type	Age Group	Sex	Number Observed	Number Expected	SIR	95% C.I. Lower-Upper
<b>Study Period: 1979-1995</b>						
All Types	0-19	Both	87	67.0	1.3*	1.04 - 1.60
All Types	0-19	Female	46	33.2	1.4*	1.01 - 1.85
All Types	0-4	Female	14	7.7	1.8	0.99 - 3.04
Acute Lymphocytic Leukemia	0-19	Female	12	4.6	2.6*	1.34 - 4.53
Acute Lymphocytic Leukemia	0-4	Female	7	2.2	3.3*	1.30 - 6.70
<b>Study Period: 1996-2000</b>						
All Types	0-19	Both	25	20.6	1.2	0.78 - 1.79
All Types	0-19	Female	13	9.4	1.4	0.74 - 2.37
All Types	0-4	Female	3	2.2	1.4	0.28 - 4.02
Acute Lymphocytic Leukemia	0-19	Female	3	1.5	2.0	0.40 - 5.83
Acute Lymphocytic Leukemia	0-4	Female	2	0.7	2.9	0.32 - 10.4

\* Statistically elevated,  $p < 0.05$

TABLE 6

**Dover Township Childhood Cancer Incident Cases (0 to 19 Years)  
Standardized Incidence Ratios (SIR), 1996 Through 2000**

<b>Cancer Type</b>	<b>Sex</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>All Cancers</b>	Total	25	20.6	1.2	0.78 - 1.79
	Male	12	11.3	1.1	0.55 - 1.86
	Female	13	9.4	1.4	0.74 - 2.37
<b>Bone</b>	Total	3	1.1	2.6	0.53 - 7.71
	Male	1	0.6	1.7	0.02 - 9.23
	Female	2	0.5	3.7	0.42 - 13.5
<b>Brain/CNS</b>	Total	4	3.5	1.1	0.31 - 2.92
	Male	1	2.1	0.5	0.01 - 2.70
	Female	3	1.5	2.1	0.41 - 6.02
Astrocytoma	Total	3	1.5	2.0	0.39 - 5.73
	Male	0	0.8	-	-
	Female	3	0.7	4.4	0.88 - 12.8
<b>Leukemia</b>	Total	7	4.9	1.4	0.57 - 2.94
	Male	3	2.9	1.0	0.21 - 3.04
	Female	4	2.0	2.0	0.53 - 5.06
Acute Lymphocytic Leukemia	Total	5	3.6	1.4	0.45 - 3.25
	Male	2	2.1	1.0	0.11 - 3.45
	Female	3	1.5	2.0	0.40 - 5.83
<b>All Lymphoma</b>	Total	5	3.3	1.5	0.49 - 3.56
	Male	3	1.9	1.6	0.33 - 4.73
	Female	2	1.4	1.4	0.16 - 5.05
Hodgkin's	Total	2	1.8	1.1	0.13 - 4.11
	Male	0	0.8	-	-
	Female	2	1.0	2.1	0.23 - 7.42
Non-Hodgkin's Lymphoma	Total	2	1.0	1.9	0.22 - 6.97
	Male	2	0.7	3.0	0.34 - 10.8
	Female	0	0.4	-	-

Table continued

Table 6 continued

<b>Cancer Type</b>	<b>Sex</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>Soft Tissue Sarcomas</b>	Total	3	1.5	1.9	0.39 - 5.68
	Male	2	0.8	2.4	0.27 - 8.80
	Female	1	0.7	1.4	0.02 - 7.72
<b>Sympathetic Nervous System</b>	Total	1	1.0	1.0	0.01 - 5.65
	Male	0	0.6	-	-
	Female	1	0.4	2.4	0.03 - 13.6
Neuroblastoma	Total	1	0.9	1.1	0.01 - 6.07
	Male	0	0.5	-	-
	Female	1	0.4	2.5	0.03 - 14.1
<b>Wilms' Tumor</b>	Total	0	0.6	-	-
	Male	0	0.2	-	-
	Female	0	0.3	-	-

