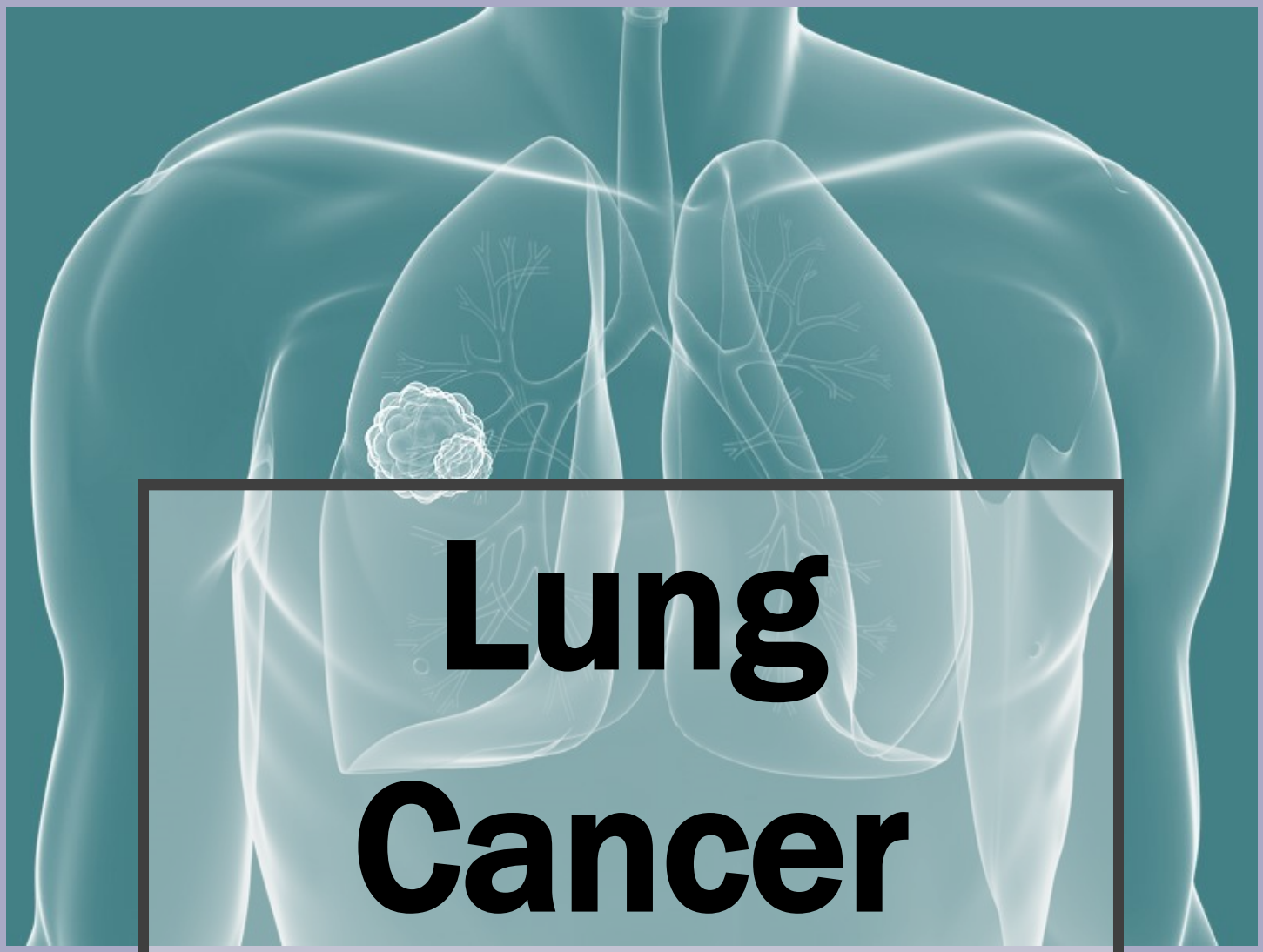

Lung Cancer

in Madison County, New York

An Assessment of the Burden of Disease and the Contributing Social-Ecological Conditions

Madison County Department of Health

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Executive summary

Purpose

Both lung cancer incidence and mortality are higher in Madison County, NY than in New York State overall. Furthermore, while national and state lung cancer mortality rates continue to drop, in Madison County they have remained similar to the 1970's, and even have increased among women. Cancer (all types) is the second leading cause of death in the county, and the leading cause of premature death. Taking steps to reduce the burden of lung cancer has an opportunity not only to save lives, but can also reduce both healthcare costs and the toll cancer takes on families county-wide.

To accomplish this we need to create an understanding of the risk factors for lung cancer as they exist in the county. Beyond describing the burden of disease and risk factors, this health issue profile documents the current policy, system, and environmental (PSE) conditions related to the two primary risk factors for lung cancer: tobacco use and radon. From this come feasible, actionable, and evidence-based recommendations to strengthen the PSE conditions aimed at changing the context of how we are exposed to risk factors within the county. PSE approaches can help make the healthy choice the easy choice. These recommendations provide an opportunity for community leaders to address this issue at a population-level through sustainable change.

Methods

Lung cancer disease and risk factor data from various secondary sources were gathered and summarized. To assess disease-related PSE conditions, Madison County Department of Health (MCDOH) assembled a PSE assessment workgroup to develop an assessment methodology and to serve as a technical advisory panel throughout the assessment process. The workgroup utilized existing tools and developed new ones to create a standardized process that can be repeated in subsequent years. This will allow MCDOH and other organizations to measure any impacts from future PSE changes, and/or programming. MCDOH also conducted a literature review of evidence-based and promising PSE approaches.

Key findings

Madison County has some of the highest adult smoking rates in the state. The county is also considered a high risk radon area. Regarding PSE conditions, Madison County, and the vast majority of its townships and villages have not taken steps to expand upon Federal and State laws by implementing any progressive policies aimed at reducing lung cancer risk factors, while many surrounding peer counties have. The county does have a growing list of smoke-free places to work and play, but it is not comprehensive. School district policies vary across the county. Many have strengthened their polices to make them more inclusive of the changing smoking culture, but there is still room for improvement.

Five attainable and promising PSE recommendations are proposed: 1) pass the Tobacco 21 Law in the county; 2) add e-cigarette language to existing smoke-free policies and signage; 3) require disclosure of smoking policy in rental agreements; 4) implement tobacco retailer licensing and density restrictions; and 5) mandate radon-resistant construction and follow-up testing for new buildings. A list of other PSE opportunities, and supporting evidence are outlined in the literature review (Appendix A).

Most lung cancer deaths are preventable. There are clear opportunities to address PSE conditions regarding lung cancer risk factors. We hope the county can implement far-reaching measures aimed at building upon the momentum to reduce cancer's impact on our community.

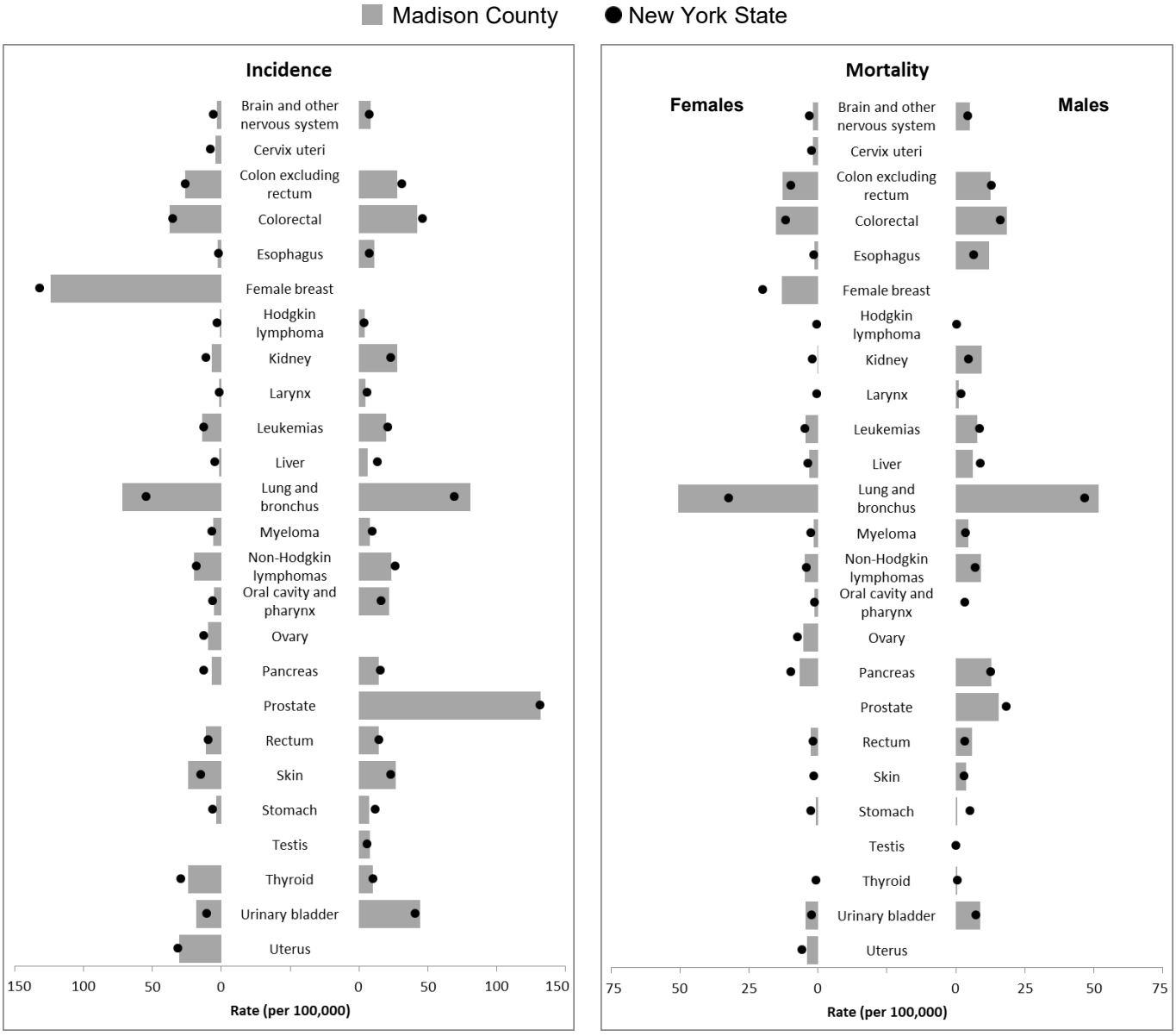
Foreword

In October 2017, New York State (NYS) announced a new initiative to examine cancer trends and the potential causes of cancer across the state[1]. In New York, cancer is now the second leading cause of death behind heart disease, and the leading cause of premature death (death before age 75)[2]. Furthermore, in 2015 nearly 110,000 New Yorkers learned they have cancer, and around 35,000 died from the disease[3].

To align with this initiative the Madison County Department of Health (MCDOH) created a snapshot of cancer incidence and mortality rates within Madison County. For the majority of cancer types, the county rates are similar to, or lower than NYS (Fig. 1). However, lung and bronchus cancer rates stand out. Not only is lung cancer the leading cause of cancer-related deaths, but Madison County has significantly higher rates of diagnosis and mortality than NYS, especially among women.

Seeing these discrepancies prompted MCDOH to develop this report. The goal of this effort is twofold: 1) to better understand trends in the burden of disease; and 2) to assess the current state of social-ecological risk factors. The report describes data and recommendations that can empower policy makers, prevention programs, community advocates, and the general public to address this issue.

Figure 1. Cancer incidence and mortality rates (per 100,000) in Madison County and New York State, 2011-2015[4]



Introduction

Figure 2. WWI-era cigarette advertisements[5].

One hundred years ago lung cancer was a rare disease. In fact, in 1912 there were only 374 confirmed cases worldwide[6]. In 2015, over 234,000 people were diagnosed with lung cancer in the United States alone[7]. Lung cancer is a significant public health issue. In the US, cancer (all types) is the second leading cause of death. Lung cancer is the leading cause of cancer death in both men and women[8]. It incurs a tremendous financial impact on individuals and families affected by it, and the healthcare system in general. Furthermore, the vast majority of lung cancer deaths are preventable[8,9,10].

So what changed? Why has lung cancer evolved from an extremely rare condition, to one of the leading causes of death? In 1950, Doll and Hill[11] published an article in the *British Medical Journal* that reported the results from a study where they compared interviews among the increasing number of patients presenting to the hospital with lung cancer to those in the hospital who did not have lung cancer. They found that a significantly higher proportion of the lung cancer cases had a smoking history when compared to the non-cases. They concluded that there appeared to be an association between carcinoma of the lung and smoking. This was further supported by how well the increasing incidence of lung cancer correlated with the increasing trend of cigarette consumption (Fig. 3).

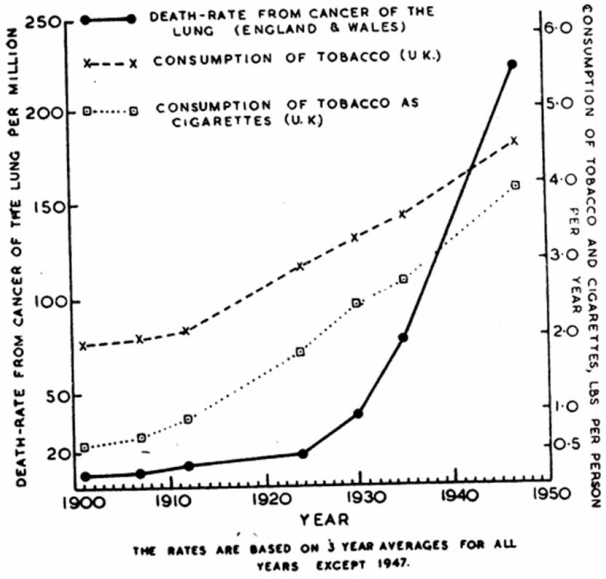


Figure 3. Death rate from cancer of the lung and rate of consumption of tobacco and cigarettes[11].

Smoking became very popular during World War I (1914-1918). Cigarettes were smoked by soldiers in

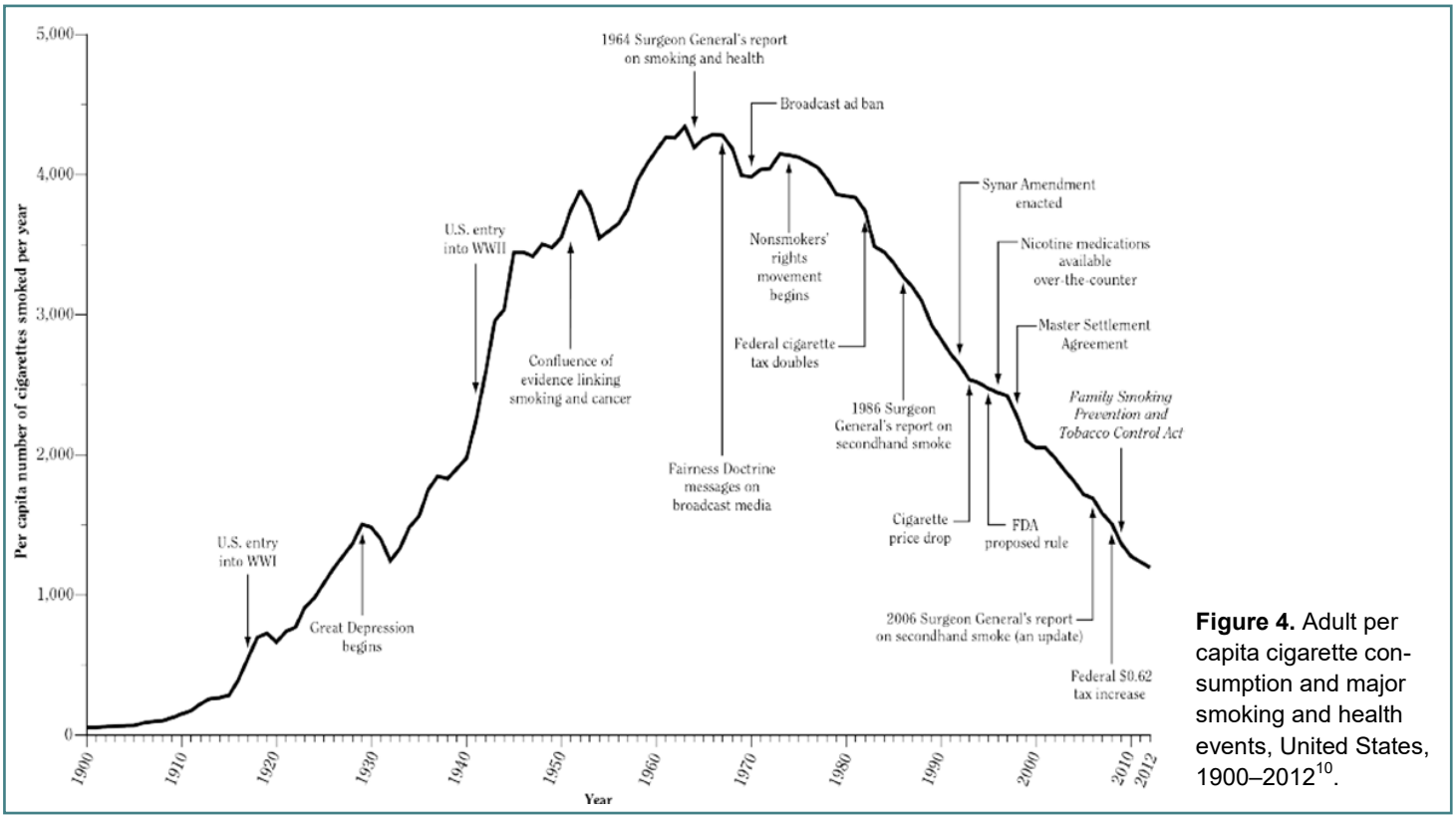


Figure 4. Adult per capita cigarette consumption and major smoking and health events, United States, 1900–2012[10].

the trenches to relieve stress, as well as by many civilians. In the decades that followed the war, smoking continued to be "enjoyed" by hundreds of thousands (Figs. 2 & 3). At the peak of cigarette smoking in the United States, each year over 4,000 cigarettes per capita were smoked[10].

In 1964, a landmark report was published by the U.S. Surgeon General, Dr. Luther L. Terry[12]. It concluded that smoking was harmful to human health, and that individuals should make efforts to not take up the habit or to quit. For several days, the report was the topic of newspaper headlines across the country and lead stories on television newscasts. In 1999, *USA Today* ranked it among the top news stories of the 20th century. The release of that report was one of the first in a series of steps, still being taken over 50 years later, to diminish the impact of tobacco use on the health of people worldwide[10]. Smoking rates have declined since the report, but we have yet to return to the rates prior to World War I (Fig. 4).

