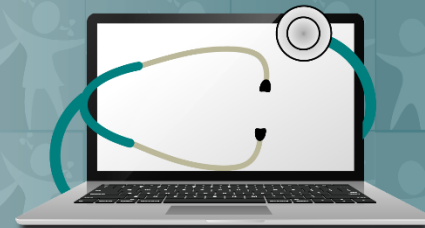




# PEHSU NATIONAL CLASSROOM

Pediatric Environmental  
Health Specialty Units



[www.pehsu.net/nationalclassroom.html](http://www.pehsu.net/nationalclassroom.html)



## Webinars

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Live and On-Demand

Case Conferences  
Journal Clubs  
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Interactive and Self-Paced

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## Resource Catalog

Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals

Topics included:  
Air Quality, Pesticides,  
Natural Disasters, BPA,  
Mold, Lead, Mercury



# School Environmental Health: Why It Matters and What to Look For

Luke Gard, CIEC, CMC, BOC  
Safe and Healthy School Program Manager  
Children's Mercy Hospital – Center for Environmental Health

# Objectives

- Identify the connection between school indoor environment, student health and academic performance
- Explain the importance of a facility and district-level indoor environmental health program
- Identify common issues routinely observed in schools

# Acknowledgements

CMH-CEH would like to acknowledge the both the Region 7 PEHSU and Region 7 EPA for grant funding that allows CMH-CEH to provide a variety of school trainings throughout Region 7

We would also like to acknowledge the various local and regional school districts that partner with CMH-CEH to PROACTIVELY assess, monitor, and improve environmental conditions within their facilities.

# Acknowledgements

This material was supported by the American College of Medical Toxicology (ACMT) and funded (in part) by the cooperative agreement FAIN: U61TS000238-02 from the Agency for Toxic Substances and Disease Registry (ATSDR).

Acknowledgement: The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-95877701. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications

# School Environmental Conditions

Condition	% of Schools	# of Schools	# of Students
Lighting	15.6	12,200	6,682,000
Heating	18.9	15,000	7,888,000
Ventilation	27.1	21,100	11,559,000
Indoor Air Quality	19.2	15,000	8,353,000
Noise Control	28.1	21,900	11,044,000
Physical Security	24.2	18,900	10,638,000

School Facilities: Condition of America's Schools. U.S. General Accounting Office, Washington, DC, 1995.  
GAO/HEHS 95-61

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*This was the last  
comprehensive  
survey performed.  
20 years ago!*

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GAO/HEHS 95-61

# School District: Primary Goals

- Manage facilities to optimize student success
- Meet or exceed state's academic standards
- Provide the safest and healthiest learning environments





# Schools Face Inherent & Unique Challenges



- Most densely occupied buildings
- Constantly fluctuating educational needs
- Budget dollars for regular maintenance and renovation forced to a low priority

In other words...deferred maintenance

# Percent of School Staff Training

Topic	Total (%)
Disposal of hazardous materials	86.8 (82.5-90.1)
Green cleaning products and practices	63.8 (58.0-69.2)
How to address mold problems	62.6 (56.7-68.2)
How to reduce the use of hazardous materials	77.4 (72.3-81.8)
Indoor air quality	39.2 (33.5-45.1)
Labeling of hazardous materials	85.9 (81.5-89.4)
Pest management practices that limit the use of pesticides	56.1 (50.5-61.5)
School drinking water quality	25.6 (20.9-30.9)
Storage of hazardous materials	87.9 (83.7-91.1)
Use of hazardous materials	87.4 (83.2-90.6)

# Relationship Between IEQ and:

- Student and staff health
- Attendance
- Academic performance
- General cognitive ability



Turunen, et.al. International Journal of Hygiene and Environmental Health, 2014 217(7)

Gaihre, S et.al. Journal of School Health, 2014 84(9).