TABLE 7

Dover Township Childhood Cancer Incident Cases (0 to 4 Years)  
Standardized Incidence Ratios (SIR), 1996 Through 2000

Cancer Type	Sex	Number Observed	Number Expected	SIR	95% C.I. Lower-Upper
<b>All Cancers</b>	Total	4	5.5	0.7	0.20 - 1.88
	Male	1	3.3	0.3	0.00 - 1.69
	Female	3	2.2	1.4	0.28 - 4.02
<b>Bone</b>	Total	0	0.0	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
<b>Brain/CNS</b>	Total	0	0.9	-	-
	Male	0	0.6	-	-
	Female	0	0.3	-	-
Astrocytoma	Total	0	0.4	-	-
	Male	0	0.2	-	-
	Female	0	0.1	-	-
<b>Leukemia</b>	Total	3	2.0	1.5	0.30 - 4.36
	Male	1	1.2	0.9	0.01 - 4.71
	Female	2	0.8	2.4	0.27 - 8.65
Acute Lymphocytic Leukemia	Total	3	1.6	1.9	0.38 - 5.50
	Male	1	0.9	1.1	0.01 - 6.16
	Female	2	0.7	2.9	0.32 - 10.4
<b>All Lymphoma</b>	Total	0	0.3	-	-
	Male	0	0.2	-	-
	Female	0	0.1	-	-
Hodgkin's	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
Non-Hodgkin's Lymphoma	Total	0	0.1	-	-
	Male	0	0.1	-	-
	Female	0	0.0	-	-

Table continued

Table 7 continued

<b>Cancer Type</b>	<b>Sex</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>Soft Tissue Sarcomas</b>	Total	0	0.4	-	-
	Male	0	0.2	-	-
	Female	0	0.2	-	-
<b>Sympathetic Nervous System</b>	Total	1	0.8	1.3	0.02 - 6.93
	Male	0	0.4	-	-
	Female	1	0.4	2.8	0.04 - 15.6
Neuroblastoma	Total	1	0.8	1.3	0.02 - 6.93
	Male	0	0.4	-	-
	Female	1	0.4	2.8	0.04 - 15.6
<b>Wilms' Tumor</b>	Total	0	0.4	-	-
	Male	0	0.2	-	-
	Female	0	0.2	-	-

**TABLE 8**

**Toms River Childhood Cancer Incident Cases (0 to 19 Years)  
Census Tracts 228, 231, 232, and 236**

Disease Grouping	1979 - 1995		1996 - 2000	
	Male	Female	Male	Female
Malignant Bone Tumors	0	0	0	0
Brain/Central Nervous System (Astrocytoma)	3 (2)	3 (1)	1 (0)	0 (0)
Retinoblastoma	0 )	0 )	0 )	0
Sympathetic Nervous System (Neuroblastoma)	1	1	0	0 (0)
Hodgkin's Disease	2 (1)	0 (1)	0 (0)	0
Non-Hodgkin's Lymphoma	0 )	0 )	0 )	0
Other Lymphomas	1	0	0	0
Leukemia (Acute Lymphocytic Leukemia)	2	4	2	1 (1)
Melanoma	0	1	0	0
Skin	0 (1)	0 (4)	0 (1)	0
Hepatic Tumors	0 )	0 )	0 )	0
Renal Tumors (Wilms' Tumor)	0	0	0	0 (0)
Thyroid	0	1	0	0
Nasopharyngeal Carcinomas	0	0	0	0
Soft Tissue Sarcomas	2 (0)	0 (0)	1 (0)	0
Germ Cell/Trophoblastic	1 )	0 )	0 )	0
Other Benign/Borderline	0	0	0	0
In Situ Cancers	0	0	0	0
Other/Unspecified	0	2	0	0
<b>Total</b>	<b>12</b>	<b>12</b>	<b>4</b>	<b>1</b>

