

# Radon, From the Ground into Our Schools:

## Parent/Guardian Awareness of Radon Levels in Vermont Schools

Katie Grenoble<sup>1</sup>, Florence Lambert-Fliszar<sup>1</sup>, Kirsten Martin<sup>1</sup>, Scott Neary<sup>1</sup>, Kyle Remy<sup>1</sup>  
Shawn Sanford<sup>1</sup>, Ethan Witt<sup>1</sup>, Rebecca Ryan<sup>2</sup>, David Kaminsky MD<sup>1,3</sup>, Jan Carney MD<sup>1,3</sup>

<sup>1</sup>The Robert Larner, M.D. College of Medicine at UVM, <sup>2</sup>American Lung Association, <sup>3</sup>UVM Medical Center

### Introduction

- **Radon is the leading cause of lung cancer among non-smokers** and the second leading cause of lung cancers after smoking. Radon causes an estimated 21,000 lung cancer-related deaths per year [1].
- Residential exposure to radon positively correlates with lung cancer risk [2]. While less well-documented, the level of exposure to radon in schools may be harmful to schoolchildren, faculty, and staff [3].
- The Department of Health provides free radon testing to schools, yet only 74 out of 297 total schools in the state have been tested as of 2017, and **almost 15% of these schools had levels of radon that were above the EPA's recommended action level** [4, 5].
- Of the schools with radon levels above the EPA standard, **36% have not mitigated the high radon levels** [5].
- The cost to mitigate elevated radon in schools varies from \$4,000 to \$75,000 depending on the severity of the problem and the building structure [6]. For comparison, the cost of a school bus is \$87,000 [7], and the cost of treatment for lung cancer is over \$92,000/patient/year [8].
- Increased knowledge of radon correlates with increased likelihood to test for and correct elevated radon levels [9].

### Methods

- We created a 29-question survey based on published radon surveys. Our survey assessed parent awareness of radon, its health effects, radon in schools, and participant demographics.
- We distributed paper and online surveys to parents of K-12 students via medical clinics in The UVM Health Network, a farmer's market, and a grocery store. We also distributed surveys to parents via social media platforms.
- We received and analyzed 126 completed surveys. 45 additional surveys were incomplete and excluded from data analysis. We manually entered paper surveys into LimeSurvey, and exported data from LimeSurvey into Excel.
- Two Vermont parents participated in a focus group during which open-ended questions generated discussion that was recorded and transcribed.

### Results

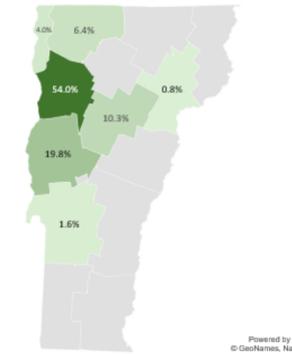
#### Demographic data:

- Female (80%)
- Caucasian (93%)
- Had a college or graduate degree (83%)
- Ages 31 to 50 (77%)
- School Districts:
  - Vermont: 25
  - New York: 1
  - Unknown: 3

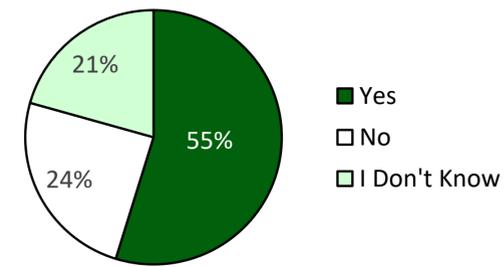
#### General knowledge of radon:

- 68.2% knew that radon comes from rock
- 84.9% knew that radon is a gas
- 50.8% knew that radon affects the lung

