HEALTH STATISTICS REVIEW
FOR LOUISIANA COMMUNITIES that RECEIVED ASBESTOS-CONTAMINATED VERMICULITE from LIBBY, MONTANA

Prepared by
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Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

SUMMARY

In 2001, it was determined that some exfoliation plants in Orleans Parish, Jefferson Parish, and St. John the Baptist Parish, Louisiana received vermiculite contaminated with asbestos fibers originating from the W.R. Grace mine in Libby, Montana. After receiving funding, in a cooperative agreement, from the Agency for Toxic Substances and Disease Registry (ATSDR), a health statistics review was conducted to evaluate whether the populations residing in zip codes 70084 (St. John the Baptist Parish), 70117 and 70126 (Orleans Parish), and 70121 (Jefferson Parish), had elevated cancer incidence for cancer sites associated with exposures to asbestos. All of the sites reviewed were exfoliation plants except for zip code 70126. In this review, the three exfoliation plant sites (zip codes 70084, 70117, and 70121) and the one receiving plant (70126) will be analyzed separately and jointly. Cancer incidence data (1991-2000) from the Louisiana Tumor Registry (LTR), a state funded population based cancer incidence registry covering the entire state, was utilized for this review.

Standardized Incidence Ratios (SIRs) were computed to compare the observed number of cases to the expected number of cases based on incidence rates for the state of Louisiana as a whole. White females and white males in the 70084, 70117, 70121, and 70126 zip codes combined had significantly higher SIRs for stomach cancer. White females had significantly higher SIRs for digestive tract cancers in zip code 70084. In zip code 70084, black females and black males had statistically higher incidence for lung and bronchus cancer. In zip code 70117, white males had significantly higher incidence ratios for digestive tract cancer, respiratory cancer, lung and bronchus cancer, and stomach cancer when compared to the state of Louisiana. In zip code 70121, black females had a statistically higher incidence for mesothelioma.

The Louisiana Department of Health and Hospitals, Office of Public Health, Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) plans to provide residents of these communities with follow-up health education.

INTRODUCTION

The United States Environmental Protection Agency (EPA) identified four facilities in Louisiana, which may have received vermiculite-containing ore from mines in Libby, Montana. These facilities include two in Orleans Parish, one in Jefferson Parish, and one in St. John the Baptist Parish. After these facilities were identified, LDHH/OPH/SEET received funding from the U.S. Department of Health and Human Services (DHHS)/ATSDR to conduct a health statistics review for communities that received asbestos-contaminated vermiculite from Libby, Montana.

Vermiculite is a porous mineral used as insulation and to hold water in potting soil. The vermiculite ore being examined in this review was mined in Libby, Montana from the early 1920's until the mine closed in 1990. It was distributed, mostly for commercial purposes, around the United States and abroad. This vermiculite was contaminated with tremolite asbestos.

Exposure to asbestos in vermiculite ore may increase the risk of asbestosis. Asbestosis is a chronic lung disease that can produce shortness of breath and permanent lung damage, and increase the risk of dangerous lung infection, lung cancer, and mesothelioma. Mesothelioma is a rare cancer of the thin membranes that line the chest and abdomen.

From the peak 1950s to the 1980s, contaminated ore from the Libby mine was shipped throughout the U.S. to processing and receiving facilities in different cities. The EPA has identified vermiculite facilities in the U.S. that received vermiculite ore from Libby, Montana. The activities at these sites included, but are not limited to, the manufacturing of building construction materials, insulation, steel, plastics, fertilizer, and chemicals (See www.epa.gov/region08/news/erlibby/libbyfact.html).

Populations living near these vermiculite-receiving facilities may have been exposed to asbestos as a result of vermiculite processing. Mining, milling, and exfoliation activities account for the vast majority of processing releases of asbestos from vermiculite. Exfoliation, the major processing step at vermiculite processing facilities, involves heating the mineral to drive off excess water to produce small, lightweight, low-density pieces. Ninety-four percent of crude vermiculite is exfoliated (1).

The most probable route of human exposure to asbestos-contaminated vermiculite occurs via inhalation, either by occupational exposure, by non-occupational ambient air exposure, or by exposure to contaminated clothing of household contacts of vermiculite-processing facility employees. It is not currently known how many people were potentially exposed to asbestos from these vermiculite-processing facilities; however, one estimate is over 13 million people (1).

There have been studies conducted to suggest that populations in proximity to asbestos mines and mills have experienced excess asbestos-related diseases, specifically mesothelioma. A South African report of residents living near asbestos mines and mills noted that one third of the mesothelioma cases had no employment history associated with asbestos, and that these non-occupational cases were exposed because of their residential proximity to the mines and mills (2). Other studies also detected excess mesothelioma cases in the immediate neighborhoods of factories that processed asbestos (3, 4, 5).

