

Health Consultation

Cancer Incidence Analysis

City of Pittston, Luzerne County, Pennsylvania

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Prepared By:

Pennsylvania Department of Health
Division of Environmental Health Epidemiology
Health Assessment Program



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Health Consultation: Disclaimer

The Pennsylvania Department of Health (PADOH) Health Assessment Program (HAP) collaborates with the Agency for Toxic Substances and Disease Registry (ATSDR) to prepare health consultation (HC) documents. ATSDR is the lead federal public health agency responsible for implementing the health-related provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), including assessing the presence and nature of health hazards at Superfund sites, helping to prevent or reduce further exposure and illnesses resulting from those hazards, and expanding the knowledge base about the health effects of exposure to hazardous substances. A HC is a written response to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material; it considers the levels of hazardous substances at a site, whether people might be exposed to contaminants, by what pathways, and what potential harm the substances might cause to people. In order to prevent or mitigate exposures, a consultation may lead to specific actions and recommendations, 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; conducting health studies; characterizing demographics; recommending changes/additions to related Commonwealth of Pennsylvania policies/regulations, improving quality of life; and/or providing health education for health care providers and community members.

ATSDR provides technical assistance and funding to PADOH to help identify and evaluate environmental health threats to communities by using the best science, taking responsive public health actions, and providing trusted health information. This HC was supported by funds from a cooperative agreement with the ATSDR but has not been reviewed and cleared by ATSDR. More information about ATSDR is available online at www.atsdr.cdc.gov.

The conclusions and recommendations presented in this HC document are based on an analysis of the environmental sampling data and information made available to the PADOH within a limited time frame. The availability of additional sampling data, new information and/or changes in site conditions could affect the conclusions and recommendations presented in this document. PADOH will consider reviewing additional future data related to the site, if made available and deemed appropriate.

Background and Statement of Issues

In response to a request from some area residents and elected officials to investigate perceived elevated rates of cancer in the city of Pittston, Luzerne County, the PADOH performed a cancer incidence analysis and prepared this HC. The residents have expressed concern that historical disposal of contaminants at the Butler Mine Tunnel (BMT) National Priorities List (NPL) site could be causing an increased incidence of cancer in their community. Area residents believe exposures related to contaminants at the BMT (NPL) site have resulted in increased levels of cancer in their community, specifically the area around Mill and Carroll Streets, referred to in this HC as the area of concern.

On May 24, 2011, the US Environmental Protection Agency (EPA) hosted a community meeting in Pittston. Representatives from the EPA, PADOH, ATSDR and Pennsylvania Department of Environmental Protection (PADEP) met with community members to address their questions and concerns. PADOH also presented their review of the state's cancer registry data and self-reported health surveys. The purpose of this HC is to provide a summary of PADOH's cancer incidence analysis, answer questions received during the meeting and provide relevant public health findings.

Butler Mine Tunnel (BMT)

BMT was constructed prior to the 1930s as a drainage tunnel for underground coal mines via a series of interconnecting drainage ditches. Flow from the tunnel discharges directly into the Susquehanna River. The tunnel drains an approximate five-square-mile area of abandoned underground coal mines and continues at present to drain the mine workings. During mining operations, multiple boreholes were drilled into the underground coal mines to serve as air vents. In the 1970s, contamination at the BMT site was caused by illegal disposal of oily waste and industrial waste water into a mine borehole at the HiWay Auto Service (HWAS) Station, located approximately 3.5 miles inland from the Susquehanna River. Mill and Carroll streets, the area where the concerned residents live, are located approximately 1.5 to 2 miles from the contamination source (HWAS borehole). In 1979, EPA emergency personnel responded to the BMT discharge at the Susquehanna River by installing booms to collect the oily substances on the surface water. This response continued until December 1980, collecting 160,000 gallons of oil, which contained approximately 13,000 pounds of dichlorobenzene. In 1985, approximately 100,000 gallons of waste oil containing 1 to 3 percent of bis-2 ethylhexyl phthalate were released at the BMT site following heavy rains associated with Hurricane Gloria.[1] EPA added the site to the NPL in 1987, and remedial construction was completed in 2005. [2]

Years of sampling data from the BMT site demonstrate a significant decrease in the amount of contamination in the discharge water, compared to the data from the 1980s. Regular sampling of the tunnel water discharge indicates that no volatile forming compounds have been detected since regular monitoring began in 2005. [2] Water samples collected from the contamination source, HWAS borehole, show low to non detect chemical concentrations. Chemical concentrations at the end of the tunnel where the water discharges into the Susquehanna River are also low to non detect. Residual oil continues to be detected and bis (2ethylhexyl) phthalate is the only chemical that has been detected above screening values (drinking water standards). However, the discharged water is not used for consumption, and the chemical bis (2ethylhexyl) phthalate does not volatilize. This eliminates the possibility of area residents being exposed to these contaminants via the ingestion and inhalation exposure pathways. **It is important to note that the area of concern (along Mill**

and Carroll Street in Pittston) is not located directly over the tunnel or the contamination source of the BMT site, as shown in Figure 1.

In 2009, EPA conducted a 5-year review of the BMT NPL site. [3] The 2009 review evaluated vapor intrusion and concluded that the potential for vapor intrusion at the site from the subsurface contamination source is not considered to be significant. This conclusion is based on a review of the Remedial Investigation (RI) report, borehole sampling performed during the remedial actions and nearby land use. Currently, there is no residential sampling, however, based on the evaluation performed by the EPA, no contamination from the BMT is currently impacting the nearby residents around Mill and Carroll streets.