Cigarette smoking is linked to about 80% to 90% of all lung cancers, and people who smoke cigarettes are 15 to 30 times more likely to get, or die from lung cancer than people who do not[8,9,13]. The more cigarettes one smokes per day, the more tobacco products one uses, and the earlier s/he starts smoking, the greater the risk of lung cancer[8,14,15,16]. While smoking is the predominant risk factor, there are multiple other risk factors for lung cancer[8]. Lung cancer is also associated with the following:

Radon: This is a naturally occurring gas that comes from rocks and soils that can be trapped in houses and buildings. It cannot be seen, tasted, or smelled. Nationally, radon is attributed to about 20,000 cases of lung cancer each year. It is the second leading cause of lung cancer.

Secondhand smoke exposure: When a person breathes in secondhand smoke it is like s/he is smoking. In the U.S., about 7,300 people die each year from lung cancer due to secondhand smoke exposure.

Personal or family history of lung cancer: One's risk of cancer can be higher if relatives have had lung cancer. Especially among those who smoke. It is important to note that relatives may have similar exposures (smoking, secondhand smoke, radon in the home).

Other substances: Substances such as asbestos, arsenic, diesel exhaust, silica, and chromium can cause lung cancer with high exposures. Especially

What is lung cancer?[8,17]

The lungs (Fig. 5) are an organ in the respiratory system. They are the mechanism for how the body gets oxygen and removes carbon dioxide. The body is consistently producing new cells and replacing old or damaged ones. When this process is interfered with the body begins forming new cells when it doesn't need them, and/or damaged cells don't die as they should. They can start to build up, and form a growth called a tumor. Tumors can be benign (not cancerous) or malignant (cancerous).

The 2 most common types of lung cancer are called small cell, and non-small cell. About 7 of 8 lung cancers are non-small cell. Lung cancer can be diagnosed in different stages. There are 4 stages, I, II, III, and IV. The higher numbers are more advanced, harder to treat, and more of a threat to life. Stage I lung cancer involves a tumor about 5cm in diameter (about the size of a lime). Depending on stage, type, and what is best for the patient, there are many treatment options.

The vast majority (about 86%) of lung cancer cases are preventable[9]. Avoiding smoking and exposure to secondhand smoke are the primary ways to avoid the disease. Testing one's home for radon (and taking action if it is high), and promoting behaviors like regular healthcare check-ups, a healthy diet, and exercise also can reduce one's risk.

Learn more about lung cancer:
https://www.cdc.gov/cancer/lung/

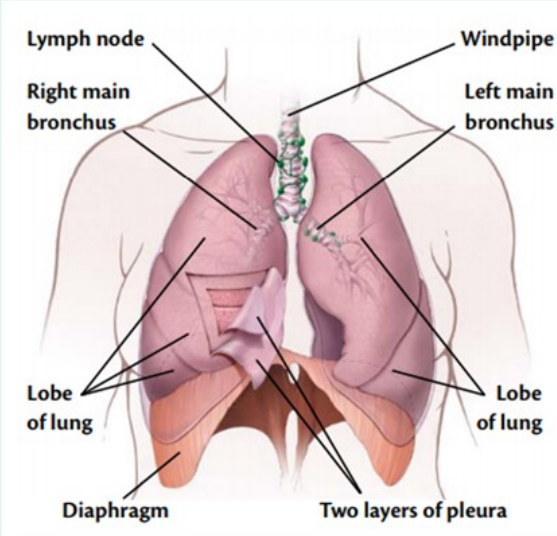


Figure 5. The lungs and nearby tissues.

among those who smoke.

Radiation therapy to the chest: Cancer survivors who have had radiation therapy to the chest are at a higher risk of lung cancer.

Diet: Research is ongoing about different foods and dietary supplements and their association with lung cancer risk. It is known that poor diet, excess alcohol consumption, and physical inactivity increase one's general cancer risk.

Since 2000, rates of both lung cancer incidence and mortality in the United States have been declining (Fig. 6)[7]. The highest rates are among African American men, and Non-Hispanic White women.

While the decreasing trend regarding lung cancer is great news, the disparities between racial/ethnic groups, sexes, socio-economic status (SES), and geography are concerning[7].

Obviously, national statistics do not allow us to understand how and where lung cancer is affecting Madison County. The following pages aim to provide a clearer picture regarding trends in lung cancer incidence, mortality, and risk factors throughout the county.

This information is intended to guide conversations about changes individuals, communities, and policy makers can implement to minimize the impact lung cancer is having on Madison County families and communities. This goes beyond traditional behavior changes. We need to recognize that progressive policies, supportive systems, and healthy environments are necessary to help us and our neighbors live healthy lives. This report offers some evidence-based and promising approaches to empowering our neighbors to make healthy decisions, and hopefully increase the momentum of returning lung cancer to the rare disease that it once was.

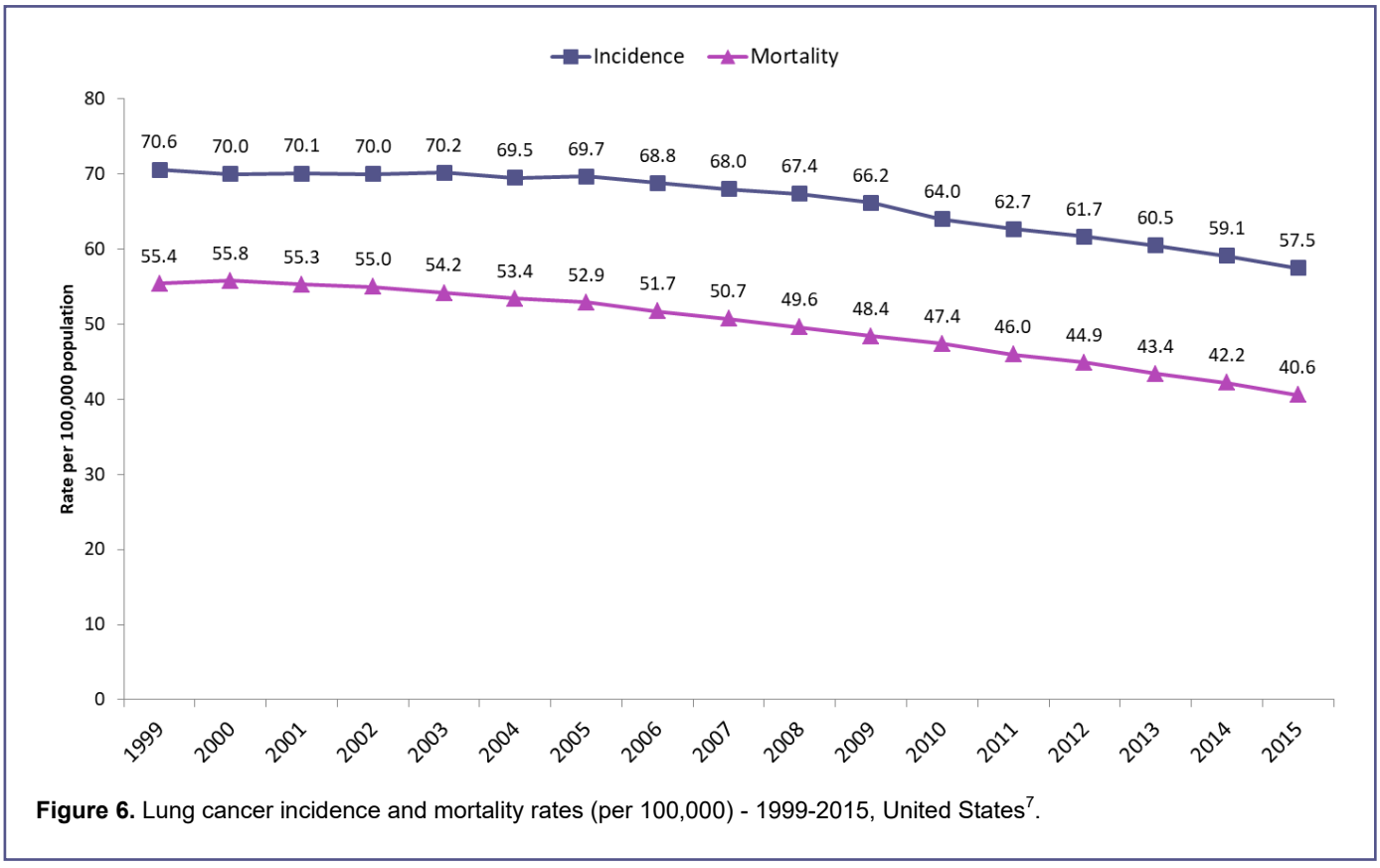


Figure 6. Lung cancer incidence and mortality rates (per 100,000) - 1999-2015, United States[7].

Lung Cancer in Madison County

Disease Burden

Risk Factors

Data Limitations

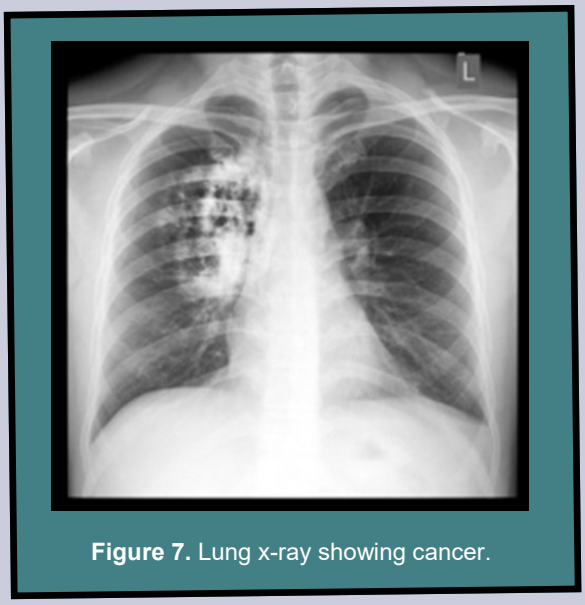


Figure 7. Lung x-ray showing cancer.

Lung cancer burden

Incidence and mortality

As referred to previously, since 2000, rates of both lung cancer incidence and mortality in the United States have declined[7]. This trend is also evident when looking at the data from New York State (NYS) (Fig. 8)[4]. However, Figure 8 also shows that rates in Madison County are higher than in NYS overall. When looking at just female lung cancer, both incidence and mortality rates in Madison County have shown an increasing trend.

Every 10 years, the United States Department of Health and Human Services sets health prevention goals for the upcoming decade. In the most recent version, Healthy People 2020, a goal was set to reduce the lung cancer death rate to 45.5 deaths per 100,000 persons by the end of the decade[18]. As of 2015, death rates in Madison County for both males and females (50.8 per 100,000) exceed this goal[4]. According to the most recent data available (2011-2015), among the 62 counties in NYS, mortality rates among Madison County women are the 7th highest in the state, and among Madison County men are the 41st highest (Fig. 9 on page 10)[4].

The map on page 13 (Fig. 10) displays the percent difference between the amount of expected lung cancer cases in a given area versus the amount of observed lung cancer cases in that area. Based on this map, it becomes clear that lung cancer burden is not distributed equally across the county. The highest above expected percent differences are concentrated in the Oneida and Lenox areas, as well as the southern part of the county.

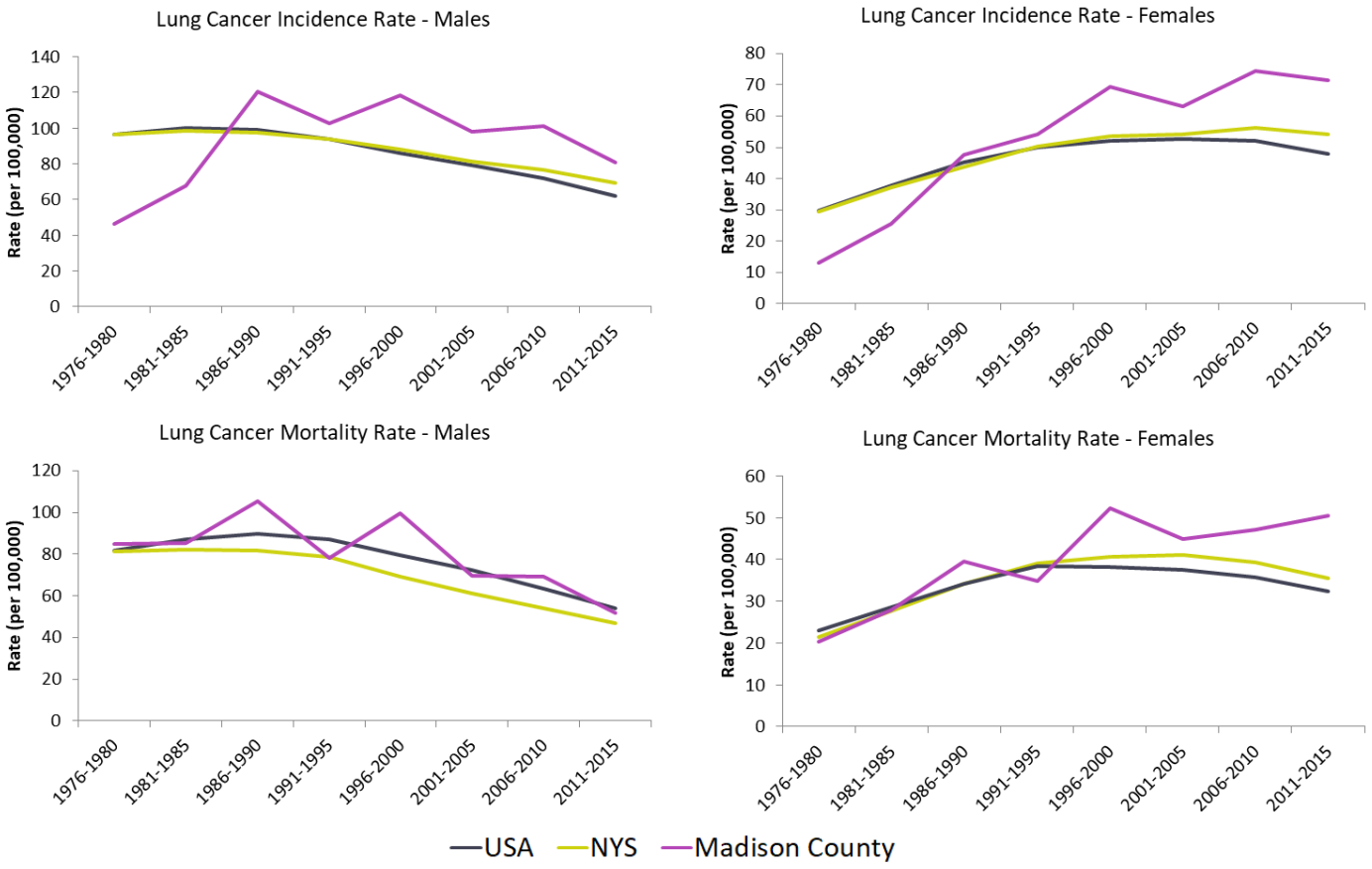


Figure 8. Lung cancer incidence and mortality rates among men and women in Madison County, New York State, and the United States, 1976-2015[4,7].

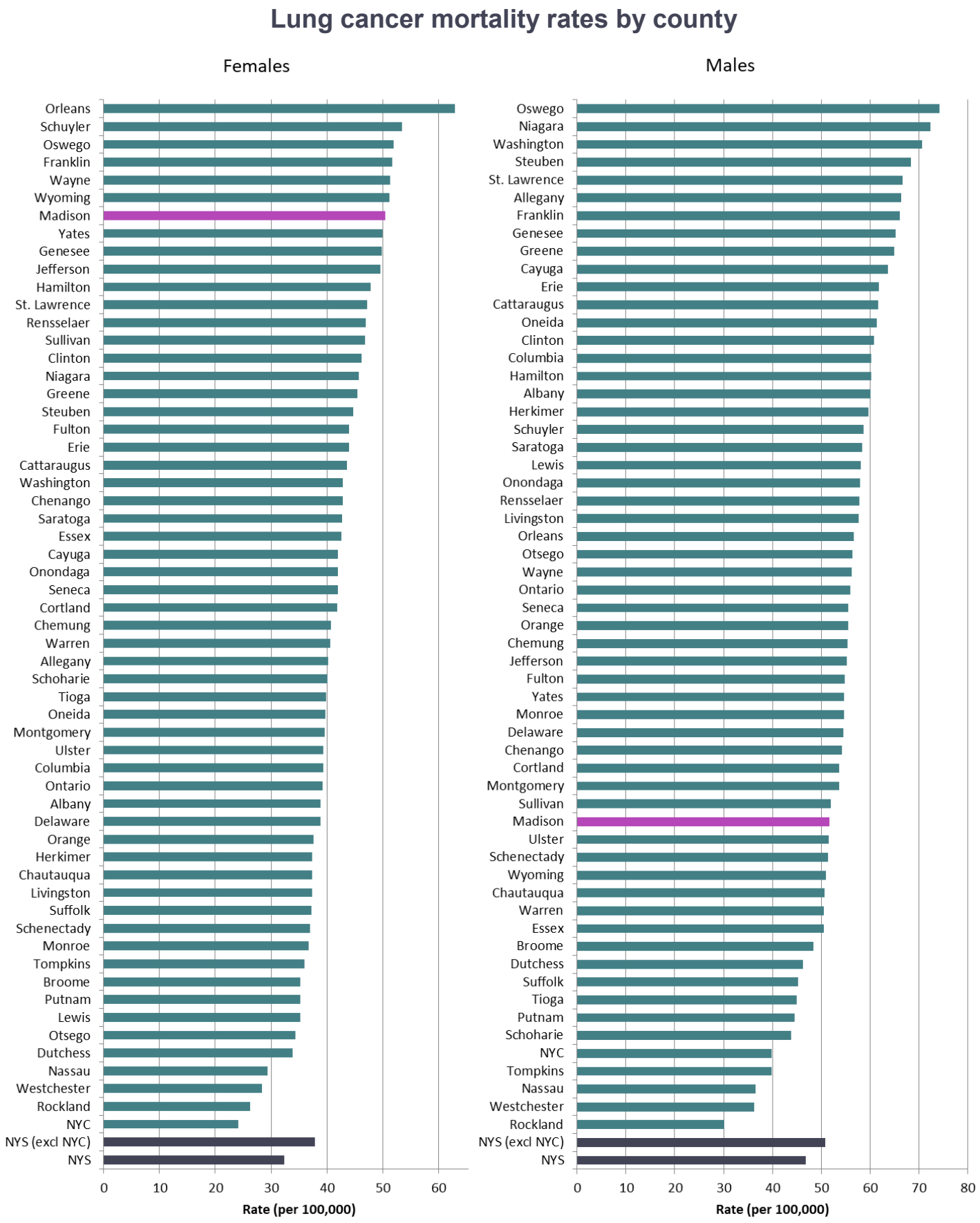


Figure 9. Lung cancer mortality rates by New York State county, 2011-2015[4].

