

Questions & Answers

Regarding *A Cross-Sectional Study of Asbestos-Related Morbidity and Mortality in Vermonters Residing Near an Asbestos Mine – Updated December 9, 2008*

What is the purpose of this report?

Many studies have found that breathing in asbestos fibers is associated with lung cancer, asbestosis, and mesothelioma (a rare cancer) in people who work with asbestos. Few studies have looked at the risk of developing these diseases from non-occupational exposures.

The Vermont Department of Health designed this study to collect and analyze all available information about asbestos-related health conditions among people who lived in the 13 towns that fall within a 10-mile radius of the Vermont Asbestos Group mine. In the absence of current environmental sampling data, we looked at readily available data from death certificates, hospital discharge billing records and the Vermont Cancer Registry for a 10-year period, 1996 to 2005.

We wanted to see if we could better understand health risks associated with living near the mine, compared to living anywhere else in Vermont.

What are the key findings?

This study found statistically significant associations between asbestosis disease and death and living in towns that fall within a 10-mile radius of the mine:

1. Vermonters who were discharged from the hospital with a diagnosis of asbestosis were more likely to live near the mine, compared to people living elsewhere in the state.
2. Vermonters who died from, or with, asbestosis were more likely to live near the mine, compared to people living elsewhere in the state.

What are the data sources for this report?

For this report, we studied *morbidity* (illness) and *mortality* (death) data from the most recent 10 years available (1996-2005). The data sets we used were:

1. *Death certificates* maintained by the Vermont Vital Statistics System
2. *Case reports* of new diagnoses of cancer reported to the Vermont Cancer Registry
3. *Hospital discharges* reported to the Vermont Department of Health by Vermont Association of Hospitals and Health Systems - Network Services Organization (VAHHS-NSO) under a contract with the Vermont Department

of Banking, Insurance, Securities and Division of Health Care Administration (BISHCA).

Which health conditions were studied and why?

Chrysotile asbestos is the type of asbestos that was mined in Vermont. Research has shown that breathing chrysotile asbestos is related the development of lung cancer, mesothelioma, and asbestosis among asbestos mine workers. We reviewed data about Vermonters to see if residents (not just workers) had any of these health conditions.

Asbestosis is a serious, progressive, long-term disease of the lungs. Inhaling asbestos fibers that irritate and inflame lung tissues, causing the lung tissues to scar, causes asbestosis.

Lung cancer is the same as “malignant neoplasm of bronchus and lung.” This is cancer that forms in tissues of the lung, usually in the cells lining air passages.

Mesothelioma is a rare cancer that may affect the lining of the lungs (pleura) or the lining of the abdominal contents (peritoneum). Most mesotheliomas are caused by exposure to asbestos.

What does “univariate statistical analysis of observed data” mean?

Univariate is a mathematical expression meaning that the effect of only one exposure variable is examined at a time. In this study, the exposure variable being studied was whether people lived near the asbestos mine or not. It was not feasible to examine more than one exposure variable at a time.

Statistical analysis means our study was based on mathematical calculations, rather than on anecdotal data, such personal reports or focus groups.

Observed data means that the data were collected without participating in the clinical process. Observational studies are conducted when the researcher cannot ethically or practically intervene. For example a researcher cannot give someone a cancer, but rather study it after it has already occurred. In an observational study, the exposure status of the study participants is not under the control of the investigators. We used available data sets, rather than identifying and interviewing people, to conduct the study.

Did this study find a cause-and-effect relationship between living near the asbestos mine and developing (or dying with) asbestos-related health conditions?

No. Although statistically significant increases in asbestosis disease and death were found in those who lived near the mine, the study does not explain the *cause* of the increase. A major limitation of the study is the lack of information regarding exposure; that is, whether people inhaled asbestos, and if so, how much, over how many years, etc. The

study indicates that further research is needed to determine what health risks, if any, people living near the mine may have.

We cannot prove a cause-and-effect relationship between living near the asbestos mine and developing (or dying with) asbestosis because it is impossible to account for all the other factors (including work-related exposure) that might play a role. It is important to review all relevant information and never conclude an exposure relationship on one study alone.

This report is of a *cross-sectional study*, which means we observed events all at a single point in time. A cross-sectional study takes a “snapshot” of the population in question and bases its overall finding on the characteristics of study participants. However, since exposure and disease status are measured at the same point in time, it may not always be possible to distinguish whether the exposure preceded or followed the disease.

What is chrysotile asbestos and how is it different from other types of asbestos?

Asbestos is the name of a group of highly fibrous minerals with separable, long, and thin fibers. There are two general types of asbestos, amphibole and chrysotile. Some studies show that amphibole fibers stay in the lungs longer than chrysotile, which may account for amphibole asbestos being more toxic or harmful to the body than chrysotile asbestos.

Statistical Terms & Definitions

SMR: Standardized Mortality (Death) Ratio or Standardized Morbidity (Illness) Ratio

The SMR is the ratio of observed to the expected number of deaths (or illnesses) in the study population. A ratio of 1.0 means that the number of deaths (or illnesses) is exactly as would be expected, given the age structure of the population. A ratio of 5.0 means that the number of deaths (or illnesses) is five times higher than would be expected. A ratio less than 1.0 means that fewer deaths (or illnesses) were observed than would be expected.

OR: Odds Ratio

The Odds Ratio is a measure of association used to determine the strength or impact of a relationship between a disease (such as asbestosis) and a factor (such as exposure to asbestos). A number larger than 1.0 means that the odds of the disease are higher in presence of the factor. A number smaller than 1.0 means that the odds of the disease are lower in the presence of the factor.

CI: Confidence Interval

A study based on small numbers of cases cannot precisely determine the true rates of disease in the population. It can only estimate it, providing both a best guess and a

“confidence interval” around it within which we are reasonably “confident” that the true value lies.

All statistics in this report are calculated at a 95 percent confidence level. The Death Certificate Asbestosis Odds Ratio was found to be 12.69 (95% CI, 4.10 – 34.21) in our study. The confidence interval is the range 4.10 - 34.21. We are 95 percent confident that the true Odds Ratio lies between 4.10 and 34.21. The confidence interval tells us that if we repeated the same study many times, 95 percent of the confidence intervals calculated would include the true odds ratio.

Confidence intervals are used to test for statistical significance. In this example, the odds ratio is greater than 1.0 (an association is observed) and the confidence interval does not overlap with 1.0, thus we are 95% confident that the true Odds Ratio is indeed more than 1.0 (the association is statistically significant).

P-value

The *p*-value is similar to confidence intervals in that it is a calculation that measures the probability that obtaining a result is due to chance alone. A *p*-value less than or equal to 0.05 indicates statistical significance (and allows us to conclude with 95% confidence) that there is a difference between the two groups being studied. The smaller the *p*-value, the less likely the association being reported is due to chance.

In our example, the *p*-value for the Death Certificate Asbestosis OR is 0.0001. There is only a one-in-10,000 chance that this finding is due to chance; therefore it is highly significant.

In this report, the *p*-values are all less than 0.05; therefore, all associations being reported are statistically significant.

ICD: International Classification of Disease

The ICD is used to classify medical records and death certificate information in a standardized way, so it may be grouped together and analyzed.