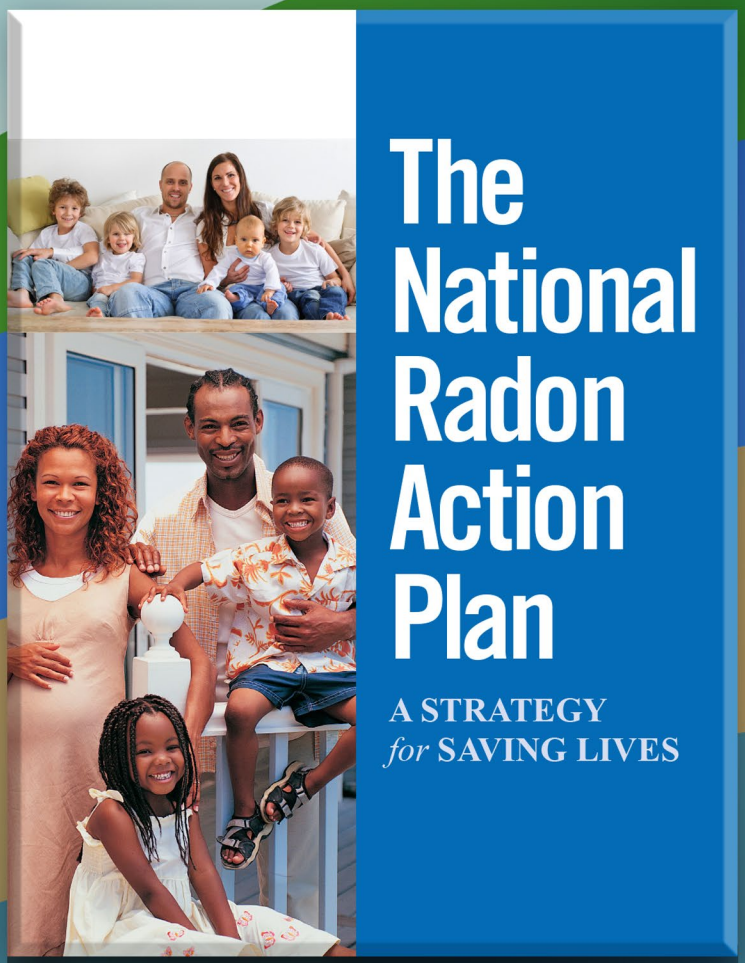

Reflections on the National Radon Action Plan's (NRAP) Progress, 2015–2020

When we find, fix and prevent high indoor radon levels as a standard practice so that no American is exposed to avoidable radon at home, school or work, we will have truly achieved the vision of the National Radon Action Plan.

—NRAP, 2015

Developed through the collaborative efforts of:

American Lung Association (Lung Association)

American Association of Radon Scientists and Technologists (AARST)

AARST Foundation

American Society of Home Inspectors (ASHI)

Cancer Survivors Against Radon (CanSAR)

Children's Environmental Health Network (CEHN)

Citizens for Radioactive Radon Reduction (CR3)

Conference of Radiation Control Program Directors (CRCPD)

Environmental Law Institute (ELI)

National Center for Healthy Housing (NCHH)

National Tribal Air Association (NTAA) (since 2017)

U.S. Environmental Protection Agency (EPA)

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC)

U.S. Department of Housing and Urban Development (HUD)

We dedicate our NRAP progress report, our past NRAP efforts and our future radon action plans to the memory of our dedicated team leader and friend, Janice Nolen. Janice led this team to create and deliver the NRAP. The progress we can report in 2020 is indebted to Janice's bold, gracious and righteous work. We miss Janice and will seek to honor our friend daily with lives saved from lung cancer.