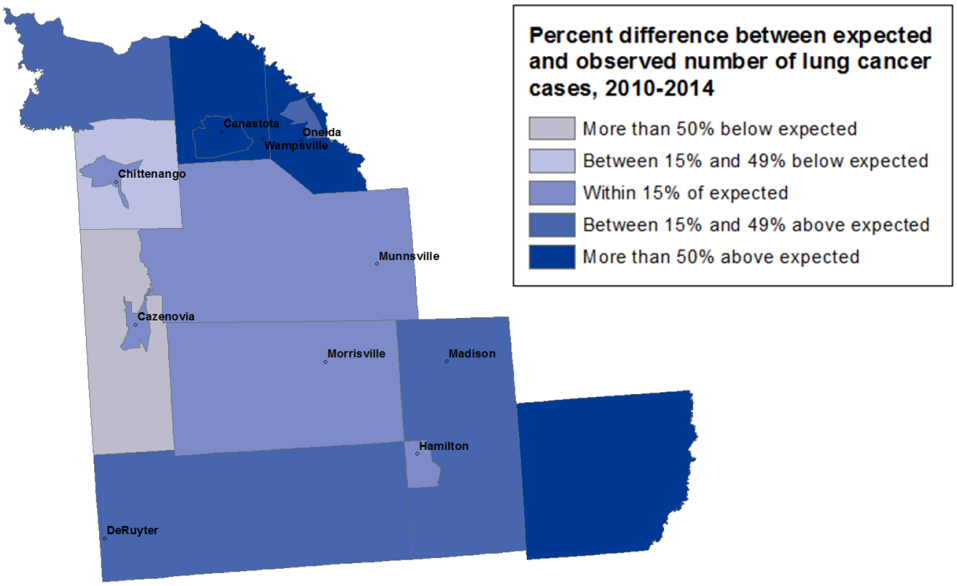


Figure 10. Percent difference in expected versus observed lung cancer cases by Madison County census tract*, 2010-2014[4].

**Census tracts are geographic areas determined by the United States Census Bureau. These boundaries are drawn to include between 1,200 and 8,000 people. The expected number of cases is the number of people in a given census tract that would be expected to develop cancer within a five-year period if the area had the same rate of cancer as NYS as a whole. Age and population size are also taken into account, because you would expect to see more people develop cancer in an area with a larger population or a higher percentage of older residents[4,19].*

Leading causes of death

From 2011-2015, cancer (overall) has been at, or near the leading cause of death in Madison County[2]. When focusing solely on premature death (<75 years of age), cancer (overall) has the highest rates. Lung cancer is the number one cause of cancer-related deaths[8].

Lung cancer risk factors

A recent study estimates that 40% of all new cancer diagnoses in the United States, and about 86% of lung cancer diagnoses are preventable[9]. Therefore, understanding how common risk factors for disease are distributed in the community can inform prevention efforts to impact the burden of disease.

Adult smoking

It is estimated that about 82% of new lung cancers, and about 81% of lung cancer deaths are attributed to cigarette smoking[9]. Based on two representative surveys conducted in the county, the Behavioral Risk Factor Surveillance System (BRFSS) and the Community Tobacco Survey (CTS), it is estimated that around 18% - 21.1% of Madison County adults smoke cigarettes[20,21].

Figure 11 shows the declining trend in cigarette smoking prevalence in the county. This mirrors both national and state trends[10,22]. According to the most recent BRFSS estimates, Madison County smoking rates are

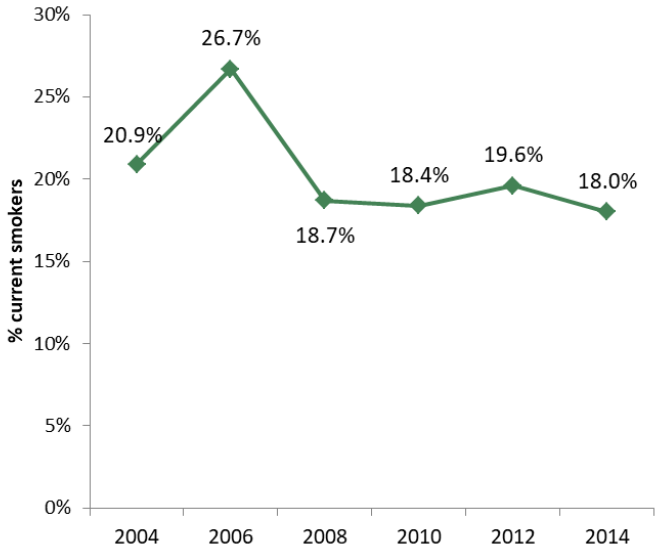


Figure 11. Estimated smoking prevalence in Madison County, 2004-2014 (CTS)[20].

1 in 5 Madison County adults smoke cigarettes[20,21]

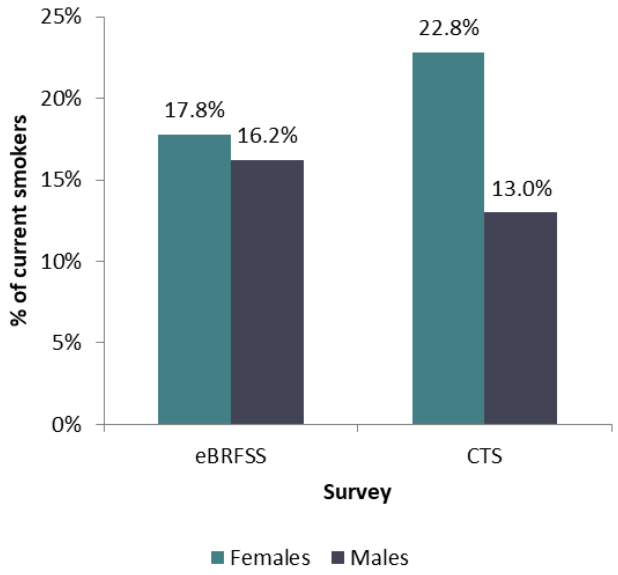


Figure 12. Smoking prevalence estimates among females and males, Madison County, 2013-2014[20,24].

higher than throughout the state (in 2016, 14.1% of NYS adults were smokers, versus 21.1% in Madison County)[21].

When broken up by sex, county surveys show that smoking is more common among women than men (Fig. 12). These differences do not reflect regional, state, or national trends, where it is more common for males to smoke[22,23].

Research shows that cigarette smoking is disproportionately more common among certain racial/ethnic groups, populations with lower SES; lesbian, gay, bisexual, and transgender (LGBT) persons; people suffering from mental illness, disability, and/or substance abuse; and people living in rural areas[10,23].

While cigarette smoking rates are declining, there is an increasing use of other tobacco products. Electronic cigarettes (e-cigarettes) have become common in recent years. Due to their relative limited existence, there is a lack of data about trends in their use. In the most recent data available for Madison County (2014), it is estimated that about 5% of adults in the county use e-cigarettes, at least some days[20]. They are most popular among individuals who are 24-35 years of age, have at least some college education, and are middle income ($25,000-$75,000 per year). E-cigarette users are much more likely to be a traditional cigarette smoker. In 2014, at a state level, 12.7% of young adults (18-24) used e-cigarettes, compared to 5.7% of adults 25+[25].

	Percent who use cigarettes	Percent who use e-cigarettes	Percent who use other tobacco products than cigarettes*
Overall use	18.0%	4.5%	13.0%
Cigarette smoking status			
Smoker	-	15.5%	37.8%
Non-smoker	-	2.0%	7.6%
Sex			
Female	22.8%	4.9%	4.7%
Male	13.0%	4.1%	21.7%
Age			
18-24	37.0%	2.2%	41.5%
25-34	13.6%	14.6%	8.5%
35-44	15.1%	2.6%	1.7%
45-54	16.6%	3.6%	11.0%
55-64	11.6%	2.6%	8.0%
65+	14.6%	3.7%	7.6%
Education			
No college	25.8%	4.0%	19.6%
Some college	19.5%	7.3%	8.2%
4+ year degree	3.2%	2.1%	7.8%
Income			
<$25,000	33.8%	3.3%	14.2%
$25,000-$50,000	18.6%	6.4%	17.2%
$50,000-$75,000	7.6%	6.7%	4.9%
$75,000+	23.1%	0.7%	21.6%

Table 1. Cigarette, e-cigarette, and other tobacco use and demographics among Madison County residents, 2014 (CTS)[20]. *Question for Other tobacco products: "Do you currently use any other types of tobacco products? (other than cigarettes)."

E-CIGARETTES

E-cigarettes are still fairly new, and scientists are continuing to learn about their long-term health effects. They produce an aerosol by heating a liquid that usually contains nicotine—the addictive drug in regular cigarettes, cigars, and other tobacco products—flavorings, and other chemicals that help to make the aerosol. Users inhale this aerosol into their lungs. They come in various shapes and sizes, and go by a variety of names (e.g., "e-cigs", "vape pens", and "electronic nicotine delivery systems (ENDS)").

E-cigarettes are often marketed as a being safer than conventional cigarettes, and can help current smokers stop smoking. While they may be less harmful than cigarettes, they still are highly addictive, contain a number of harmful and potentially harmful substances, can lead to adverse health effects, and cause unintended injuries. They are not currently approved by the FDA as a quit smoking aid. Most e-cigarette users also report at least occasionally using conventional cigarettes. If someone has never smoked or used other tobacco products or e-cigarettes, she or he should not start[26,27].

Surveys of adults and youth show an increasing trend in their usage. In the United States, youth and young adults (18-24) are most likely to use e-cigarettes[20,26].

Research shows:[26,28]

- Nicotine intake among experienced adult e-cigarette users can be comparable to that from conventional cigarettes.
- Exposure to toxic substances other than nicotine from e-cigarettes is significantly lower than from conventional cigarettes.
- E-cigarette use by youth and young adults increases their risk of ever using conventional cigarettes.
- E-cigarette use increases airborne concentrations of particulate matter and nicotine in indoor environments.
- Adolescents who use e-cigarettes have increase coughing and sneezing and increased asthma exacerbations.
- Drinking or injecting e-liquids can be fatal.

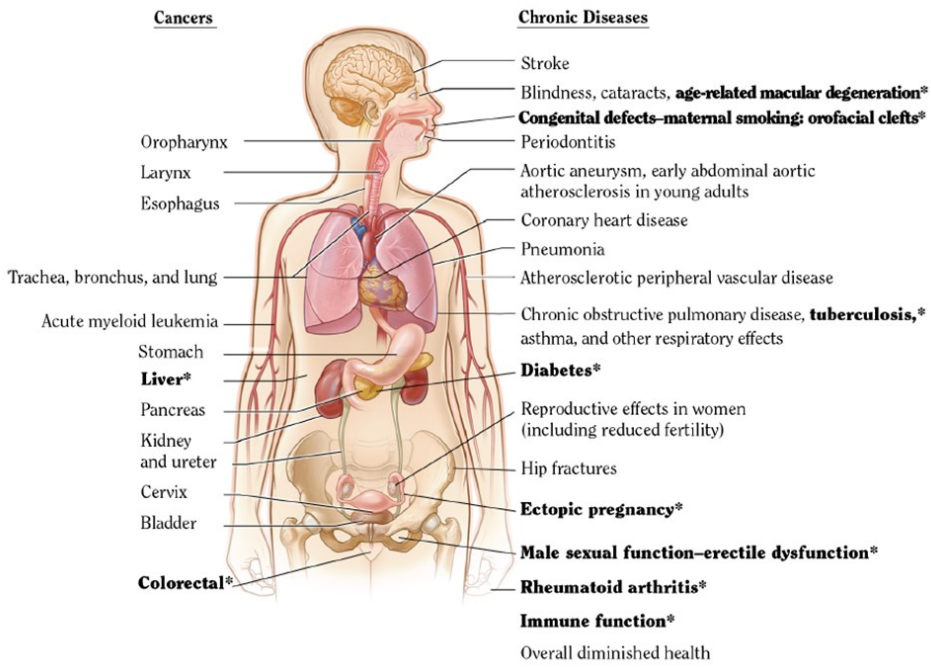


Figure 13. The health consequences causally linked to smoking[10].

SMOKING AND HEALTH

The health risks associated with smoking extend far beyond lung cancer. Smoking has been causally linked to many chronic conditions and cancers (Fig. 13). It is estimated that more than 437,000 adults die each year from smoking-related diseases (not including exposure to secondhand smoke)[10]. There is further evidence that this figure of smoking-related mortality is actually an underestimate[29].

Youth smoking

Almost all adults addicted to nicotine started smoking or using other tobacco products in their teens. Nearly 9 out of 10 adult smokers started smoking by age 18, and 99% started by age 26[30]. Tobacco companies specifically target advertising and products to entice youth to start smoking, hoping to develop "lifelong" customers[31,32,33].

1 in 10 Madison County youth smoke cigarettes[34]

Surveys of Madison County students grades 7-12 show that since 2003, the proportion of students who reported smoking at least 1 cigarette in the past month decreased by almost half (Fig. 14). The most recent survey (2014), revealed that among the students who had smoked at least 1 cigarette in their lifetime, the majority say they were 13-14 years old when they smoked a whole cigarette for the first time. This is an older age than reported in the 1999-2007 surveys, when the majority said that they were 11-12 years old when they smoked a whole cigarette for the first time[34].

Previous surveys did not ask about e-cigarette use among these students. There are plans to incorporate these questions in future county surveys. Throughout NYS, about 21% of high school students reported using e-cigarettes in 2016. This proportion has nearly doubled since they first asked the question in 2014[35].

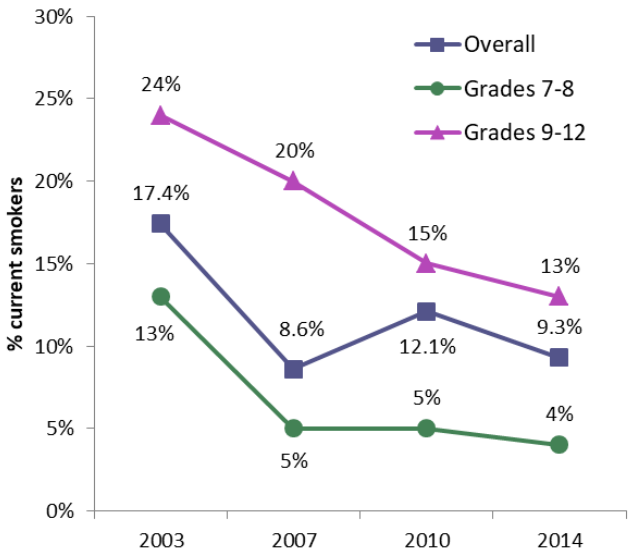


Figure 14. Proportion of Madison County students (grades 7-12) who report smoking at least 1 cigarette in the past month, 2003-2014[34].

Secondhand smoke

About 3% of new lung cancer cases and lung cancer deaths are attributable to secondhand smoke (SHS) exposure[9]. SHS exposure caused more than 7,300 lung cancer deaths each year during 2005–2009 among adult nonsmokers in the United States[10]. There is limited data available to determine the extent of SHS exposure in the county, as these questions are not included in any surveys. State indoor air quality laws; the growing numbers of households, businesses and schools with voluntary smoke free rules; and declining cigarette smoking rates has decreased the amount and degree to which people are exposed to smoke[36].

Beyond someone in a person's household smoking, the type of housing in which one lives also plays a role in SHS exposure. Among children who live in homes in which no one smokes indoors, those who live in multi-unit housing (for example, apartments or condos) have 45% higher cotinine (a product formed after the chemical nicotine enters the body) levels than children who live in single-family homes[37]. During 2011–2012, 2 out of every 5 children ages 3 to 11 in the United States were exposed to SHS regularly[36].

Radon

Nationally, radon is attributed to about 20,000 cases of lung cancer each year, and is the second leading cause of lung cancer[8]. Radon is a radioactive noble gas that comes from the decay of radium. Radium occurs naturally in the rocks and soils. Some areas have different levels of radium due to varied geology; therefore, the radon concentration in a home is dependent on the type of soil a home is built on and the construction of the home. It can enter the home through cracks, openings, and various penetrations in a building's foundation. It is a colorless, odorless, invisible gas that can only be detected through the use of proper equipment and protocols. The U.S. Environmental Protection Agency (EPA) recommends taking action to eliminate radon from a home if it is measured above 4 picoCuries per Liter (pCi/L) in the lowest living area[38].

The highest levels of radon are usually found in the basement, if a home has one. Basement radon concentrations average between 2 to 3 times higher than first-floor concentrations, and the percent of homes with basement screening concentrations above 4 pCi/L are

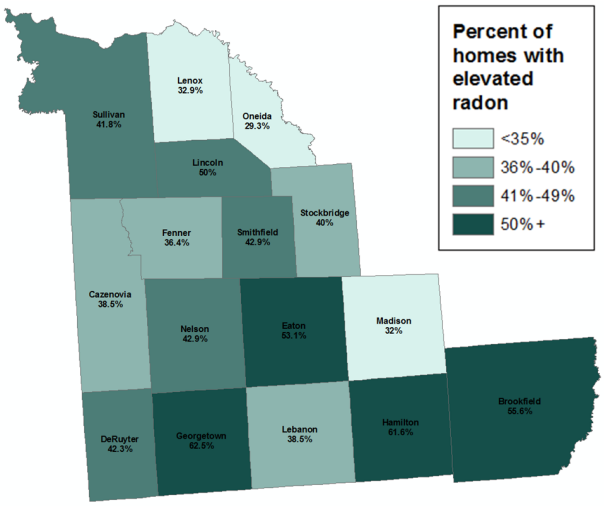


Figure 15. Map of proportion of basements tested with elevated radon (4 pCi/L) by Madison County Township, 1987-2017[39].