Although the larger, heavier asbestos particles settle to earth with limited potential for off-site contamination, an appreciable fraction of the asbestos discharged by asbestos facilities has been

documented to be in the form of free fibers that could potentially remain in the atmosphere for long periods of time, travel great distances, and expose many people (6, 7). Anecdotal evidence from Libby residents revealed that the mine and the two exfoliation plants produced large quantities of particles that were released into the ambient air, covering houses, buildings, cars, etc.

The ATSDR, Division of Health Assessment and Consultation (DHAC) is conducting a detailed exposure pathway evaluation for the River Road (Jefferson Parish) facility in New Orleans; a health consultation (HC) for this effort will be released by the end of the year. The health consultation will follow the format of the exposure pathway HCs already released for the Phase I site evaluation project (http://www.atsdr.cdc.gov/naer/index.html).

Health outcomes that have a known or suggestive association with asbestos exposure include:

Mesothelioma

Mesothelioma is a form of cancer that affects the cells that form the lining around the outside of the lungs (pleura), but that can also occur in the abdomen (peritoneum) or around the heart (pericardium). Affected cells grow without restraint and can eventually form a malignant tumor that can destroy these vital organs. The cancer can remain virtually 'dormant' for 20 to 40 years after the initial exposure. Mesothelioma is a uniquely related to asbestos exposure and is a relatively rare cancer; however, asbestos-related pleural disease is much more common and is diagnosed in approximately five million individuals every year (8).

Lung Cancer

Lung cancer is a malignant tumor of the bronchial lining. The tumor grows through surrounding carcinoma tissue, invading and often obstructing air passages. The time between exposure to asbestos and the occurrence of lung cancer is about 20 to 30 years.

There is little doubt that all types of asbestos can cause lung cancer. For example, statistically significant increases in lung cancer mortality have been reported in workers exposed primarily to chrysotile (9, 10), amosite (11), crocidolite (12, 13), anthophyllite (14), and tremolite (15, 16) or to multiple fiber types (17). It should be noted that there is a synergistic effect between smoking and asbestos exposure, which creates an extreme susceptibility to lung cancer.

Gastrointestinal/Digestive Cancers

A number of epidemiological studies of workers exposed to asbestos fibers in workplace air suggest that workers may have increased risk of gastrointestinal/digestive cancers. However, it is usually assumed that any effect of asbestos on the gastrointestinal tract after inhalation exposure is most likely the result of mucociliary transport of fibers from the lung to the stomach.

Mortality studies of asbestos workers have often revealed small increases in the incidence of death from cancer at one or more extrathoracic sites, mostly in tissues of the gastrointestinal system. In a mortality study of 17,800 insulation workers, a total of 99 deaths from cancers of the esophagus, stomach, colon or rectum were observed, while only 59.4 deaths of this sort were expected (18). Similarly, 26 deaths from gastrointestinal cancer were observed in a group of 2,500 asbestos textile workers, where only 17.1 were expected (18). In contrast, a number of other epidemiological studies have not detected significant association between increased risk of extrathoracic cancers and asbestos exposure (19, 10, 13, 14).

Other health outcomes, which are associated with asbestos exposure for which no routinely calculated data are available, include most notably asbestosis.

METHODS

DATA REVIEW

The LDHH/OPH/SEET visited all four of the Louisiana facilities that have been identified as receiving Libby, Montana vermiculite, and analyzed cancer incidence in four zip codes: Southern Mineralite Company, Orleans Parish (zip code 70117), W.R. Grace Company/ Zonolite, Jefferson Parish (zip code 70121), Filter Media Company, Saint John the Baptist Parish (zip code 70084) and Best Wall Gypsum on Almonaster Boulevard, Orleans Parish (zip code 70126). The zip codes 70084, 70117, and 70121 contained vermiculite-processing facilities that were all exfoliation plants. The Almonaster Boulevard site (zip code 70126) was not an exfoliation plant, but it was a receiving plant and a manufacturer of gypsum lath and plaster products. The cancer incidence rate was reviewed at the zip code level because residential areas are present within the 70126 zip code ½ mile to the North and 1-mile to the west of the industrialization site.

In analyzing this cancer incidence document, LDHH/OPH/SEET chose to combine all zip codes (exfoliation and receiving plants) because this would provide more statistical stability in analyzing the cancer incidence data. The population represented at the zip code level provides smaller numbers and are less likely to show a true significance. When the zip codes are combined, there are more advantages to showing any statistical significance.

