

Independent Review of Lung Cancer Incidence in Seneca County and Evaluation of a Potential Relationship to the Seneca Meadows Landfill

By Rosanne McTyre, Ph.D. and Ben Hoffman, MD, MPH

October 28, 2024

Several months ago, the Seneca Meadows, Inc. team engaged us to conduct a scientifically-based investigation in response to allegations concerning a potential role of the Seneca Meadows Landfill (SML) to a lung cancer cluster identified by the NY State Department of Health (NYSDOH) around 2017. To perform a comprehensive assessment and derive a conclusion, we conducted:

- A review of all of the data available on air-borne exposures from the landfill including landfill gas, hydrogen sulfide, and odor; and their regulation and emissions control,
- A comprehensive review of the literature on landfills and the incidence of lung cancer,
- And a literature review of risk factors for lung cancer.

We also spoke with NYSDOH to further understand the analysis conducted in the region of the SML that led to the subsequent allegations, and any follow-up that was planned. Our findings are presented below.

Based on the totality of the evidence considered for this investigation, and a review of the scientific literature on documented causes of lung cancer, we conclude that there is no evidence that the Seneca Meadows Landfill contributes to the lung cancer incidence in its vicinity, regardless of whether a cancer cluster does or does not exist. There are no material chemical exposures including hydrogen sulfide arising from landfill gas into the ambient air at sufficient levels to create adverse health impacts in the surrounding communities. SML has complied and continues to comply diligently to fulfill state and federal regulatory requirements which are protective of public health to protect its neighbors and the environment. Regardless, neither hydrogen sulfide nor odor cause lung cancer. Any increase in lung cancer rates is likely random variation seen in cancer data and more likely related to known and established risk factors for lung cancer including most importantly cigarette smoking and radon exposure in housing.

Below, we address in detail:

- Landfill gas, hydrogen sulfide, and odor,
- Regulations and emissions,

- Potential for human health impacts of living near landfills in general, including a comprehensive literature review,
- Review of lung cancer and its related risk factors,
- And a review of NYSDOH cancer registry analyses.

LANDFILL GAS, HYDROGEN SULFIDE, AND ODOR

Composition of Landfill Gas

Landfill gas (LFG) is a natural byproduct of the decomposition of organic material in landfills. LFG is composed of roughly 50% methane, 50% carbon dioxide (CO₂), and less than 1% Non-Methane Organic Compounds, including volatile organic compounds, nitrogen, oxygen, ammonia, and sulfides such as hydrogen sulfide and mercaptans.

Characteristics of Hydrogen Sulfide

Hydrogen sulfide (H₂S) and mercaptans contain sulfur compounds that give the landfill gas mixture its rotten-egg odor. Sulfur compounds produce odors even at extremely low concentrations in the parts-per-billion (ppb) range and can be detected at much lower concentrations than those at which adverse health effects may occur. Smelling landfill gas containing sulfides does not mean it is harmful to human health (Health-NY 2024). Depending upon the amount and duration of exposure, some individuals may experience transient irritation to their eyes, nose, and throat. There is no evidence that low-level exposures to hydrogen sulfide that may exist in the vicinity of a modern landfill will lead to chronic health effects (ATSDR/CDC 2001).

Other Sources of Hydrogen Sulfide

Hydrogen sulfide can be produced by various sources in a community, even without a landfill. For instance, it can come from wet soil, wetlands, stormwater drains, sewer pipes, liquid manure commonly used as fertilizers and municipal water treatment plants.

Wetlands produce H₂S as a byproduct of natural processes, as water-saturated soil lacks oxygen, leading to anaerobic microorganisms breaking down organic matter. This process, known as sulfate reduction by microorganisms, produces hydrogen sulfide as a byproduct (Meyer-Dombard, 2020).

Community Perception of Odors

Humans can distinguish between an almost infinite number of different odors. One person may be able to smell an odor like hydrogen sulfide at extremely low concentrations, while another person in the same community or home cannot. Often, communities attribute ambient odors to a nearby landfill when other more likely sources exist, such as large wetlands and forests surrounding SML, which includes the Montezuma National Wildlife Refuge covering over 10,000 acres of wetlands.

