



MICHIGAN BRFSS SURVEILLANCE BRIEF

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Disparities in Radon Awareness and Testing Among Michigan Residents, 2020-2021

Background

Radon gas and the substances into which it breaks down (known as “decay products”) are known carcinogens.¹ When inhaled, radon gas and its decay products emit radiation in the lungs and cause DNA damage that can lead to cancer.^{2,3} Radon is found naturally in air, soil, and groundwater, but it can become concentrated in confined air spaces, such as household basements, as it is drawn up through the ground.¹⁻³

Radon is the second leading cause of lung cancer after smoking.³ Individuals who smoke and who are exposed to radon are more likely to develop lung cancer than individuals who do not smoke, but have the same radon exposure.³⁻⁵ The United States Environmental Protection Agency (EPA) estimates that exposure causes 21,000 lung cancer deaths per year nationwide and that one in 15 American homes have high levels of radon.^{4,5} In Michigan, it is estimated that one in four homes have elevated levels.⁶

Radon exposure in the home is preventable, due to the availability of simple and inexpensive testing, cost-efficient mitigation methods, and radon-reducing features that can be included in newly constructed homes.⁵ In order to understand radon awareness and radon testing practices among Michigan residents, the responses to relevant questions from the 2020 and 2021 Michigan Behavioral Risk Factor Surveys (BRFS) were analyzed. This brief provides the prevalence of radon awareness and testing by several demographic characteristics and by Michigan prosperity region.

Methods

MiBRFSS conducts a telephone-based health survey of adult Michigan residents that provides statewide prevalence of chronic health conditions, health-related behaviors, medical conditions, and preventive health care practices. It provides

What is the Michigan Behavioral Risk Factor Surveillance System (MiBRFSS)?

The MiBRFSS comprises annual, statewide telephone surveys of Michigan adults ages 18 and older, and is part of the national BRFSS coordinated by the CDC. The MiBRFSS follow the CDC BRFSS protocol and use the standardized English core questionnaire that focuses on various health behaviors, medical conditions, and preventive health care practices related to the leading causes of mortality, morbidity, and disability. Landline and cell phone interviews are conducted across each calendar year. Data are weighted to adjust for the probabilities of selection and a raking weighting factor is used to adjust for the distribution of the Michigan adult population based on eight demographic variables. All analyses are performed using SAS callable SUDAAN® to account for the complex sampling design.

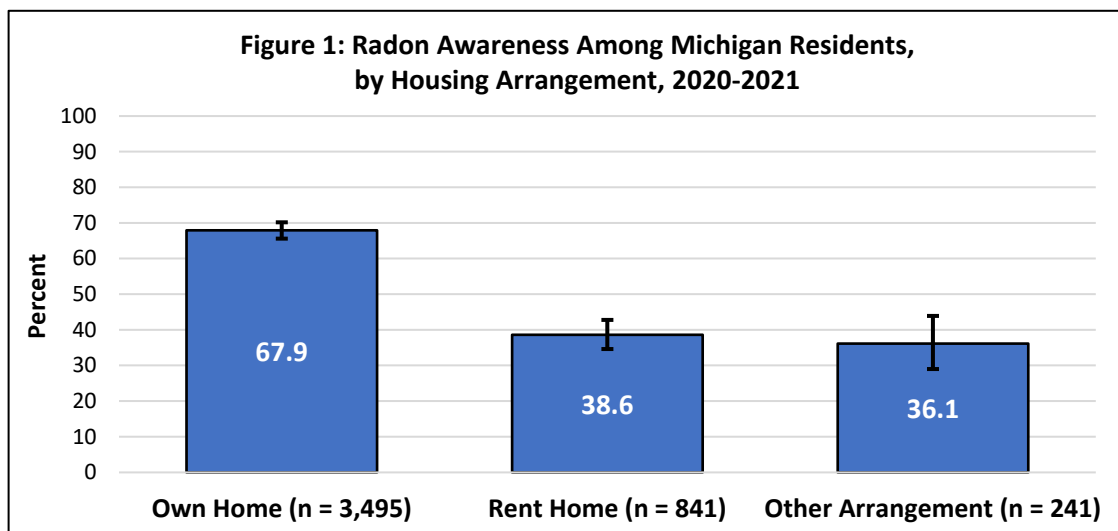
cross-sectional data, and a temporal relationship cannot be established. Prevalence estimates are suppressed if they are based on a denominator of less than 50 respondents or have a relative standard error of greater than 30%.