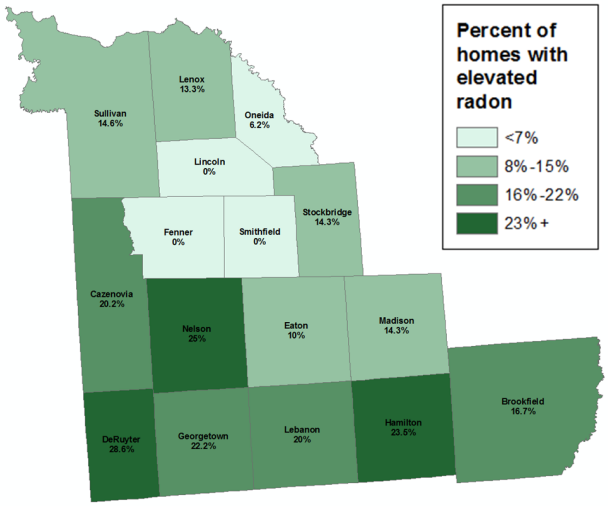


Figure 16. Map of proportion of 1st floors tested with elevated radon (4 pCi/L) by Madison County Township, 1987-2017[39].

considerably greater than the long-term living area estimates[37]. Among all the Madison County homes tested in the basement since 1987 (1,194 homes), 42% had radon levels above 4 pCi/L. This is higher than the estimated proportion of basements tested with elevated levels throughout the state, 18%[39]. Figure 15 displays the proportion of basements tested with elevated levels by Madison County Township. The highest proportions are in the southern part of the county (Georgetown, Brookfield, Hamilton, and Eaton).

Homes may also be tested on the 1st floor, which represents the long-term living area. The long-term living area estimates are the best indicators for the percent of homes in an area that are above the EPA action guideline concentration of 4 pCi/L. Among all the Madison County homes tested on the 1st floor since 1987 (514 homes), 16% had radon levels above 4 pCi/L. This is higher than the estimated proportion throughout the state, 5%[39]. Figure 16 displays the proportion of 1st floors tested with elevated levels by Madison County Township. Again, the highest proportions are in the southern part of the county (DeRuyter, Nelson, Hamilton, and Georgetown).

Table 2 displays the data from the maps above. It is important to note that for towns with few measurements, the uncertainty is quite large. While some townships have low numbers of tests, the elevated percentages are consistent with surrounding counties and towns, as the county is at the northern edge of a "high

Township	Basement		1st floor	
	# tested	% elevated	# tested	% elevated
Brookfield	36	55.6%	12	16.7%
Cazenovia	234	38.5%	94	20.2%
DeRuyter	26	42.3%	14	28.6%
Eaton	64	53.1%	40	10.0%
Fenner	11	36.4%	1	0.0%
Georgetown	16	62.5%	9	22.2%
Hamilton	177	61.6%	81	23.5%
Lebanon	13	38.5%	5	20.0%
Lenox	173	32.9%	90	13.3%
Lincoln	8	50.0%	2	0.0%
Madison	25	32.0%	14	14.3%
Nelson	21	42.9%	4	25.0%
Oneida	184	29.3%	81	6.2%
Smithfield	7	42.9%	5	0.0%
Stockbridge	15	40.0%	14	14.3%
Sullivan	184	41.8%	48	14.6%
Madison County	1,194	42.0%	514	15.6%

Table 2. Statistics from homes tested for radon in Madison County, 1987-2017[39].

radon belt". Madison County is considered a high risk radon county[38,39].

Even in areas with below average levels of indoor radon, it is prudent to measure homes for indoor radon. In areas with above average concentrations of indoor radon, existing homes should be measured and new construction should employ radon-resistant building techniques[38].

Workplace exposures

Epidemiologic research has shown associations between occupational exposures and risk of developing lung cancer. These include coal mine dust, silica, asbestos, flock (short fibers of synthetic materials such as nylon, rayon, or polypropylene), byproducts and materials used in chemical manufacturing, diesel exhaust, metals (arsenic, beryllium, cadmium, chromium, and nickel), and polycyclic aromatic hydrocarbons (from the incomplete combustion of vegetable materials and fossil fuels)[40,41,42]. Many of these exposures have a synergistic relationship with cigarette smoking. Research shows that workers with these exposures, who also smoke have a much higher risk of lung cancer than those with similar exposures who do not smoke[43,44].

Occupations at a higher risk of lung cancer include mining, construction, automotive work, and manufacturing[42,45]. It is estimated that 20% to 25% of Madison County residents work in these occupations[46]. However, it is not known how prevalent lung cancer is among the residents with these occupations.

Socioeconomic status

Socioeconomic status (SES) is most often based on a person's income, education level, and other factors, such as social status in the community and where he or she lives. Studies have found that SES can predict the likelihood of an individual's or a group's access to education, certain occupations, health insurance, and living conditions[47,48]. SES, in particular, appears to play a major role in influencing the prevalence of behavioral risk factors for cancer (e.g., tobacco smoking, physical inactivity, obesity, and excessive alcohol intake)[49,50,51,52,53]. Furthermore, there is evidence that tobacco companies have made a concerted effort to develop marketing strategies that target lower SES populations[53,54,55,56].

Results from the most recent Madison County Community Tobacco Survey (2014) show that current smoking status differs by income and education level (Table 1 on page 14). The highest cigarette smoking rates are among the lowest income populations (<$25,000), and those without a college degree[20]. Data are not available for smoking status by health care coverage type in Madison County. Throughout NYS, the highest smoking rates are among the Medicaid population[3].

SES can also play a role in an individual's knowledge about radon and its risk factors, as well as one's ability to test for and mitigate it, if found elevated[57].

Finally, SES is an important factor in an individual's access to health insurance and healthcare. Research shows that individuals without health insurance and/or routine healthcare visits are more likely to be diagnosed with late-stage cancers that might have been treated more effectively or cured if diagnosed earlier[58,59,60]. Financial, physical, and cultural beliefs are also barriers that prevent individuals or groups from obtaining effective health care.

Limitations to the data

The data presented in this chapter offer many insights. However, there are limitations with looking at these data. First, the cancer registry counts cases based on place of residence at the time of diagnosis. It does not account for where an individual may have lived prior. The latency period for cancers can be 5 to 40 years, so exposures and risk factors for individuals who are diagnosed with cancer may have taken place in counties other than Madison. While the NYS Cancer Registry receives a gold standard rating for data quality and completeness, there still is the possibility that cases are misclassified or missed.

Risk factors such as smoking and use of other tobacco products are self-reported. There is the potential that an individual will not report unhealthy behaviors due to social norms, and other factors. These are also estimates for the overall population. Therefore, the actual prevalence of a given risk factor may be different than what the surveys estimate.

Due to the relative small population size of the county, risk factors and cancer cases involve small numbers of people. This can affect differences in actual versus expected cases and prevalence estimates. The small numbers also relate to environmental sampling. For the towns with few radon measurements, the uncertainty of the proportion of homes with elevated radon is quite large.

Socioeconomic status (SES) in Madison County

The maps below display the proportion of some commonly used SES indicators by census tract*. From this we can see how certain SES factors are distributed throughout the county. The census tracts with the lowest SES indicators are consistently concentrated in the Oneida area, as well as the southern portions of the county.

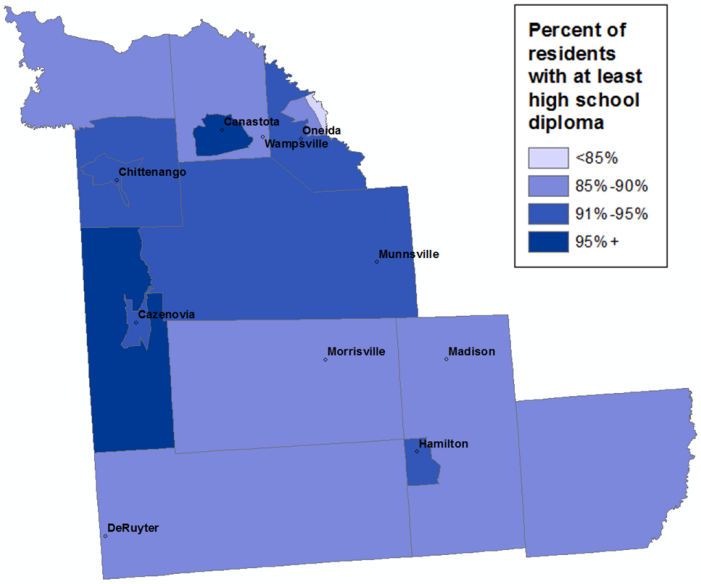


Figure 17. Proportion of individuals with less than a high school diploma by census tract*[61].

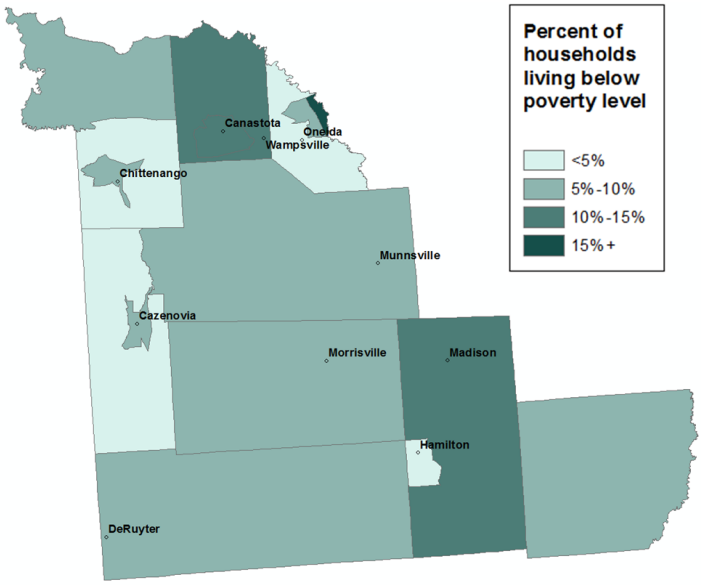


Figure 18. Proportion of families living below poverty level by census tract*[61].

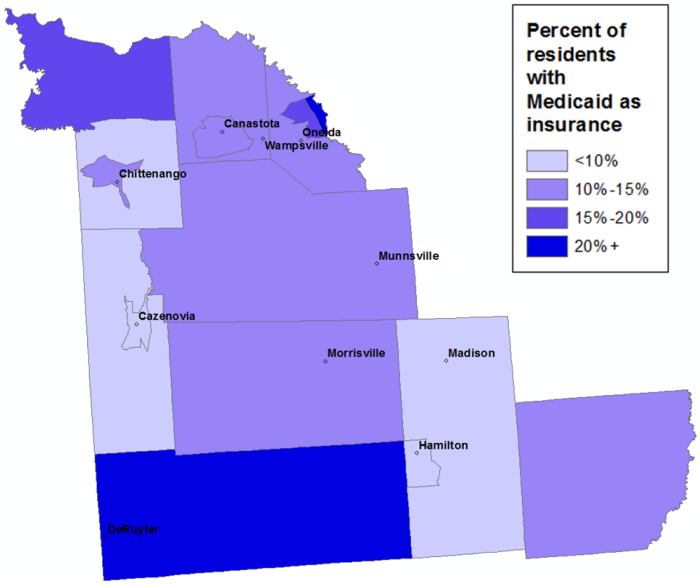


Figure 19. Proportion of individuals enrolled in Medicaid by census tract*[61].

**Census tracts are geographic areas determined by the United States Census Bureau. These boundaries are drawn to include between 1,200 and 8,000 people, and represent a sub-county community. Every year, the US Census Bureau collected data through the American Community Survey, to document how these communities may be changing and to better understand their demographics[19].*

Policies, Systems, and Environmental (PSE) Approaches to Disease Prevention

Introduction to PSE

PSE in Madison County: An Assessment

Recommendations

Figure 20. A depiction of the potential impact from various types of public health interventions[65,66].

Introduction to PSE

The theory behind policies, systems, and environmental (PSE) approaches to reducing the burden of chronic disease stems from the social-ecological model. This model understands health to be affected by the interaction between the individual, the group/community, and the physical, social, and political environments[62,63,64].

Individuals can take ownership of their health by adopting healthy behaviors and reducing exposure to risk factors for disease. In the case of lung cancer prevention, this can include testing one's home for radon and not smoking. To encourage these behaviors there continues to be an approach of conducting education programs, one-on-one medical screening and advice, and tobacco cessation treatment.

Interpersonal relationships and community can also play a factor in one's health. Public health initiatives have established and promoted community health programs to encourage individuals to adopt healthy behaviors. These can include tobacco cessation support groups, tobacco awareness events, and walking clubs.

Efforts to change behavior on a case-by-case basis can be expensive, time consuming, and labor intensive. Furthermore, some people just do not respond to these efforts, and/or they are not reaching certain populations.

The social-ecological model acknowledges that there are many more factors that influence an individual's behavior beyond his or her motivation. There is a push in public health to move beyond the "event-based" and educational efforts to strive for health equity. A method to accomplish this is by addressing the PSE conditions surrounding disease risk factors.

Pushing for change among PSE conditions can encourage people to "default" to the healthy decision – making the healthy decision, the most practical and easy decision. This method can systematically improve the context in which people make health decisions, particularly more vulnerable community members.

> **Policies** are considered written statements provided by an organization, reflecting its position, decision, or course of action regarding a particular topic. They can be presented in the form of ordinances, resolutions, agreements, or enforceable laws.
>
> **System-level** approaches intend to change the procedures, whether personnel or resource-related, that impact health outcomes. Institutions may include: healthcare, workplaces, schools, and transportation systems.
>
> **Environmental** modifications affect how people interact with their surroundings. These can include the manmade infrastructure, natural green spaces, economic or social environment.

The three concepts are not unique and can actually influence one another; therefore, PSE can create comprehensive change in the long-term.

New York State is a great example of a state that has adopted progressive PSE strategies, such as increased tobacco taxes, among other initiatives. The smoking prevalence in NYS has decreased to a lower rate, and more quickly than states who have not adopted similar measures[7]. Although, there is a growing list of new and evidence-based approaches that offer even more progress. Some of these are examined in the next sections.

PSE in Madison County: an assessment

In order to address lung cancer burden, research shows that creating PSE changes have the greatest impact on health, especially regarding inequities (see literature review in Appendix A).

In the summer of 2018, Madison County Department of Health (MCDOH) conducted an initial assessment of PSE conditions regarding the two primary lung cancer risk factors throughout the county (tobacco use and radon). The goal of this assessment was not only to identify opportunities to strengthen PSE conditions and collaboration, but also to identify and recognize assets that have helped the county rank among the healthiest counties in the state.

MCDOH implemented a standardized approach to the assessment utilizing both existing and originally developed tools. This offers the opportunity to repeat the assessment in subsequent years to measure progress and changes. The components of the assessment consisted of:

Tobacco use & exposure

- Policy analysis – state, county, local levels
- Analysis of school district code of conducts
- Observation of smoke-free spaces
- Tobacco retailer assessment
- Tobacco retailer mapping analysis

- Compilation of tobacco prevention efforts, initiatives, and organizations

Radon exposure

- Client mapping for radon testing & mitigation
- Assessment of local building permits for inclusion of radon

The results and methodology for each component are presented in the following pages. The final pages of this section (pp. 34-35) contain recommendations about approaches and opportunities for community leaders to address this issue through sustainable change.

Tobacco retail and smoke-free policies

Research indicates tobacco retail and smoke-free policies contribute to the number of smokers, consumption amount, the quantity of new smokers, and the number of people exposed to secondhand smoke (Appendix A). The assessment was completed in two parts: 1) brief overview of Federal and New York State Laws; and 2) policy scan at the county-, township-, and village-levels to determine if policies/laws that go beyond the state/federal level have been enacted. The policy scan was conducted using the entity websites and searching the following terms: Tobacco, Smoking, Smoke free, Cigarettes, Electronic cigarettes, Vaping, Electronic nicotine delivery system / ENDS, Vaporizer.

Federal laws

HUD smoke-free housing: The U.S. Department of Housing and Urban Development (HUD) implemented a mandate that all Public Housing Agencies administering low-income, conventional public housing must initiate a smoke-free policy[67].

Family Smoking Prevention and Tobacco Control Act: Requires tobacco industry registration, product listing, and disclosure of contents of tobacco products, research, and marketing information to the U.S. Food and Drug Administration (FDA). This act recently updated its language to include electronic-cigarettes[68].

Patient Protection and Affordable Care Act: Expanded tobacco screening and cessation resources under health insurance plans[69].

Children's Health Insurance Plan and Reauthorization Act (CHIPRA): Raised the federal tax rate for cigarettes from $0.39 per pack to $1.01 per pack (2009)[70].

New York State Laws

Clean Indoor Air Act (CIAA): Regulates indoor and outdoor smoking as well as to prohibit smoking in all places of employment and restaurants. In 2017, NYS expanded the CIAA to include all electronic nicotine delivery systems (ENDS), such as e-cigarettes[71].

New York State Tobacco Free Outdoor Air [9 NYCRR §386.1]: Smoke-Free State Parks[72].

New York State Tobacco and Vape Free Outdoor Air [§1399-o]: Smoke-free[73]:

- Playgrounds [§ 1399-o-1]
- Grounds of Hospitals and Health Care Facilities
- Within 100 feet of entryways of both public or private educational institutions or outdoor areas

Adolescent Tobacco Use Prevention Act (ATUPA): Prohibits the sale of all tobacco products to minors (individuals under age 18). The law includes the following: traditional or herbal cigarettes, chewing or powdered tobacco, shisha, cigars, bidis, gutka, nicotine water, electronic cigarettes, liquid nicotine, and smoking paraphernalia[73].

Tobacco excise taxes: NYS requires a $4.35 tax on a package of cigarettes, plus $0.68 per additional five cigarettes contained in that cigarette pack. However, there are two exemptions to this law: members of the U.S. Armed Services may purchase cigarettes tax-free and tribal communities may sell a portion of cigarettes without additional tax. There is also a tax on other tobacco products (75% of the wholesale price)[74].

Registration and licensing of tobacco retailers and wholesalers: All retailers are required to apply for registration, pay fees ($300 annually), and publicly display a valid registration certificate (penalty is up to $35,000)[74].

New York State Administrative Regulation, 9 NYCRR §386.1: Use of tobacco products is prohibited in state parks and violations can be fined up to $250[72].

Cigarette Marketing Standards Act (CMSA): Prohibits the sale of tobacco below the cost of production[74].

Child-resistant packaging: The NY General Business Law §399-gg only allows the sale of liquid nicotine if packaged in a child-resistant bottle[74].

Cigarette Fire Safety Act: This law prohibits the sale or distribution of cigarettes in New York that do not meet an established fire-safe performance standard[74].

Placement of tobacco products in retail stores: Retailers are prohibited from selling tobacco products in self-service displays. Instead, all tobacco products must be located out of consumer reach, such as behind the counter[74].

Prohibits the shipping of cigarettes: The 2010 National Prevent All Cigarette Trafficking (PACT) Act prohibits the delivery of all tobacco products through the U.S. Postal Service, FedEx®, and UPS, except licensed producers/sellers[74].

