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Evaluation of Connecticut's Indoor Air Quality Tools for Schools Programs

Elaine Marie Abrams

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EVALUATION OF CONNECTICUT'S INDOOR AIR QUALITY
TOOLS FOR SCHOOLS PROGRAM

Elaine Marie Abrams

B.S. Western Connecticut State University, 1998

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at the
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EVALUATION OF CONNECTICUT'S INDOOR AIR QUALITY TOOLS FOR SCHOOLS PROGRAM

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Preface

To date, formal evaluations of Indoor Air Quality Tools for Schools (IAQ Tools for Schools) have not been completed. In January 2002, Connecticut’s Indoor Environment Resource Team decided to evaluate its approach to implementation of IAQ Tools for Schools in Connecticut. IAQ Tools for Schools, a national program based on proven, scientific methods for preventing, understanding and solving indoor air quality problems, was designed to give schools information and skills to manage school indoor air quality in a low-cost, practical manner. Steps in the evaluation process included engaging key stakeholders, describing the program activities and expected effects, focusing on the evaluation design, deciding on an evaluative method, developing a survey tool, implementing the tool, synthesizing the results, and evaluating the survey tool. A two-page questionnaire was developed, piloted and distributed to the 50 Connecticut public schools that had completed IAQ Tools for Schools training between December, 1999 and February, 2002. A 50% response rate resulted in a sample of 25 schools. Approximately 75% of the respondents rated their overall satisfaction with IAQ Tools for Schools as “4” or “5” with 5 the highest category. The “walkthrough with industrial hygienist,” was listed as the most useful part of IAQ Tools for Schools training followed by the “IAQ Action Kit.” Although the "walkthrough with industrial hygienist" was listed as the most useful part of IAQ Tools for Schools training, the mean number of repairs for those schools lacking the walkthrough was roughly the same as those with both trainings. Between 30-40% of the sample reported that they had distributed, collected and summarized checklists, prioritized repairs, reviewed school blueprints, and distributed a summary report to
the school administration. Approximately 22% of the sample reported establishing or up-dating an existing IAQ policy as a result of implementing IAQ Tools for Schools. Of the sample schools, 49% were able to repair, or schedule a repair for ventilation problems, 31% for source reduction problems, 41% for water problems, and 32% for problems related to renovations after the training. Almost half of the sample responded that new policies or committees resulted from implementing IAQ Tools for Schools, and 41% of the sample noted a decrease in symptoms, while 42% of the sample did not notice any change in symptoms, and 17% did not know. Overall, the survey tool and analysis was an effective evaluation method and through its application showed that the Connecticut IAQ Tools for Schools training model has been effective in guiding the implementation of IAQ Tools for Schools. In addition, Connecticut schools that had received IAQ Tools for School were able to identify and remediate a substantial number of indoor air quality problems.
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The Connecticut Indoor Environment Resource Team

Participating Connecticut Public Schools
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Background

In our industrialized nation, people spend the majority of time indoors, especially in the colder latitudes. Construction of tight, energy efficient buildings and homes in the last 20 years has literally “sealed in” pollutants in our living spaces. Synthetic building materials and other pollutants introduced by humans, including biological and chemical pollutants, have further affected the quality of indoor air. Proper maintenance and functioning of mechanical heating and cooling systems often goes by the wayside, producing variability in temperature and humidity levels, and preventing inadequate amounts of fresh outside air. Outside air can be contaminated from nearby manufacturing plants and traffic, further compromising indoor air quality.

Health complaints from employees working inside buildings have focused attention on exposures to indoor contaminants and their health effects. The term, “Sick Building Syndrome” describes a complex of reversible, adverse symptoms experienced by persons when occupying a particular building or space (Seltzer, 1994). These vague, predominantly subjective complaints include headache, burning eyes, nose and throat, dizziness and respiratory complaints. “Building Related Illness,” on the other hand, represents a clinical condition associated with occupying a particular indoor environment. Such conditions have positive laboratory and other clinical findings including, but not limited to, dermatitis, asthma, pneumonitis and asthma (Seltzer, 1994).

Research has focused on building-related factors associated with health complaints, while the exact pathophysiologic mechanisms explaining how indoor environmental factors cause symptoms remains elusive (Seltzer, 1994). Bardana’s (2001) overview of indoor air pollution, however, provides a broader understanding of
adverse effects on human health as well as a framework for developing environmental control measures.

While attention to employees’ symptoms in the workplace has dominated discussion on poor indoor air quality and its health effects, little attention has been paid to the school indoor environment. Schools are chronically under-funded and proper maintenance of these densely populated buildings often takes low priority. In February 1995, the United States General Accounting Office issued a report, *Condition of America’s Schools*, which revealed that one-half of all public schools in the United States reported at least one major building feature in disrepair. Most of these schools had multiple problems, however, including at least one unsatisfactory environmental condition. In Connecticut, 68 percent of schools reported indoor environmental problems. In addition to environmental problems, three-quarters of schools spend funds during the previous three years on requirements to remove or correct hazardous substances, such as asbestos and lead.

Based on estimates, it was projected that the nation’s schools need about $112 billion to repair or upgrade America’s multibillion dollar investment in facilities to “good” overall condition. Of this, $11 billion is needed to comply with federal mandates that require schools remove or correct hazardous substances affecting indoor air quality, such as asbestos, lead and radon.

Children are particularly vulnerable to environmental pollutants because of their rapid physical development and the fact that they spend at least one-third of their time inside school buildings (Scheff, Paulius, Huang, Conroy, 2000). Staff and student health
symptoms, truancy, decrease in work productivity, and potential liability may all be a result of poor indoor air quality in schools.

Given the large volume of daily occupants and low air exchange rates due to inadequate or poorly maintained ventilation systems, the level of carbon dioxide, volatile organic compounds and biological pollutants is often high (Smedje and Norback, 2001). Classes of pollutants found at varying levels in schools include volatile organic compounds (VOCs), inorganic gases, particulate matter, and biologically-based pollutants, such as house dust, mold, bacteria and cockroaches (CASE Report, 2000). There are also multiple sources and locations for environmental exposures in schools, including art rooms, chemistry labs, school kitchens, wood working shops, photography rooms, cleaning products and pesticides. However, much is unknown about levels of exposures and their link to disease causation in children.

Most indoor air quality problems in schools are related to improper maintenance or functioning of existing ventilation systems resulting in inadequate fresh air ventilation. Moisture intrusion from leaking roofs and windows and old carpeting also contribute to poor indoor air quality. Schools built with poorly designed or maintained flat roofs and those built on concrete slab are particularly susceptible to moisture intrusion. Renovation projects conducted while school is in session also can result in exposure to indoor pollutants.

Exposure to diesel exhaust from idling school buses has also gained recent attention. Diesel exhaust is classified as a probable human carcinogen. Exposures to carbon particulates and other chemicals contained in diesel exhaust are correlated with respiratory illnesses, including asthma. Children may be especially susceptible to diesel
particulates since their small size can penetrate a child’s narrow airways. Furthermore, idling buses, especially queued idling buses, have higher concentration of particulates than moving buses (Juberg, D., 2001).

Although current Connecticut Department of Environmental Protection (CTDEP) Regulation DEP 22a-174-18 limits school bus engine idling time to three minutes, the regulation is not monitored or enforced. In early 2002, CTDEP initiated a cooperative approach with Connecticut School Transportation Association (COSTA) to address idling. A memo was mailed to COSTA members statewide explaining the importance of enforcing the three-minute bus idling policy. In addition, Connecticut DEP kicked off a “Clean School Bus Program” pilot in January, 2002. The program will look at cleaner fuels and new technology to reduce bus emissions and is expected to significantly reduce risk exposure to children and improve regional air quality (CTDEP, 2002).

In May, 2002, the Connecticut General Assembly’s (CGA) Environment Committee signed into effect Public Act No. 02-56, “An Act Concerning the Idling of School Buses.” The statute limits the idling of school buses when not in motion to three consecutive minutes except in specific situations (CGA, 2002).

Poor indoor air quality in schools and related exposures may explain a steady increase in prevalence of asthma in school-age children. Children are exposed to a variety of pollutants from a variety of sources within schools that may aggravate existing asthma. A Pew Environmental Health Commission Report (May 2000) notes the numbers of people with asthma increased 75% between 1984-1994. That number increased by 160% for children under age 5 and by 74% for children ages five to fourteen.
Childhood asthma is the most frequent reason for emergency room visits as well as absenteeism from school (NIH, 1999). Asthma death rates are increasing—in the past twenty years the number of deaths attributed to asthma has nearly tripled. In addition, the prevalence of asthma disproportionately affects minorities and poor, urban children (National Heart, Lung and Blood Institute, 1999).