Other Potential Sources

Area residents have also expressed concern that other potential sources of exposure exist in the Pittston community. To address these concerns, PADEP and EPA investigated these potential concerns and sources, which included underground storage tanks (USTs), potential historical dumping and surface water outflow. The following summarizes PADEP investigations of possible contamination sources in the community [4]:

- In June 2011, PADEP conducted a site inspection in the community to determine if there was evidence of a former landfill in the Stauffer Heights area and if sampling of area surface water and soils is warranted. Although some residents mentioned at the public meeting that the area was formerly the "Pittston City Dump," others stated that only illegal surface dumping of trash took place. While a limited amount of local trash dumping was noted, no evidence of an operating landfill was observed. Since there was no surface water noted at this time, no water samples were collected. As a follow-up, PADEP reviewed aerial photographs of the area from the 1930s, the 1950s, the late 1960s, the early 1970s and post-2000. The photographs did not indicate that the area was used as a landfill.
- In July 2011, PADEP sampled a surface water discharge after a precipitation event in an area near the end of Mill Street to determine possible contaminant source areas or surface contamination from historic dumping and surface water drainage from that area. This sample was analyzed for volatile organic compounds (VOCs). With the exception of acetone detected at a very low level, no VOCs were detected. The area is a housing development, with several new townhouse complexes completed. As part of the development process, a large sedimentation pond was constructed close to the end of Mill and Carroll streets. The surface water flow noted by the area resident in the aforementioned pictures seems to be intermittent and the result of normal surface water drainage from higher elevations. Recent construction activities (home building and earth disturbance) may have exacerbated this problem.
- PADEP reviewed its records for this area of Pittston to identify other potential sources (spills, releases, discharges, etc.) of environmental contaminants. With the exception of a small 2008 diesel spill that impacted a nine-square-foot area at a property on Webster Street, no other potential sources of contamination were found within 1,000 feet of either Carroll or Mill streets. No incidents encountering buried wastes were reported to the PADEP during the excavation and construction activities that took place in recent years.

In addition, the City of Pittston is currently undertaking a sewer improvement project. The sewer project involves the separation of the sanitary sewer from the existing combined sewer system in order to eliminate flooding and combined sewage overflows. [5] The project will replace the existing combined sewers with 10,000 linear feet of storm sewers and 11,500 linear feet of sanitary sewers. [6]

Currently, there is no residential sampling data (i.e., indoor air or residential soil) collected in the area of concern, and therefore, it is not possible to conclude if potential community-level exposures to chemicals may be present in these areas. PADOH cannot comment on or evaluate potential exposures to environmental chemicals associated with other possible sources of contamination, such as historical mine operations, on-going sewer projects, historical dumping and other industrial sources around the community.

Cancer Data Review

The PADOH Bureau of Epidemiology, Division of Community Health Epidemiology, obtained data from the Pennsylvania Cancer Registry (PCR), which is a comprehensive database of all cancers diagnosed in Pennsylvania residents [7]. Since 1980, the PCR has collected patient-specific cancer data that include geographic location, date of diagnosis and cancer type. To investigate community concerns, PADOH reviewed the PCR data for the Pittston ZIP code (18640). To determine if the rates are statistically elevated, the ZIP code is the standard unit of measurement, because the denominator is well defined and the analysis generates statistically significant results for a small geographic area. Multiple-year data are generally used in analyses, because cases collected in a single year are subject to a large amount of chance variation, compared to a longer interval.

For the analysis, PADOH compared the cancer rates in Pittston to statewide rates from the PCR over a 17-year period from 1992 to 2008, (Table 1), the latest year of finalized validated data in the PCR. To analyze potential county or regional variations, PADOH also compared the cancer rates in Luzerne County to statewide rates for the same timeframe (Table 2). The 2000 U.S. census was the source of basic population data. [8] Cancer cases were tabulated in accordance with ICD-10 (site coding definitions used by the PADOH Bureau of Health Statistics and Research to prepare the PCR annual reports) [7]. The data were further standardized to eliminate possible effects due to differences in race, gender and age between the study area and the rest of the commonwealth. Adjusted Statewide incidence rates were used to calculate the expected number of cases that would have occurred if the study area had incidence rates similar to the rest of the state. The statistical significance of the indirectly age-adjusted incidence rates was calculated in accordance with the methodology recommended by Selven, et. al. [9] For this HC, the number of cancers refers to the number of primary cancer sites reported, not the number of people, as some individuals may have more than one cancer during the period of interest. However, in general, the number of primary sites is relatively similar to the number of persons with cancer.

To determine if the cancer rates are elevated, the “observed cases” are the number of cancers reported to the PCR for the Pittston ZIP code. The “expected cases” represent the number of cases expected to occur if Pittston experienced rates of cancer similar to the rest of Pennsylvania during the study period. The ratio of observed cases to expected cases is known as the standardized incidence ratio (SIR). A SIR of 1.0 means the observed number is exactly the same as the expected number. A SIR greater than 1.0 means there is a higher number than expected. Conversely, a SIR less than 1.0 means there is a lower number of cases than expected. The deviation from 1.0

represents the percentage above or below the expected (i.e., a SIR of 1.05 means there is a 5 percent excess). Statistical formulas (Z-test) are then applied to determine whether the difference is considered statistically significant. The difference is said to be statistically significant if it is greater than what would be expected to happen by chance alone. In common practice, a statistically significant finding means that the probability that the observed number of cases could have happened by chance alone is 5 percent or less.