NRAP SAVES LIVES

Radon causes an estimated 21,000 lung cancer deaths in the United States every year and is the leading environmental cause of cancer death in North America.[1] In 2015, eight nongovernmental organizations (NGOs) from industry and the not-for-profit sector joined three federal agencies in the National Radon Action Plan, or the **NRAP: A Strategy for Saving Lives.** Our multisector team came together in 2015 because of our shared commitment to eliminating avoidable radon-induced lung cancer in the United States. For the past 5 years, we have paced national action toward that end with a bold goal in the NRAP to mitigate 5 million high-radon homes and save 3,200 lives annually by 2020. By building radon testing and mitigation practices into the systems that govern purchasing, financing, constructing, maintaining and renovating buildings; creating incentives and funding for radon risk reduction; disseminating professional standards; and raising awareness of radon risk, we are approaching our goal set in 2015. In 2020, as we reflect on the NRAP, we see much to celebrate, including progress we can count in lives saved, strategic impact with our plan, and a strong national partnership to drive radon action in the future.

NRAP LIVES SAVED

The NRAP's bold goal was to mitigate 5 million homes and save 3,200 lives annually by 2020. This was the best performance we could imagine as we set our plan in 2015. New requirements to test for and fix high radon through the Federal Housing Authority's (FHA) multifamily mortgage insurance programs—changes the NRAP team has pushed for and supported at every step—have already contributed to **saving between 1,800 to 2,000 lives annually by 2020, and work completed to date through FHA will save between an estimated 13,000 to 26,000 total lives over time.** Both numbers—annual and total lives saved—will grow every year as more high-radon housing is found and fixed through FHA's business. This impact represents just one NRAP strategy, and because FHA generates annual data, we can measure it in lives saved so far and in the future.[2] **The NRAP saves lives.**

We are saving lives.

Targeted action to advance radon requirements in the HUD Federal Housing Administration's (FHA) multifamily mortgage insurance programs and a partnership with states, EPA and certified industry to implement them has saved lives. FHA's policy saves lives by finding and fixing elevated radon.[2] Estimates of lives saved through FHA represent only a fraction of NRAP success that we can quantify. We measure progress on many strategies qualitatively in Table 1, "NRAP Accomplishments 2015–2020."

Our plan, which concentrated on the most promising strategies for quick and direct saving of lives, appears to work.

In 2015, we identified a key strategy for saving lives as a standard requirement for radon testing and reduction in housing finance and insurance rules. In part, the NRAP team sought to build on the impact of the Federal Radon Action Plan (FRAP). The FRAP was a 2010–2015 effort to extend the reach, scope and impact of federal action on radon. Under the FRAP, in 2013, HUD created a comprehensive radon testing and mitigation policy for FHA-insured

refinancing transactions and new construction in multifamily buildings. The initial policy required testing one-fourth of ground floor units in existing buildings in EPA's Zone 1 and 2 radon areas, those counties with high and moderate radon potential[3]; mitigating where elevated radon levels are found; and installing soil gas control systems, which are passive controls for radon, in new construction and major rehabilitation projects. NRAP partners supported HUD's rollout of the policy by providing technical assistance and identifying aspects of the draft policy that could be improved. The HUD FHA requirements affect hundreds of thousands of housing units annually, build radon risk reduction into durable policy, and save lives that we can count. In December 2020, HUD expanded the policy's scope and impacts by requiring testing of all ground floor units and expanding the requirements nationwide (i.e., removing the previous Zone 3 low-risk area exemption). HUD's action on radon requirements during the NRAP have been transformative because FHA's success with them has demonstrated conclusively the feasibility of such requirements in all loans, a change that could help to eliminate avoidable lung cancers from indoor radon. This action also, importantly, helps to reduce radon risk in some affordable housing. We prioritize building on the FHA's success to extend protections, particularly for renters and low-income households.

We have become a high-functioning partnership capable of national impact.

In the NRAP, cross-sector stakeholders aligned on the most promising strategies—approaches that demanded diverse expertise, relationships and agency to achieve—assets our team has only when working together. The process we used to develop, deliver and track the NRAP has us continuously communicating and acting on a shared plan and building technical knowledge, trust, accountability and our team's capacity to improve the health of all Americans.

NRAP STRATEGIC SUCCESS

When developing the NRAP, our team evaluated approaches to radon risk reduction for their life-saving **impact**, the level of **effort** required to achieve them, the **feasibility** of success, and our ability to **measure** impact in lives saved. We ranked strategies on these criteria, giving extra weight to those that directly save lives or advance environmental justice, resulting in our shared vision of the 5-year strategic plan:

1. Advancing radon risk reduction through housing finance and risk management policies, building codes, and energy upgrade standards to require testing and fixing high radon levels as standard practice.
2. Encouraging increased focus and funding from public and philanthropic housing and health programs toward radon risk reduction.
3. Establishing and spreading technical quality standards and certified capacity across a nationwide professional radon industry.
4. Increasing visibility for the radon issue in homes, schools and childcare centers.

