

Health Consultation

EVALUATING COMMUNITY CONCERNS FOLLOWUP

IN

CHESHIRE, CONNECTICUT

CHESHIRE NEW HAVEN COUNTY, CONNECTICUT

Prepared by
Connecticut Department of Public Health

FEBURARY 7, 2013

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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SUMMARY

INTRODUCTION The town of Cheshire, CT is a residential community located in New Haven County with a population of 26,190. In August 2002, the Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by a resident of Cheshire to evaluate the environmental community concerns of the town, many of which stem from a history of health concerns, specifically cancer, and possible links with environmental contamination. The past contamination of volatile organic compounds (VOCs) in the town's drinking water supply is well known within the community. The purpose of this health consultation is to follow up on a public health action plan item from the 2004 Cheshire Evaluating Community Concerns Public Health Assessment (PHA) that listed evaluating an additional 5 years of childhood cancer and pediatric leukemia incidence rates. The 2004 PHA (ATSDR 2004) evaluated the environmental health concerns of the community in Cheshire and provides details on the history of the site, as well as pathways of exposure. Many of the community concerns focus on cancer and possible links with environmental contamination.

CONCLUSION ATSDR reached 2 important conclusions in this health consultation:

Conclusion 1 Connecticut Department of Public Health (CT DPH) evaluated an additional eight years of childhood cancers and pediatric leukemia since the previous cancer study was conducted in Cheshire. Childhood cancers and pediatric leukemia do not appear to trend upwards nor downwards from 1975-2008.

Basis for Conclusion The number of childhood cancers and pediatric leukemia cases during the 4 time intervals from 1975-2008 have not shown an increase nor decrease over time. Instead, they fluctuate over time.

Next Steps CT DPH will continue to work closely with the Cheshire Community Advisory Panel (CAP), Connecticut Department of Energy and the Environmental Protection (CT DEEP), and town leaders, as well as the Chesprocott Health District to ensure that the environmental and health concerns of the residents of Cheshire area are identified and addressed. CT DPH will communicate the findings of this followup health consultation to the Cheshire community.

Conclusion 2 CT DPH concludes that during the 2000-2008 time interval, female pediatric leukemia and childhood cancer incidence rates were higher than expected. However, they were not statistically significant. Male pediatric leukemia and

childhood cancer cases cancer incidence rates were less than expected. This decrease was not statistically significant.

Basis for Conclusion Pediatric leukemia and childhood cancer cases were evaluated during the 1999-2008 time period in Cheshire for females and males. Standardized incidence ratios (SIRs) were calculated for Cheshire using statewide rates as a comparison. Female SIRs were higher than expected while male SIRs were lower than expected. None of these differences were meaningful because the number of cancer cases was small which results in unstable SIR estimates.

Next Steps CT DPH will continue to work closely with the Cheshire CAP, CT DEEP, and town leaders, as well as the Chesprocott Health District to ensure that the environmental and health concerns of the residents of Cheshire are identified and addressed. CT DPH will communicate the findings of this follow up health consultation to the Cheshire community.

For More Information If you have questions about material presented in this health consultation, you should contact the Connecticut Department of Public Health at (860) 509-7740.

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health (CT DPH) and the Agency for Toxic Substances and Disease Registry (ATSDR). CT DPH and ATSDR will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

The town of Cheshire, CT is a residential community located in New Haven County with a population of 26,190. Cheshire, originally a part of the Town of Wallingford, was settled in 1694 and incorporated as a town in May of 1780. Located in the south central section of the State, Cheshire is approximately 14 miles north of New Haven and 25 miles southwest of Hartford, easily accessible from Interstates 84, 91 and 691 and state routes 70, 68, and 10. The town has a land area of 33 square miles and is bounded on the north by Southington and Wolcott, on the east by Meriden and Wallingford, on the south by Hamden, and on the west by Prospect and Waterbury.