A module of four questions regarding radon gas were asked in the 2020 and 2021 surveys. The first question in the module was “Do you know what radon is?” If survey respondents answered “yes” to this question, they were then asked, “Has your current household ever been tested for the presence of radon gas?” The prevalence of radon awareness was first assessed by housing arrangement (homeowner, renter, or other arrangement). Weighted logistic regression models were utilized to assess the relationship between radon awareness and testing and various demographics among Michigan homeowners. All analyses accounted for the complex survey design.

Results

Prevalence of Radon Awareness Among Michigan Residents by Housing Arrangement

In 2020 and 2021, MiBRFSS surveyed 4,577 Michigan adults about radon awareness and radon testing responses. Of those respondents, 76.3% owned their home, 18.4% rented their home, and 5.3% indicated they had another housing arrangement. Overall, 60.5% of Michigan adults knew what radon gas was, but this awareness was significantly higher among homeowners (67.9%) compared to renters (38.6%) and those with another housing arrangement (36.1%) (**Figure 1**). Due to these findings, further analyses for this brief focused solely on homeowners.



Error bars represent 95% confidence intervals.

Prevalence of Radon Awareness and Radon Household Testing Among Michigan Homeowners, by Demographics

Table 1 shows the estimated prevalence of radon awareness among Michigan homeowners, broken down by several demographic characteristics. These estimates indicate the following Michigan homeowners have significantly lower radon awareness: female compared to male (62.1% vs. 74.0%); those ages 18-39 years (55.2%) compared to those ages 40-69 years (72.1%) or age 70 years or older (73.2%); Black non-Hispanic compared to white non-Hispanic (43.1% vs. 72.4%); Hispanic compared to white non-Hispanic (39.0% vs. 72.4%); those who did not finish high school compared to those who did (42.6% vs. 69.9%); and those who have a household income of less than \$50,000 compared to those who do not (62.0% vs. 72.6%). Additionally, Michigan homeowners who currently smoke had significantly lower radon awareness than those who formerly smoked (53.3% vs. 65.7%) but not those who have never smoked (60.4%).

Table 1 also shows the estimated prevalence of radon household testing completed, broken down by several demographic characteristics. Of Michigan homeowners who reported having radon awareness, less than half (47.3%) reported having their current household tested for radon. More homeowners ages 18-39 years have had their current household tested (58.5%) compared to those ages 40-69 years (46.3%) and age 70 years or older (40.1%). Fewer homeowners with a

household income of less than \$50,000 compared to those with a higher income (38.5% vs. 52.2%) and fewer unemployed or nonworking homeowners compared to employed homeowners (41.7% vs. 52.1%) had testing completed.

Table 1. Radon Awareness and Household Testing Among Michigan Homeowners, by Demographics, MiBRFSS 2020-2021