Mohai, et.al. Health Affairs, 30(5)

Cartieaux E, and MA Rzepka, Arch. Pediatrics, 2011 18(7)

Mendell and Heath Indoor Air, 2005 15(1)

Mendell, Mark and Heath, Garvin, U.S. Department of Education, April 2004, LBNL-2004-06

# Student success influenced by:

- Temperature
- Ventilation adequacy
- Relative humidity
- Carbon dioxide levels
- Amount of daylight
- Presence of noise
- Indoor pollutants and contaminants



## STUDENT HEALTH AND ACADEMIC PERFORMANCE

### Quick Reference Guide

#### All Children Deserve a Healthy Learning Environment

Children are inherently more vulnerable to environmental hazards because their bodies are still developing. Substandard environmental conditions in schools, such as insufficient cleaning or inadequate ventilation, can cause serious health problems for children. Evidence that indoor air quality (IAQ) directly impacts health and student academic performance continues to mount.<sup>1,2</sup>

IAQ refers to those characteristics of the air in indoor environments, such as levels of pollutants, humidity, temperature, etc., that impact the occupants' health, comfort and ability to perform.

*Taking steps to improve the IAQ of schools is critical to bettering student health and academic performance.*

#### Building the Case with Evidence

Scientific evidence has long demonstrated an association between poor IAQ and respiratory health effects, including asthma. Maintenance issues in schools, such as mold and moisture or excessive use of cleaning chemicals, have been shown to trigger asthma and allergies.

According to the Centers for Disease Control and Prevention (CDC), asthma is one of the leading causes of school absenteeism.<sup>3</sup> Multiple studies have found that children's overall performance decreases with illnesses or absences from school.<sup>4,5</sup>

##### *The Scientific Evidence is Mounting*

Qualitative and quantitative evidence demonstrating the relationship between IAQ and human performance and productivity has become more robust. Studies demonstrate that improved IAQ increases productivity and improves the performance of mental tasks, such as concentration and recall in both adults and children.<sup>6</sup> This strengthens the case for schools to develop IAQ management plans, which include critical maintenance tasks, as a key part of an education development strategy.

*"Each year since our IAQ management program began, we have been able to boost both reading and math test scores and have created exceptional learning environments that promote student success." – Dave Hill, Blue Valley School District, Kansas*

#### Evidence from Scientific Literature

Scientific evidence shows that there are key areas in which schools can take action to improve IAQ in order to advance the health and performance of students and school staff. In fact, a structured maintenance program is a cornerstone of academic performance and IAQ.

##### *Managing Your School Environment Despite Tight Operating Budgets*

School boards and administrators often consider the maintenance budget as *soft money* that they can cut without affecting core academic program needs; however, scientific literature demonstrates otherwise:

- Health, attendance and academic performance can improve with increased maintenance.<sup>7,8</sup>
- Schools with better physical conditions show improved academic performance, while schools with fewer janitorial staff and higher maintenance backlogs show poorer academic performance.<sup>9</sup>

##### *The Effects of Air Ventilation on Health and Performance*

Most schools' ventilation rates are below recommended levels.<sup>10</sup> However, ensuring adequate air ventilation rates in all classrooms can:

- Reduce absences and the transmission of infectious diseases.<sup>11</sup>
- Improve the overall health and productivity of teachers.
- Improve test scores and student performance in completing mental tasks.<sup>12, 13, 14, 15, 16, 17</sup>

In one study, students in classrooms with higher outdoor air ventilation rates scored 14 to 15 percent higher on standardized test scores than children in classrooms with lower outdoor air ventilation rates.<sup>18</sup>

In addition, ensuring that heating, ventilation and air conditioning (HVAC) drainpans and other components are clean reduces the chance of occupant illnesses.



# Impact of Asthma on Schools

- Significant rise in childhood asthma—49% increase since 1982
- #1 chronic illness among children and adolescents in US
- As of 2009, 7.1 million (14%) children have been diagnosed with asthma and asthma is the #1 cause of school absences with 14.7 million missed school days
- In 2011, 4.1 million of children under 18 years of age had an asthma attack.

