

Invisible Risks: Assessing Healthcare Professionals' Knowledge, Attitudes and Practices Around Indoor Air Quality



Executive Summary

Americans spend 90% of their time indoors where the levels of pollutants are often two-to-five times higher than outdoor concentrations. Indoor air is filled with pollutants that can negatively impact our health. Healthcare professionals (HCP) can play a vital role in protecting their patients from the health impacts of indoor air pollution. The American Lung Association conducted a nationwide survey of healthcare professionals to assess their attitudes, beliefs and practices around indoor air pollution. A total of 901 usable surveys from all 50 states and the District of Columbia were received.

Key Findings

1. Nearly all (N=804, 89.2%) respondents strongly agreed or agreed that assessing exposure to indoor air pollution (IAP) can be relevant for the care of patients.
2. However, only one in four (N=241, 26.7%) strongly agreed or agreed that they were satisfied with their current knowledge of the health effects of IAP.
3. A consensus among HCPs, regardless of geography, practice type or length of practice, on the importance of their role in educating patients about the health impacts of IAP and the relevance of assessing exposure to patient care.
4. This survey highlights critical gaps in HCPs' self-perceived knowledge and preparedness to discuss IAP with their patients. While familiar with some common indoor allergens and secondhand smoke, professionals reported significantly lower familiarity with the health effects of pollutants like radon, emissions from residential combustion, lead paint dust, particulate matter and volatile organic compounds (VOCs) – all of which pose substantial risks to public health.
5. A considerable proportion (49.2%) of respondents reported discussing IAP with only a few or none of their patients, citing barriers such as a lack of knowledge and time constraints.

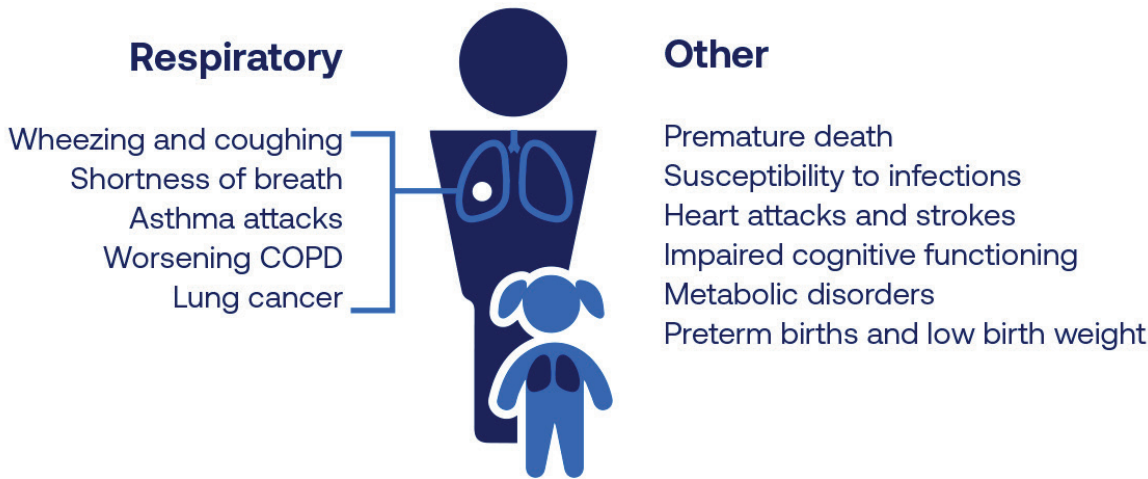
These findings underscore a clear need for enhanced training and resources for healthcare professionals on the diverse range of indoor air pollutants, their health consequences and effective communication strategies. Integrating IAP information into medical, nursing and allied health curricula and providing continuing education opportunities could empower HCPs to confidently address this critical environmental health issue with their patients. Strategies to streamline IAP assessment and clinical workflows are necessary to overcome time-related barriers.

Equipping HCP with the necessary knowledge and tools will enable them to fulfill their potential as trusted messengers, identify at-risk individuals, effectively educate patients, recommend appropriate interventions and advocate for healthier indoor environments.