**Note:** The parenthetical numbers are a subset of the rows directly above them.

TABLE 9

Toms River Census Tracts: Summary of Select SIRs

Cancer Type	Age Group	Sex	Number Observed	Number Expected	SIR	95% C.I. Lower-Upper
<b>Study Period: 1979-1995</b>						
All Types	0-19	Both	24	14.4	1.7*	1.07 - 2.49
All Types	0-4	Both	12	3.4	3.6*	1.84 - 6.22
All Types	0-4	Female	10	1.5	6.5*	3.13 - 12.0
Brain/CNS	0-4	Both	4	0.6	7.0*	1.87 - 17.8
Brain/CNS	0-4	Female	3	0.3	11.3*	2.27 - 33.0
Astrocytoma	0-4	Both	2	0.2	8.9*	1.00 - 32.1
Acute Lymphocytic Leukemia	0-4	Female	4	0.4	9.4*	2.52 - 24.0
<b>Study Period: 1996-2000</b>						
All Types	0-19	Both	5	4.2	1.2	0.39 - 2.81
All Types	0-4	Both	0	1.1	-	-
All Types	0-4	Female	0	0.4	-	-
Brain/CNS	0-4	Both	0	0.2	-	-
Brain/CNS	0-4	Female	0	0.1	-	-
Astrocytoma	0-4	Both	0	0.1	-	-
Acute Lymphocytic Leukemia	0-4	Female	0	0.1	-	-

\* Statistically elevated,  $p < 0.05$

TABLE 10

Toms River Childhood Cancer Incident Cases (0 to 19 Years)  
Standardized Incidence Ratios (SIR), 1996 Through 2000

Cancer Type	Sex	Number Observed	Number Expected	SIR	95% C.I. Lower-Upper
<b>All Cancers</b>	Total	5	4.2	1.2	0.39 - 2.81
	Male	4	2.3	1.7	0.46 - 4.39
	Female	1	1.8	0.6	0.01 - 3.04
<b>Bone</b>	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
<b>Brain/CNS</b>	Total	1	0.7	1.4	0.02 - 7.93
	Male	1	0.4	2.4	0.03 - 13.2
	Female	0	0.3	-	-
Astrocytoma	Total	0	0.3	-	-
	Male	0	0.2	-	-
	Female	0	0.1	-	-
<b>Leukemia</b>	Total	3	1.0	3.0	0.61 - 8.88
	Male	2	0.6	3.4	0.38 - 12.2
	Female	1	0.4	2.5	0.03 - 14.1
Acute Lymphocytic Leukemia	Total	2	0.7	2.8	0.31 - 9.99
	Male	1	0.4	2.3	0.03 - 13.0
	Female	1	0.3	3.4	0.04 - 18.9
<b>All Lymphoma</b>	Total	0	0.7	-	-
	Male	0	0.4	-	-
	Female	0	0.3	-	-
Hodgkin's	Total	0	0.4	-	-
	Male	0	0.2	-	-
	Female	0	0.2	-	-
Non-Hodgkin's Lymphoma	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-

Table continued

Table 10 continued

<b>Cancer Type</b>	<b>Sex</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>Soft Tissue Sarcomas</b>	Total	1	0.3	3.2	0.04 - 17.9
	Male	1	0.2	5.9	0.08 - 32.6
	Female	0	0.1	-	-
<b>Sympathetic Nervous System</b>	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
Neuroblastoma	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
<b>Wilms' Tumor</b>	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.1	-	-

TABLE 11

Toms River Childhood Cancer Incident Cases (0 to 4 Years)  
Standardized Incidence Ratios (SIR), 1996 Through 2000