The LTR provided incident cancer cases for the years 1991-2000. The LTR, operated by the Louisiana State University Health Sciences Center (LSUHSC), is a population-based Surveillance, Epidemiology, and End Results (SEER) cancer registry covering the entire state of Louisiana. The registry has been in operation in the New Orleans metropolitan area since 1974, in South Louisiana since 1983 and in the rest of the state since 1988. By law, every health care provider is required to report newly diagnosed cancers. In order to accurately report the mesothelioma cases found in zip codes 70084, 70117, 70121, and 70126, SEET verified the cases with the LTR. LDHH/OPH also reviewed SEER incidence data as a comparison to the zip code data in order to provide the most accurate data.

The period of time selected for evaluation of cancer incidence data was 1991-2000, which was the most recent data available at the time of this analysis. Cancer incidence was chosen for this review because cancer incidence rates are affected by multiple factors: how advanced the cancer is at the time of diagnosis, access to health care, and other factors not related to exposure. An incident case was defined as an individual residing within one of the selected zip codes who was diagnosed with a new primary malignant cancer of the specific sites during the evaluation period. The variables analyzed included: address at time of diagnosis, parish of residence, primary cancer site, histology type, date of diagnosis, age at diagnosis, date of birth, race, sex, and zip code. Information on other risk factors such as occupational exposures or personal lifestyle habits is not available in the abstracted medical data used in this review.

DATA ANALYSIS

Cancer types evaluated in this study were determined by an ATSDR protocol for health statistics review for communities that received asbestos-contaminated vermiculite from Libby, Montana. Analyses were conducted for potential asbestos-related cancer types. The asbestos related cancer

types include malignant neoplasms of the digestive system, malignant neoplasms of the respiratory system, malignant neoplasms of the lung and bronchus, malignant neoplasms of the stomach, and mesothelioma. Mesothelioma is a subset of neoplasms of the peritoneum, retroperitoneum and pleura. Table 2 presents a list of the International Classification of Disease Oncology (ICD-O-2) codes for the cancer groupings evaluated.

Standardized incidence ratios (SIRs) were calculated for specific age groups, sexes, and races. The SIR compares the actual occurrence of cancer in the study population (in this case, zip codes 70084, 70117, 70121 and 70126) relative to what might be expected if the zip code had the same cancer incidence rate as the comparison population (Louisiana). A SIR is the ratio of the observed number of cases to the expected number of cases.

The SIR tells us how much higher or lower the zip code cancer rate is than that in the other population, the State of Louisiana. If the observed number of cases equals the expected number of cases, the SIR will equal one. If there are more observed cases than are expected, then the SIR will be greater than one. If there are fewer observed cases than one would expect, then the SIR will be less than one. For example, if 10 cases are observed in the study population, but 5 cases were expected, then the SIR = 10/5 = 2 and the area has twice the cancer rate than expected. But if 20 cases were expected, then the SIR = 10/20 = 0.5 and the area has half the rate than expected.

Caution should be exercised, however, when interpreting the SIR. The interpretation must take into account the actual number of cases observed and expected, not just the ratio. Two SIRs can have the same number, but represent very different scenarios. For example, a SIR of 1.5 could mean 3 cases were observed and 2 were expected (3/2 = 1.5). Or it could mean 300 cases were observed and 200 were expected (300/200 = 1.5). In the first instance, only one excess cancer case occurred, which could easily have been due to chance. But, in the second instance, 100 excess cancers occurred and it would be less likely that this would occur by chance alone.

To help interpret the SIR, the statistical significance of the difference can be calculated. In other words, the number of observed cases can be determined to be significantly different from the expected number of cases or the difference can be due to chance alone. "Statistical significance" for this review means that there is less than 5 percent chance (p-value <0.05) that the observed difference is merely the result of random fluctuation in the number of observed cancer cases. If the SIR is found to be statistically significant, then the difference between the expected and observed cases is probably due to some set of factors that influences the rate of that disease.

Louisiana's average annual cancer incidence rates were used to derive the expected number of cancer cases. The study area, age-sex-race-specific population, and race were determined from the LTR. Data were analyzed for cancers of the digestive system, respiratory system, lung and bronchus, mesothelioma, stomach, and all cancers combined and were compared to Louisiana. Males, females, blacks and whites were evaluated separately and results combined for an overall adjusted SIR. Tables 3A – 3E show the number of cancers observed in zip codes 70084, 70117, 70121, and 70126 for the 10-year period of 1991-2000. Intercensal estimates of the zip code populations for the years 1991-1999 were projected based on the 1990 and 2000 reported census data.

SIRs were calculated for each type of cancer and reported when four cases or more were observed in the zip codes within the 10-year period. Calculating SIRs with fewer cases leads to statistical instability. Louisiana was used as the comparison population. The zip code

calculations were based on the 1990 and 2000 census data plus estimates from years between census surveys.