In August 2002, the Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by a resident of Cheshire, Connecticut to evaluate the environmental community concerns of the town, many of which stem from a history of health concerns, specifically cancer, and possible links with environmental contamination. The past contamination of volatile organic compounds (VOCs) in the town's drinking water supply is well known within the community.

The purpose of this health consultation is to follow up on a Public Health Action Plan item included in the 2004 Cheshire Evaluating Community Concerns Public Health Assessment (PHA) (ATSDR 2004) which included evaluating 5 additional years of childhood cancer and pediatric leukemia incidence rates. The 2004 PHA evaluated the environmental health concerns of the community in Cheshire and provided details on the history of the town's public water supply contamination, as well as pathways of exposure. Many of the community concerns focus on cancer and possible links with environmental contamination. The past contamination of volatile organic compounds (VOCs) in the town's drinking water supply is well known within the community and was the primary focus of the 2004 PHA. The PHA was finalized November 2004 (ATSDR 2004).

Summary of the 2004 PHA

Public Water Supply Contamination

Environmental assessments in Cheshire have been focused on the past contamination of the public water supply. It is known that the town's public water supply was contaminated with volatile organic compounds (VOCs) from the late 1970s through the late 1980s. Aeration towers were installed in 1985 and 1987 which reduced the VOC levels in the drinking water to below the drinking water standards. The VOCs found in the public water supply that were above drinking water standards were trichloroethylene (TCE) and 1, 2-dichloropropane (DCP).

The possible ways people could have been exposed to contaminants in the public water supply in the past are through direct contact with the contaminated water (ingestion, skin contact, inhaling

contaminated indoor air). Because the level of VOC contamination after 1988 was below state drinking water standards, Cheshire residents who drank the water after this date were not exposed to contaminant levels of concern through this pathway.

Cancer and noncancer risks from TCE and DCP exposure in the public water supply were found to be minimal. In the 2004 PHA, CT DPH concluded that past exposures to TCE and DCP in the public water supply do not present harm to public health. A complete discussion of the history of public water supply contamination can be found in the 2004 PHA.

Summary of Previous Health Outcome Data

In the 2004 PHA, cancer incidence data (reports of new cancer diagnoses) for the years 1975-2000 were obtained for the town of Cheshire from the Connecticut Tumor Registry (CTR). Seven cancer types, as well as all cancers combined (adults and children), were evaluated. The specific cancer types were: Non-Hodgkin's Lymphoma, liver, bladder, kidney, brain, leukemia, and breast. These types of cancer were selected for evaluation based on past concerns raised by residents and because of possible associations found in other studies between the contaminants found in drinking water and certain cancers. Only cases reported to the CTR as a primary cancer of the types being evaluated and diagnosed among a resident of Cheshire were included for analysis. Cases were selected based upon the address reported by the hospital to CTR at the time of diagnosis.

CT DPH concluded in the 2004 PHA that overall, there does not appear to be significant elevations of cancer incidence in Cheshire. Non-Hodgkin's Lymphoma and leukemia have been associated with TCE (the primary contaminant previously found in Cheshire's public water supply) exposure in human studies and are therefore biologically plausible outcomes in Cheshire. For most of the elevations found in the review of cancer incidence rates during the years 1975-2000, there were no time trends found, except for an increasing trend in all childhood cancers combined. This increasing time trend prompted the addition of the above mentioned Public Health Action item included in the 2004 PHA. However, small number of cases in many categories, especially childhood cancers, resulted in unstable SIRs with large confidence intervals, that resulted in a lack of statistical significance. However, the cancer risks calculated for these two tumor types were not consistently, nor strongly elevated during the time periods that were analyzed. Breast cancer was found to be elevated during the most recent time period evaluated in the 2004 PHA. However, breast cancer has not been associated with TCE exposure, so CT DPH concluded that the elevation in this cancer during the most recent time period is not likely a result of environmental exposure.

