

Community Environmental Quality Knowledge and Awareness among Nurses: Developing and Piloting an Assessment Survey in Schools

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Parents, educators, and health care providers play multiple roles in a child's life. Each role entails certain responsibilities (for example, meeting basic needs and safety needs, and providing education and health care). One primary responsibility is protection from physical, mental, or environmental harm.

The school is an important consideration for protection from environmental harm. In America, more than 53 million children and about 6 million adults spend a significant portion of their days in school buildings (U.S. Environmental Protection Agency [EPA], 2009a), with children spending an average of 32.5 hours in schools each week (Juster, Ono, & Stafford, 2004).

In addition to understanding factors that may affect the health of all school children, it is also essential to consider the school environment's impact on children with chronic conditions, such as asthma, since these children may be more vulnerable to environmental agents. For the past two decades, the nationwide prevalence of childhood asthma has risen substantially (Dey, Schiller, & Tai,

About one in five Americans spends a considerable number of hours in school each week, and thus, is exposed to a variety of environmental agents. Community health nursing professionals require resources and specific training to acquire the environmental knowledge needed to raise personal and community awareness as an enhancement of their practice. Given limited resources for schools and local public health education initiatives, identifying and prioritizing environmental concerns comes before actions to prevent or reduce exposures. With the rise in prevalence of childhood asthma, of special concern are those agents within the school environment that may serve as asthma triggers. This pilot project, within a larger study in a large school district in metropolitan Atlanta, Georgia, developed and piloted an environmental health priorities survey with school nurses and other school staff about indoor and outdoor microenvironments relevant to school-aged children. Findings indicate that participants ($N = 34$) could prioritize environmental issues to inform future intervention activities (such as continuing education training), and distinguish predominantly indoor from typical outdoor exposure agents and their major sources.

2004; Mannino et al., 2002). Among children under 18 years of age, about 1 in 8 has been diagnosed with asthma sometime in their lives, with the proportion increasing with age subgroup (Dey & Bloom, 2005). In fact, asthma is the chronic disease responsible for the most disabilities, hospital admissions, and school absenteeism (EPA, 2009b).

Environmental issues regarding asthma and other chronic diseases are complex and may include identifying and reducing the levels of exposure to

various agents in different microenvironments. Microenvironments include indoor and outdoor places people spend time to live, eat, sleep, work, learn, play, and travel (in transit). Schools incorporate many such microenvironments. Thus, it has been generally recommended consistently that asthma education be part of a school-based management plan covering clinical, behavioral, and environmental factors.

Community health nursing professionals require resources and specific

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training to acquire environmental knowledge to raise personal and community awareness as an enhancement of their practice. However, given limited resources for schools and local public health agencies, prioritizing environmental concerns is necessary and precedes actions.

This article describes a pilot project in which a community/school environmental health priorities survey was developed and tested among school nurses and clinic assistants, principals, main office staff, and teachers within a large school district in metropolitan Atlanta, Georgia, during the spring and fall of 2007. The survey focused on specific indoor and outdoor microenvironments relevant to school-aged children and topics such as asthma triggers and their sources.

Background

Health education and health promotion research have often focused on health literacy. The Institute of Medicine (IOM) defines health literacy as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (IOM, 2004) and includes basic science literacy (Zarcadoolas, Pleasant, & Greer, 2005). Health literacy differs from general literacy in that general literacy is related to a person's level of education (Kickbusch, 2001), whereas health literacy could include environmental public health sciences (EHS) topics.

Previous research has suggested appropriate informational brochures and/or interactive workshops with clear, simple, culturally sensitive language, oral presentations, group discussions, and visual aids (such as photos, sample products) were most effective in promoting health and science literacy. Health care provider categories covered by previous educational research (such as surveys, curriculum assessment, and/or development) and policy statements specific to children's environmental health (CEH) include the following:

- Health professionals in general (Etzel, Balk, & the American Academy of Pediatrics (AAP) Committee on Environmental Health, 1999; Etzel et al., 2003; National Association of School Nurses [NASN], 2005a; Shendell,

Apte, Kim, & Smorodinsky, 2002; Society for Public Health Education [SoPHE], 2004).

