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Preventing Environmental Asthma Triggers in Child Care

Final Report

Completed by the Minnesota Department of Health – Indoor Air Unit

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A. Overview

The Minnesota Department of Health (MDH) completed a Preventing Environmental Asthma Triggers (PEAT) in Child Care Centers project with funding from the U.S. Environmental Protection Agency (CH 9659820). The project grant proposal had outlined the following purpose, objectives, activities, and expected outcomes.

A.1 Project Purpose

The MDH Preventing Environmental Asthma Triggers (PEAT) project will establish a model evaluation and education module to train childcare center staff regarding environmental asthma triggers in a minimum of seven childcare centers in Minneapolis, Minnesota. We will provide intensive consultation services to the participating centers on the following environmental asthma triggers: moisture/mold, dust, cockroaches, pet dander, dust mites, chemicals, secondhand smoke, combustion byproducts, respiratory infectious agents, and outdoor ozone and fine particulate levels. Using the materials developed and lessons learned with the seven centers, we will host a training for up to 120 childcare center staff to provide them with knowledge and resources on environmental asthma triggers.

A.2 Objectives

a. Inspect buildings to identify specific building-related issues of childcare centers.
b. Train childcare center staff regarding
- Asthma, environmental triggers and methods to control them.
- The importance of hand washing to help prevent the spread of colds and chest infections.
- Develop a childcare center specific environmental asthma management plan.

A.3 Project Activities

1. development of building evaluation procedures, surveys, and training materials
2. pilot test the building evaluations, trainings, and consultations in seven childcare centers
3. evaluate results and revise materials
4. host a training for up to 120 childcare center staff to share findings and conclusions from pilot consultations
5. develop a website where materials can be easily accessed in the future

A.4 Expected Project Outcomes

- Seven childcare centers evaluated for environmental asthma triggers.
- Staff at the participating centers will have the knowledge and some resources they need to reduce environmental asthma triggers.
- A building evaluation procedure and training curriculum will be available for any interested parties that can be used to assess environmental asthma triggers in childcare centers.

MDH has achieved and exceeded the project objectives, having completed the activities and evaluated the project outcomes. Section B of this report describes the activities completed and evaluates the outcomes of the project. Details of how the grant funds were used are described in the Section C of this report.

There were no problems associated with the spending of the grant funds. Two project extensions were requested and approved by EPA. The first request was submitted because our project had to be reviewed by the Institutional Review Board at the Minnesota Department of Health and the EPA. The second request was submitted to allow for additional trainings to be completed with funds that remained at the end of the project. There were no publications arising from this project at the time of writing this final report. There were no copyright materials, software, etc. developed as the result of this project; all materials, described in section B.5, are public domain and available on our website.

B. Activities Completed and their Evaluation

B.1 Development of building evaluation procedures, surveys, and training materials

Building Evaluation
MDH developed a draft child care "Building Evaluation Procedure", to serve as an educational and evaluation module. It included a questionnaire, walk-through checklist, and associated educational recommendations.

The draft procedure was developed to evaluate existing asthma triggers as well as conditions, practices, and policies that may increase asthma triggers inside a child care center. The existing and potential asthma triggers evaluated were moisture, mold, dust, cockroaches, pet dander, dust mites, chemicals, secondhand smoke, combustion byproducts, respiratory infectious agents, and outdoor ozone and fine particulate levels.

The draft procedure evaluated all areas of a building, including classrooms, offices, bathrooms, hallways, entrances, building exterior, rooftop, ventilation systems, mechanical room, and custodial storage areas. It also included model recommendations for each possible problem and an explanation of its relevance to asthma. The procedure, recommendations, and explanations were developed primarily using a variety of best practices documents and technical articles; these references are listed in Appendix A. Also, MDH staff used prior experiences with schools to craft the resources. The issues assessed and addressed by the procedure are listed in Figure 1. In addition to the observational building evaluation procedure, a sampling protocol was researched and developed to measure asthma triggers and other indoor contaminants (see Appendix B-6).