Concerns About Health Risks

People living near landfills may experience higher levels of concern about health risks due to odors, even if actual exposure is quite low. Some reasons for this include:

- The smell of landfill gas can be unpleasant, often due to sulfur compounds. An offensive odor can trigger concern and alarm, leading people to worry about their health.
- When people smell something unusual, they may lack information about what it is or whether it is harmful. This uncertainty can lead to fear and concern about health effects.
- Media stories or anecdotes about health problems linked to landfill gas exposure can amplify concerns.
- People may associate the smell with reports of cancer or other health issues, even if those reports are not directly relevant to their situation.

Gas Collection and Control Systems

Systems for collecting and controlling landfill gas significantly affect gas migration and odors. At landfills, gas is collected through vertical gas collection wells installed down into the landfill. The gas is extracted from buried waste under vacuum pressure and routed through pipes to an energy facility for electricity generation, making landfill gas an alternative fuel source. This process reduces reliance on conventional electricity sources and can decrease landfill hydrogen sulfide emissions by up to 90% (USEPA 2024).

Until 1995, landfill gas from the Seneca Meadows Landfill was passively vented. This changed in 1994 when SML began installing a gas collection piping system. Since the initial landfill gas collection system was installed, Seneca Meadows has continually increased the quantity of LFG collected by designing and constructing additional extraction wells and horizontal collectors. As a result, landfill gas emissions have been dramatically reduced since the mid- to late 1990s. Based on operational conditions at SML and weather patterns, nearby residents may occasionally detect odors coming from the landfill, but at very low levels in the ppb range, as documented by air monitoring stations. The exposures are not harmful to human health as documented below.

Commercial Use of Landfill Gas

SML sells a portion of the collected landfill gas to Seneca Energy, an independently owned, operated, and permitted facility operating eighteen internal combustion engines for electricity generation. There is a renewable natural gas (RNG) facility that converts landfill gas into natural gas. Flares may be employed to burn off excess methane before it enters the atmosphere, reducing odors as much as possible. A gas collection control

system at SML greatly minimizes exposure to landfill gas, meaning residents in surrounding communities should not experience adverse health effects from low levels of landfill gas emissions (ATSDR/CDC 2001).

REGULATION AND EMISSIONS

Regulatory Framework

Solid waste landfills in New York State are heavily regulated by the New York State Department of Environmental Conservation (DEC). Landfills must comply with nuisance and health-based emission standards. The New York State Ambient Air Quality Standard (NYSAAQS) has been set at 10 ppb to prevent disagreeable odors. This is not a health-based standard, as 10 ppb is the threshold where the rotten-egg smell becomes noticeable for some individuals, well below health-based exposure limits (6 NYCRR Part 257).

In comparison, the U.S. Occupational Safety and Health Administration (OSHA) has set a health-based standard for worker safety at 20,000 ppb on a continuous basis, with a maximum of 50,000 ppb during any 10-minute work period (OSHA H2S). OSHA's health-based standards are significantly higher than New York State's nuisance odor standard of 10 ppb (OSHA H2S).

Air Monitoring Programs at the Landfill and in the Community

The Seneca Meadows Landfill has been conducting ambient air monitoring of landfill emissions for many years. Several relevant air monitoring programs have confirmed the lack of community exposure to landfill gases:

- 1. Landfill Gas Emissions Database:** SML has maintained a database concurrent with the operation of the gas collection system since 1997. Actual emissions of H₂S are quite low, and modeled results have remained well below DEC's annual and short-term guideline concentrations.
- 2. On site Investigations:** An extensive onsite landfill gas investigation was performed in March 1997 by DEC to determine surface emissions, emission rates, and evaluate health risks. The results were included in the 1998 DEIS, leading to the approval of the Part 360 and Part 201 permits.
- 3. Continuous H₂S Monitoring:** Pursuant to the Title V permit, continuous H₂S monitoring is required to comply with the State's nuisance odor-based ambient air quality standard. Air monitoring stations are located north, south, east and southwest along the landfill's borders to assess emissions heading toward Seneca Falls and Waterloo. Wetlands and agricultural fields are located north, west, and east of the landfill, which are likely contributors to H₂S emissions. The permit requires that the average concentration of hydrogen sulfide does not exceed 10 ppb for over an hour. Raw data (in 5-minute increments) includes temperature, wind direction, wind speed, humidity,

barometric pressure, H₂S, and the H₂S one-hour average and is submitted to DEC.