Connecticut Department of Public Health (DPH) issued a report, “Asthma in Connecticut” in 2001, documenting a statewide childhood asthma rate of 10.4%. Data was obtained through two sources—the Behavioral Risk Factor Surveillance System (BRFSS), a statewide telephone survey, as well as through state child health insurance data (HUSKY). The report broke down asthma rates by age. Children age 13-17 years had the highest prevalence rate (14.4%), followed by children age 5-12 years (10.9%). Hispanic and black children had slightly higher rates than white children did (Connecticut State Department of Public Health, 2001).

Another report, “A Survey of the Prevalence of Asthma Among School Age Children in Connecticut” (Schwab, Cullen & Schwartz, 2000), showed lower childhood asthma prevalence rates for all age groups. Data was collected through a survey distributed to school nurse offices throughout the state. Differences in prevalence rates relate to differences in statewide asthma tracking patterns.

The “Hartford Health Survey” (Hartford Department of Health, 2000) revealed 33% of all of Hartford’s households reported at least one member with asthma. The highest rates were among Hispanics where 50% reported a member with asthma. Poor households were particularly affected, with asthma reported in 44% of households living in poverty. The asthma prevalence rate among Hartford’s elementary age children was
estimated at 9.0%. In addition, Hartford’s children have the highest rate of emergency room visits for asthma among children age 0-14 years, accounting for 15% of all visits.

These alarming trends in asthma prevalence in school-aged children have prompted public health officials nationwide to address indoor air quality in schools. However, school districts have difficulty finding and funding solutions to indoor environmental problems without laws or guidelines to steer them. A lack of legally enforceable standards for indoor air quality, complicated by the diversity of potential contaminants, often forces policy makers to rely on state agencies and private consultants to evaluate individual schools’ indoor air quality problems.

Despite an absence of enforceable standards, legislation in the area of school indoor air quality has been active. In January 2001, the CGA introduced Bill No. 1265, “An Act Concerning Indoor Environmental Quality in Schools.” The bill would have required schools to take a more pro-active role in addressing indoor air quality issues, tracking asthma cases, performing asthma assessments, and keeping logs of health complaints by students and staff and their relationship to environmental triggers. The bill would have also required each Board of Education to conduct indoor air quality assessments, including performing annual HVAC inspections and maintaining written records. Although the bill did not pass, some of the provisions on asthma tracking did get incorporated into other public health legislation.

In February 2002, the CGA Education Committee introduced Bill No. 5039, “An Act Concerning Indoor Air Quality in Schools,” and Bill No. 5707, introduced by the Environment Committee, “An Act Concerning Indoor Environmental Quality in Schools” (CGA, 2002). While both bills aimed to improve indoor air quality and provide a funding
mechanism for improvements, only Bill No. 5707 would require each board of education to perform an inspection program of the indoor environmental quality of its schools, and encourage the implementation of Indoor Air Quality (IAQ) Tools for Schools as a prevention program. As of May, 2002, neither bill has been signed into law.

In 1995, the United States (US) Environmental Protection Agency (EPA), in conjunction with several governmental and non-governmental agencies, launched a major initiative called IAQ Tools for Schools. The goals of the initiative were to provide schools with low-cost solutions to preventing or remediating many indoor air quality problems. An “IAQ Action Kit” was developed to guide prevention of, and management of, a variety of indoor air quality problems in schools. Use of the kit requires the designation of a school “IAQ Coordinator” to facilitate the process. The kits, available free of charge, include an “IAQ Coordinator’s Guide” which stresses the importance of the IAQ Coordinator, the “IAQ Management Plan,” and the “IAQ Team” at each school. “IAQ Checklists” provide coordinators with step-by-step guidance in assessing IAQ problems. The kit also contains fact sheets, a problem-solving wheel, videos, sample documents and other resources.

Schools often need more guidance than is available in the IAQ Tools for Schools kit. Most EPA Regional Offices now collaborate with state health departments and non-profits, such as local chapters of American Lung Association (ALA), to provide IAQ Tools for Schools workshops both regionally and locally. Over 760 schools and local public health officials nationwide have been trained in IAQ Tools for Schools (EPA, 2001).
Connecticut’s Indoor Environment Resource Team is a collaborative effort of regional and state agencies, and non-profit agencies (a complete list of participating members is included in the Appendix). The Resource Team provides a forum to discuss progress and barriers to remediation of a variety of indoor environment issues, including IAQ Tools for Schools training. Legislative issues around indoor air quality and future funding of IAQ Tools for Schools are also discussed.

Presently, there are two sources of EPA funding related to IAQ Tools for Schools in Connecticut. U.S. EPA New England provides a $20,000 grant to the State Department of Public Health (DPH) for the grant period October 2001 to September 2002, and DPH subcontracts with ConnectiCOSH. The EPA also funds a national cooperative grant to the ALA who in turn provides some funding to the ALA of Connecticut for IAQ Tools for Schools training.

Training personnel from the DPH, the ALA of Connecticut, the Connecticut Education Association (CEA), and ConnectiCOSH team up with industrial hygienists from Yale’s and the University of Connecticut’s Occupational and Environmental Medicine Programs to provide IAQ Tools for Schools training to school districts wanting to assess, prioritize and remediate a variety of indoor air quality problems. As of April, 2002, IAQ Tools for Schools has been implemented in 114 Connecticut public schools in 26 districts. The Resource Team also sponsored a statewide conference on school environmental issues in October, 2001.

Cooperation from school administration assists in successful implementation of IAQ Tools for Schools trainings. Districts are encouraged to schedule trainings when key staff, including school principals, custodial staff, school nurses, and parents can be in
attendance. The initial three-hour training consists of a general overview of indoor air quality problems and their health effects, including asthma. The IAQ Action Kit is introduced as well as group exercises and video presentations. The “second” training provides each participating school district with a sample “walkthrough” by a licensed industrial hygienist. This walkthrough training provides schools with actual examples of sources of indoor air problems, remedies and prevention tips.

**Program Evaluation**

Program evaluation in public health provides a systemic way to develop, improve, guide, or account for public health initiatives. In the past, program evaluation was often only used to measure performance. During the past several decades, however, the practice of program evaluation has evolved as a distinct discipline, with specific methods, definitions, and applications for planning, implementing and evaluating a variety of public health programs in a variety of settings. (MMWR, 1999, Bond, Boyd & Rapp, 1999, Deeds, Cleary & Neiger, 1992). Ideally, evaluation begins in the planning phase and continues throughout the life of a program.

There are different types of evaluation and each has a specific application (Figure 1). Formative evaluation attempts to measure process or outcomes while a program is in progress (Bond et al., 1997). Formative evaluation could be defined as “any combination of measurements obtained and judgments made before or during implementation of materials, methods or programs to control, assure, or improve the quality of program performance or delivery” (Green & Lewis, 1986, p. 362). It is a measure of program efforts or proposed activities rather than program effects (Thomas, 1991). Summative evaluation occurs when a program is ending, or at appropriate “break points” during
implementation. Summative evaluation also helps to determine if program goals and objectives have been met (Bond et al., 1997).

Evaluation design depends on what information is trying to be ascertained. Process evaluation answers the question as to whether program resources are being utilized efficiently, whereas impact evaluation answers the question as to what changes resulted. This is similar to outcome evaluation, providing information about whether the program made a difference in health outcomes (Deeds et al., 1992).

Program evaluation involves several steps including the initial phase of engaging stakeholders—those persons involved in or affected by the program—as well as users of the evaluation. This step increases the chances the evaluation will be useful, improves
credibility, and avoids conflict of interest. Stakeholders also play an important role in clarifying program activities and expected effects, deciding on an evaluative method and design, survey tool development, implementation of the survey tool, synthesis of the results, and evaluation of the survey tool.

Mail surveys are a common method of evaluation in public health due to ease of use, cost effectiveness and ability to reach a large population. (King, Pealer & Bernard, 2001). However, there are limitations to using mail surveys. One major limitation to mail surveys is selection bias. Often, those who respond are more motivated to begin with and, therefore, are not reflective of the population. Another limitation is non-response bias, or the potential difference between those who respond to a survey and those who do not.

Research has shown that it may be justifiable to reject survey study return rates lower than 50% (King et al., 2001). Thus, the use of inducement strategies to increase return rates, including use of postage paid return envelope, cover letter, egotistic appeal, university or governmental sponsorship, and deadlines should be utilized to the maximum extent (King et al. 2001).

In January 2002, the Connecticut Indoor Environment Resource Team chose to evaluate IAQ Tools for Schools in Connecticut. To date, no formal evaluations of IAQ Tools for Schools in any EPA region have been completed. A graduate student (myself) from the University of Connecticut Graduate Program in Public Health was recruited to plan, design and implement a survey questionnaire that would provide both quantitative and qualitative evaluative measures about program process and impact. Ideally, the survey tool could be utilized nationally and process and outcome data could be generalized wherever IAQ Tools for Schools had been implemented.
Methods

Design and sample

The final survey instrument consisted of closed-ended and open-ended questions about key issues in implementing IAQ Tools for Schools (a copy of survey can be found in the Appendix). Demographic information concerning location of school district, school grade level and occupational title of IAQ Coordinator was solicited. Specific closed-ended questions related to key IAQ Coordinator’s Checklist items, the school’s progress in remediating a variety of IAQ related issues, frequency of IAQ team encounters, job titles of school and community participants, and usefulness of various components of IAQ Tools for School training were included. Open-ended questions addressed barriers to implementation, motivating factors, additions or deletions to training, and additional resources. A question about perception of change in health symptoms and a five-item Likert scale used to rate overall satisfaction with program were also included.

