



**Pollution, People, and Powerplants: Health Burdens in
Peabody, MA
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Executive Summary

Background: The Massachusetts Municipal Wholesale Electric Company (MMWEC) has received regulatory approvals to build a 60 megawatt (MW) natural gas/diesel fired power plant, called Project 2015A, in Peabody, MA to meet “peak” electricity demand for 14 participating municipalities in the state. There are two other gas/diesel-fired turbines operated by the Peabody Municipal Light Plant (PMLP) at the site of Project 2015A that collectively have a total capacity of 68 MW.

Objectives: This report’s objectives are to 1) summarize baseline health data in populations surrounding Project 2015A, 2) compare disease prevalence in populations closer to Project 2015A and the rest of the state, 3) identify risk factors, such as age and environmental justice (EJ) status, that may make the surrounding population more vulnerable to health impacts caused or exacerbated by emissions from the power plant, and 4) identify key components of a future community health impact assessment (CHIA).

Methods: This report’s focus area is comprised of census tracts and block groups that are completely or partially within a 2 kilometer (km) radius from the site of the proposed power plant, 58 Pulaski St., Peabody, MA. EJ metrics, derived from the U.S. Census American Community Survey (ACS), were provided by Massachusetts at the block group level. Demographic data from the ACS and disease outcomes from U.S. Centers for Disease Control (CDC) PLACES were used to provide data at the census tract level. Linear regression was used to compare mean disease prevalence and age ranges among census tracts within 2km of Project 2015A versus the rest of the state. Prevalence data was re-scaled to provide municipal-level disease prevalence for the 14 municipalities participating in Project 2015A. Pediatric asthma data for Peabody was obtained from the Massachusetts Environmental Public Health Tracking tool. This report also identified schools, hospitals, long term care facilities, and facilities regulated by Massachusetts Department of Environmental Protection (DEP) Bureau of Air and Waste inside the focus area.

Results: The proposed plant is within 2km of eight block groups that meet Massachusetts’ EJ criteria in Peabody, Salem, and Danvers. **On average, census tracts in the focus area have significantly higher prevalence of cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, and stroke, adjusting for prevalence of smoking, lack of health insurance, EJ status, and total population.** Significantly more

people <5 years and ≥65 years live in the focus area than outside of the focus area. On a municipal level, Peabody has higher rates of emergency department visits for asthma among children <14 years than the state average, though this difference is not statistically significant.

Conclusion: Census tracts within 2km of the site of Project 2015A have higher disease prevalence for several outcomes than census tracts in the rest of the state, on average. **These findings support the need for an analysis of health impacts from emissions from the existing PMLP turbines, the proposed plant, and ambient concentrations.** More people <5 years and ≥65 years living close to the proposed plant than the rest of the state suggests the population may have increased susceptibility to health impacts from air pollution. A CHIA should include additional air pollution monitoring in the focus area, further investigation into health outcomes and risk factors in the most vulnerable and susceptible populations near the proposed plant, and further investigation into pediatric emergency room visits for asthma in Peabody.

Background

The plant

In 2015, MMWEC¹ began the process of planning a new 60MW electricity generating facility, Project 2015A, located at 58R Pulaski St. in Peabody, MA, a city on the north shore of Boston with a population of roughly 51,000.² Project 2015A is designed to operate during periods of high or “peak” demand, such as during extremely hot days in the summer.³ The proposed site is home to two existing gas/diesel-fired turbines, known as the Water Rivers Plant that also provide peak energy.⁴ The proposed “peaker plant” would provide additional capacity to 14 MMWEC participating municipalities, including Peabody and others throughout the state. The project would use natural gas, with ultra low Sulphur diesel as a backup fuel source, and it will also require a gas compressor, and a 90-foot exhaust stack to be built onsite.⁵ MMWEC expects the plant to run 249 hours a year, though its air approval permit from DEP approves 1250

¹ Massachusetts Wholesale Electric Company, “Who We Are – MMWEC,” accessed July 13, 2022, <https://www.mmwec.org/who-we-are/>.

² City of Peabody, “A Business and Community Guide,” 2018, https://www.peabody-ma.gov/comm_dev/PeabodyGuide.pdf.

³ Massachusetts Wholesale Electric Company, “Project 2015A,” MMWEC, accessed July 13, 2022, <https://www.project2015a.org/>.

⁴ Massachusetts Department of Environmental Protection, “Waters River Station Final Air Quality Operating Permit,” January 30, 2014, <https://www.mass.gov/doc/peabody-peabody-municipal-light-plant/download>.

⁵ Massachusetts Department of Environmental Protection, “Peabody Final Air Quality Plan Approval,” September 30, 2020, <https://www.project2015a.org/wp-content/uploads/2021/07/MMWEC-Peabody-Final-Plan-Approval.pdf>.

hours/year, with diesel firing limited to 250 hours/year.⁶ The plant's construction is underway, though it is not yet operational.

Community concerns

In the summer of 2021, the Peabody Board of Health sent a letter to Governor Baker requesting an Environmental Impact Report (EIR) and comprehensive health impact assessment (CHIA) to more fully characterize the surrounding community's potential health risks associated with toxic emissions from the proposed project.⁷ Danvers, Wakefield, Holden, and Marblehead Boards of Health have sent letters to the Governor's office supporting Peabody's requests. Community and non-profit groups, including Breathe Clean North Shore, Slingshot (formerly Community Action Works), Massachusetts Climate Action Network, and 350 Massachusetts North Shore have echoed this request with a petition signed by over 1,250 residents across the state to the Massachusetts Executive Office of Energy and Environmental Affairs (EEA).⁸ The plant's location in an Environmental Justice (EJ) neighborhood and proximity to seven other EJ neighborhoods is one of several concerns raised by these groups. Under the 2021 Massachusetts climate law, *An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy*, the state created a requirement that all projects that impact air quality within one mile of an Environmental Justice neighborhood conduct an EIR.⁹ However, because 2015A's permitting process began before the law's passage in 2021, it is not legally held to this requirement.

Regulatory Review

In the fall of 2016, MMWEC sent an Environmental Notification Form (ENF) for Project 2015A to the Massachusetts Secretary of EEA.¹⁰ One month later, the Secretary responded to the ENF,

⁶ Massachusetts Department of Environmental Protection.

⁷ Peabody Board of Health, "Letter to Governor Charles Baker Re Project 2015A," July 8, 2021, <http://cleanpowercoalition.org/health>.

⁸ The Action Network, "Stop the Fossil Fuel Power Plant in Peabody," accessed July 13, 2022, <https://actionnetwork.org/petitions/stop-the-fossil-fuel-power-plant-in-peabody/>.

⁹ Commonwealth of Massachusetts, "An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy," accessed July 13, 2022, <https://malegislature.gov/Laws/SessionLaws/Acts/2021/Chapter8>.

¹⁰ Massachusetts Wholesale Electric Company, "Environmental Notification Form: MMWEC Simple Cycle Gas Turbine Project," accessed July 13, 2022, <http://eeaonline.eea.state.ma.us/EEA/emepa/mepadocs/2016/090716em/nps/enf/15578%20MMWEC%20Simple%20Cycle%20Gas%20Turbine.pdf>.

stating that the project met all relevant state environmental requirements.¹¹ In its ENF review, EEA determined the project did not meet the 100MW energy generation threshold to require an EIR. The Secretary required that the project undergo Peabody Conservation Commission review for wetland resource impacts, as well as a review for compliance with MA Global Warming Solutions Act, and approval from MA Department of Public Utilities (DPU) for an aboveground fuel oil storage tank. The project site is not in a 100- or 500-year floodplain, though EEA recognized that the site is next to Waters River, which “may be susceptible to increased flood elevation due to rising sea level and increased storm intensity” and recommended the site be built at a higher elevation to protect the site from flooding. Because the project site is in a 100-foot buffer zone of a nearby wetland, it underwent a wetlands analysis. It was determined to be exempt from the MA Wetlands Protection Act regulations because the project is contained within a fenced yard.¹²

The MA DEP reviewed the air quality impact and noise disturbances associated with the project relative to MA and federal regulations.¹³ DEP estimated the air emissions will be below National Ambient Air Quality Standards (NAAQS) for SO₂, NO_x, CO, PM₁₀, PM_{2.5}, and Pb, thus designating the project as a non-major source under the Clean Air Act (CAA). Non-major sources are generally not required to obtain a federal air quality permit under the CAA.¹⁴ Because the project constitutes a major modification to an existing air pollutant source, it had the potential to trigger Nonattainment New Source Review (NNSR) review if NO_x and VOC emissions are estimated above the NNSR threshold. However, potential NO_x and VOC emissions were estimated to be below the NNSR threshold, and the project is not subject to NNSR review.¹⁵

As part of its air quality permit review, MA DEP conducted air quality dispersion modeling analyses to assess the impact of pollutant emissions from the proposed plant in addition to the

¹¹ Massachusetts Executive Office of Energy and Environmental Affairs, “Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, EEA Number: 15578,” October 2016, <http://eeaonline.eea.state.ma.us/EEA/emepa/mepacerts/2016/sc/enf/15578%20ENF%20MMWEC%20Simple%20Cycle%20Gas%20Turbine%20Peabody.pdf>.

¹² Commonwealth of Massachusetts, “Wetlands Protection Act,” accessed July 13, 2022, <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIX/Chapter131/Section40>.

¹³ Massachusetts Department of Environmental Protection, “Peabody Final Air Quality Plan Approval.”

¹⁴ U.S. Department of Environmental Protection, “Title V Operating Permits,” accessed July 13, 2022, <https://www.epa.gov/title-v-operating-permits/who-has-obtain-title-v-permit>.

¹⁵ Massachusetts Department of Environmental Protection, “Peabody Final Air Quality Plan Approval.”

two existing energy generating turbines at the site.¹⁶ DEP evaluated predicted air pollutant concentrations in comparison with DEP-developed significant impact levels (SILs) that create a threshold for either “insignificant” impact if predicted impact is less than SIL, or warrants further impact evaluation. Three models estimated impacts of criteria air pollutants for the proposed turbine alone, the proposed turbine plus the other two onsite, and of the cumulative emissions of the three turbines plus background pollutant concentrations. The model that estimated impacts from the proposed project alone predicted exceedances of SILs for 24-hour maximum predicted NO₂, 24-hour maximum predicted PM_{2.5}, and 24-hour maximum predicted PM₁₀. Because these predicted impacts exceeded SILs, they were evaluated for their cumulative impact and were not found to have any worst-case predicted emissions exceeded NAAQS. This seemingly satisfied DEP’s SIL evaluation process. MA EEA was satisfied with the project’s use of Best Available Control Technology to control emissions, including water and Selective Catalytic Reduction (SCR) injection to control NO_x emissions. They were also satisfied with the project’s “good combustion practices” to control CO and VOCs, as well as its limited use of diesel fuel, which releases more significant amounts of PM, PM₁₀, PM_{2.5}, and SO_x when burned.¹⁷

DEP also modeled 24-hour and annual emissions of each air pollutant identified by MMWEC and estimated that maximum concentrations from the plant (not accounting for any other sources) were below MA DEP values for Ambient Air Limits (AAL) over a 24-hour period, as well as Threshold Exposure Levels (TEL) over on year.^{18,19} AALs and TELs are limits based on continuous lifetime (70 years) exposure to concentrations associated with one in one million excess lifetime cancer risk, which are calculated using established risk characterization methods.²⁰

Massachusetts DEP assessed the project’s construction and operation for compliance with DEP’s Noise Policy 90-001, included in Massachusetts Air Pollution Control sound regulations,

¹⁶ Massachusetts Department of Environmental Protection.

