

HIPPY for Healthy Home Program: Results of Pre and Post Surveys Addressing Indoor Air Quality Contaminants in Arkansas Homes

Ferguson Alesia^{1*}, Desiree Burroughs-Ray² and Simpson Nikiya³

¹Department of Occupational and Environmental Health, Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences (UAMS), USA

²Internal Medicine-Pediatrics Resident, University of Tennessee Health Sciences Center, USA

³Department of Epidemiology, Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences (UAMS), USA

*Corresponding author: Ferguson Alesia, Department of Occupational and Environmental Health, Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences (UAMS), 4301 West Markham, slot 820, Little Rock, AR 72205, USA, Tel: 5015266662; E-mail: aferguson@uams.edu

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Abstract

Background: HIPPY for Healthy Homes is a collaborative program between the University of Arkansas for Medical Sciences' College of Public Health and the parent involvement, school readiness program called Home Instruction for Parents of Preschool Youngsters (HIPPY) to build capacity for education and knowledge on key hazards in the home.

Methods: Radon, mould, carbon monoxide and indoor irritants for respiratory illnesses (e.g., asthma) and allergies, were identified as important hazards in the home to be addressed by the Arkansas HIPPY program. Program implementation with HIPPY involved an in-class training program for HIPPY coordinators and home-based educators (HBCs and HBEs), development of materials (e.g., brochures, website), and an outreach format to best implement the program. The four-hour in-class training for the HBCs and HBEs combined PowerPoint presentations and group activities, and in the one year training period reached 151 HIPPY HBEs and HBCs in six regions of the State of Arkansas. An online version of the training was later developed for sustained implementation of the program by giving new HIPPY educators the opportunity to learn about these hazards and share with their parents.

Results: This paper reports on the methodologies of the HIPPY for Healthy Homes program and results from a pre- and post-assessments delivered during the in-class training to evaluate knowledge on the key home hazards presented and effectiveness of the training at increasing knowledge for 151 HBEs and HBCs. Potential impact of project methodology on parents in the program receiving and understanding the information and ultimately changing behavior is based on a brief follow-up post assessment of 47 HBEs and HBCs.

Conclusion: This program can offer a useful methodological approach to reach families associated with home based educational program in order to educate them on important home hazards. Areas for improvement and expansion exist.

Keywords: Healthy homes; Home based educators; Radon; Mould; Allergies; Carbon monoxide; Home intervention programs

Abbreviations:

EPA: Environmental Protection Agency; UAMS: University of Arkansas for Medical Science; HBEs: Home Based Educators; HBCs: Home Based Coordinators

Introduction

The HIPPY for Healthy Homes was a collaborative effort between the UAMS' College of Public Health and the children community and outreach organization Home School Instruction for Parents of Pre-School Youngsters (HIPPY) to build capacity in the State for education and health protection from hazards in the home. The project involved curriculum development for parents of these children and training of HIPPY coordinators and home-based outreach educators in 6 regions of the State on specific indoor air hazards, and training on deliver of this curriculum. Radon, mould, carbon monoxide, and asthma and

allergy triggers were identified as key indoor contaminants, not currently addressed in any HIPPY program curriculum, having the potential to contribute to respiratory and other illness in the home, and of particular interest to this State. The objectives of this project were designed to address the EPA's Region 6's Priority Project Areas of "promoting integrated approaches to reducing exposures and risks to indoor contaminants in the homes" and "training of community health workers" to assist parents and families in managing indoor asthma triggers and other contaminants affecting respiratory illnesses. The organization Arkansas HIPPY is a home-based, home intervention and educational program serving over 5000 children a year in the State of Arkansas, by using at any one time approximately 50 Home Based Coordinators (HBCs) and 250 Home-Based Educators (HBEs) to reach parents. Each HBC will oversee anywhere from 3-6 HBEs and coordinate activities with the HIPPY director at the State Level. Researchers on this project wanted to expand the role of home-based educators in the program by equipping them with knowledge on key home hazards they could share with parents and children in the program.

Intervention programs and healthy homes

Home interventions to improve health outcomes have been extensively researched and reported on in the literature with success in some areas. Some home based interventions have targeted low-income families through education and access to resources in an effort to reduce exposure to asthma triggers and have resulted in a significant reduction in unscheduled health care visits [1,2]. Other successful interventions provide a global approach to reducing asthma triggers by implementing home construction remediation techniques to address the moisture sources that contributed to mould, cockroaches and dust mites in the home. By exhausting water vapour from kitchens and bathrooms, repairing plumbing leaks, removing water damaged building materials, as well as environmental cleaning, participants in a Cleveland interventional study experienced a reduction in maximum symptom days, hospitalizations and emergency department visits, for example [3]. These examples illustrate the potential for home-based interventions to serve as an effective means of improving overall family health and child development through the improvement of the home environment.

Home health visits

Home visiting programs have exploded in recent years, allowing for an intimate evaluation of educational programs delivered in the home to effectively augment child development and provide family support [4,5]. Home health visits providing pre- and post-natal care administered by nurses in a few studies resulted in increased use of parenting resources and had a positive impact on indicators of cognitive behavior and development, such as higher graduation rates from high school [2,6,7]. Administered interventions to parents in the home were demonstrated to be equally beneficial in toddlers with congenital heart defects, demonstrating improvement of motor skill development to an age appropriate level despite motor delays early in life [8]. This benefit is also observed in adults suffering from congestive heart failure who typically experience an increasing frequency of hospital admissions to treat acute exacerbations with only short-term benefit derived from therapeutic agents as the disease progresses [9]. In another study, just a single home visit one week after discharge was able to result in a reduction in unplanned hospital admissions and hospital deaths even 18 months after the intervention [10].