- Medical students (Goldman, Rosenwasser, & Armstrong, 1999; Graber, Musham, Bellack, & Holmes, 1995; Pope, Rall, the Committee on Curriculum Development in Environmental Medicine, & the Institute of Medicine [IOM], 1995a; Sachdeva, 2000; Schenk, Popp, Neale, & Demers, 1996; Williams, Davis, Parker, & Weiss, 2002).
- Medical residents (Bearer & Phillips, 1993; Frazier et al., 1999; Musham, Bellack, Graber, & Holmes, 1996; Roberts & Gitterman, 2003; Williams et al., 2002).
- Primary care physicians, such as pediatricians (Clark et al., 2000; Kilpatrick et al., 2002; Williams et al., 2002; Wolf & Cimino, 2001) and pediatric sub-specialties (Etzel et al., 2003).
- Nursing students (Bellack, Musham, Hainer, Graber, & Holmes, 1997; Larsson & Butterfield, 2002)
- Registered nurses and school nurses (Bellack et al., 1997; National Center for Education Statistics [NCES], 2005; Pope, Rall, the Committee on Curriculum Development in Environmental Medicine, & IOM, 1995b; Shendell et al., 2002; Van Dongen, 2002; Watterson, Thomson, Malcolm, Shepherd, & McIntosh, 2005).

However, little attention and few resources have been dedicated to providing this kind of continuing education to enhance the EHS training and skills of health care providers. Only recently have policy statements addressed EHS literacy concerning public and private settings, both during training and in practice (National Environmental Education and Training Foundation [NEETF], 2004; SoPHE, 2004). Yet, these findings focused on physicians, medical students, and primary care residents (NEETF, 2004; SoPHE, 2004).

Collectively, these previous policy statements and applied research efforts have specified education in at least the basic concepts in the broad field of EHS: (a) exposure assessment, (b) reduction and prevention, (c) types of pollutants, and (d) sources of pollution. Multidisciplinary teams in the United States (McCurdy et al., 2004) and Canada (Rootman & Ronson, 2005) have identified and published potential educational inter-

ventions based on reviews of the transition from undergraduate education to graduate education and/or continuing training for professional health care providers. These teams determined that health care providers should receive education and training in EHS and CEH throughout their careers.

Previous publications on health literacy also focused on clinical issues, such as access to and quality of care, health education and promotion, and communications between patients and health care providers (IOM, 2004; Licence, 2004). These publications were most often related to adult and childhood chronic diseases and injuries. Only a few publications have addressed EHS literacy issues linked to human health. Zarcadoolas, Timm, and Bibeault (2001) incorporated input from general community representatives, focused on land use and solid and hazardous waste, and used a written guide with graphics for the intervention. Another study involved focus groups consisting of community women (Evans, Fullilove, Green, & Levison, 2002). The researchers used a validation survey to assess awareness of environmental risks to health.

The combined results of the aforementioned publications indicated that science-based education should be the focus for both EHS and CEH. Techniques used should (a) focus on oral presentations and group discussions in workshop formats related to distributed written materials (Bamford & Warder, 2001; Corburn, 2002; Green, 2000; National Work Group on Literacy and Health [NWGLH], 1998; Ratzan, 2001); (b) consider multi-part, multimedia workshops to ensure science-based information can be communicated effectively and be understood by participants (Gazmararian, Curran, Parker, Bernhardt, & DeBuono, 2005; Houts, Doak, Doak, & Loscalzo, 2005); and (c) help clarify concepts and components of health literacy, such as EHS for nurses (Speros, 2005).

Finally, efforts to foster and improve EHS literacy among health professionals, such as nurses, both in practice and in training should be in concert with professionals working in education and public health. These professionals include school staff (such as teachers), community health workers, environmental health scientists, health educators, and health promotion and behavioral scientists.

Figure 1.
Georgia State University Institute of Public Health Checklist Survey to Identify and Rank Priorities among Environmental Asthma Triggers and Other Environmental Quality Issues of Potential Concern in Your Community

Please write an "X" in box to left of the choice which best describes your position at school:
 I am a teacher (4th grade) I am the school clinic nurse. I am the principal. I am main office staff.

Please write an "X" in box to left of each item you are concerned about, and then circle your "top 3 concerns" per category.