¹⁷ Massachusetts Executive Office of Energy and Environmental Affairs, “Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, EEA Number: 15578,” October 2016.

¹⁸ Massachusetts Department of Environmental Protection, “Air Pollution Control,” Pub. L. No. 310 CMR 7.00, accessed July 13, 2022, <https://www.mass.gov/regulations/310-CMR-700-air-pollution-control-0>.

¹⁹ Massachusetts Department of Environmental Protection, “Peabody Final Air Quality Plan Approval.”

²⁰ Massachusetts Department of Environmental Protection, “Methodology for Updating Air Guidelines: Allowable Ambient Limits (AALs) and Threshold Effects Exposure (TELs),” December 21, 2011, <https://www.mass.gov/doc/methodology-for-updating-guidelines-allowable-ambient-limits-threshold-effect-exposure-limits/download>.

which requires that any new sound source be limited to 10 A-weighted decibels (dBA) above “quiet” background levels.²¹ As a result of the noise assessment, DEP required baffles (or acoustic barriers) to be added onsite to reduce noise pollution around the existing facilities.²²

Methods

Data sources

EJ block group designations were obtained from 2015-2019 ACS data that was reported by Massachusetts in 2020.²³ Massachusetts designates block groups as meeting EJ criteria if the block group’s annual median household income is <65% of the state annual median household income, the block group’s non-white population is ≥40% of the total population, ≥25% of households lack English proficiency in the block group, or the block group’s annual median household income is <150% of the state annual median household income and the non-white population is ≥25% of the total population.²⁴

Demographic factors, including age ranges, were obtained from 2015-2019 ACS data at the census tract level.²⁵ Prevalence of health outcomes among adults ≥18 years, including disease, risk factors, and preventative care, were obtained from 2019 CDC PLACES data.²⁶ Pediatric asthma prevalence and emergency department visits for asthma were obtained from the Massachusetts Environmental Public Health Tracking tool. The most recent year available for these data is 2017.²⁷ This report also identified schools, hospitals, and long-term care facilities inside the focus area based on information from Massachusetts Bureau of Geographic Information (MassGIS).²⁸ In addition, major roadways, including interstate and state routes, as well as facilities regulated by Massachusetts DEP’s Bureau of Air and Waste in 2016 were identified in the focus area from MassGIS.

²¹ Massachusetts Department of Environmental Protection, Air pollution control.

²² Massachusetts Department of Environmental Protection, “Peabody Final Air Quality Plan Approval.”

²³ Commonwealth of Massachusetts, “MassGIS Data: 2020 Environmental Justice Populations,” accessed July 13, 2022, <https://www.mass.gov/info-details/massgis-data-2020-environmental-justice-populations>.

²⁴ Commonwealth of Massachusetts.

²⁵ US Census Bureau, “Data Releases,” Census.gov, accessed July 25, 2022, <https://www.census.gov/programs-surveys/acs/news/data-releases.html>.

²⁶ “PLACES: Census Tract Data (GIS Friendly Format), 2020 Release | Chronic Disease and Health Promotion Data & Indicators,” accessed July 13, 2022, <https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Census-Tract-Data-GIS-Friendly-Format-2020-/ib3w-k9rq>.

²⁷ “MEPHT | Health Data,” accessed July 13, 2022, <https://matracking.ehs.state.ma.us/Health-Data/index.html>.

²⁸ “MassGIS (Bureau of Geographic Information) | Mass.Gov,” accessed July 25, 2022, <https://www.mass.gov/orgs/massgis-bureau-of-geographic-information>.

Geographic comparisons

The focus area in this report is a 2km radius around the site of the proposed plant, 58 Pulaski St, Peabody, MA. Block groups with EJ designations are reported by the state, and data from census tracts entirely or partially within the focus area were evaluated for disease prevalence and risk factors. Disease prevalence and age ranges within the focus area versus the rest of the state was compared with linear regression. To assess EJ status between census blocks, we applied the Massachusetts EJ criteria for block groups to census tracts.

Disease prevalence by city and town was compared by converting the census tract prevalence to municipality level data. Prevalence was converted by multiplying the raw prevalence counts (numerator) in each census tract by a weighting variable that disaggregated the counts to a 250m x 250m population point grid. Within each municipality, we summed the weighted counts and calculated prevalence using each town's population.²⁹ Disease prevalence was compared between Peabody and the 11 other municipalities that have contracted to receive power from the peaker plant, which include Boylston, Holden, Hull, Mansfield, Marblehead, Russell, Shrewsbury, South Hadley, Sterling, Wakefield, and West Boylston. We also included Chicopee and Holyoke in the municipal disease comparisons, though both municipalities intend to withdraw from Project 2015A.^{30,31} State reported pediatric asthma prevalence and rates of emergency department visits for asthma in Peabody were compared to the state.

Results

Environmental Justice and vulnerable populations

The 2km radius around the proposed site, or the focus area of this report, encompasses areas in eight EJ block groups within the municipalities of Peabody, Salem, and Danvers (Figure 1). Within the City of Peabody, nearly 42% of people lived in census block groups that met EJ criteria in 2020 (Table 3).³²

²⁹ Marcello Schiavina, Sergio Freire, and Kytt MacManus, "GHS-POP R2019A - GHS Population Grid Multitemporal (1975-1990-2000-2015) - OBSOLETE RELEASE," June 28, 2019, <https://doi.org/10.2905/0C6B9751-A71F-4062-830B-43C9F432370F>.

³⁰ Chicopee Municipal Lighting Plant, "Comments of the Chicopee Municipal Lighting Plant," April 6, 2021, <https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/13381726>.

³¹ Holyoke Gas and Electric Department, "Statement of Holyoke Gas and Electric Department," April 2, 2021, <https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/13368248>.

³² Commonwealth of Massachusetts, "MassGIS Data: 2020 Environmental Justice Populations."

In addition to the presence of several EJ neighborhoods in the focus area, there were also 19 miles of major roadways and 13 facilities regulated by MA DEP Bureau of Air and Waste, such as those with air operating permits, hazardous waste, or use of toxics regulated by in the focus area that may also contribute to poorer environmental quality in the area. There were also two hospitals, four schools, and four long-term care facilities inside the focus area, which suggests there are young, sick, or otherwise vulnerable populations near the plant's proposed site (Figure 1).

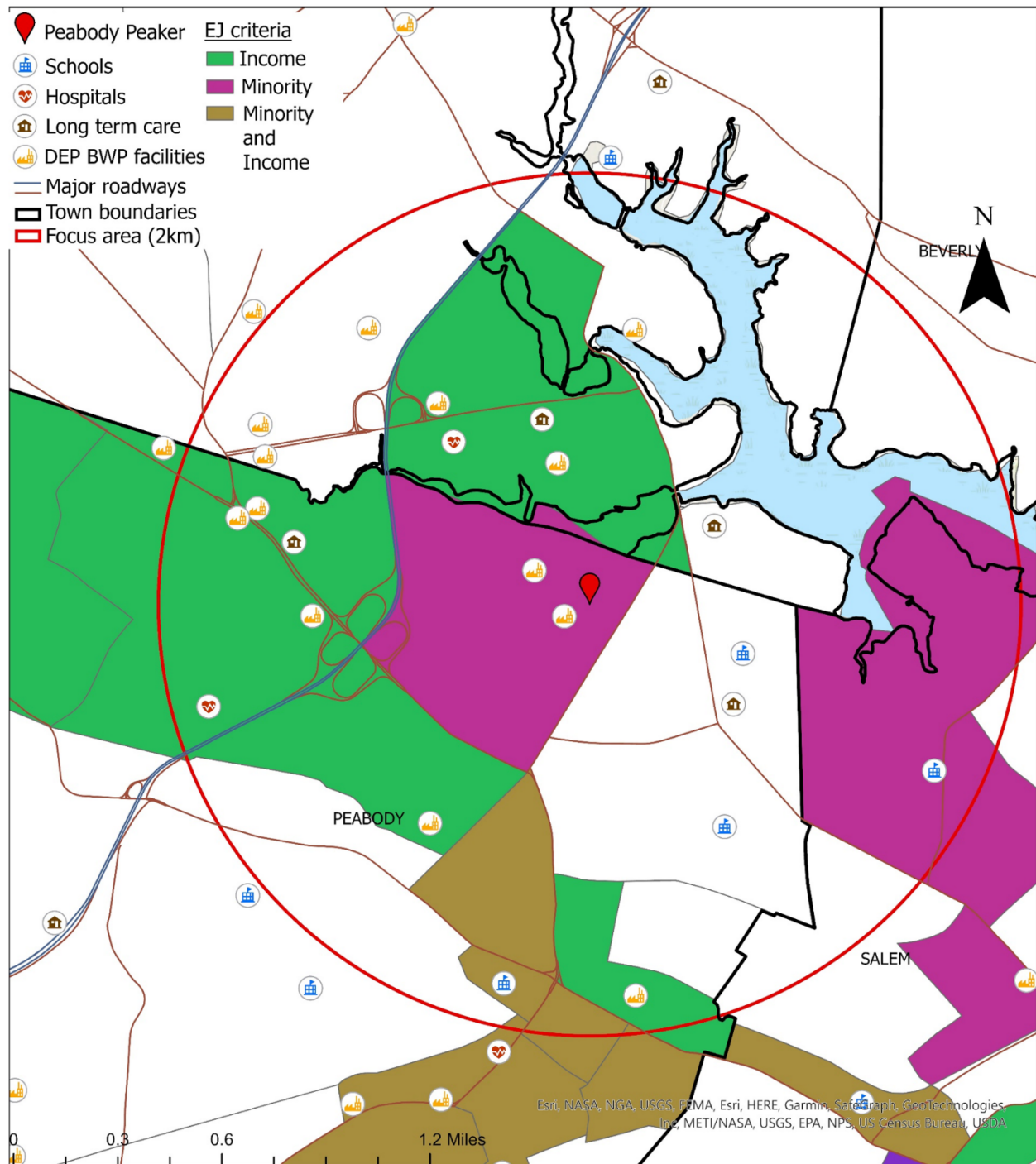


Figure 1. Environmental justice block groups and facilities that indicate vulnerabilities in focus area. Schools, hospitals, long-term care facilities, major roadways, DEP regulated facilities, and EJ status are mapped.