# One district's asthma clinic visits

#	School 1		School 2		School 3		School 4		School 5		School 6		School 7	
	ID	# of Visit	ID	# of Visit	ID	# of Visit	ID	# of Visit	ID	# of Visit	ID	# of Visit	ID	# of Visit
1	2608	56	11850	40	2608	56	711	7	1695	10	83	8	2253	19
2	436	48	1589	25	2966	56	218	2	1517	4	11367	6	3215	4
3	1536	28	1570	21	1540	51	11299	2	993	2	2233	4	1097	2
4	2314	27	366	20	436	48	679	1	1341	2	3029	3	1644	2
5	1723	21	2171	13	7802	47	1030	1	1358	2	778	2	1676	1
6	690	16	2446	11	7948	42	2286	1	1965	2	2047	2	2068	1
7	2171	13	869	10	1222	39	2706	1	10373	2	2825	2		
8	865	7	8978	7	286	33	2618	1	124	1	10428	2		
9	1701	4	8117	6	1536	28	12197	1	495	1	462	1		
10	2299	4	10508	3	2314	27			810	1	1186	1		
11	2031	3	9136	2	1723	21		17	811	1	2086	1		
12	12675	3	169	1	544	20			991	1	2655	1		
13	569	2	299	1	2464	17			1336	1	10412	1		
14	1579	2	329	1	433	16	Early Childhood		1681	1	10885	1		
15	9136	2	1231	1	690	16			2138	1				
16	567	1	2870	1	2724	12			2163	1				
17	1023	1			2163	9		10	2286	1				
18	1231	1			2895	9			2568	1				
19	1421	1			865	7			8481	1				
20	1681	1			1409	7	1421	1	8555	1				
21	1891	1			1739	7	11629	1	9872	1				
22	3096	1			2352	7	11733	1	9892	1				
23	3290	1			283	5								
24	11756	1			1701	4		3						
25					1703	4								
26					1871	4								
27					8176	4								
28					11709	4								
29					3009	3								
30					10596	3								

1 Visit  
2 - 5  
6 - 15  
16 - 34  
> 35 Visits

# Legal Requirements

**Legal requirements specifically related to students and staff with asthma and allergies are outlined in:**

- Individuals with Disabilities Education Act (IDEA)
- Section 504 of the Rehabilitation Act of 1973 requires - *that schools both promote the health development and achievement of students with asthma while removing disability barriers (including IAQ or environmental issues) that may impede health, participation, and achievement.*

Can this lead to litigation?



# Safe & Healthy Schools Program Should Be Comprehensive

An Integrated approach that considers:

- People
- Any potential health hazards
- The facility structure itself, including systems
- How facility is cleaned, maintained, operated

Goal is to reduce absenteeism while improving student performance

# A Sustainable Management Plan

District should create district-level and building-level teams to discuss and address issues

Communication is  
Critical!



# Why do districts fail?

- Overwhelmed by process
- Interest wanes after an issue has been resolved
- Time and budget constraints
- “Champion” of the program leaves
- Fear of IEQ “Pandora’s Box” and negative publicity
- Believe IEQ issues not important as, or are separate from, student academic performance



# HVAC Systems and Ventilation



# HVAC Systems and Ventilation





# HVAC Systems and Ventilation



# HVAC Systems and Ventilation





# HVAC Systems and Ventilation





# HVAC Systems and Ventilation



# Cleaning and Allergen Control



# Cleaning and Allergen Control





# Cleaning and Allergen Control







Is this cluttered?



# And what about this space?





# Institute of Medicine Report - 2004

Summary of Findings Regarding Association Between Health Outcomes and	
Exposure to Damp Indoor Environments	Presence of Mold or Other Agents in Damp Indoor Environments
<b>Sufficient Evidence of a Causal Relationship</b>	
<b>Sufficient Evidence of an Association</b>	
<ul style="list-style-type: none"> <li>• Upper respiratory (nasal and throat) tract symptoms</li> <li>• Cough</li> <li>• Wheeze</li> <li>• Asthma symptoms in sensitized persons</li> </ul>	<ul style="list-style-type: none"> <li>• Upper respiratory (nasal and throat) tract symptoms</li> <li>• Cough</li> <li>• Hypersensitivity pneumonitis in susceptible persons</li> <li>• Wheeze</li> <li>• Asthma symptoms in sensitized persons</li> </ul>
<b>Limited or Suggestive Evidence of an Association</b>	
<ul style="list-style-type: none"> <li>• Dyspnea (shortness of breath)</li> <li>• Lower respiratory illness in otherwise healthy children</li> <li>• Asthma development</li> </ul>	<ul style="list-style-type: none"> <li>• Lower respiratory illness in otherwise healthy children</li> </ul>
<b>Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists</b>	
<ul style="list-style-type: none"> <li>• Airflow obstruction (in otherwise healthy persons)</li> <li>• Skin symptoms</li> <li>• Mucous membrane irritation syndrome</li> <li>• Gastrointestinal tract problems</li> <li>• Chronic obstructive pulmonary disease</li> <li>• Fatigue</li> <li>• Inhalation fevers (nonoccupational exposures)</li> <li>• Neuropsychiatric symptoms</li> <li>• Lower respiratory illness in otherwise healthy adults</li> </ul>	<ul style="list-style-type: none"> <li>• Dyspnea (shortness of breath)</li> <li>• Skin symptoms</li> <li>• Asthma development</li> <li>• Gastrointestinal tract problems</li> <li>• Airflow obstruction (in otherwise healthy persons)</li> <li>• Fatigue</li> <li>• Mucous membrane irritation syndrome</li> <li>• Neuropsychiatric symptoms</li> <li>• Chronic obstructive pulmonary disease</li> <li>• Cancer</li> </ul>