New York State Bills

Senate Bill S5433A, Public Health Law: Prohibits the sale of tobacco products at pharmacies[75].

Senate Bill S3978, Public Health Law: Increases the age to purchase tobacco products from 18 years old to 21 years old[76].

Senate Bill S3155A, Public Health Law: Prohibits smoking in private passenger cars, vans or trucks where minors less than 14 years of age are passengers[77].

Madison County laws

In July 2018, Madison County revised its smoke-free law to prohibit the use of tobacco on all property owned or leased by the county. It also defines tobacco use to include Electronic Nicotine Delivery Systems (ENDS)[78].

Madison County: Town laws

Overall, there were 9 tobacco-free policies identified for Madison County towns. Out of the 16 towns, only two (13%) had a policy to regulate the conditions of tobacco product advertising. Thirty eight percent (38%) of towns in Madison County have a policy that prohibits smoking in public places (i.e. parks, beaches, playgrounds, trails). One town (6%) implemented an ordinance of compliance with the NYS Clean Indoor Air Act, which prohibits smoking inside restaurants and bars.

Madison County: Village laws

There were 3 tobacco-free policies identified in the villages of Madison County. Of the 9 villages, 2 (22%) designated public spaces, including parks and beaches, smoke-free. One village also recognized the local casino as a smoke-free environment.

Tobacco policies	Madison County (Y/N)	Towns (n = 16) n (%)	Villages (n = 9) n (%)
Minimum age of purchase (above 18)	N	0 (0%)	0 (0%)
Taxes on tobacco sales (higher than state)	N	0 (0%)	0 (0%)
Density of tobacco retail locations per capita	N	0 (0%)	0 (0%)
Tobacco retail locations in proximity to schools	N	0 (0%)	0 (0%)
Additional retail license required for locality	N	0 (0%)	0 (0%)
Prohibit pharmacies from selling tobacco products	N	0 (0%)	0 (0%)
Conditions on tobacco product displays	N	0 (0%)	0 (0%)
Conditions on tobacco product placement	N	0 (0%)	0 (0%)
Conditions on tobacco product discounting	N	0 (0%)	0 (0%)
Conditions on tobacco product advertising	N	2 (13%)	0 (0%)
Prohibits smoking in public places (parks, beaches, playgrounds, trails)	Y	6 (38%)	2 (22%)
Prohibits smoking in public building entryways	Y	0 (0%)	0 (0%)
Prohibits smoking inside restaurants and bars (beyond CIAA)	N	1 (6%)	1 (11%)
Prohibits smoking outside restaurants and bars (beyond CIAA)	N	0 (0%)	0 (0%)
Prohibits smoking in vehicles with children	N	0 (0%)	0 (0%)
Prohibits smoking in individual units within multi-family properties	N	0 (0%)	0 (0%)
Prohibits smoking in multi-family properties indoor common areas	N	0 (0%)	0 (0%)

Table 3. Results from Madison County townships and villages policy scan, June 2018. Polices that go beyond existing state or federal laws.

Public support regarding tobacco policies

Through the 2014 *Community Tobacco Survey of Adult Residents of Madison County* (CTS), a representative sample of residents were asked about their feelings regarding various tobacco-related policies. Figure 21 displays responses to some of the policy questions asked.

Among all of the policies asked about, the strongest support was for: multi-unit dwelling (MUD) rental leases disclosing whether or not smoking is prohibited on the premise; prohibiting smoking at public playgrounds, public building entryways, and parks/outdoor recreation areas; and prohibiting smoking in cars with children present.

Lastly, the survey offers further evidence that policies do have an effect on how much individuals smoke. Among Madison County smokers almost half (47%) said that prices have caused them to reduce their smoking and/or quit (Fig. 22)[20]. The highest proportion reporting this effect was among individuals from households making <$25,000 per year.

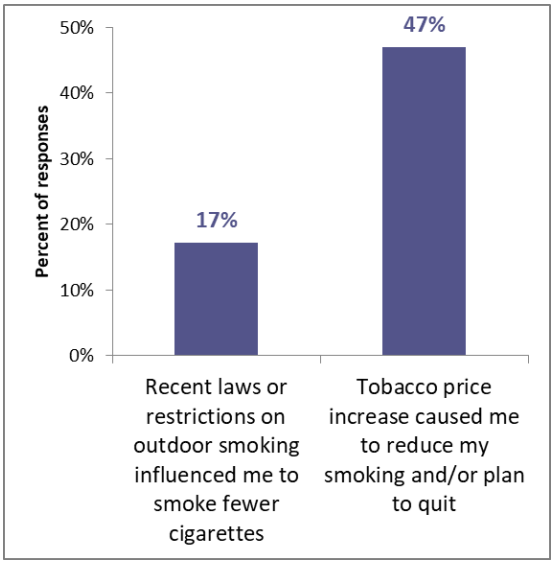


Figure 22. Tobacco policy impact on smoking behavior among current smokers, Madison County 2014 (CTS)[20].

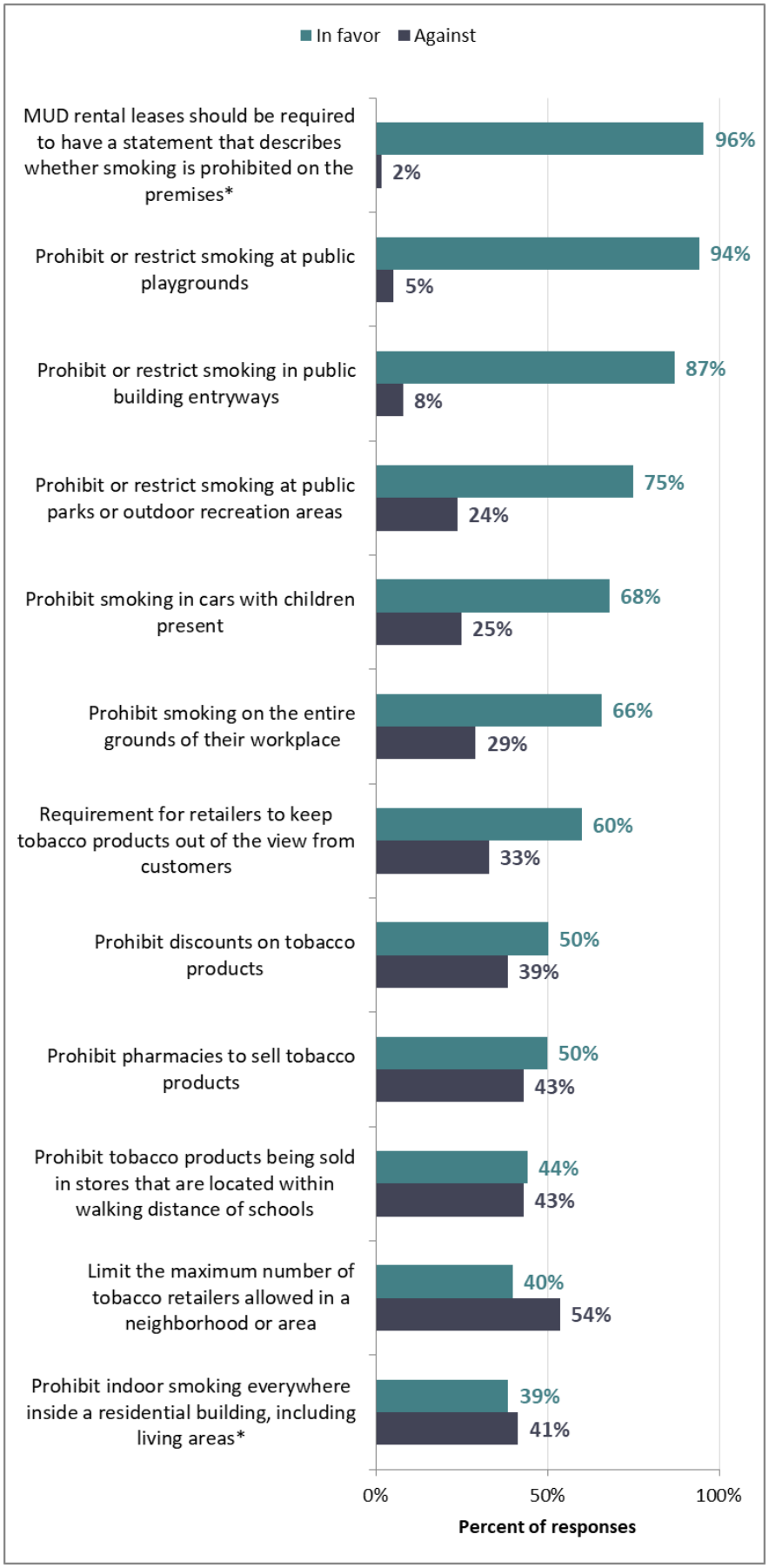


Figure 21. Public policy support, Madison County 2014 (CTS)[20]. Not all respondents provided definitive answer.
MUD = multi-unit dwelling
*among MUD residents

School tobacco policies

School-based tobacco policies that create smoke-free environments, support prevention education, and increase access to cessation resources can decrease the likelihood of youth tobacco use, which is associated with tobacco use later in life (Appendix A). The assessment was completed in two parts: 1) brief overview of Federal and New York State Laws; and 2) policy scan of school districts to determine if policies/laws that go beyond the state/federal level have been enacted. The policy scan used code of conducts available on school district websites or the superintendent's office was contacted. The following terms were used in the policy scan: Tobacco, Smoking, Cigarettes, Enforcement, Electronic cigarettes, Cessation, Vaping, Electronic nicotine delivery system / ENDS, Vaporizer.

Federal Laws

Pro-Children Act (1994): Prohibits smoking in and around federally-funded facilities that provide services to children, including education, day care, healthcare, and early childhood development[79].

New York State Laws

NYS Education Law § 409: Prohibits the possession and use of all forms of tobacco on school campuses (including school grounds, school transportation, and school-sponsored events)[80].

New York Education Law § 3624: Prohibits bus drivers from smoking while transporting students[81].

New York Education Law § 804: Requires all schools to include tobacco prevention in health education curriculum[82].

Madison County School Districts

Madison County School Districts had a total of 31 policies that help create a smoke-free environment. In the policy assessment, 4 out of 10 (40%) school districts included e-cigarette language in their tobacco prevention policies. Complying with NYS law, 100% of school districts prohibit possession of tobacco products for students of any age. Thirty percent (30%) of schools specifically outline enforcement protocol for tobacco violation and identify designated personnel for enforcement measures. Seven out of 10 (70%) school districts identified specific consequences for tobacco policy violations. Two school districts (20%) mentioned that they would not allow sponsorship from tobacco companies. Lastly, 30% of schools discussed tobacco prevention education as well as cessation resources for both students and staff in the Code of Conduct.

Tobacco Policies	School districts (n = 10) n (%)
E-cigarettes included in tobacco policy language	4 (40%)
Prohibits possession of tobacco products for students of any age	10 (100%)
Identifies Enforcement Protocol	3 (30%)
Establishes designated individual(s) for enforcement	3 (30%)
Identifies specific consequences for violation(s) to the policy	7 (70%)
Prohibits sponsorship from tobacco companies	2 (20%)
Prevention curriculum mentioned	3 (30%)
Tobacco cessation mentioned	3 (30%)

Table 4. Results from Madison County school district policy scan, June 2018. Polices that go beyond existing state or federal laws.

Smoke-free signage in designated public places

Smoke-free signs can assist with awareness and enforcement of smoke-free policies (Appendix A). As a result, signage is associated with reduced exposure to secondhand smoke, lower smoking rate, and decrease in the amount of tobacco use. The MCDOH team conducted a signage assessment of 31 public places with smoke-free designation in Madison County, including the county campus buildings, 5 libraries, and 25 recreation spaces. The assessment included an in-person observation of each location to evaluate signage criteria.

Almost all public recreation spaces designated smoke-free had no smoking signage (92%). However, only 1 (4%) included e-cigarettes. No signs documented any penalties for violations.

Signs observed during assessment. Above: Maxwell field (Oneida, NY). Below: Oneida Public Library (Oneida, NY).

Assessment criteria	Public recreation spaces* (n = 25) n (%)	Libraries & county buildings (n = 6) n (%)
Tobacco free signage is visible	23 (92%)	4 (67%)
Signage includes information about e-cigarettes	1 (4%)	0 (0%)
Penalties for violation is documented	0 (0%)	0 (0%)
Observed individual smoking in designated smoke free place	1 (4%)	1 (17%)

Table 5. Results from Madison County smoke-free spaces observation assessment, June 2018.
*Public recreation spaces include parks, beaches, and athletic fields.

Tobacco retail assessment

The retail environment impacts the percentage of tobacco users, amount of tobacco used, and the number of people who start smoking (Appendix A). The MCDOH team utilized the Standardized Tobacco Assessment for Retail Settings (STARS) surveillance tool[83] to document the point of sale environment in the county. The assessment included information about price, product type, and marketing. Team members attempted to visit all licensed tobacco retailers in Madison County[84].

Fifty one of the 60 retailers (59 licensed and 1 e-cigarette shop) were audited (85%). The full results are available in Tables 6 and 7 (pages 28-29). The majority of retailers sell flavored tobacco products (90%), have price promotions on at least one tobacco product (78%), and have tobacco advertising within 3-feet of the floor (53%) (Fig. 23). The most common type of tobacco retailer in the county is chain convenience stores (53%).

When compared to all other types of retailers, chain convenience stores:

- Have the lowest prices:
  - Cigarettes: $7.94 [range: $6.29 – $8.63]
  - E-cigarettes: $8.46 [range: $7.59 – $9.99]
- Are 9 times more likely to have price promotions
- Are 6 times more likely to sell e-cigarettes

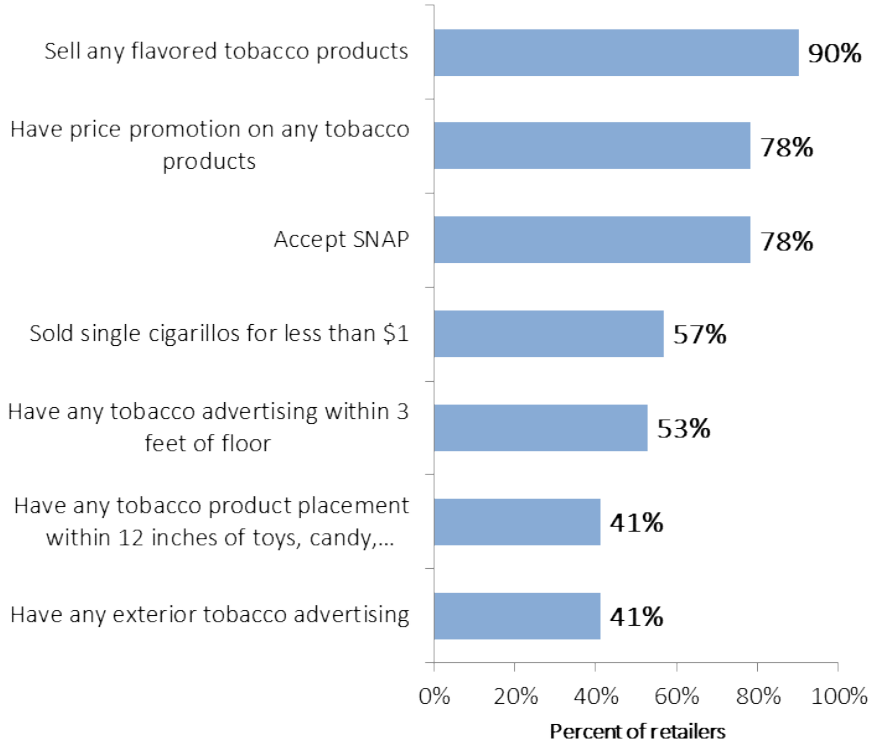
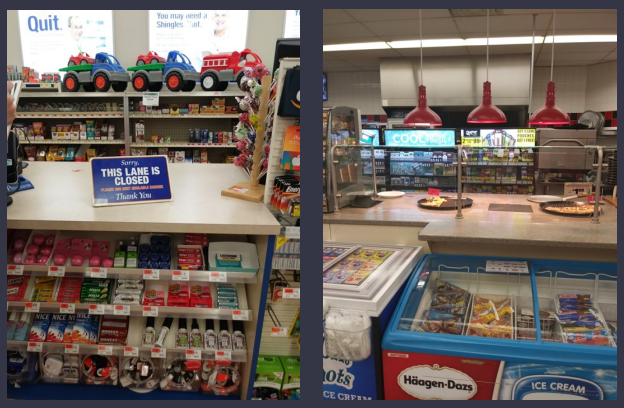


Figure 23 Retail assessment observations of interest - among audited retailers (n=51), Madison County, June 2018.

THE GOOD

Price Chopper (pictured) has made a concerted effort limit the amount of tobacco products sold, and hide them from patrons' view.

THE BAD



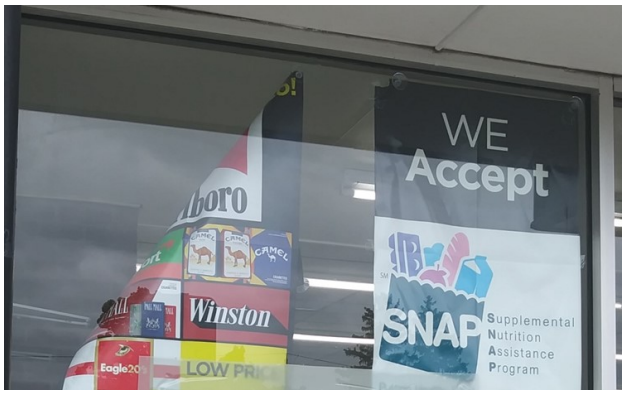
Tobacco products next to toys, candy, gum, and treats (undisclosed locations, Madison County, NY).

	Retailers n (%)
Total number of retailers	60 (-)
By municipality	
Brookfield	2 (3%)
Cazenovia	6 (10%)
DeRuyter	2 (3%)
Eaton	4 (7%)
Fenner	0 (0%)
Georgetown	1 (2%)
Hamilton	5 (8%)
Lebanon	0 (0%)
Lenox	9 (15%)
Lincoln	0 (0%)
Madison	3 (5%)
Nelson	1 (2%)
Oneida	14 (23%)
Smithfield	0 (0%)
Stockbridge	1 (2%)
Sullivan	12 (20%)
Type of store	
Chain convenience store with or without gas	27 (53%)
Small business	9 (18%)
Drug store/ pharmacy	8 (16%)
Mass merchandiser or discount store	7 (14%)
Grocery store or supermarket	6 (12%)
Beer, wine, or liquor store	1 (2%)
E-cigarette shop	1 (2%)
Other	1 (2%)
Most common retailers (by number of locations in county)	
Savon	7 (12%)
Rite Aid	5 (8%)
Dollar General	5 (8%)
Tops	4 (7%)
Kwik Fill	4 (7%)
Byrne Dairy	4 (7%)
Sunoco/Express Mart	3 (5%)
Kinney Drugs	3 (5%)
3 with 2 locations	- (-)
19 with 1 location	- (-)
Within 1/2 mile of a school	28 (47%)
Tribal-affiliated retailers	8 (13%)
Number of retailers audited	51 (85%)

Table 6. Madison County tobacco retailer characteristics, June 2018. All Madison County retailers (n=60)[83,85]. Small business = locally owned convenience store or corner market.