Home instruction for parents of preschool youth (HIPPY)

Home Instruction for Parents of Preschool Youth (HIPPY) is an international program that spread from Israel in 1969 and ultimately settled in the HIPPY USA national office located in Little Rock, Arkansas. Found in 23 states, reaching more than 15,000 families in over 100 communities across the country, HIPPY is able to impact children at risk and bridge the achievement learning gap [11]. Arkansas is the largest HIPPY provider in the country, with 33 programs across the state spanning 69 of the 75 counties in Arkansas, ultimately reaching 5,300 families [12]. HIPPY utilizes an evidence-based curriculum in the homes of families with children ages three to five years old to support parents in preparing their children for success in school through activity packets, storybooks and manipulative shapes [13]. The effectiveness of this program has been consistently proven even in diverse communities. One study demonstrated higher math achievement scores at a third grade follow-up among Latino children participating in HIPPY compared to other Latino third graders in the same school [14]. In addition to providing parents with materials to strengthen cognitive skills and reading readiness, parents

are also provided with resources to address barriers to participation such as financial limitations.

Implementing a healthy homes program

Recognizing the home environment as a major contributor to child and family health, due to the increased amount of time individuals spend indoors, HIPPY-Arkansas requested a healthy home supplemental curriculum for Arkansas families. Previous partnerships with HIPPY Arkansas and the University of Arkansas for Medical Sciences (UAMS) have attempted to bridge this gap by providing lead education at parent education workshops [15]. Environmental lead exposure, often in the form of exposure paint chips and dust from lead-based paint in old homes, can result in elevated blood lead concentrations, which have been shown to have an inverse and linear relationship with IQ scores in children [16]. Other key indoor air contaminants were the focus of this current healthy homes project and curriculum for HIPPY and included: triggers for asthma and allergies, carbon monoxide, mould and radon. These contaminants were chosen not only because of the inexpensive mitigation activities that could be implemented in the home and communicated to parents, but also because of the importance of these under addressed hazards in Arkansas [17].

Radon in the home

Radon results from the decay of Uranium and can cause health problems for those who are exposed to a high enough concentration, by causing damage at a cellular level [18]. As the second largest contributor to lung cancer, at a rate of 21,000 Americans each year, the carcinogenic effects of radon are amplified in individuals that smoke [19]. The Environmental Protection Agency map, illustrating the prevalence of this contaminant in the United States, demonstrates higher levels in the Western and Northern regions of the country [20]. Arkansas is shown to have moderate levels in the northern region and areas in the central region (i.e., Hot Springs), based on limited measurements taken many years prior. In addition, Arkansas has a smoking rate of 19.4% compared to the National average of 15.6% [21]. If present, radon levels tend to be higher in basement/low level areas of the home. To prevent radon infiltration, there are strategies ranging from simple to more involved steps that can be implemented to reduce low to high radon levels including: sealing foundation cracks, installing soil gas barriers, utilizing fans to create room pressurization to prevent radon from entering the home or other means of increasing the ventilation in the home mechanically or naturally [22]. Through parent education on simple ways to measure radon in the home, reinforcing the importance of smoke-free policies in the home, and training on above-mentioned interventions, radon infiltration and exposure can be reduced or prevented.

Carbon monoxide in the home

Carbon Monoxide is a colorless, odorless, and tasteless gas that is released from combustion sources within the home, cars in attached garages, and cigarette smoking in the home. Other sources of carbon monoxide that should also be identified in homes include: unvented space heaters and gas furnaces/fireplaces, improperly functioning gas ranges, leaky wood stoves and back-drafting space heaters [23]. Due to the low social-economic status of many in Arkansas and harsh winters, many families use dangerous, improperly vented sources of heat for both cooking and climate control in the home to save money. Acute carbon monoxide poisoning is associated with headache, dizziness,

confusion and nausea, even leading to immediate death if left untreated [24]. Despite the lethal nature of carbon monoxide poisoning, studies simply show that many households do not use carbon monoxide monitors compared to smoke alarms, 97% and 29% respectively [25]. In addition, levels below 35-70 ppm, where conventional detectors do not alarm, are harmful long term to those with heart disease and have even been connected to low birth weight in children born to exposed pregnant women [26]. Due to the innocuous nature of carbon monoxide parents must be educated to identify potential sources of carbon monoxide in the home, control those sources, and install appropriate monitoring devices.

Mould in the home

Mould, often referred to as mildew or fungi, represents a biological aerosol that potentiates its growth through the ubiquitous presence of microscopic mould spores in the environment. Mould spores, along with the mycotoxins and volatile organic compounds they sometimes produce, have the ability to cause respiratory illnesses, headache, fatigue, rashes and more [27]. Although health effects vary, children with pre-existing respiratory conditions (e.g., asthma) and compromised immune systems are particularly vulnerable to mould exposure [28,29]. Required conditions for mould growth include a surface for growth, a food source, mould spores, and a moisture source. Arkansas experiences a unique problem in regards to mould issues as a result of its mixed climate, experiencing extremes of hot and cold, and predominately high humidity levels. When hot and cold air meet on thin surfaces that supply an organic food source (i.e., wood, dirt), condensation occurs and mould growth results. Indoor environments can be made less hospitable to mould growth with appropriate ventilation design, temperature regulation, and most importantly home occupant knowledge and maintenance in addressing water and condensation sources in the home. Parents of young children should be vigilant in identifying mould growth in the home as well as possible conditions that create moisture problems and enable mould growth. Simple home interventions include identifying potential sources of moisture, treating and eliminating mould growth in the home, utilizing a dehumidifier to remove moisture, and drying water damaged items within 48 hours or disposing of them [30]. However, economic resources may be needed to address some extensive moisture issues (e.g., fix leaking pipes and roof, proper insulation throughout home and inadequate ventilation conditions) and extensive areas of mould growth may require professional assistance for mould remediation.