The air we breathe is filled with gases and particles. Some IAPs damage the alveolar wall through oxidative stress, inflammation, and direct cellular toxicity, which can reduce lung function. If small enough, the particles will cross into the bloodstream, and throughout the body, reducing the oxygen-carrying capacity of the blood and impacting health. Short-term health effects from IAP include headaches, eye, nose and throat inflammation, and coughing, painful breathing and bronchitis. Long-term side effects can reduce the immune response, impact the central nervous system and cognition,⁴ cause exacerbations in respiratory diseases, and even cause cancer. Poor indoor air can also impact the blood, spleen, liver and reproductive system.^{5,6,7} The World Health Organization attributes 3.2 million deaths related to household air pollution to ischemic heart disease, stroke, lower respiratory infections, COPD and lung cancer.⁸

Air pollution can harm children and adults in many ways



List of Common Indoor Air Pollutants

Building Construction and Furnishings

- [Asbestos](#)
- [Building and Paint Products](#)
- [Carpets and Rugs](#)
- [Formaldehyde](#)
- [Lead](#)

Fuel-burning Appliances

- [Carbon monoxide](#)
- [Nitrogen dioxide](#)
- [Particulate matter](#)
- [Residential wood burning](#)
- [Health Impact of Combustion in Homes](#)
- [The Health Harms of Fuel-burning Home Appliances](#)

Moisture and Water

- [Mold](#)
- [Floods and water damage](#)

Occupancy

- [Cockroaches](#)
- [Dust and dust mites](#)
- [Pet dander](#)
- [Secondhand smoke](#)
- [Particulate matter](#)
- [Volatile organic compounds](#)
- [Rodents](#)
- [3D printers](#)

Outdoor Sources

- [Radon](#)
- [Wildfire Smoke](#)

Scents and Chemicals

- [Cleaning supplies and household chemicals](#)
- [Volatile organic compounds](#)
- [Essential oils](#)
- [Fragrances](#)

Who is Most at Risk?

While IAP affects all stages of life, certain populations are particularly vulnerable. Children, the elderly and people with pre-existing health conditions who spend more time indoors are at increased risk of exposure to pollutants. The elderly are less able to fight the effects of pollutants and are more likely to have multiple health conditions. Children take more breaths than adults and are also closer to the ground, where pollutant concentrations are higher, putting them at higher risk. Pregnant individuals and their babies are also at higher risk for adverse health outcomes because of poor air quality. People with pre-existing health conditions like asthma and COPD are especially vulnerable because air pollution can make their conditions worse.

Air Pollution: Affects All Life Stages

Pre-Conception



Intrauterine



Newborn



Toddler



Child



Adolescent



Adult



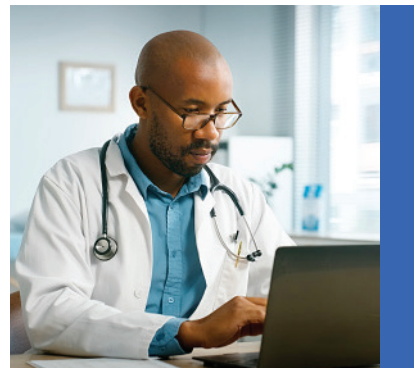
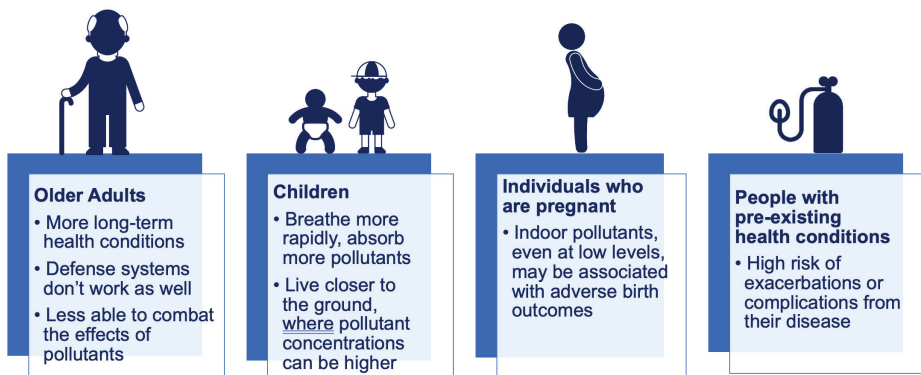
Elderly



Communities of color and low-income communities are disproportionately impacted by IAP because these communities are more likely to live in:

1. Sub-standard housing;
2. Closer proximity to high pollutant sources like factories, highways and ports;
3. Higher risk of chronic disease which can be exacerbated by pollution;

Vulnerable Populations



Healthcare professionals (HCP) should be familiar with IAP because:

1. They are trusted messengers of health-related matters, can communicate the risks of IAPs, and offer mitigation strategies;
2. Early identification and intervention are key to minimizing exposure and health impacts; and,
3. Vulnerable populations, including children, older adults, people who are pregnant, and individuals with existing lung and heart disease are disproportionately affected by IAP.^{9,10}