Surveys and Other Data Collection
Three types of surveys were developed to collect further observational data about the facilities and occupants. A parent survey was developed, to collect data about the children in the centers, including whether they had asthma type symptoms and their sensitivities to specific asthma triggers (see Appendix E for details). An asthma tracking log was developed for child center directors to track the occurrence of asthma symptoms, medication use, and outcomes of the asthma symptoms (see Appendix F for a copy of the log). A method to collect data about air quality conditions in the Twin Cities was developed (see Appendix H for details), and a method to track absenteeism was established (see Appendix G for details).

Figure 1. Indoor Environmental Issues Addressed by Building Evaluation Procedure

Building Condition	*Maintenance Procedures*	*Staff Practices*
• Operational policies • Building disrepair • Heating, ventilation, air conditioning • Moisture	• Renovation • General cleaning • Floor cleaning • Cleaning products • Pests and pesticides	• Communications • Outdoor pollutants • Animals & plants • Hand washing • Disinfection & sanitation • Diaper changing • Smoking • Furniture and materials • Art supplies • Personal products

Training Presentations

Training presentations were developed to be used at various on-site trainings and conferences. A Power Point curriculum entitled "Preventing Environmental Asthma Triggers in Your Child Care Center" was created. The first part of this curriculum covered general information about asthma, environmental triggers, the importance of the child care environment, and general actions child care staff could take to improve their center. The second part of the curriculum covered specific findings at each child care center or an overall summary of findings at the seven Minneapolis centers.

A knowledge quiz was developed to evaluate the effectiveness of the environmental training. The quiz was designed to measure child care staff's knowledge of environmental asthma triggers before and after the on-site environmental asthma training. The quiz can be found in Appendix D. It was pre-tested on MDH personnel.

Three other Power Point presentations were developed or utilized. An overview of the PEAT project was prepared entitled "Indoor Environment and Asthma: Introduction to PEAT". Also, MDH's Food, Beverage and Lodging Program developed a curriculum entitled "Reducing Exposure to Colds and Flu: Intervention for Children with Asthma and Everyone Else Too", which discussed colds, hand-washing, and covering your cough. This interactive curriculum involved both children and staff. Finally, MDH contracted with public health nurses to teach a course developed by the American Lung Association entitled "Caring for Kids with Asthma". This 1.5-2 hour curriculum covers asthma, its signs and symptoms, when to give medications, and how to deliver medications. A variety of exercises and hands-on demonstration materials are utilized in this training.

B.2 Pilot test the building evaluations, trainings, and consultations in seven childcare centers

After the building evaluation procedure, surveys, trainings, and other data collection methods were researched and developed, they were piloted in seven childcare centers in Minneapolis. The pilot testing timeline of these resources is summarized in Figure 2.

Figure 2. Summary Timeline of Pilot Testing of PEAT Resources

Period	*Activity*
Fall-Winter 2005	Obtained institutional review board and EPA quality assurance plan approvals
Spring 2006	Recruited and selected seven Minneapolis child care centers
July - August 2006	Completed baseline environmental evaluation and surveys at each center ("Baseline")
September 2006	Conducted Parent Survey
October 2006	Provided educational report with findings and recommendations to each center's administration
November 2006	Completed three trainings at each center
January – February 2007	Completed follow-up environmental evaluation to assess outcomes ("Follow-up")
July - August 2007	Additional dust sampling completed ("Follow-up 2")
January 2007	Collected absenteeism data and air pollution data

During the fall of 2005 and prior to the start of this project MDH applied for Institutional Review Board (IRB) approval from MDH and EPA. The building evaluation procedures, parent surveys, asthma tracking logs, and consent forms were submitted, reviewed, revised, and re-submitted for approval. In addition, MDH received approval from EPA for the Quality Assurance Project Plan for the environmental sampling to be conducted in the child care centers. IRB approval was obtained in spring 2006. It was then renewed in the fall of 2006. Later that fall the additional analysis of samples collected for this project was also IRB approved.