Asthma and allergies in the home

Asthma is a chronic lung disease that causes inflammation and narrowing of the airways, and it's the most common chronic illness among children in America [31]. African Americans and individuals with low socioeconomic status have been disproportionately affected, reaching a prevalence of 11.9% and 11.2% respectively in 2010 [32]. In Arkansas, asthma is most prevalent among those who are obese, African American, or at lower income levels [33]. Asthma prevalence has steadily increased from 2001-2010 at a rate of 1.5% per year for children, reaching a prevalence of 8.4% in 2010 [34]. Although the reasons for this growth in asthma incidence is not well understood, it has been associated with the condition of families and children now spend nearly all of their time indoors, predominantly in their home, with prolonged exposure to indoor contaminants [35]. Indoor exposures from allergens produced by house dust mites, cats,

cockroaches, harsh cleaning and maintenance products have been shown to induce asthma symptoms. In addition, environmental tobacco smoke has also been causally linked to asthma exacerbations. Some of these indoor allergens, including house dust mite allergen, have sufficient evidence for the establishment of a causal link between exposure and asthma development [36]. Some studies have shown that the home environment can be modified to mitigate its contribution to disparities in asthma prevalence; families reporting higher levels of environmental control through improved cleaning techniques, experienced a decrease in the number of emergency department visits related to asthma symptoms [37]. Other studies have demonstrated the ability of regular cleaning by dusting with a damp cloth and vacuuming weekly to control indoor allergens levels and prevent them from accumulating [38].

Methods

The University of Arkansas for Medical Sciences (UAMS) partnered with the Home Instruction for Parents of Preschool Youth (HIPPY-Arkansas) organization to implement a healthy homes program using the existing home visitation arrangement between home based educators (HBEs) and parents [39]. Utilizing an integrated approach involving the project team at UAMS working with the HIPPY Program Director and their HBEs and HBCs, educational and outreach materials, an in class training program, and a method of information delivery were developed. This was in essence an outreach and educational program using pre and post assessments to evaluate the impact of the training and potentially the outreach format to reach families. Statistical significance ($p < 0.5$) between the change in correct answer from pre to post answer indicated significant knowledge change for the training. This healthy home program emphasized as key topics 'allergies and asthma triggers', 'carbon monoxide', 'mould' and 'radon hazards' in the home. Education materials associated with the program included brochures, a resource booklet, and a website. These materials incorporated a balanced mix of medical messages, simple and practical engineering controls, house maintenance practices, and resources in the community for additional help and support. Home based educators received in-class training on these specific home hazards or topics, best practices on how to deliver the educational materials and messages to parents, how to address questions or seek help when needed, and how to assist parents with locating local resources to fix problems in the home. Realistic 'Tips-for-the-Week' on one healthy home topic at a time were sent out by the UAMS project team to HBEs and HBCs to be shared with parents to supplement the training and enhance the interaction with the parents during the home visitation every two months, allowing the HBCs and HBEs to concentrate on one topic at a time. A total of 5 sets of 'Tips-for-the-Week' were sent. Supplemental links to EPA websites on these topics were also included in these emails of 'Tips-for-the-Week'. By tailoring an outreach and education program to the format conducive to the home visitation process used by home-based educators, we sought to meet the specific needs of the target population.

Throughout the development of the educational materials, the HIPPY Program Director provided guidance to the UAMS project team on reading level (i.e., no higher than 10th grade reading level), appropriate methods of delivery and presentation format given her experience in working with this population and in understanding the interactions that occur between parents and their HBEs. In addition, content experts at the Environmental Protection Agency (EPA) (i.e., radon expert and children's health) and from Arkansas Children's

Hospital (i.e., asthma expert) reviewed the brochures and other materials, and their comments were utilized to improve the content and accuracy of the information. To enhance grant activities and the outreach effort to parents an initial workshop early in grant activities was held to engage and educate HIPPY coordinators (i.e., supervisors of HBEs) on these home hazards and to be understand the structure of the HIPPY for Healthy home objectives so they could better assist their HBE in their region. This workshop occurred in February of 2013 at the HIPPY state wide conference in Little Rock. Funding also allowed for the hosting of three parent workshops in three different cities the State of Arkansas (i.e., Hope, Batesville and McGehee) to more directly assist some HIPPY parents near the close of the grant. These parental workshops were held in January of 2015 and engaged over 60 families between the three cities. At these 2 hour workshops parents were introduced to the hazards of mould, radon, carbon monoxide and allergy and asthma triggers in the home and provided simple strategies to address these hazards. At two of the three parent workshop, Spanish HBEs translated the lessons to the Spanish families that were present.

and maintenance phases of sustainable health behaviors. During the in-class training, pre and post surveys were delivered to HBEs and HBCs and 6 months to 12 months later, 49 of these individual completed follow-up post surveys for the program. At the in class training, HBEs and HBCs were given enough brochures for the parents they served. For HBE's that did not attend the training, brochures and other materials from the Environmental Protection Agency were mailed to their offices to be shared with parents. In addition, HBEs and HBCs had access to the brochures and the resource booklet through the project website. The format of the in-class trainings, brochures, resource booklet, website and the on-line class is described below in more details.

