Cancer Incidence and Asbestos in Drinking Water, Town of Woodstock, Ulster County, New York, 1980-1998

Background
In November 1985, asbestos contamination was discovered in the public water supply of the Town of Woodstock, Ulster County, New York. The source of the asbestos was asbestos-cement (AC) pipes installed in the town water system in the mid to late 1950s. Due to the high corrosivity of the local water, the entire town water supply system may have contained some level of asbestos fibers. The time frame during which asbestos fibers started leaching into the water is unknown but may have been as early as 1960. Exposure of workers to airborne asbestos has been shown to increase the risk of lung cancer and mesothelioma (cancer of the lining of the lung, chest, or abdominal cavity). However, studies of asbestos contamination of drinking water have produced conflicting results.

The New York State (NYS) Department of Health (DOH) conducted a preliminary study of cancer incidence for the years 1973-1983 among Woodstock residents living in the census blocks that include the water district. No evidence of elevated gastrointestinal or respiratory cancer incidence was observed. Since cancer resulting from exposure to asbestos can take 20 to 30 years to develop, sufficient time from the start of exposure may not have passed at the time of that study. Also, cancer rates were based on census boundaries and would have included people who did not live on the public water supply. The present study includes only people who lived on the water supply and takes into account length of residence. In addition, sufficient time has now passed to allow asbestos-related cancers to develop.

Methods
In 1986, NYS DOH established the Woodstock Asbestos Exposure Registry (WAER) to monitor cancer incidence among individuals who, between 1960 and 1985, lived in homes serviced by the Woodstock water supply. The objective of this study was to calculate cancer incidence rates among the registry population for total cancers, gastrointestinal cancers (esophagus, stomach, intestine colon, rectum, liver, gall bladder, pancreas, and peritoneum), respiratory cancers, and mesothelioma, and then compare these to cancer rates for NYS excluding New York City (NYC).

Extensive efforts were made to contact and recruit current and former residents. These included an in-person registration week, mailed questionnaires, reminder letters, follow-up telephone calls, and telephone interviews. A total of 2,936 current or former Woodstock residents participated in the registry. Address and health information were updated every two years through 1998.

The NYS Cancer Registry (NYSCR) was used to confirm cancer diagnosis and to identify unreported cancers among registry participants who remained in NYS. For registry participants who moved out-of-state, self-reported cancers were counted. Cancer incidence for participants who stayed in NYS was examined separately from all participants. Since the entire town water supply may have contained some level of asbestos starting around 1960, the follow-up period for observation of cancer was 1980-1998. Having the follow-up begin in 1980 allowed for a time period of 20 years to pass since the earliest time of first exposure. This is consistent with the expected lag of 20-30 years or more for development of asbestos-related cancers.
Standardized incidence ratios (SIRs) and 95% confidence intervals (CIs) were calculated. An SIR is the observed number of cancers in the study population divided by the expected number of cases. The expected numbers of cases were based on cancer rates by age, gender, and race for NYS excluding NYC. An SIR of 1.00 means that the observed number of cancers was the same as the expected number, an SIR below 1.00 means fewer than expected cancers were observed, and an SIR above 1.00 means that more than expected cancers were observed. The confidence interval for the SIR expresses how precise the SIR estimate is. An SIR is said to be statistically significant (the SIR is unlikely to be due to chance) if the confidence interval does not include 1.00.

Findings
The SIRs for gastrointestinal, respiratory, and total cancer groupings were all approximately 1.00 or less and all confidence intervals (CIs) included 1.00. For individual types of the gastrointestinal cancers, only the SIR for pancreatic cancer was marginally statistically significant at 2.19 (95% CI=1.00-4.16), based on a total of nine observed cases. The excess in pancreatic cancer occurred primarily among men (SIR=3.08; 95% CI=1.13-6.70), and was only slightly elevated among women (SIR=1.39; 95% CI=0.29-4.06). No cases of mesothelioma were reported among WAER participants. The SIRs listed above are for WAER participants who remained in NYS. Similar results were observed for all WAER participants.

Discussion and Conclusions
This study did not demonstrate an increased incidence of total gastrointestinal cancer, total respiratory cancer, or all cancers combined among WAER participants relative to NYS excluding NYC. When individual gastrointestinal cancers were examined, only pancreatic cancer was significantly elevated. The excess of pancreatic cancer among men in our study might be due to factors other than asbestos exposure. Cigarette smoking is the risk factor most consistently associated with pancreatic cancer. In this study, a history of cigarette smoking was available for eight of nine pancreatic cancer cases, and seven of the eight were current or former smokers. In addition, three of the nine cases of pancreatic cancer lived on the Woodstock water supply for less than ten years before their cancer was diagnosed. It is very unlikely that cancers diagnosed within ten years of first exposure would be related to asbestos exposure. Although the pancreatic excess was statistically significant, it may nevertheless be due to factors other than exposure to asbestos.

Important limitations of the study are uncertainty about levels of asbestos and uncertainty about when leaching of asbestos into the water supply first began. Four out of five water samples collected in November 1985 had asbestos levels greater than 10 million fibers per liter (MFL), with the maximum equaling 304.5 MFL. However, the water sampling occurred after the water mains were flushed and may have been higher than the usual concentrations. The general pattern of results in this study did not demonstrate a likely link between exposure to asbestos in drinking water and cancer occurrence among participants in the WAER. As a result of these findings, the WAER is officially ending.

If you would like to receive a copy of the full report or have any questions about this study, please contact (toll-free) Nicholas Teresi at 1-800-458-1158, extension 27530, or e-mail ceheduc@health.state.ny.us.