Ninety-five percent confidence intervals (95% CIs) were calculated to assess statistical significance (20). A confidence interval is a range of possible values for the SIR that is considered consistent with the normal variation in disease over time in a geographic area. The confidence interval consists of two numbers -- the lower bound and the upper bound of the range of normal SIR values. If both the lower and upper bound numbers of the confidence interval are less than 1, then the conclusion of the statistical test is that a disease is occurring less frequently in the specific zip code than it is in the Louisiana population. This is called a "statistically significant decrease" or a "statistically significant deficit." If the lower bound number is less than 1 and the upper bound number is greater than 1, then the conclusion of the statistical test is that a disease is occurring in the specific zip code at the same frequency as in the Louisiana population (or cannot be distinguished from normal fluctuations using this statistical technique). This is called "not statistically significantly different." Lastly, if both of the numbers in the confidence interval are higher than 1, then the conclusion of the statistical test is that a disease is occurring more frequently in the zip code than it is in the rest of the country. This is called a "statistically significant increase "or a "statistically significant excess."

RESULTS

DEMOGRAPHICS

In order to characterize the populations living in zip codes 70084, 70117, 70121, and 70126, 2000 U.S. census data were evaluated as shown in Table 1. The racial distribution of residents living within these zip codes differs from one another. In the 70084 zip code, 52 % of the residents are black compared to 87% black residents in the 70126 zip code. In the 70117 zip code, 89% of the residents are black while the 22% of the residents in the 70121 zip code are black. The population labeled “other” was not calculated in this report because the numbers were too small to accurately represent the population.

In the 70117 zip code, 38% of persons live below the poverty level, whereas in the 70121 zip code, only 13% do. As expected, gender differences among zip codes are small. As shown in Table 1, the median year of residence occupancy for zip codes 70117, 70121, and 70126 was 1993. In zip code 70084, 1986 was the median year of occupancy.

INCIDENCE DATA

As reported in Table 3A, all zip codes combined showed stomach cancer in white males and white females has a two-fold statistically significantly elevated incidence. When the age-adjusted total SIRs were calculated for this specific type of cancer, it was not statistically significant. Also, all cancers combined in the four zip codes showed a statistically elevated cancer incidence rate in white males, white females, and total SIR.

In Table 3B, zip codes 70084, 70117, and 70121, the exfoliation plants, showed a statistical significance in digestive tract, respiratory organs, and lung and bronchus cancers, and all cancers combined in white males. Also, in these zip codes, white females and black females had a significantly elevated incidence of stomach cancer.

In Table 3C, zip code 70084, a three-fold significantly elevated adjusted SIR for all sites combined was observed. White females had an elevated rate of digestive tract cancer and black

females and black males had elevated rates of respiratory organ cancer. Black females and black males also had statistically significantly higher rates for lung and bronchus cancer.

In Table 3D, zip code 70117, stomach cancer in white males was twice as high as expected ($p<0.05$), but the overall adjusted SIR for all sex-race groups was not elevated. In white males, digestive tract, respiratory organ and lung and bronchus cancers were statistically elevated and the adjusted SIRs for these cancer types were also elevated.

In zip code 70121, Table 3E, stomach cancer in white females and digestive tract cancer in white males was statistically elevated. Also, mesothelioma in black females was statistically significantly elevated.

Finally, in Table 3F, zip code 70126, stomach cancer CIs for white males showed a statistically significant elevation, but the overall adjusted SIR for stomach cancer in this area was not elevated. Digestive tract cancer in white males and white females was higher than expected and the adjusted SIR for this cancer was also statistically elevated.

CONCLUSIONS

Observations about the cancer rates for zip codes 70084, 70117, 70121, and 70126 are as follows: for all zip codes combined a statistically significant increase is seen for white males and white females in stomach cancer and in zip code 70121 for mesothelioma in black females in the 1991 – 2000 period. In zip code 70084, white males and black females show a statistically significant elevation in all cancers combined. White females, black males and black females show a statistical elevation in respiratory organ and lung and bronchus cancers. In this same zip code, white females show statistically significantly elevated cancer in the digestive tract.

In zip code 70121, elevated rates for stomach cancer in white females and mesothelioma in black females were statistically significant. There could be a number of attributable risk factors for this increase. These include: age, asbestos exposure, or family history of stomach cancer.

Limitations

Residential proximity to the vermiculite containing asbestos site was selected as an environmental indicator of exposure. This provided a clear geographically defined environmental parameter. There are obvious limitations to the use of residence at diagnosis as the prime environmental indicator. The approach assumes that proximity equals exposure and ignores the latency period of cancer. Limited data exist to determine completed routes of exposure, such as through air, water or other sources. It is possible that portions of the groups are exposed while others are not. Additionally, occupational exposure information was not available.