	Aware of Radon (n=3,495)		Tested Current Household (n=2,520)	
	Weighted %	95% CI ^a	Weighted %	95% CI ^a
Statewide	67.9	(65.6-70.2)	47.3	(44.8-49.8)
Age				
18-39	55.2^c	(49.6-60.7)	58.5	(51.4-65.2)
40-69	72.1	(69.1-74.9)	46.3	(43.1-49.5)
70+	73.2	(69.5-76.6)	40.1	(35.7-44.6)
Gender				
Female	62.1	(58.9-65.1)	47.6	(44.1-51.1)
Male	74.0	(70.6-77.2)	47.0	(43.5-50.6)
Race/Ethnicity				
White non-Hispanic	72.4	(70.1-74.6)	47.3	(44.6-49.9)
Black non-Hispanic	43.1	(34.3-52.4)	35.0	(23.5-48.5)
Hispanic	39.0	(26.0-53.7)	-- ^b	-- ^b
Education				
Less than a high school education	42.6	(30.9-55.2)	-- ^b	-- ^b
High school graduate or more	69.9	(67.6-72.0)	47.6	(45.1-50.1)
Household Income				
< \$50,000	62.0	(57.8-66.2)	38.5	(33.9-43.2)
\$50,000 or more	72.6	(69.6-75.5)	52.2	(48.8-55.5)
Employment Status				
Employed	69.6	(66.4-72.6)	52.1	(48.5-55.7)
Unemployed or nonworking	66.3	(62.8-69.5)	41.7	(38.2-45.2)
Disability Status				
Has a disability	63.6	(58.6-68.3)	42.0	(37.0-47.3)
Does not have a disability	69.3	(66.7-71.8)	49.2	(46.3-52.1)
Population Density of Residence				
Metropolitan	67.0	(64.3-69.6)	48.8	(45.9-51.7)
Micropolitan	73.0	(66.3-78.7)	41.2	(35.0-47.8)
Rural	69.1	(61.3-75.9)	40.5	(32.4-49.1)
Cigarette smoking				
Current smoking	53.3	(47.8-58.7)	46.1	(39.3-53.0)
Former smoking	65.7	(61.9-69.3)	46.4	(42.2-50.6)
Never smoking	60.4	(57.7-63.0)	46.0	(42.9-49.0)

a. 95% CI = 95% confidence interval (CI)

b. Data is suppressed.

c. Percentages and 95% CI in bold font indicates the estimated prevalence of radon awareness or radon household testing for that particular population of homeowners is significantly different than those of the other populations within that demographic category.

Prevalence of Radon Awareness and Radon Household Testing Among Michigan Homeowners, by Region

Homeowners' radon awareness varied greatly across the state of Michigan. The Upper Peninsula (UP) was the region with the greatest radon awareness, estimated at more than 80% of its homeowners, and the Detroit Metro region (DM) had the lowest awareness, at less than 60% of homeowners (**Figure 2**). The specific areas driving the low awareness in metropolitan Detroit are the City of Detroit and Macomb County, with 37.3% and 49.6% of homeowners knowing about radon respectively (data not shown). In the Southeast (SE) and Southwest (SW) regions, in which the nine counties that mandate radon-reducing features in new construction are located, about one in four homeowners did not know what radon was (data not shown). While it had the highest radon awareness, the UP had the lowest prevalence of homeowners testing their current household for radon, tying with the East Central (EC) region at approximately 40% (**Figure 3**). The SE region had the highest prevalence of testing at nearly 60%, but, in the SW region, less than half of homeowners reported that they had completed radon testing.