METHODS IN ANALYSIS OF CANCER INCIDENCE DATA

The CTR is a population-based surveillance system that began collecting information on Connecticut residents diagnosed with cancer in 1935, and as such, is the oldest tumor registry in the country. All newly diagnosed cancers among Connecticut residents are required by law to be reported to the CTR.

The CTR calculated standard incidence ratios (SIRs) for the time interval 1999-2008 for total childhood cancers cases, aged 0-19 years old, and for pediatric leukemia cancer cases, aged 0-19

years old, by gender. CTR also reported expected and observed cancer cases and 95% confidence intervals for each cancer type by gender. CT DPH requested that the CTR calculate a 10 year interval for consistency even though there is a two year overlap in tumor data for the last time interval.

In order to evaluate if a given cancer type is elevated for a given time period, a standardized incidence ratio (SIR) is calculated. An SIR compares the number of cancers reported in Cheshire to the number that would normally be expected based upon known statewide incidence rates for the cancer. An SIR greater than one indicates that there were more cases reported in Cheshire than expected, while an SIR less than one indicates that fewer than expected were reported. For example, an SIR of 1.5 indicates that 50% more cases occurred than were expected. Separate SIRs are usually calculated for each gender where appropriate. In order to calculate SIRs, it is necessary to obtain population information for the entire state and for Cheshire. The population estimate used in this analysis was from the nearest decennial year of the U.S. census (2000). This allows an estimate of an “at-risk” population in Cheshire (by age and gender for each time period) and to estimate statewide rates by age and gender for each cancer type.

Interpretation of Standardized Incidence Ratios (SIRs)

In order to determine if the number of cancer cases occurring in Cheshire were elevated, SIRs were calculated for both pediatric leukemia and for all childhood cancers combined. The SIRs were calculated for children from birth to age 19 (pediatric leukemia and all childhood cancers combined), and for males and females. The SIRs were adjusted to take into account the age distribution of the population in Cheshire.

Care should be taken in interpretation of SIRs due to statistical variability. As a measure of statistical variability, “95% confidence intervals” are presented for each SIR. The size of the 95% confidence interval depends on the number of cases. For small numbers of cases, the range of the confidence interval will be larger than for cancer types with a large number of cases. An SIR is considered statistically significant if the 95% CI does not include the value one. Statistically significant means that there is less than a 5% chance that the observed difference is the result of random fluctuations in the number of cases. An SIR that is statistically significant *does not necessarily indicate a finding is of public health relevance*. Statistically significant SIRs can still occur due to random variation. For example, when using the 95% confidence limit, one would expect one out of twenty calculated SIRs to be significant due to random variation alone. When incidence rates in Cheshire were analyzed in the Cheshire PHA 2004, a total of fifty-seven SIRs were calculated, so up to three SIRs would be expected to be elevated by chance alone.

In evaluating the public health significance of elevated SIRs (those greater than 1.00), a number of factors are considered. The magnitude of the SIR elevation is an important finding. For example, an SIR of 5.00 (500% increase) is much more suggestive of an important finding than an SIR of 1.5 (50% increase). Also, the size of the confidence limit reflects the stability of the SIR estimate. A narrower confidence interval, such as 1.1 to 1.2, indicates the calculated SIR is more precise than a SIR that has a large confidence interval.

Another factor that should be used in evaluating SIR are trends over time. Since four time periods have now been evaluated for Cheshire, consistency over time can be considered.

RESULTS

Summary of Years 1999-2008

This section presents the results of pediatric leukemia and all childhood cancer cases in Cheshire for the period 1999-2008. Table 1 contains the SIRs for this time period broken down further by gender.

During the 10 year time period evaluated in this HC, there were no statistically significant increases or decreases in male or female pediatric leukemia and childhood cancer cases. The SIRs for female childhood cancer and female pediatric leukemia cases were above one and for males, both SIRs were below one but with no statistical significance. Confidence intervals were fairly wide, suggesting unstable SIR estimates.