The sample consisted of all of the 50 Connecticut schools that had completed IAQ Tools for Schools trainings between December 1999 and February 2002. It included elementary (64%), middle (14%), high (18%) and combined K-8 schools (4%) (Table 1).

Table 1. Comparison of Sample vs. State Breakdown by Grade Level

<table>
<thead>
<tr>
<th></th>
<th>Sample (n = 50)</th>
<th>State (n = 1069)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>64%</td>
<td>62%</td>
</tr>
<tr>
<td>Middle School</td>
<td>14%</td>
<td>17%</td>
</tr>
<tr>
<td>High School</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>Combined (K-8)</td>
<td>4%</td>
<td>4%</td>
</tr>
</tbody>
</table>

The sample included schools from rural (26%), suburban (64%) and urban (1%) districts throughout the state, although the majority of schools were geographically
located in Eastern Connecticut. The sampled schools were in Educational Reference Groups (ERG) B-I. The Connecticut State Department of Education groups school districts together of similar socioeconomic status (SES) into nine ERGs. ERGs are often used to compare similar school districts to each other. Districts are ordered from highest SES (A) to lowest SES (I).

It is essential to pre-test survey instruments before they are used (Price, Desmond, & Hallinan, 1987). Input about survey design, potential questions and method of data collection was solicited from the Connecticut Indoor Environment Resource Team, US EPA New England, two industrial hygienists, and the thesis committee. Three IAQ Coordinators in three selected school districts familiar with IAQ Tools for Schools piloted the survey. Based on input, changes and additions to survey questions and format were completed. A question regarding titles of IAQ Team members was added, as well the addition of third option—Scheduled for Repair—to the survey question about which specific IAQ problems had been identified or repaired. A question as to whether schools would wish to be contacted by members of the Connecticut Indoor Environment Resource Team was removed from the survey.

Survey Process

The two-page questionnaire was mailed to pre-designated IAQ Coordinators at each of the 50 sample schools. A cover letter explaining the purpose of the survey, its affiliation with the DPH and the University of Connecticut, instructions, assurance of confidentiality, and deadline date was included (a copy of the cover letter can be found in the Appendix). A stamped return envelope was also included.
Results

The final sample of respondents represented 25 schools (50%) that returned the completed survey by the deadline date. Respondents included 14 elementary (56%), four middle (16%), five high (20%) and two combined schools (8%).

Two schools (8%) were located in urban districts, 14 (56%) suburban and 9 (36%) in rural districts. Fifty two percent of the sample represented schools in ERGs A-D (highest SES), while 64% of the respondents were in ERGs A-D. Forty-eight percent of the sample represented schools in ERGs E-I (lowest SES), while 36% of respondents were from ERGs E-I (Table 2).

Table 2. Percent of Sample (n = 50) & Respondents (n = 25) Representing ERGs

<table>
<thead>
<tr>
<th>ERG Group</th>
<th>% of Sample</th>
<th>% Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERG A</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>ERG B</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>ERG C</td>
<td>8%</td>
<td>20%</td>
</tr>
<tr>
<td>ERG D</td>
<td>34%</td>
<td>36%</td>
</tr>
<tr>
<td>ERG E</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>ERG F</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>ERG G</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>ERG H</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>ERG I</td>
<td>2%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Frequencies and proportions for each of the survey questions were tabulated. A complete table is included in the Appendix. However, a summary of key findings is also presented here.

The majority of the respondents' designated IAQ Coordinators were school administrators (30%), nurses (27%) or teachers (23%). Three-quarters had completed both trainings. Those lacking trainings had not completed the walkthrough with an
industrial hygienist. About one half reported that they had some kind of indoor air quality policy or committee in place prior to trainings.

About one quarter of the respondents had completed all of the checklist steps. Over three quarters of the respondents reported that they had distributed, collected and summarized checklists, prioritized repairs, reviewed school blueprints, and distributed a summary report to the school administration, yet less than one quarter reported assessing lead or radon status. About two thirds of the respondents reported assessing pest status. About one third reported assessing asbestos status and one third reported establishing or up-dating an existing IAQ policy as a result of implementing IAQ Tools for Schools.

IAQ problems were organized into ventilation problems, source reduction problems, water problems, and renovation-related problems (Table 3).

Table 3. Percent of IAQ Problem Identified or Repaired by Respondents (n = 25)

<table>
<thead>
<tr>
<th>IAQ Problem</th>
<th>Identified</th>
<th>Repaired or Scheduled for Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation</td>
<td>60%</td>
<td>49%</td>
</tr>
<tr>
<td>Source reduction</td>
<td>37%</td>
<td>31%</td>
</tr>
<tr>
<td>Water identification</td>
<td>56%</td>
<td>41%</td>
</tr>
<tr>
<td>Renovations</td>
<td>48%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Over 60% of the respondents identified ventilation problems, and 49% were able to repair or schedule a repair. The most commonly cited ventilation problems were temperature and dryness problems (72%) and HVAC units and ventilation problems (65%). Of the total sample, over 37% identified source reduction problems, and 31% were able to repair or schedule repair. The most commonly cited source reduction problems included need for carpet removal (80%) and general cleanliness (64%). Fifty-six percent of the sample identified water problems and 41% were able to repair or
schedule a repair. The most commonly cited water problems were roof leaks (75%) and
general leaks, spills or moisture problems (72%). Forty-eight percent of the sample
identified IAQ problems related to renovations, and 32% were able to repair or schedule
repair. Other identified problems included bird nesting problems and saturated building
insulation.

Schools were asked how funds for repairs would be obtained. The majority of the
respondents reported that funds would come from the school budget, although many
schools were unsure where funding would come from. At least one school noted that
funds might come from a state grant or from existing renovation funds.

Almost one half of the respondents reported that new policies or committees
resulted from implementing IAQ Tools for Schools. Policies ranged from a teacher “dust
area” (an area that each teacher is responsible for cleaning) to a HVAC filter change and
maintenance policy. New committees included the addition of an indoor air quality
committee or a safety and health committee.

Factors that motivated schools to participate in IAQ Tools for Schools were
assessed. The majority of the respondents noted staff illness, complaints of poor indoor
air quality, and an increase in number of asthmatic students as motivating factors. Some
schools were motivated by particular indoor air quality problems, while one school noted
a desire to be “pro-active.”

The most commonly reported participants involved in implementing IAQ Tools
for Schools included school nurses (≥100%), custodians (100%), principals (88%), and
teachers (68%). Students (4%), PTO (16%) and local health department (16%) were least
likely to be involved.
Almost one half of the respondents reported that their designated IAQ Team had not met more than a few times since IAQ Tools for Schools trainings. The remaining half met either monthly or even more frequently. The respondents reported that the “walkthrough with industrial hygienist” was the most useful part of IAQ Tools for Schools training followed by the IAQ Action Kit. “Videos” and “group exercises” were cited as the least useful parts of IAQ Tools for Schools training.

The most frequently suggested addition or change to IAQ Tools for Schools trainings was a request for more intensive or thorough trainings. Other additions included more aggressive scheduling of trainings, a list of funding recommendations, and specific examples of indoor air quality policies. Requests for additional resources by the Resource Team included a “health symptoms survey,” a “contact person” for each school, and names of reputable vendors to assist with IAQ problems.

Based on a five-item Likert scale, 76% of the respondents rated their overall satisfaction with IAQ Tools for Schools as “4” or “5” with 5 the highest category. Major barriers to fully implementing IAQ Tools for Schools included lack of funding, time constraints, availability of IAQ contractors, apathy, scarcity of custodial and other school personnel, and impending renovation projects.

Perception of change in health symptoms since implementing IAQ Tools for Schools revealed that 41% of the respondents noted a decrease in symptoms, 42% of the did not notice any change in symptoms, and 17% did not know or could not answer. One school noted improvement in student asthma symptoms after mold remediation. Many schools noted an increase in interest and general awareness about indoor air problems. One school supported state legislation in the area of indoor air quality.
Discussion

Results provided qualitative and quantitative data about the types of indoor air quality problems, use and effectiveness of Connecticut’s two-stage model of training, school personnel participation and barriers to remediation of IAQ problems. Overall, results from the respondents indicate Connecticut schools are experiencing a wide range of indoor air problems, and that Connecticut’s IAQ Tools for Schools program appears to be highly effective in assisting schools in formulating a team approach, assessing, documenting and prioritizing IAQ related problems, and in their remediation efforts. Despite the fact that only 25% of the respondents had completed all of the IAQ Coordinator checklist steps, satisfaction was high, or very high, among respondents.