A “cancer cluster” is defined as an occurrence of a greater than expected number of cases of cancer within a group of people, a geographic area or a period of time. This definition does not imply causality. Cancer clusters generally involve: larger numbers of cases than expected of one type of cancer, rather than several different types; a rare type of cancer, rather than common types; or an increased number of cases of a certain type of cancer in an age group that is not usually affected by that type of cancer [10].

Residents expressed concern that conducting a cancer rate analysis based on the overall Pittston ZIP code would include areas of Pittston outside the area of concern (Mill and Carroll streets). To address this concern, PADOH evaluated the PCR data for a subset of the Pittston ZIP code (2000-2008). Geocoding patient data began in 2000. For this analysis, the area of concern was identified as a 3 mile diameter containing Mill and Carroll streets, the source borehole and an area just east of the source borehole. The area of concern for this analysis represents approximately 63 percent of the Pittston ZIP code. Figure 2 shows the Pittston ZIP code area and the area of concern inside the Pittston ZIP code. Patient addresses in the PCR are geocoded by latitude and longitude to enable location of residence at time of diagnosis. Location of cancer cases within the area of concern and the rest of the Pittston ZIP code was performed using a template on ArcGIS. The distribution of cancers in the area of concern was compared to the distribution in the rest of the Pittston ZIP code, as described further in the Results and Discussion Section.

Results and Discussion

PADOH compared the cancer rates in the city of Pittston to statewide rates (Tables 1). Overall, for the Pittston ZIP code, there were 2,305 cancer cases during the period between 1992 to 2008. Based on statewide cancer rates, a total of 2,079 cancers cases were expected to occur in the Pittston ZIP code. This represents a SIR of 1.11, or 11 percent higher than expected, and this excess is statistically significant. Among the specific cancer types, statistically significant excesses were found for colon and rectum, lung, and thyroid. These cancer types are generally not those closely linked to environmental chemical hazards.

To further assess the findings in Pittston, PADOH compared the rates to those for the rest of Luzerne County rather than the state (Table 2). The total observed number of cancer cases in Luzerne County (1992-2008) was 36,928, compared to 36,677 expected. The resulting SIR for all cancer sites is 1.01, or 1 percent higher than expected. This difference is not statistically significant. However, statistically significant increased rates were observed for Luzerne County for mouth, stomach, colon and rectum, uterus, cervix, thyroid, leukemia, and polycythemia. The excess of cancers (colon and rectum and thyroid) seen in Pittston are not unique to this location but are seen throughout the county.

Based on geocoded data, PADOH evaluated the cancer data for a subset of Pittston cancer cases located in the area of concern compared to the rest of the Pittston ZIP code. During the nine year time period (2000-2008), a total of 792 cancer cases were diagnosed within the area of concern and

458 cancers in the remainder of the Pittston ZIP code (Table 3). No statistical tests could be performed on cancers that had less than five observations, due to low numbers. **No statistically significant differences were found in the distribution of cancer types in the area of concern, compared to the remainder of the Pittston ZIP code. The results of the geocoded cancer data analysis indicate there are no important differences in the distribution of cancer among residents of the area of concern, compared to the other parts of the city of Pittston.** This suggests that it is unlikely there is a unique exposure in the area of concern that is producing unusual patterns or incidence of cancer. However, this analysis and interpretation does not account for persons who relocated in or out of the area of concern during the observation period.

No statistically significant differences were found when comparing the distribution of cancer cases among persons living above the BMT area to the distribution of cancer cases among persons living outside the BMT area. Therefore, the results of the geocoded cancer data analysis indicate there are no important differences in the distribution of cancer among residents living in the area of concern, compared to the remainder of the City of Pittston.

The cancer types found in Pittston at a statistically higher rate (i.e. colon and rectum, lung, and thyroid) than expected are not closely linked to environmental chemical hazards. The strongest risk factor for lung cancer is smoking with about 80 percent of all cases attributed to this risk, followed by radon and certain occupational exposures. Factors associated with colon and rectum cancer are less well known, but identified risk factors are diet, history of colonic polyps and inflammatory bowel disease. Obesity and alcohol abuse and nitrosamines in grilled foods have also been linked to colon cancer. Thyroid cancer is closely linked to radiation exposure, hormonal factors and iodine deficiency and excess. Many of the cancers are preventable through lifestyle changes, such as smoking cessation, improved diet and exercise, along with regular cancer screenings.

Cancer is a common illness even in the absence of environmental exposures; every community will have a substantial number of cancer cases. Because cancer is not a single disease, it does not have a single cause. Many causes or risk factors can contribute to a person's chance of getting cancer. Risk factors are different with each type of cancer and include such things as age, race, gender, genetic factors, diet, occupation and exposure to chemicals, radiation and tobacco. Genetics play a large role for many cancers, such as breast and colon cancer, meaning that a family's health history can be a risk factor for some types of cancers. Environmental contaminants are only one of the many connections between cancers, but being exposed does not necessarily mean a person will develop cancer. The amount of a contaminant a person is exposed to, the length of exposure, and the route of exposure can also affect whether a person will experience negative health effects from an exposure. [11]

According to the American Cancer Society, cancer incidence data (2005-2007) shows that 44.29 percent of the U.S. population will develop some form of cancer in their lifetime. [12] Generally, cancer rates in Pennsylvania tend to be slightly higher than those nationally (Figure 3). Based on statistics from the Centers for Disease Control and Prevention (CDC), age-adjusted cancer incidence rates from 2003-2007 show rates of certain cancers (colon and rectum, lung, and thyroid) tend to be higher in Pennsylvania when compared with national trends. For example, cancer incidence rates for colon and rectum cancers during this time frame were 54.5 per 100,000 and 49 per 100,000 in Pennsylvania and the U.S. populations, respectively. [13]