The cause(s) of the increased incidences of cancer are not known. There are many risk factors that were not considered for this health consultation.

CHILD HEALTH CONSIDERATIONS

SEET and ATSDR recognize the unique vulnerability of infants and children demand special emphasis in communities faced with contamination. Children breathe differently and have different lung structures than adults. It is not known if these differences may cause a greater amount of asbestos fibers to stay in the lungs of a child when they are breathed in than in the

lungs of an adult. Eating asbestos-contaminated soil and dust is another source of exposure for children. These diseases usually appear many years following the first exposure to asbestos and are therefore not likely to be seen in children. But since it may take up to 40 or more years for the effects of the exposure to be see, people who have been exposed to asbestos at a young age may be more likely to contract these diseases than those who are first exposed later in life. In the small number of studies that have specifically looked at asbestos exposure in children, there is no indication that younger people might develop asbestos-related diseases more quickly than older people (21).

Developing fetuses and infants are not likely to be exposed to asbestos through the placenta or breast milk of the mother. Results of animal studies do not indicate that exposure to asbestos is likely to result in birth defects.

RECOMMENDATIONS

1. Based on the results of this review, the Louisiana Office of Public Health, Section plans to perform health education activities regarding vermiculite containing asbestos, as requested by the residents in zip codes 70084, 70117, 70121, and 70126.

2. ATSDR will combine the findings from this health consultation with findings from other health statistics reviews on sites that processed vermiculite from Libby and develop a national summary report of the overall conclusions and strategies for addressing the public health implications, as needed.

3. LDHH/OPH/SEET will review the occupational history of the mesothelioma cases reported in this document.

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Table 1: Estimated 2000 Demographic for zip codes: 70084, 70117, 70121, 70126 and Louisiana					
Demographic Characteristic	**70084 n (%)**	**70117 n (%)**	**70121 n (%)**	**70126 n (%)**	**Louisiana n (%)**
Total Population	7,416 (100)	51,252 (100)	12,998 (100)	40,677 (100)	4,468,976 (100)
White	3,451 (47)	4,806 (9)	9,630 (74)	4,195 (10)	2,856,161 (64)
Black	3,849 (52)	45,536 (89)	2,789 (22)	35,411 (87)	1,451,944 (32)
Other	116 (1)	910 (2)	579 (4)	1,071 (3)	160,871 (4)
Gender					
Female	3,854 (52)	27,387 (53)	6,755 (52)	22,134 (54)	2,306,073 (52)
Male	3,562 (48)	23,865 (47)	6,243 (48)	18,543 (46)	2,162,903 (48)
No. of Families	1,917	12,078	3,188	10,539	1,156,438
No. of Households	2,831	22,469	6,373	15,889	1,656,053
Median Age (years)	32.5	32.3	39.5	32.8	34.0
1999 Annual Income (dollars)					
Household (median)	$34,529	$19,567	$32,441	$30,627	$32,566
Per capita	$14,237	$10,595	$19,855	$14,146	$16,912
1999 Poverty Level					
Persons below	1,740 (23)	19,298 (38)	1,744 (13)	9,157 (22)	851,113 (19)
Families below	383 (20)	4,107 (34)	313 (10)	1,999 (19)	183,448 (16)
Year residence occupied (median)	1986	1993	1993	1993	1994

- This information was obtained from the Census 2000 Summary File 1 (SF-1) 100-Percent Data Technical Documentation (PDF 9, IMB)

Table 2. Asbestos-related and Reference Cancer Groupings International Classification of Diseases – Oncology (ICD–O-2) Codes.

Cancer Grouping	ICD-0-2 Site Groupings	Excluding Histology
Asbestos- related Cancer Types:		
Malignant neoplasm of digestive system	C150-C159, C170-C199, C209-C212, C218, C220-C221, C239-C259, C268-C269, C480-C482, C488	M9590-M9989
Malignant neoplasm of respiratory system	C300-C301, C310-C319, C320-329, C384, C339, C381-C383, C388, C390, C398, C399	M9590-M9989
Malignant neoplasm of lung and bronchus	C340-C349	M9590-M9989
Malignant neoplasm of stomach	C160-C169	M9590-M9989
Mesothelioma	M9050-M9053	----------