MDH recruited child care centers in Minneapolis to pilot the building evaluation procedure and trainings. A mailing was sent to all licensed child care centers in Minneapolis (94 total). The mailing included a cover letter, informed consent form, and an application questionnaire. These can be found in Appendix C. Twelve child care centers applied to participate in the project, and seven centers were ultimately selected to participate. Centers were selected using the following criteria:

- availability of staff, parents, and the facility to fully participate in the pilot testing including all aspects of the environmental evaluations, surveys, and trainings
- motivation of building staff to address indoor environmental problems
- number of children and staff with asthma
- a consistent enrollment rate

A baseline evaluation of the centers were completed in July - August 2006 and consisted of the following activities. First, the center director and maintenance personnel were interviewed using the building evaluation procedure questionnaire. Next, a systematic walk-through assessment was performed using the walk-through inspection of the procedure. In addition, classroom air was sampled for various contaminants and ventilation parameters, between 2 pm and 3 pm. This time of day was selected because it was most likely that children and staff had occupied the room for at least two or more hours at the time of sampling. Pressure differentials were also measured in areas with exhaust ventilation equipment. Finally, prior to scheduled housekeeping in the evening, dust samples were collected from carpets and upholstered furniture. Three samples were collected at each of seven centers. Findings were analyzed and summarized into

educational reports for each center. The reports were submitted to each center in October 2006. It described findings from the baseline evaluation and recommendations to prevent and control asthma triggers. In addition, a HEPA vacuum cleaner, pest management kit, and a carbon monoxide alarm were provided to each center.

A follow-up environmental evaluation of each center was performed in January - February 2007. This follow-up evaluation involved the same methods used in the baseline evaluation: staff were interviewed about practices and policies, a walk-through assessment was completed, and environmental samples were collected. In addition, the staff completed an Environmental Action Log, which identified how the recommendations were addressed. Findings from the follow-up evaluation were compared to the baseline evaluation, to assess the progress made. A final report was written and submitted to each center evaluated improvements and provided some final recommendations.

A second follow-up visit was completed during the summer of 2007. During this follow-up visit dust samples were collected for a third time from carpet and furniture, which were analyzed for dust, allergens, and moldiness. The other elements of the evaluation were not completed.

During September 2006, parents of children attending the seven participating child care centers completed a total of 254 surveys, one survey per child. In addition, attendance records and data about daily air quality conditions were collected for September-December of 2005 and September-December of 2006. Asthma logs were distributed for completion during July-August 2006.

During November 2006, three types of trainings were completed on-site. Staff at each center completed the "Preventing Environmental Asthma Triggers in Your Child Care Center" training. The knowledge quiz was administered before and after the training, to identify any increase in child care staff's understanding of asthma triggers. Also, during the fall, center staff participated in the hand-washing and covering the cough training and the "Caring for Kids with Asthma" class.

B.3 Evaluate results and revise materials

Building Evaluations

Indoor environmental asthma triggers were evaluated at seven Minneapolis child care centers. A total of 499 distinct issues were assessed using the draft building evaluation procedure (questionnaire and walk-through checklists) and the environmental sampling. These issues were evaluated at both baseline and follow-up. The findings were classified as "preferable" or "problem", using previously determined criteria identified in the building evaluation procedure or sampling protocol (see Appendix B-7).

At baseline (summer 2006), the indoor environments at the seven child care centers were generally conducive to limiting the likelihood of asthma symptoms or attacks. On average, 80% of all the issues assessed were classified as preferable in the centers, ranging from 75 - 85% in

each center. Most maintenance practices, staff behaviors, and administrative policies contributed to a healthful indoor environment. For the most part, the buildings were in good condition and the mechanical equipment operated well.

Nevertheless, a variety of asthma triggers and associated indoor environmental problems were identified at baseline. An average of 100 problem types were identified at baseline, ranging between 76 and 126 in each center. The average number of problem types identified during the walk-through (48) were similar to the number identified and reported through the questionnaire (47). See figure 3 for a summary.

Figure 3. Summary of Findings: Average Number of Problem Types Identified in the Seven Pilot Centers at Baseline and Follow-up

Building Evaluation Area	*Number of Possible Problem Types*	*Number of Problem Types--Baseline*	*Number of Problem Types--Follow-up*
Walk-through Inspection	327	48	39
Practices and Policies Questionnaire	162	47	24
Air Sampling	5.0	2.1	1.9
Dust Sampling	5.0	2.4	2.3
TOTAL	**499**	**100**	**67**

Most of the individual problems identified in each center were "minor" and had a small impact on the child care center environment. In addition, each center had 2-3 problems of "moderate" importance. None of the centers had major problems that constituted a public health emergency. The "moderate" problems included issues related to moisture, ventilation, and general cleanliness (see Appendix B-5 for details)

Air sampling found carbon dioxide, relative humidity, and temperature levels outside the recommended ranges for indoor air quality (see Appendix B-8). Moreover, elevated cat and dog allergens were prevalent and dust mite allergens were identified in some areas, but cockroach allergens were not present (see Appendix B-9).