<p>Environmental Asthma Triggers-- AT/INSIDE SCHOOLS</p> <input type="checkbox"/> Pollen (tree, flower, plant) <input type="checkbox"/> Mold <input type="checkbox"/> Respiratory infections/viruses <input type="checkbox"/> Cold, dry air (think weather) <input type="checkbox"/> Express strong emotions <input type="checkbox"/> Dust mites <input type="checkbox"/> Pet allergens (cat, dog) <input type="checkbox"/> Cockroach and rodent feces <input type="checkbox"/> Exercise/Physical Activity <input type="checkbox"/> Combustion pollutants (particles, nitrogen oxides, sulfates) <input type="checkbox"/> Environmental (secondary, involuntary) tobacco smoke exposure <input type="checkbox"/> Personal care products (fragrances, hairspray, etc) <input type="checkbox"/> Cleaning products <input type="checkbox"/> Other _____	<p>Environmental Asthma Triggers-- AT/HOME</p> <input type="checkbox"/> Pollen (tree, flower, plant) <input type="checkbox"/> Mold <input type="checkbox"/> Respiratory infections/viruses <input type="checkbox"/> Cold, dry air (think weather) <input type="checkbox"/> Express strong emotions <input type="checkbox"/> Dust mites <input type="checkbox"/> Pet allergens (cat, dog) <input type="checkbox"/> Cockroach and rodent feces <input type="checkbox"/> Exercise/Physical Activity <input type="checkbox"/> Combustion pollutants (particles, nitrogen oxides, sulfates) <input type="checkbox"/> Environmental (secondary, involuntary) tobacco smoke exposure <input type="checkbox"/> Personal care products (fragrances, hairspray, etc) <input type="checkbox"/> Cleaning products <input type="checkbox"/> Other _____
<p>Environmental Asthma Triggers-- IN COMMUNITY (OUTDOORS)</p> <input type="checkbox"/> Pollen (tree, flower, plant) <input type="checkbox"/> Mold <input type="checkbox"/> Respiratory infections/viruses <input type="checkbox"/> Cold, dry air (think weather) <input type="checkbox"/> Exercise/Physical Activity <input type="checkbox"/> Combustion pollutants (particles, nitrogen oxides, sulfates) <input type="checkbox"/> Environmental (secondary, involuntary) tobacco smoke exposure <input type="checkbox"/> Diesel-powered trucks, buses, trains etc <input type="checkbox"/> Pesticide use (called "drift," chemicals in aerosols/on particles) <input type="checkbox"/> Other _____	<p>Other Environmental Quality Concerns in YOUR Community</p> <input type="checkbox"/> Combustion pollutants (particles, nitrogen oxides, sulfates) <input type="checkbox"/> Environmental (secondary, involuntary) tobacco smoke exposure <input type="checkbox"/> Diesel-powered trucks, buses, trains etc <input type="checkbox"/> Pesticide use (called "drift," chemicals in aerosols/on particles) <input type="checkbox"/> Industry (pointsources of outdoor air pollution) <input type="checkbox"/> Car/SUV traffic (congested primary roads, Interstate freeways) <input type="checkbox"/> Lack of walkability due to lack of sidewalks, or they need repairs <input type="checkbox"/> Lack of public parks ("green space," playgrounds, ball courts) <input type="checkbox"/> Poor quality of housing (especially rental apartments) <input type="checkbox"/> Other _____

Table 1.
Asthma and Environmental Health Knowledge and Awareness among School District Head Nurse and Clinic Assistant Participants, Summer 2007

	Pretest (% correct)			Posttest (% correct)		
	N ^a	Mean	Range	N	Mean	Range
CUAS Quiz	16	84.6	73.3-93.3	4	86.7	80.0-93.3
CPHT Questionnaire	16 ^b	78.3	65.2-87.0	4	77.2	69.6-82.6
Overall	16	80.8	71.1-89.5	4	80.9	76.3-86.8

^a Of the four nurses and 80 clinic assistants (or licensed practical nurses who replaced clinic assistants during 2006-07 school year), only 28 clinic assistants and the four nurses sent back paperwork; of those responded, N = answered surveys, including the four nurses.

^b One clinic assistant returned forms with only this survey completed (19 items = 82.6% answered correct).

Note: CUAS = Columbia University Asthma Coalition. This quiz had 15 true/false items. CPHT = Chicago Public Housing Training. This quiz had 23 true/false items.

Such coordination can make course work and continuing education more effective (Howze, Baldwin, & Kegler, 2004; IOM, 2004; Kueuter, De Rosa, Howze, & Baldwin, 2004; NASN, 2005b; NCES, 2005; Peterson, Cooper, & Laird, 2001).