The plan we produced (see Table 1) was considered to have a high potential for significant impact and was launched with assets that partnerships need to succeed,[4] including—

- A common agenda, shared measures and mutually reinforcing activities.
- An extended commitment: a 5-year goal.
- Built-in relationships with policymakers to facilitate rapid progress.
- Strategies based on expert consensus and best available data.
- Activation of a broad constituency: 14 organizations.

After 5 years, we celebrate the HUD FHA multifamily loan program radon requirements as success to build on. Through their implementation, we have demonstrated that the path we envision can succeed. Lender policy and building codes, enhanced radon risk warning and notification requirements, workforce capacity, and quality assurance systems are being guided toward a coherent national strategy.

NRAP MEASURES OF PROGRESS

Evidence of the NRAP's influence and impact is visible across the strategies we targeted, including—

1. Building-In Radon Risk Reduction

This strategy focuses on embedding rules and standards to reduce radon risk, including building codes, a potentially enormous lever. Every 3 years, the International Residential Code (IRC), a model code for one- and two-family homes and low-rise townhomes, is updated. Radon control in new construction, which appears in IRC Appendix F, Radon Control Methods, is now required by hundreds of counties and municipalities, as well as 10 states.[5] In 2019, NRAP partners succeeded in advancing a post-construction testing requirement into Appendix F to verify that installed radon control systems work. This is a significant accomplishment. Improving radon control through building codes lies at the heart of the NRAP mission and remains a potent opportunity to save lives from radon, but it is a challenging change to achieve. We acknowledged this objective as a long-term goal with a complex path to success in the NRAP. Already, builders are installing radon control even where it is not required, and many states and localities are considering requirements. We are eager to build on success with the IRC to promote radon control requirements in all state and local codes.

2. Providing Incentives and Direct Support

Recognizing that financing for radon testing and mitigation can be an obstacle, Strategy 2 seeks incentives for people who can afford to pay—to make radon testing and mitigation convenient and even tax-free—and to direct funds to reduce the risk for people who cannot afford it. The tax incentive strategies identified in the NRAP have not yet been implemented and depend on action by the U.S. Department of the Treasury. NRAP partners will continue to engage Treasury and support any effort to finalize tax incentives for radon testing and mitigation. Radon testing has become increasingly standard in both market-rate and low-income healthy homes and energy service offerings. Examples include the Energy+Health models seen across the country, such as the Columbia Gas of Ohio (CGOH) WarmChoice® program and the City of Fort Collins, Colorado, Healthy Homes program, which promotes radon testing and provides mitigation support for low-income homeowners.[6] We also see new guidance and training for energy service providers on how to address housing-based health risks, including radon during energy retrofits. For example, EPA's Indoor airPLUS Program, the Building Performance Institute's Healthy Homes Evaluator certification and the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) equip home energy contractors, among others, with tools to assess homes and ensure that their work at least does no harm, including taking preventive steps to control radon risk. Though we see progress in use of precautionary controls, much more investment is needed to find and fix high radon levels and thereby prevent lung cancers and capture health care savings and years of healthy life in return. The demonstrated potential for social investment in radon is strong, even decoupled from energy services. For example, some of the nation's highest indoor radon levels are found in Pennsylvania, where 40 percent of homes are predicted to have high radon. The MOVES Radon Environmental Justice Project in Allegheny County is coordinating charitable giving through a

project focused in two low-income, African American communities. These communities have smoking rates 14 percent above the state's average, driving risks of lung cancer from radon even higher. Industry and advocacy leaders (also members of our NRAP Leadership Committee) joined with Pennsylvania's radon program and a local health department to find at-risk homes and deliver donated, certified testing and mitigation services. Other projects have demonstrated the feasibility of using block grants, including HUD's Indian Community Development Block Grant Imminent Threat Funds, which the Spokane Tribe of Indians used to mitigate radon in air and water. In HUD's 2021 budget, Congress allocated $4 million for a demonstration program to test and mitigate radon in public housing, which will help to decrease radon levels in underserved communities. Much more investment in underserved communities is required, and we prioritize creating equitable access to radon risk-reduction services.