Cancer Data Review Limitations

Health outcome data evaluations, such as the cancer incidence analysis described in this HC, are measures of disease occurrence in a defined population. Such evaluations can help to provide an overall picture of community health and can potentially identify or confirm excess disease in a community. Elevated rates of a particular disease do not imply the finding is caused by hazardous substances in the environment. There are many limitations to any statistical analysis that examines the relationship between environmental exposures and chronic diseases such as cancer:

- The PCR is considered to be highly reliable. The quality of the analysis is directly related to the accuracy of the information in this reporting system.
- This cancer data review can only determine whether there is an abnormal rate of cancer in the study area. Cause and effect relationships cannot be established, because other factors may contribute to the observation. These include heredity, lifestyle, exposures from other sources, occupational exposures and other unrecognized factors.
- The PCR uses only the residence of the individual at the time he or she was diagnosed with the disease. Information on previous residence and length of residency are not included in the PCR. Population mobility and changes in population could affect the results of this analysis.
- Since cancer can take decades to develop, the current health outcome data reflect past exposures and may not correspond to current conditions.

Conclusions

Based on a review of the cancer incidence data for Pittston, Luzerne County and the area around Mill and Carroll streets, **PADOH concludes the following:**

- Overall, the Pittston ZIP code had an 11 percent higher cancer incidence rate when compared to the overall state rate, and this difference is statistically significant. Among the specific cancer types, statistically significant elevated rates were found for colon and rectum, lung, and thyroid. However, these cancer types are not closely linked to environmental chemical hazards. The excess of cancers (colon and rectum and thyroid) is not unique to Pittston and was also observed at the county level.
- No statistically significant differences in the distribution of cancer were found in the area of concern (around Mill and Carroll streets) when compared to the remainder of the Pittston ZIP code. Therefore, the results of the geocoded cancer data indicate there are no important differences in the distribution of cancer among residents of the area of concern, compared to the remainder of the city of Pittston.
- Area residents raised concerns of possible exposure to chemicals in their homes associated with historical mining activities, historical dumping, on-going sewer projects and potential industrial sources in the community. To address these concerns, PADEP and EPA investigated these potential exposure sources that included underground storage tanks, potential historical dump sites, dumping within the mine and surface water outflow and did not identify any sources requiring further assessment. It is important to note that the area petitioned by residents (along Mill and Carroll streets in Pittston) is not located directly over the BMT site and that living near a hazardous waste site does not necessarily mean that exposure from the site has occurred. Several factors, including site conditions, types of

chemicals and chemical concentrations, would influence the likelihood of exposures occurring.

General and Overall Public Health Recommendations for the Community

Many causes or risk factors can contribute to a person's chance of getting cancer. More than 30 percent of cancers could be prevented by modifying or avoiding these risk factors. You can reduce your risk of getting cancer in a variety of ways, including keeping a healthy weight and eating a healthy diet, avoiding tobacco use, limiting the amount of alcohol you drink, reducing excess exposure to Ultra Violet (UV) light, and checking your home for radon.[15] A summary of these risk factors is presented below:

- **Healthy diet/weight and physical activity.** Research has shown that being overweight or obese substantially raises a person's risk of getting uterine, breast, prostate and colorectal cancers. [14] Diets high in fruits and vegetables may have protective effects against many cancers. Conversely, excess consumption of red and preserved meat may be associated with an increased risk of colorectal cancer. In addition, healthy eating habits that prevent the development of diet-associated cancers will also lower the risk of cardiovascular disease. Regular physical activity (30 minutes of daily physical activity) and the maintenance of a healthy body weight, along with a healthy diet, can considerably reduce cancer risk. [16]
- **Tobacco use.** Tobacco use is the single greatest avoidable risk factor for cancer. Lung cancer is the leading cause of cancer death, and cigarette smoking is the greatest risk factor. Compared to nonsmokers, men who smoke are about 23 times more likely to develop lung cancer, and women who smoke are about 13 times more likely. Smoking causes about 90 percent of lung cancer deaths in men and almost 80 percent in women. Smoking also causes cancer of the voice box, mouth and throat, esophagus, bladder, kidney, pancreas, cervix, and stomach; it can also cause acute myeloid leukemia. Avoiding tobacco products and quitting smoking can greatly reduce a person's risk of developing many kinds of cancer. [16] Information on smoking cessation programs can be found on the PADOH website at: http://www.portal.state.pa.us/portal/server.pt/community/smoke_free/14315/tobacco_prevention_and_control_programs_home/557661
- **Alcohol consumption.** Studies have shown that drinking alcohol regularly in excess increases the risk of getting mouth, voice box and throat cancers, liver cancer, breast cancer, and colorectal cancer. The risk from heavy drinking for several cancer types (e.g., cancer of the voice box, mouth, throat and esophagus) substantially increases if a person is also a heavy smoker. Consuming alcohol in moderation can reduce the potential risks. [16]
- **UV radiation.** UV radiation, and in particular solar radiation, causes a variety of types of skin cancer, such as basal cell carcinoma, squamous cell carcinoma and melanoma. UV-emitting tanning devices are now also classified as carcinogenic to humans based on their association with skin and ocular melanoma cancers. Avoiding excessive UV exposure, applying sunscreen, wearing protective clothing, and avoiding tanning devices are effective preventive measures to reduce the risk of skin cancer. [15]

- **Radon exposure in the home.** Radon comes from the natural breakdown of uranium in soil and rock, and exposure occurs from migration of radon gas into the home. Long-term exposure to radon gas can lead to lung cancer. Smoking combined with radon exposure makes the risk for lung cancer even higher. There is no known safe level of exposure to radon and the EPA strongly recommends that people fix their homes if test shows 4 Pico curies (pCi/L) or more. [17] Radon levels in homes can be reduced by improving the ventilation, sealing floors and walls, and/or installing a radon mitigation system. Since radon is odorless, testing is the only way to determine levels of radon in the home. Do-it-yourself radon detection kits can be ordered through the mail or bought in home supply stores. [18] Additional information on radon exposure and testing can be found on the PADEP, Bureau of Radiation Protection website: <http://www.dep.state.pa.us/brp/default.htm>.