Methods and Materials

This study was a pilot project within a larger study on asthma triggers in a school district in metropolitan

Atlanta, Georgia. Approval from the school district and Georgia State University's (GSU) Institutional Review Board was obtained prior to initiating the study.

In spring 2007, three questionnaires were mailed to the four school district head nurses and 80 other health care professionals (HCPs) (including school-based clinic assistants, licensed practical nurses [practical nurses replaced clinic assistants in the 2006-2008 school years]). One

survey assessed their availability to attend an EHS workshop. Typically, before providing education and resources to enhance a person's professional knowledge, skills, and awareness (KSAs), his or her baseline KSAs should be defined. Thus, the other two questionnaires, the Columbia University Asthma Coalition Quiz (CUAS) and the Chicago Public Housing Training Questionnaire (CPHT), were used to test EHS knowledge and awareness (National Institutes of

Table 2.
School District Participants Who Identified Targeted Environmental Asthma Triggers as Being of Interest or Concern and/or (as %) as a “Top 3 Priority” by Microenvironment in a Pilot Study in Metropolitan Atlanta, GA (DCSS), Summer 2007 and 2007-2008 School Year

	Being of Interest or Concern (as % of Responses)				Triggers in/at School Being of Interest or Concern and a “Top 3 Priority” (as % of Responses)				Triggers in/at School Identified as a “Top 3 Priority” (as % of Study Population)			
	Triggers in/at School	Triggers at Home	Outdoor Community Triggers	Other	Triggers in/at School	Triggers at Home	Outdoor Community Triggers	Other	Triggers in/at School	Triggers at Home	Outdoor Community Triggers	Other
Pollen	52.9%	41.2%	76.5%	**	50.0%	53.8%	76.9%	**	25.0%	21.2%	58.8%	**
Mold	61.8%	58.8%	35.3%	**	75.0%	68.4%	58.3%	**	45.5%	39.4%	20.6%	**
Respiratory infection	64.7%	44.1%	41.2%	**	70.0%	42.9%	64.3%	**	43.8%	18.2%	26.5%	**
Cold, dry air	38.2%	23.5%	47.1%	**	58.3%	37.5%	62.5%	**	21.2%	8.8%	29.4%	**
Express strong emotions	17.6%	8.8%	**	**	33.3%	33.3%	**	**	5.9%	2.9%	**	**
Dust mites	29.4%	52.9%	**	**	90.0%	88.2%	**	**	26.5%	45.5%	**	**
Pet allergens	0.0%	38.2%	**	**	0.0%	61.5%	**	**	0.0%	23.5%	**	**
Cockroach and rodent feces	35.3%	26.5%	**	**	66.7%	50.0%	**	**	23.5%	12.1%	**	**
Exercise physical activity	52.9%	26.5%	32.4%	**	77.8%	77.8%	45.5%	**	41.2%	20.6%	14.7%	**
Combustion pollutants	8.8%	20.6%	20.6%	38.2%	100.0%	16.7%	57.1%	53.8%	8.8%	3.0%	11.8%	20.6%
Environmental tobacco smoke	15.2%	29.4%	26.5%	35.3%	80.0%	70.0%	44.0%	75.0%	11.8%	20.6%	11.8%	26.5%
Personal care products	14.7%	35.3%	**	**	40.0%	58.0%	**	**	5.9%	20.6%	**	**
Cleaning products	35.3%	44.1%	**	**	50.0%	46.7%	**	**	17.6%	20.6%	**	**
Diesel-powered trucks, buses	**	**	58.8%	58.8%	**	**	85.0%	52.6%	**	**	50.0%	30.3%
Pesticide use	**	**	44.1%	38.2%	**	**	66.7%	61.5%	**	**	29.4%	23.5%
Industry	**	**	2.9%	32.4%	**	**	0.0%	63.6%	**	**	0.0%	20.6%
Car/SUV traffic	**	**	**	64.7%	**	**	**	85.7%	**	**	**	57.6%
Lack of walkability	**	**	**	44.1%	**	**	**	64.3%	**	**	**	27.3%
Lack of public parks	**	**	**	44.1%	**	**	**	64.3%	**	**	**	27.3%
Poor quality of housing	**	**	**	29.4%	**	**	**	44.4%	**	**	**	15.2%
Other	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	2.9%

^a This was a multiple choice/response survey, where participants could choose from a list (see Figure 1) and then from those choices rank 1 to 3 priority issues per microenvironment.
^{**} This asthma trigger was not included in the list for this microenvironment.