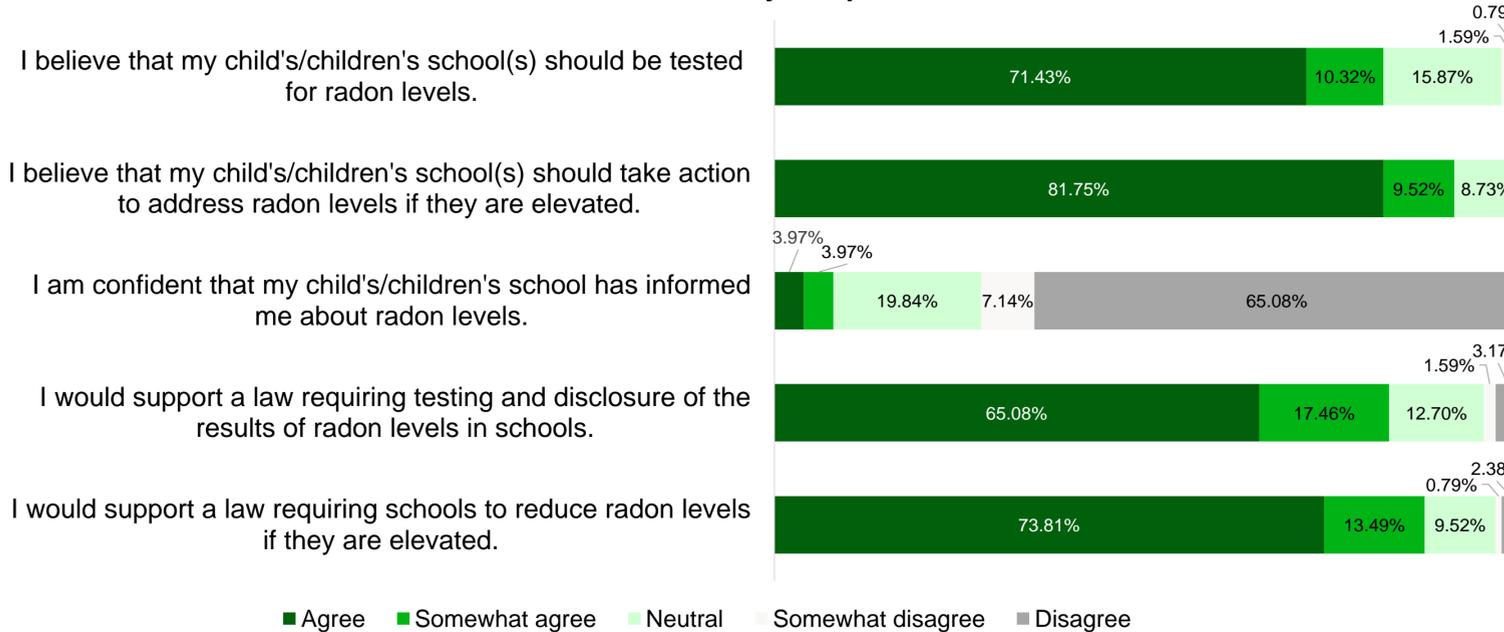
#### Survey Distribution



#### Has your home been tested for radon exposure?



#### Selected Survey Responses



#### Focus Group Themes

**Insufficient awareness**  
"In everybody's mind [smoking] is the only way you can get lung cancer. But it could have been something as simple as where you lived or [where you went to school]."

**Financial implications for schools and taxpayers**  
"We need more information about [radon] to get the support behind paying for [mitigation]."

**Responsibility for public safety and its precedence**  
"We put smoke alarms, exit signs and sprinkler systems ... in these buildings to protect people. ... And yet we don't do anything to protect them against a known carcinogen."

### Discussion

- The majority of the surveyed parents demonstrated general knowledge of radon, but only half believed that radon affects the lungs. Future efforts should focus on increasing parent awareness of the risk of radon to children in schools.
- Only 8% were confident that their child's school had informed them about radon levels. Additionally, most Vermont parents believe that their children's schools should be tested for radon and are in favor of laws requiring radon testing and disclosure.
- **91.2% believe their children's schools should take action to address elevated radon levels and 87% would support mandated mitigation.**
- Our results support the need for schools to disclose radon testing status to parents in order to create safe environments in Vermont schools.
- Potential limitations of the survey include a homogenous sample population and the participation of only two focus group members.

### Conclusion

We have identified two major knowledge gaps of Vermont parents: radon as a cause of lung cancer and the status of radon testing in schools. Educating parents on these issues can empower them as advocates for legislation that mandates testing and mitigation.

### References

1. Agency, U.S.E.P. *Health Risk of Radon*. 2017; Available from: <https://www.epa.gov/radon/health-risk-radon>.
2. Kim, S.H., et al., *Attributable risk of lung cancer deaths due to indoor radon exposure*. *Ann Occup Environ Med*, 2016. **28**: p. 8.
3. Branco, P.T., et al., *Children's Exposure to Radon in Nursery and Primary Schools*. *Int J Environ Res Public Health*, 2016. **13**(4): p. 386.
4. Education, V.a.o., *Classifying School Districts by Size and Type of Education Offered: FY2017*. 2017.
5. Michelle Reddinger, Public Health Industrial Hygienist, S.N.a.S. Administrator, Editor. 2016. Department of Health. Environmental Health Division: Vermont Seminar, M.C.E.S.S., *Radon Risk and Public Health in Vermont* V.D.o. Health, Editor. 2015. p. 110
7. Financial, D.T., *Bus Financing for Municipalities* T.B. Busses, Editor. p. 5.
8. Mariotto, A.B., et al., *Projections of the cost of cancer care in the United States: 2010-2020*. *J Natl Cancer Inst*, 2011. **103**(2): p. 117-28.
9. Wang, Y., et al., *Radon mitigation survey among New York State residents living in high radon homes*. *Health Phys*, 1999. **77**(4): p. 403-9.