In-class training workshops for home based educators

During a one-year period, seven in-class trainings were held to train HIPPY coordinators and HBEs from the six regions of Arkansas. Each of these HBEs is responsible for visiting 22-25 parents each week to provide in-home instruction, while an HBC may oversee 3-6 HBEs and their interaction with parents. In-class trainings were held in six regions of Arkansas to alleviate travel barriers and encourage participation. Regional trainings were coordinated with the HIPPY administrator in the Little Rock office and HBCs in other cities. Each in-class training (two to three from the UAMS) integrated a PowerPoint presentation, hands-on activities based on Liberating Structures, small group activities and descriptions of brochures to train HBEs and their HBC on healthy home concepts. Each training lasted four hours and participants were allotted time at the beginning and end of training to complete pre- and post-assessments to assess change in knowledge on the topics of mould, radon, carbon monoxide and asthma and allergies triggers. Training emphasized home strategies designed to keep a home healthy and free from hazards. In addition, tips were discussed with HBEs and HBCs on how to engage parents and address their concerns about these hazards. The typical training agenda is displayed in Table 1.

To give HBEs a holistic understanding of a healthy home and the many hazards present, many of which are related, the “seven principles of healthy homes,” as stated by the National Center on Healthy Housing, were also presented. These were: Keep it: 1) Clean, 2) Dry, 3) Safe, 4) Ventilated, 5) Pest-Free, 6) Contaminant-Free, 7) Maintained [40]. For the hands on activities, HBEs were shown an illustration of a home and asked to identify potential sources of indoor home contaminants. HBEs also received 30 minutes to review the brochures on mould, radon, carbon monoxide and asthma and allergies and discuss strategies for working with parents of limited means and sometimes limited educational background. As a final activity HBEs were divided into 5 smaller groups and tasked with presenting the information present in one of the brochures, to reinforce the concepts of the hazards and tips for limiting exposure to that hazard in the home. The training concluded with a Childhood Asthma Video from the Centers for Disease Prevention and Control (CDC) [40] and a working lunch where a discussion of all topics was encouraged.

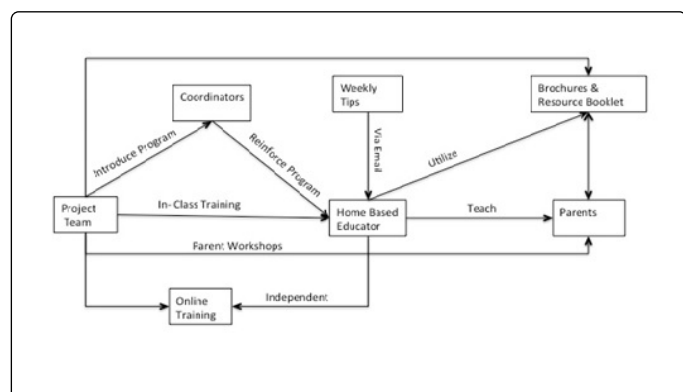


Figure 1: HIPPY for Healthy Homes Program Implementation Format: The HIPPY for Healthy Home format was designed to engage and train home based educators and coordinators, who would then engage the parents in the HIPPY program on specific hazards. Repeated messages to home based educators through TIPS-of-the-week would solidify main message to parents. Brochures, materials and the developed website provided further guidance on how to address these hazards.

The format and implementation of the overall HIPPY for Healthy Homes program is depicted in Figure 1. Following completion of the in-class training, HBEs delivered these messages verbally to parents during the weekly home visitation and reinforced these messages using the developed brochures summarizing the hazards, potential sources of those hazards in the home, health effects from exposure to those hazards, and remediation strategies. During parent visits, HBEs also delivered structured ‘Tips-for-the-Week’ that served as cues for awareness and action for parents. When it comes to home hazards that are persistent, the repetition of ‘cues for action’ are important in action

Time	Activity
8:45-9:00 am	Registration/Pre-assessment
9:00-9:10 am	Welcome/Grant Explanation

9:10-10:30 am	Healthy Homes Concepts: Mould, Radon, Carbon Monoxide, Asthma and Triggers, Seven Principles of a Healthy Home
10:30-10:45 am	Hands On Activity – “Identifying Home Hazards”
10:45-10:50 am	Break
10:50-11:15 am	Curriculum Overview and Working with Parents
11:15-11:45 am	Group Presentations
11:45-11:55 am	CDC Video on Asthma
11:55 am-12:25 pm	Working Lunch (Discussion)
12:25-12:45 pm	Post Assessment and Paperwork Completion

Table 1: Typical Home Based Educator Training Agenda: Typical 4-hr training agenda for the in-class training included a variety of strategies to engage participants on the key home hazards and varied from presentations from trainers to group presentations led by participants.

Interactive group activities and discussions during the training utilized ‘Liberating Structures (LS)’ to facilitate learning by encouraging participants to utilize their newly gained knowledge to educate others and identify potential home health hazards. Liberating Structures comprise 33 adaptable microstructures that empower groups of any size to interact, coordinate and work together in an atmosphere that promotes participation of all individuals.

The primary Liberating Structure used in these trainings was the “1,2,4-All” structure of individual thought all the way up to group discussion. By engaging the collective intelligence and creativity of a group, it allows for the development of proposals and actions from the bottom-up rather than the traditional top-down method [39].