Environmental Health Sciences, 2005). All 4 district head nurses and 28 of the other health care professionals responded.

Some lead nurses and other district health care professionals were able to attend the workshop on August 1, 2007, mid-morning to early afternoon at GSU, a downtown location accessible to Atlanta's public transportation system. GSU daily parking permits were available to individuals who came by car. Each participant received a folder, notepad, pen, highlighter, PowerPoint presentations, and other relevant written resources on environmental exposures (such as sources, agents). All participants received an approved incentive, a \$50 gift card for school and clinic supplies.

At the workshop, EHS workshop participants ($n = 4$) as well as HCPs ($n = 7$), principals ($n = 5$), main office staff ($n = 9$), and teachers ($n = 9$) from the seven participating primary schools in the larger study completed the GSU Institute of Public Health's survey developed for this project to identify and rank priorities among environmental asthma triggers and other environmental quality issues of potential concern in their community (see Figure 1). Following the workshop, nurses and other health care professionals repeated the CUAS and CPHI to measure immediate impact. The total number of participants was 34.

A matching Microsoft Access database was created to enter survey responses. Automated coding options prevented faulty entries and reduced human error among possible entry codes for a given question. For example, only "0" for "no" or "false" and "1" for "yes" or "true" were allowed. Data queries each provided one spreadsheet, which was exported and saved in Microsoft Excel. The principal investigator conducted final data reviews for purposes of quality control. Descriptive statistics were calculated with SPSS version 15.

Results and Discussion

Table 1 summarizes asthma and EHS knowledge and awareness of school health professional workshop recruits who responded (pre-workshop, baseline) and nurses participating on August 1, 2007 (post-workshop, immediate impact). Given the small sample sizes, no statistical sig-

nificance test of immediate impact was conducted. Nevertheless, the average respondent scored over 80%. In addition, on one questionnaire ("CUAS quiz"), for posttest compared to pre-test, the arithmetic mean (average) score was slightly higher, and participants scored within a narrower range (had more similar scores). These results suggested the workshop had a small, immediate, positive, overall impact on knowledge and awareness of participating school nurses.

Table 2 summarizes the indoor and outdoor triggers, irritants, and related factors of concern prioritized ("top 3") by EHS workshop participants and staff of participating schools on the GSU Institute of Public Health Checklist/Survey (see Figure 1). Concerns were stratified as being in the community outdoors and in specific microenvironments of interest to the health of school children (at school and at home). The top three concerns and priorities for inside or immediately outside schools were respiratory infections, mold or fungi, and quantity and quality of physical activity. It was deduced that the general concern over mold/fungi also indicated concerns about dampness or leaks onto surfaces and materials. No participants identified pet allergens, such as from cats and dogs, as a concern in schools. This finding was interesting given previous school-based EHS research noted clothes, bags, and stuffed animals can be sources of pet allergens people potentially brought into classrooms. For homes, mold and dust mites were the top two reported concerns and priorities, though dust mites appeared to be of relatively much greater concern among identified priorities. Pollen from flowers, plants, and trees, and diesel-powered mobile sources were the top two reported concerns for outdoor community triggers. Further, more than 75% of respondents who chose these concerns prioritized them as "top 3," and diesel exhaust appeared to be of greatest concern.

Practical Implications and Conclusion

Enhancing EHS and CEH literacy among nurses working in community settings, such as schools, can have several positive impacts on entire communities. Increasing the frequency of informative communications among school nurses and teachers

(who can also be parents, caregivers, and guardians) may improve general day-to-day and long-term monitoring of outcomes. Outcomes of interest include student health, academic productivity, and social and athletic well being. These activities can also help promote overall community awareness of both outdoor and indoor air and environmental quality. Awareness will allow nursing professionals to help school-aged children and their families prevent or reduce exposure. One way is to provide education on sources of pollutants (agents of exposure or hazards to our health) in microenvironments or places children spend their time, both indoors and outdoors, such as schools.

The survey piloted in this study may be used or modified for future studies to help rapidly assess and prioritize community environmental quality and health issues of present concern among nursing and other health care and education professionals. The survey was limited to schools, homes, and recreational facilities typically frequented by school-age children. Future initiatives should assess baseline awareness and knowledge, and then allocate resources to nurses to enhance their educational, clinical, and community leadership roles in grades K through 12 on environmental health topics.

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