3. Spreading Technical Quality Standards and Certified Capacity

This strategy addresses the need for a qualified radon workforce that can ensure radon testing and mitigation are conducted according to standards of practice so that American families can rely on the life-saving results. Development of consensus standards involves several NRAP partners. Prior to the NRAP and at the close of the FRAP, publication of multifamily testing and mitigation standards provided the springboard needed to make new radon requirements in FHA a reality; without reference standards to support training on testing and mitigating multifamily buildings, HUD FHA's program could not have moved forward. Efforts continue to help states to incorporate the latest standards into their radon requirements and programs. AARST provided free access, and EPA issued guidance through the State Indoor Radon Grant Program recommending use of the most current testing and mitigation standards for all buildings.

It is a sign of maturity for the industry that, as of 2020, consensus American National Standards Institute (ANSI)/AARST standards now exist for every building type, providing the foundation needed to expand life-saving radon rules. Similar efforts continue to grow the quality workforce needed to respond to the risk. Congress has recommended that EPA support state radon programs that have in place adequate certification or credentialing requirements for radon measurement and mitigation workers. Since the inception of NRAP, four states have taken actions to adopt or strengthen certification requirements, and several others have initiated a state-level process to create requirements.

4. Increasing Visibility for Radon in Homes, Schools and Childcare Centers

Building awareness of the radon risk is a perennial challenge because radon is odorless and invisible, and its effects in the human body occur at the cellular level, often resulting from long-term, unrecognized exposure. Radon is a silent killer, yet we know of simple and effective methods for reducing it to save lives and life years and avoid health care costs for individuals, communities, health systems and populations. Increasing awareness of the risks from radon and simple technical solutions is essential. One success that we are eager to extend is the connection between the NRAP and state comprehensive cancer control programs, initially forged under the FRAP in 2010. Leaders across sectors have worked together at the federal and state levels since the FRAP began to align radon-related, CDC-funded cancer control activities with FRAP and NRAP strategies. Today, radon is addressed in more state cancer plans (85%) than ever before, and plans are increasingly aligned with the NRAP strategy. Furthermore, members of our NRAP team have strengthened ties to the community by joining state cancer control consortia in four states and building ties to the Lung Cancer Action Network and American Cancer Society to keep the national spotlight on radon risk. A related success central to our ability to characterize, communicate and address our nation's

radon risk is using CDC's National Environmental Public Health Tracking Network's radon dataset. In 2020, for the first time ever, the Tracking Network has radon testing data at the state and county levels for most of the United States, and users can explore the number of buildings tested, as well as radon levels pre- and post-mitigation. Radon data come from some Tracking Network–funded states and national radon testing laboratories. NRAP team members, including the project lead, CDC, worked for years to stand up this national data system and engage users. As state and radon laboratory participation grows, data will be available at the census-tract level to support fine-tuned targeting for future radon interventions. High-quality data to map the risk reduction and results from certified measurement and mitigation services is key to reinforcing the evidence that the benefits of radon mitigation outweigh the costs of treating preventable lung cancer. Making the case for preventing lung cancer from radon is important for reaching health care professionals as well. NRAP leaders shepherded *Reducing the Risk from Radon: Information and Interventions: A Guide for Health Care Providers*—released in 2018 and updated in 2020 to reach and equip the health care community so that health care professionals, in turn, educate their patients—and created educational and motivational materials for schools to visually describe the risks and solutions.[7]

NRAP PATH TO FUTURE SUCCESS

When industry, nonprofit and public agencies collaborate, it can be a powerful response to problems that cannot otherwise be addressed, such as reducing national lung cancer rates by reducing radon exposure in all buildings. Cooperation is challenging, but also motivating when it saves lives. Our NRAP team exemplifies effectiveness in collaboration, and as we consider what will come next, we know that this team is good at partnering across sectors, sharing information thoroughly and regularly, meeting with allies, discussing sticking points and refining our approach to respond to changing needs. We expect to build on our most powerful success so far with continued efforts to incorporate radon requirements into housing financing and codes to achieve greater impact by 2025 in an **NRAP 2.0.** As we have in the past, we will focus on actions that drive mitigations of high-radon buildings and strengthen the infrastructure for quality services. We intend to strengthen our focus on environmental justice in NRAP 2.0.