- 4. Procedures for Exceedances:** In the event of detection above one-hour 10 ppb, the H₂S Ambient Air Monitoring Work Plan procedures must be followed:

SML must collect a point measurement at the point of the exceedance with a Jerome H₂S analyzer. If the point measurement exceeds the one-hour H₂S standard, SML must notify DEC within 24 hours and investigate further. The results and corrective actions must be submitted to DEC within 14 days.

To date, when H₂S has been measured above the 10 ppm, the follow-up point measurements with the Jerome H₂S analyzer have shown that the State's one-hour 10 ppm standard was not exceeded. Consequently, SML has not had to submit a 24-hour notice to DEC or a 14-day investigation/corrective action report to DEC.

- 5. Community Complaints:** Community resident odor complaints are investigated immediately by Seneca Meadows Landfill staff in accordance with its operating permit. These results consistently show no correlation with elevated H₂S readings. SML responds to all complaints received by performing an investigation, including a review of data on H₂S from the monitoring stations. The results of the investigations consistently show no correlation between the complaints and H₂S detections. The wind direction is generally west to east, and the majority of odor complaints are east of the landfill. However, the East Monitoring station recorded the fewest H₂S detections above 10 ppb (0.12%), while the North Monitoring station recorded the highest detections (0.90%). Wetlands are located north adjacent to the landfill.
- 6. Additional Community Air Monitoring:** Additional community air monitoring has been conducted through the New York State Community Air Screen (CAS) program in 2018. This program was launched by the DEC to better understand toxic air pollutants at the community level. DEC received applications for the CAS program and accepted the application from Seneca Falls Environmental Action Committee. To evaluate the potential impact on air quality from the facility, including the use of odor neutralizers/deodorizers, air samples were collected for formaldehyde analysis in addition to those for forty-three volatile organic compounds (VOCs) routinely collected in the CAS program. In June and July 2018, two 1-hour air samples were collected for VOCs and seven 1-hour air samples for formaldehyde near the SML. These samples were analyzed by NYSDEC's laboratory, leading to an evaluation of potential air quality concerns. NYSDEC concluded that results were below short-term and long-term health-based air concentration values, with all results being similar to concentrations found in NYSDEC's ambient air monitoring network. The results of the Seneca Falls community air screening are available in the NYSDEC CAS Report.

Results were compared with long-term health-based air concentrations for outdoor air designed to protect public health from long-term exposure to pollutants. Findings showed that all but three VOCs—1,2-dichloroethane, benzene, and carbon tetrachloride—were below the long-term health-based comparison values. DEC stated that these three VOC are commonly found above long-term health-based comparison values in most areas of the State, indicating a cancer risk range of 1 to 3-in-a-million, which DEC characterized as a low level of risk and below the threshold warranting follow-up testing. Regardless, these chemicals have not been classified as causes of lung cancer in humans by the International Agency for Research on Cancer(IARC), the specialized cancer agency of the World Health Organization (IARC 2024).

Lastly, results were compared to ambient air monitoring concentrations from DEC’s air toxics monitoring network, operational statewide since 1990. This network supports NYSDEC’s efforts to reduce human exposure and health risks from air toxics. The comparison evaluated whether sampling results were significantly different from air monitoring concentrations at other state locations, and DEC determined that the results were similar to monitoring concentrations found at other rural locations in New York State.

POTENTIAL FOR HUMAN HEALTH IMPACTS OF LIVING NEAR LANDFILLS

Research Overview

There has been substantial research regarding health impacts, including cancer, related to solid waste landfills. Key points from relevant studies and sources include:

Air Quality and Health Impacts

Research has primarily focused on older, unlined landfills without gas capture systems, which have been associated with higher emissions of landfill gas. SML differs from these older landfills due to its gas capture system, implemented since the late 1990s.

Gas Capture Systems

Modern landfills with gas capture systems are designed to mitigate these emissions by collecting and treating landfill gas. These systems aim to reduce the release of harmful gases into the atmosphere.

Studies specifically examining the effectiveness of these systems in reducing health risks have failed to show any connection between landfill emissions and lung cancer (UK 2024). The New York City Department of Health conducted a significant study on Staten Island at the Fresh Kills Landfill and found no relationship between lung cancer and living near the landfill (NYC DOH 2020).

Epidemiological Studies

Some epidemiological studies have explored the potential health impacts of living near landfills. Findings have been mixed, with few studies suggesting an increased risk of certain health issues, including cancer, while most have found no significant associations (Vinti 2021).