The respondents rated the “walkthrough with the industrial hygienist” as the most effective element of training, yet, a comparison of the mean number of repairs reported by respondents that had not completed the walkthrough (mean repairs= 5, n = 6) with the rest of the respondents (mean repairs = 6, n = 19) did not reveal any outward differences in remediation efforts (Table 4). Due to the small sample size and lack of power, the ability to detect differences was very low.

Table 4. A Comparison of Sample Schools, No. of Trainings, and No. of Repairs

<table>
<thead>
<tr>
<th>Type of School</th>
<th># Trainings</th>
<th># Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Elementary</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Rural Elementary</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Suburban Middle School</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Suburban Middle School</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Despite a substantial number of reported IAQ problems, lack of adequate remediation funds, and other barriers, the respondents made substantial progress
prioritizing and repairing IAQ problems. Reported perceptions of decreases in health related symptoms following remediation are encouraging.

There appeared to be an inverse relationship between remediation and level of difficulty or expense to remediate. For example, two thirds of the respondents identified the need to upgrade or replace HVAC filters, and almost two thirds were able to complete this relatively low cost intervention. In contrast, plumbing and temperature problems, typically much more costly to remediate, were identified in almost two thirds of the sample, yet less than one third were able to remediate.

The mean number of repairs for the middle school respondents was 8.2 repairs (n = 6), 5.7 repairs for elementary schools (n = 15), and 3.75 repairs for high schools (n = 4).

There also appeared to be a relationship between how often the school’s IAQ Team met during implementation and the number of reported repairs. Responding schools that met monthly (n = 7.0, mean repairs = 7.9) had more repairs than those that met “a few times” (n = 16, mean repairs = 5.5). Due to the small sample size and lack of power, the ability to detect differences was very low.

One notable finding was an absence of identification of radon as a source reduction problem. It is unknown whether responding schools had previously tested for radon and thus, did not “identify” it as a problem, or if radon testing had ever been performed. EPA recommends that all schools nationwide be tested for radon. In 1995, EPA found that nearly one in five schools has at least one room with radon above the EPA recommended action level of 4 pCi/L (EPA, 2002). To date, approximately 20% of the schools nationwide have done some testing. Some states have tested all their public
schools (EPA, 2002). As of 2001, the Connecticut DPH reports that 279 Connecticut schools in 48 districts have completed radon testing.

Sixty percent of the respondents identified a lack of bus idling policy as a source reduction problem, yet, only 40% were successful in establishing or enforcing such a policy. A new Connecticut statute limiting school bus engine idling time to three consecutive minutes should help to enforce school bus idling policies. The DEP’s new cooperative approach to enforcing bus idling limit may also be of assistance to schools struggling with this issue.

Respondent rates verified the usefulness of this assessment tool. The survey’s 50% response rate is considered to be adequate. Procedures such as using a cover letter, providing a stamped addressed return envelope, giving a deadline date, noting a university affiliation, and using a friendly format (open and close-ended questions with checklists) most likely improved survey returns.

Results are limited by possible selection bias. The sample was not chosen at random since only those schools that had completed at least one IAQ Tools for Schools Training were included. Response bias is also possible since schools responding to the survey may have been more motivated to report their results if committees or policies were already in place to address IAQ problems, were more successful at implementing IAQ Tools for schools, or had additional resources available to remediate. In fact, almost half of responding schools claimed a policy or committee to address IAQ was in place prior to training.

Another limitation to the survey is the reliance on self-report. There was no method to verify whether schools actually performed the changes that were reported by
the designated IAQ Coordinator. Also, measurable changes in disease or health symptoms could not be verified.

Results of this evaluation may not be predictive of schools trained in IAQ Tools for Schools nationally. Connecticut ranks first in the United States in per capita personal income and among the highest in per pupil spending. Furthermore, two thirds of the responding schools were in the top five ERGs. A comparison of mean number of repairs made by responding schools in ERG B (n = 2, mean repairs = 6.0) to responding schools in ERG G (n = 5, mean repairs = 6.6) did not reveal any major differences. However, due to the small sample size and lack of power, the ability to detect differences was very low.

To date, implementation of IAQ Tools for Schools has not occurred in any of the districts in Connecticut’s lowest ERG, with the exception of one school. About 17% of all Connecticut schools are in the lowest ERG. Schools grouped among the higher ERGs may have been more likely to obtain funding for remediation, may have been more likely to initiate implementation of IAQ Tools for Schools, an thus may have been more likely to report results.

This study was not designed to include a control group of schools that did not participate in Tools for Schools, so we are unable to draw conclusions as to why schools did not participate in the program. It is possible that poorer schools have other higher priority issues than IAQ, that they have more difficulty funding remediation, have less political pressure or other incentives to participate, were not aware of the program, or any of many other possibilities.

Connecticut’s IAQ Tools for Schools’ use of a statewide outreach program based at DPH may have affected overall success in both identification and remediation of IAQ
problems, and in establishing IAQ policies. In addition, Connecticut Indoor Environments Resource Team's collaborative interagency model and judicious use of funding are most likely important components in the successful implementation of IAQ Tools for Schools in Connecticut. DPH works closely with US EPA New England to obtain funding for future trainings and "shares" monetary and human resources with ConnectiCOSH and the ALA of Connecticut. Industrial hygienists from University of Connecticut and Yale University "volunteer" their efforts providing schools with the important "walkthrough" training. The Connecticut Education Association provides media outreach, as well as serving as a lobby for school IAQ legislation along with Connecticut Federation of Educational & Professional Employees.

Finally, other differences not yet identified or measured could also influence generalization of results.
Recommendations

Before expanding use of the IAQ Tools for Schools survey to other Connecticut schools, or to other EPA regions, some important changes and additions to the survey are recommended. First, adding “did not assess” and “not applicable” as a fourth possible answer to survey question #4 regarding which IAQ problems had been identified, repaired, or scheduled for repair may help clarify non-response to this question. Second, including incentives in the survey mailing, such as booklets or a video about IAQ, or $1 token payment, may also improve return rates. Third, to reduce selection bias, a control sample of schools not yet trained in IAQ Tools for Schools could be surveyed along with a random sample of trained schools.

The survey may also include a question about when schools were last tested for radon. Testing for radon is a simple, unobtrusive and inexpensive procedure. Including radon kits in the IAQ Tools for Schools Action Kit, as well as a recent copy of EPA’s “Radon in Schools” (2nd Ed) document, may encourage radon testing in schools that have not tested for radon.

In Connecticut, a copy of current Connecticut DEP school bus idling regulation, as well as sample bus idling policies, may assist schools in developing their own policy (a general section on developing indoor air quality policies is included in the IAQ Coordinator Guide). Updated copies of all local and state policies and legislation regarding indoor air quality should be provided.

Ideally, changes in measurable health outcomes before and after implementing IAQ Tools for Schools should be evaluated. The IAQ Tools for Schools Kit encourages schools to keep a log of IAQ–related health symptoms and complaints among staff and
students. However, this must be done very carefully, since the process of training on IAQ initially would be likely to raise awareness and report of illness, particularly within a passive surveillance approach such as nurse logs or OSHA or workers’ compensation reports. A simple health symptoms survey could be distributed at baseline (before IAQ Training begins) and on a regular basis to staff and students that would provide valuable documentation about health outcomes.

Ongoing communication between the Connecticut Indoor Environment Resource Team and the school IAQ Coordinators should be encouraged. Reinforcement of ongoing remediation efforts, regular IAQ committee meetings, and policy updates, as well as providing overall encouragement of a school’s individual efforts, can be achieved via regular correspondence (i.e., IAQ newsletters). Innovative problem solving efforts and funding sources should be shared. Maintaining lists of reputable independent contractors specializing in mold remediation and other IAQ problems may also be helpful.

Future IAQ Tools for Schools trainings should stress the importance of ongoing evaluation of the program. Schools should be aware that their participation in IAQ Tools for Schools surveys is vital to evaluating not only the effectiveness of the training and progress with remediation efforts, but also in ascertaining additional funding and future legislation around indoor air quality in schools.

To date, successful outreach to Connecticut’s poorest school districts has not occurred. Since asthma appears to be an even bigger problem among minorities, and since the schools in poor districts would be likely to have even more significant problems, it seems that it would be useful for the Tools for Schools program to target
such schools for participation. Alternative outreach activities, as well as a new approach to implementation for these districts should be explored.

In 2001, EPA reported that 760 schools nationwide had completed IAQ Tools for Schools training, yet, to date, Connecticut alone has trained well over 100 schools despite minimal funding. Future successes for Connecticut's IAQ Tools for Schools program will ultimately rely on additional funding and willingness of schools to participate, as well as the continued sharing of resources from participating Resource Team members.
References


Seltzer, J. Building related illnesses. *Journal of Allergy and Clinical Immunology, 94*, 351-359.