The intention of using these Liberating Structures was to get all HBEs in the training to talk about their understanding of the topics covered, their experiences with working with parents in the home, and any difficulty they envision in sharing these healthy home tips with parents. This demonstrated to HBEs the technique they should also use to get parents to talk about their home, the potential hazards they are aware of, and barriers to changing the home environment. These LS engagement strategies can also positively affect recall and a feeling of enjoyment of the learning experience.

Materials developed for project

Brochures: Five brochures were developed utilizing existing materials available through the EPA and other educational organizations. Brochures were simple, clear and effective to ensure that the developed materials were suitable for HIPPY parents. Each brochure defined a health hazard, symptoms associated with exposure, methods to prevent exposure, as well as additional resources. The five brochures were: 1) General Healthy Homes, 2) Asthma and Allergies, 3) Carbon Monoxide, 4) Mould, and 5) Radon.

These tailored brochures, along with other materials received through EPA were handed out for HBEs and HBCs to share with parents and also mailed to HBEs and HBCs in all HIPPY programs that were unable to attend the in class 4-hour training. For the items mailed to HIPPY programs, a letter was included reminding them of the program and its website with additional material. HBCs and HBEs were encouraged to not only hand these brochures out, but to discuss concerns with parents. An example of the brochure format is found in Figure 2, which depicts the Asthma and Allergies triggers brochure.

Resource booklet: A resource booklet created specifically for this program was made available to parents and provides information regarding local and state resources. Early efforts to identify published material outlining state and local resources that promoted healthy homes were unsuccessful. Therefore the development of this resource booklet for this project was necessary. In order to best serve the families participating in HIPPY for Healthy Homes, it was necessary to identify all possible programs and initiatives that would enable families to create and sustain a healthy home.

The resource booklet highlights the following: 1) Arkansas Home Safety Resources, 2) State and Regional Energy Efficiency and Rebates, 3) Local Resources, and 4) Additional Self Help Steps to Home Safety. This booklet also includes resources to address home hazards (e.g., Arkansas Department of Human Services assistance program, Injury Control and Prevention Center at the Arkansas Children’s hospital, and affordable purchase options for carbon monoxide monitors and safe home heating devices). Development of this resource booklet revealed a lack of adequate healthy home services in the State of Arkansas. Arkansas does not currently have a Healthy Homes Program through a Health Department or any other organization.

Website: The website acts as a resource for HBCs, HBEs and parents participating in the program and is available at: <http://publichealth.uams.edu/apple/hippy-for-healthy-homes/>. The materials presented during the training are available on the website and include presentations, brochures and resource booklet. Additional resources for parents, HBCs and HBEs are also provided with links to the EPA, the Center for Disease Prevention and Control (CDC) as well as the material from the U.S. Department of Housing and Urban Development (HUD) regarding healthy homes [11].

Online Course: The training was adapted into an online course through ‘CourseSites by Blackboard’, a free course development learning environment to reach HBEs and HBCs unable to attend the in class trainings (Figure 3). This online course contains all training materials including PowerPoint slides and pre- and post-assessments, as well as links to additional Healthy Homes information and the HIPPY for Healthy Homes program website were the brochures could be found. Participants complete six modules that address the goals of the program, and then key topic areas of asthma and allergy triggers, mould, radon, carbon monoxide and ventilation, with a review module. Prior to beginning the modules, participants are prompted to

complete a pre-assessment to gauge their baseline knowledge level of indoor air contaminants.

Each module consists of a PowerPoint presentation containing modified training slides that have been streamlined to facilitate independent learning. To simulate a live training, audio explaining each slide is initiated as the participant advances through the PowerPoint presentation. The last module contains a review of healthy homes, indoor health hazards, as well as an interactive activity to reinforce the training.

Following completion of all seven modules, participants are prompted to complete a post-assessment to evaluate the utility of the online training. Participants may request a certificate of training verifying the completion of the training, as well as information on necessary steps to receive educational credits. Participants can receive those educational credits through the Traveling Arkansas Professional Pathways (TAPP) credit program found at <http://professionalregistry.astate.edu/registry.asp>

These home-based educators are typically enrolled in this registry for their professional training as early childhood educators. TAPP consists of eight Key Content Areas and the HIPPY for Healthy Homes online training program addresses the Health, Safety and Nutrition content areas.

Simple certificates of training completion are also available once the participant has completed all modules and assessments and makes a request from the UAMS project team. TAPP credits are also given for the participants in the in-class training. Access to the online training can be found at <https://publichealth.coursesites.com>, and clicking the link HIPPY for Healthy Homes.

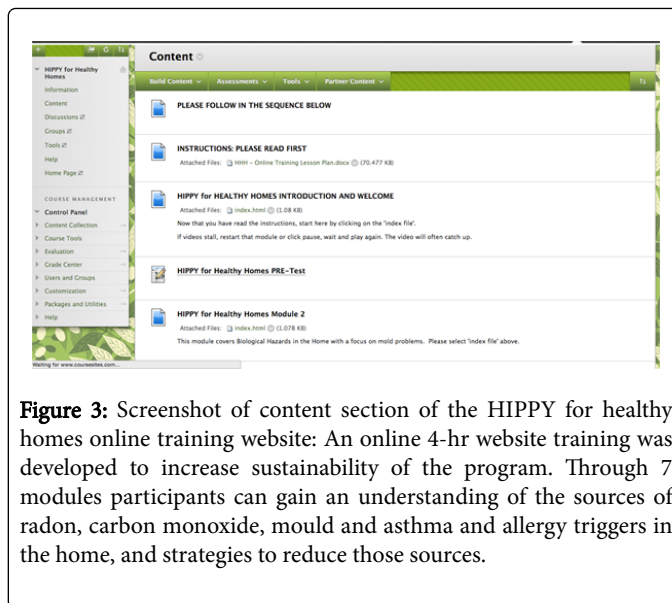


Figure 3: Screenshot of content section of the HIPPY for healthy homes online training website: An online 4-hr website training was developed to increase sustainability of the program. Through 7 modules participants can gain an understanding of the sources of radon, carbon monoxide, mould and asthma and allergy triggers in the home, and strategies to reduce those sources.