When we compared age ranges of people living within and outside of the focus area, we found that on average, significantly more people less than five years of age and significantly more people greater than age 65 live in census tracts in the focus area (Table 1), suggesting that **more vulnerable populations live in close proximity to the proposed peaker plant.**

Table 1. Average age ranges of census tracts in focus area and rest of MA

Age Range	Focus Area mean %	MA mean %	p value
<5	6.48	5.50	<0.0005
5-9	4.66	5.50	<0.0005
10-14	4.98	5.94	<0.0005
15-17	2.89	3.71	<0.0005
18-24	9.31	10.77	
25-34	15.33	15.55	
35-64	40.42	40.94	
>65	21.94	16.86	<0.0005

Health comparisons by census tracts

To compare disease prevalence between the focus area and the rest of the state, the nine census tracts entirely or partially within the 2km radius of the proposed peaker plant comprised the focus area (Figure 2). Thirteen health outcomes, including asthma, cancer, chronic kidney disease, chronic obstructive pulmonary disease, diabetes, high blood pressure, high cholesterol, mental health, obesity, physical health, sleep, and stroke, as well as five treatments/preventative factors, including blood pressure medication, cervical cancer screening, colon cancer screening, mammography use, and routine checkup, were compared between the focus area and the rest of the state.

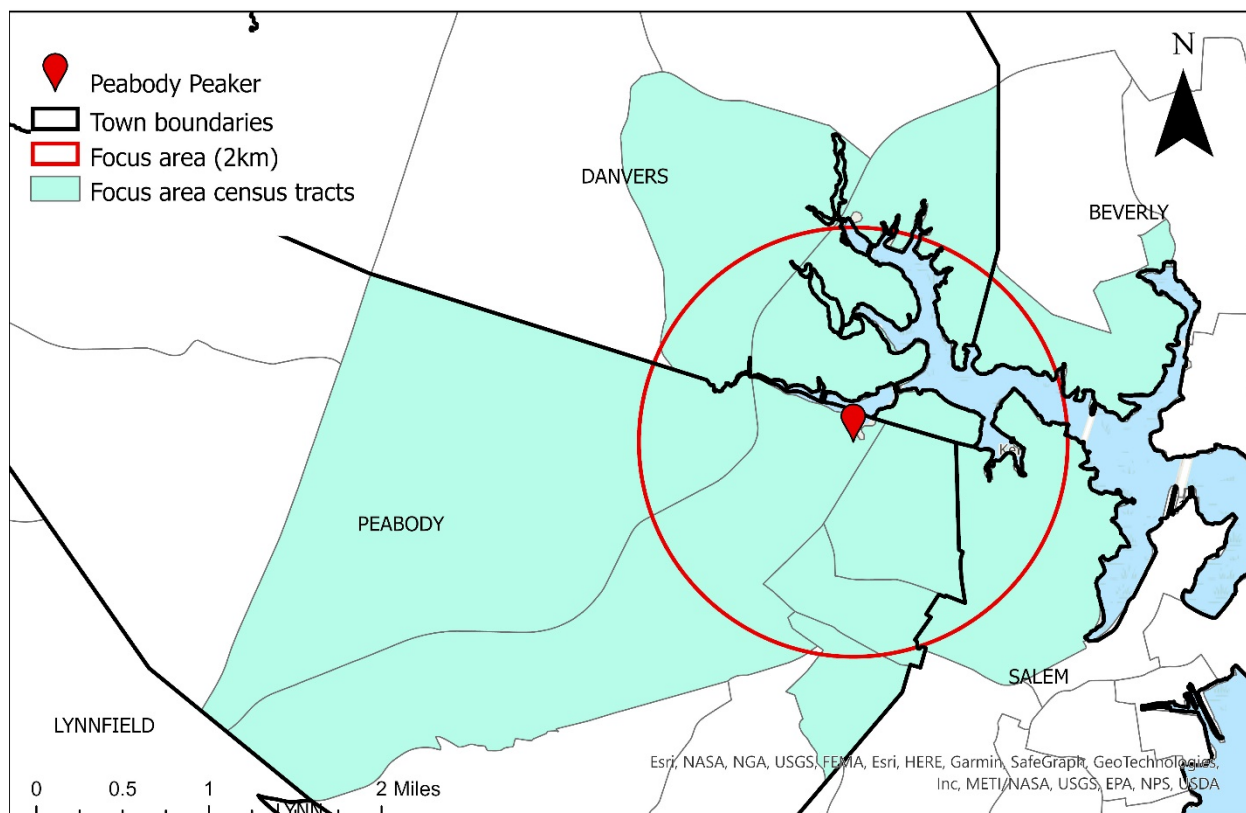


Figure 2. Census tracts and focus area for comparing health outcomes.

Among adults, five diseases, including cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, and stroke are significantly higher in the focus area compared to the rest of the state, on average (Table 2). These differences were statistically significant when we adjusted for smoking prevalence, lack access to health insurance, EJ status, and total population.

Table 2. Average crude prevalence (cases per person) of diseases in census tracts in focus area and the rest of MA

Outcome	Focus area mean (pop=46,925)	MA mean (pop=6,500,655)	p-value	Adjusted p-value ¹
Disease				
Asthma	9.53	10.26	<0.0005	<0.0005
Cancer	8.14	7.05	<0.0005	<0.0005
Chronic obstructive pulmonary disease	6.46	5.81	<0.005	<0.05
Chronic kidney disease	2.80	2.59	<0.005	<0.0005
Coronary heart disease	6.50	5.53	<0.0005	<0.0005
Diabetes	8.51	8.41		

High blood pressure	28.41	27.66		
High cholesterol	30.19	28.90	<0.05	
Mental health not good for >=14 days	13.82	14.15		<0.05
Obesity	25.52	26.14		<0.0005
Physical health not good >=14 days	12.13	11.88	<0.05	<0.005
Sleep <7 hours	34.18	35.24	<0.05	<0.0005
Stroke	3.18	2.86	<0.005	<0.005
Treatment/prevention				
Blood pressure medication	75.74	72.87	<0.005	
Cervical cancer screening among women	85.74	86.72		<0.005
Colon screening	71.21	68.81	<0.0005	<0.0005
Mammography use	80.99	81.8	<0.0005	<0.0005
Routine checkup <1 year	81.46	79.51	<0.0005	<0.0005

Data from 2019 CDC PLACES 2015-2019 release. Prevalence is calculated among adults aged ≥18.

¹Adjusted for EJ status, smoking, total population, and lack of insurance coverage

Maps with percentiles of prevalence of cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, and stroke in the focus area are shown below (Figures 2-6). Maps for prevalence of asthma, diabetes, high blood pressure, high cholesterol, obesity, smoking and lack of health insurance are provided in the appendix. Of the nine census tracts within focus area, several are in the highest quartile (75-100th percentile) of disease, state-wide. One census tract in the focus area is in the highest quartile of disease prevalence for eight diseases, including cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, diabetes, high blood pressure, high cholesterol, and stroke (Figure 7). This census tract has EJ neighborhoods, several major roadways, a hospital, a long-term care facility, and four facilities regulated by DEP, as seen in Figure 1. In the census tracts that are in the highest quartile for 3-7 diseases, there are also EJ neighborhoods, roadways, facilities regulated by DEP, a school, a hospital, and a long-term care facility.

When disease prevalence is evaluated in the context of EJ neighborhoods and sensitive populations, such as schools and hospitals, it is apparent that several census tracts that have relatively high disease prevalence also have EJ and other sensitive populations, as well as other polluting facilities and major roadways. These findings are notable and warrant further investigation.

Studies have found that long- and short-term exposure to air pollution mixtures and constituents, including NO₂ and O₃, have associations with cardiovascular disease and high blood pressure, which is a risk factor for cardiovascular disease.³³ A recent study that analyzed ambient NO₂ concentrations in 398 high income cities worldwide found that small increases (10 µg/m³) were associated with risk of overall mortality and cardiovascular and respiratory mortality.³⁴ Indeed, researchers have also found that increased exposure to particulate matter in air pollution is associated with greater mortality to COVID-19,³⁵ suggesting that air pollution creates greater vulnerabilities to other illnesses that affect the respiratory and circulatory system. The International Agency for Research on Cancer classifies outdoor air pollution as carcinogenic to humans, as particulate matter in air pollution may cause DNA damage and has the potential to activate inflammatory or hormone-mediated pathways that can lead to cancers.³⁶ A better understanding of chemical constituents, and their sources, of air pollution in the focus area would help identify ways to reduce air pollution and potentially lower the risk of some cancers in the community.

³³ Robert D. Brook et al., "Air Pollution and Cardiovascular Disease," *Circulation* 109, no. 21 (June 2004): 2655–71, <https://doi.org/10.1161/01.CIR.0000128587.30041.C8>; You-Jung Choi et al., "Short-Term Effects of Air Pollution on Blood Pressure," *Scientific Reports* 9, no. 1 (December 30, 2019): 20298, <https://doi.org/10.1038/s41598-019-56413-y>; Paolo Giorgini et al., "Air Pollution Exposure and Blood Pressure: An Updated Review of the Literature," *Current Pharmaceutical Design* 22, no. 1 (2016): 28–51, <https://doi.org/10.2174/1381612822666151109111712>.

³⁴ Xia Meng et al., "Short Term Associations of Ambient Nitrogen Dioxide with Daily Total, Cardiovascular, and Respiratory Mortality: Multilocation Analysis in 398 Cities," *BMJ* 372 (March 24, 2021): n534, <https://doi.org/10.1136/bmj.n534>.

³⁵ Andrea Pozzer et al., "Regional and Global Contributions of Air Pollution to Risk of Death from COVID-19," *Cardiovascular Research* 116, no. 14 (December 1, 2020): 2247–53, <https://doi.org/10.1093/cvr/cvaa288>.

³⁶ IARC, *Outdoor Air Pollution*, accessed July 14, 2022, <https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015>.

