HEALTHY INDOOR AIR FOR AMERICA'S HOMES: A SUCCESSFUL PARTNERSHIP

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Abstract

Healthy Indoor Air for America's Homes is a collaborative interagency effort with the goal of delivering basic but comprehensive indoor air quality information to consumers and built environment professionals. Funding has been provided from the U.S. Department of Agriculture – Cooperative State Research, Education, and Extension Service and the Environmental Protection Agency. The development and implementation of the program was outlined in this article, beginning with an initial project team and emerging as a nationwide program. Outreach outcomes were numerous, positively impacting thousands of consumers. Research initiatives were also described, including the development of two demonstration houses. The program celebrated its tenth year during the 2005 conference of the Housing Education and Research Association. Healthy Indoor Air for America's Homes can be considered as a successful partnership with bright prospects for the future.

Introduction

The Healthy Indoor Air for America's Homes program is a collaborative interagency effort to increase the knowledge and understanding of residential indoor air quality (IAQ) issues by the general public. The goal of this program is to deliver basic but comprehensive IAQ information to consumers and built environment professionals. The objective of Healthy Indoor Air for America's Homes is to educate consumers and built environment professionals about

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sources, health risks, and control measures related to common residential indoor air problems and to help consumers reduce their health risks from these problems (Vogel & McMindes, 1999).

Funding has been provided by the U.S. Department of Agriculture – Cooperative State Research, Education, and Extension Service (USDA/CSREES) and the U.S. Environmental Protection Agency (EPA) – Indoor Environments Division. The partnership started with meetings convened by the Consumer Federation of America who felt that EPA and USDA/CSREES were a logical match combining technical knowledge and outreach capabilities on IAQ issues.

The need for this program was based on research showing that the quality of indoor air can be worse than that of outdoor air. This occurs because many homes are being built and remodeled more tightly without regard to the factors that assure fresh and healthy indoor air. Homes today also contain furnishings, combustion appliances, and household products that can result in poor IAQ (U.S. Environmental Protection Agency, 1995).

As part of the program consumers learn to identify possible signs of IAQ problems (Healthy Indoor Air for America's Homes, 2001). These include:

- Noticeable lack of air movement
- Unusual and noticeable odors
- Stale or stuffy air
- Dirty or faulty central heating or air conditioning equipment
- Damaged flue pipes or chimneys
- Unvented combustion air sources for fossil fuel appliances
- Excessive humidity
- Presence of molds and mildew
- Health reaction after remodeling, weatherizing, using new furniture, using household and hobby products, or moving into a new home
- Feeling noticeably healthier outside

Consumers are also instructed in common sources of air quality problems (Tremblay & Vogel, 1999), including:

Moisture and biologicals such as molds, mildew, dust mites, animal dander, and cockroaches from high humidity levels, inadequate ventilation, and poorly maintained humidifiers and air conditioners.

Combustion products including carbon monoxide, from unvented fossil fuel space heaters, unvented gas stoves and ovens, and backdrafting from furnaces and water heaters.

Formaldehyde from durable press draperies and other textiles, particle board products such as cabinets and furniture framing, and adhesives.

Radon which is a radioactive gas from soil and rock beneath and around the home's foundation, groundwater wells, and some building materials. It is a common pollutant found in many homes and has been linked to lung cancer.

Household products and furnishings such as paints, solvents, air fresheners, hobby supplies, dry cleaned clothing, aerosol sprays, adhesives, and fabric additives used in carpeting and furniture which can release volatile organic compounds.

Asbestos found in most homes more than 20 years old. Sources include deteriorating, damaged, or disturbed pipe insulation, fire retardant, acoustical material, and floor tiles.

Lead from lead-based paint dust created when removing paint by sanding, scraping, or burning.

Particulates from dust and pollen, fireplaces, wood stoves, kerosene heaters, and unvented gas space heaters.

Tobacco smoke which produces particulates, combustion products, and formaldehyde.