Follow-up and Contact Information

If additional environmental sampling data become available, PADOH will be available to review the data, if requested and deemed appropriate.

If residents have concerns about their health, they should contact their health care provider. For questions or concerns about this report, please contact the PADOH Division of Environmental Health Epidemiology at (717) 346-3285 or via e-mail to Farhad Ahmed at fahmed@pa.gov or Christine Lloyd at chlloyd@pa.gov.

References

1. EPA. Butler Mine NPL site <http://www.epa.gov/reg3hwmd/npl/PAD980508451.htm>
2. EPA. Butler Mine Tunnel Factsheet. March 2011
<http://www.epa.gov/reg3hwmd/super/sites/PAD980508451/pdfs/ButlerMineTunnel-Info2011REV3-1Final.pdf>
3. EPA. Five-Year Review Report. Butler Mine Tunnel Superfund Site. July 2009
<http://www.epa.gov/superfund/sites/fiveyear/f2009030002935.pdf>
4. PADEP. Letter to Senator Yudichak. July 5, 2011
5. Commonwealth of PA. Department of Community and Economic Development, Commonwealth Financial Authority. 2011 http://www.newpa.com/webfm_send/1944
6. Commonwealth of PA. Recovery Act in PA. 2011.
<http://www.recovery.pa.gov/portal/server.pt?open=514&objID=525527&mode=2&projectid=333360>
7. PA Cancer registry. 2011
http://www.portal.state.pa.us/portal/server.pt/community/pa_cancer_registry/14280
8. US Bureau of Census. US Census 2000 Data Engine. June 2003.
<http://www.census.gov/support/SF1Data.html>
9. Selven S, Sacks ST, Merrill DW. Standardization of Age Adjusted Mortality Rates, Lawrence Berkeley Laboratory, University of California. February 1980.
10. National Institute of Health, National Cancer Institute. Factsheet on Cancer Clusters. 2006.
<http://www.cancer.gov/cancertopics/factsheet/Risk/clusters>
11. ATSDR. Cancer Fact Sheet. 2002 <http://www.atsdr.cdc.gov/com/cancer-fs.html>
12. American Cancer Society. Lifetime Risk of Developing or Dying from Cancer. 2010
<http://www.cancer.org/cancer/cancerbasics/lifetime-probability-of-developing-or-dying-from-cancer>
13. CDC. United States Cancer Statistics. 2003-2007. <http://apps.nccd.cdc.gov/uscs/>
14. ATSDR. Cancer Factsheet. 2002 <http://www.atsdr.cdc.gov/COM/cancer-fs.html>.
15. World Health Organization. Cancer Prevention Guidelines.
<http://www.who.int/cancer/prevention/en/>
16. CDC. Cancer Prevention and Control. 2011.
<http://www.cdc.gov/cancer/dcpc/prevention/other.htm>
17. EPA. Citizen Guide to Radon. 2009 <http://www.epa.gov/radon/pubs/index.html>
18. PADEP. Citizen's Guide to Radon. 2010.
<http://www.eibrary.dep.state.pa.us/dsweb/Get/Document-78810/2900-BK-DEP0375.pdf>

Authors, Technical Advisors

Pennsylvania Department of Health
Bureau of Epidemiology
Division of Environmental Health Epidemiology
Health Assessment Program

Authors

Pennsylvania Department of Health
Bureau of Epidemiology
Division of Environmental Health Epidemiology
Health Assessment Program

Farhad Ahmed, MBBS, MPH
Principle Investigator, Health Assessment Program
Division of Environmental Health Epidemiology

Christine Lloyd, MS
Epidemiology Program Specialist, Health Assessment Program
Division of Environmental Health Epidemiology

Reviewers

Stephen Ostroff, MD
Director, Bureau of Epidemiology

James Logue, DrPH, MPH
Director, Division of Environmental Health Epidemiology

Barbara Allerton, MPH, RN
Epidemiology Research Associate

Figures and Tables

Figure 1- Aerial map of Pittston, including the BMT and Mill and Carroll Streets.