Table 3A. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for All Zip Codes Combined (70084, 70117, 70121, and 70126) in Louisiana, 1991-2000.				
Site	**Observed**	**Expected**	**SIR**	**95% CI Lower- Upper**
All				
All, white males	1187	938.56	1.265	1.21 – 1.33
All, white females	954	867.34	1.099	1.04 – 1.16
All, black males	1791	1823.31	0.982	0.95 – 1.02
All, black females	1607	1543.85	1.041	0.99 – 1.084
Total	5539	5173.02	1.096	1.05 – 1.09
Digestive tract				
Digestive tract, white males	253	181.75	1.392	1.23 – 1.54
Digestive tract, white females	204	182.27	1.119	0.99 – 1.25
Digestive tract, black males	365	376.59	0.969	0.89 – 1.05
Digestive tract, black females	376	357.62	1.051	0.97 – 1.14
Total	1198	1098.23	1.091	1.09 – 1.15
Respiratory organs				
Respiratory organs, white males	255	216.59	1.177	1.06 – 1.30
Respiratory organs, white females	153	167.61	0.913	0.79 – 1.04
Respiratory organs, black males	444	471.48	0.942	0.87 – 1.02
Respiratory organs, black females	215	205.75	1.045	0.93 – 1.17
Total	1067	1061.43	1.005	0.96 – 1.06
Lung and Bronchus				
Lung and Bronchus, white males	230	193.06	1.191	1.07 – 1.32
Lung and Bronchus, white females	138	158.49	0.871	0.75 – 1.00
Lung and Bronchus, black males	387	414.03	0.935	0.09 – 1.01
Lung and Bronchus, black females	201	192.10	1.046	0.93 – 1.17
Total	956	957.68	0.998	0.95 – 1.05
Stomach				
Stomach, white males	28	15.75	1.778	1.27 – 2.37
Stomach, white females	12	5.20	2.310	1.35 – 3.53
Stomach, black males	53	59.22	0.895	0.70 – 1.11
Stomach, black females	36	42.71	0.843	0.63 – 1.09
Total	129	122.88	1.05	0.90 – 1.21
Mesothelioma				
Mesothelioma, white males	--	4.60	0.217	0.01 – 0.72
Mesothelioma, white females	--	1.73	0.578	0.02 – 1.92
Mesothelioma, black males	--	4.25	0.706	0.19 – 1.53
Mesothelioma, black females	--	1.45	2.074	0.58 – 4.50
Total	8	12.03	0.665	0.34 – 1.11

Note: -- Denotes number of cases were too small to report.

Table 3B. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for Exfoliation Plants Combined (70084, 70117, and 70121) in Louisiana, 1991-2000.				
Site	**Observed**	**Expected**	**SIR**	**95% CI Lower- Upper**
All				
All, white males	869	670	1.298	1.23 – 1.37
All, white females	661	630	1.049	0.98 – 1.12
All, black males	1181	1149	1.028	0.98 – 1.08
All, black females	986	955	1.032	0.98 – 1.09
Total	3697	3404	1.102	1.06 – 1.12
Digestive tract				
Digestive tract, white males	182	132	1.377	1.21 – 1.55
Digestive tract, white females	139	133	1.042	0.90 – 1.19
Digestive tract, black males	237	237	0.999	0.89 – 1.12
Digestive tract, black females	235	224	1.049	0.94 – 1.17
Total	793	726	1.092	1.03 – 1.16
Respiratory organs				
Respiratory organs, white males	186	153	1.214	1.07 – 1.36
Respiratory organs, white females	109	129	0.848	0.72 – 0.99
Respiratory organs, black males	321	296	1.083	0.99 – 1.15
Respiratory organs, black females	138	129	1.066	0.92 – 1.22
Total	754	707	1.066	1.00 – 1.13
Lung and Bronchus				
Lung and Bronchus, white males	173	136	1.268	1.11 – 1.43
Lung and Bronchus, white females	100	122	0.822	0.69 – 0.96
Lung and Bronchus, black males	282	260	1.083	0.98 – 1.19
Lung and Bronchus, black females	133	121	1.099	0.95 – 1.26
Total	688	640	1.076	1.01 – 1.14
Stomach				
Stomach, white males	17	11	1.503	0.96 – 2.16
Stomach, white females	12	5	2.309	1.35 – 3.53
Stomach, black males	32	37	0.856	0.63 – 1.12
Stomach, black females	36	27	1.346	1.00 – 1.74
Total	97	81	1.203	1.01 – 1.41
Mesothelioma				
Mesothelioma, white males	--	3	0.303	0.01 – 1.02
Mesothelioma, white females	--	1	0.735	0.02 – 2.43
Mesothelioma, black males	--	3	1.142	0.32 – 2.48
Mesothelioma, black females	--	1	3.414	0.95 – 7.41
Total	8	8	0.981	0.49 – 1.63