Sulfur compounds, including hydrogen sulfide, have not been linked to cancer, and there is no convincing evidence that living near a modern municipal waste landfill increases cancer risk (ATSDR 2016).

Based on a thorough review of the scientific literature spanning two decades, only one study identified a potential association between living near a modern municipal solid waste landfill and a higher incidence of lung cancer (Mataloni 2016). This study reviewed aggregated data from multiple Italian landfills and suggested that individuals living near landfills had a slightly increased risk of lung cancer. However, the Mataloni study exhibits numerous methodological flaws, questioning the finding of increased lung cancer mortality, which is reviewed in detail in Appendix A.

A subsequent multi-center, multi-country systematic review updated the association between municipal solid waste landfill disposal and adverse health outcomes (Vinti 2021). Nine landfill studies were identified, and upon detailed review, investigators failed to find a conclusive association between lung cancer and proximity to a municipal solid waste landfill. The overall evidence for health risks related to proximity to landfills was classified as low.

The Vinti analysis discussed the Mataloni study, stating that when using H₂S exposure as a tracer in the air, researchers found incremental elevations in risk. However, when they repeated the analysis based on distance from the landfill rather than H₂S concentrations, no significant associations appeared between mortality outcomes and residing 0-2 km from a landfill compared to those living 3-5 km away. The Mataloni study only evaluated health effects from landfills in Italy from 1996-2008. The 2003 European Landfill Directive, requiring landfill gas mitigation, was not fully implemented until 2009, meaning community exposures would have been higher during the study years. Therefore, cancer mortality rates observed in the Mataloni study cannot be contextualized with SML, where gas capture systems have been operational since 1995. SML has also enhanced the efficiency and quantity of landfill gas captured over the past three decades, indicating that the Mataloni findings refer to health effects from older landfills, not comparable to SML.

An earlier systematic review in 2009 did not find elevations in lung cancer within communities near landfills (Porta et al. 2009). Mataloni referenced this finding as motivation for his later study of landfills in Italy.

No other studies in scientific literature or analyses from U.S. state-level Departments of Health (such as DEC) have established conclusive evidence linking lung cancer to emissions from properly built and operated modern municipal solid waste landfills.

Conclusion on exposure: Overall, there is limited evidence suggesting potential health risks associated with landfill emissions from modern landfills with gas capture systems, particularly concerning lung cancer incidence and/or mortality. A review of related literature is available upon request. Furthermore, there is no scientific evidence that H₂S causes lung cancer, and exposure to H₂S in highly regulated municipal landfills is not a threat to public health. Landfill gas can often lead to odors due to release of sulfur compounds from trash decomposition. While this can be a nuisance, it does not mean that smelling landfill gas is harmful to health.

Therefore, our review found no evidence that the SML is contributing to material exposure and/or to risk of lung cancer in the community,

REVIEW OF LUNG CANCER AND ITS RELATED RISK FACTORS

Due to its importance among cancer diagnoses, the literature on lung cancer is extensive and spans decades. The objective of this review is to present a succinct, referenced synopsis based on the latest published reviews and government data.

Lung cancer is the leading cause of cancer-related death worldwide (Leiter, 2023). In the US, a total of 238,340 men and women were expected to be diagnosed with lung cancer in 2023, and one in 16 people will be diagnosed with lung cancer in their lifetime. Lung cancer kills almost three times as many men as prostate cancer, and almost three times as many women as breast cancer (ACSa, 2023).

According to the NYSDOH (NYSDOH Latency 2015), the latency period for lung cancer is 5 to 40 years. This means that lung cancer caused by exposure to a cancer-causing substance will generally develop 5 to 40 years after the exposure. This results in difficulty in determining the cause of any individual patient's lung cancer.

Because of its importance as one of the leading causes of cancer in the world, the causes of lung cancer have been widely studied. Several risk factors that cannot be changed, including age, gender, race/ethnicity, and family history or genetic background (ACSb, 2023), have been associated with the disease. Lung cancer is more common among men, adults over 60 years old, African Americans, and those with a family history (Thandra, 2021).

Disparities by socioeconomic status and place of residence have been noted and attributed largely to cigarette smoking patterns. For example, the risk of lung cancer is greater in persons with lower socioeconomic status (SES). This disparity reflects historical differences in smoking prevalence that remain today. In 2021, 21% of individuals without a high school diploma and 31% of individuals with a GED smoked

cigarettes, compared to 3% of individuals with a high school degree. Persons with lower SES are also likely to be diagnosed with advanced-stage disease and lack access to high-quality healthcare (ACSA, 2023).