Percentiles of cancer prevalence in Massachusetts by census tract, 2019

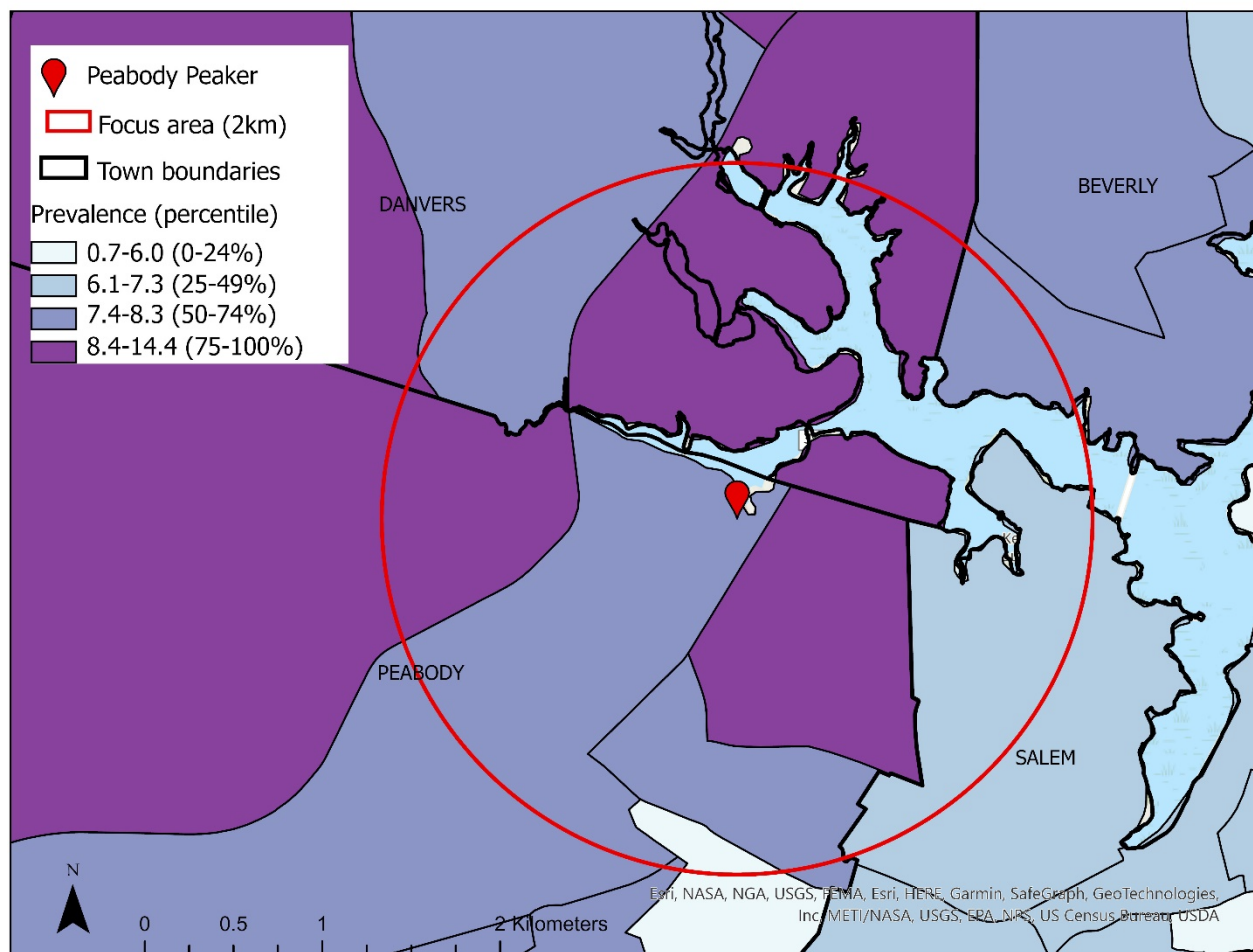


Figure 2. Percentiles of cancer prevalence in focus area

Percentiles of chronic kidney disease prevalence in Massachusetts by census tract, 2019

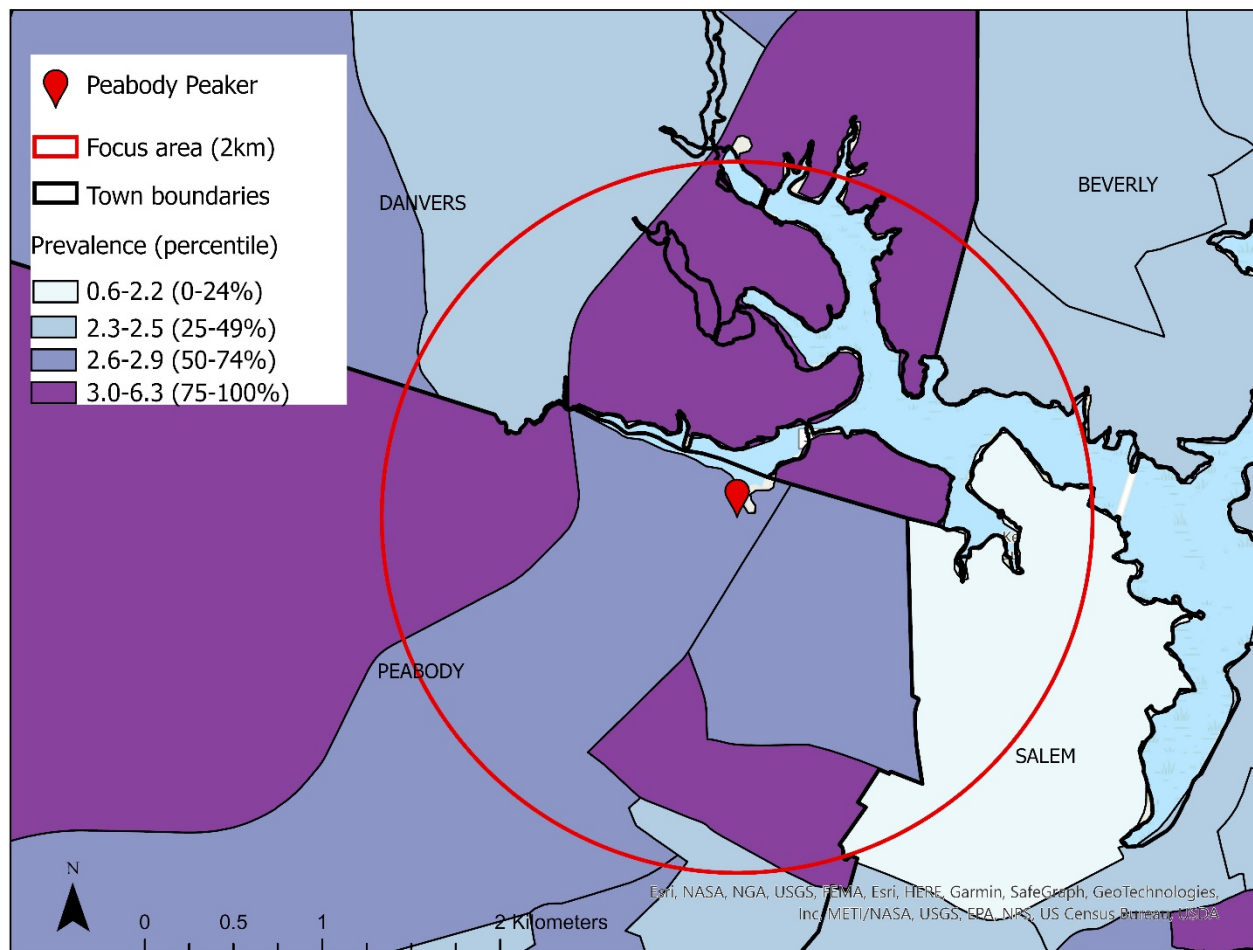


Figure 3. Percentiles of chronic kidney disease prevalence in study area

Percentiles of chronic obstructive pulmonary disease prevalence in Massachusetts by census tract, 2019

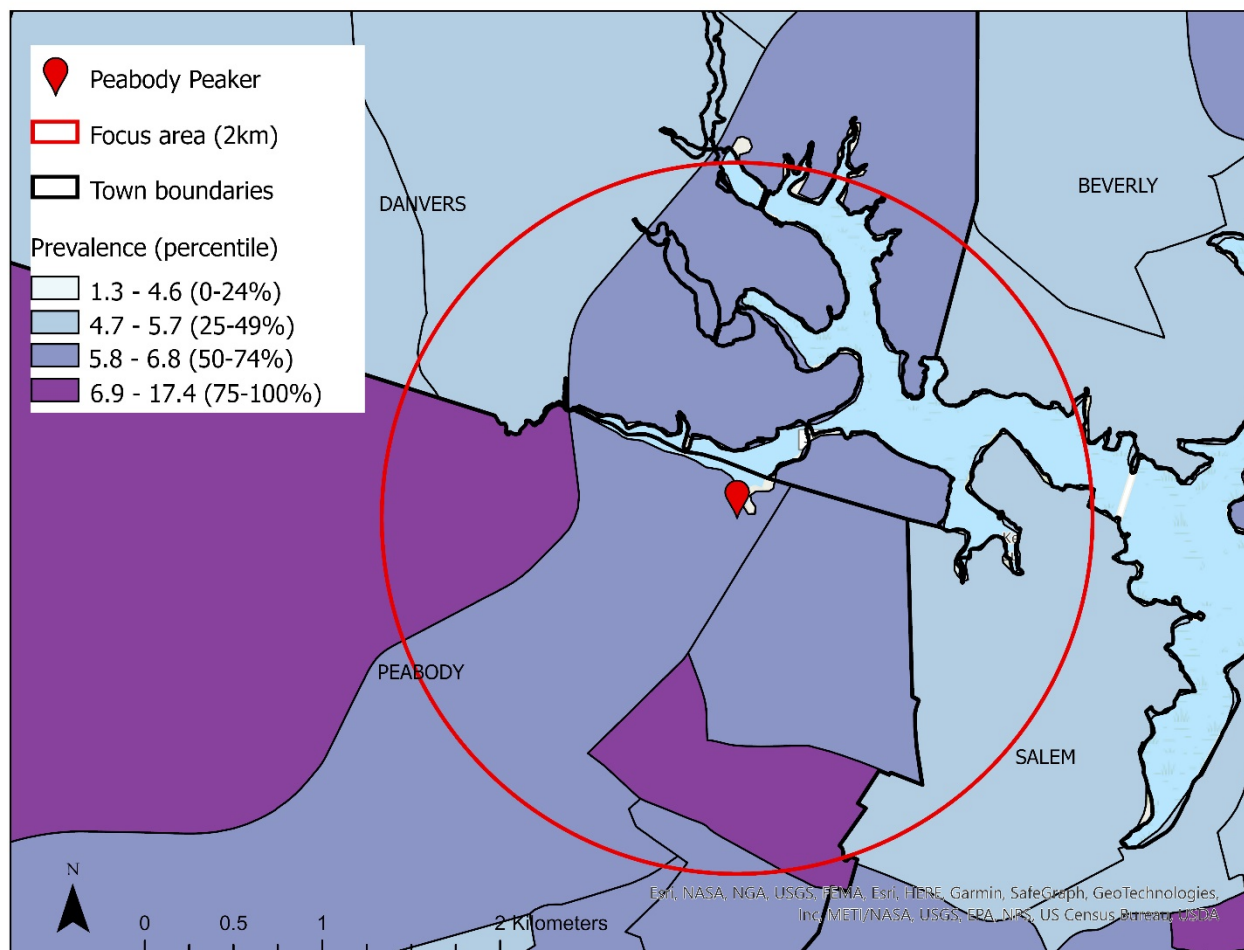


Figure 4. Percentiles of chronic obstructive pulmonary disease prevalence in study area

Percentiles of coronary heart disease prevalence in Massachusetts by census tract, 2019