> **In 2020, we acknowledge that risk reduction lags, particularly for populations facing an inability to pay and because of the lack of public financing and funding mechanisms. We are committed to finding solutions for the radon burden in underserved communities.**

We prioritize work that can be measured in lives saved and continuously seek to collect and analyze national progress using the best data available, to refine our measurement systems, and to quantify our impacts. We always remember that the bottom line for radon risk reduction is measured in lives saved from lung cancer.

TABLE 1. NRAP ACCOMPLISHMENTS, 2015–2020

KEY: Estimates are based on progress we can document on outcomes we aimed for in 2015. ✓ = Progress contributed to measurably increasing lives saved from radon. ⊕ = Progress is on track to affect change(s) that we expect to increase lives saved but cannot measure. ⊖ = Progress has been minimal.

PRIORITIES	NRAP STRATEGIES, 2015–2020	PROGRESS TOWARD TARGET OUTCOMES (IN BOLD)
1. BUILD-IN RADON RISK REDUCTION	1.1 Work with housing finance [sector] to encourage radon testing and mitigation as a standard practice.	1.1 **Housing finance and insurance industries increase radon testing and mitigation in homes.** Continued growth in integrating radon requirements across some HUD programs, including FHA's Residential Care Facility (2017); Rental Assistance Demonstration (2019); and Multifamily Accelerated Processing (MAP) Guide (2013, 2016, 2020), which provides guidance about implementing FHA mortgage insurance for multifamily housing. ✓
	1.2 Embed radon risk-reduction requirements in state and local building codes.	1.2 **State and local building codes require that homes be built to resist radon.** Partial success with the IRC: post-construction testing, and mitigation if radon level is high, are now required in Appendix F if the appendix is adopted by the jurisdiction. We need universal adoption of radon control requirements. Also, some success with ASHRAE 189.1/IGCC for large multifamily buildings, and Connecticut and Maine added state-wide requirements. ⊕
	1.3 Develop the research base on the cost-effectiveness of preventive and mitigation actions for radon in energy upgrades.	1.3 **Energy upgrades include radon risk reduction as standard practice where needed.** The BARRIER study, initially funded by HUD and expanded by DOE with support from EPA, involved several NRAP members and had a research agenda partly established under the FRAP. The study demonstrated that simple, low-cost precautionary radon interventions curb increases in radon that might otherwise occur during home energy retrofits. This encouraged DOE WAP to adopt the measures (sealing foundations, covering open sump pits, etc.) where elevated radon levels may be present, to add an informed consent requirement for clients, and to add proper vapor barrier installation training for practitioners. ✓
2. PROVIDE INCENTIVES & SUPPORT	2.1 Ensure radon is a priority risk addressed in healthy homes programs and grant-making.	2.1 **Criteria for national programs promoting healthy homes include radon risk reduction.** HUD's Health@Home: High-Performance Housing Rehabilitation Guidelines adopted an expanded version of the precautionary measures from the BARRIER study, and the Enterprise Green Communities criteria also reference them. However, we have not seen significant new funding that we can connect to measurable radon risk reduction since 2015. ⊕
	2.2 Leverage government-backed and other housing loans to cover radon mitigation.	2.2 **New sources of funding are available to motivate owners to test and mitigate.** The intent with this strategy is to create incentives for people who can afford it to pay to reduce their risk. No significant new incentives have been built intomarket-rate housing loans since 2015, so we consider this a strategy for further development. Moving forward, we will continue to push for action in this area. ⊖
	2.3 Secure direct support from philanthropies, charities and others, including governments, to reduce radon risk for low-income Americans in homes, schools and childcare centers.	2.3 **Radon mitigation is financed where occupants are unable to afford mitigation.** We have seen progress in Pennsylvania, Colorado and Connecticut on grants and charitable giving, but little direct support has been provided relative to the need, particularly considering the risks facing low-income renters. ⊕
	2.4 Leverage tax incentives, including Health Savings Accounts, to cover radon mitigation costs to reduce cancer-related health care costs.	2.4 **Tax incentives exist that increase voluntary radon testing and mitigation.** When the NRAP launched, there was an indication that radon testing and mitigation might be included as an IRS-approved Health Savings Account (HSA) expenditure, but we have not been able to advance federal policy in this area. Moving forward, we will continue to push for action in this area. ⊖