Cancer Type	Sex	Number Observed	Number Expected	SIR	95% C.I. Lower-Upper
<b>All Cancers</b>	Total	0	1.1	-	-
	Male	0	0.7	-	-
	Female	0	0.4	-	-
<b>Bone</b>	Total	0	0.0	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
<b>Brain/CNS</b>	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
Astrocytoma	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
<b>Leukemia</b>	Total	0	0.4	-	-
	Male	0	0.2	-	-
	Female	0	0.2	-	-
Acute Lymphocytic Leukemia	Total	0	0.3	-	-
	Male	0	0.2	-	-
	Female	0	0.1	-	-
<b>All Lymphoma</b>	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
Hodgkin's	Total	0	0.0	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
Non-Hodgkin's Lymphoma	Total	0	0.0	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-

Table continued

Table 11 Continued

<b>Cancer Type</b>	<b>Sex</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>Soft Tissue Sarcomas</b>	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-
<b>Sympathetic Nervous System</b>	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
Neuroblastoma	Total	0	0.2	-	-
	Male	0	0.1	-	-
	Female	0	0.1	-	-
<b>Wilms' Tumor</b>	Total	0	0.1	-	-
	Male	0	0.0	-	-
	Female	0	0.0	-	-

**TABLE 12**

**Dover Township Childhood Cancer Incident Cases By Census Tract  
Standardized Incidence Ratios (SIR), 1979 Through 2000  
All Race and Sex Groups Combined (0 to 19 Years)**

<b>Census Tract</b>	<b>Number Observed</b>	<b>Number Expected</b>	<b>SIR</b>	<b>95% C.I. Lower-Upper</b>
<b>220</b>	7	6.9	1.0	0.41-2.10
<b>221</b>	2	3.1	0.6	0.07-3.32
<b>222</b>	0	0.4	-	-
<b>223</b>	5	4.4	1.1	0.37-2.65
<b>224</b>	11	10.7	1.0	0.51-1.84
<b>225</b>	0	0.8	-	-
<b>226</b>	5	4.0	1.2	0.40-2.89
<b>227</b>	19	12.9	1.5	0.89-2.30
<b>228</b>	8	4.2	1.9	0.82-3.75
<b>229</b>	7	4.8	1.5	0.59-3.04
<b>230</b>	8	7.0	1.1	0.49-2.25
<b>231</b>	7	4.0	1.8	0.71-3.65
<b>232</b>	11	8.1	1.4	0.68-2.42
<b>233</b>	11	7.7	1.4	0.72-2.57
<b>234</b>	3	3.0	1.0	0.20-2.92
<b>235</b>	3	2.6	1.2	0.23-3.37
<b>236</b>	3	2.3	1.3	0.27-3.89
<b>Other</b>	0	1.0	-	-

**Note:** Two cases lacked sufficient address information to code to a census tract.

**TABLE 13**

**Average Annual Childhood Cancer Incidence Rates, All Cancers Combined  
Overlapping Three-year Periods, 1979-2000**

Three-year Period	New Jersey (8,781)*	Dover Township (112)*	Toms River (29)*
<b>1979-81</b>	17.7	22	20
<b>1980-82</b>	17.4	18	6.9
<b>1981-83</b>	18.3	18	21
<b>1982-84</b>	18.9	18	21
<b>1983-85</b>	19.3	21	36
<b>1984-86</b>	18.8	26	30
<b>1985-87</b>	18.9	29	30
<b>1986-88</b>	18.6	26	31
<b>1987-89</b>	18.5	26	55
<b>1988-90</b>	19.3	24	56
<b>1989-91</b>	19.8	27	48
<b>1990-92</b>	20.2	27	24
<b>1991-93</b>	19.9	28	24
<b>1992-94</b>	20.1	28	24
<b>1993-95</b>	19.6	25	39
<b>1994-96</b>	19.4	24	38
<b>1995-97</b>	18.1	18	30
<b>1996-98</b>	18.6	21	7.5
<b>1997-99</b>	18.0	21	7.4
<b>1998-00</b>	17.1	26	29

**Note:** Rates are average annual number of cases diagnosed in the three-year period per 100,000 children. Rates are more variable when based on fewer cases.

\* - Total number of cases over the 22-years.

