The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

August 11, 2000

Gregory Erickson, Director
Wilmington Board of Health
121 Glen Road
Wilmington, MA 01887

Dear Mr. Erickson:

We are responding to your recent request that we provide you with a summary of the interim results of our evaluation of cancer incidence data for the town of Wilmington between the years 1987-1995 (attached). As you are aware, community concerns largely relate to childhood cancers diagnosed among children in the Kelly Hill area of Wilmington, many of whom have been reportedly diagnosed between 1996 and the present. For that reason, these summary analyses should be interpreted with caution. This interim report provides only a portion of the information of a much larger effort on the part of our Bureau to evaluate resident concerns regarding childhood cancer in Wilmington. Therefore, it is important to note that no conclusions can be reached at this time regarding the true picture of childhood cancer in Wilmington.

As you know, we have been asked by concerned residents and the Wilmington Board of Health to evaluate a suspected "cluster" of childhood brain cancer, Hodgkin's disease, leukemia, and non-Hodgkin's lymphoma (NHL) in the Kelly Hill area, and concerns about childhood cancer in the town as a whole. As part of our effort to respond to these concerns, the Community Assessment Unit (CAU) has evaluated cancer incidence data available from the Massachusetts Cancer Registry (MCR) for these four cancer types in children and adults town-wide and by smaller geographic areas (i.e., census tracts).

Although many of the Wilmington children with cancer reported to our Bureau have been diagnosed in more recent years, the 9-year period 1987-1995 constitutes the time period for which the most recent and complete cancer incidence data are available from the MCR. Due to the types of concerns expressed by the Wilmington community and several other cities and towns in Massachusetts,

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the MDPH Bureau of Health Statistics, Research and Epidemiology is actively working to update the cancer registry file, however this process is expected to take several more months. As discussed at the last two meetings of the Kelly Hill area working group, due to the lack of more current data from the MCR, our Bureau is making progress on a number of other efforts to address cancer concerns for more recent years.

We are currently waiting for a response to our request to access and use hospital discharge data from a source outside the DPH. In addition, we have been working with the MCR to contact hospital facilities directly to request information on children not yet reported to the MCR with a diagnosis of one of these four cancer types. Since an important piece of the childhood cancer investigation involves potential exposures in Wilmington, we are also in the process of developing a childhood cancer questionnaire to evaluate risk factors, including possible environmental factors, related to childhood cancer in Wilmington.

Evaluation of Cancer Incidence Data

Attached to this letter are tables summarizing cancer incidence rates for the town of Wilmington and it's four census tracts between 1987-1995. The tables contain information on the number of individuals diagnosed with a particular cancer type (Obs), the number of individuals expected in Wilmington diagnosed with that cancer type (Exp), and the Standardized Incidence Ratio (SIR). The SIR is the number of (observed) cancer cases in a census tract or town divided by the number (expected) in that area, based on the state's cancer rates, which is then multiplied by 100. An SIR greater than 100 indicates that more cancer cases occurred than expected; an SIR less than 100 means that fewer cases occurred than expected. For example, an SIR of 150 is interpreted as 50 percent more cases than the expected; an SIR of 90 indicates 10 percent fewer cases than expected. As a result of the instability of incidence rates based on small numbers of cases, SIRs are generally not calculated when fewer than five cases were observed in a particular area. When an SIR is statistically significant, as indicated by an * symbol, there is less than a 5% chance that the observed number of cases is due to chance alone. In addition to the enclosed tables, we have included a more detailed explanation of the Standardized Incidence Ratio and 95% Confidence Interval (95% CI) that may be useful to you in interpreting the following information (see Attachment A).

Cancer Incidence in Wilmington Census Tracts 1987-1995

The attached Tables 1 through 8 present cancer incidence rates between 1987-1995 for the town of Wilmington as a whole and for each of its four census tracts for brain cancer, Hodgkin's disease, leukemia, and NHL. Analysis by census tract or smaller geographic area helps in understanding whether the elevated incidence of a certain cancer type observed town-wide may be explained by an increase in cases in a particular geographic area of the town. Since much of the cancer concerns focused on Wilmington children, results are presented for both children (age 0-19 years) and for adults (age 20 and older). Figure 1 depicts the location and boundaries of Wilmington census tracts.