Figure 2: Radon Awareness Among Michigan Homeowners, by Region, MiBRFS 2020-2021

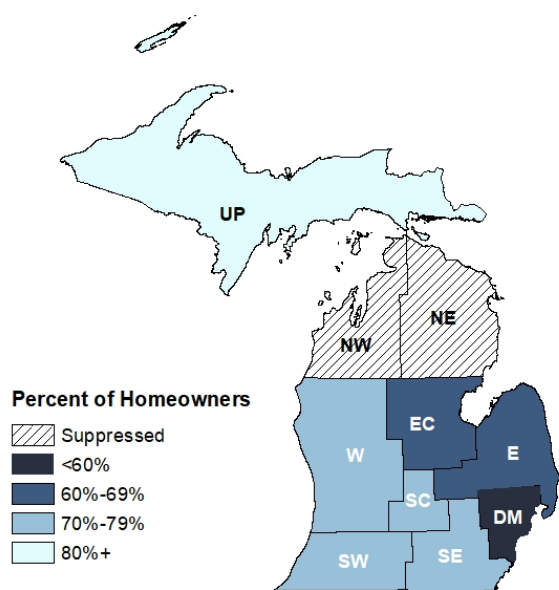
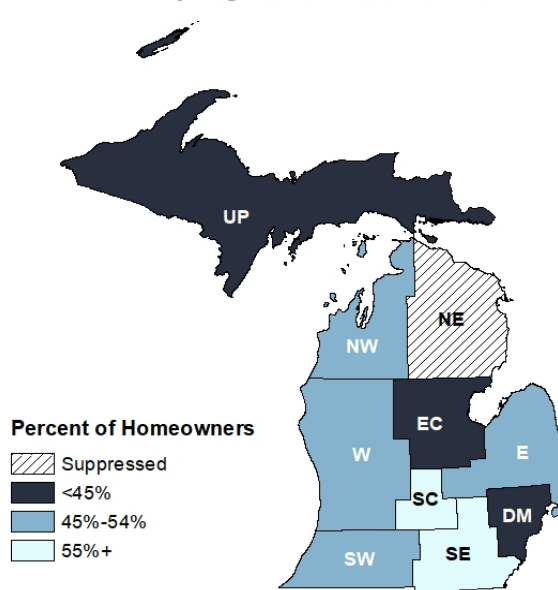


Figure 3: Radon Testing Among Michigan Homeowners by Region, MiBRFS 2020-2021



Discussion

Radon exposure is a significant cause of lung cancer, estimated by the World Health Organization to be related to 3-14% of lung cancer deaths.² In Michigan, this would be equivalent to 150-730 deaths per year.⁷ Elevated levels of radon can be present in a home despite how old the home is, how it was built, or how much radon is detected in neighboring homes.⁶ The EPA recommends that radon testing should occur in every home every two years and that even homes built or newly outfitted with radon-reducing features should be tested.⁵ Currently, the Michigan Residential Building Code requires that radon-reducing features are built in all new construction in nine southern counties that have high proportions of homes exceeding the safe threshold of radon: Branch, Calhoun, Cass, Hillsdale, Jackson, Kalamazoo, Lenawee, St. Joseph, and Washtenaw.^{8,9} Additionally, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) has an indoor radon program that educates residents on the risks of radon exposure and encourages them to take action to reduce high exposures.⁶

Radon exposure prevention efforts and the data analyses that inform them should look across the entire state of Michigan. Homes with elevated radon have been identified in every Michigan county, and the nine counties with radon-reducing construction requirements are not the only ones with more than 25% of homes testing high for radon.⁹ Overall, nearly one in three Michigan homeowners did not know what radon was. Despite that radon testing is considered relatively simple and inexpensive⁵, less than half of Michigan homeowners reported their current residences ever being tested. This analysis also identified certain Michigan populations and regions experiencing disparities in radon awareness and testing. Underserved or marginalized populations (people of color, women, those with low income or educational attainment) had significantly lower radon awareness, and fewer homeowners with lower income or without current employment completed radon testing. Additionally, the highest estimate of radon testing by region, which excluded homeowners unaware of radon, was only 60%. Detroit Metropolitan and East Central regions had low awareness, as well as low testing completed by homeowners with radon awareness. The Upper Peninsula had the highest estimate of radon-aware homeowners but the lowest of radon-aware homeowners having their current households tested.

This study demonstrates a need for continued and strengthened effort in radon reduction across Michigan.

- EGLE and MDHHS will continue collaborative dissemination of public health messaging regarding the risk of radon exposure. November is Lung Cancer Awareness Month, January is Radon Action Month, and both are opportune times to raise awareness in Michigan. Communities that should be of focus in such outreach are those with disproportionately high lung cancer burden, limited radon awareness, low income, low literacy, or low English proficiency, as well as landlords and tenants.
- Michigan entities working to reduce lung cancer burden can consider projects and partnerships to identify and address barriers that Michigan residents face in mitigating homes with high radon levels, including financial barriers.
- Advocacy efforts can focus on changes such as the expansion of the language in the seller’s disclosure statement for real estate transactions or for the adoption of radon protections for tenants of rental properties.

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