As with earlier analyses of pediatric leukemia and childhood cancer cases, these analyses are complicated by very small numbers. For example, only 1.44 cases of female pediatric leukemia are expected over this ten-year period. So, even though there are more than expected numbers of leukemia in females (4 observed vs. 1.4 expected), the confidence limits are large and do not indicate statistical significance. There was only male pediatric leukemia case for the same period when 2.04 cases would be expected. These numbers only highlight the problems with statistical stability when a very low number of cases are involved.

In addition, SIRs for childhood cancers for this time period were not statistically significant. Evaluation of this category of cancers is also constrained by the very small numbers that occur over a time period of ten years. During the 1999 to 2008 time period, the SIR for girls approached 2.0 (as in the 1995 to 2000 period) (ATSDR 2004), but again also resulted in large confidence limits that do not indicate statistical significance.

Table 1. Cheshire SIRs* for the Years 1999-2008

	SIR	95% CI[^]	Observed Cases	Expected Cases
Pediatric Leukemia (0-19)				
Females	2.85	0.78-7.30	4	1.4
Males	0.49	0.01-2.72	1	2.04
All Childhood Cancers (0-19)				
Females	1.90	0.95-3.40	11	5.8
Males	0.87	0.37-1.71	8	9.22

*Standardized Incidence Ratio

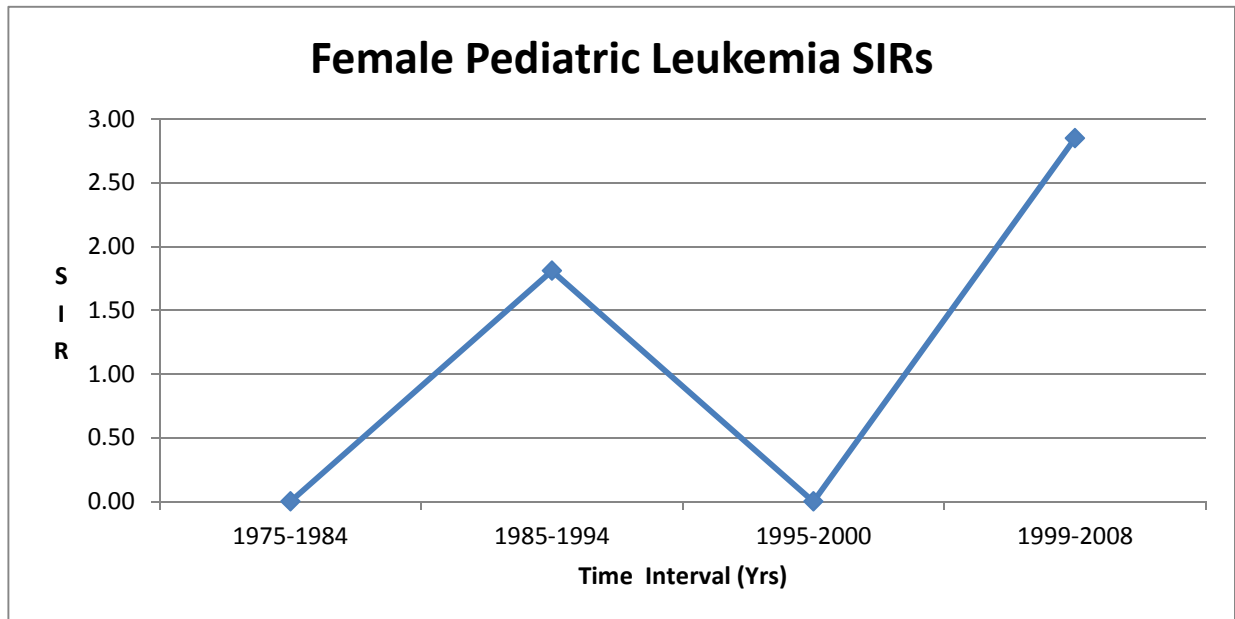
[^]Confidence Interval

Time Trends, Year 1975-2008

There was no apparent time trend in pediatric leukemia, with numbers of cases being highly variable between the four time periods evaluated. During the time periods 1975-2008, there was no apparent increase or decrease over time in the small number of pediatric leukemia cases observed (1975-1984, n=4, 1985-1994, n=4, 1995-2000, n=2, 1999-2008, n=5). Figures 1 and 2 show the fluctuation of pediatric leukemia and childhood cancer SIRs for the 4 time intervals separated out by gender. There were also no time trends for the four intervals if cancer cases were separated out by gender.

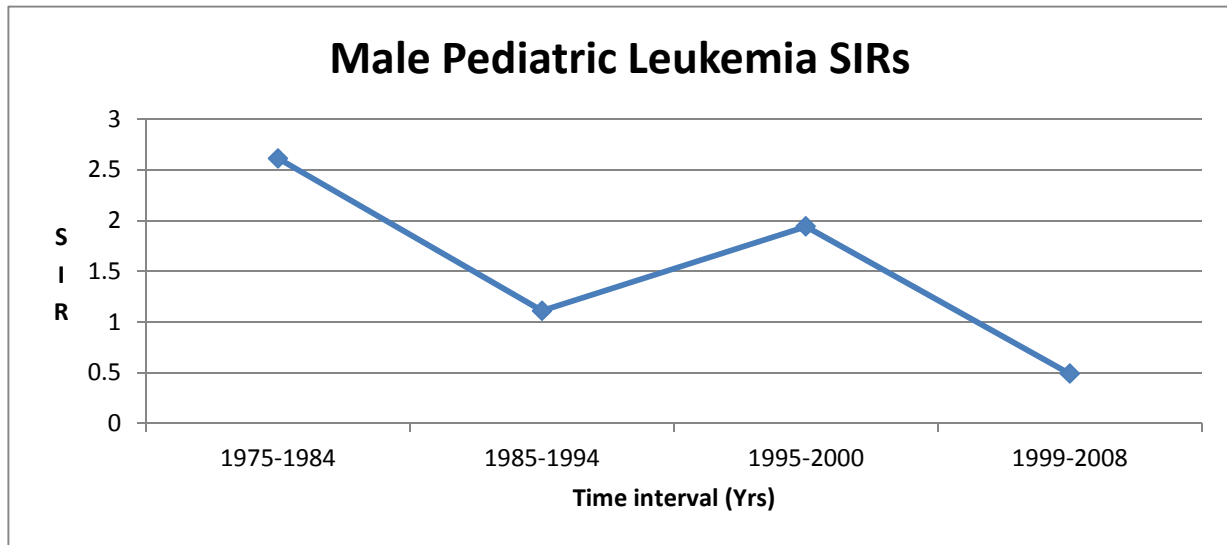
From the time periods 1975-2008, there was no apparent increase or decrease over time in the small number of childhood cancer cases observed (1975-1984, n=12, 1985-1994, n=17, 1995-2000, n=14, 1999-2008, n=19). Figures 3 and 4 show the fluctuation of childhood cancer SIRs for the 4 time intervals separated out by gender. There were also no time trends for the four intervals if cancer cases were separated out by gender.

Figure 1. Female Pediatric Leukemia SIRs[^] for 1975-2008.