In addition, several important risk factors can be modified and controlled, which are responsible for increasing the risk of lung cancer in humans. These are outlined below:

Cigarette Smoking

Cigarette smoking is the number one risk factor for lung cancer. In the US, it is linked to about 80-90% of lung cancer deaths (CDC, 2023), with people who do not smoke accounting for less than 20% of lung cancer deaths (Thandra, 2021).

Cigarette smokers are 15 to 30 times more likely to get lung cancer or die from lung cancer than people who do not smoke. Even smoking a few cigarettes a day or smoking occasionally increases the risk. The use of other tobacco products, such as cigars and pipes, also increases the risk of lung cancer. While the health effects of smoking marijuana (cannabis) have not been widely studied due to the drug's illegal status in many states, the combustion of marijuana is known to produce carcinogenic substances, with levels of some, such as tar and polycyclic aromatic hydrocarbons, higher than those in tobacco. Marijuana has also been shown to induce premalignant cellular changes in bronchial epithelium similar to those of tobacco smoking (Thandra, 2021).

Exposure to secondhand smoke, including smoke from other people's cigarettes, pipes, and cigars, also causes lung cancer. In the U.S., one out of four people who don't smoke, including children, are exposed to secondhand smoke (Thandra, 2021; ACSA, 2023). The relationship between exposure to secondhand smoke and lung cancer is dose-dependent: the higher the dose, the higher the risk. Certain carcinogens in secondhand smoke are inhaled in larger concentrations than by the smoker because of filters on the user end of cigarettes (Thandra, 2021).

Radon Gas

After smoking, radon is the second leading cause of lung cancer in the U.S. (ACSA, 2023), and up to 30% of lung cancer cases in non-smokers are associated with radon exposure (Krewski, 2006). The Environmental Protection Agency (EPA) estimates that radon causes about 21,000 lung cancer deaths each year. Radon exposure and tobacco smoking have a synergistic effect on lung cancer risk (Thandra, 2021; ACSA, 2023).

Radon is a naturally occurring gas that forms in rocks, soil, and water. It cannot be seen, tasted, or smelled. It is estimated that one out of every 15 homes in the US have high radon levels. When radon enters homes or buildings through cracks or holes, it can become trapped and builds up in the air inside. Over long periods, exposure to high radon levels can cause lung cancer (CDC, 2023).

According to the American Cancer Society (ACSa, 2023), individuals can lower their risk of radon exposure by having their homes tested for the gas, regardless of where they live, and taking recommended steps to mitigate exposure when necessary (www.cdc.gov/radon/radon-action.html). High-risk locations include much of the Northeast US (Thandra, 2021). Interactive radon maps can be found at radon.com/maps.

Asbestos and Other Occupational Exposures

Asbestos is a naturally occurring mineral used in construction because of its flame-resistant properties. It is known to deposit fibers in the lungs and is associated with various lung diseases, including mesothelioma, pneumoconiosis, and bronchogenic lung cancer (Thandra, 2021). Work that involves asbestos exposure increases the risk of lung cancer by approximately 70% (Jarvholm, 2014). Studies of the effectiveness of workplace interventions to limit exposure and mitigate risk remain scarce (ACSa, 2023). Additionally, asbestos fibers are also known to trap tobacco particulates, explaining the synergistic effect of asbestos with tobacco smoking on lung cancer (ACSa, 2023).

Other occupational exposures associated with an increased lung cancer risk include chemical mixtures, such as soot and coal-tar pitch, and compounds such as nickel and chromium, among others (ACSa, 2023; ACSb, 2023). This review uncovered no studies indicating that working in or near a solid waste landfill confers an increased risk of lung cancer.

Air Pollution

Air pollution is estimated to account for about 1-2% of lung cancer deaths in the US (ACSa, 2023). Particulate matter is designated as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC) and is highly regulated in vehicular and industrial production by the U.S. Environmental Protection Agency (Alberg, 2013).

Outdoor air pollution comprises a variety of pollutants from many sources, including power generation, transportation, and industrial as well as agricultural emissions. Inhaling particulate matter—a microscopic mixture of solid and liquid pollutants—has been linked to an 8-9% increased risk of lung cancer (ACSa, 2023).