Development and Implementation

As a first step toward educating Cooperative Extension faculty, a pilot course was delivered in Nashville, Tennessee, in August 1994. With funding from EPA's Indoor Environments Division, EPA Region IV, the American Lung Association of Tennessee, and USDA/CSREES, a residentially-oriented version of the Orientation of Indoor Air Quality (OIAQ) course was delivered to 40 cooperative partner affiliates and USDA State Extension Housing and Environment Specialists. In September 1995, with funding provided by EPA Region VII and USDA/CSREES, a second residentially-oriented version of the OIAQ course was delivered to 50 cooperative partner affiliates and USDA State Extension Housing and Environment Specialists in Nebraska City, Nebraska. These courses were a success and served as a foundation for this partnership.

In July 1995, 12 Extension Housing and Environment State Extension staff met with Washington, DC-based EPA and CSREES staff to design a national IAQ Extension educational program. The program includes:

1. A national IAQ program manual. This training manual contains 12 self-guided and self-contained modules consisting of lesson plans, visuals, and videos. There are also consumer self-assessments, marketing and media materials, program record-keeping materials, and evaluation tools. Dozens of ideas are provided for program implementation (Vogel & McMindes, 1999).
2. A train-the-trainer workshop to train 50 IAQ Extension program managers (one per state).
3. A train-the-trainer program to train county Extension educators by the state program managers.
4. A training program by county educators to educate consumers who are most at risk concerning IAQ issues and encourage them to reduce their health risks from IAQ problems.

A call for proposals was issued in September 1995 to select a lead state for developing the manual and the national train-the-trainer workshop. A team of six Extension Housing Specialists representing the four regions of the U.S. (Northeast, South, Central, and West) was selected with Michael Vogel, Montana State University Extension Service Housing Specialist, as Project Leader and Montana as lead state.

The project team worked closely for a year to develop the program, the manual, and the workshop. The workshop was held in Nebraska City, Nebraska, in November 1996 with over 50 participants representing 45 states, Washington, DC, Puerto Rico, and two representatives of the National Association for Family and Community Education (NAFCE). At the workshop the manual was given to each participant. Over 1,200 copies of the manual were ordered by educators throughout the country and copies were provided to the 37 member states of NAFCE.

Outreach Impacts

In terms of impact, the original 50 participants trained an additional 2,500 Extension educators in the first two years of the program and reached more than 15,000 other professionals including health officials, home builders, realtors, and Extension volunteers (NAFCE). Behavior changes included stopping exposing children to environmental tobacco smoke (secondhand smoke), testing and mitigating for radon, and adopting good IAQ practices. Figure 1 displays program outreach impacts for 1995–2005.

The project team, under the leadership of Michael Vogel and Barbara Allen of the Montana State University Extension Service, has continued to support the project in numerous ways including the development of videotapes, posters, the newsletter *Breathing Room* which highlights state activities to provide ideas for program managers around the country, a listserv, a Web site, multi-language material, and an *Indoor Air Hazards Every Homeowner Should Know About* booklet (distributed by the Consumer Information Center in Pueblo, Colorado). To date, over 300,000 copies of the booklet have been sent to interested educators and consumers.

A national satellite conference was held in April 1998, with an introduction by EPA Administrator Carol Browner. Also, three regional update meetings were held in the spring of 1999 in Salt Lake City, Utah, Atlanta, Georgia, and Washington, DC. The project team also launched National Home Indoor Air Quality Action and Awareness Month in October 1998, and this event took place again in October 1999. Initially, educational packets were distributed to over 900 IAQ partners throughout the U.S. President Clinton issued a presidential proclamation designating October as Indoor Air Quality Month, which has become a national annual event. Since 2000 all materials and resources have been made available on the Healthy Indoor Air for America's Homes Web site (www.healthyindoorair.org).

As a result of the continued requests for copies of the manual, and the need for an update and inclusion of sections dealing with secondhand smoke and asthma, a revision was undertaken in 1999 which included user feedback from the spring regional meetings. In 2002 all the information contained in the manual was placed on a reference CD. This reference CD also includes PowerPoint presentations (with recommended scripts) for each training module within the manual.