Survey Methods

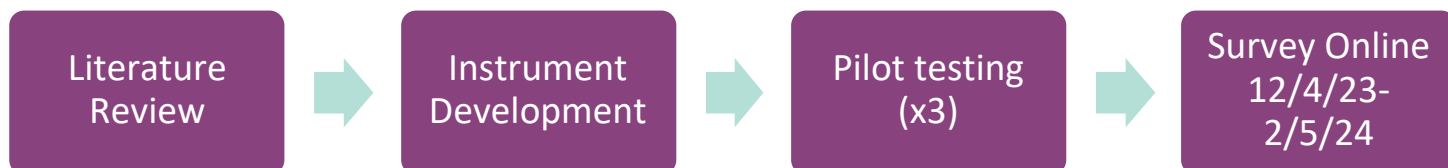
There is a lack of information on HCP's knowledge, attitudes, and practices related to IAP. The American Lung Association sought to fill this knowledge gap and a [nationwide survey](#) of over 900 HCPs about attitudes, beliefs and practices of IAP and its health impacts was conducted.

The Lung Association drafted and refined a questionnaire with input from internal and external experts, including toxicologists, HCPs, researchers and indoor air quality experts. Content validity exercises were completed and revisions were made based on feedback. The survey was pilot tested with subsequent revisions resulting in a survey instrument with 28 questions.

The target audience was HCPs currently practicing in the U.S. While providers (physicians, physician assistants and nurse practitioners) were the primary audience, responses were collected from any credentialed HCP. The response goal was 1,000. An effort was made to ensure the survey was disseminated, and responses were obtained, from all 50 states.

The survey was distributed electronically from December 5, 2023 through February 5, 2024. Survey recruitment occurred through direct messaging to Lung Association HCP contacts, e-newsletter posts and social media channels. A vendor was also contracted to reach a larger audience of HCPs. At least two reminder emails were distributed.

Survey Tool Development



Data files were collated, checked for valid responses, and exclusion criteria were applied. Exclusion criteria included respondents outside of the 50 states of U.S. and District of Columbia, incomplete surveys (e.g. surveys with only demographic information or under five questions answered) and non-HCP respondents. Responses to individual survey questions were evaluated for valid response ranges (e.g. surveys providing text results instead of numerical response) and those specific questions' responses were eliminated. Content analysis of open-ended questions was completed. Descriptive analytics (e.g. healthcare license type, geographic area, and geography type) were provided. Proportional testing using Chi Square was used to analyze the data where there were comparisons among and between respondents. A priori to test for statistical significance was set at $p < 0.05$. Analysis was conducted using SAS v9.4¹¹

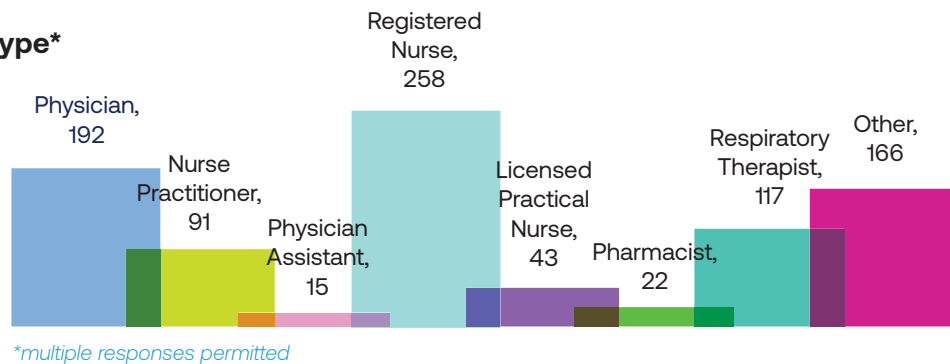
Results

A total of 1,201 surveys were submitted. Following the application of exclusion criteria, 901 surveys were available for analysis. All 50 states and the District of Columbia were represented. Respondents from seven states (Minnesota, California, Illinois, New York, Florida, Texas and Wisconsin, listed in order of number of responses) comprised N=391 (43.4%) of responses.

Demographics

Respondents represented a variety of healthcare license types, including registered nurse N=258 (28.6%), physician N=192 (21.3%), respiratory therapist N=117 (13%), nurse practitioner N=91 (10%); licensed practical nurse N=43 (4.8%), pharmacist N=22 (2.4%), physician assistant N=15 (1.7%) and other N=166 (18.4%) (multiple responses were permitted).