# Moisture Control / Mold Prevention



# Moisture Control / Mold Prevention





# Moisture Control / Mold Prevention



# Source Control / Room Contents



# Source Control / Room Contents





# Source Control / Room Contents



# Source Control / Room Contents



# Source Control / Room Contents





# Source Control / Room Contents



# Source Control / Room Contents



# Source Control / Room Contents





# Safety, Security, and Injury Prevention





# Safety, Security, and Injury Prevention



# Safety, Security, and Injury Prevention





# The Learning Environment



# The Learning Environment





# The Learning Environment



# This is under the classroom?



Condensation on tunnel walls...



...a clogged drain in tunnel.



# This is outside the classroom?

Air Intakes



Idling vehicle exhaust brought into the facility



Allergens and pest harborage



# This may be above the classroom?



A clogged roof drain may not seem like a serious issue...





but if it leads to this...



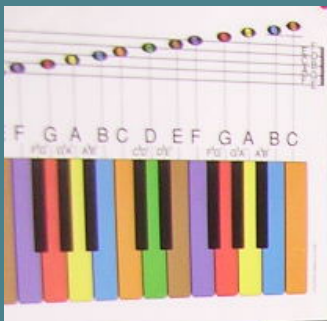


or this, then we may have an issue!

# It's about making informed decisions







Monthly Life Skills

January  
integrity

"The King & I"

Yul Brynner - passed away  
Deborah Kerr - passed away  
Siam 1862

"I Whistle a Happy Tune"

(King, Miss Anna,  
Louis, Tuptim)  
Lady Chung  
Luntan

"Oklahoma"

Yordan Machae - passed away  
Arling Jones - 73

(Curley, Laurie,  
Aunt Eller, Old  
Blue, Judd

"Oh What a Beautiful  
Morning"

Setting Oklahoma - 1906  
"Surrey w/ the Fringe on  
Top"

Seven Brothers  
Brothers

Howard Keel - passed away  
Gene Powell - 78

(Adam, Milly)  
(All Brothers &)

1850  
{Oregon Territory}

"Bless Your Beautiful Heart"  
"Wonderful Wonderful Day"





# How significant is the problem?

What does that ceiling stain mean?

Is one pest a problem?

# Key Messages

- The “Healthy Schools” movement is a holistic or comprehensive approach that promotes occupant health.
- There is a link between the environment in a school facility and the health of the occupants, attendance, and overall performance of students and staff.
- Certain groups (children and other sensitive individuals) are at greater risk for adverse health effects.
- “at present, evaluation of good IEQ is based not on specific indoor exposure limits...but on good practices of design, maintenance and operation of buildings that are considered to provide conditions of acceptable IEQ”.

# CMH-CEH is able to provide the following:

- Administrative training to get senior buy-in
- Nurses training focused on asthma management in clinic setting and environmental triggers
- Safe and Healthy School Specialist (SHSS) training for custodial, maintenance, and other staff
- Hands-on walkthrough of facilities to identify issues and offer recommendations for improving conditions
- Assist with policy evaluation and development
- Facility investigations for occupant concerns

# Thank You!

To PEHSU for allowing us the opportunity to present.

To Dr. Jennifer Lowry, coordinator of Region 7 PEHSU and the Medical Director for the Center of Environmental Health at Children's Mercy Hospital-Kansas City.

Luke Gard, CIEC, CMC, BOC  
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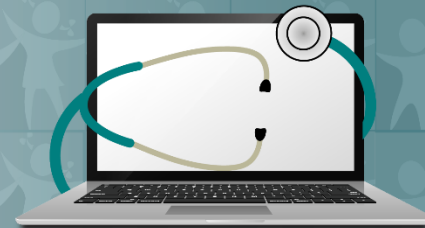


Any Questions?



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