Results

We wanted a means to evaluate the HIPPY for Healthy Homes training program and its potential impact on their community of parents and children. A survey to look at the pre and post knowledge of HBE's and HBCs before and after the in-class training was designed, along with a follow-up post survey to be delivered later. The 151 HBEs and HBCs that received in-class training represented the six regions of Arkansas and were responsible for 22-26 families each. The region with the highest participation was the Southeast region at 40% participation. The participation rates for the remaining regions of the state were the Central region at 30%, the Southwest region at 13%, the Northwest region at 5% and Northeast region of Arkansas at 11%. Although, the surveys did not require participants to indicate whether they were coordinators or home based educators, through communication with HIPPY director, our estimate is that of the 151 trained, 10 were HBCs. Participants were predominantly Caucasian (49%) and African American (42%). Less than 2% were Hispanic and American Indian, while the remaining did not identify race. There were 142 training participants that identified as female (94%). There was only one 1 male and the remaining participants did not indicate sex, although we recall the remaining as female. Most of the HBEs and HBCs were either over fifty years of age (30%), in the 31-40 years old age group (29%), or ages 41-50 years old (26%). The median age for HBEs and HBCs was 42 years with a minimum age of 19 years and a maximum age of 71 years.

All in class trainings were dynamic and engaging, with much time in the agenda allowed for questions and discussion. During the in-class training, HBEs and HBCs expressed a desire for program materials (i.e., brochures) translated into Spanish so that the curriculum could be distributed to Latino families they serve. Although materials developed in the program were not translated to Spanish as program budget did not allow, already available materials in Spanish on especially asthma were received from EPA during the course of the program and sent out to HIPPY offices requesting such materials. Among its typical 5000 children a year, there are close to 500 of those children that speak Spanish. During the trainings conducted across the state, many of the HBEs and HBCs commented on the presence of

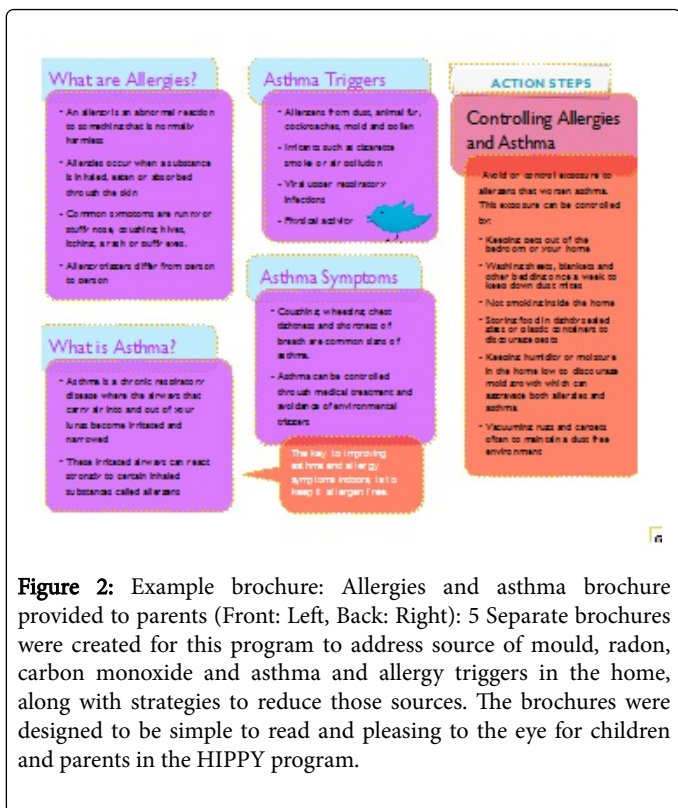


Figure 2: Example brochure: Allergies and asthma brochure provided to parents (Front: Left, Back: Right): 5 Separate brochures were created for this program to address source of mould, radon, carbon monoxide and asthma and allergy triggers in the home, along with strategies to reduce those sources. The brochures were designed to be simple to read and pleasing to the eye for children and parents in the HIPPY program.

potential hazards in their own home and requested additional information to address these hazards. This promoted us to add additional links to of materials and advice on the program website. In addition, they requested information on resources available in the community to address these indoor air contaminants, such as carbon monoxide detectors and smoke detectors. This resulted in numerous discussions regarding the lack of available funding to support the provision of home protective equipment, and aided in the development of the State Resource Booklet available on the website and sent out to HIPPY programs.