Workers with prolonged occupational exposures are at the highest risk. For example, truckers, who are chronically exposed to vehicular fumes, have a 50% increased risk of lung cancer (Thandra, 2021).

A meta-analysis of 14 studies on outdoor air pollution, primarily conducted in North America and Europe, reported a statistically significant 9% (RR= 1.09, 95% 1.04-1.14) increase in risk for lung cancer incidence or mortality for each 10 µg/m³ increase in PM_{2.5} concentrations, and an 8% (95% CI 1.04-2.01) increase for PM₁₀ (Hamra, 2014). Given the highly fatal nature of lung cancer, mortality is considered a valid indicator of incidence.

Indoor air quality also influences lung cancer risk, especially among non- smokers. This exposure arises from coal use in homes, burning of biomass for cooking and heating, and cooking oil fumes. Studies have found that proper ventilation of cooking areas can reduce lung cancer risk by up to 50% (ACSa, 2023; ACSb, 2023).

Other Risk Factors

Arsenic in Water: According to the International Agency on Cancer (IARC), arsenic has been implicated in causing lung cancer in humans. Arsenic is a heavy metal primarily sourced from groundwater leakage, potentially exposing many agricultural and industrial workers (Thandra, 2023).

Infection: Inflammation and cellular damage during respiratory infections have been linked to lung cancer. For instance, infections with tuberculosis, HIV, and more recently, COVID-19, increase the risk of developing lung cancer (Thandra, 2021).

Chronic Obstructive Pulmonary Disease: COPD primarily occurs due to smoking. COPD-related inflammation and scarring are independently associated with an increased risk of developing lung cancer. COPD is the most common independent risk factor for lung cancer, aside from smoking, and increases the risk by 6-13% (Thandra, 2021).

Conclusion on health effects: In summary, 80-90% of lung cancer deaths in the U.S. are linked to cigarette smoking and the use of other tobacco products. The remaining 10-20% of lung cancer can be attributed to various non-smoking-related exposures, including radon exposure, asbestos, and other chemical exposures—particularly among workers, along with air pollution and prior infections or diseases (Thandra, 2021).

Underprivileged populations are at higher risk for cigarette smoking, HIV and TB infection, poor air quality, limited access to healthcare, elevated lung cancer risk, and poorer lung cancer survival rates. Prevention efforts should be directed toward risk factors such as smoking, occupational and environmental exposures, and HIV and TB infection. Increasing access to screening, nicotine replacement programs, and aggressive lung cancer treatments among underprivileged populations can help reduce disparities (Thandra, 2021).

There is no scientific evidence that the SML contributes in any way to lung cancer in the community surrounding the landfill.

CANCER REGISTRY ANALYSES

The New York State Cancer Registry (NYSCR)

The NYSCR is based on data collected by SEER (National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER: <https://seer.cancer.gov/>)). The data the NYDOH uses to monitor cancer incidence in New York is similar to that submitted by New York State to SEER.

Cancer incidence tracking mechanisms record where patients lived at the time of their cancer diagnosis, not where they lived when exposed to potential carcinogens.

“The New York State Cancer Registry only records where a person lives at the time of their cancer diagnosis. When that residence information is shown on maps and other data displays, it may create the impression that something related to that location is causing the cancers. However, because of cancer latency, if a person were exposed to a contaminant affecting their risk, the exposure may not have occurred at that location. In fact, the causes of cancer may have more to do with the personal histories, genetics, or lifestyles of the people who live in an area” (NYSDOH 2022).

Incidence rates are reported by county, and the finest breakdown available upon request is census block groups, which consist of 1-5 census blocks as determined by the U.S. census. Data are reported in 5-year rolling averages.

To protect confidentiality and assure the robustness of statistical calculations, cancer numbers reported are suppressed if below 16 cases (<https://www.cdc.gov/united-states-cancer-statistics/technical-notes/suppression.html>). This does not mean the NYDOH is hiding evidence; rather, it is following CDC guidance. Confusion has arisen because, before 2017, numbers under 16 were reported publicly.

After 2017, the NYDOH stopped providing numbers less than 16 cases to maintain confidentiality. This was to be in step with CDC partly for confidentiality and also for statistical considerations, as small numbers can be misinterpreted. Thus, data by zip code have not been publicly reported since 2017 and can no longer be found in the NYSDOH website or interactive maps.