	Retailers n (%)
Characteristics	
Have pharmacy counter	11 (22%)
Sell alcohol	45 (88%)
Accept Women, Infants, and Children (WIC) Food and Nutrition Service	8 (16%)
Accept Supplemental Nutrition Assistance Program (SNAP)	40 (78%)
Types of products sold	
Cigarettes	51 (100%)
Menthol cigarettes	50 (98%)
Cigarillos	44 (86%)
Large cigars	32 (63%)
Chew	41 (80%)
E-cigarettes	32 (63%)
Flavored products	
Any flavored products	46 (90%)
Flavored cigarillos	44 (86%)
Flavored large cigars	26 (51%)
Flavored chew	38 (75%)
Flavored e-cigarettes	32 (63%)
Product placement and advertising	
Store displays a graphic health warning sign	1 (2%)
Any exterior advertising	21 (41%)
Any advertising within 3ft of floor	27 (53%)
Any product placement within 12 inches of toys, candy, gum, etc.	21 (41%)
Average prices (without tax)	
Cheapest cigarette pack	$8.12 (range: $6.29 - $9.50)
Newport menthols	$10.46 (range: $9.33 - $12.05)
Blu disposables (e-cigarettes)	$8.68 (range: $7.59 - $9.99)
Price promotions	
Price promotion on any products	40 (78%)
Cigarettes	33 (65%)
Menthol cigarettes	24 (47%)
Cigarillos	29 (57%)
Chew	18 (35%)
E-cigarettes	16 (31%)
Sell single cigarillos	43 (84%)
Sold single cigarillos for less than $1	29 (57%)

Table 7. Madison County tobacco retailer assessment results, June 2018. Among audited retailers (n=51).



Tobacco advertising (undisclosed locations, Madison County, NY).

Tobacco retailer mapping

Research indicates that tobacco retailers target low SES communities and young people[53,54,55,56]. The MCDOH staff utilized geographic information system mapping technology (ESRI ArcGIS[85]) to analyze tobacco retailer density, density by demographic indicators, and proximity to schools (as seen in Fig. 24)[61,84,86].

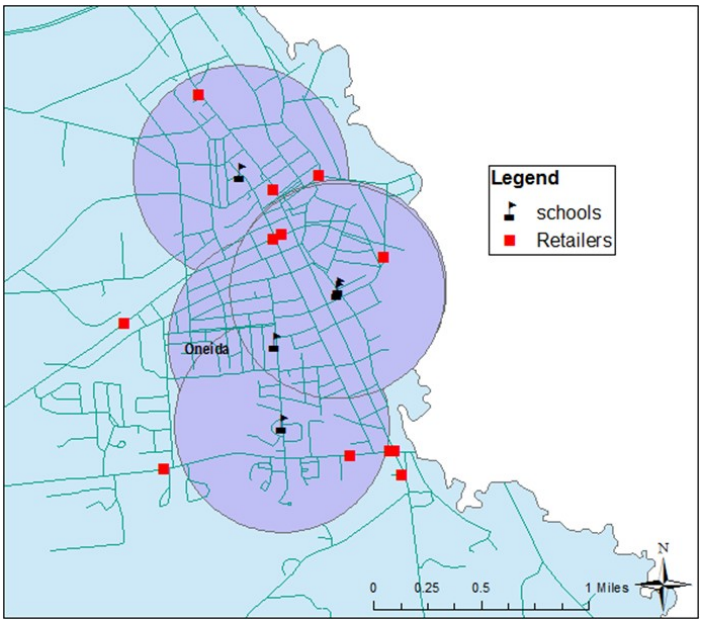


Figure 24. Tobacco retailers within 1/2 mile from schools, Oneida, NY, June 2018[84,86].

Proximity to schools

Almost half (47%) of retailers were within 1/2 mile of at least one school (elementary, middle, and high school). Among the audited retailers, there were not any significant differences in retail environments and marketing in relationship to proximity to a school. Chain convenience stores were most frequently located close to schools (57% of all retailers within 1/2 mile of schools) (Fig. 25).

Density by township

The City of Oneida and Sullivan Township had the highest number of tobacco retailers (14 and 12, respectively). When looking at the number of retailers

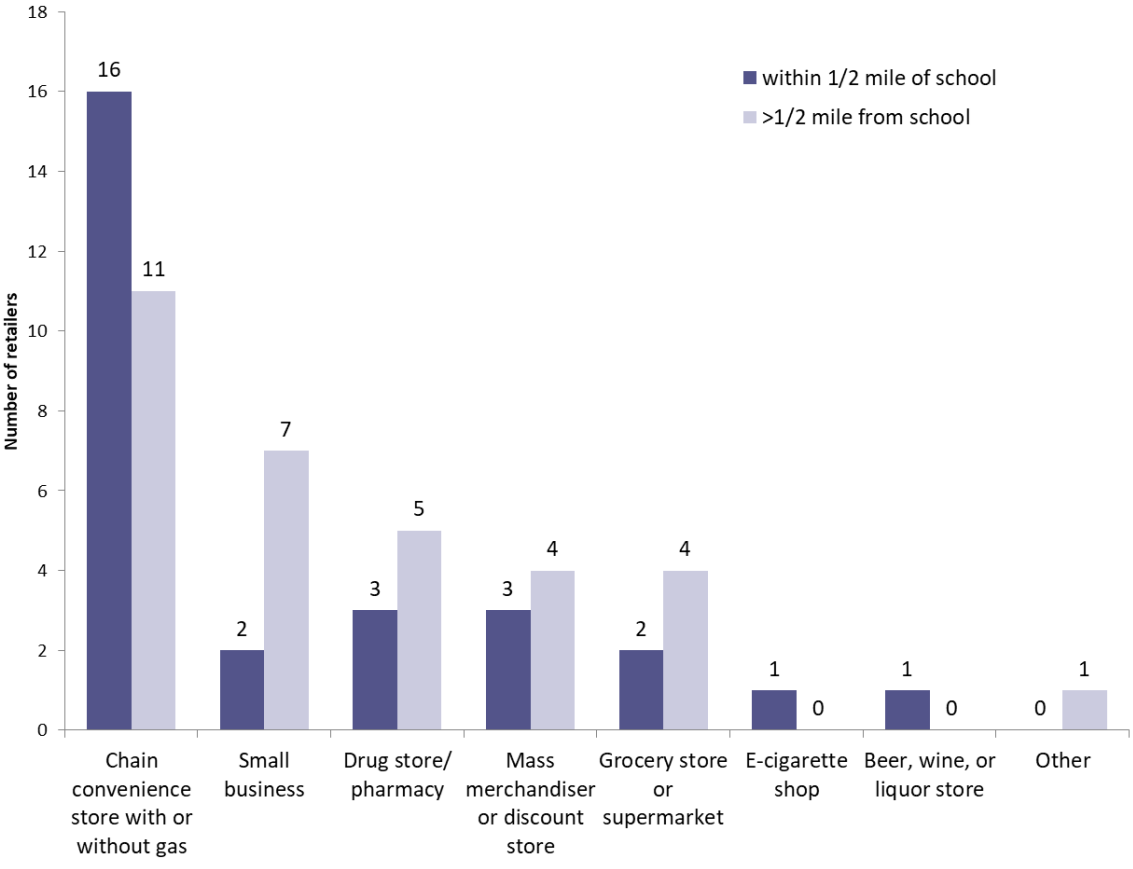


Figure 25. Number of retailers by type and proximity to schools, Madison County, June 2018[84.86].
Small business = locally owned convenience store or market.

per 1,000 residents (density), the highest densities were in the Townships of Georgetown and DeRuyter (2.0 and 1.4 retailers per 1,000 residents, respectively). Madison County overall has a density of 0.8 retailers per 1,000 residents (Table 7 & Fig. 26).

Density by SES

The highest density of retailers is in census tracts with 15% or more of the households living below the federal poverty level (1.2 retailers per 1,000 residents). While this is consistent with tobacco marketing trends in regards to SES, we also see a high density of retailers in communities the with lowest proportion of the households living in poverty (Table 7 & Fig. 27).

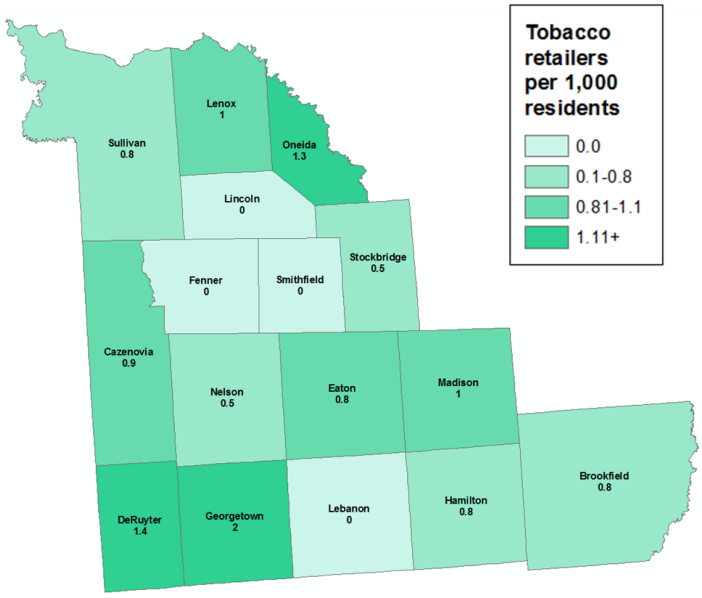


Figure 26. Map of tobacco retailer density by Madison County township, June 2018[61,84].

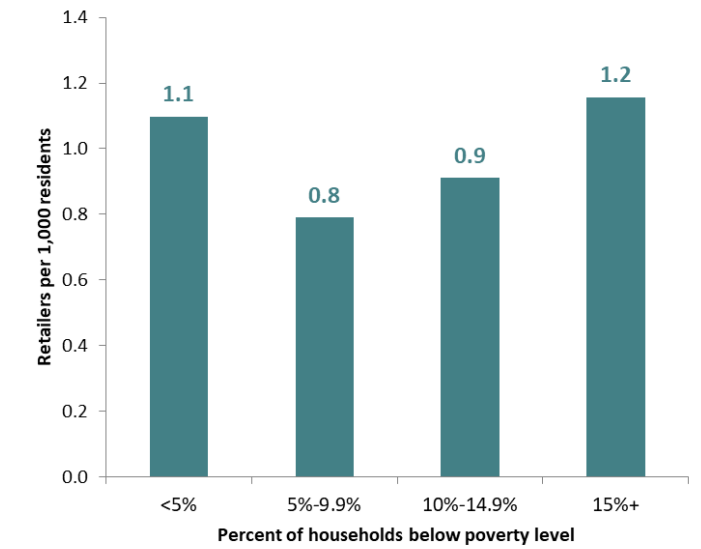


Figure 27. Tobacco retailer density by percent of households living below poverty level, Madison County, June 2018[61,84].

Tobacco retailer density	Retailers per 1,000 residents	People per retailer
Madison County overall	0.8	1201
By municipality		
Brookfield	0.8	1264
Cazenovia	0.9	1176
DeRuyter	1.4	703
Eaton	0.8	1210
Fenner	0.0	-
Georgetown	2.0	507
Hamilton	0.8	1314
Lebanon	0.0	-
Lenox	1.0	998
Lincoln	0.0	-
Madison	1.0	989
Nelson	0.5	1948
Oneida	1.3	799
Smithfield	0.0	-
Stockbridge	0.5	2209
Sullivan	0.8	1276
Other CNY counties		
Cayuga	0.8	1271
Cortland	0.9	1133
Oneida	0.9	1078
Onondaga	0.9	1153
Oswego	0.9	1086
CNY overall	0.9	1137
Lowest smoking county (Rockland)^	0.7	1356
Highest smoking county (Oswego)^	0.9	1086
Lowest lung cancer incidence county (Queens)!	0.8	1204
Highest lung cancer incidence county (Oswego)!	0.9	1086
By percent of population below		
less than 5%	1.1	911
5-9.9%	0.8	1266
10-14.9%	0.9	1098
15%+	1.2	865

Table 7. Retailer density, Madison County, June 2018[61,84].
^2016 NYS BRFSS[21]
!NYS cancer registry, 2011-2015[4]

Tobacco prevention resources, efforts, initiatives, and organizations

There is a wealth of information for tobacco prevention at the state- and community-level, including smoke-free policies, advocacy, and enforcement efforts. This brief outline of resources was created by web searches and in-person conversations with the PSE Assessment workgroup.

State Level

New York State Association of County Health Officials (NYSACHO): Promotes smoke-free legislation through advocacy and education efforts.
http://www.nysacho.org/files/Advocacy/2018%20Advocacy/NYSACHO%20Gen_%20Statement%20limitng%20use%20of%20tobacco%20products.pdf

New York State Quitline Services: Free and confidential service that provides effective stop smoking services to New Yorkers who want to stop smoking.
https://www.nysmokefree.com

Tobacco-Free SUNY: All State Universities of New York implemented a tobacco-free campus policy.
http://system.suny.edu/healthaffairs/tobaccofree/

Community Level

Madison County properties are 100% smoke-free.

19 Community organizations, such as libraries and daycare centers have implemented smoke-free policies (Appendix B).

29 Community parks and outdoor recreation spaces are designated smoke-free (Appendix B).

BRiDGES Tobacco Prevention Program (BTPP): Received NYS Department of Health Bureau of Tobacco Control grant funding for community engagement and Reality Check youth program.
https://www.bridgescouncil.org/tobacco
http://www.realitycheckofny.com/

Community Action Partnership (CAP) of Madison County: Received NYS grant for smoking cessation program geared towards low-income families.
https://capmadco.org/

CNY Regional Center for Tobacco Health Systems at St. Joseph's Hospital: Leading the Central NY Tobacco Dependence Treatment Standard of Care Model.
http://www.healthecny.org/content/sites/hec/CNY_Regional_Center_for_Tobacco_Health_Systems_flyer.pdf

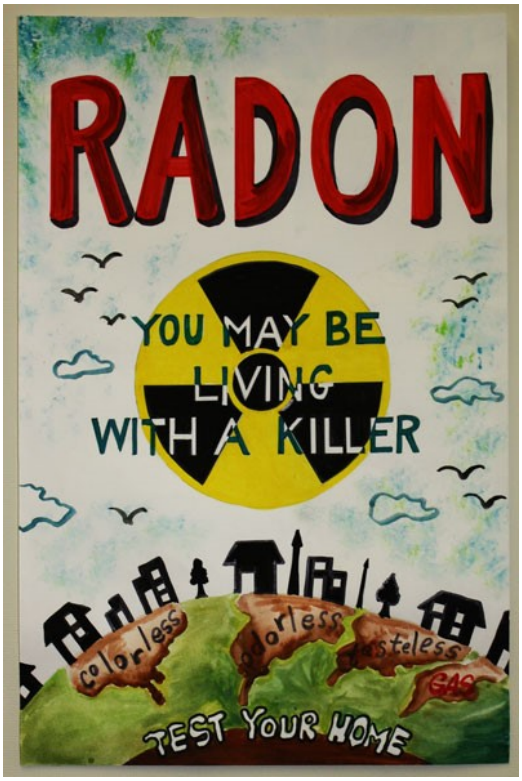


Figure 28. Radon awareness poster contest winner, 2015-2016 school year (Shiho Oki, Astoria, NY)[38].

Client mapping for radon testing & mitigation

Research indicates that individuals who have access to affordable prevention resources are more likely to adopt healthy behaviors (Appendix A).

MCDOH conducted a client journey map to identify both barriers and assets of the radon testing and mitigation process. The aim was to understand the client journey of radon testing and mitigation. This mapping exercise is based on an individual or family, living in a single-family home, and is seeking information about radon. Readability was measured for all written materials and based on the 5th grade and below recommendation for health literacy.

This assessment did not address awareness about, and/or motivating some to test one's home for radon. Once someone has decided to test, 7 barriers were identified as opportunities to improve an individual's experience during the testing and mitigation process.

The full client journey map report is available in Appendix C.

Building permits inclusion of radon

MCDOH conducted an assessment of the inclusion of radon on building permit applications, including county, township, and village levels. Permits can increase awareness of radon exposure harms, as well as requirements for radon testing and mitigation (Appendix A). The potential outcome is reduced levels of radon in homes and new buildings, and lower human exposure. Building permits were obtained online, or through locality officials. Each permit was searched for the following set of terms: Radon, Testing, and Mitigation.

The county building permit along with the 16 towns and 9 villages were included in the analysis. None (0) of the permits obtained included radon policies.

	Madison County (Y/N)	Towns (n = 16) % (n)	Villages (n = 9) % (n)
Radon is mentioned in building permit	N	0 (0%)	0 (0%)
Requirement for radon testing	N	0 (0%)	0 (0%)
Requirement for radon mitigation (when elevated)	N	0 (0%)	0 (0%)
Offer discount on permit application fee if testing for radon is included	N	0 (0%)	0 (0%)

Table 8. Madison County radon building permit scan results, June 2018.

Recommendations for expanding this assessment

We acknowledge that there are more PSE conditions one can look at regarding lung cancer risk factors. Below are some recommended topic areas with promising approaches and resources to making this assessment more robust. If interested, we encourage entities, either individually or in collaboration with MCDOH to explore these projects. Results from these activities can accompany this document as evidence in pushing for PSE changes, programming, and improved community health.