Each center was provided an average of 61 recommendations, which was presented to the center in a report and presentation. At follow-up in winter 2007, center staff reported implementing, partially implementing, or expecting to implement, on average, 38 of the 61 recommendations. (see Appendix B-1 and B-2 for details).

Improvements were directly observed using the building evaluation procedure. The average number of problem types declined by about 33% from 100 to 67. Most of the improvements were noted in the reported policies and practices (see Appendix B-3). In addition, modest improvements were observed during the walk-through inspection (see Appendix B-4), with sizable specific improvements were observed in certain areas, such as cleaning, stained materials, moisture problems, irritant chemicals, and damaged areas (see Appendix B-6).

Cat allergen, dog allergen, and dust concentrations were lower in settled dust at follow-up and second follow-up, while dust mites did not decline over time (see Appendix B-10). It seems the basic improvements completed by center staff--such as changes in cleaning, ventilation filtration, air exchange, and entry mats--impacted the smaller cat, dog and dust particles which are brought into buildings, but not the dust mite allergens. The relative moldiness fluctuated over time, which appears to be due to seasonal changes and the disruption of mold during renovations (see Appendix B-11).

Based on the findings, the draft Building Evaluation Procedure was revised. Some sections were found to be not applicable to the types of buildings involved in the pilot evaluations. The child care centers were generally found in churches, stand alone buildings, or larger commercial buildings. Much of the ventilation section of the draft procedure was not relevant to these buildings, and would have been too complex for child care staff to utilize. In addition, a variety of minor issues that were in the draft procedure were consolidated to shorten the Building Evaluation Procedure. Overall, the final version had 1/3 of the issues removed, and it is 27 pages in length, including questions, observation checklist items, recommendations, and a brief explanation.

In addition, a shorter Model Environmental Asthma Trigger Prevention Plan was developed. We determined that many child care centers would prefer a short plan they could use to immediately adopt new policies and practices, without first completing an extensive evaluation of the building. The Model Plan summarizes all the questions/issues and recommendations from the Building Evaluation Procedure into a 5-page work plan. The Model Plan links by reference to the Building Evaluation Procedure, where the used can find more guidance and explanation.

Training Presentations

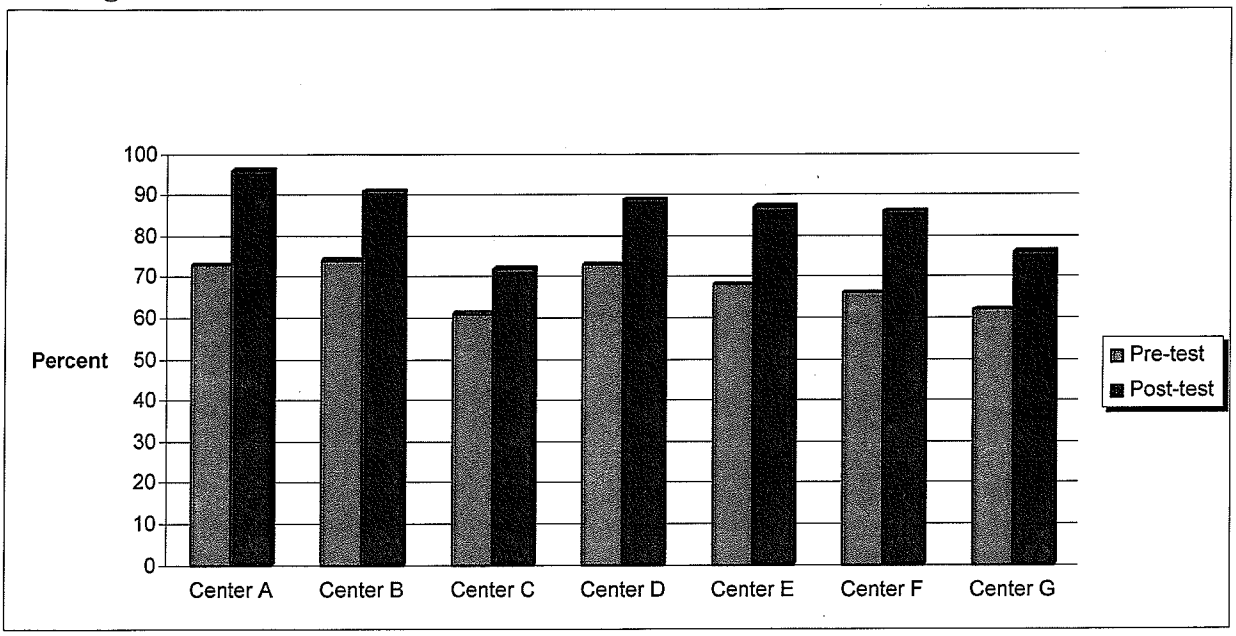
The on-site trainings were successfully completed at the seven child care centers. Both the "Preventing Environmental Asthma Triggers" and the "Hand washing and Covering the Cough" trainings were completed on-site at each center. Most of the staff at the centers were able to attend these trainings. In addition, the "Caring for Kids with Asthma" class was completed at five centers; the two other centers had previously completed the same training.