Appendices
Connecticut Indoor Environment Resource Team Members

April 22, 2002

United States Environmental Protection Agency New England Regional Office (USEPA)

Connecticut State Department of Public Health (DPH)

Connecticut Council for Occupational Safety and Health (CTCOSH)

Connecticut Department of Labor

Connecticut Department of Environmental Protection (DEP)

Connecticut Department of Education

Connecticut Education Association (CEA)

American Lung Association of Connecticut

Connecticut Association of Boards of Education

Connecticut School Building & Grounds Association

Connecticut Federation of Educational & Professional Employees

Connecticut Association of Local Health Directors

United States Department of Education, Region I, Office for Civil Rights

University of Connecticut Health Center-Division of Occupational and Environmental Medicine

Yale Occupational & Environmental Medicine Program
### SCHOOL DEMOGRAPHICS (n=25)

<table>
<thead>
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<td>MIDDLE</td>
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</tr>
<tr>
<td>HIGH</td>
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</tr>
<tr>
<td>COMBINED K-8</td>
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</tr>
<tr>
<td>URBAN</td>
<td>8%</td>
</tr>
<tr>
<td>SUBURBAN</td>
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<tr>
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### SCHOOLS BY ERG (n=25)

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</tr>
<tr>
<td>B</td>
<td>8%</td>
</tr>
<tr>
<td>C</td>
<td>20%</td>
</tr>
<tr>
<td>D</td>
<td>36%</td>
</tr>
<tr>
<td>E</td>
<td>8%</td>
</tr>
<tr>
<td>F</td>
<td>12%</td>
</tr>
<tr>
<td>H</td>
<td>16%</td>
</tr>
<tr>
<td>I</td>
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### BOTH TRAININGS COMPLETE? (n=25)

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<tr>
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<td>24%</td>
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### IAQ COORDINATOR CHECKLIST (n=25)

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<tr>
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</tr>
<tr>
<td>CHECKLISTS COLLECTED &amp; SUMMARIZE</td>
<td>80%</td>
</tr>
<tr>
<td>REVIEW BLUEPRINT</td>
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</tr>
<tr>
<td>ASSESS PEST STATUS</td>
<td>60%</td>
</tr>
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<td>ASSESS ASBESTOS</td>
<td>34%</td>
</tr>
<tr>
<td>ASSESS RADON</td>
<td>24%</td>
</tr>
<tr>
<td>ASSESS LEAD</td>
<td>24%</td>
</tr>
<tr>
<td>PRIORITIZE REPAIRS &amp; UPGRAGES</td>
<td>68%</td>
</tr>
<tr>
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### IAQ COORDINATOR (n=25)

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<thead>
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<tr>
<td>TEACHER</td>
<td>23%</td>
</tr>
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<td>FACIL MGR</td>
<td>8%</td>
</tr>
<tr>
<td>OTHER</td>
<td>8%</td>
</tr>
<tr>
<td>PARENT</td>
<td>4%</td>
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### IAQ MGMT PLAN PRIOR? (n=25)

<table>
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<th>Percent</th>
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<tbody>
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<td>76%</td>
</tr>
<tr>
<td>NO</td>
<td>24%</td>
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### IAQ PROBLEMS (n=25)

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<th>Problem</th>
<th>Identified</th>
<th>Repaired</th>
<th>Scheduled Repair</th>
<th>Not Identified</th>
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<td>OBSTRUCTIONS FROM AIR VENTS</td>
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<td>32%</td>
<td>12%</td>
<td>44%</td>
</tr>
<tr>
<td>FILTER NEED UPGRADE OR REPLACING</td>
<td>4%</td>
<td>56%</td>
<td>4%</td>
<td>36%</td>
</tr>
<tr>
<td>HVAC &amp; VENTS NEED CLEANING</td>
<td>4%</td>
<td>42%</td>
<td>19%</td>
<td>35%</td>
</tr>
<tr>
<td>TEMP/DRYNESS/HUMIDITY</td>
<td>36%</td>
<td>24%</td>
<td>12%</td>
<td>28%</td>
</tr>
<tr>
<td>ARTS/SCIENCES ROOM VENTIL</td>
<td>53%</td>
<td>33%</td>
<td>14%</td>
<td>53%</td>
</tr>
<tr>
<td>OUTDOOR AIR INTAKE NEEDS IMPROVE</td>
<td>17%</td>
<td>38%</td>
<td>6%</td>
<td>39%</td>
</tr>
<tr>
<td>RADON REMEDIATION</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>IAQ PROBLEMS (n=25)</td>
<td>IDENTIFIED</td>
<td>REPAIRED</td>
<td>SCHEDULED REPAIR</td>
<td>NOT IDENTIFIED</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>------------</td>
<td>----------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>ASBESTOS REMEDIATION</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>76%</td>
</tr>
<tr>
<td>CLEANING CMPDS NEEDS REPLACE WITH GREENER</td>
<td>8%</td>
<td>24%</td>
<td>0%</td>
<td>68%</td>
</tr>
<tr>
<td>GENERAL CLEANING</td>
<td>28%</td>
<td>16%</td>
<td>20%</td>
<td>36%</td>
</tr>
<tr>
<td>CARPET CLEANING</td>
<td>32%</td>
<td>24%</td>
<td>24%</td>
<td>20%</td>
</tr>
<tr>
<td>PEST USE REMEDIATION</td>
<td>4%</td>
<td>24%</td>
<td>0%</td>
<td>72%</td>
</tr>
<tr>
<td>ARTS/SCIENCES NEED REPLACE WITH GREENER</td>
<td>8%</td>
<td>20%</td>
<td>4%</td>
<td>68%</td>
</tr>
<tr>
<td>CLASSROOM ANIMAL DANDER</td>
<td>56%</td>
<td>36%</td>
<td>0%</td>
<td>56%</td>
</tr>
<tr>
<td>BUS IDLING POLICY LACKING</td>
<td>20%</td>
<td>32%</td>
<td>85</td>
<td>40%</td>
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<tr>
<td>LEAKS, SPILLS, MOISTURE</td>
<td>20%</td>
<td>44%</td>
<td>8%</td>
<td>28%</td>
</tr>
<tr>
<td>PLUMBING PROBLEMS</td>
<td>16%</td>
<td>28%</td>
<td>12%</td>
<td>44%</td>
</tr>
<tr>
<td>ROOF PROBLEMS</td>
<td>20%</td>
<td>52</td>
<td>4%</td>
<td>24%</td>
</tr>
<tr>
<td>BASEMENT/CRAWLSPACE NEEDS UPGRAADING</td>
<td>8%</td>
<td>4%</td>
<td>4%</td>
<td>84%</td>
</tr>
<tr>
<td>REMOVAL OF WATER DAMAGED MATERIALS</td>
<td>8%</td>
<td>32%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>RENOVATIONS</td>
<td>16%</td>
<td>8%</td>
<td>24%</td>
<td>52%</td>
</tr>
</tbody>
</table>

OTHER PROBLEMS
- BIRDS NESTING IN OVERHANG
- SATURATED INSULATION
- OVERALL CLEANLINESS
- MOLD REMOVAL

HOW FUNDS OBTAINED?
- TOWN CAPITAL IMPROVEMENT FUND
- FEDERAL BUDGET
- RENOVATION BUDGET
- GRANT FROM STATE
- UNSURE

NEW POLICIES OR COMMITTEES? (n=25)                      PERCENT  HOW OFTEN IAQ TEAM MET? (n = 25) PERCENT
YES                                                      44%      A FEW TIMES  48%            
NO                                                       52%      MONTHLY    24%            
NOT APPLICABLE                                           4%       OTHER      28%            

TYPES OF POLICIES
- TEACHER DUST AREA
- IAQ TOOLS FOR SCHOOLS COMMITTEE
- SYSTEM WIDE IAQ COMMITTEE
- NO IDLING POLICY
- IAQ TEAMS
- SAFETY & HEALTH COMMITTEE
- HVAC/FILTER CHANGE MAINTENANCE POLICY
- CENTRAL SCHOOLS FOR SCHOOLS