Assess policies about screening patients for tobacco use within the local healthcare system

http://quityes.org/docs/healthcare-provider-reminder-systems.pdf
https://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/decisionmakers/systems/index.html

Leverage data from electronic health records, insurance claims, and other sources for surveillance/ evaluation of the implementation and outcomes of health systems change cessation interventions

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6341a2.htm

Assess the effectiveness of school district tobacco policies

http://www.nctobaccofreeschools.org/adopt/TFSNeedsAssessmentTool.pdf

Assess the impact of commercial tobacco in local American Indian communities

http://keepitsacred.itcmi.org/resources/smoke-free-policy-toolkit/
http://www.aastec.net/wp-content/uploads/2016/04/aastec_eToolkit_v8-1.pdf

Photovoice about tobacco's impact on Madison County

https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/photovoice/example
http://countertobacco.org/wp-content/uploads/2016/03/CounterTobacco_PhotovoiceProject_FINAL_2015.01.08.pdf

Inventory and assess smoke-free policies among local multi-family housing properties

https://center4tobaccopolicy.org/tobacco-policy/smokefree-multi-unit-housing/
http://dhhs.ne.gov/publichealth/Documents/11SF_MUHPoliciesNE.pdf

Assess public's perception of risks associated with radon and motivation to test

http://www.who.int/ionizing_radiation/env/radon/en/index1.html

Recommendations

There are a multitude of evidence-based and promising PSE approaches available to policy makers, schools, healthcare systems, landlords, and others. Many of these are summarized in our literature review (Appendix A). This can serve as a "menu" with evidence about the impact they have had on their communities. To accompany this evidence, MCDOH has also compiled a list of PSE implementation tools, resources, and examples (Appendix D).

The assessment provides great insights about the PSE conditions in Madison County. Some of these are imposed and/or developed by the state or the country. However, home rule law provides local governments the power to impose stricter and more encompassing laws and initiatives[87]. Thus, Madison County, and its localities have the unique opportunity to implement far-reaching measures, similar to other peer counties and communities to help reduce risk factors for lung cancer and make sustainable change. These can change the context in which health decisions are made, and can impact behavior among vulnerable populations, such as those of lower SES, who may not voluntarily make behavior changes. Beyond policy makers, entities such as schools and hospitals can take action to help empower the people they serve to live healthier lives.

MCDOH has identified 5 most promising approaches based on the results of this assessment and their potential impact. These focus on the two primary risk factors for lung cancer: tobacco use and radon. They also contain examples of local communities who have taken steps to implement these health improvement initiatives.

Risk factor - Tobacco use

Policy: Tobacco 21 Law

The Tobacco 21 Law increases the minimum age to buy tobacco products, including electronic nicotine delivery systems (ENDS), to age 21[88]. Research indicates the following:

- Decrease tobacco use between 15-25% among the next generation of smokers.
- Reduce smoking-related deaths, such as lung cancer, by 10%.
- $212 billion in healthcare savings over the next 50 years[89].

Local example: The counties of Albany, Cattaraugus, Chautauqua, Cortland, Nassau, Onondaga, Orange, Schenectady, Suffolk, Sullivan, Tompkins and Ulster in addition to New York City adopted Tobacco 21[90].

Policy: Add e-cigarette language

Many institutions such as school districts, workplaces, public parks, have adopted strong smoke-free policies; however, there is evidence that adding e-cigarette language to policies will have a greater impact on preventing initiation, decreasing the behavior, and increasing quit attempts. Research indicates the following:

- E-cigarette use, especially among young people, increases risk of ever smoking cigarettes.
- Employees in a smoke-free workplace are 1.9 times more likely to quit smoking.
- Consumption of tobacco products decreases in a smoke-free environment[91].

Local example (schools): Canastota, Chittenango, Morrisville-Eaton, and Stockbridge Valley school districts[92,93,94,95].

Local example (county): Madison and Oneida Counties prohibit the use of all tobacco products, including vaping, on county property[78,96].

Policy: Require disclosure of smoking policy in rental agreements

There is tremendous evidence for health outcomes and resident preference for smoke-free living. It is recommended that private landlords and other multifamily housing units must disclose the smoking policy in the lease agreement. Research indicates the following:

- Disclosure requirements educate both property owners and tenants on the harms of second- and third-hand smoke.
- Many property owners opt to create smoke-free policies due to the disclosure mandate along with lower maintenance costs associated with smoke-free units[97].
- 92% of U.S. multi-family residents believed tenants have the right to smoke free housing[98].

Local example: Rockland County and the City of Buffalo, New York have both adopted laws to mandate the adoption and disclose of a smoking policy in tenant lease agreements[99,100].

Policy: Tobacco retailer licensing & density restrictions

The tobacco retail environment allows for tobacco companies to market disproportionately to low-income and minority communities. Laws to enforce fee-based tobacco retail licensing, density, and proximity to youth spaces have been used to address this disparity. Regu-

lations may include the following:

- Strengthening the license process for tobacco retailers and requiring a minimum distance from youth spaces (i.e. schools, parks, playgrounds) reduces sales to minors[101,102].
- Communities have:
  - Opted for no new tobacco retailers to address tobacco retailer density.
  - Established a minimum physical distance between retailers.

Local example: Broome County adopted local law to require a 500-ft minimum of tobacco retailers from schools[103]. Cayuga County implemented an ordinance that enforces a 100-ft minimum from school campuses[104].

Risk Factor – Radon exposure

Policy: Mandate radon-resistant construction & follow-up testing for new buildings

Since Madison County is a high-risk area for radon exposure, it is recommended that all new construction projects undergo radon testing and abide by Radon Resistant New Construction (RRNC) standards[38]. Mandated RRNC and follow up radon testing would apply to all structures during the building permit process. Benefits include:

- RRNC is research-based to ensure that all new facilities utilize construction standards to limit future exposure to radon.
- Contractors can utilize RRNC as a marketing opportunity and cost savings for potential clients.

Local example: Towns of Lima and Caledonia in Livingston County, New York have both adopted the International Residential Code for Radon Control Methods[105].

A note about public health programming

This assessment and resulting recommendations focus on PSE approaches. We are not advocating to eliminate individual-level and event-based programming. Instead, we aim to complement these existing approaches with trying to affect the context in which our community makes health decisions, and to make sustainable change. Programming certainly has an important place in improving population health, and we hope these statistics, materials, and assessment can be used to justify needs.

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Appendices

PSE Literature Review

Smoke-free Places in Madison County

Radon Client Map

PSE Implementation Tools & Resources

Appendix A: Literature Review: PSE Approach to Lung Cancer Risk Factors

PSE Overview

Despite the downward trend in lung cancer, there still remains a disparity among low socioeconomic status (SES), more rural, and female community members. In order to address lung cancer burden, research shows that creating policies, system-level, and environmental (PSE) changes have greatest impact on this health inequity. Rather than focusing on individual behaviors, PSE is a sustainable and comprehensive approach to improve population health. This method can systematically improve the context in which people make health decisions, particularly more vulnerable community members.

Policies are considered written statements provided by an organization, reflecting its position, decision, or course of action regarding a particular topic. They can be presented in the form of ordinances, resolutions, agreements, or enforceable laws. **System-level** approaches intend to change the procedures, whether personnel or resource-related, that impact health outcomes. Institutions may include: healthcare, workplaces, schools, and transportation systems. **Environmental** modifications affect how people interact with their surroundings. These can include the manmade infrastructure, natural green spaces, economic or social environment. The three concepts are not unique and can actually influence one another; therefore, PSE can create comprehensive change in the long-term.[1]

PSE Approaches to Reduce Lung Cancer Burden

This literature review serves as a guide for the Madison County community on evidence-based PSE tools to address lung cancer risk factors. The sections are outlined below:

Section 1: Tobacco Use & Exposure

Community

Policy: Tobacco 21 Law

NYS has a reputation for strong tobacco laws, including the expansion of the Clean Indoor Air Act to include electronic cigarettes in 2017. However, the state government has yet to pursue the recent Tobacco 21 Law. Several states including California, Hawaii, Maine, New Jersey and Oregon as well as Washington, DC have implemented this policy. There is evidence that this law will decrease tobacco use between 15-25% among the next generation

of smokers and smoking-related deaths, such as lung cancer, will be reduced by 10%.[2] In fact, the youth smoking rate decreased from 13 to 6.7% in just four years after Needham, MA changed the minimum age to 21 in 2006.[3] Lastly, research indicates $212 billion in healthcare savings over the next 50 years due to Tobacco 21.[2] New York City as well as the counties of Albany, Cattaraugus, Chautauqua, Cortland, Nassau, Onondaga, Orange, Schenectady, Suffolk, Sullivan, Tompkins and Ulster have already adopted Tobacco 21.[4] It is also recommended that Tobacco 21 laws should encompass not only tradition tobacco products, but electronic nicotine delivery systems (ENDS).[5]

Policy: Prohibit smoking in vehicles with young passengers

There is tremendous evidence that secondhand smoke (SHS) is connected with poor health outcomes, particularly among children. SHS can cause the following health outcomes: higher frequency of asthma attacks, respiratory symptoms and infections, ear infections, and sudden infant death syndrome (SIDS).[6] One way to prevent SHS exposure is to ban smoking in cars while driving with young people. Several states, including Arkansas, Vermont, Utah, Maine, Louisiana, California, Virginia, and Oregon, have passed laws prohibiting smoking in vehicles with minors (ranging from under 18 to under 8). In a study performed by Harvard School of Public Health, average levels of respirable particulate matter were compared between passengers in vehicles with smoking present and adults in bars where smoking is legal. The passengers had significantly higher amounts of respirable particulate matter. The study also compared levels between windows open or closed, and still found higher levels even with ventilation. Lastly, 82% of US adults agreed with the smoking ban in cars with children under age 13 in a 2013 survey, regardless of their own smoking status (i.e. former smoker, current smoker, or never smoker).[7]

Environment: Utilize signage for smoke-free areas

There are several opportunities to create healthier outdoor environments by implementing smoke-free laws. This includes the movement to protect children in outdoor play spaces, including parks and playground facilities.[8] There are also efforts to expand smoke-free policies on county building perimeters and hospital campuses.[9] In a study conducted in Kentucky, residents living in communities with 100% smoke-free laws or ordinances were 7.9% less likely to be diagnosed with lung cancer than those who did not.[10] Although these laws are demonstrated to be effective alone, institutions can optimize policies using signs. Signage is associated with reduced exposure to SHS and littering as well as de-normalization of smoking behavior. The use of signs raises awareness and assists with the enforcement of smoke-free policies.[11]

Healthcare

Policy: Encourage greater insurance coverage of cessation treatment options

After the implementation of the Patient Protection and Affordable Care Act (ACA), states had the opportunity to increase access to healthcare services by the expansion of Medicaid. One component of the expansion included tobacco use screening followed by tobacco cessation treatment provided to clients. In 2017, a study demonstrated a significant increase in smoking cessation participation and individual quit attempts in states that opted to expand Medicaid insurance for low-income adults.[12] Similarly, it is recommended that all private health insurance plans expand their coverage for tobacco cessation treatment for clients. The purpose is twofold: 1) greater quality of life for patients; and 2) long-term healthcare cost savings. Furthermore, the National Health Interview Survey found a significant increase between 2010 and 2015 in the percentage of patients (60.6%), who received quitting advice from a health professional. This increase can be attributed to the availability and affordability in tobacco cessation treatment after the adoption of the ACA.[13,14]

Schools

Policy: Add e-cigarette language

Although the traditional cigarette use among young people has declined, there is more evidence that e-cigarettes have gained popularity in school-aged people. In 2016, more than 2 million U.S. middle and high school students used e-cigarettes in the past 30 days, including 4.3% of middle school students and 11.3% of high school students. Furthermore, there is evidence that e-cigarette use by youth and young adults increases their risk of ever smoking traditional cigarettes. School districts, particularly public institutions, have strong anti-smoking policies already in place; however, it is strongly recommended to strengthen the current policy by adding electronic cigarettes and

other electronic nicotine delivery systems (ENDS) language.[1] Locally, Canastota, Chittenango, Morrisville-Eaton, and Stockbridge school districts have updated tobacco-free policies to include e-cigarettes.

Policy: Expand tobacco prevention education and cessation resources

Since 1994, the CDC has recommended the implementation of tobacco prevention education in schools. This guideline also provided evidence of successful quit attempts among young people, who had access to school-based tobacco cessation or were referred to a community organization by school staff.[15] The Rural Health Information Hub also recognizes school-based cessation programs as an evidence-based practice for lowering rates of tobacco use among students. Education and cessation resources equip students to prevent initiation, receive social support from staff and peers, and connect students to additional community resources.[16] Locally, DeRuyter, Morrisville-Eaton, and Oneida School Districts have implemented strong school-based tobacco policies to prevent uptake in behavior as well as connect students and staff to tobacco cessation resources.[17–19]

Environment: Create smoke-free college campuses

New York State (NYS) K-12 public schools are required to have smoke-free campuses; however, undergraduate institutions are exempt. The NYS Tobacco Free organization created a Dean's List based on the strength of smoke-free policies at each college. In Madison County, Cazenovia College received a B+, while both Morrisville State College and Colgate University received a D grade.[20] There is strong evidence that smoke-free outdoor regulations have a positive impact on discouraging tobacco initiation along with reducing lung cancer burden.[21]

Retail

Policy: Increase tobacco taxes and/or minimum sales price

New York State implemented a minimum sales price law, stating all tobacco products must be sold at least at production cost; this law prohibits discounted prices. There is substantial evidence that raising the price or taxation of tobacco products significantly lowers tobacco purchase among youth (18-24 years) as well as low SES or ethnic minority community members.[22] In addition, the increase in cigarette price reduces the demand; therefore, the smoking prevalence, quantity consumed, and initiation of smoking are all reduced.[23,24,14]

Policy: Tobacco retailer licensing and density restrictions

The tobacco retail environment allows for tobacco companies to market disproportionately to low-income and minority communities. As a result, a few states have begun implementing license policies to address this disparity. State and local government use licensing as a policy tool to regulate businesses.[25] States, including Minnesota, Oregon, Kansas and Maine, have banned self-serve for all nicotine-delivery systems. Minnesota has also implemented a fee-based tobacco retail licensing system on a state-level.[26] In addition, three states have passed laws that establish a minimum distance between youth spaces, such as parks and schools, and tobacco retailers. In a local level, Cayuga County has implemented a local ordinance with strengthened regulation on retail licensing for tobacco products as well as prohibiting retail locations within a 100-foot radius of schools.[27] In addition, communities have adopted regulations that do not allow any new tobacco retailer licenses. These not only address the proximity issue, but more importantly, the density of retailers in more vulnerable communities.[28] Lastly, strengthening the license process for tobacco retailers has shown to reduce sales to minors.[25,29]

Policy: Eliminate tobacco sales from pharmacies and grocery stores

The question of why pharmacies sell both medication and tobacco products has been commented on for many years. In 2010, both the American Pharmacists Association and American Medical Association passed resolution to discourage the sale of tobacco products from any business that provides prescriptions, including pharmacies and grocery stores.[30] Although companies like CVS have voluntarily stopped their sales of tobacco, two states actually adopted a tobacco-free pharmacy policy as well. According to a study conducted in California and Massachusetts, tobacco-free pharmacy laws are associated with a greater reduction in tobacco retailer density as well as a reduction in smoking trends.[31,32] In addition, there is no evidence to demonstrate that the CVS Corporation is struggling financially; in fact, the company is continuing efforts to fight tobacco companies. On a local level, Rockland County in New York banned all sales of tobacco products at pharmacy locations.[33] Changing the environment of both pharmacies and grocery stores will again de-normalize smoking behavior.

Workplaces

Environment: Create smoke-free workplaces

There is substantial evidence that smoke-free workplaces can lower the prevalence of tobacco use. A smoke-free workplace may be created by adopting policies such as no smoking near the entrance perimeter or entire campus. In addition, workplaces can encourage employees to quit by providing health insurance coverage for cessation resources and counseling. Employees who receive insurance coverage of cessation resources are more likely to seek cessation treatment or stop smoking altogether.[1] In a longitudinal study, participants whose workplace that adopted smoke-free policies were 1.9 times more likely to quit smoking than those whose workplace did not. The study also demonstrated a significant decrease in consumption among participants who worked in a smoke-free environment.[34] Another study found that the prevalence of tobacco use among staff decreased from 27.6% to 13.8%. Furthermore, the staff support for the policy increased from 60.6% to 80.3% after 1 year.[35]

Policy: Incorporate e-cigarette language

Recently, employers have revamped their smoke-free environment by adding e-cigarette language to pre-existing policies. Employers can update workplace policies to designate any nicotine delivery system as a tobacco product. The purpose is threefold: 1) lowers rate of tobacco use among employees; 2) lowers healthcare costs and sick days; and 3) prevents e-cigarette users from also modeling hand-to-mouth behavior. Building signage should be updated to include e-cigarettes as well to promote the comprehensive policy change.[36]

The Community Preventive Services Task Force recommends worksite-based incentives in conjunction with interventions to support individual cessation efforts are effective in reducing tobacco use among workers.[36] Employers should screen for both traditional and electronic tobacco users. This will allow worksite policies and wellness programs to be tailored to meet the needs of employees. Additionally, all e-cigarette users can be eligible for cessation resources under employee health insurance plans.[36]

Housing

Policy: Create smoke-free multifamily housing units

Americans spend between 85-90% of their day indoors. There is substantial evidence that states with comprehensive indoor air legislation have significantly reduced secondhand exposure, asthma prevalence, and emergency room visits due to lung function.[37] That said, only recently have policymakers addressed tobacco use in homes, specifically with vulnerable populations (i.e. children, low-income residents, elderly). In 2016, the US Department of Housing and Urban Development (HUD) adopted a 100% smoke-free public housing law. Smoke-free housing is also associated with a decrease in cigarette consumption and may cause an increase in tobacco cessation. A study conducted in 2017 demonstrated that nearly 92% of participants believed tenants have the right to smoke free housing; yet, over 80% of nonsmoking residents lived in multifamily housing where smoking is permitted.[38] In addition, smoke-free policies in housing complexes have not shown change in vacancy or tenant turnover, and actually lower cleanup costs for building companies.[39] Due to the evidence for health and resident preference, it is recommended that private landlords and other multifamily housing units incorporate the same policy.

Other communities, including Rockland County and the City of Buffalo, New York have both adopted laws to mandate the adoption and disclose of a smoking policy in tenant lease agreements.[5] The requirement to disclosure smoking policies educates both property owners and tenants on the harms of second- and third-hand smoke. In many multifamily units, property owners have opted to create smoke-free policies due to the disclosure mandate along with lower maintenance costs associated with smoke-free units.[5]

Conclusion

All forms of nicotine – from cigarettes to chew to vaping – contribute to the risk of lung cancer. Smoke-free legislation at the systems level has been significantly associated with a decrease in perinatal deaths, preterm births, asthmas rates among children, smoking prevalence, and lung cancer rates.[40] Smoke-free policies have created healthier environments and ultimately, changed social norms around tobacco use.