Table 3C. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for zip code 70084 in Louisiana, 1991-2000.				
Site	**Observed**	**Expected**	**SIR**	**95% CI Lower - Upper**
All				
All, white males	118	93.70	1.259	1.08 – 1.46
All, white females	101	77.80	1.298	1.09 – 1.16
All, black males	80	67.18	1.191	0.98 – 1.42
All, black females	70	59.14	1.183	0.96 – 1.43
Total	369	297.82	1.233	1.14 – 1.38
Digestive tract				
Digestive tract, white males	24	18.10	1.326	0.92 – 1.81
Digestive tract, white females	24	14.82	1.620	1.12 – 2.21
Digestive tract, black males	10	13.96	0.717	0.39 – 1.14
Digestive tract, black females	12	13.32	0.901	0.53 – 1.38
Total	70	60.2	1.163	0.97 – 1.40
Respiratory organs				
Respiratory organs, white males	28	21.70	1.291	0.92 – 1.72
Respiratory organs, white females	15	40.06	0.374	0.23 – 0.55
Respiratory organs, black males	27	16.84	1.604	1.14 – 2.15
Respiratory organs, black females	15	7.72	1.944	1.21 – 2.86
Total	85	86.32	0.985	0.82 – 1.68
Lung and Bronchus				
Lung and Bronchus, white males	27	19.28	1.400	0.99 – 1.88
Lung and Bronchus, white females	13	38.13	0.341	0.20 – 0.51
Lung and Bronchus, black males	22	14.78	1.489	1.01 – 2.06
Lung and Bronchus, black females	15	7.20	2.084	1.29 – 3.06
Total	77	79.39	0.97	0.79 – 1.16
Stomach				
Stomach, white males	--	1.54	0.648	0.02 – 2.15
Stomach, white females	0	0.59	0	0
Stomach, black males	--	2.23	0.449	0.02 – 1.49
Stomach, black females	--	1.60	1.252	0.22 – 3.13
Total	--	5.96	0.671	0.23 – 1.34
Mesothelioma				
Mesothelioma, white males	0	0.45	0	0
Mesothelioma, white females	0	0.49	0	0
Mesothelioma, black males	0	0.15	0	0
Mesothelioma, black females	0	0.05	0	0
Total	0	1.14	0	0

Note: -- Denotes number of cases were too small to report.

Table 3D. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for zip code 70117 in Louisiana, 1991-2000.				
Site	**Observed**	**Expected**	**SIR**	**95% CI Lower - Upper**
All				
All, white males	363	225.99	1.606	1.47 – 1.75
All, white females	214	219.10	0.977	0.87 – 1.09
All, black males	1042	1013.29	1.028	0.98 – 1.08
All, black females	865	850.82	1.017	0.96 – 1.07
Total	2484	2309.2	1.076	1.04 – 1.11
Digestive tract				
Digestive tract, white males	62	44.97	1.379	1.11 – 1.68
Digestive tract, white females	48	48.51	0.990	0.76 – 1.24
Digestive tract, black males	214	208.89	1.024	0.91 – 1.14
Digestive tract, black females	207	199.32	1.039	0.92 – 1.16
Total	531	501.69	1.058	0.98 – 1.14
Respiratory organs				
Respiratory organs, white males	77	51.44	1.497	1.23 – 1.79
Respiratory organs, white females	35	35.29	0.992	0.74 – 1.29
Respiratory organs, black males	275	262.50	1.048	0.95 – 1.15
Respiratory organs, black females	117	115.81	1.010	0.86 – 1.17
Total	504	465.04	1.084	1.01 – 1.16
Lung and Bronchus				
Lung and Bronchus, white males	69	45.74	1.509	1.23 – 1.82
Lung and Bronchus, white females	31	33.35	0.929	0.68 – 1.22
Lung and Bronchus, black males	244	230.89	1.057	0.95 – 1.17
Lung and Bronchus, black females	113	108.25	1.044	0.89 – 1.21
Total	457	418.23	1.093	1.01 – 1.18
Stomach				
Stomach, white males	8	3.86	2.071	1.04 – 3.45
Stomach, white females	--	2.02	0.992	0.19 – 2.48
Stomach, black males	28	32.81	0.854	0.61 – 1.14
Stomach, black females	19	23.75	0.800	0.53 – 1.13
Total	--	62.44	0.913	0.73 – 1.12
Mesothelioma				
Mesothelioma, white males	0	1.10	0	0
Mesothelioma, white females	0	0.34	0	0
Mesothelioma, black males	--	2.32	1.291	0.36 – 2.80
Mesothelioma, black females	--	0.78	1.277	0.04 – 4.23
Total	--	4.54	0.881	0.31 – 1.77

Note: -- Denotes number of cases were too small to report.

Table 3E. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for zip code 70121 in Louisiana, 1991-2000.