Current License Type*



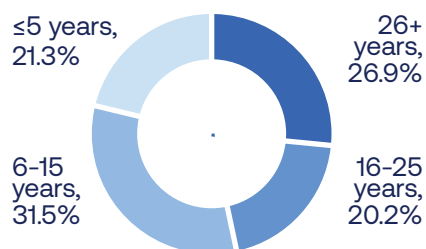
Survey respondents practiced in all geographic areas including suburban N=454 (37.9%), urban N=377 (31.5%), rural N=330 (27.5%), and tribal communities N=37 (0.03%). Multiple responses were permitted.

Area Served*



Respondents reported a variety of years in practice including: 26 years or more N=243 (26.9%), 16-25 years N=182 (20.2%), 6-15 years N=284 (31.5%) and five years or less N=192 (21.3%).

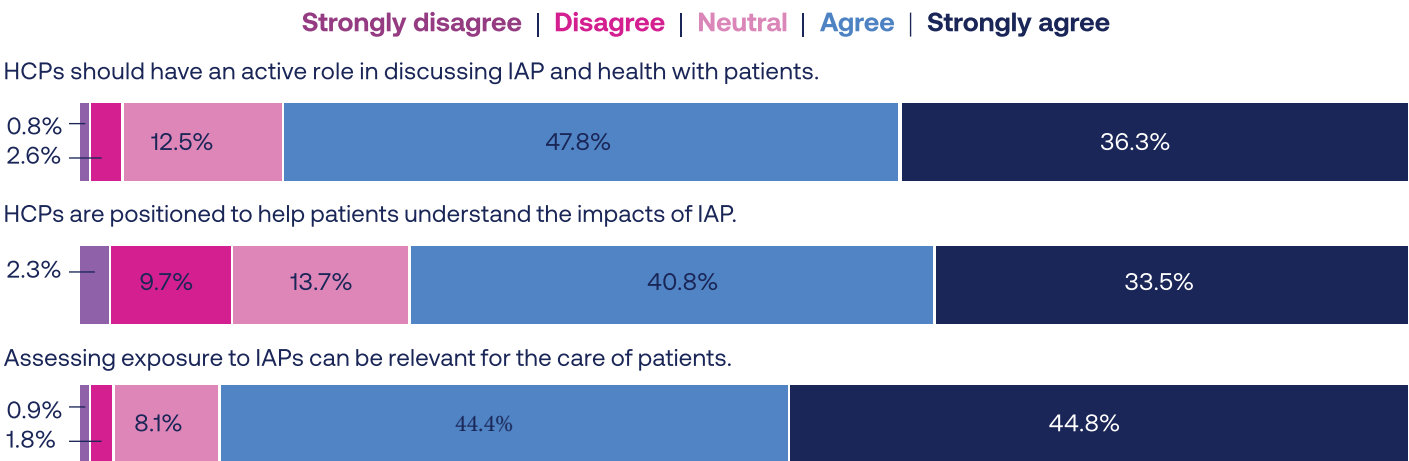
Years in Practice



Healthcare Professionals Should Assess and Have an Active Role in IAP

Slightly more than four out of five (N=758, 84.1%) of respondents strongly agree or agree that HCPs should have an active role in helping patients understand IAP. Nearly three out of four (N=670, 74.4%) of respondents strongly agree or agree that HCPs can help patients understand the impact of IAP. Nearly all (N=804, 89.2%) of respondents strongly agree or agree that assessing exposure to IAP can be relevant for the care of patients.

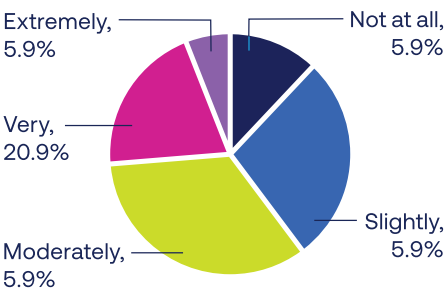
Respondents agree that Healthcare Professionals (HCPs) should assess for and play an active role in helping patients understand indoor air pollution (IAP).



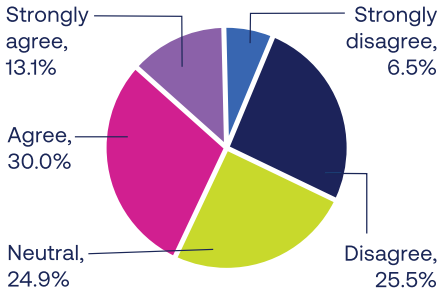
One in Four Are Satisfied with Their Current Knowledge of Indoor Air Pollution

Of particular importance to clinical practice, only slightly more than one in four (N=241, 26.7%) strongly agree or agree that they are satisfied with their current knowledge of the health effects of IAP and only two out of five (N=388, 43.1%) feel well-prepared to discuss the health effects of IAP with their patients. See Table 1 on next page.