During the time period 1987-1995, the incidence of adult brain cancer was slightly elevated town-wide and in census tract 3313. One case of childhood brain cancer occurred in Wilmington,

located in census tract 3313. Slight elevations in both adult and childhood leukemia were observed town-wide, and a statistically significant elevation of adult leukemia was observed in census tract 3311.02 among females alone and among males and females combined. No cases of childhood NHL were reported for the town of Wilmington between 1987-1995 and adult NHL occurred about as expected. In a previous evaluation of Hodgkin's disease conducted by our Bureau, a statistical elevation of this cancer was observed town-wide and in census tract 3313 between 1987-1994. Between 1987-1995, Hodgkin's disease remained statistically significantly elevated in Wilmington adults both town-wide and in census tract 3313, however this elevation is based on the same cases previously reported. No additional cases of Hodgkin's disease were diagnosed in 1995. One child (0-19 years) was diagnosed with Hodgkin's disease in Wilmington between 1987-1995. Based on the information evaluated for the four cancer types so far, all childhood cases diagnosed between 1987-1995 were located in CT 3312 and CT 3313 (the census tract where Kelly Hill is located).

Summary

While we recognize the Board of Health's interest in having access to information available to date, we again stress that appropriate caution be applied when interpreting this information. These data solely represent the number of cancer cases by census tract for a specific period of time, and in many census tracts an SIR could not be calculated, because the number of observed cases was small (i.e. less than five). It is important to note that with the exception of adult NHL, the width of the 95% confidence intervals (the statistical measure used to determine if an SIR is statistically elevated or decreased) presented in Tables 1-8 indicate that the rates observed are statistically unstable due to the small number of cases. Please see Attachment A for further explanation of the 95% confidence interval. It is important to keep in mind that it is impossible to predict with confidence whether the picture of childhood cancer in Wilmington for the years 1996 to the present is similar to that observed between 1987-1995. Finally, this summary evaluation does not provide any information on an individual's exposure to potential environmental contamination (e.g., their drinking water source), or whether something they might have been exposed to is related to their cancer. This type of information, generated from several sources (Town of Wilmington, Massachusetts Department of Environmental Protection, etc.), is being assembled by BEHA/CAU staff into one environmental data set which will allow for more complete evaluation as it relates to the pattern of childhood cancer in Wilmington. The descriptive statistical evaluation of data contained in this summary should not be used to determine whether a pattern of cancer exists in Wilmington until all other information is complete or available. Most importantly, these results do not represent the Department of Public Health's complete evaluation of childhood cancer concerns in the Kelly Hill neighborhood, CT 3313, and the town of Wilmington.

We hope the information provided helps to answer some of your concerns regarding the incidence of these four cancers in Wilmington children and adults at a smaller geographic level for the years 1987-1995. If you have any questions regarding this information or any other environmental health concerns, please feel free to contact me at 617-624-5757.

Sincerely,

Theresa A. Cassidy, Chief
Community Assessment Unit
Bureau of Environmental Health Assessment

Cc: Suzanne K. Condon, Director, BEHA
         Martha Steele, Deputy Director, BEHA
         Meg Blanchet, CAU, BEHA
         The Honorable James R. Miceli, Representative
         Susanne Simon, ATSDR Region 1
         Valerie D'Amelio, Co-chair, Kelly Hill Group, CCN
         Richard Chalpin, DEP
         Paul Giddings, DEP

Attachment A

**Explanation of a Standardized Incidence Ratio (SIR)
And 95% Confidence Interval**

In order to evaluate cancer incidence a statistic known as a standardized incidence ratio (SIR) was calculated for each cancer type. An SIR is an estimate of the occurrence of cancer in a population relative to what might be expected if the population had the same cancer experience as some larger comparison population designated as "normal" or average. Usually, the state as a whole is selected to be the comparison population. Using the state of Massachusetts as a comparison population provides a stable population base for the calculation of incidence rates. As a result of the instability of incidence rates based on small numbers of cases, SIRs were not calculated when fewer than five cases were observed.

Specifically, an SIR is the ratio of the observed number of cancer cases to the expected number of cases multiplied by 100. An SIR of 100 indicates that the number of cancer cases observed in the population evaluated is equal to the number of cancer cases expected in the comparison or "normal" population. An SIR greater than 100 indicates that more cancer cases occurred than expected and an SIR less than 100 indicates that fewer cancer cases occurred than expected. Accordingly, an SIR of 150 is interpreted as 50% more cases than the expected number; an SIR of 90 indicates 10% fewer cases than expected.