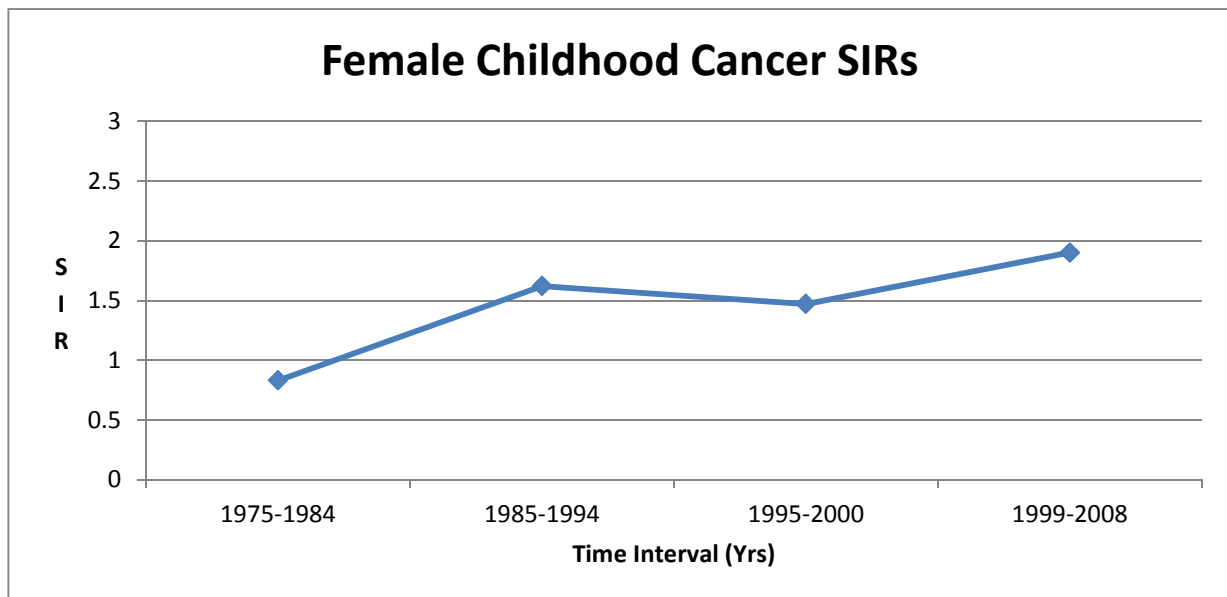
[^]Standardized Incidence Ratio

Figure 2. Male Leukemia SIRs^ for 1975-2008.



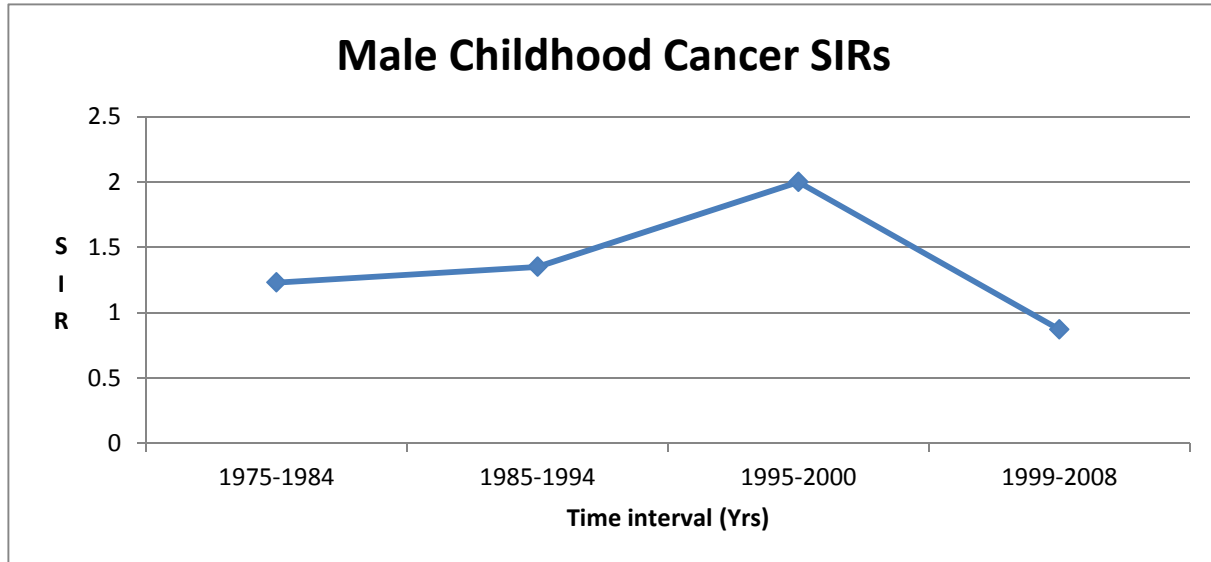
^Standardized Incidence Ratio

Figure 3. Female Childhood Cancer SIRs^ for 1975-2008.