Only **1 in 4** are satisfied with their current Knowledge of the health effects of indoor air pollution.



Only **2 in 5** HCPs feel well-prepared to discuss The health impacts from indoor air pollution with patients.

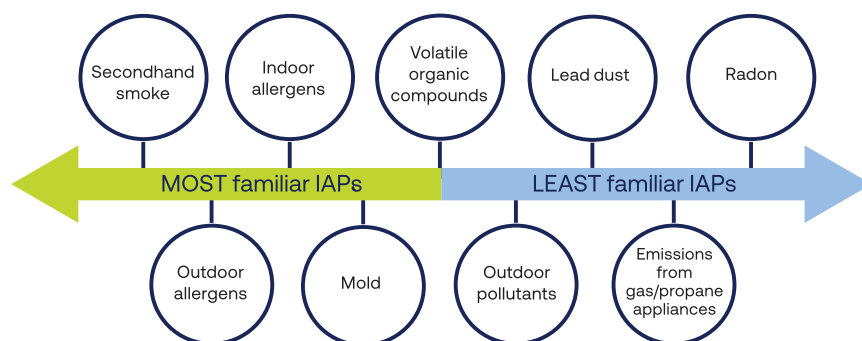


Question #11	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
I am concerned about the health impacts of indoor air pollution on my patients.	N=14 (1.6%)	N=20 (2.2%)	N=478 (53.1%)	N=215 (23.9%)	N=174 (19.3%)
Assessing exposure to indoor air pollutants can be relevant for the care of my patients.	N=8 (0.9%)	N=16 (1.8%)	N=73 (8.1%)	N=400 (44.4%)	N=404 (44.8%)
I feel well-prepared to discuss the health impacts from indoor air pollution with my patients.	N=59 (6.5%)	N=230 (25.5%)	N=224 (24.9%)	N=270 (30.0%)	N=118 (13.1%)
Healthcare professionals are positioned to help patients understand the impacts of indoor air pollution.	N=21 (2.3%)	N=87 (9.7%)	N=123 (13.7%)	N=368 (40.8%)	N=302 (33.5%)
Healthcare professionals should have an active role in discussing indoor air pollution and health with their patients.	N=7 (0.8%)	N=23 (2.6%)	N=113 (12.5%)	N=431 (47.8%)	N=327 (36.3%)
How satisfied are you with your current knowledge of the health effects of IAP?	N=109 (12.1%)	N=254 (28.2%)	N=297 (33.0%)	N=188 (20.9%)	N=53 (5.9%)

Table 1: Healthcare professionals' responses regarding their attitudes and beliefs about indoor air pollution and its relevance to their clinical practice.

Healthcare Professionals Are Not Familiar with Common Indoor Air Pollutants

HCPs were asked about their familiarity with the health effects of specific IAPs. HCPs responded that they were least familiar with the health effects of radon, emissions from residential combustion, lead dust, and outdoor pollutants infiltrating the indoor environment. HCPs were most familiar with the health effects of secondhand smoke, outdoor allergens, indoor allergens, and volatile organic compounds (VOCs). See Table 2 on next page.