Caution should be exercised, however, when interpreting an SIR. The interpretation of an SIR depends on both the size and the stability of the SIR. Two SIRs can have the same size but not the same stability. For example, an SIR of 150 based on 4 expected cases and 6 observed cases indicates a 50% excess in cancer, but the excess is actually only two cases. Conversely, an SIR of 150 based on 400 expected cases and 600 observed cases represents the same 50% excess in cancer, but because the SIR is based upon a greater number of cases, the estimate is more stable. It is very unlikely that 200 excess cases of cancer would occur by chance alone.
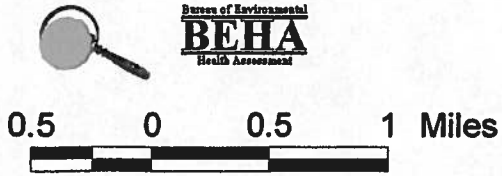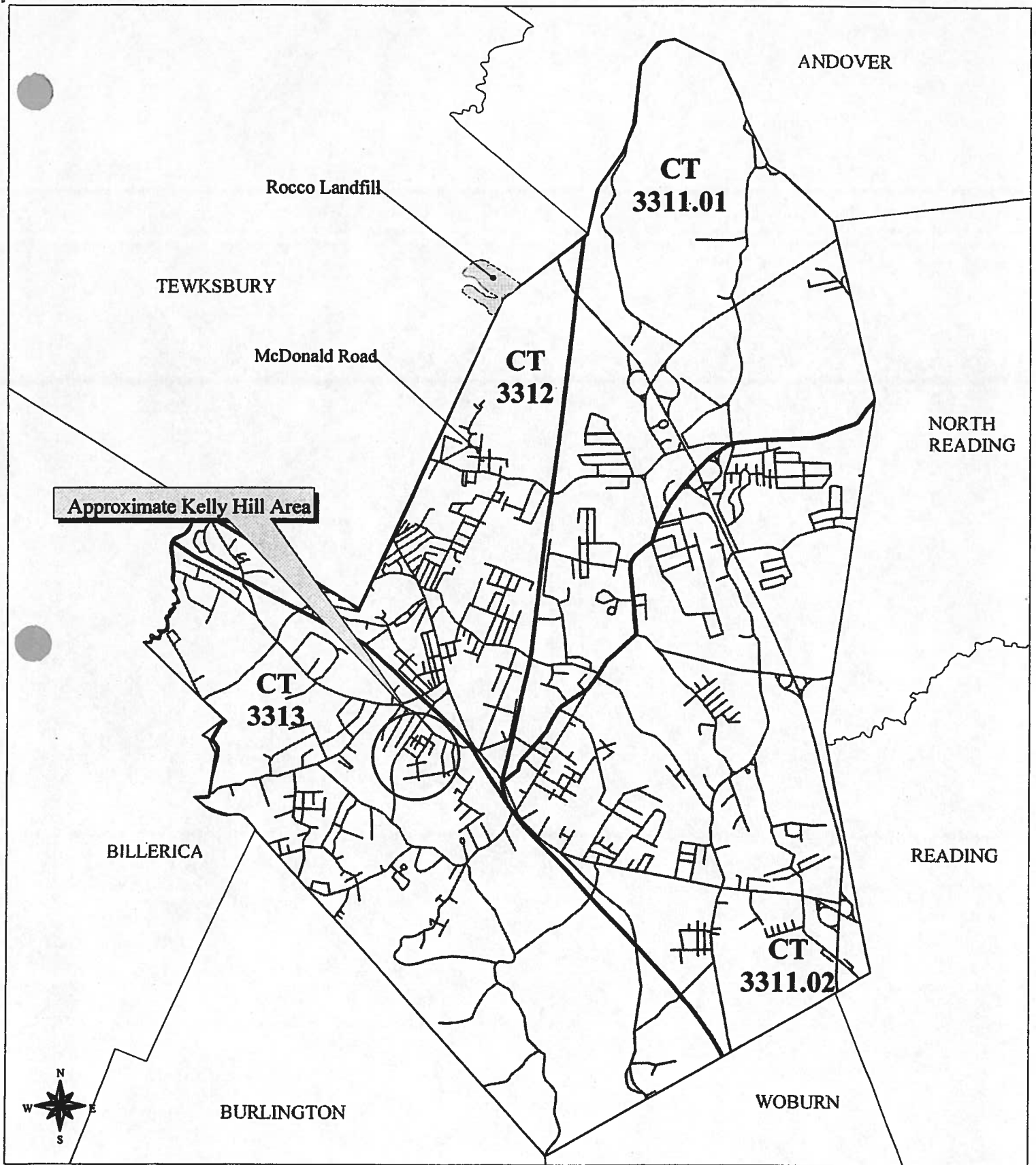
To determine if the observed number of cases is significantly different from the expected number or if the difference may be due solely to chance, a 95% confidence interval (CI) was calculated for each SIR. A 95% CI assesses the magnitude and stability of an SIR. Specifically, a 95% CI is the range of estimated SIR values that has a 95% probability of including the true SIR for the population. If the 95% CI range does not include the value 100, then the study population is significantly different from the comparison or "normal" population. "Significantly different" means there is less than 5% percent chance that the observed difference is the result of random fluctuation in the number of observed cancer cases.