WHAT WERE MOTIVATING FACTORS TO IMPLEMENTING IAQ TFS?
- DISTRICT WIDE MANDATE
- REQUESTS FOR HEALTHIER SCHOOL ENVIRONMENT
- STAFF COMPLAINTS
- SPECIFIC IAQ PROBLEMS
- NEW CONSTRUCTION & RENOVATIONS
- BETTER UNDERSTANDING OF IAQ PROBLEMS
- VISIBLE MOLD
- WATER DAMAGE
- TEMP/VENTILATION CONCERNS
- INCREASE IN ASTHMATIC STUDENTS
- HEALTH COMPLAINTS
- SCHOOL PROBATION
PART OF IAQ TFS TRAINING MOST USEFUL (n=25)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAQ TFS ACTION KIT</td>
<td>26%</td>
</tr>
<tr>
<td>VIDEOS</td>
<td>15%</td>
</tr>
<tr>
<td>WALKTHROUGH WITH INDUS HYGIENIST</td>
<td>27%</td>
</tr>
<tr>
<td>PRESENTATION ON IAQ</td>
<td>21%</td>
</tr>
<tr>
<td>GROUP EXERCISES</td>
<td>11%</td>
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WHO PARTICIPATED IN PROCESS? (n=25)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHOOL NURSE</td>
<td>100%</td>
</tr>
<tr>
<td>PARENTS</td>
<td>64%</td>
</tr>
<tr>
<td>FACILITY MGR</td>
<td>40%</td>
</tr>
<tr>
<td>TEACHERS</td>
<td>68%</td>
</tr>
<tr>
<td>LOCAL HEALTH DEPT</td>
<td>16%</td>
</tr>
<tr>
<td>SCHOOL HEALTH ADVISORY BD</td>
<td>24%</td>
</tr>
<tr>
<td>SCHOOL PRINCIPAL</td>
<td>88%</td>
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PART OF IAQ TFS TRAINING LEAST USEFUL (n=25)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>IAQ TFS ACTION KIT</td>
<td>0%</td>
</tr>
<tr>
<td>VIDEOS</td>
<td>47%</td>
</tr>
<tr>
<td>WALKTHROUGH WITH INDUS HYGIENIST</td>
<td>0%</td>
</tr>
<tr>
<td>PRESENTATION ON IAQ</td>
<td>12%</td>
</tr>
<tr>
<td>GROUP EXERCISES</td>
<td>41%</td>
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WHO PARTICIPATED IN PROCESS? (n=25)

<table>
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<tr>
<th>Activity</th>
<th>Percent</th>
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<tbody>
<tr>
<td>BOARD OF EDUCATION</td>
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</tr>
<tr>
<td>PTO</td>
<td>16%</td>
</tr>
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<td>UNION</td>
<td>44%</td>
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<tr>
<td>CUSTODIAL</td>
<td>100%</td>
</tr>
<tr>
<td>STUDENTS</td>
<td>4%</td>
</tr>
<tr>
<td>CENTRAL ADMIN</td>
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ADDITIONS OR CHANGES TO TRAINING

MORE PRACTICAL, LESS FRAGMENTED TRAINING, MORE INTENSIVE, MORE AGGRESSIVE WITH SCHEDULING, LESS INFO IN PACKET GO THROUGH IAQ PACKET MORE THOROUGHLY, FUNDING RECOMMENDATIONS, PRESSURE SCHOOLS TO RESOLVE PROBLEMS CHECKLISTS MORE SPECIFIC, UPDATED MATERIALS, COPIES OF STATE IAQ POLICIES

WHAT ADDITIONAL RESOURCES COULD IAQ TEAM PROVIDE?

FUNDING RESOURCES, NAMES OF IAQ VENDORS, SUCCESS STORIES OF OTHER SCHOOLS, LIST OF PROFESSIONALS, CONTACT PERSON FOR EACH SCHOOL, HEALTH SYMPTOMS SURVEY, TAPE PROVIDES WIDER VARIETY OF BLDG PROBLEMS

HOW SATISFIED WITH IMPLEMENTATION OF IAQ TFS? (n=25)

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Percent</th>
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<td>2</td>
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<td>3</td>
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<tr>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>5 = HIGH</td>
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WHAT IS YOUR PERCEPTION OF OVERALL CHANGE IN HEALTH SYMPTOMS? (n=25)

<table>
<thead>
<tr>
<th>Change Description</th>
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<tbody>
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<td>SYMPTOMS INCREASED</td>
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<tr>
<td>SYMPTOMS DECREASED</td>
<td>41%</td>
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<tr>
<td>NO CHANGE NOTICED</td>
<td>42%</td>
</tr>
<tr>
<td>DO NOT KNOW</td>
<td>17%</td>
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WHAT MAJOR BARRIERS TO IMPLEMENTING IAQ TFS STILL EXIST?

AVAILABILITY OF CONSULTANTS FOR IAQ
RENOVATIONS PENDING, LACK OF TIME, LACK OF MANPOWER, LACK DISTRICT WIDE COORDINATION, FUNDS, MISTRUST, APATHY,

COMMENTS

STATE LEGISLATION NEEDED, ATTITUDES HAVE IMPROVED, BROUGHT AWARENESS ABOUT IAQ,
February 19, 2002

Dear Tools for Schools Coordinator:

Some time ago, your school began a new program to monitor and improve indoor air quality called Indoor Air Quality Tools for Schools. On behalf of Connecticut’s Indoor Environment Resource Team, congratulations on your progress!

The Resource Team is attempting to assess the effectiveness of the IAQ Tools for Schools (TfS) program in Connecticut, and we are seeking your help. I am a graduate student in public health at University of Connecticut assisting this effort, as part of my thesis project. I have developed a two-page survey to assist the Resource Team in tracking school indoor air quality improvements, as well as help identify major indoor air quality problems. The survey may eventually be utilized for tracking TfS activities at schools nationwide. Results of the survey will provide information on improving the IAQ Tools for Schools trainings, as well as provide the Resource Team with other valuable information.

I am asking the IAQ Coordinator at each school to complete the survey. It should not take more than 10-15 minutes. Answer the questions based on your overall knowledge of what has taken place at your school. If your are “co-coordinating” IAQ Tools for Schools, you only need to complete one survey for your each school. The Resource Team would also appreciate you attaching any copies of reports that your school has produced as part of the IAQ Tools for Schools process that you think might be helpful to the overall evaluation.

Anonymous composite results will be sent to schools that completed this survey. All survey results will be held in confidence. Please fax your completed survey to (203) 426-1631 or return in the pre-stamped, addressed envelope included in this mailing. Return deadline is March 15, 2002. If you have specific questions about the survey, please do not hesitate to email me at eabramsrm@aol.com. If you would like to discuss your IAQ Tools for Schools progress, please call Kenny Foscue, MPH, IAQ Tools for Schools Resource Team member, State Dept. of Public Health at 1-860-509-7742.

On behalf of myself and Connecticut’s Indoor Environment Resource Team, thank you for completing this very important survey!

Sincerely,

Elaine Abrams, RN
Graduate Program in Public Health
University of Connecticut Health Center
IAQ TOOLS FOR SCHOOLS SURVEY

SCHOOL __________________________ CITY/TOWN __________________________

☐ Elementary  ☐ Middle School  ☐ High School  ☐ Other:

IAQ COORDINATOR(S) __________________________ PHONE ___________ E-MAIL ___________

☐ School Nurse  ☐ Facility Mgr.  ☐ Administrator  ☐ Teacher  ☐ Parent  ☐ Other

1. Did your school complete BOTH of the IAQ Tools for Schools trainings (Introductory 3hrs & Walkthrough with Industrial Hygienist)?
   ☐ YES  ☐ NO

2. Did your school have an IAQ MANAGEMENT PLAN or HEALTH & SAFETY TEAM that addressed IAQ PRIOR to IAQ Tools for Schools trainings?
   ☐ YES  ☐ NO

3. Which IAQ COORDINATOR CHECKLIST STEPS have been COMPLETED to date?
   ☐ All Steps Completed  ☐ Checklist Log  ☐ Distribution of Action Packets
   ☐ Checklists Collected & Summarized  ☐ Review School Blueprint
   ☐ Assess Pest/Pesticide Status  ☐ Assess Asbestos Status
   ☐ Assess Radon Status  ☐ Assess Lead Status
   ☐ Prioritize Repairs & Upgrades  ☐ Develop & Distribute Summary Report
   ☐ Establish or Update IAQ School Policy

4. Which IAQ PROBLEMS have been identified, repaired, or scheduled for repair? (Please check)
   IDENTIFIED  REPAIRED  SCHEDULED

VENTILATION PROBLEMS
Obstructions from air vents ☐ ☐ ☐
Filters need upgrading or replacing ☐ ☐ ☐
HVAC units & ventilators need cleaning ☐ ☐ ☐
Temperature/dryness/humidity need improving ☐ ☐ ☐
Arts & Sciences room needs ventilating ☐ ☐ ☐
Outdoor air intakes need improving ☐ ☐ ☐

SOURCE REDUCTION PROBLEMS
Radon remediation needed ☐ ☐ ☐
Asbestos remediation needed ☐ ☐ ☐
Cleaning compounds need replacing with “greener products” ☐ ☐ ☐
General cleaning improvement needed ☐ ☐ ☐
Carpet cleaning or removal needed ☐ ☐ ☐
Pests or pesticide use remediation needed ☐ ☐ ☐
Arts/science materials need replacing with “greener products” ☐ ☐ ☐
Classroom animal dander exposure ☐ ☐ ☐
Bus idling policies lacking ☐ ☐ ☐

WATER IDENTIF PROBLEMS
Inspections of leaks, spills, moisture ☐ ☐ ☐
Plumbing problems ☐ ☐ ☐
Roof problems ☐ ☐ ☐
Basement or crawlspace needs upgrading ☐ ☐ ☐
Removal of water-damaged materials needed ☐ ☐ ☐

OTHER PROBLEMS
Renovations to classrooms, buildings ☐ ☐ ☐
Other problems, please list:
5. If FUNDS are required for REPAIRS/UPGRADES, how will they be OBTAINED?