Question #14	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Emissions from gas or propane appliances including carbon monoxide, benzene, particulate matter and nitrogen oxides	N=64 (7.1%)	N=183 (20.3%)	N=262 (29.1%)	N=286 (31.7%)	N=106 (11.8%)
Indoor allergens such as those from mice, dust mites, cockroaches, dander from pets, etc.	N=17 (1.9%)	N=123 (13.7%)	N=182 (20.2%)	N=322 (35.7%)	N=257 (28.5%)
Infiltration of outdoor air pollutants, such as emissions from transportation, industrial operations, wildfire smoke, etc.	N=41 (4.6%)	N=156 (17.3%)	N=232 (25.7%)	N=304 (33.7%)	N=168 (18.6%)
Lead dust from lead-based paint	N=55 (6.1%)	N=189 (21.0%)	N=240 (26.6%)	N=268 (29.7%)	N=149 (16.5%)
Mold growth indoors	N=20 (2.2%)	N=124 (13.8%)	N=205 (22.8%)	N=350 (38.8%)	N=202 (22.4%)
Outdoor allergens such as pollens from trees, greens, and weeds that find their way indoors	N=14 (1.6%)	N=82 (9.1%)	N=177 (19.6%)	N=355 (39.4%)	N=273 (30.3%)
Particulate matter from candles, incense, or indoor burning of wood in fireplaces or wood stoves	N=46 (5.1%)	N=179 (19.9%)	N=212 (23.5%)	N=305 (33.9%)	N=159 (17.6%)
Radon	N=136 (15.1%)	N=233 (25.9%)	N=218 (24.2%)	N=206 (22.9%)	N=108 (12.0%)
Secondhand smoke from cigarettes, cigars, marijuana, or vape devices	N=5 (0.6%)	N=46 (5.1%)	N=120 (13.3%)	N=353 (39.2%)	N=377 (41.8%)
Volatile organic compounds and chemicals such as those found in cleaning products, fragrances or air fresheners, pesticides, or paint/remodeling materials	N=43 (4.8%)	N=165 (18.3%)	N=208 (23.1%)	N=317 (35.2%)	N=168 (18.6%)

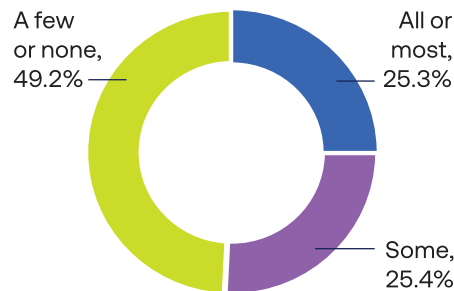
Table 2: Healthcare professionals' self-reported familiarity with the health effects of various indoor air pollutants.

A composite score was developed from responses to the question “How familiar are you with the health effects of the following indoor air pollutants?” This gave a composite score of 0 – 1, where 0 was no knowledge and 1 was perfect knowledge. Each of the 10 elements of this question had equal weight as an IAP and health impact. This made a continuous variable from 0 to 1 where a mean score was available to compare knowledge among provider types. Therapists (RT, PT, and OT) ranked themselves with the highest knowledge (0.658). Physicians rated themselves with a score of 0.626, while registered nurses rated themselves with a slightly lower score of 0.598.

HCPs Are More Likely to Discuss Limiting Indoor Air Pollution with Patients with Asthma/Respiratory Conditions and Patients Age 65+

Nearly half of respondents N=444 (49.2%) selected “none” or “a few” when asked how often they discuss the impact of IAP on patient health. However, when asked if they have ever talked with their patients about how to limit exposure to IAP, N=566 (62.8%) responded in the affirmative. Patients with asthma/respiratory conditions N=637 (33.6%) and patients over 65 years of age N=244 (12.9%) were the most frequently identified patient groups receiving education about limiting IAP exposure (multiple responses were permitted).

With What Portion of Your Patients Do You Discuss the Impact of Indoor Air Pollution on Health?



HCPs Are More Likely to Discuss Indoor Air Pollution than Outdoor Air Pollution with Patients

When asked if respondents were more likely to talk to their patients about outdoor air pollution or IAP, 46.8% (N=422) indicated they were more likely to talk to their patients about IAP; 36.9% (N=332) indicated outdoor air pollution. A notable number, N=147 (16.3%) indicated that they were not likely to talk to their patients about either outdoor or IAP.

Allergy Testing and Mitigation Are Recommended for Patients

In response to patients reporting symptoms potentially related to IAP, N=653 (72.5%) respondents indicated they were likely or very likely to recommend interventions to mitigate exposure. Interventions most recommended included:

1. Eliminating/reducing sources of pollution N=495 (15.1%);
2. Using portable HEPA air cleaner N=390 (11.9%);
3. Enhancing cleaning and/or dust control N=366 (11.2%);
4. Increasing ventilation N=354 (10.8%); and
5. Referrals to allergy testing N=338 (10.3%).
6. About ten percent (10.6%) (N=349) indicated they would provide educational handouts as the intervention

(Multiple responses were permitted).