For example, if a confidence interval does not include 100 and the interval is above 100 (e.g., 105-130), then there is statistically significant excess in the number of

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cancer cases. Similarly, if the confidence interval does not include 100 and the interval is below 100 (e.g., 45-96), then the number of cancer cases is statistically significantly lower than expected. If the confidence interval range includes 100, then the true SIR may be 100, and it cannot be concluded with sufficient confidence that the observed number of cases is not the result of chance and reflects a real cancer increase or decrease. Statistical significance is not assessed when fewer than five cases are observed.

In addition to the range of the estimates contained in the confidence interval, the width of the confidence interval also reflects the stability of the SIR estimate. For example, a narrow confidence interval (e.g., 103--115) allows a fair level of certainty that the calculated SIR is close to the true SIR for the population. A wide interval (e.g., 85-- 450) leaves considerable doubt about the true SIR, which could be much lower than or much higher than the calculated SIR. This would indicate an unstable statistic.

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Figure 1
Location of Census Tracts in Wilmington, MA

Table 1

Brain Cancer Incidence among Children (ages 0-19) in Wilmington, MA
1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	0	0.1		NC -- NC	0	0.1		NC -- NC	0	0.1		NC -- NC
3311.02	0	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC	0	0.1	NC	NC -- NC
3312	0	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC	0	0.1	NC	NC -- NC
3313	1	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC	1	0.1	NC	NC -- NC
All CTs Combined	1	2.3	NC	NC -- NC	0	1.9	NC	NC -- NC	1	0.4	NC	NC -- NC
			NC				NC				NC	

Note: SIRs are calculated based on the exact number of expected cases.

Expected number of cases presented are rounded to the nearest tenth.

SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval

Exp = Expected number of cases   NC = Not calculated

SIR = Standardized Incidence Ratio   * = Statistical significance

Table 2

Brain Cancer Incidence among Adults (ages 20 and Older)
in Wilmington, MA : 1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	2	1.3		NC -- NC	1	0.7		NC -- NC	1	0.5		NC -- NC
3311.02	3	3.3	NC	NC -- NC	1	1.9	NC	NC -- NC	2	1.5	NC	NC -- NC
3312	2	2.2	NC	NC -- NC	2	1.2	NC	NC -- NC	0	0.9	NC	NC -- NC
3313	6	2.3	NC 260	95 -- 566	1	1.3	NC	NC -- NC	5	1.0	NC 495 *	160 -- 1156
All CTs Combined	13	9.1	143	76 -- 245	5	5.1	NC 98	31 -- 228	8	3.9	203	87 -- 400

Note: SIRs are calculated based on the exact number of expected cases.
Expected number of cases presented are rounded to the nearest tenth.
SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval
Exp = Expected number of cases   NC = Not calculated
SIR = Standardized Incidence Ratio   * = Statistical significance

Table 3

Hodgkin's Disease Incidence among Children (ages 0-19) in Wilmington, MA
1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	0	0.1		NC -- NC	0	0.04		NC -- NC	0	0.04		NC -- NC
3311.02	0	0.2	NC	NC -- NC	0	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC
3312	0	0.2	NC	NC -- NC	0	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC
3313	1	0.2	NC	NC -- NC	1	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC
All CTs Combined	1	0.7	NC	NC -- NC	1	0.4	NC	NC -- NC	0	0.3	NC	NC -- NC
			NC				NC				NC	

> Note: SIRs are calculated based on the exact number of expected cases.
>
> Expected number of cases presented are rounded to the nearest tenth.
>
> SIRs and 95% CI are not calculated when observed number of cases < 5.
>
> Obs = Observed number of cases   95% CI = 95% Confidence Interval
>
> Exp = Expected number of cases   NC = Not calculated
>
> SIR = Standardized Incidence Ratio   * = Statistical significance

Table 4

Hodgkin's Disease among Adults (ages 20 and Older)
in Wilmington, MA : 1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	2	0.7		NC -- NC	1	0.4		NC -- NC	1	0.3		NC -- NC
3311.02	3	1.8	NC	NC -- NC	3	1.0	NC	NC -- NC	0	0.8	NC	NC -- NC
3312	3	1.4	NC	NC -- NC	2	0.8	NC	NC -- NC	1	0.6	NC	NC -- NC
3313	5	1.4	NC 360 *	116 -- 839	3	0.8	NC	NC -- NC	2	0.6	NC	NC -- NC
All CTs Combined	13	5.2	248 *	132 -- 424	9	2.9	NC 309 *	141 -- 587	4	2.3	NC	NC -- NC
												NC