TABLE 14

Average Annual Childhood Cancer Incidence Rates, Leukemia  
Overlapping Three-year Periods, 1979-2000

Three-year Period	New Jersey (2,003)*	Dover Township (28)*
1979-81	4.5	1.6
1980-82	4.4	3.2
1981-83	4.4	6.4
1982-84	4.3	6.4
1983-85	4.2	6.4
1984-86	3.9	3.2
1985-87	3.9	8.0
1986-88	3.9	8.0
1987-89	4.0	11
1988-90	4.2	6.4
1989-91	4.1	9.6
1990-92	4.2	4.8
1991-93	4.4	6.3
1992-94	4.5	1.6
1993-95	4.4	6.2
1994-96	4.5	6.1
1995-97	4.4	6.0
1996-98	4.6	4.5
1997-99	4.4	5.9
1998-00	4.1	8.8

**Note:** Rates are average annual number of cases diagnosed in the three-year period per 100,000 children. Rates are more variable when based on fewer cases.

\* - Total number of cases over the 22-years.

TABLE 15

Average Annual Childhood Cancer Incidence Rates, Brain/CNS Cancers  
Overlapping Three-year Periods, 1979-2000

Three-year Period	New Jersey (1,490)*	Dover Township (16)*
1979-81	2.7	4.8
1980-82	2.7	3.2
1981-83	3.2	1.6
1982-84	3.3	3.2
1983-85	3.5	3.2
1984-86	3.3	4.8
1985-87	3.3	4.8
1986-88	3.2	3.2
1987-89	3.2	4.8
1988-90	3.3	3.2
1989-91	3.4	4.8
1990-92	3.4	3.2
1991-93	3.3	3.1
1992-94	3.2	1.6
1993-95	3.2	0
1994-96	3.4	1.5
1995-97	3.2	1.5
1996-98	3.4	1.5
1997-99	3.0	3.0
1998-00	3.0	4.4

**Note:** Rates are average annual number of cases diagnosed in the three-year period per 100,000 children. Rates are more variable when based on fewer cases.

\* - Total number of cases over the 22-years.

**APPENDIX I**

**1980, 1990, AND 2000 U.S. CENSUS BUREAU POPULATIONS  
OCEAN COUNTY, DOVER TOWNSHIP, AND TOMS RIVER CENSUS TRACTS**

	Age Range	1980		1990		2000	
		Dover Township	Toms River	Dover Township	Toms River	Dover Township	Toms River
<b>Total:</b>	<b>0-4</b>	4,100	896	4,780	937	4,956	1,017
	<b>5-9</b>	5,059	1,145	5,222	1,049	5,790	1,156
	<b>10-14</b>	5,915	1,396	5,335	1,004	6,297	1,210
	<b>15-19</b>	<u>5,766</u>	<u>1,490</u>	<u>5,520</u>	<u>1,129</u>	<u>5,890</u>	<u>1,216</u>
	<b>Total</b>	20,840	4,927	20,857	4,119	22,933	4,599
<b>Male:</b>	<b>0-4</b>	2,107	450	2,362	497	2,596	541
	<b>5-9</b>	2,554	593	2,591	523	2,955	592
	<b>10-14</b>	2,967	719	2,589	503	3,279	653
	<b>15-19</b>	<u>2,948</u>	<u>786</u>	<u>2,741</u>	<u>581</u>	<u>3,005</u>	<u>642</u>
	<b>Total</b>	10,576	2,548	10,283	2,104	11,835	2,428
<b>Female:</b>	<b>0-4</b>	1,993	446	2,418	440	2,360	476
	<b>5-9</b>	2,505	552	2,631	526	2,835	564
	<b>10-14</b>	2,948	677	2,746	501	3,018	557
	<b>15-19</b>	<u>2,818</u>	<u>704</u>	<u>2,779</u>	<u>548</u>	<u>2,885</u>	<u>574</u>
	<b>Total</b>	10,264	2,379	10,574	2,015	11,098	2,171