^Standardized Incidence Ratio

Figure 4. Male Childhood Cancer SIRs[^] for 1975-2008.



[^]Standardized Incidence Ratio

DISCUSSION

The public health significance of the results described above, needs to be evaluated with an understanding of the limitations of epidemiology, known risk factors for specific cancers, and known environmental contamination in Cheshire.

Cancer is not a single disease, and studies have generally shown that different cancer types have different causes, patterns of incidence, risk factors, and latency periods (period between exposure and development of disease). Therefore, each of the cancer types evaluated should be viewed as separate issues. If there were a common environmental exposure resulting in elevated cancer risk in Cheshire, it would have likely affected the incidence of only one cancer type.

The type of cancer analysis conducted in this Health Consultation is often referred to as an “ecological analysis,” in that it looks at cancer over a broad area, and does not take into account individual characteristics of cases. As such, ecological analyses have a number of limitations that prevent drawing cause and effect conclusions. This type of analysis is most often used to identify areas where more detailed studies are needed. Also, this type of analysis cannot determine what may have caused an individual’s cancer, nor answer if an observed increase incidence in the community is or is not related to a specific environmental contamination.

Overall, there do not appear to be statistically significant elevations in cancer incidence in Cheshire for the 1999-2008 time period for childhood cancers or pediatric leukemia.

Among the 2 SIR elevations (where the SIR is greater than 1), the strength of the effect was low, with SIRs near or less than three (highest 2.85 for female pediatric leukemia). Small numbers of cases in all categories resulted in unstable SIRs with large confidence intervals that resulted in a lack of statistical significance.

In addition, since the air treatment towers (public water treatment device) were installed in the mid to late 1980s, children born after 1989 (and adults consuming public water in Cheshire after 1989) were not exposed to TCE that was once present in the public water supply. Therefore, after the late 1980s, there is no pathway of exposure to TCE in the public water supply that could contribute to cancer rates.

Lastly, in analyzing all 4 time intervals by gender for both pediatric leukemia and childhood cancers, there were no time trends found. Individual female childhood cancers and pediatric leukemia SIRs exceeded 1 at times and approached 3 but fluctuated over the 4 time periods. The maximum SIR of 2.85 was during the latest time period of 1999-2008 after the water supply was treated (and thus there was no pathway of exposure to contaminated water as described above) for the females who were diagnosed during this period.

Limitations

There are a number of methodological limitations that must be considered when looking at the conclusions of this analysis. This assessment attempted to analyze cancer data for Cheshire on a town wide basis to determine if the patterns of occurrence for selected cancers were unusual. Results from such an analysis cannot conclude with certainty if an observed elevated cancer rate is or is not related to a common cause, such as the environment. Rather, this type of analysis can generate hypotheses that could be investigated by more definitive methods. Conversely, negative findings cannot with certainty conclude that the observed cancers are not related to environmental factors. In addition, this type of analysis cannot determine what may have caused any one individual's cancer. Cancers, in general, have a variety of risk factors that could not be evaluated in this report. It is believed that many cancers are related to behavioral factors, such as smoking, diet, and alcohol consumption. Other factors include socioeconomic status and genetics.