Section 2: Radon Exposure

As previously discussed, radon has been identified as the second leading cause of lung cancer. Although there is no safe amount of exposure, both the Environmental Protection Agency and Surgeon General have formally recommended mitigation for levels of 4pCi/L or higher.[41] NYS provides radon test kits for $11 as well as free post mitigation detectors at no cost.[42] There have been previous initiatives to encourage homeowners to test for radon independently; however, there are examples of effective PSE strategies to address this issue.

Housing

Policy: Radon awareness and mitigation in real estate or rental units

Although most states, including New York, mandate landlords and real estate companies to disclose radon levels to tenants or building occupants, there are additional steps that can prevent human exposure to radon. First of all, there is discrepancy in mandatory reporting and testing since disclosure is only required for *known* exposure risk. Some states have also strengthened language to require both testing and reporting. In other words, there is no requirement to test prior to real estate transactions. In addition, Maine recently implemented a law that not only requires regular radon testing, but also the mitigation of multiunit housing at high levels.[41] This mandate is essential for protecting low-income families, who do not have the financial means to remediate the situation on their own. There are funding assistance opportunities for radon mitigation, particularly for buildings that accommodate low SES individuals, such as the Community Development Block Grant Program (CDBG).

Policy: Mandate radon-resistant construction in new buildings and follow-up radon testing

There are two Radon Resistant New Construction (RRNC) laws that can be used as references, including the International Residential Code and American National Standards Institute's Standard: Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses.[41,43] The purpose of this legislation is to ensure that all new facilities utilize construction standards to limit future exposure to radon. Unfortunately, states that require these new building codes only apply to residential buildings instead of all new structures. Since Madison County is a high-risk area for radon exposure, it is recommended that all new construction projects, regardless of residential status, abide by RRNC standards and undergo recommended radon testing every 5 years. This would involve building permits to require radon inspections prior to construction. Contractors can utilize RRNC as a marketing opportunity and cost savings for potential clients. On a local level, the towns of Lima and Caledonia in Livingston County, New York have both adopted the International Residential Code for Radon Control Methods.[10]

Conclusion

There is strong evidence to support the link between radon exposure and lung cancer; therefore, the removal of this exposure through testing and mitigation will lower risk of lung cancer. More importantly, the policies outlined can protect the most vulnerable populations, including children and lower SES individuals. The PSE strategies discussed above provide an opportunity for county governments to prioritize the issue of radon in their community.

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Appendix B: Madison County Smoke-free Places

As of August 2018, the following community organizations, such as libraries and daycare centers, and places have created either 100% smoke-free grounds or limited distance of smoking from entryways.

Location	Type	Smoke-Free Regulation
Madison County[1,2]	Government Property (including parks)	100% Tobacco Free Grounds
Madison Hall Association[1]	Community Organization	100% Tobacco Free Grounds
Celebration Children's Center[1]	Community Organization	100% Tobacco Free Grounds
Jennifer Hook's Daycare[1]	Community Organization	100% Tobacco Free Grounds
ARISE	Community Organization	Limited Distance from Entryway
Church on the Rock[1]	Community Organization	100% Tobacco Free Grounds
Cazenovia College	College	100% Tobacco Free Grounds
Canastota Public Library[1]	Library	100% Tobacco Free Grounds
DeRuyter Public Library[1]	Library	100% Tobacco Free Grounds
Morrisville Public Library[1]	Library	100% Tobacco Free Grounds
Oneida Public Library[1]	Library	100% Tobacco Free Grounds
Sullivan Public Library[1]	Library	100% Tobacco Free Grounds
Oneida YMCA[1]	Community Organization	100% Tobacco Free Grounds
Hazel Carpenter Home[1]	Housing Unit	Limited Distance from Entryway
Karing Kitchen	Community Organization	Limited Distance from Entryway
Oneida Nation Early Learning Center[1]	Community Organization	Limited Distance from Entryway
Madison Bistro	Restaurant	100% Tobacco Free Grounds
Madison County Planned Parenthood	Community Organization	100% Tobacco Free Grounds
Mary Rose Center	Community Organization	100% Tobacco Free Grounds
Sgarlata Concrete Inc.	Community Organization	Limited Distance from Entryway
Wild Animal Park	Community Organization	Limited Distance from Entryway
City of Oneida Parks (8)[1]	Park	100% Tobacco Free Grounds
Town of Cazenovia Parks (2)	Park	100% Tobacco Free Grounds
Town of Sullivan Parks (2)[3]	Park	100% Tobacco Free Grounds
Town of Lenox Skate Park[3]	Park	100% Tobacco Free Grounds
Town of Madison, Lake Park[3]	Park	Smoke-Free Beach and Pavilions
Town of Nelson, Baseball Field[3]	Park	Smoke-Free Baseball Fields
Town of Stockbridge, Carlon Field[3]	Park	Smoke-Free Playgrounds & Athletic Fields
Village of Cazenovia (3)[3]	Park	100% Tobacco Free Grounds
Village of Chittenango Parks (9)[3]	Park	100% Tobacco Free Grounds
Village of Hamilton Park	Park	100% Tobacco Free Grounds

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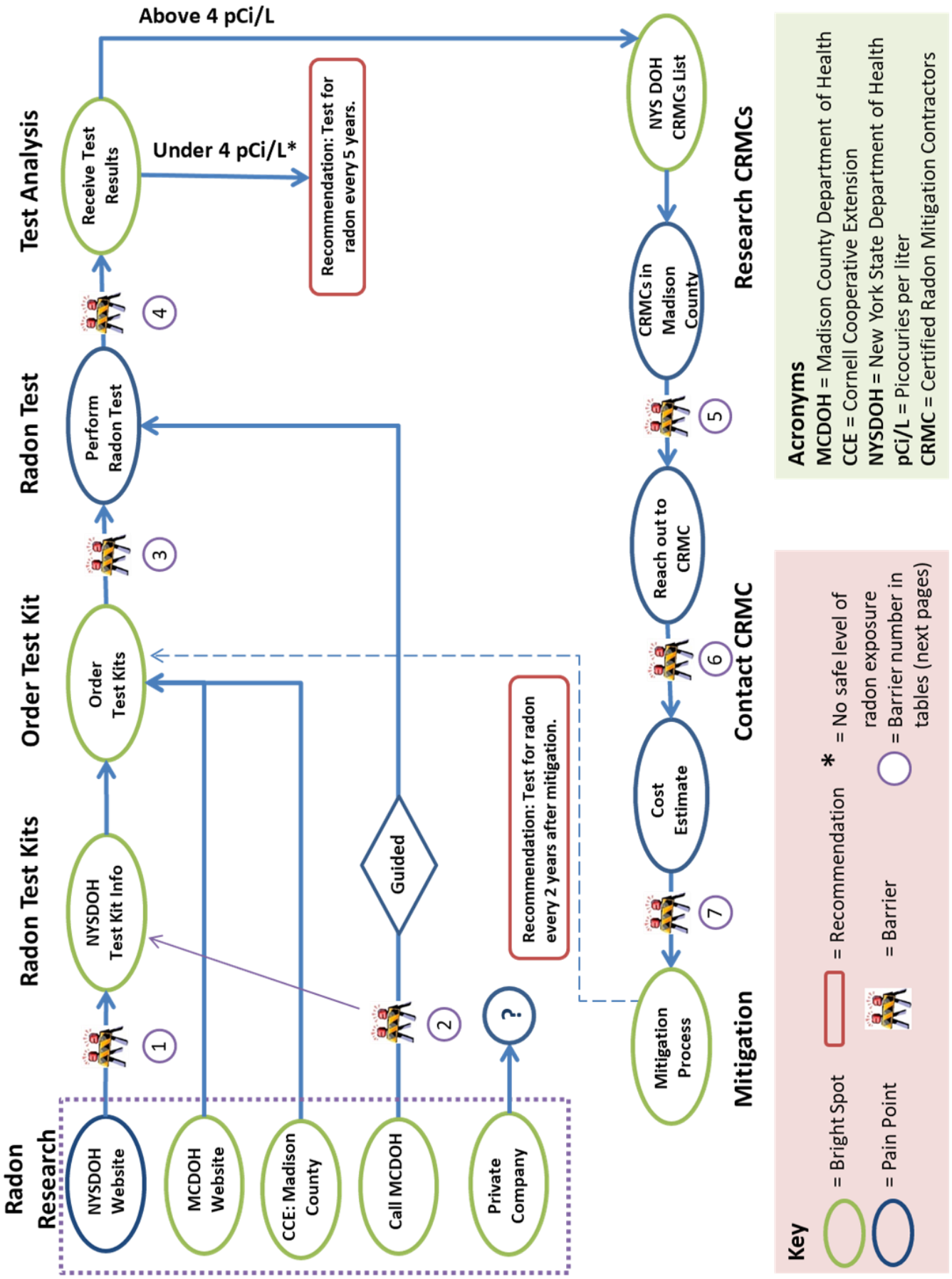
Appendix C: Radon Client Map



Bright spot = Individual should find step straightforward and/or informative
Pain point = Individual may find step frustrating and/or have trouble completing step without direct assistance

Madison County DOH aimed to understand the client journey of radon testing and mitigation. This mapping exercise is based on an individual or family, living in a single-family home, and is seeking information about radon. Readability was measured for all written materials and based on the 5th grade and below recommendation for health literacy.

Entry Point:	New York State Department of Health Website	Madison County Website	Cornell Cooperative Extension: Madison County	Contact MCDOH via Phone	Contact Private Company
Experience at Touch Point:	Despite the wealth of resources on the NYS DOH, the radon page is difficult to navigate and does not seem to be designed for clients, but rather health professionals. The readability test indicated a 9th grade reading level. In addition, the page consists of links instead of brief descriptions, including to the test kits page.	The Madison County page on radon is easy to understand (6th grade reading level), specifically what it is and how it is harmful. The page also highlights the need for testing with the map of elevated radon levels by town. Directs clients to the NYS DOH website for testing and mitigation.	This is a great resource for community members; the description of radon as a health hazard is easy to understand and informative. The "Testing & Mitigation" section referred clients to NYS DOH.	Clients reach out directly to the MCDOH Health Educator and receive in-person education as well as step-by-step guidance for radon testing. The reading materials provided are at an appropriate reading level and additional instructions are provided.	Clients may opt to reach out directly to a private company. It is unknown whether this is a bright spot or pain point.
Bright Spot or Pain Point?	Pain Point	Bright Spot	Bright Spot	Bright Spot*	Unsure
Barriers	#1: The information is difficult to understand and may deter clients from finding the test kit resource.	n/a	n/a	#2: *Grant funding is not consistently available for MCDOH to provide this service. If grant funding unavailable, MCDOH directs client to NYSDOH	Potential Barriers: • Contractor may not be radon certified • Independent radon test kits are more expensive • Misinformation about testing & mitigation
Ideas for Achieving the Ideal Experience:	The yearly recommendations for testing should be clearly outlined. The state could have descriptions as well as resource links.	Provide local contact information for residents.	The "Testing & Mitigation" section could have been highlighted better rather than only new construction.	Maintain consistent grant funding to ensure clients receive this guidance from local health department.	Private companies should direct clients to NYS DOH website for education and discounted radon test kits.
Source	https://www.health.ny.gov/environmental/radiological/radon/radon.htm	https://www.madisoncounty.ny.gov/1695/Radon	http://madisoncountycce.org/environment/healthy-homes/radon	Jennifer McGohan, Health Educator II MCDOH	n/a

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Pain point = Individual may find step frustrating and/or have trouble completing step without direct assistance

Client Journey

Touch Point:	NYS DOH Radon Test Kits	Order Radon Test Kit	Radon Test	Test Analysis
Experience at Touch Point:	The NYS DOH page provides information on how to order the radon test kits, whether it is a client's first time, building new construction, or testing after mitigation. The webpage reads at a 6th grade level. There is also a Spanish version available for order forms.	The order form is easy to fill out and does not include scientific jargon. However, there is a cost and a long wait period prior to receiving the test kit. Clients may be deterred from sending in the form or may lose motivation to test for radon after they have waited so long.	The directions for home testing are easy to read and written at a 4th grade reading level; however, the description of proper conditions for home may be more difficult to comprehend (7th grade). Short-term tests can range from two to 90 days. Doors and windows should be shut for 12 hours before starting the test; wind or stormy weather can impact the test. Tests should be placed at least 20 inches from the ground, away from exterior walls, high heat or humidity.[1]	Step 1: Send in radon test Step 2: Wait on test results (~7 days) Step 3: Receive test results Step 4: Interpret test results appropriately. A positive result is considered 4 pCi/L or higher by the EPA; however, there is no safe amount of radon exposure.[1]
Bright Spot or Pain Point?	Bright Spot	Pain Point	Pain Point	Bright Spot
Barriers	n/a	#3: • Radon Test Kit: $11 • Order forms take between 6-8 weeks to process and receive kit	#4: • Clients may not understand the proper conditions for home testing. • EPA recommends conducting two short-term radon test kits, but clients only receive one.	n/a
Ideas for Achieving the Ideal Experience:	More information about what to expect when conducting a radon test or how long the results take to come back would be helpful.	Free test kits could be provided to encourage more people to order radon test kits. Shorter process time of order forms would be ideal.	Directions for radon test must be easy to understand. If the recommendation is two, the client should buy and receive two kits.	Postage for return packages could be provided to incentivize clients. This is an opportunity to communicate to a general audience on what the results mean and next steps.
Source	https://www.health.ny.gov/environmental/radiological/radon/testkit.htm	https://www.health.ny.gov/forms/doh-2247.pdf https://www.health.ny.gov/forms/doh-2247es.pdf	www.epa.gov/sites/production/files/2015-05/documents/hmbuygud.pdf	www.epa.gov/sites/production/files/2015-05/documents/hmbuygud.pdf

Bright spot = Individual should find step straightforward and/or informative
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If Positive (4 pCi/L+) Test Results:

Touch Point:	Research Certified Radon Mitigation Contractors (CRMC)	Contact CRMC	Cost Estimate	Mitigation Process, NYS DOH Website
Experience at Touch Point:	The NYS DOH website has good information about criteria when selecting a contractor and list of local CRMCs. Step 1: NYS DOH: CRMCs List Step 2: NYS DOH: CRMCs in Madison County	After conducting research on CRMCs, the client must contact a CRMC and request cost estimate.	CRMCs will provide homeowners a price estimate for the radon mitigation.	CRMCs can begin work within a few days of authorization; depending on the house, installation can take between 3-5hours. After the process, it is recommended that clients test for radon every two years in order to ensure the system is working properly. Individuals can apply for *free* radon test kits from NYS DOH as an incentive for addressing the issue.
Bright Spot or Pain Point?	Bright Spot, Pain Point	Pain Point	Pain Point	Bright Spot
Barriers	#5: No CRMCs in Madison County [3 in Syracuse, 1 in Rome]	#6: • Lack of motivation to research, select, and contact CRMC. • May not select a certified contractor	#7: Financial (single family home: $1100-2500)[2]	n/a
Ideas for Achieving the Ideal Experience:	The website should better inform residents by outlining general costs and typical length of mitigation.	NYS could incentivize the certification process, so more contractors are eligible (specifically local ones).	NYS or local government can provide financial resources to address radon mitigation.	This is a good opportunity for clients to continue the testing process through free kits.
Source	https://www.health.ny.gov/environmental/radiological/radon/mitigation/county_map.htm https://www.health.ny.gov/environmental/radiological/radon/mitigation/madi_mitigators.htm	http://best-inspection.com/new-york-radon-mitigation/	http://best-inspection.com/new-york-radon-mitigation/	https://www.health.ny.gov/environmental/radiological/radon/mitigation/what_is_mitigation.htm

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Appendix D: Tools for PSE Implementation

Due to the complex nature of the PSE approach, the CDC recommends that community leaders engage a multi-sector group of stakeholders.[1] Stakeholders can provide local expertise on readiness, feasible ways to implement PSE strategies as well as provide evaluation support. Although there is evidence for specific PSE strategies, it is important to create an evaluation plan prior to implementation as well.[1] After identifying stakeholders and an evaluation plan, the following tools can be utilized for the implementation of PSE strategies:

Tobacco 21 Law	Implementation Handbook	https://tobacco21.org/wp-content/uploads/2017/03/T21HandBook.pdf
County-Level Policies	ChangeLab Solutions, Smoke-Free Checklist	http://changelabsolutions.org/sites/default/files/CA.CompSmokefreePlaces-FINAL_201603.pdf
Updating Policy Language for E-Cigarettes	ChangeLab Solutions, Model Ordinance Workplace example	http://www.changelabsolutions.org/publications/e-cig-ord https://journals.lww.com/joem/fulltext/2015/03000/Guidance_to_Employers_on_Integrating.15.aspx
School Smoke-Free Policy Example	SUNY Cortland, Policy Statement	http://www.nystobaccofreecolleges.org/wp-content/uploads/2013/11/SUNY-Cortland-policy.pdf
Tobacco Retailer Licensing	ChangeLab Solutions, Licensing Checklist	http://changelabsolutions.org/sites/default/files/TRL_Implementation-Checklist_FINAL_20120907.pdf
Tobacco Retailer Density	ChangeLab Solutions, Infographic	http://changelabsolutions.org/publications/infographic-tobacco-retailer-density
Smoke-Free Housing Guidelines	US Department of Housing & Urban Development New York State Condos CDC Healthy Homes Manual	http://www.smokefreehousingny.org/wp-content/uploads/HUD-Smoke-Free-Housing-ToolKit1.pdf http://www.smokefreehousingny.org/wp-content/uploads/Condo-Guide.pdf http://www.cdss.ca.gov/calworks/res/pdf/HSP/HealthyHomesManual.pdf
Reducing Household Radon	CDC Household Radon Policies and Practices EPA Homeowner Guide	https://www.cdc.gov/cancer/dcpc/pdf/HouseholdRadon.pdf https://nepis.epa.gov/Exe/ZyPDF.cgi/P100F7ZO.PDF?Dockey=P100F7ZO.PDF
Radon Testing Kits	New York State Inexpensive & Free Kits	https://www.health.ny.gov/environmental/radiological/radon/testkit.htm
RRNC Legislation	International Residential Code	https://www2.iccsafe.org/states/Seattle/seattle_residential/PDFs_residential/Appendix%20F.pdf http://aarst-nrpp.com/wp/wp-content/uploads/2017/08/Policies-to-Prevent-2017.pdf
PSE General Resource PSE General Resources: Tobacco Use Data Resources	Action4PSE Change Tobacco Policy Center, Model Policies Tobacco Policy Center, Toolkits HealtheCNY	http://action4psechange.org http://tobaccopolicycenter.org/center-publications/model-policies/ http://tobaccopolicycenter.org/center-publications/guides-toolkits/ http://www.healthecny.org

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