By definition, cancer registries are unable to track or be used to ascertain the cause of any particular patient’s cancer. The HIPAA-protected medical records of individual patients, along with their complete history of where they lived and their occupation, would need to be examined separately to make any inferences about potential cancer causes. These data are kept confidential. No cancer registry in the country is designed to perform individual-level studies; analyses from cancer registries at best generate hypotheses used to examine patterns over time.

Similarly, due to the long latency period of cancer, the movement of people throughout their lives prior to a cancer diagnosis, and the many factors impacting cancer development, cancer registry data and maps depicting rates of cancer incidence in a given region cannot prove that something in the environment caused the cancer (NYSDOH 2024).

Lung Cancer in Seneca County

In Mantius et al. (<https://waterfrontonline.blog/2023/06/28/seneca-meadows-nys-largest-landfill-sits-in-a-disadvantaged-area-with-high-lung-cancer-rates-is-that-a-problem/>), Peter Mantius reviewed the NYSDOH cancer registry website and determined that Seneca County NY had a lung cancer incidence rate higher than expected and reported it by zip code. None of these data are currently available on the NYSDOH website, thus could not be independently verified.

As reported by Peter Mantius in his various newsletters, using data up to 2017, NYSDOH had identified over 50 lung cancer clusters across New York State. One such lung cancer cluster, LU-H-17, spanned four counties: Seneca, Wayne, Ontario, and Cayuga and referred to this website:

https://apps.health.ny.gov/statistics/cancer/environmental_facilities/mapping/map/.

We noted however, that this analysis did not specifically separate Seneca County or the area around the landfill. The publicly available data that was reported from NYSDOH, showing cancer clusters, was not finely tuned to the question of interest, which is lung cancer rates in the landfill area or in Seneca County alone. As we understand it NYSDOH is currently working on conducting a more targeted analysis of observed versus expected lung cancer rates in northern Seneca County; results will be reported to the public when available.

We note that these analyses, by nature, even if they show a cluster in a more defined target area such as Seneca County with a more specific comparison group, will not help clarify the issue of any potential role of the SML on risk of lung cancer because by design, it cannot be used to pinpoint potential causes or contributors of specific disease.

Cancer registry analyses are descriptive and can only be suggestive of an observed pattern. As stated above, by definition, cancer registries are unable to track or be used to ascertain the cause of any particular patient's cancer. The HIPAA-protected medical records of individual patients, along with their complete history of where they lived and their occupation, would need to be examined separately to make any inferences about potential cancer causes. These data are kept confidential. No cancer registry in the country is designed to perform individual-level studies; analyses from cancer registries at best generate hypotheses used to examine patterns over time.

Of note, the smoking prevalence rate in Seneca County is 19.6%, exceeding the statewide average of 12%

(https://www.health.ny.gov/prevention/tobacco_control/reports/statshots/volume15/n2_smoking_among_adults.pdf).

The average indoor radon level in Seneca County is 3.8 pCi/L, exceeding the national average of 1.3 pCi/L (<https://county-radon.info/NY/Seneca.html>) and just below the federal action level of 4.0 pCi/L.

Given the high rates of tobacco use and radon levels in Seneca County, factors other than living near a landfill may be the cause of elevated rates in the disadvantaged population in the area of the landfill.

CONCLUSION

In order to offer our expert opinion about any role of the Seneca Meadows Landfill in the alleged incidence of lung cancer in the vicinity of the facility, we conducted a thorough and exhaustive review of relevant materials including as reported by Peter Mantius and others, the scientific literature, and data provided by the New York State Department of Public Health and conclude the following:

1. The Seneca Meadows Landfill is diligent in complying with federal and state health based regulations regarding landfill emissions to protect public health.
2. Landfill emissions materially only yield occasional odors which are largely related to sulfur containing air release from the trash decomposition. Odor does not cause lung cancer. Hydrogen sulfide does not cause lung cancer. No other chemical releases were found to contribute to material exposures. Without exposure there can be no risk.
3. There are many risk factors for lung cancer, and about 80% of lung cancer is caused by cigarette smoking. An additional large amount is caused by radon exposure in homes. Disadvantaged communities are more prone to be affected by these risk factors, and access to medical care can be an issue.
4. Peter Mantius and others used data that are no longer available from the NYSDOH to make a case for the landfill being the cause of lung cancer in the community. We found no support for these allegations and our scientific training and experience leads us to conclude that this could not possibly be true based on the science and the methods that have been used in the cancer cluster cancer registry analyses performed by NYSDOH, and what is known about lung cancer risk.