6. Have any NEW POLICIES or COMMITTEES resulted by implementing IAQ Tools for Schools?
   - YES 
   - NO 
   If YES, please note type of policies/committees:

7. What were the MOTIVATING FACTORS to implementing IAQ Tools for Schools at your school?

8. How often has your IAQ TEAM met since training taken place?
   - Monthly since training 
   - Have not met more than a few times 
   - Other (specify)

9. Please check who PARTICIPATED in your IAQ Tools for Schools process:
   - School nurses 
   - Parents 
   - Facility managers 
   - Teachers 
   - Local Health Dept. 
   - School Health Advisory Board 
   - School Principal/Admin 
   - School Board of Education 
   - Parent Organization (PTO) 
   - Custodial staff 
   - Students 
   - Central School Admin 
   - Others (please specify)

10. Which part of IAQ Tools for Schools TRAINING was MOST USEFUL? (PICK ONE)
    - Tools for Schools Action Kit 
    - Videos (Taking Action & Ventilation Basics) 
    - Walkthrough Training with Industrial Hygienist 
    - Presentation on IAQ 
    - Group Exercises

11. Which part of IAQ Tools for Schools TRAINING was LEAST USEFUL? (PICK ONE)
    - Tools for Schools Action Kit 
    - Videos (Taking Action & Ventilation Basics) 
    - Walkthrough Training with Industrial Hygienist 
    - Presentation on IAQ 
    - Group Exercises

12. What ADDITIONS or CHANGES to IAQ Tools for Schools TRAININGS would be helpful?

13. What ADDITIONAL RESOURCES could IAQ Tools for Schools Resource Team provide?

14. How SATISFIED are you with overall implementation of IAQ Tools for Schools so far?
    (LOW) 1 2 3 4 5 (HIGH)

15. What MAJOR BARRIERS to fully implementing IAQ Tools for Schools still exist?

16. What is your PERCEPTION of OVERALL CHANGE IN HEALTH SYMPTOMS or complaints since IAQ Tools for Schools was implemented?
    - Symptoms increased 
    - Symptoms decreased 
    - No change noticed 
    - Don’t know

17. Please feel free to offer COMMENTS, THOUGHTS, and SUGGESTIONS about IAQ Tools for Schools:
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Survey Results

TITLE OF IAQ COORDINATOR

- Nurse: 27%
- Facility MGR: 8%
- Admin: 30%
- Teacher: 23%
- Parent: 4%
- Other: 8%

BOTH IAQ TFS TRAININGS COMPLETED?

- Yes: 76%
- No: 24%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ MGMT PLAN PRIOR TO TRAINING?

- NO: 46%
- YES: 54%

ALL CHECKLISTS COMPLETED

- ALL STEPS COMPLETED: 24%
- NOT COMPLETED: 76%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ COORDINATOR CHECKLIST

NOT COMPLETED
20%

CHECKLIST LOG
80%

IAQ COORDINATOR CHECKLIST

NOT COMPLETED
24%

DISTRIBUTE ACTION PACKET
76%
CONNETICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ COORDINATOR CHECKLIST

NOT COMPLETED
20%

CHECKLIST COLLECTED & SUMMARIZED
80%

IAQ COORDINATOR CHECKLIST

NOT COMPLETED
20%

REVIEW SCHOOL BLUEPRINT
80%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ COORDINATOR CHECKLIST

ASSESS RADON
24%

NOT COMPLETED
76%

IAQ COORDINATOR CHECKLIST

ASSESS LEAD
24%

NOT COMPLETED
76%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ COORDINATOR CHECKLIST

- Not Completed: 32%
- Prioritize Repairs & Upgrades: 68%

IAQ COORDINATOR CHECKLIST

- Not Completed: 30%
- Distribute Summary Report: 70%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

IAQ COORDINATOR CHECKLIST

- Establish or update IAQ policy: 28%
- Not completed: 72%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

OBSTRUCTIONS FROM AIR VENTS

- Identified: 12%
- Repaired: 32%
- Scheduled for repair: 12%
- Not identified: 44%

FILTERS NEED UPGRADING OR REPLACING

- Identified: 4%
- Repaired: 56%
- Scheduled: 4%
- Not identified: 36%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

HVAC UNITS & VENTILATORS NEED CLEANING

- Identified: 4%
- Repaired: 42%
- Scheduled: 19%
- Not Identified: 35%

TEMP/DRYNESS/HUMIDITY NEEDS IMPROVING

- Identified: 36%
- Repaired: 24%
- Scheduled: 12%
- Not Identified: 28%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

ARTS/SCIENCES ROOM NEEDS VENTILATING

- Not Identified: 53%
- Identified: 33%
- Scheduled: 14%
- Repaired:
  - 33%

OUTDOOR AIR INTAKES NEED IMPROVEMENT

- Not Identified: 39%
- Identified: 17%
- Scheduled: 6%
- Repaired: 38%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

**RADON REMEDIATION**
- Identified: 0%
- Repaired: 0%
- Scheduled: 0%
- Not Identified: 100%

**ASBESTOS REMEDIATION**
- Identified: 8%
- Repaired: 8%
- Scheduled: 8%
- Not Identified: 76%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

CLEANING COMPOUNDS NEED REPLACING WITH GREENER PRODUCTS

- Identified: 8%
- Repaired: 24%
- Not Identified: 68%
- Scheduled: 0%

GENERAL CLEANING NEEDED

- Not Identified: 36%
- Identified: 28%
- Repaired: 16%
- Scheduled: 20%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

CARPET CLEANING OR REMOVAL NEEDED

- Identified: 32%
- Scheduled: 24%
- Repaired: 24%
- Not Identified: 20%

PEST OR PESTICIDE USE REMEDIATION

- Identified: 4%
- Repaired: 24%
- Scheduled: 0%
- Not Identified: 72%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

ARTS/SCIENCES NEED REPLACE WITH GREENER PRODUCTS

- Identified: 8%
- Repaired: 20%
- Scheduled: 4%
- Not Identified: 68%

CLASSROOM ANIMAL DANDER

- Identified: 8%
- Repaired: 36%
- Scheduled: 0%
- Not Identified: 56%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

BUS IDLING POLICY LACKING

- Identified: 20%
- Not Identified: 40%
- Scheduled: 8%
- Repaired: 32%

INSPEC OF LEAKS/SPILLS/MOISTURE

- Identified: 20%
- Not Identified: 28%
- Scheduled: 8%
- Repaired: 44%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

PLUMBING PROBLEMS

- Identified: 16%
- Repair: 28%
- Scheduled: 12%
- Not Identified: 44%

ROOF PROBLEMS

- Identified: 20%
- Repair: 52%
- Scheduled: 4%
- Not Identified: 24%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

BASEMENT/CRAWLSPACE NEEDS UPGRADES

- Identified: 8%
- Repaired: 4%
- Scheduled: 4%
- Not Identified: 84%

REMOVAL OF WATER DAMAGED MATERIALS

- Identified: 8%
- Repaired: 32%
- Scheduled: 20%
- Not Identified: 40%
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

RENOVATIONS TO CLASSROOMS/BUILDINGS

- Identified: 16%
- Repaired: 8%
- Scheduled: 24%
- Not Identified: 52%
### CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
#### Summary of Results

**OTHER IAQ PROBLEMS IDENTIFIED?**

<table>
<thead>
<tr>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASBESTOS NEEDS TO BE REMOVED</td>
</tr>
<tr>
<td>SATURATED ROOF INSULATION NEEDS REMOVAL</td>
</tr>
<tr>
<td>CLASSROOM CEILINGS MOLD ALL TO BE REMOVED</td>
</tr>
<tr>
<td>NEW BUILDING CONSTRUCTION</td>
</tr>
<tr>
<td>LACK OF CUSTODIAL STAFF TO COMPLETE TASKS</td>
</tr>
<tr>
<td>HVAC UNITS NEED TO BE REPAIRED</td>
</tr>
<tr>
<td>ALL FACILITIES NEED TO BE RENOVATED OR REBUILT</td>
</tr>
<tr>
<td>FACILITIES RENOVATION GOES TO VOTER REFERENDUM</td>
</tr>
<tr>
<td>OVERALL CLEANLINESS NEEDED</td>
</tr>
<tr>
<td>BIRDS NESTING IN OVERHANG &amp; EXPANSION JOINTS</td>
</tr>
<tr>
<td>HOW FUNDS TO BE OBTAINED?</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>UNSURE</td>
</tr>
<tr>
<td>TOWN CAPITAL IMPROVEMENT FUND</td>
</tr>
<tr>
<td>STATE BUDGET FEDERAL BUDGET</td>
</tr>
<tr>
<td>FEDERAL BUDGET</td>
</tr>
<tr>
<td>RENOVATION BUDGET</td>
</tr>
<tr>
<td>SCHOOL BUDGET</td>
</tr>
<tr>
<td>TOWN COUNCIL</td>
</tr>
<tr>
<td>GRANT FROM STATE FOR SOME REPAIRS</td>
</tr>
<tr>
<td>CAPITAL BUDGET</td>
</tr>
</tbody>
</table>
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

NEW POLICIES OR COMMITTEES FORMED AS RESULT OF IAQ TFS?