PRIORITIES	NRAP STRATEGIES, 2015–2020	PROGRESS TOWARD TARGET OUTCOMES (IN BOLD)
3. TEST & MITIGATE USING PROFESSIONAL RADON SERVICES	3.1 Finalize and disseminate consensus standards for testing, mitigating and ensuring measurement device accuracy.	3.1 **Professional standards are widely recognized, disseminated and adopted.** Thanks to consistent, collaborative effort, there are ANSI accredited standards of practice for testing and mitigation in every building type; they were adopted by reference in HUD's FHA program for multifamily housing and residential care facilities and as recommended guidance in EPA's radon grant program. Many of the new consensus national radon standards are driving risk reduction in building types not previously addressed with reference standards (multifamily and large buildings, medical and nursing facilities) and are, in turn, creating market activity and local policies not seen prior to 2015.
	3.2 Provide training on radon testing and mitigation in home health and safety training.	3.2 **Home health and safety programs (in-home) include radon.** This strategy was intended to spread certified radon risk-reduction capacity to aligned fields and activities, such as building performance and fire safety, but we have not seen the progress that seems possible yet. However, the adoption of the precautionary measures for radon in DOE and HUD programs has prompted national training for WAP practitioners who often work within community action agencies that provide multiple home services.
	3.3 Promote the radon profession to practitioners, such as home inspectors.	3.3 **More certified radon professionals are available nationwide.** Home inspectors have been trained, including through ASHI's 67 chapters, which offer local education, including radon training. The ASHI School has started a radon detection and inspecting radon systems course and trained an estimated 600 inspectors between 2016 and 2019.
4. INCREASE VISIBILITY	4.1 Promote radon testing and mitigation through a comprehensive disclosure of health risk to home buyers and loan borrowers.	4.1 **State/local laws require disclosure/information, and borrowers request testing and mitigation.** One state's real estate commission (Kentucky) has expanded its property condition disclosure form, and one county and one city require testing of homes during real estate transactions (Montgomery County, Maryland, and Iowa City, Iowa).
	4.2 Encourage state cancer control plans to prioritize radon.	4.2 **State cancer plans include strategies for reducing radon.** More state cancer control plans than ever before address radon (40 of 47 plans [85%], and 29 include radon objectives). Building on FRAP and NRAP efforts, states and CDC now call on our team regularly to help align state lung cancer control investments with NRAP strategy, and several NRAP leaders participate in comprehensive cancer consortia, including in Illinois, Kentucky, Pennsylvania and Tennessee.
	4.3 Focus on radon in coordinated messaging about health risks in homes, schools and childcare centers.	4.3 **Increased coordination of communication makes clear that radon is a serious risk that needs priority.** Radon risk is not as visible as it needs to be in messaging about risks to health in homes, schools and childcare centers, particularly for low-income and minority communities, but we celebrate NRAP success with the National Tribal Air Association signing on to the NRAP in 2017 and the addition of a tribal representative to our team. NRAP team members have also spearheaded campaigns for radon testing in schools in multiple states known to have high radon levels (Indiana, Ohio, Pennsylvania).
	4.4 Promote radon awareness to medical, public health and childcare communities through consistent outreach using targeted materials.	4.4 **Medical, public health and childcare practitioners educate about and reduce radon in environments.** Community health and child development leaders need to be active to prevent lung cancer from radon. We have seen some progress engaging medical, public health and childcare leaders, particularly the release by NRAP team members of *A Physician's Guide to Radon* in 2018 and a guide for health care providers, outreach to public health and nursing communities, and the growing ties with national lung cancer organizations that are helping to keep radon in the spotlight.