The preventing Environmental Asthma Triggers" training was evaluated with a knowledge quiz administered before and after the training. A consistent and significant improvement was observed in the quiz scores for providers in each child care center. A total of 51 childcare providers were tested, and 46 attendees improved their test scores at the post-quiz. Overall a 17 percentage point improvement was found on the post-test as compared with the pre-test (Figure 4 shows the scores for each center).

The second part of the training program consisted of a hand washing and cover your cough training that was completed at each center. This training involved both children and staff. The importance of hand washing and covering your cough was discussed in an interactive experience for the staff and children.

Finally, each center staff received an in-depth medical training. This training was completed by a nurse with the Minnesota Visiting Nurses Association. It covered medical aspects of asthma such as symptoms, medications, and the center staff's role in helping with medical management of children's asthma.

Figure 4. Average Knowledge Test Scores Before and After Environmental Training



Surveys and Other Data Collection

Parent surveys were completed for 220 children at the seven child care centers. The survey identified 88 children which might have asthma using the broad definition of asthma or asthma-related symptoms in this survey: 1) ever had asthma; 2) if the child had wheezing or whistling in the chest in the past or; 3) if the child experienced wheezing or whistling in the chest within the past 12 months. By comparison, parents reported only 13 children that had been identified by a physician as having asthma. This low number is because children are often not diagnosed with asthma due to the difficulty of making an accurate diagnosis under the age of 5. Children are often diagnosed with "reactive airway disease" or some other label instead. This is supported by the finding that six of the children not diagnosed with asthma had been prescribed a nebulizer. To identify children with respiratory condition that were asthma-like or pre-asthma, the survey focused on wheezing and whistling in chest symptoms. Findings are summarized in Figure 5 with further details in Appendix D.