Note: SIRs are calculated based on the exact number of expected cases.
   Expected number of cases presented are rounded to the nearest tenth.
   SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval
Exp = Expected number of cases   NC = Not calculated
SIR = Standardized Incidence Ratio   * = Statistical significance

Table 5

Leukemia Incidence among Children (ages 0-19) in Wilmington, MA
1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	0	0.2		NC -- NC	0	0.1		NC -- NC	0	0.1		NC -- NC
3311.02	0	0.5	NC	NC -- NC	0	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC
3312	2	0.5	NC	NC -- NC	2	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC
3313	2	0.5	NC	NC -- NC	2	0.3	NC	NC -- NC	0	0.2	NC	NC -- NC
All CTs Combined	4	1.6	NC	NC -- NC	4	1.0	NC	NC -- NC	0	0.7	NC	NC -- NC
			NC				NC				NC	

Note: SIRs are calculated based on the exact number of expected cases.

Expected number of cases presented are rounded to the nearest tenth.

SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval

Exp = Expected number of cases   NC = Not calculated

SIR = Standardized Incidence Ratio   * = Statistical significance

Table 6

Leukemia Incidence among Adults (ages 20 and Older)
in Wilmington, MA : 1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	2	1.5		NC -- NC	1	0.9		NC -- NC	1	0.6		NC -- NC
3311.02	11	3.9	NC 285 *	142 -- 510	5	2.3	NC 218	70 -- 508	6	1.6	NC 384 *	140 -- 836
3312	1	2.4		NC -- NC	0	1.4		NC -- NC	1	1.0		NC -- NC
3313	0	2.6	NC	NC -- NC	0	1.5	NC	NC -- NC	0	1.1	NC	NC -- NC
All CTs Combined	14	10.3	NC 135	74 -- 227	6	6.1	NC 98	36 -- 213	8	4.2	NC 190	82 -- 375

Note: SIRs are calculated based on the exact number of expected cases.

Expected number of cases presented are rounded to the nearest tenth.

SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval

Exp = Expected number of cases   NC = Not calculated

SIR = Standardized Incidence Ratio   * = Statistical significance

Table 7

Non-Hodgkin's Lymphoma Incidence among Children (ages 0-19) in Wilmington, MA
1987-1995

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	0	0.05		NC -- NC	0	0.03		NC -- NC	0	0.02		NC -- NC
3311.02	0	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC	0	0.04	NC	NC -- NC
3312	0	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC	0	0.04	NC	NC -- NC
3313	0	0.1	NC	NC -- NC	0	0.1	NC	NC -- NC	0	0.03	NC	NC -- NC
All CTs Combined	0	0.5	NC	NC -- NC	0	0.3	NC	NC -- NC	0	0.1	NC	NC -- NC
			NC				NC				NC	

Note: SIRs are calculated based on the exact number of expected cases.

Expected number of cases presented are rounded to the nearest tenth.

SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval

Exp = Expected number of cases   NC = Not calculated

SIR = Standardized Incidence Ratio   * = Statistical significance

Table 8

**Non-Hodgkin's Lymphoma among Adults (ages 20 and Older)
in Wilmington, MA : 1987-1995**

Census Tract	Total				Males				Females			
	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI	Obs	Exp	SIR	95% CI
3311.01	2	3.2		NC -- NC	1	1.8		NC -- NC	1	1.5		NC -- NC
3311.02	9	8.5	NC105	48 -- 200	7	4.7	NC149	60 -- 307	2	3.8	NC	NC -- NC
3312	6	5.3	112	41 -- 245	4	3.0		NC -- NC	2	2.3	NC	NC -- NC
3313	8	5.8	138	59 -- 271	4	3.2	NC	NC -- NC	4	2.6	NC	NC -- NC
All CTs Combined	25	22.9	109	71 -- 161	16	12.7	NC126	72 -- 205	9	10.2	NC 88	40 -- 167

Note: SIRs are calculated based on the exact number of expected cases.
Expected number of cases presented are rounded to the nearest tenth.
SIRs and 95% CI are not calculated when observed number of cases < 5.

Obs = Observed number of cases   95% CI = 95% Confidence Interval
Exp = Expected number of cases   NC = Not calculated
SIR = Standardized Incidence Ratio   * = Statistical significance