The cancers evaluated in this report are only those reported to the Connecticut Tumor Registry (CTR). The CTR is part of the National Cancer's Institute's Surveillance Epidemiology and End Results (SEER) Program since its inception in 1973. The SEER Program provides high quality data, and according to SEER-sponsored audits of hospitals, 98% of cancers are ascertained by SEER registries. However, the CTR only holds data for persons in Connecticut at the time of their diagnosis, and will not have cancer information recorded for those people who moved out of state and were diagnosed after moving. In addition, the analyses are based on the patient's address at the time of diagnosis, and only include patients residing in Cheshire when they are diagnosed. Hence, patients living in other Connecticut towns at the time of their diagnosis will not be included, even if they lived in Cheshire at some point prior to their diagnosis. This limitation is unavoidable in the type of analysis conducted here. However, it is also true that people who recently moved into Cheshire and were subsequently diagnosed with cancer are included in this analysis. These two processes of people moving into town while others are moving out should not result in a major

difference in cancer incidence rates estimated for Cheshire and therefore, should not impact the final results or conclusions.

CONCLUSIONS

CT DPH reached the following conclusions:

CT DPH evaluated an additional eight years of pediatric leukemia and childhood cancers since the previous cancer data review was conducted in Cheshire. Pediatric leukemia and childhood cancers do not appear to trend upwards or downwards from 1975-2008. Over the 4 time intervals evaluated between 1975 and 2008, cancer rates fluctuate up and down and do not show an increasing or decreasing trend.

CT DPH concludes that during the 2000-2008 time interval, female pediatric leukemia and childhood cancers were higher than expected in Cheshire. However, the increase was not statistically significant. Male pediatric leukemia and childhood cancer cases were less than expected and also not statistically significant. Standardized incidence ratios (SIRs) were calculated for Cheshire using statewide rates for comparison. The SIRs show that pediatric leukemia and childhood cancer incidence rates in Cheshire were higher than the state for females and lower than the state for males. Numbers of cancers were small and SIR estimates were unstable.

RECOMMENDATIONS

No recommendations at this time.

PUBLIC HEALTH ACTION PLAN

Actions Taken

- 1) CT DPH has met routinely with the Cheshire Community Advisory Panel (CAP), CT DEEP, RWA, and Chesprocott Health District to discuss the details of the Cheshire PHA as well as any important environmental issues in the town and try to come up with a resolution to many of these issues. CT DPH has also educated community leaders on environmental issues in Cheshire and methods in order to resolve many of these issues.
- 2) CT DPH has assisted the community in forming a Community Advisory Panel made up of town leaders as well as concerned citizens to assist and advice CT DPH on the concerns of the residents as well as serve as liaison between the public and CT DPH.
- 3) CT DPH held a Public Availability Session (PAS) in Cheshire to hand out information and educate the residents about the Cheshire PHA process and information on environmental issues.
- 4) CT DPH held another PAS in May 2004 when the draft of this PHA was released to allow the public an opportunity to ask questions concerning the details of the PHA as

well as comment on the PHA. In addition, CT DPH has handed out information and educated the residents about environmental issues in the town of Cheshire.

- 5) CT DPH prepared a fact sheet in May 2004 to summarize the results and conclusions of this PHA. The fact sheet was distributed at the PAS in May 2004.
- 6) CT DPH analyzed pediatric leukemia and total childhood cancer rates from 1999-2008.

Actions Planned

- 1) CT DPH will continue to work closely with the Cheshire CAP, CT DEEP, and town leaders, as well as the Chesprocott Health District to ensure that the environmental concerns of the residents of Cheshire are met.

REFERENCES

ATSDR 1997. Toxicological Profile for Trichloroethylene, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substance and Disease Registry, September, 1997.

ATSDR 2004. Public Health Assessment. Community Concerns Evaluation, Cheshire, Connecticut. U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substance and Disease Registry, November, 2004.

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REPORT PREPARATION

The Health Consultation for Followup Recommendations, Evaluating Community Concerns in Cheshire, Connecticut was prepared by the Connecticut Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, and procedures existing at the data of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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