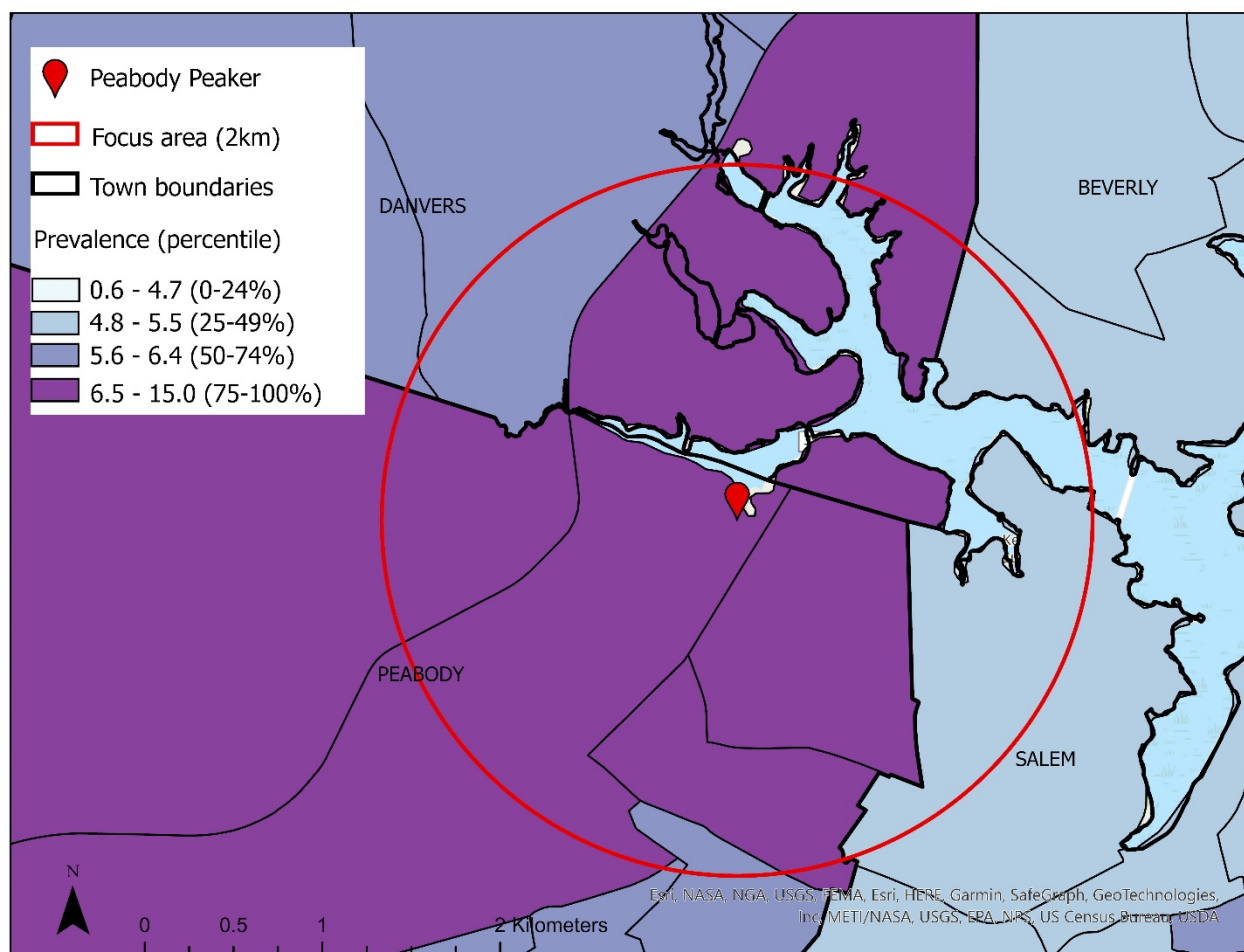


Figure 5. Percentiles of coronary heart disease prevalence in focus area

Percentiles of stroke prevalence in Massachusetts by census tract, 2019

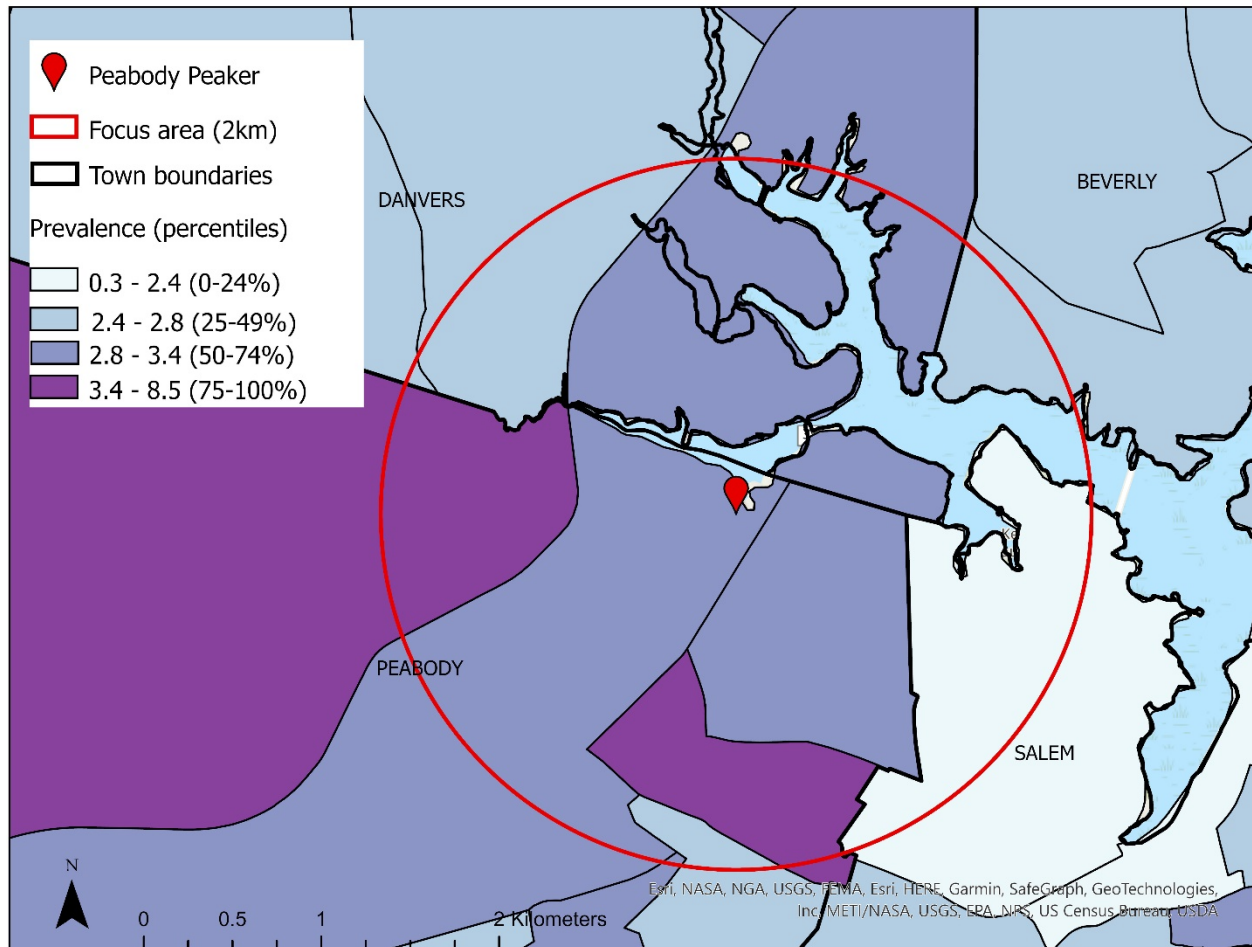


Figure 6. Percentiles of stroke prevalence in focus area

Counts of highest prevalence for 10 diseases by census tract in Massachusetts, 2019

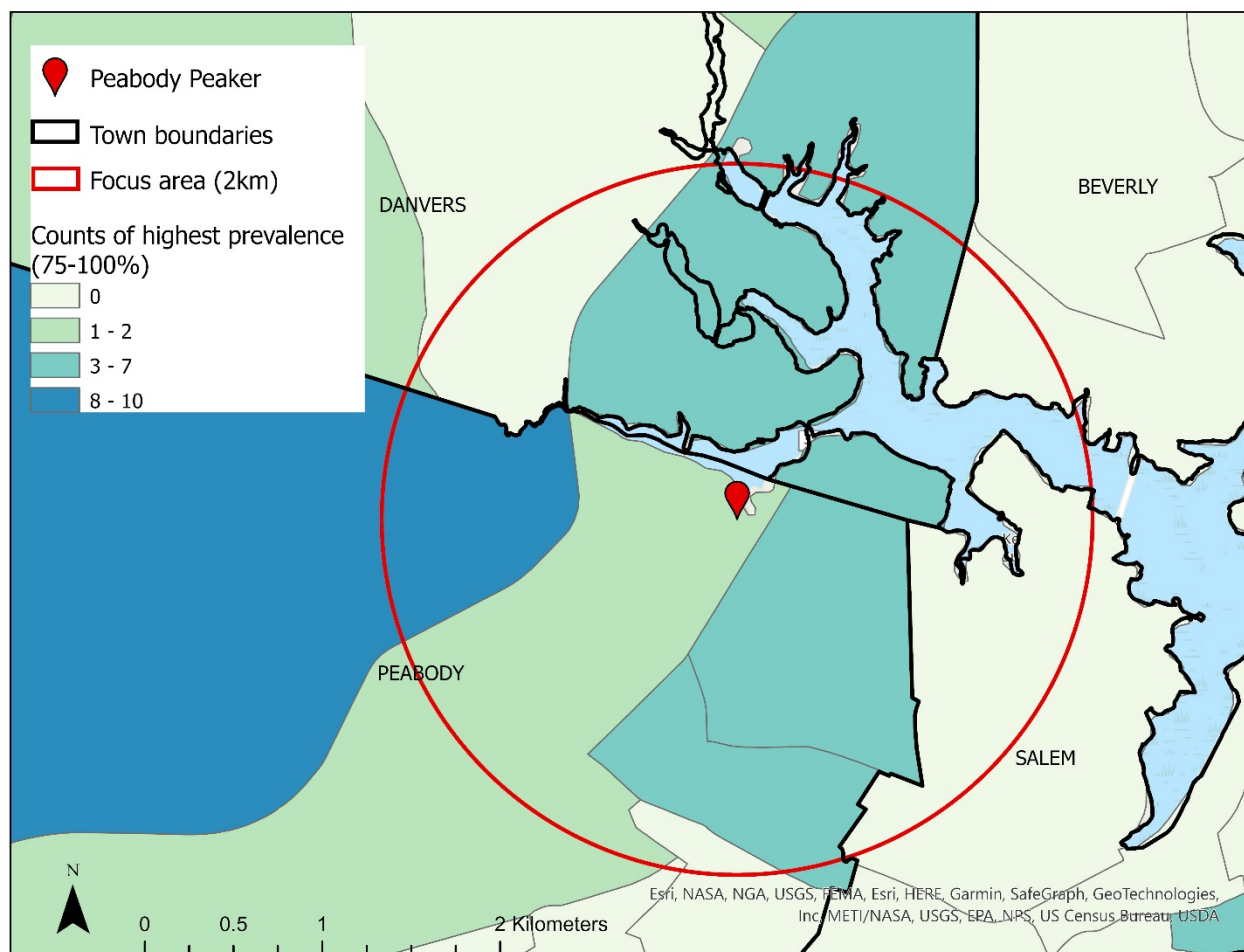


Figure 7. Frequency of highest quartile (75-100 percentile) for 10 health outcomes (asthma, high blood pressure, cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, diabetes, high cholesterol, obesity, and stroke) in focus area

Health comparisons by municipalities

Peabody's history of leather production earned its nickname of "Leather Capital of the World,"³⁷ and the city has felt the effects of producing goods to benefit other communities. This has also come at a cost for Peabody, as tanneries have polluted Peabody's soil.³⁸ Project 2015A would

³⁷ "History of Peabody Leatherworkers Museum," George Peabody House Museums, accessed July 26, 2022, <https://peabodymuseums.com/peabody-leatherworkers-museum/history/>.