Our review found no evidence that the SML is contributing to material exposure and/or to risk of lung cancer in the community.

REFERENCES

6 NYCRR Part 257: Controlling Pollution from Facilities

ACSa (American Cancer Society). Cancer Facts and Figures 2023. Atlanta; American Cancer Society (2023)

ACsb (American Cancer Society). What Causes Lung Cancer? 2023

Alberg, AJ, Brock MV, Ford JG, Samet JM, Spivak SD. Epidemiology of lung cancer: diagnosis and management of lung cancer, 3rd Ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 143 (5 suppl): e15-e29S (2013)

ATSDR 2016: ATSDR ToxProfiles

ATSDR/CDC 2001: Landfill Impact

CDC: Risk Factors for Lung Cancer, 2023

Hamra GB, Nuha N, Cohen A. et al. Outdoor particulate matter exposure and lung cancer: a systematic review and meta-analysis. Environ Health Perspect 122:906-911 (2014)

Health-NY 2024: Environmental Health - Air and Landfill Gas. IARC 2024: IARC Information

IARC 2024: <https://www.iarc.who.int/cancer-type/lung-cancer/>

Jarvholm, B., Astrom E. The risk of lung cancer after cessation of asbestos exposure in construction workers using pleural malignant mesothelioma as a marker of exposure. J Occup Environ Med. 56(12):1297-301 (2014)

Krewski, D., Lubin, JH, Zielinski JM et al. A combined analysis of North American case-control studies of residential radon and lung cancer. J Toxicol Environ Health 69:533-597 (2006)

Leiter, A., Veluswamy, R.R., Wisnievesky, J.P. The global burden of lung cancer: current status and future trends. Nature Reviews Clinical Oncology 20, 624-639 (2023)

Mataloni F, Badaloni C, Golini MN, Bolignano A, Bucci S, Sozzi R, Forastiere F, Davoli M, Ancona C. Morbidity and mortality of people who live close to municipal waste landfills: a multisite cohort study. Int J Epidemiol. 2016 Jun;45(3):806-15

Meyer-Dombard DR, Bogner JE, Malas J. A Review of Landfill Microbiology and Ecology: A Call for Modernization With 'Next Generation' Technology. Front Microbiol. 2020 Jun 3;11:1127

NYC DOH - Cancer and Other Health Outcomes, 2020

NYSDEC CAS Report: Community Air Quality

NYSDOH: Cancer Data by County, 2024

NYSDOH:https://www.health.ny.gov/statistics/cancer/environmental_facilities/mapping/about/concerned_about_cancer_in_your_community; 2022

NYSDOH Latency 2015 <https://www.health.ny.gov/diseases/cancer/#> OSHA H2S: H2S Standards. 29 CFR 1910

OSHA H2S: <https://www.osha.gov/hydrogen-sulfide/standards>

Porta D, Milani, S, Lazzarino AI, Perucci, CA, Forastiere, F. 2009. Environmental Health, 8:60

SEER: <https://seer.cancer.gov/statistics/>

Thandra, K.CI, Barsouk, A., Saginaw, K., Aluru, JS, Barsouk, A. Epidemiology of Lung Cancer. Contemp Oncol (Pozn) 25(1):45-52, 2021. 31

UK 2024: <https://www.gov.uk/government/publications/landfill-sites-impact-on-health-from-emissions/impacts-on-health-of-emissions-from-landfill-sites>

US EPA: Basic Information About Landfill Gas; 2024

Vinti G, Bauza V, Clasen T, Medicott K, Tudor T, Zurbrügg C, Vaccari M. Municipal Solid Waste Management and Adverse Health Outcomes: A Systematic Review. Int J Environ Res Public Health. 2021 Apr 19;18(8):4331

Rosanne B. McTyre, Ph.D trained at Yale and Johns Hopkins and has a Ph.D in Epidemiology. She has conducted a variety of independent reviews related to disease incidence in environmental settings, and is an expert in risk communications.

Ben Hoffman, MD, MPH, trained at Yale and Brown Universities as well as Mt. Sinai School of Medicine and is board certified in internal medicine, preventive medicine and environmental/occupational health.