Site	Observed	Expected	SIR	95% CI Lower - Upper
All				
All, white males	388	349.81	1.109	1.02 – 1.20
All, white females	346	333.49	1.038	0.95 – 1.13
All, black males	59	68.26	0.864	0.69 – 1.06
All, black females	51	46.02	1.108	0.87 – 1.38
Total	844	797.58	1.058	0.99 – 1.12
Digestive tract				
Digestive tract, white males	96	69.10	1.389	1.17 – 1.63
Digestive tract, white females	67	70.01	0.957	0.78 – 1.16
Digestive tract, black males	7	14.26	0.491	0.24 – 0.84
Digestive tract, black females	16	11.19	1.430	0.90 – 2.08
Total	186	164.56	1.13	0.99 – 1.27
Respiratory organs				
Respiratory organs, white males	81	80.05	1.012	0.84 – 1.21
Respiratory organs, white females	59	53.18	1.109	0.89 – 1.36
Respiratory organs, black males	19	16.81	1.130	0.75 – 1.59
Respiratory organs, black females	6	5.92	1.013	0.45 – 1.81
Total	165	155.96	1.058	0.93 – 1.19
Lung and Bronchus				
Lung and Bronchus, white males	77	71.40	1.078	0.89 – 1.29
Lung and Bronchus, white females	56	50.16	1.117	0.89 – 1.38
Lung and Bronchus, black males	16	14.83	1.079	0.68 – 1.57
Lung and Bronchus, black females	5	5.55	0.901	0.36 – 1.68
Total	154	141.94	1.085	0.95 – 1.23
Stomach				
Stomach, white males	8	5.91	1.354	0.68 – 2.25
Stomach, white females	7	0.59	11.859	5.65 – 20.35
Stomach, black males	--	2.37	1.266	0.35 – 2.75
Stomach, black females	--	1.40	0.715	0.02 – 2.37
Total	--	10.27	1.85	1.22 – 2.61
Mesothelioma				
Mesothelioma, white males	--	1.74	0.576	0.02 – 1.91
Mesothelioma, white females	--	0.53	1.885	0.06 – 6.24
Mesothelioma, black males	0	0.15	0	0
Mesothelioma, black females	--	0.04	47.354	8.36 – 118.19
Total	4	2.46	1.626	0.57 – 3.23

Note: -- Denotes number of cases were too small to report.

Table 3F. Summary of Age-Adjusted Standardized Incidence Ratios (SIRs) for zip code 70126 in Louisiana, 1991-2000.				
Site	**Observed**	**Expected**	**SIR**	**95% CI Lower - Upper**
All				
All, white males	318	269.06	1.182	1.08 – 1.29
All, white females	293	236.96	1.236	1.12 – 1.36
All, black males	610	674.58	0.904	0.85 – 0.97
All, black females	621	588.49	1.055	0.99 – 1.13
Total	1842	1769.09	1.041	1.00 – 1.08
Digestive tract				
Digestive tract, white males	71	49.59	1.432	1.17 – 1.72
Digestive tract, white females	65	48.93	1.329	1.07 – 1.61
Digestive tract, black males	134	139.48	0.961	0.83 – 1.10
Digestive tract, black females	141	133.79	1.054	0.91 – 1.20
Total	411	371.79	1.105	1.02 – 1.19
Respiratory organs				
Respiratory organs, white males	69	63.41	1.088	0.89 – 1.31
Respiratory organs, white females	44	39.07	1.126	0.87 – 1.42
Respiratory organs, black males	123	175.33	0.702	0.60 – 0.81
Respiratory organs, black females	77	64.11	1.201	0.97 – 1.44
Total	313	341.92	0.915	0.83 – 1.00
Lung and Bronchus				
Lung and Bronchus, white males	57	56.64	1.006	0.79 – 1.24
Lung and Bronchus, white females	38	36.85	1.031	0.76 – 1.32
Lung and Bronchus, black males	105	153.54	0.684	0.58 – 0.79
Lung and Bronchus, black females	68	71.11	0.956	0.78 – 1.16
Total	268	318.14	0.842	0.76 – 0.93
Stomach				
Stomach, white males	11	4.44	2.480	1.14 – 3.86
Stomach, white females	--	2.00	1.501	0.42 – 3.26
Stomach, black males	21	21.81	0.963	0.65 – 1.34
Stomach, black females	14	15.96	0.877	0.54 – 1.30
Total	--	44.21	1.108	0.87 – 1.39
Mesothelioma				
Mesothelioma, white males	0	1.31	0	0
Mesothelioma, white females	0	0.37	0	0
Mesothelioma, black males	0	1.62	0	0
Mesothelioma, black females	0	0.57	0	0
Total	0	3.87	0	0

Note: -- Denotes number of cases were too small to report.

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CERTIFICATION

This Vermiculite site, a review of creosote, health consultation is prepared by the Louisiana Department of Health and Hospitals under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time health consultation began.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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