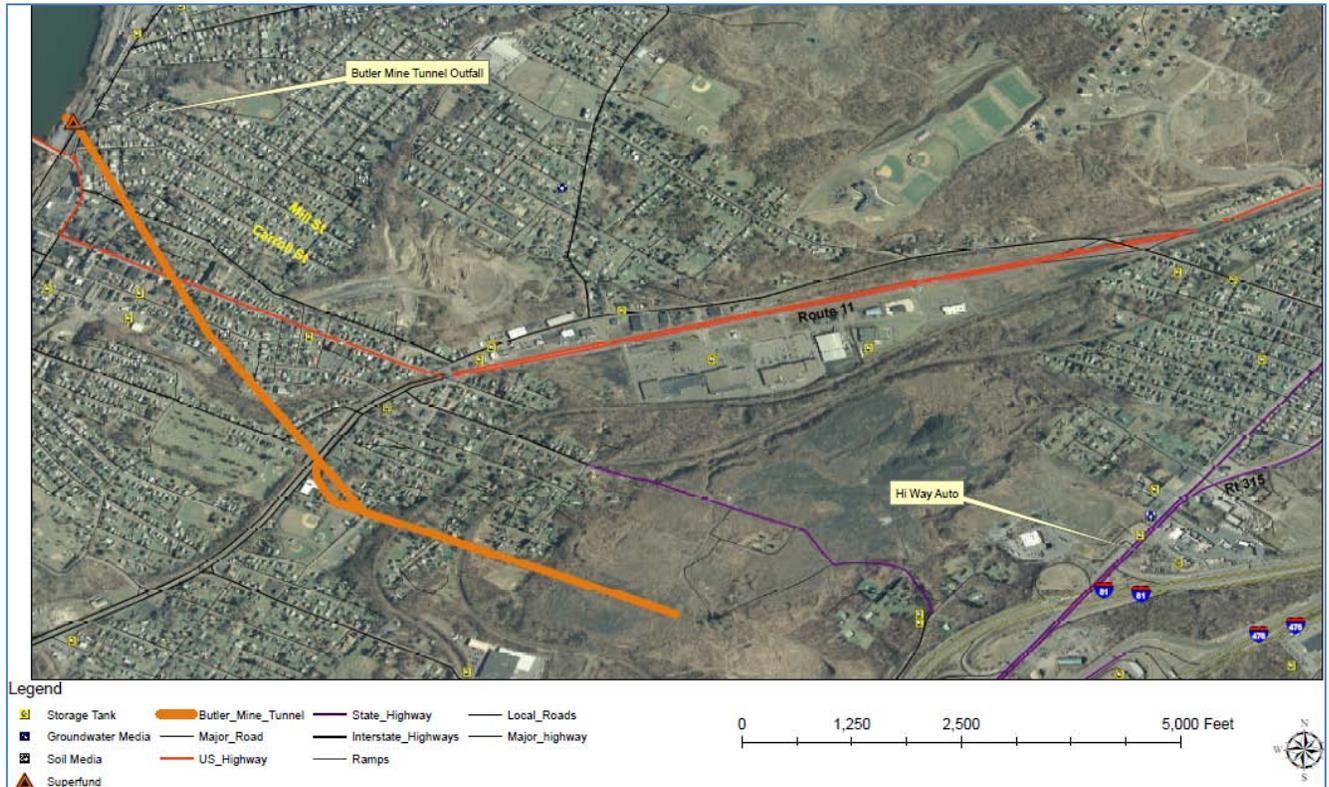


Figure 2 - The area of concern within Pittston ZIP Code Area 18640

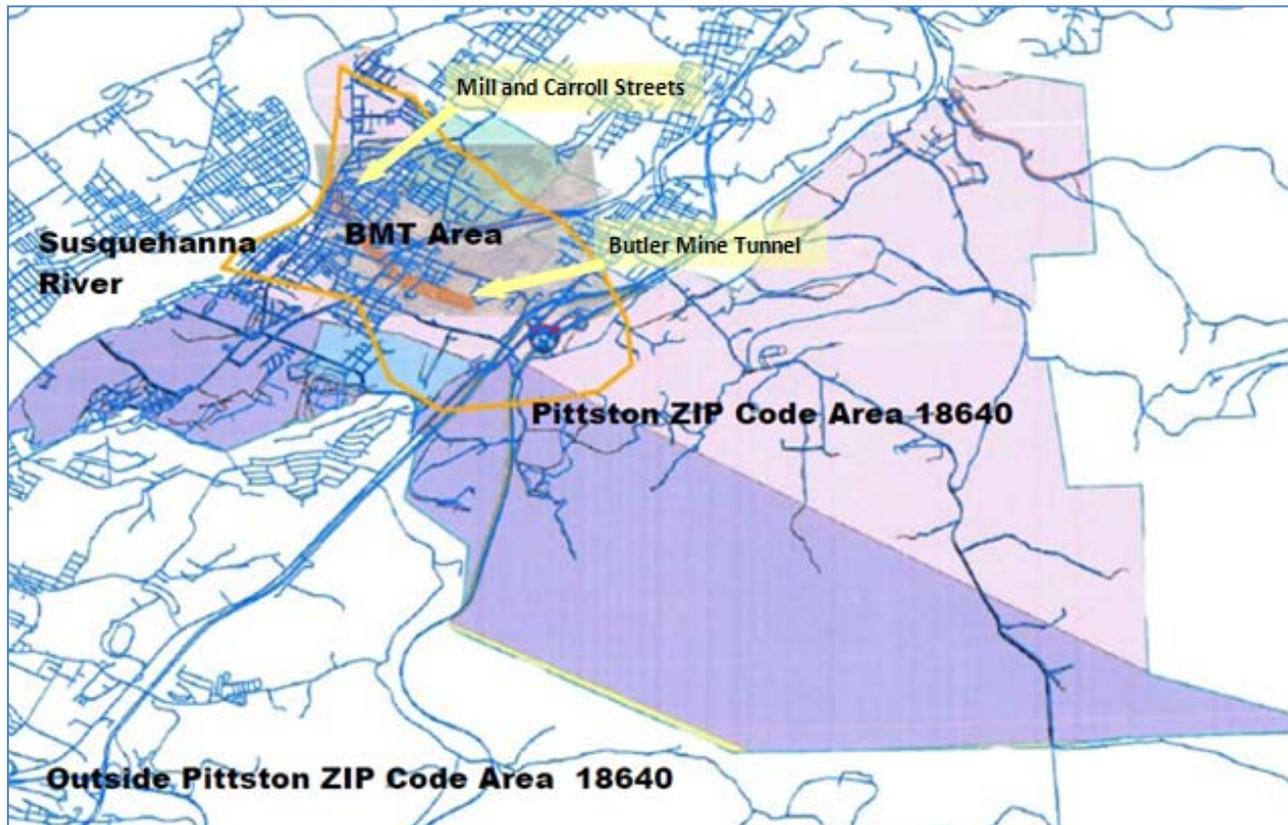
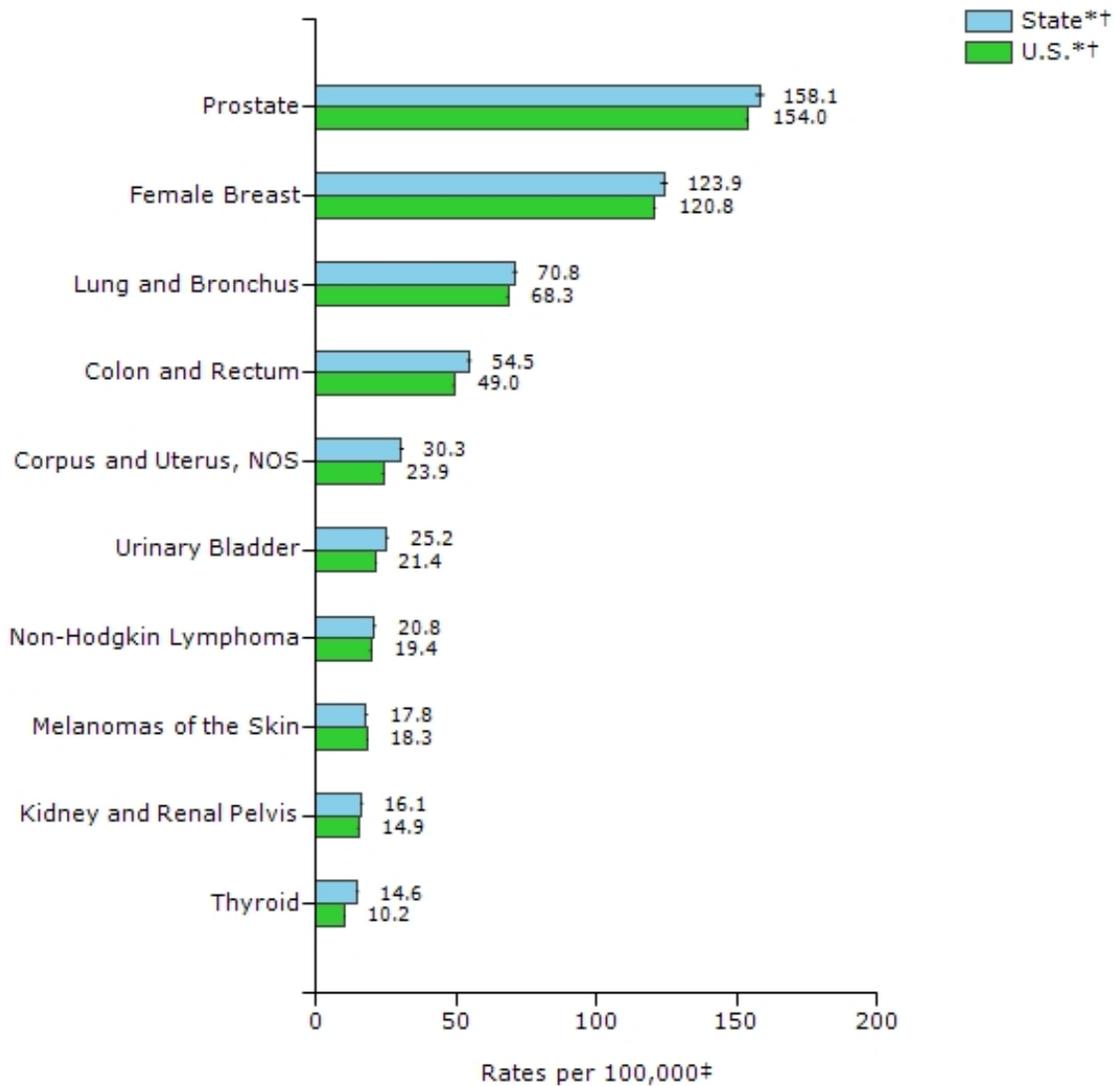


Figure 3 – Pennsylvania versus U.S. levels of Age-Adjusted Invasive Cancer Incidence Rates for the 10 Primary Sites with the Highest Rates (male and female, 2003-2007)



* Data are from selected statewide and metropolitan area cancer registries that meet the data quality criteria for all invasive cancer sites combined. See [registry-specific data quality](#) information. Rates cover approximately 97% of the U.S. population.

† Excludes basal and squamous cell carcinomas of the skin except when these occur on the skin of the genital organs, and *in situ* cancers except urinary bladder.

‡ Rates are age-adjusted to the 2000 U.S. standard population based on 95% confidence interval (19 age groups). Rates are suppressed and not ranked if the population of the specific category (area, sex) is less than 50,000 or case counts are fewer than 16.