Outreach and Training Sessions Conducted

- Train-the-trainer sessions: 5,005
- Number of individuals trained: 169,714
- Extension educators: 5,303
- Health department officials: 12,227
- Teachers: 13,467
- Utility representatives: 9,456
- Real estate professionals: 12,202
- Builders: 12,809
- Others (e.g., childcare providers): 104,230
- Consumers reached through workshops (e.g., students, parents, homeowners, and renters): 4,244,341
- Consumers reached through media (e.g., newsletters, radio, television): 33,639,323
- National office telephone, e-mail, and Web site inquiries: 224,557

Instructional Materials Distributed

- *Indoor Air Hazards Every Homeowner Should Know About*, English, booklet: 302,500
- *Indoor Air Hazards Every Homeowner Should Know About*, Spanish, booklet: 11,925
- *IAQ Training Toolkit* (with video program): 3,867
- *Kids Care About Clean Indoor Air* activity folders: 1,081
- *Air'ickson's* coloring book: 27,311
- Asthma book cover: 11,770
- Asthma book marker: 4,409
- Project posters: 4,320

As a Result of Healthy Indoor Air for America's Homes Consumers Have

- stopped exposing their children to secondhand smoke: 40,980
- had their homes tested for radon: 55,108
- had their homes mitigated for radon: 9,044
- tested for lead: 29,925
- hired professional to do lead abatement: 1,426
- hired professional to measure formaldehyde levels: 1,053
- taken steps to reduce/control levels of formaldehyde: 2,648
- installed carbon monoxide detectors: 33,825
- taken steps to check/maintain/correct combustion appliances for combustion and carbon monoxide problems: 50,479
- selected and used home pesticides more wisely: 38,479
- adopted safer remodeling practices to avoid IAQ hazards: 15,645
- selected and used household products more wisely: 24,966
- detected and removed mold, mildew, and other biological IAQ hazards: 27,372
- improved/corrected moisture levels in the home: 26,902
- visually inspected materials that may contain asbestos for damage or wear: 2,740
- sent samples of material potentially containing asbestos to approved laboratory for analysis: 727
- hired professional to seal, cover, or remove asbestos: 296
- got community schools to adopt "IAQ Tools for Schools" guidance: 9,954
- made other behavioral changes/actions: 186,035

Figure 1. Ten Year Impact Data for Healthy Indoor Air for America's Homes

In addition, since 2002 Montana State University Extension Service has coordinated the National Radon Action and Awareness Month poster contest. Working with schools, teachers, and other school personnel (for example art teachers and family and consumer sciences teachers), this annual event serves as the time for Extension agents from each state to focus their outreach and education efforts on radon awareness. Jeffrey Holmstead, EPA Assistant Administrator of the Office of Air and Radiation, urged the nation to recognize January 2005 as National Radon Action Month and encouraged EPA partners and programs to honor this observation with appropriate programs, ceremonies, and activities.

Research Impacts

In addition to outreach, there have been several research endeavors conducted on IAQ. Rich Seifert, University of Alaska-Fairbanks, has focused on IAQ in Interior Alaska homes, radon in Interior Alaska homes, and ventilation in Alaska homes. Some results were that Alaska's cold, dry winters result in low relative humidity in homes, active subslab depressurization is effective for radon mitigation, and controlled ventilation requires airtight envelope and ducts.

Research conducted by Michael Vogel, Montana State University Extension Service, has included the county radon profiling project (in which 49% of Montana homes tested greater than 4 pCi/L), weatherization contribution to generation and spread of lead-based paint dust, weatherization contribution to asbestos in vermiculite insulation, and the home indoor IAQ tracking project (which is currently assessing 2,000 homes for carbon monoxide, lead, mold, hanta-virus, and environmental tobacco smoke).

Shirley Niemeyer at the University of Nebraska-Lincoln has directed her research on realtors' perceptions of IAQ in housing transactions. Environmental issues included radon, asbestos, lead, mold and moisture, and water quality. Questions addressed were: Do realtors provide IAQ information to consumers? Do home buyers purchase property unaware of environmental conditions? Are more trained testers and inspectors for environmental housing issues needed?