Training pre-/post-survey

During the one-year time period, seven in-class training workshops were held to train 151 HIPPY home based educators and coordinators from the six regions of Arkansas. During the training, participant pre and post knowledge was assessed by administering a pre- and post-test consisting of ten questions; the available answer choices were, “True,”

“False,” or “Not Sure” (Table 2). There were five questions (#1, 2, 3, 8, 9) that showed show a statistically significant change in proficiency level with a p-value <0.05 indicating a pre-deficiency in knowledge of these indoor health contaminants, and the ability of the training to improve that knowledge base. The question demonstrating the greatest improvement between pre- and post-test was Question #9 reviewing the proper procedures to prevent radon exposure in the home. This was also the question that the fewest number of HBEs and HBCs answered correctly on the pre-test (21%). Trainees were more knowledgeable regarding identifying signs of mould and factors that can contribute to mould growth. Overall HBEs and HBCs possessed a baseline knowledge of the main cause of mould in the home, ventilation in terms of HVAC maintenance, carbon monoxide sources, smoking as a trigger for asthma and allergies and the importance of smoke detectors with a pre-test score >90%. However, pre-knowledge on detecting radon, in addition to home practices that can prevent radon from entering the home was lacking.

Questions	Correct Answer	% Pre Correct	% Post Correct	P-value
Overgrowth of mould in the house is due to water leaks, condensation or high humidity levels.	TRUE	93.40%	100%	0.001
You can see and smell radon in your home.	FALSE	62.90%	94.70%	<0.001
Bleach is an effective treatment for some indoor mould problems.	TRUE	73.50%	96.70%	<0.001
Cockroaches and dust mite allergens do not affect asthma and allergies.	FALSE	88.10%	94.00%	0.07
HVAC systems should be checked regularly and filters replaced regularly (at least every 3 months).	TRUE	92.10%	98.00%	0.13
Cars left running in an attached garage can be a source of carbon monoxide.	TRUE	97.40%	99.30%	0.18
Signs of water damage may be hidden behind walls or under furniture.	TRUE	98.00%	99.30%	0.32
Smoke alarm monitors should be placed on every floor of the house.	TRUE	93.40%	98.00%	0.03
Sealing cracks in your foundation does not reduce radon infiltration.	FALSE	21.20%	76.80%	<0.001
Smoking in the house can exacerbate asthma and allergies		96.00%	98.00%	0.1

Table 2: Pre and post knowledge questions: Participants of the in-class training demonstrated reasonable pre knowledge on some of the concepts of home hazards such as sources of carbon monoxide and mould, however pre-knowledge was lacking on strategies to reduce radon infiltration. The in class training increased the knowledge based for the participants in all areas (significant increase in knowledge was shown on 5 of the 10 questions).

Follow-up survey

Following completion of the program, a simple follow-up post-survey was designed to look at the use of program strategies among Home Based Educators (HBEs) and Home Based Coordinators (HBCs) 6 months to a year after their in-class training took place. The survey was distributed to 151 trained HBEs and HBCs via email with 49 completed surveys returned either by email, fax, or regular mail; a response rate of 32%. In the initial phase of just reaching out to these HBEs and HBCs, only 27 surveys were returned. With phone calls made to contact them and inform them of the survey, an additional 22 responded. Three of the 49 individuals indicated they were

coordinators. Some emails or phone numbers were no longer valid and some HBEs in particular indicated they were no longer with the program. On average, 44 of the respondents had worked for HIPPY a median of 9.4 years with a minimum of 2 years and a maximum of 23 years. Of the 42 Home Based Educators that responded (5 known HBCs removed from count), they reported working with an average of 25 parents each week.

Some results are found in Table 3. Overall, training participants found the training to be helpful (i.e., 93.88%), with a considerably smaller subset of participants finding the training to be somewhat helpful (i.e., 6.12%). The majority of HBEs and HBCs reported sharing

the information learned during the training (i.e., 91.83%) and sharing the brochures and hand-outs provided by the program with the families they work with (i.e., 83.67%). The majority of home based educators were not sure if the parents they worked with were implementing changes in their home based on tips and guidance received (i.e., 57.7%), however, some felt that parents were making changes (i.e., 30.80%). All trainees reported that they would continue to share Healthy Home tips and utilize the information they learned to improve the health of the families they work with. Regarding the

modality of the training (i.e., in class versus online), 46.94% say they would have preferred the convenience of the online training. From the survey results, participants also indicated that the three most useful training modules were asthma/allergies, carbon monoxide and mould. Ventilation and then radon was rated as the least useful training modules. Since the announcement in January, 2015 when activities ended on the grant outreach efforts, 19 HBEs have taken the online training, with 14 completing pre and post assessments.

Question	Yes	No	Somewhat	Not Sure	%No Response
1. Did you find the training on Healthy Homes helpful	93.88%		6.12%		
2. Have you shared any of this information with your parents?	91.83%			6.13%	2.04%
3. Have you shared the brochures and/or handouts?	83.67%	16.33%			
4. Are your parents making changes based upon what you shared with them?	30.80%	3.80%		57.70%	7.70%
5. Will you continue to share Healthy Homes tips with your parents in the future?	100%				
6. Did you find the training useful for yourself and the health of your home?	100%				
7. There is now an online training available for home based educators. Would you have preferred to take the training online?	46.94%	26.53%	3.06%	20.41%	3.06%

Table 3: Home based educator and coordinator follow-up post training survey: A follow-up survey with 49 home based educators and home based coordinators was used to assess the potential impact of the program on changing behavior in the home. Close to one third of indicated that they were aware that parents were making changes in the home. All indicated that they would continue to share tips from the training with their parents.

