

Dover Township

Childhood Cancer Investigation

Childhood Cancer Epidemiologic Study: Interim Report and Next Steps

Background

In December 1999, the New Jersey Department of Health and Senior Services (NJDHSS) released an Interim Report of the Case-Control Study of Childhood Cancers in Dover Township. This report was issued jointly with the Agency for Toxic Substances and Disease Registry (ATSDR) to keep the community informed of the progress of the study, and to provide the results of the preliminary analyses conducted. We issued the Interim Report of this multi-year study because of our commitment to release information as it becomes available throughout the investigation.

Study Design

The Case-Control Study of Childhood Cancers in Dover Township (Ocean County) is an exploratory epidemiologic study. Its purpose is to identify possible risk factors that might explain why there has been an increased rate of certain childhood cancers in Dover Township.

This epidemiologic study uses the case-control method, which is considered the best way

to study rare diseases. Information from case and control populations is systematically gathered and compared to assess a broad range of life exposures, habits, activities, and familial patterns, in an attempt to identify possible disease risk factors. The Case-Control Study of Childhood Cancers in Dover Township (Ocean County) consists of two parts: an Interview Study, and a Birth Records Study.

Risk Factors Studied

The following groups of risk factors were considered and are being assessed in the Interview Study:

- demographic, pregnancy and birth characteristics
- family medical history
- health, medical conditions and medical procedures
- dietary factors
- exposure to tobacco smoke and alcohol
- household exposures to chemicals, animals, and household appliance electromagnetic fields
- parental occupational data
- source of drinking water
- residential proximity to hazardous sites

- exposure to air pollutant sources.

The first six factor groups are discussed in the Interim Report. The final four will be included in the final report.

For the Birth Records Study, only those factors that may be identified through or derived from birth certificates were evaluated as part of the case-control study. These include demographic information such as parents' ages, pregnancy and birth characteristics, drinking water source, residential proximity to waste sites, and exposure to air pollutant sources (the latter three being derived from residence at time of birth).

The factors listed above were chosen either because previous studies in other communities indicate they may be related to childhood cancers, or because of community concerns. In addition, completed exposure pathways to hazardous chemicals within portions of this community are also being considered.

Interview Study Methods and Selection of Subjects

For the Interview Study,

study cases were children diagnosed with leukemia or nervous system cancers before the age of twenty years, who were diagnosed from 1979 through 1996, and who were residents of Dover Township at the time of diagnosis. Controls were children matched for age, gender and race who were living in Dover Township at the time a cancer case was diagnosed. Four controls were randomly selected through school records for each study case. Families of all forty eligible case children and 159 control children participated in the Interview Study.

A series of questions was posed to both case and control families to learn if there were any differences in potential risk factors. A structured telephone interview with parents or guardians was conducted by NJDHSS staff. All interviews were conducted between March 1998 and January 1999.

Birth Records Study and Selection of Subjects

There was concern among community members that children born in Dover Township were being diagnosed with cancer after moving out of the area. The purpose of the Birth Records Study was to identify these children, and compare information that could be obtained from birth certificates with information on birth certificates from other children born in Dover Township who did not have cancer. Birth certificates for children diagnosed with any type of cancer anywhere in New Jersey between 1979 and 1996 were examined. Children whose

mothers were residents of Dover Township at the time of the birth were eligible for the study. Cancer registries from nine other states were also queried for childhood cancer cases, to learn if any of these children were born in Dover Township.

Forty-eight cases were identified in the Birth Records Study, including 24 who were also Interview Study cases. Ten controls were randomly selected from birth certificates for each case, matched on year of birth, gender, and mother's residence in Dover Township at the time of the child's birth.

Strengths and Limitations of the Case-Control Study

The outcome of any epidemiologic study can be affected by the selection of study subjects, and by the type and quality of data obtained. If unsuitable cases and/or controls are selected, or if inaccurate or incomplete data are collected, comparisons made between the two groups may be difficult to interpret.

The investigators of the Case-Control Study of Childhood Cancers in Dover Township (Ocean County) took steps to ensure that all cases were identified and included in the study, and that controls were representative of the population of children in Dover Township. The New Jersey State Cancer Registry contains accurate information on childhood cancer cases diagnosed in New Jersey. All forty case families identified as eligible participated in the Interview Study. The participation rate among

potentially eligible control families was high (80%), which indicates that these controls are likely to be representative of the population. A limitation of the Interview Study is that individuals may not accurately recall past behaviors or experiences that were included in the questionnaire, or that parents of cases may remember their children's potential exposures to risk factors differently than parents of controls. The study attempted to reduce these differences by using identical notification and interviewing procedures for all participants, to the extent practicable; using a small number of experienced interviewers; and by not releasing copies of the questions before all interviews were completed. An important limitation is that numbers of cases in sub-categories (e.g., specific cancer and age groups) are small.

The Birth Records Study received information on potential cases from nine other states that maintain cancer registries. A strength of the Birth Records Study is that these nine states are listed by the U.S. Census Bureau as being the destination of 70 percent of Ocean County residents who move to other states. Randomly selected birth certificates from Dover Township which were used as controls are also representative of the population. A limitation of this study is that birth certificates contain far less information than was obtained through the interview process, and no information on a child's potential exposure to risk factors after birth.