³⁸ "02/27/1997: CLEANUP UNDERWAY AT PEABODY TANNERY SITE," accessed July 26, 2022, https://archive.epa.gov/epapages/newsroom_archive/newsreleases/24935ffcb6926652852574e200037bc3.html.

provide power to 11 other communities, in addition to Peabody. This project falls into a similar pattern historically seen in Peabody of bearing environmental costs and raising EJ concerns to benefit other communities. In order to evaluate the health disparities between Peabody, the producer of energy for other municipalities, disease prevalence was compared between Peabody and the other municipalities participating in Project 2015A. Peabody consistently ranks in the top three highest prevalence for disease outcomes when compared to the 11 other municipalities (Table 3). Peabody has the highest prevalence of chronic kidney disease, coronary heart disease, chronic obstructive pulmonary disease, and stroke, the second highest prevalence of high blood pressure, and the third highest prevalence of high blood pressure. Compared to the 11 other municipalities participating in peaker plant, ten have fewer proportions of their population that live in an EJ block group (Table 3).

Table 3. Disease prevalence in 12 MMWEC municipalities contracted with Project 2015A

Town	Asthma	High blood pressure	Cancer	Chronic kidney disease	Coronary heart disease	COPD	Diabetes	High chol.	Obesity	Stroke	% of pop in EJBG
Peabody	9.40	29.40	8.66	2.89	6.79	6.55	8.74	31.20	25.15	3.28	41.5
Boylston	10.00	28.00	8.10	2.30	5.10	4.90	7.40	31.80	29.00	2.40	0
Holden	9.99	27.96	8.22	2.35	5.19	4.93	7.31	31.47	28.78	2.45	0
Hull	9.93	30.66	8.14	2.49	5.58	5.85	8.12	32.73	26.27	2.73	0
Mansfield	9.53	25.21	6.69	1.98	3.98	4.53	6.23	26.99	28.25	2.08	0
Marblehead	8.68	27.29	8.85	2.48	5.51	4.68	7.45	31.71	23.38	2.56	12.9
Russell	2.12	6.13	1.55	0.50	1.19	1.33	1.67	6.31	5.45	0.58	0
Shrewsbury	9.60	26.81	7.46	2.23	4.87	4.61	7.26	30.13	27.19	2.34	61.3
South Hadley	10.41	26.16	7.72	2.56	5.72	5.84	7.54	25.75	23.17	2.81	24.6
Sterling	10.00	28.00	8.10	2.30	5.10	5.00	7.30	31.80	29.30	2.40	0
Wakefield	7.58	21.34	6.34	1.84	4.11	3.95	5.58	23.96	18.50	2.00	3.9
West Boylston	10.19	31.44	8.33	2.73	6.59	6.55	8.88	32.61	31.28	3.16	44.2
Chicopee*	9.84	27.57	6.63	2.61	5.94	6.80	8.40	26.52	24.80	3.05	66.1
Holyoke*	10.40	29.48	6.08	3.29	6.78	7.31	11.31	27.13	29.35	3.54	76.8

*Chicopee and Holyoke intend to withdraw from Project 2015A. Their disease prevalence is shown, but not used in comparisons reported in the results.

Asthma outcomes in Peabody

MA Environmental Public Health Tracking reports that prevalence of pediatric asthma (grade K-8) is lower in Peabody compared to the rest of the state (6.2; 95% confidence interval (CI): 5.5-6.9 vs. 12.1; 95% CI 12-12.2) for the most recent years available, 2016-2017 (Table 4).³⁹

However, **the proportion of children ages <5 years and 5-14 years who had emergency room visits for asthma was higher than children of those ages in the state** (age <5=169.6; 95% CI 118.9-220.2 vs. 144.4; 95% CI 14.2-148.0 and age 5-14=92.8; 95% CI 67.1-118.6 vs. 77.1; 95% CI 75.2-79.1) in 2017, though differences were not significantly different (Table 4).

Air pollution is an established risk factor for asthma, especially among children, whose lungs are more vulnerable to the effects of air pollution. Levels of O₃ that are below EPA's NAAQS thresholds have been associated with increased asthma symptoms among African American children,⁴⁰ and likewise low levels of NO₂ have also been shown to increase the risk of childhood asthma symptoms.⁴¹ A thorough estimation of O₃ and NO₂ releases from the current and proposed power plants in Peabody for the duration of time when they are running, along with accurate ambient air concentrations, would present a better picture of what the plants' risks are for asthma in Peabody and the focus area.

Table 4. Pediatric asthma prevalence and ER visits in Peabody vs. MA

	Peabody Prevalence (95% CI)	Statewide Prevalence (95% CI)
Pediatric ^a asthma prevalence 2016-2017	6.2 (5.5-6.9)	12.1 (12-12.2)
Pediatric ^a asthma ER visits 2017		
<5	169.6 (118.9-220.2)	144.1 (140.2-148.0)
5-14	92.8 (67.1 - 118.6)	77.1 (75.2-79.1)
15-34	36.7 (26.1 - 47.3)	54.2 (53.1-55.2)
35-64	38.3 (30.1 - 46.5)	46.7 (45.9-47.5)
≥65	23.3 (15.0 - 31.7)	24.6 (23.7-25.6)

³⁹ "MEPHT | Health Data."

⁴⁰ Michelle L. Hernandez et al., "Low-Level Ozone Has Both Respiratory and Systemic Effects in African American Adolescents with Asthma despite Asthma Controller Therapy," *Journal of Allergy and Clinical Immunology* 142, no. 6 (December 1, 2018): 1974-1977.e3, <https://doi.org/10.1016/j.jaci.2018.08.003>.

⁴¹ Rajen N. Naidoo, "NO₂ Increases the Risk for Childhood Asthma: A Global Concern," *The Lancet Planetary Health* 3, no. 4 (April 1, 2019): e155–56, [https://doi.org/10.1016/S2542-5196\(19\)30059-2](https://doi.org/10.1016/S2542-5196(19)30059-2).

^aPediatric= grade K-8

Key components of Community Health Impact Assessment (CHIA)

A CHIA has been requested by the Peabody Board of Health, other Boards of Health, and community groups. A CHIA is designed to involve and engage stakeholders in decision making, consider impacts on vulnerable groups, evaluate short- and long-term impacts and benefits, assess physical, mental, environmental, economic, and social determinants of health, and identify mitigation measures to reduce harmful impacts.⁴² A CHIA should include a robust evaluation of the risks posed by additional pollutants to communities over-burdened with health concerns.

This report outlines several important components that a CHIA of Project 2015A should have in order to adequately achieve its goals and address community concerns:

1. A CHIA must engage the community, including vulnerable populations. CHIAs require community knowledge and involvement.⁴³ Massachusetts guidelines include bringing together communities and public health concerns to make decisions to promote public health.⁴⁴
2. Background air pollution concentrations should be monitored with new air pollution sensors, as DEP's air dispersion modeling included ambient concentrations in Lynn and Boston. In early 2022, MA DEP purchased seven air monitors (Purple Air monitors) for the City of Peabody that will measure PM_{2.5} concentrations in several of the city's EJ neighborhoods.⁴⁵ Consistent monitoring and analysis of the air quality should be a component of any CHIA conducted.
3. In addition to monitoring for PM, DEP should evaluate pollutants at the proposed sites soil and groundwater on a continual basis, as fossil fuel power plants are known to pollute local waterways.

⁴² "Health Impact Assessment | Mass.Gov," accessed July 14, 2022, <https://www.mass.gov/health-impact-assessment>.

⁴³ North American HIA Practice Standards Working Group, "Minimum Elements and Practice Standards for Health Impact Assessment," September 2014, <https://sophia.wildapricot.org/resources/Documents/HIA-Practice-Standards-September-2014.pdf>.

⁴⁴ "Health Impact Assessment | Mass.Gov."

⁴⁵ "Peabody Awarded Sensors to Monitor Pollution | News | Salemnews.Com," accessed July 14, 2022, https://www.salemnews.com/news/peabody-awarded-sensors-to-monitor-pollution/article_b5197488-8507-11ec-9a19-db86ef4a124e.html.

4. A cumulative evaluation of maximum impact from the proposed plant, the Waters River Plant, and geographically appropriate ambient air pollution concentrations should be modeled under worst-case and average conditions. For example, the Waters River Plant operates for an average of 5.2 hours per start⁴⁶; what is the maximum number of hours it runs on peak days? What impact will that have on air quality and community exposure on those days?
5. Baseline health and vulnerability status of surrounding populations should be characterized on a more refined scale than census tracts, prioritizing EJ block groups and populations within census tracts with worse disease outcomes.
6. Evaluate risks posed by other elements of the plant, including methane releases associated with gas compressor blowdowns. The DEP Air Permit approval process does not account for methane gas releases through planned releases or accidental leaks from the natural gas compressor that will be added to the site. Malfunctions have led to unplanned releases at Enbridge's natural gas compressor station in Weymouth, MA⁴⁷, and has been observed in scientific literature.⁴⁸
7. A more extensive monitoring and evaluation process should be developed to quantify population exposures and associated risks (cancer and non-cancer) to the 188 other hazardous air pollutants identified by the U.S. EPA.⁴⁹
8. Evaluate the potential short and long-term impacts of emissions from the plant on human health. This assessment must use evidence-based methods that consider physical, mental, environmental, economic, and social determinants of health.

Environmental Impact Report (EIR)

Under MA's Next Generation Climate "Roadmap" law, projects that impact air quality within 1 mile of an EJ neighborhood must conduct an EIR.⁵⁰ The Peabody Board of Health has

⁴⁶ "Opportunities for Replacing Peaker Plants with Energy Storage in Massachusetts," PSE | Physicians, Scientists, and Engineers for Healthy Energy, accessed July 13, 2022, <https://www.psehealthyenergy.org/our-work/energy-storage-peaker-plant-replacement-project/massachusetts/>.

⁴⁷ Katelyn Weisbrod, "Will a Recent Emergency Methane Release Be the Third Strike for Weymouth's New Natural Gas Compressor?," *Inside Climate News* (blog), April 16, 2021, <https://insideclimatenews.org/news/16042021/will-a-recent-emergency-methane-release-be-the-third-strike-for-weymouths-new-natural-gas-compressor/>.

⁴⁸ R. Subramanian et al., "Methane Emissions from Natural Gas Compressor Stations in the Transmission and Storage Sector: Measurements and Comparisons with the EPA Greenhouse Gas Reporting Program Protocol," *Environmental Science & Technology* 49, no. 5 (March 3, 2015): 3252–61, <https://doi.org/10.1021/es5060258>.