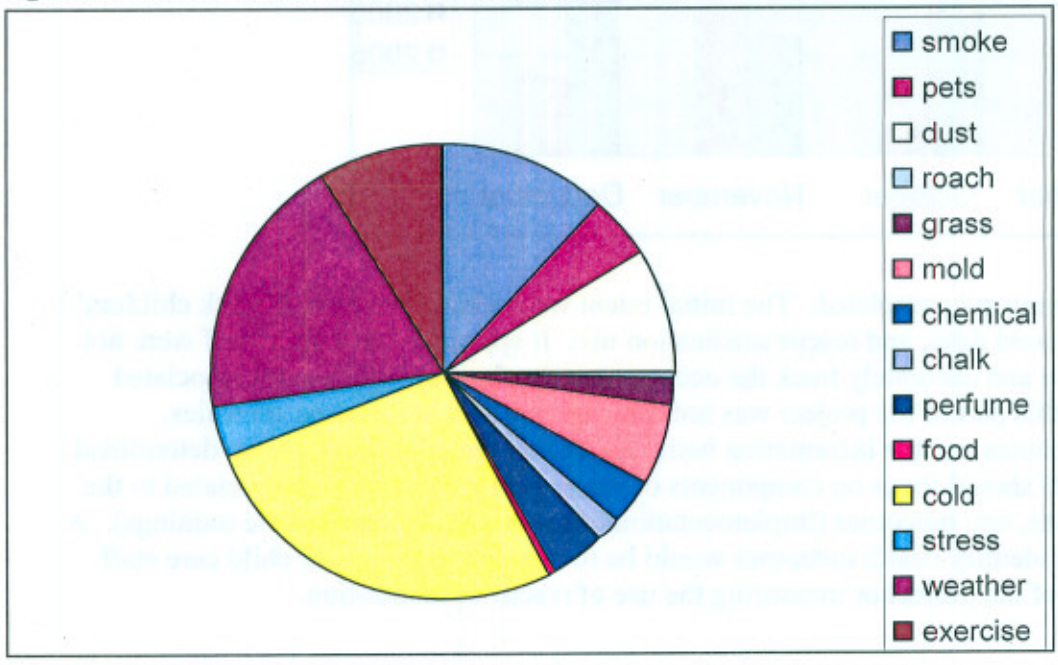
Out of 220 completed survey participants, 68 (31%) identified their childs' environmental triggers of asthma. In some cases, more than one asthma trigger was identified for a single child—a total of 160 triggers were identified for the 68 children. The frequencies of triggers are shown in Figure 6. The three triggers most often cited for asthma or wheeze were 1) colds (viral infections); 2) weather; and 3) smoke. Other common triggers included dust, exercise, and mold. It is important to note that triggers which are more subtle (such as mold, dust, pet allergens,

cockroaches) may have been under-reported compared to triggers that are apparent (infections, weather, smoke, etc).

Figure 5. Asthma and Related Symptoms in Children at Centers

Parameter	Number of Children
Total Number of Children	220
Possible asthma--one or more of: Ever had asthma Ever wheezed / whistling is chest Wheezed / whistling in chest in the past year	88 84 83 64
Wheezed at night	32
Wheezing that impaired speech	11
Exercise induced wheezing	29
Tested for allergies	16
Told by a physician that their child has asthma	13
Identified environmental asthma triggers	68

Figure 6. Environmental Asthma Triggers (N=68)

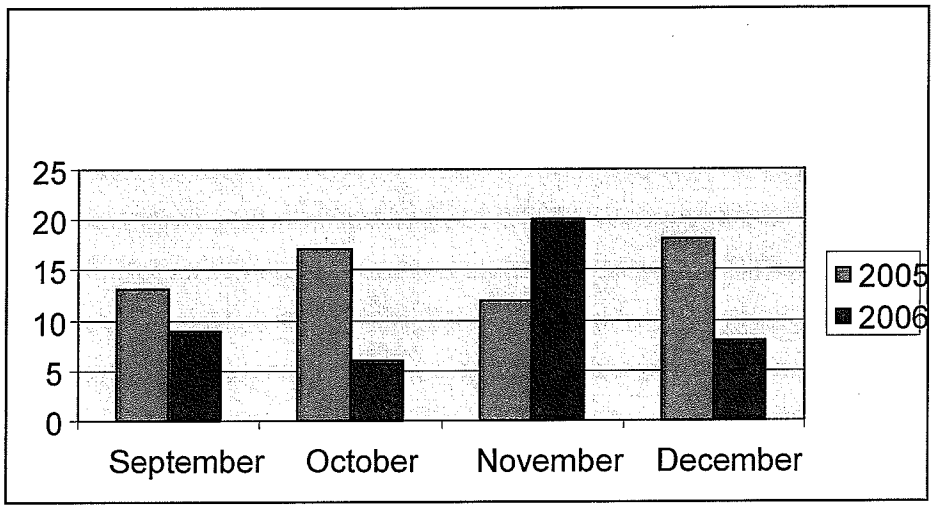


Attendance rates improved in three centers (centers A,C,D), and stayed stable in three other centers (centers B,E,F). Data were not available for one center. In centers A,C,D, attendance was higher for every month between September and December in 2006 compared to 2005, by an average of 6.6 percentage points (ranging from 1 to 25). In centers B,E,F, the average monthly attendance rate was lower slightly, by -1.2 (ranging from -4 to 1), for 2006 compared to 2005. See Appendix G for details.