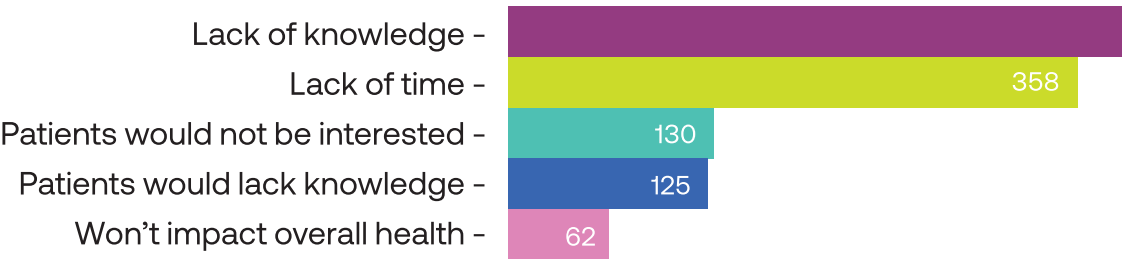
However, when asked how often **patients with asthma** are tested for allergies or referred to allergy testing to confirm their asthma triggers, N=244 (27.1%) reported “never” or “rarely”; N=199 (22.1%) responded “sometimes”; N=396 (44.0%) reported “very often” or “always”; and N=71 (7.8%) responded “not applicable.”

When asked how often **patients with COPD** are assessed for past or current occupational or environmental exposures, N=136 (15.1%) reported “never” or “rarely”; N=113 (12.5%) reported “sometimes”; N=415 (46.1%) reported “very often” or “always”; and N= 237 (26.4%) responded “not applicable.”

Knowledge and Time Are Barriers to Discussing Indoor Air Pollutants with Patients

Respondents listed several barriers that prevent them from discussing IAP with patients including lack of knowledge regarding how to approach this issue N=386 (28.8%); lack of time N=358 (26.8%); “my patients would not be interested” N=130 (9.7%); and “my patients would not be knowledgeable enough about IAP to discuss the issue” N=125 (9.3%). Nearly 200 respondents (N=197, 14.7%) indicated that they do not face barriers when discussing IAP-related health issues with patients (Multiple responses were permitted).

Barriers to Discussing IAP-Related Health Issues with Patients



Respondents were asked which IAP topics they would like to learn more about. Responses included:

- 1. Asthma triggers and allergens N=112 (16.6%)
- 2. VOCs N=96 (14.2%); Radon N=64 (17.1%)
- 3. Gas contaminants including combustion by-products and gas stove emissions N=64 (17.1%)
- 4. Smoking including e-cigarettes, vaping, marijuana, second-hand smoke, and third-hand smoke N=49 (7.3%)
- 5. Particulate matter N=36(5.3%) (Multiple responses were allowed).

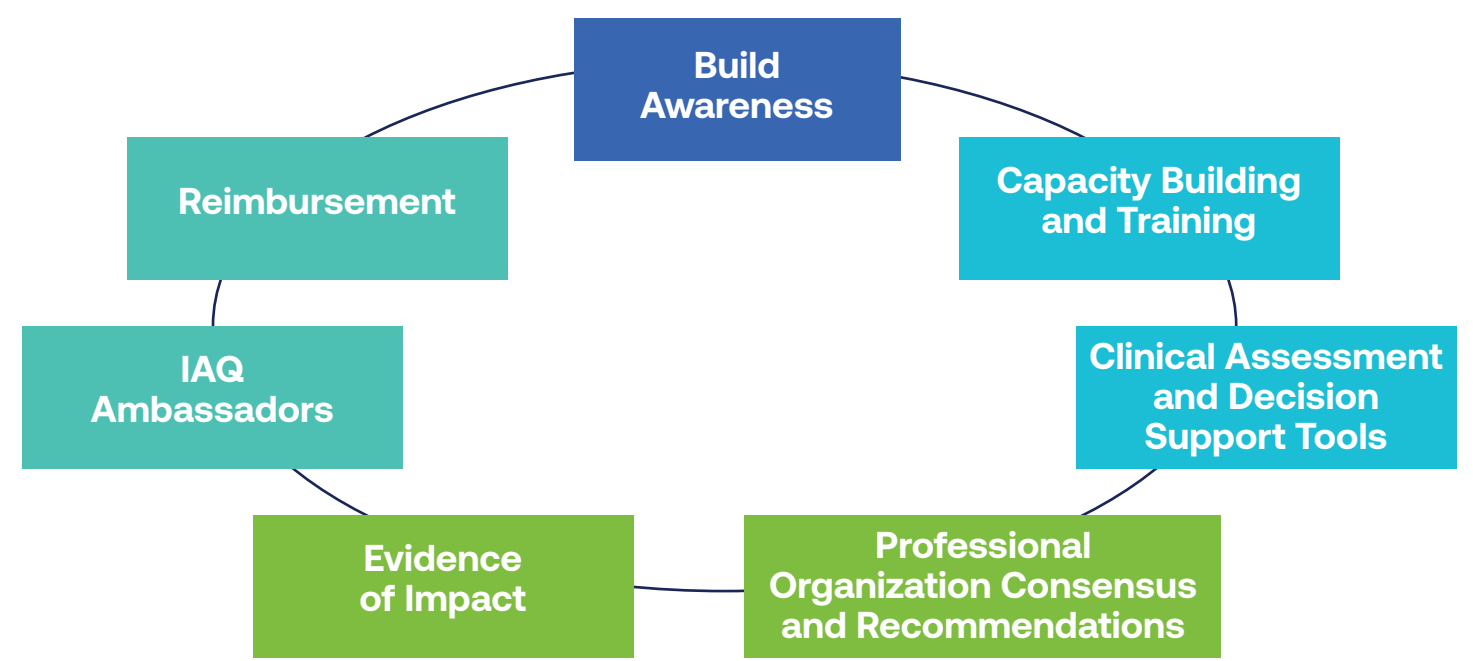
Respondents were asked about what IAP and health resources would be helpful. The following were the top requested resources:

- 1. Continuing professional education on indoor air pollution and health
- 2. Patient education materials
- 3. Research articles demonstrating link between indoor air pollution and clinical outcomes
- 4. Training to communicate effectively about indoor air pollution and health
- 5. Treatment or assessment options.

The Lung Association Is Engaging Health Care Professionals

These survey findings formed the basis for the Lung Association’s strategic direction to engage, educate and empower HCPs in indoor air quality. With guidance from its Indoor Air Quality Advisory Committee, the Lung Association is working to build awareness, capacity, and clinical assessment and decision support tools for healthcare professionals; engage other professional health organizations; ensure evidence of impact for HCP’s intervention in indoor air quality; launch an Indoor Air Quality Ambassador Program; and ensure reimbursement for related services.

Engaging Healthcare Professionals in Indoor Air Quality



Since 2024, the Lung Association has made efforts to build awareness of healthcare professionals’ role in indoor air quality through state and national medical and public health presentations, practice association publications and targeted social media campaigns.

The Lung Association sought to address the lack of clinical assessment and decision support tools through the development, pilot testing and distribution of tools, videos, HCP fact sheets and patient-facing fact sheets on mold, particulate matter, radon, residential combustion and VOCs. To help HCPs and patients take action, a personalizable Indoor Air Quality Action Plan is available in [English](#) and [Spanish](#). These resources are available at no cost through the [Indoor Air Quality Resource Hub for Healthcare Professionals](#).

The Lung Association is building the capacity of HCPs around indoor air quality, including the fall 2025 nationwide webinar for respiratory therapists in partnership with RT Magazine and our October 2026 webinar with the [National Association of Community Health Workers](#). In spring 2026, the American Medical Association featured the Lung Association’s [Invisible Risks: The health impacts of indoor air pollutants](#), a free, online, one-hour CME/CE course on its [ALA Ed Hub](#). In June 2026, the Lung Association offered a nationwide Indoor Air Quality for Healthcare Professionals Continuing Medical Education (CME) case study workshop and 400 medical professionals attended.

The Lung Association is expanding its reach through an Indoor Air Quality Ambassador Program by recruiting, vetting, training and supporting passionate HCPs nationwide to serve as indoor air quality spokespeople and educators. To learn more, please contact IAQAmbassadors@Lung.org.

What Can You Do Today to Help Your Patients At-Risk for Indoor Air Pollution?

1. Learn more! Take Invisible Risks: The health impacts of indoor air quality [online course](#), a one-hour self-paced CME/CEU free course.
2. Utilize the Lung Association's [Indoor Air Quality Resource Hub for Healthcare Professionals](#) that includes fact sheets, decision support tools, videos and more
3. Provide your patients with an Indoor Air Quality Action Plan ([English](#) and [Spanish](#))
4. Apply to be an Indoor Air Quality Ambassador!

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About the American Lung Association

The American Lung Association is the leading organization working to save lives by improving lung health and preventing lung disease through education, advocacy and research. The work of the American Lung Association is focused on four strategic imperatives: to defeat lung cancer; to champion clean air for all; to improve the quality of life for those with lung disease and their families; and to create a tobacco-free future. For more information about the American Lung Association, which has a 4-star rating from Charity Navigator and is a Platinum-Level GuideStar Member, call 1-800-LUNGUSA (1-800-586-4872) or visit: [Lung.org](https://lung.org). To support the work of the American Lung Association, find a local event at [Lung.org/events](https://lung.org/events).



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