⁴⁹ OAR US EPA, "Initial List of Hazardous Air Pollutants with Modifications," Reports and Assessments, December 16, 2015, <https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications>.

⁵⁰ Commonwealth of Massachusetts, An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy.

requested an EIR from EEA. The definition of an EIR in the “Roadmap” law states that health impacts are considered and avoided if possible:

An environmental impact report shall contain: (i) statements describing the nature and extent of the proposed project and its environmental and public health impact as result of any development, alteration and operation of the project; (ii) studies to evaluate said impacts; (iii) all measures being utilized to minimize any anticipated environment and public health damage; (iv) any adverse short-term and long-term environmental and public health consequences that cannot be avoided should the project be undertaken; and (v) reasonable alternatives to the proposed project and their environmental consequences.⁵¹

While Project 2015A was grandfathered into the permitting process before the 2021 climate law, the same principles of the law are appropriate to apply to Project 2015A. Although EEA states that the project does not meet thresholds for an EIR, EEA has required EIRs for projects that don't meet EIR thresholds in the past, such as for lighthouse improvements.⁵² As such, the request for an EIR in this case, given the local health impact, the cumulative emissions, and the community concern, is reasonable.

Conclusion

Prevalence of cancer, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, and stroke are significantly higher than the rest of the state, on average, in census tracts within 2km of the proposed site for Project 2015A. Significantly more people <5 years and ≥65 years live within 2km of the site compared to the rest of the state, on average. Eight EJ neighborhoods are within 2km of the site, as well as several schools, hospitals, and long term care facilities. Rates of emergency department visits are higher in people <14 years in Peabody compared to the state, though this difference is not significant. Project 2015A is estimated to emit several pollutants known to cause or exacerbate asthma, cancer, and heart disease.

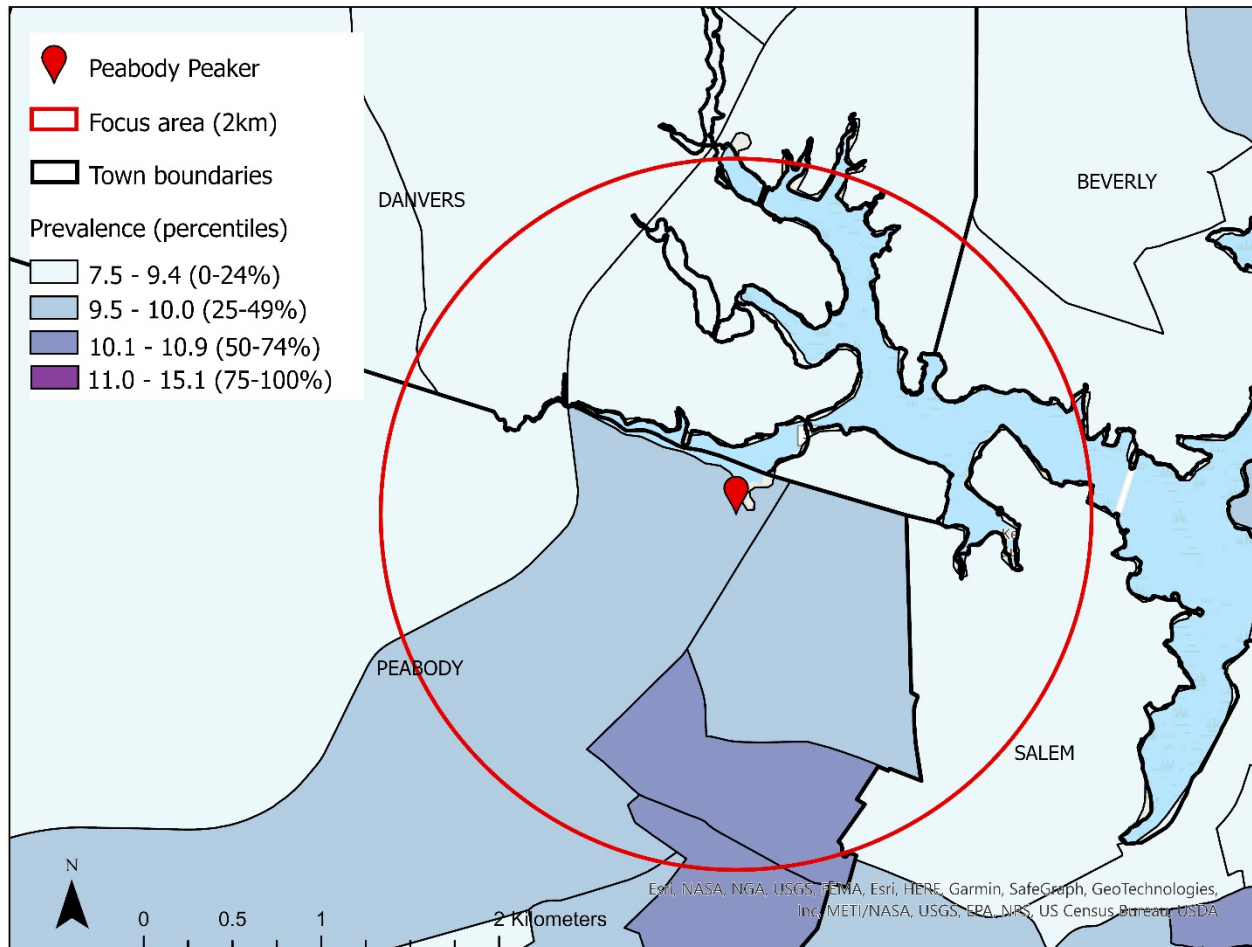
⁵¹ Commonwealth of Massachusetts.

⁵² Environmental Partners Group, Inc, “Lighthouse Inn Groin Improvements West Dennis, Massachusetts MEPA Environmental Impact Report,” accessed July 13, 2022, https://capecodcommission.org/resource-library/file?url=%2Fdept%2Fcommission%2Fteam%2FWebsite_Resources%2FProjectFiles%2FLightHouseInn%2F2017-04-14-Lighthouse+Inn-16030-MEPA+DEIR.pdf.

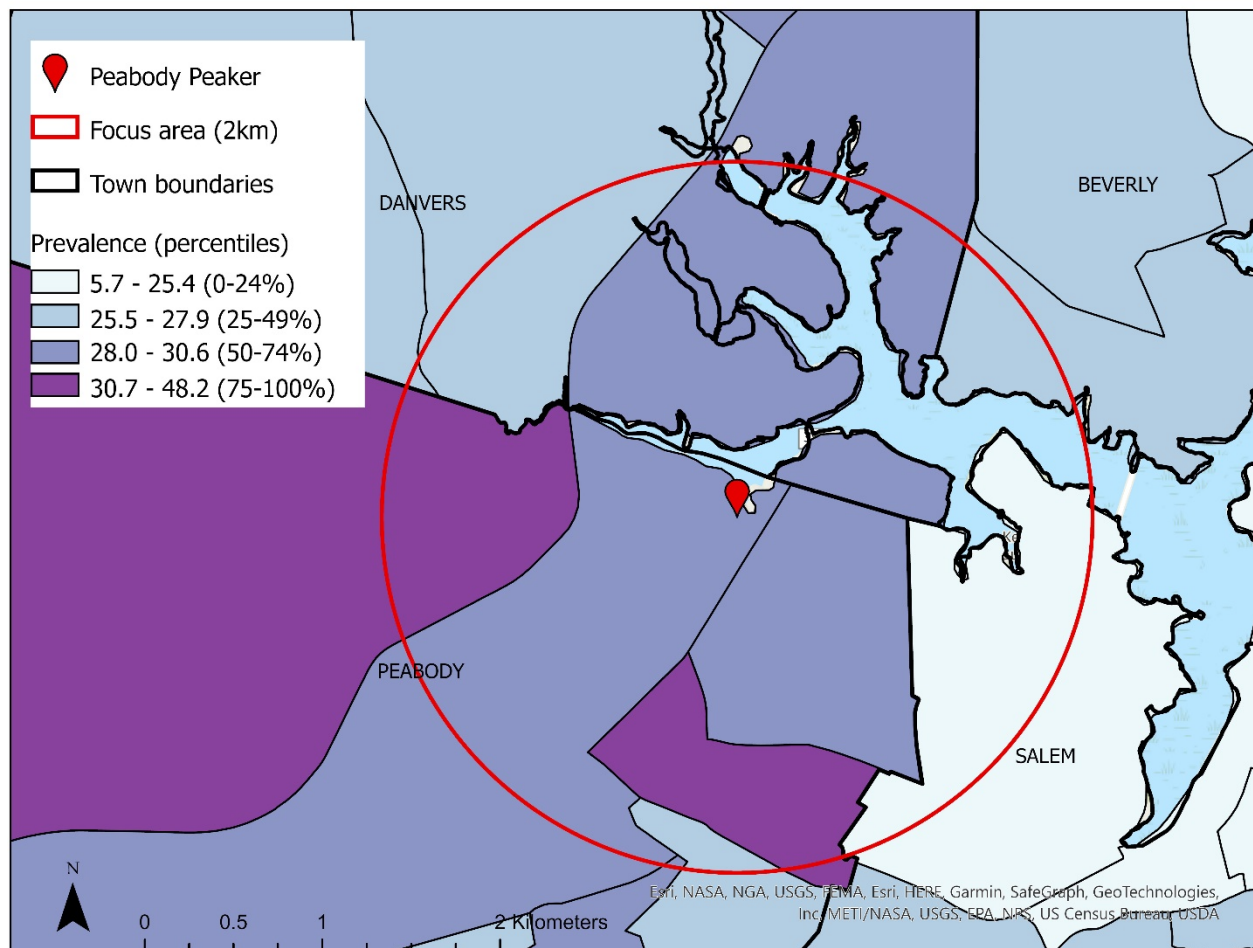
Requiring an EIR or CHIA will help produce more thorough understanding of the baseline health burdens the surrounding communities face and potential additional health impacts from the project. It is notable that if this project had been initiated after MA updated its climate law, it would be required to undergo an EIR, but new fossil fuel infrastructure is not precluded under the law. This case shows that MA's commitments to reduce fossil fuel reliance does not match its permitting actions, and updating regulatory processes is one way to force that alignment.