- N/A: 4%
- YES: 44%
- NO: 52%

TYPES OF POLICIES OR COMMITTEES FORMED

TEACHER DUST AREA
IAQ TOOLS FOR SCHOOLS COMMITTEE
SYSTEM WIDE IAQ COMMITTEE
NO IDLING BUS POLICY SIGNS POSTED
SAFETY & HEALTH COMMITTEE
EACH BUILDING HAS OWN IAQ TEAM
HEALTH & SAFETY ADDED IAQ TO MONTHLY AGENDA
HVAC FILTER CHANGE/MAINTENANCE POLICY
CENTRAL SCHOOLS FOR SCHOOLS COMMITTEE
### WHAT WERE MOTIVATING FACTORS TO IMPLEMENTING IAQ TFS?

**BUILDING RELATED FACTORS**

- District-Wide Mandate
- Requests for healthier school environment
- Staff concerns about IAQ and school's pro-active philosophy
- Need to take organized look at IAQ complaints & other issues
- Teacher & parent concerns about IAQ
- Requests for cleaner IAQ
- Used IAQ TFS prior 3 yrs ago at another district
- New construction and renovations
- Specific building IAQ problems
- Needed better understanding of problems with IAQ
- Visible mold & water damage & leaking roof
- Temp/ventilation concerns in one wing of school

**ILLNESS RELATED FACTORS**

- Increase in staff illnesses & IAQ complaints filed
- Increase in number of asthmatic students
- Complaints of headache, allergies, upper respiratory infections
- Increase in asthma & respiratory problems staff & students
- Evidence of major health problems
- School on probation & threatened loss of accreditation
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

HOW OFTEN HAS IAQ TEAM MET?

- A FEW TIMES (48%)
- MONTHLY (24%)
- OTHER (28%)

WHO PARTICIPATED IN IAQ PROCESS?

- STUDENTS
- SOURCE OF ED
- CUSTODIAL
- TEACHERS
- SCHOOL NURSE
- FACILITY ADMIN
- FACULTY/STAFF
- PARENTS
- UNIONS
- PTO
- LOCAL HEALTH DEPT.
- SCHOOL PRINCIPAL
- HEALTH ADVISORY
PART OF IAQ TFS MOST USEFUL

- Presentation: 21%
- TFS Action Kit: 26%
- Videos: 15%
- Group Exercises: 11%
- Walkthrough with Hygienist: 27%

PART OF IAQ TFS LEAST USEFUL

- Presentation: 12%
- Videos: 47%
- Group Exercises: 41%
### WHAT ADDITIONS OR CHANGES TO IAQ TFS TRAINING WOULD BE HELPFUL?

<table>
<thead>
<tr>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORE PRACTICAL &amp; MORE FRAGMENTED TRAINING</td>
</tr>
<tr>
<td>MORE INTENSIVE WALKTHROUGH WITH HYGIENIST</td>
</tr>
<tr>
<td>MORE AGGRESSIVE WITH SCHEDULING OF TRAINING</td>
</tr>
<tr>
<td>GO THROUGH IAQ PACKET MORE THOROUGHLY</td>
</tr>
<tr>
<td>FUNDING RECOMMENDATIONS</td>
</tr>
<tr>
<td>FINE THE WAY IT IS</td>
</tr>
<tr>
<td>IAQ COORDINATOR SHOULD BE PART OF INITIAL TRAINING</td>
</tr>
<tr>
<td>HEALTH SYMPTOMS SURVEY</td>
</tr>
<tr>
<td>DECREASE IN TIME NEEDED &amp; GOALS NECESSARY TO COMPLETE</td>
</tr>
<tr>
<td>CHECKLISTS COULD BE MORE SPECIFIC</td>
</tr>
<tr>
<td>LESS INFORMATION IN PACKET</td>
</tr>
<tr>
<td>KIT MATERIALS NEED TO BE UPDATED, COORDINATED, REPRINTED</td>
</tr>
<tr>
<td>BRING COPIES OF STATE IAQ POLICIES</td>
</tr>
</tbody>
</table>
## WHAT ADDITIONAL RESOURCE COULD IAQ TEAM PROVIDE?

<table>
<thead>
<tr>
<th>Resources for Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Names of vendors that sell cleaners, no odor markers, etc.</td>
</tr>
<tr>
<td>Provide success stories other schools</td>
</tr>
<tr>
<td>List of professionals in field of IAQ remediation</td>
</tr>
<tr>
<td>Phone numbers for resources</td>
</tr>
<tr>
<td>Contact person for each school</td>
</tr>
<tr>
<td>Health symptoms survey</td>
</tr>
<tr>
<td>Schools need to be pressured to resolve problems</td>
</tr>
<tr>
<td>Tape could provide wider variety of building problems</td>
</tr>
</tbody>
</table>
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION

Summary of Results

HOW SATISFIED WITH IMPLEMENTATION OF IAQ TFS?

- 4% LOW
- 2% 2
- 20% 3
- 4% 4
- 44% 5 = HIGH
## CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION

### Summary of Results

**What major barriers to fully implementing IAQ tools for schools still exist?**

<table>
<thead>
<tr>
<th>Barrier Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older buildings prohibit some steps until renovated</td>
</tr>
<tr>
<td>Lack of time to collect data and organize for discuss</td>
</tr>
<tr>
<td>Lack of manpower</td>
</tr>
<tr>
<td>Pending major renovation &amp; additions to existing structure</td>
</tr>
<tr>
<td>Lack of district wide coordination</td>
</tr>
<tr>
<td>Funds for renovation of older old buildings needed</td>
</tr>
<tr>
<td>Funds for engineering study needed</td>
</tr>
<tr>
<td>Funds for carpet remove &amp; replace</td>
</tr>
<tr>
<td>Impending renovation</td>
</tr>
<tr>
<td>Mistrust and apathy</td>
</tr>
<tr>
<td>Non-compliant custodial staff</td>
</tr>
<tr>
<td>Getting participation</td>
</tr>
<tr>
<td>Developing specifications to address ventilation concerns</td>
</tr>
<tr>
<td>Other issues competing</td>
</tr>
<tr>
<td>Budget constraints</td>
</tr>
<tr>
<td>Board of educ working with them</td>
</tr>
<tr>
<td>Avail of consultants &amp; quality of materials</td>
</tr>
</tbody>
</table>
CONNECTICUT IAQ TOOLS FOR SCHOOLS EVALUATION
Summary of Results

PERCEPTION OF CHANGE IN HEALTH SYMPTOMS SINCE IAQ TFS TRAINING

- DON'T KNOW 17%
- SYMPTOMS DECREASED 41%
- NO CHANGED NOTICED 42%
- SYMPTOMS INCREASED 0%
## COMMENTS, THOUGHTS & SUGGESTIONS

<table>
<thead>
<tr>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAQ TOOLS FOR SCHOOLS WENT BY THE WAYSIDE WHEN NEW BUILDING BUILT</td>
</tr>
<tr>
<td>STATE LEGISLATION IN THIS AREA IS NEEDED</td>
</tr>
<tr>
<td>REMOVAL OF CARPETING &amp; REPLACING TILES HELPED IN TROUBLED AREAS</td>
</tr>
<tr>
<td>ONLY VENTILATION IN OUR SCHOOL ARE WINDOWS; BLDG WELL MAINTAINED BY CUSTODIANS</td>
</tr>
<tr>
<td>ONE PARENT NOTED IMPROVED ASTHMA SYMPTOMS IN CHILD SINCE MOLD REMEDIATION</td>
</tr>
<tr>
<td>LEARNED A LOT ABOUT THE BUILDING(S)</td>
</tr>
<tr>
<td>INFORMATION WAS HELPFUL &amp; BROUGHT AWARENESS TO ALL INVOLVED</td>
</tr>
<tr>
<td>CONSTRUCTION ISSUES NEED TO ADDRESS POTENTIAL IAQ PROBLEMS</td>
</tr>
<tr>
<td>STAFF NOW HAVE BETTER UNDERSTANDING OF IAQ &amp; ENVIRONMENT</td>
</tr>
<tr>
<td>CUSTODIAL STAFF NOT COOPERATIVE</td>
</tr>
<tr>
<td>ATTITUDES HAVE IMPROVED</td>
</tr>
</tbody>
</table>
EVALUATION OF CONNECTICUT'S INDOOR AIR QUALITY TOOLS FOR SCHOOLS PROGRAM

Presented by

Elaine Abrams, RN, BS, CHES

Major Advisor

Tim Morse, PhD

Associate Advisor

Joan Segal, MS

Associate Advisor

Paula Schenck, MPH

University of Connecticut

2002
Master of Public Health Thesis

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