Claudette Reichel at Louisiana State University was instrumental in the development of the Louisiana House: Home and Landscape Resource Center. This is a research-based showcase of solutions and an educational outreach program of the Louisiana State University AgCenter and many partners. The house itself features tight construction and controlled ventilation with efficient dehumidification. At Utah State University, Leona Hawks was successful in working with partners to establish the Utah House, which features central ventilation, dehumidistats, ventilation clocks, and carbon monoxide sensors.

Joseph Ponessa of Rutgers University along with collaborators Jim Morris and Jianye Chang conducted research that resulted in the publication of *Radon-Resistant New Construction and Occupant Radon Testing Behavior in New Jersey*.

Joseph Laquatra, Mark Pierce, and Lorraine Maxwell from Cornell University examined New York limited resource households in relation to healthy homes. Key findings of that research were: limited resource households are more likely to face higher pollutant exposures; childcare facilities also face lead, asbestos, mold, radon, and carbon monoxide pollution; pesticide residues are widespread in rural homes; and a peer educator approach increases knowledge levels and awareness of IAQ.

William Angell, University of Minnesota, co-conducted a critical review of scientific literature on residential IAQ, ventilation, and building-related health effects. Findings highlighted the need for exposure studies, addressing carbon monoxide exposure, and the development of standards and guidelines. He also reported on the importance of research on damp buildings and respiratory disease, consideration of temperature and perceived air quality, and mitigation and prevention studies.

Kathleen Parrott, JoAnn Emmel, and Julia Beamish of Virginia Tech examined the impact on IAQ from consumer use of ventilation, and along with Benjamas Kutintara studied home environments and allergen avoidance practices in a hot, humid climate. Key findings from the second project were the discovery of significant negative relationships between problematic home conditions and housing satisfaction as well as between age and allergen avoidance practices. At North Carolina State University, Sandy Wiggins and Sarah Kirby conducted research on the Lead-Based Paint Pre-renovation Education Rule. Using focus groups they identified educational information and dissemination methods addressing this lead-based paint rule.

Conclusions

The destruction left by Hurricanes Katrina and Rita in September 2005 emphasized the importance of IAQ and related mold and mildew issues. The state program manager for Healthy Indoor Air for America's Homes in Louisiana, Claudette Reichel, has been a prominent spokesperson for these issues throughout the devastated region.

There exist a number of ways that states and counties can disseminate information to consumers, and HERA members can certainly contribute to these efforts. They include workshops, the distribution of an annual poster "Kids Care about Clean Air" that features a calendar with helpful IAQ tips listed for each week of the year, exhibits at county fairs and home shows, newspaper columns, articles in state and county Extension housing newsletters, and press releases. The Web site is especially useful as it includes an IAQ home tour in which consumers can click on a room to discover possible air quality problems and remedies. A number of IAQ-related items can be ordered from the Web site (www.healthyindoorair.org).

Why has this partnership worked? For a partnership to work there are seven conditions for success. Healthy Indoor Air for America's Homes has successfully met these conditions:

1. Common problem
2. Convener of stature
3. Strong leadership
4. Critical mass of players
5. Formalized charter
6. Principal players at the table
7. Common information structure

The 10th year celebration of the program was held during the 2005 annual conference of the Housing Education and Research Association held in Denver, Colorado. As part of the celebration there was a reception that included displays and posters produced by the program and the awarding of 16 IAQ scholarships. On the first full day of the conference presentations summarizing the outcomes of Healthy Indoor Air for America's Homes were made by Joseph Wysocki, Michael Vogel, and Joseph Laquatra. The keynote was delivered by Richard Jackson (co-author of *Urban Sprawl and Public Health*) on healthy homes and communities.

A panel session was also held on indoor air quality issues, collaborations, resources, and possible grant connections. Members of the panel were David Rowson, Director, Center of Asthma and Schools, EPA; Anna-Mae Kobbe, Director, Family Consumer Sciences and Nutrition, USDA/CSREES; and Barry Brooks, Public Health Advisor, National Center for Environmental Health, Centers for Disease Control and Prevention.

We have been pleased with the scope, direction, and impact that Healthy Indoor Air for America's Homes has had on the lives of Americans in the past 10 years. And, we look forward to new partnerships and collaborations in the future.

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