Throughout the development

of the study, the NJDHSS and the ATSDR had non-agency, independent scientists review all aspects of the study to ensure that valid and reliable information would be obtained.

The NJDHSS consulted an Expert Panel of epidemiologists and cancer experts from universities, medical centers, and other government agencies, to provide critical review and comment on the procedures and the report. The ATSDR employs a similar system of Peer Review of its procedures and documents. Finally, stakeholders (including the Citizens Action Committee on Childhood Cancer Cluster, industry representatives, environmental agencies, and local government representatives) were also invited to provide critique of the proposed methods in advance of the study.

Findings

For most factors studied, there were no significant differences in potential exposure to risk factors between the case and control children. The following are the findings for each risk factor group:

Demographic, pregnancy and birth characteristics:

Cases and controls were similar for the age of the mother at the child's birth, and the proportion of the child's life lived in Dover Township. There were a number of differences observed between the two groups, as well. It was more common among controls than cases to be first-born children; to have fathers with a college degree (compared to leukemia case children); or to be

born to women with less than adequate prenatal care (compared to nervous system cancer case children).

It was more common in leukemia cases than controls to have three or more siblings; a mother with less than a high school degree; to have had high birth weight; and to have been born to women with less than adequate prenatal care.

It was more common in nervous system cancer cases than controls to have had a mother with a college degree; or a mother with any complication during pregnancy.

Family medical history:

Case and control families reported similar frequencies of inherited problems or birth defects. A history of any type of cancer in a parent was more common among nervous system cancer case families than control families.

Health, medical conditions and medical procedures:

The frequency of most prenatal medical conditions and medical procedures was similar for cases and controls. Vaginal or uterine bleeding, and toxemia during pregnancy were more common among control mothers; nausea and vomiting for more than three months during pregnancy were more common among case mothers.

Antibiotic use for ten days or longer by a child was more common in case children than controls. Exposure of children to diagnostic x-rays was also more common in children with cancer.

To minimize the possibility that the x-rays were used as part of the diagnosis of cancer, x-rays received within one year before diagnosis were eliminated from the analysis. When these x-rays were not considered, there was little difference between case and control children.

Dietary factors: Reported consumption of fruits and vegetables by mothers during pregnancy and by children was similar in cases and controls. Use of multivitamins during pregnancy was less common in leukemia cases. Maternal consumption of cured meats weekly during pregnancy was less common in brain and central nervous system cases than controls. Maternal consumption of more than four glasses of tap water daily during pregnancy was more common among leukemia cases than controls.

Exposure to tobacco smoke and alcohol: There was little exposure to these risk factors, and no significant differences between cases and controls.

Household exposures to chemicals, animals, and household appliance electromagnetic fields: The frequency of most prenatal household-related exposures was similar among cases and controls. Car repairs at home during pregnancy was higher for cases; use of moth balls or crystals during pregnancy was higher among controls.

Use of electric blankets, electric mattress pads, or heated water beds was more common

among children with leukemia than controls.

Discussion

These results should be interpreted cautiously. Because of small numbers of individuals in the studies, slight changes in numbers can cause significant changes in statistical values.

Some (but not all) previous studies have shown the same associations between several factors and childhood cancers, including mother's use of multivitamins during pregnancy, and the use of electric blankets. In other studies, maternal consumption of cured meats has been shown to be a risk factor for childhood brain tumors. This study did not observe this association.

Differences between case and control children were also observed regarding tap water consumption. Although maternal consumption of higher than average amounts of tap water daily during pregnancy was more common among leukemia case mothers, there was no similar association for nervous system cancer cases. Information regarding the water source and the length of time that the water source was used is not yet available, but will be part of future analyses.

Next Steps

Parents' occupations, source of drinking water, residential proximity to hazardous sites, and exposure to air pollutant sources are still under investigation.

The ATSDR is developing a model of the community water supply to address some of the concerns relating to water source. The model takes into account seasonal variations in water demand; the particular wells that were in service during any given month; and expected percentages of water from the different wells reaching an area after the mixing of water from the wells within the distribution system, going as far back as 1962. When the model is completed, exposure to specific sources will be determined, based on the residential histories provided during the Interview Study.

A model is also being developed to examine the influence of air pollutant sources on the community. The Environmental and Occupational Health Sciences Institute (EOHSI) is developing the computer model to account for weather patterns and known air emissions. As with the drinking water source analysis, assessments of these exposures will be evaluated based on residential history.

Occupational histories of both parents during the mother's pregnancy and through the

child's cancer diagnosis (or through the same time period for controls) was obtained as part of the Interview Study. An industrial hygienist will be completing a parental occupational exposure assessment based on a review of job titles, descriptions, chemical exposures and other reported activities.

Finally, residential proximity to hazardous sites will also be assessed. Sites were selected based on documentation of off-site exposures. Environmental data, including groundwater, surface water, soil and sediment, have been collected by State, county and federal agencies, and is being utilized in the exposure assessment.

A final report is currently expected to be completed by the end of 2001.

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