Appendix

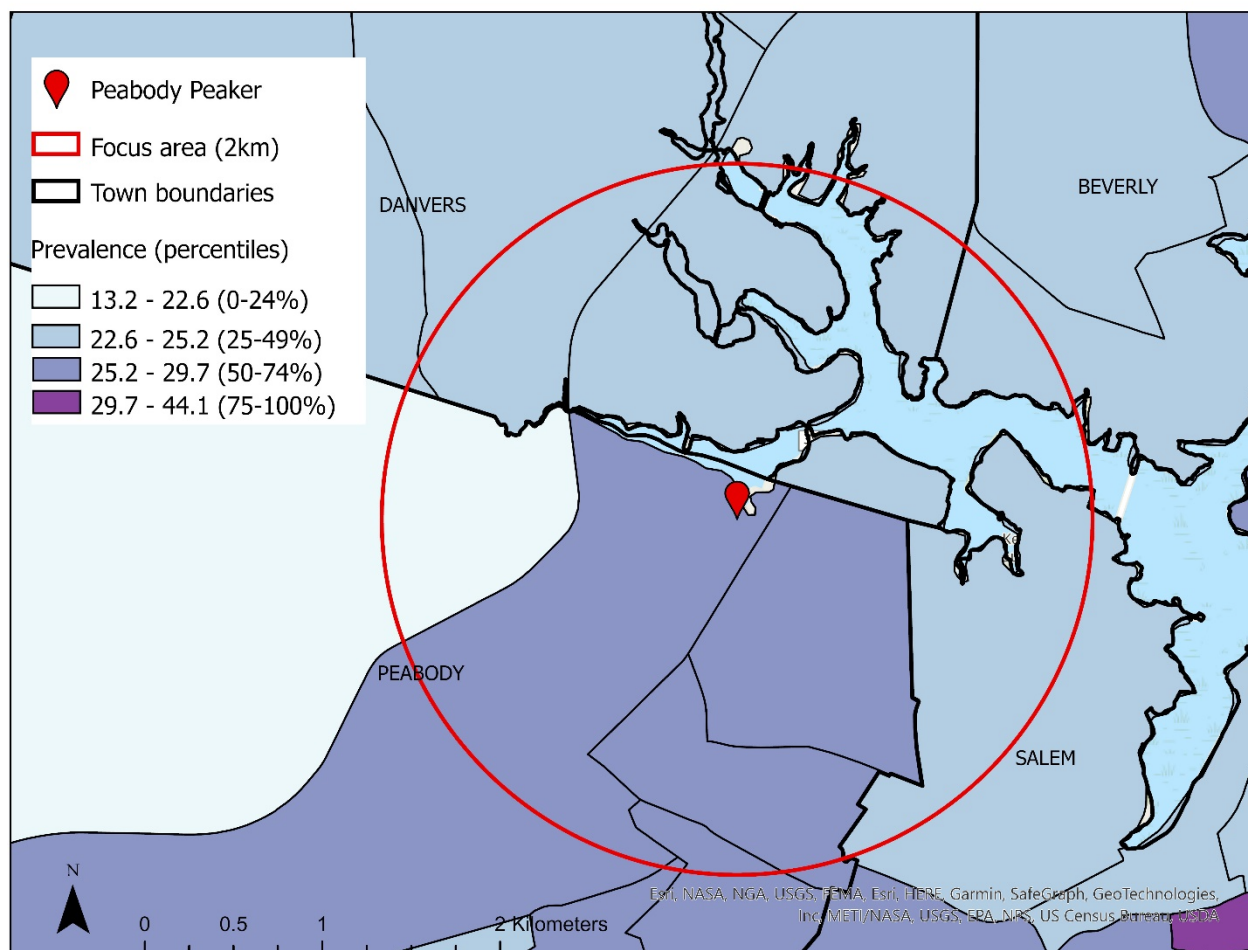
Percentiles of asthma prevalence in Massachusetts by census tract, 2019



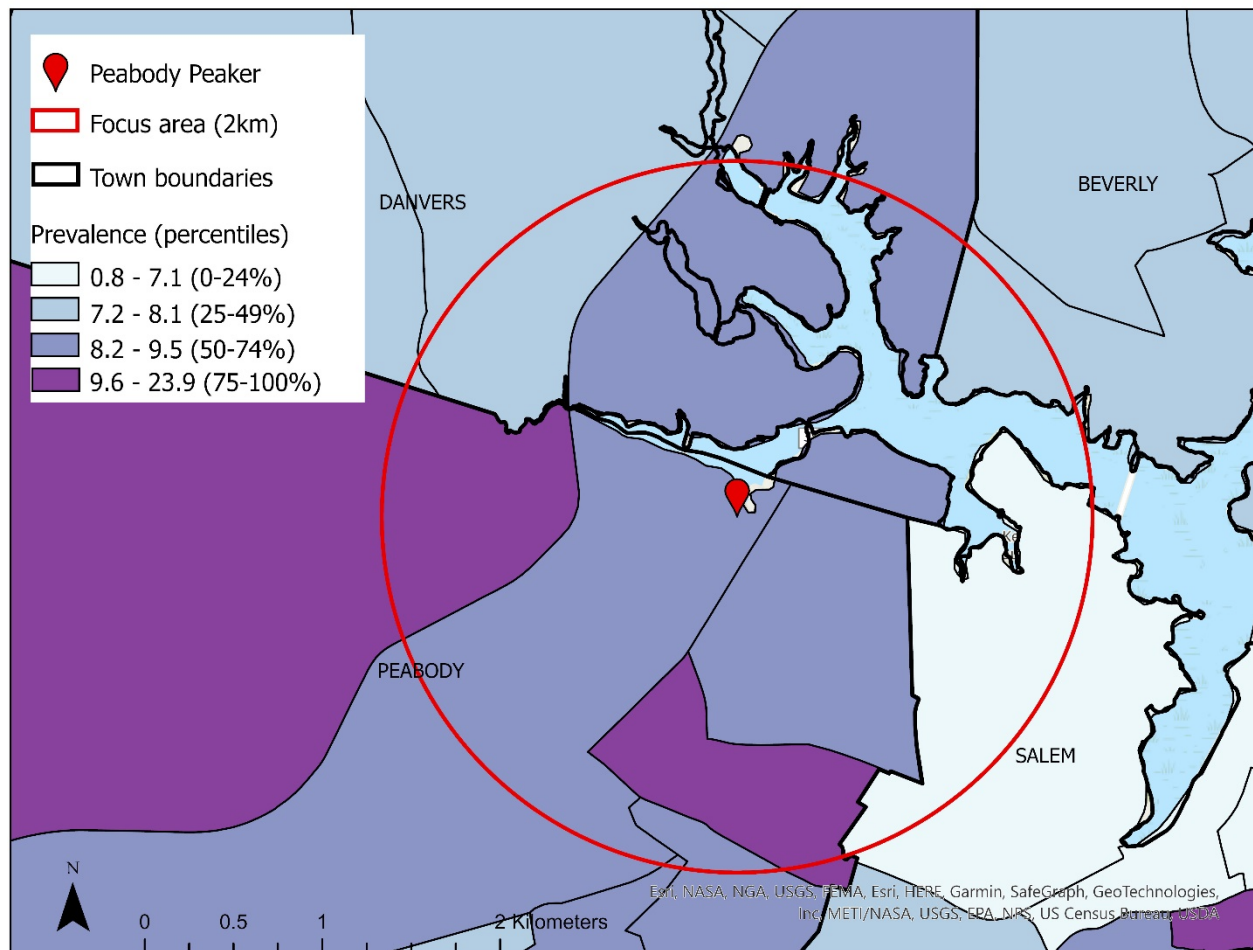
Percentiles of high blood pressure prevalence in Massachusetts by census tract, 2019



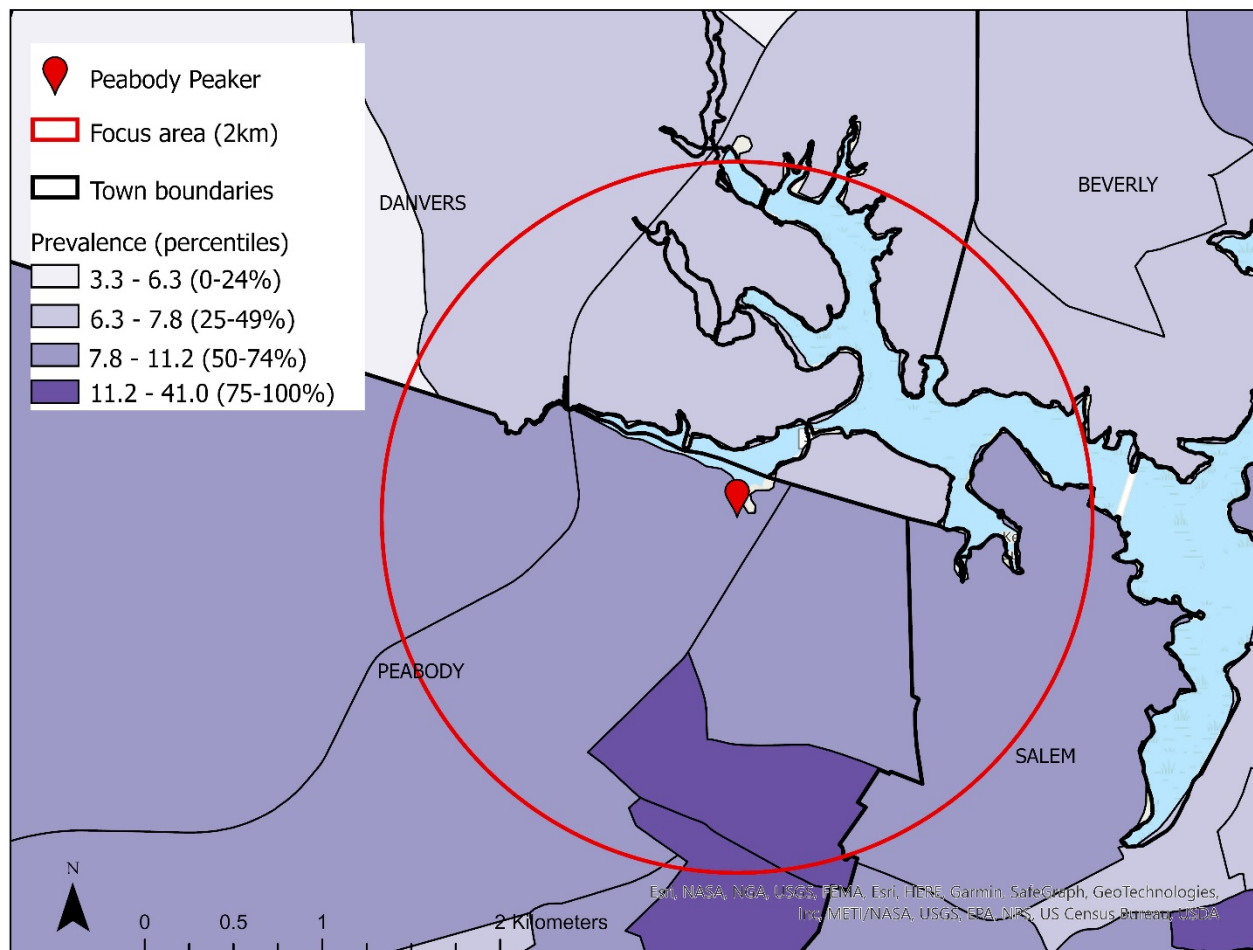
Percentiles of obesity prevalence in Massachusetts by census tract, 2019



Percentiles of diabetes prevalence in Massachusetts by census tract, 2019



Percentiles of lack of health insurance prevalence in Massachusetts by census tract, 2019



Percentiles of smoking prevalence in Massachusetts by census tract, 2019