Endnotes

[1] U.S. Environmental Protection Agency (UESPA). 2003. *EPA Assessment of Risks from Radon in Homes*. EPA-402-R-03-003. Washington, D.C.: USEPA. www.epa.gov/sites/production/files/2015-05/documents/402-r-03-003.pdf.

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World Health Organization. 2009. *Handbook on Indoor Radon: A Public Health Perspective*. Edited by H. Zeeb and F. Shannoun. World Health Organization: Geneva, Switzerland.

[2] Estimates of lives saved through radon mitigation in the HUD FHA Multifamily Loan Program are based on HUD data on loan transactions, 2013–18, an estimate of the number of affected individuals, and a range of estimates for the distribution of radon risk. The low end of the estimated lives saved range is grounded in EPA's 1992 National Residential Radon Survey (NRRS); the higher end of the estimated lives saved range is grounded in industry self-reported data. The percentage of homes predicted to test above EPA's action level in Zones 1 and 2, where FHA's policy applied during the years analyzed here, based on the NRRS is 13%, and this assumption grounds the low end of the estimated range of lives saved. Industry members of the NRAP believe the percentage of homes that would test above the action level of 4 pCi/L for radon in Zones 1 and 2 is 18–22%, and this assumption grounds the high end of the estimated range of lives saved. Additionally, radon lab data collected by CDC in its Environmental Health Program Tracking (EHPT) database since 2016 indicates pre-mitigation radon prevalence could be considerably higher, with 37% of homes in the database testing above the EPA action level. It is important to note that there is no peer-reviewed citation for the latter two estimates at this time.

[3] USEPA. 2021. "Find Information About Local Radon Zones and State Contact Information." Indoor Environments Division, Office of Radiation and Indoor Air, Office of Air and Radiation, USEPA. Last updated on January 14. www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information.

USEPA. 2016. *A Citizen's Guide to Radon*. EPA402/K-12/002. Washington, D.C.: Indoor Environments Division, Office of Radiation and Indoor Air, Office of Air and Radiation, USEPA. www.epa.gov/sites/production/files/2016-12/documents/2016_a_citizens_guide_to_radon.pdf.

[4] While experts debate the challenges most suited to coalitions and how best to support them, there is consensus around what coalitions need, at a minimum, to succeed. See, for example:

Gajda, R. 2004. "Utilizing Collaboration Theory to Evaluate Strategic Alliances." *American Journal of Evaluation* 25 (1): 65–77. doi.org/10.1177/109821400402500105.

Pankaj, V., K. Athanasiades, and A. Emery. 2014. *Coalition Assessment: Approaches for Measuring Capacity and Impact*. Washington, D.C.: Innovation Network, Inc. www.innonet.org/media/innonet-coalition-assessment.pdf.

Raynord, J. 2011. *What Makes an Effective Coalition: Evidence-Based Indicators of Success, the California Endowment*. Philadelphia: TCC Group. www.tccgrp.com/wp-content/uploads/2018/09/What-Makes-an-Effective-Coalition.pdf.

[5] International Code Council. 2017. *2018 International Residential Code®*. Country Club Hills, IL: International Code Council codes.iccsafe.org/content/IRC2018. The Council describes this code as one that "comprises all building, plumbing, mechanical, fuel gas and electrical requirements for one- and two-family dwellings and townhomes up to three stories."

[6] "The WarmChoice weatherization project deferral rate is very small, in the 1–2% range. This may be attributed to the more recent decision by CGOH to add funding to support identification and a certain degree of remediation of asbestos and radon hazards, and to cover health and safety repairs like roofing, up to ten thousand dollars if the thermal savings opportunity is very high." From Capps, L., L. Curry, and E. Levin. 2019. *Energy-Plus-Health Playbook*, p. 66. Winooski, VT: Vermont Energy Investment Corporation. e4thefuture.org/wp-content/uploads/2019/07/Energy-Plus-Health-Playbook_VEIC.pdf.

[7] Conference of Radiation Control Program Directors, Inc. (CRCPD). 2020. *Reducing the Risk from Radon: Information and Interventions: A Guide for Health Care Providers*. CRCPD Publication 20-3. Frankfort, KY: CRCPD. Originally published 2018, revised September 2020. www.radonleaders.org/resources/reducingtheriskfromradon.