Table 1 - Cancer cases and rates by type for ZIP code 18640 (Pittston) compared to Pennsylvania (1992-2008)

<u>Cancer Type</u>	<u>Cases</u> Observed	<u>Cases</u> Expected	<u>SIR</u>
Mouth	52	39.6	1.31
Esophagus	23	21.9	1.05
Stomach	33	33.4	0.99
Colon-Rectum	333	262.5	1.27 *
Liver	24	19.9	1.21
Pancreas	70	50.8	1.38
Larynx	21	18.5	1.14
Lung	355	296.0	1.20 *
Melanoma	43	53.9	0.80**
Breast	309	294.24	1.05
Uterus	78	67.5	1.16
Cervix	14	16.0	0.88
Ovary	42	33.9	1.24
Prostate	260	297.6	0.87
Kidney	53	56.2	0.94
Testis	8	7.98	1.00
Bladder	122	107.1	1.14
Thyroid	59	34.43	1.71 *
Brain	34	25.1	1.35
NH Lymphoma	83	82.2	1.01
Hodgkin's disuse	13	10.3	1.27
Multiple Myeloma	29	24.01	1.21
Leukemia's	61	50.8	1.20
Mesothelioma	7	5.91	1.18
Polycythemia +	3	2.8	1.09
CMD[⊥]	0	0.87	0.0
All Sites	2,305	2079.0	1.11 *

* Higher rate than expected based on the state rate and is statistically significant

** Lower rate expected based on the state rate and is statistically significant

+ Polycythemia became reportable in 2001. Cancer data only available for 2001 -2008

⊥ Chronic myeloproliferative disease. Cancer data only available for 2001-2008

Table 2 - Cancer cases and rates by Type for Luzerne County compared to Pennsylvania (1992-2008)

<u>Cancer Type</u>	<u>Cases</u>		<u>SIR</u>
	Observed	Expected	
Mouth	798	712.04	1.12*
Esophagus	410	391.68	1.05
Stomach	729	581.58	1.25*
Colon-Rectum	5119	4540.86	1.13*
Liver	290	354.94	0.82**
Pancreas	918	878.87	1.07
Larynx	376	336.65	1.12
Lung	4995	5243.04	0.95**
Melanoma	887	970.45	0.91**
Breast	5014	5066.29	0.99**
Uterus	1428	1168.85	1.22*
Cervix	308	282.70	1.09
Ovary	606	581.74	1.04
Prostate	4440	5446.4	0.82**
Kidney	991	1002.03	0.99
Testis	163	153.08	1.06
Bladder	1942	1904.32	1.02
Thyroid	796	621.12	1.28*
Brain	480	449.95	1.07
NH Lymphoma	1370	1445.38	0.95**
Hodgkin's disuse	214	188.83	1.13
Multiple Myeloma	398	419.2	0.95
Leukemia's	1030	893.99	1.15*
Mesothelioma	104	106.2	0.98
Polycythemia +	112	48.2	2.32 *
CMD[⊥]	12	15.03	0.80
All Sites	36928	36677.02	1.01

* Higher rate than expected based on the state rate and is statistically significant

** Lower rate than expected based on the state rate and is statistically significant

+ Polycythemia became reportable in 2001. Cancer data only available for 2001 -2008

⊥ Chronic myeloproliferative disease. Cancer data only available for 2001-2008

Table 3 – Distribution and difference in cancer cases between the area of concern and the rest of the Pittston ZIP code (18640), 2000-2008

Cancer Site	Distribution in the Area of Concern (Count, %)	Distribution in the remainder of the Pittston Zip code (Count, %)	Difference of Cases (%)	Statistical Significance
Mouth	11 1.39%	8 1.75%	-0.36%	NS
Esophagus	10 1.26%	3 0.66%	0.61%	<
Stomach	11 1.39%	6 1.31%	0.08%	NS
Colon and Rectum	103 13.01%	68 14.85%	-1.84%	NS
Liver	12 1.52%	6 1.31%	0.21%	NS
Pancreas	29 3.66%	11 2.40%	1.26%	NS
Larynx	6 0.76%	5 1.09%	-0.33%	NS
Bronchus and lung	129 16.29%	74 16.16%	0.13%	NS
Melanoma	15 1.89%	12 2.62%	-0.73%	NS
Breast	100 12.63%	57 12.45%	0.18%	NS
Cervix	6 0.76%	2 0.44%	0.32%	<
Uterus	26 3.28%	22 4.80%	-1.52%	NS
Ovary	14 1.77%	10 2.18%	-0.42%	NS
Prostate	71 8.96%	46 10.04%	-1.08%	NS
Testis	1 0.13%	2 0.44%	-0.31%	<
Bladder	49 6.19%	18 3.93%	2.26%	NS
Kidney	19 2.40%	10 2.18%	0.22%	NS
Brain/Other Nervous System	13 1.64%	4 0.87%	0.77%	<

Table 3 (continued) – Distribution and difference in cancer cases between the area of concern and the rest of the Pittston ZIP code (18640), 2000-2008

Cancer Site	Distribution in the Area of Concern (Count, %)	Distribution in the remainder of the Pittston Zip code (Count, %)	Difference of Cases (%)	Statistical Significance
Thyroid	3.41%	4.37%	-0.96%	NS
Non Hodgkin Lymphoma	30 3.79%	16 3.49%	0.29%	NS
Multiple Myeloma	13 1.64%	6 1.31%	0.33%	NS
Leukemia	28 3.54%	14 3.06%	0.48%	NS
Polycythemia	3 0.38%	0 0.00%	0.38%	<
Mesothelioma	2 0.25%	2 0.44%	-0.18%	<
Carcinoid Tumor	4 0.51%	2 0.44%	0.07%	<
All other sites	55 6.94%	31 6.77%	0.18%	NS
Total	792 100.0%	458 100.0%		

+ Significantly higher

- Significantly lower

< No statistical test, less than 5 observations

NS = Not significant