Discussion and Conclusion

This project and training were designed to facilitate capacity building through its integration into pre-existing home delivery program using home based educators to reduce children's environmental exposures in the home. The indoor health contaminants and outreach format chosen for this project were identified based on the demographics of the families participating in Home Instruction for Parents of Preschool Youth (HIPPY), the indoor health hazards they were likely exposed to, and the potential to be able to implement simple effective mitigation strategies. In Arkansas 59% of children under the age of six are in families at 100-200% of the Federal Poverty Line and 70% of these families rent their homes [12]. The combination of low socioeconomic status and rented homes results in an environment that is likely to be poorly maintained and lack necessary health precautions such as smoke or carbon monoxide detectors. Poorly maintained homes with cracks in basements, old or non-existent vapor barriers, older appliances and plumbing infrastructure can potentially lead to potentiate radon, carbon monoxide and mould exposures; however, these indoor contaminants can be effectively combated using some simple home repairs or strategies. Allergies and asthma are worsened by numerous triggers including house dust mite and cockroach allergens, therefore improved home cleaning and moisture control, for example. The training model was successful in increasing participant (i.e., HBCs and HBEs) knowledge of indoor health hazards with a greater than 90 percent of correct answer on nine of ten post assessment questions. Participants showed an increase in knowledge of allergies and asthma, carbon monoxide, mould, and radon, as well as activities that can reduce these hazards in the home,

indicating the potential for the training program and format to be adapted and utilized to train facilitators of home visitation programs that help families. The addition of an open online training course increases the flexibility of the program. The training program integrated different teaching methods to provide the information through PowerPoint and interactive large-group activities. In addition, these concepts were reinforced utilizing small group activities based on Liberating Structures. This program model can be adapted for other states and communities and easily integrated into a home-delivery program such as HIPPY. Although there may be regional differences regarding the prevalence and importance of specific indoor air contaminants, this program can be easily tailored to fit the needs of the target population. This can be achieved by providing participants with the same information for each identified air contaminant (i.e., source, health effects, simple mitigation strategies) in the training, as well as brochures on a topic. Development of a state specific resource booklet would be necessary to identify and connect members of the target population to local resources that can aid them in improving their home environment. Local health departments, emergency services, utility companies and healthy homes initiatives can serve as initial points of interest in resource identification. There are multitude of content areas for promoting a healthy home environment that could be included in a training or outreach program using home based educators, including addressing the seven principles of keeping a healthy home, promoting good hygiene practices, and addressing violence and drug usage in the home.

There were some areas that could benefit from further improvement or contact learning time in the training, primarily regarding the indoor

health contaminant radon. This knowledge deficit both in the pre and post assessment could be due to the Environmental Protection Agency (EPA) reported low or absent levels of radon in the state of Arkansas, therefore policy and educational initiatives focusing on this contaminant are absent in the state. Participants repeatedly reported that they had not heard of radon before as an indoor contaminant or its role in lung cancer. To better address this topic more time should be devoted to explaining the sources of radon and visual aids as well as videos should be utilized to illustrate how radon enters homes. Additionally, specific radon mitigation practices should be integrated into the current interactive activity to reinforce these concepts. Some modification to address this deficit was made to the online HIPPY for Healthy Homes training course to ensure that future trainees are better trained and adequately equipped to identify even simple radon mitigation practices. Training emphasized the importance of testing every home at least once for the presence of radon, given some studies in Arkansas have measured low radon levels even in the Central Region [40]. Other recommended improvements to the program are: Spanish translation of program brochures and the resource booklet.

One limitation of this program was the lack of program evaluation from parents receiving the healthy home information. This lack of feedback could provide additional information regarding the perceived importance or severity of the health hazards presented as well as the utility of the weekly tips and suggestions for home environment improvement. This would have allowed for a better evaluation of parent behavior changes regarding home health that were present or absent following education from a HBE. By implementing an additional assessment component, further information regarding the utility of the program can be gathered. However, we did deliver a follow-up post assessment, completed by 49 HBEs and HBCs. Over 91% of those respondents stated that they had shared the information with parents and over 88% had shared the brochures. Some bias may exist in those who responded to the follow-up survey. The more proactive HBEs and HBCs that followed up with parents were more likely to respond. Although the parents of the 151 HBEs and HBCs that took the in-class training, and received 'Tips-for-the week' were likely to better engage parents on these home hazards, other parents in the program who received the brochures or especially those that attended a parent workshop also benefit from the knowledge. Actual need in the home and changes related to those need of reducing hazards are more difficult to evaluate.

Home based educators and parents routinely requested information on where to receive supplies and resources, such as radon test kits, carbon monoxide monitors and smoke detectors. For the 3 parent workshops that were held combined smoke detectors and carbon monoxide monitors were handed out. In addition, at a few of our training workshops, the HIPPY program used their limited funding to supply additional detectors to the home-based educators for some of their parents. The developed resource booklet also identified some local agencies where these detectors might be available. Arkansas does not currently have a Healthy Homes program through a State Health Department commonly found in other States. Such a program, in addition to a comprehensive web based portal could further assist families with additional resources and more extensive links to multiple agencies and organizations responsible for the home environment including community health agencies and legal advice for renters. The College of Public Health at the University of Arkansas is in discussion with other agencies in order to develop such a holistic program or at minimum a web assistance portal to help HIPPY-Arkansas families and other in-need communities.

In conclusion, HIPPY has the opportunity through the online training and access to the website with brochures and the resource booklet to continue to educational outreach on healthy home hazards to their parents in this manner potentially leading to healthier families in the state of Arkansas. Parents participating in the program over the three years have the potential to receive this curriculum more than once, for repeated messaging. Through education and resource identification, HIPPY families are positioned to take an active role in ensuring the health of the home and the overall health of the family. Home based educators and home based coordinators may also have benefited from the knowledge gained to make changes to their own homes.

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