The air quality in the Twin Cities was slightly better in September – December 2006 compared to 2005 (with the exception of November—see Figure 7). There were 47 days with moderate air quality in Fall 2006 compared to 60 such days in Fall 2005. See Appendix H for details.

The smaller increase in attendance (i.e., lower absenteeism) may be attributed, to some extent, to the environmental interventions and trainings that began to be implemented during Fall 2006. In addition, differences in outdoor air quality may have contributed to improved attendance rates. However, the association was weak—for example, there was no clear trend of absenteeism when air quality was analyzed by month). There are many other factors that impact attendance which were not measured in this project.

Figure 7. Number of Days per Month with "Moderate" Air Pollution



The asthma logs were not completed. The initial intent was to have center staff track children's asthma attacks, missed days, and rescue medication use. It appeared that center staff were not able to consistently and accurately track the occurrence of asthma symptoms and associated outcomes. Since this part of the project was not directly involved in the grant activities, objectives, or outcomes and the information being collected seemed inaccurate, we determined that child care staff should focus on components of the project that were directly related to the activities, objectives, and outcomes (implementation of recommendations and the trainings). A better approach to identify health outcomes would be to survey the parents or child care staff during the course of the project or measuring the use of rescue of medication.

B.4 Host a training for up to 120 childcare center staff to share findings and conclusions from pilot consultations.

A comprehensive training was created that served the dual purpose of sharing findings and conclusions from the pilot consultations and educating attendees about asthma, its triggers, and associated indoor air quality issues. This training was a 4-hour class that included the following topics (see section B.1, above, for details):

1) "Indoor Environment and Asthma: Introduction to PEAT"

2) "Caring for Kids with Asthma"
3) "Reducing Exposure to Colds and Flu: Intervention for Children with Asthma and Everyone Else Too"
4) "Preventing Environmental Asthma Triggers in Your Child Care Center

The first training was held on a Saturday morning in March. About 110 people registered for the four hour training, with another 60 wait-listed. Sixty-two people actually attended the training, due, in part, to inclement weather.

Due to the great interest in the first training, additional trainings were held. A grant extension was obtained to continue offering trainings. Ten training events were held between Spring and Fall 2007. A total 234 individuals attended the trainings, the vast majority of whom were child care providers from child care centers or homes. A complete list of these trainings, numbers of attendees, and the topic covered are shown in Figure 8. An additional 51 child care center staff were trained through the pilot consultation on-site trainings, bringing the grand total number of training attendees to 285. All child care facilities in attendance were provided a carbon monoxide alarm.

Another three "Preventing Environmental Asthma Triggers in Your Child Care Center", trainings have been scheduled for 2008. Further trainings, presentations, and possible site evaluations are anticipated. This will sustain the project beyond the scope of the grant period.

Figure 8. Details of Trainings Completed

Location	*Number of Attendees*	*Topics*
On-site Trainings at Pilot Centers (Fall 2006)	51	1,2,3,4
MN Dept Health Conf Center (3/24/07)	62	1,2,3,4
MN Dept Health Conf Center (5/19/07)	22	1,2,3,4
MN Dept Health Conf Center (9/8/07)	26	1,2,4
Mankato Public Library (9/15/07)	27	1,2,4
Brainerd Public Library (9/29/07)	22	1,2,4
MN Dept Health Conf Center (3/21/07)	7	4
Minnesota Child Care Association Conference (4/10/07)	28	4
Minnesota Licensed Family Child Care Association Conference (5/5/07)	13	4
MN Dept Health Conference Center (3/21/07)	7	4
Kids Country Child Care Center (7/27/07)	20	4
TOTAL	285	

B.5 Develop a website where materials can be easily accessed in the future

A child care provider website was created as part of the Minnesota Department of Health Indoor Air Unit web site (http://www.health.state.mn.us/divs/eh/indoorair/childcare/childcare.html). The website is named "Best Practices to Prevent Environmental Asthma Triggers in Child Care". These best practices were developed, piloted, and revised as described in the preceding sections. They consist of the following components:

1) Model Environmental Asthma Trigger Prevention Plan
    - an example plan to make immediate improvements with task-oriented policies and procedures
2) Building Evaluation Procedure for Asthma Triggers
    - a comprehensive and detailed assessment checklist to identify and address asthma triggers and underlying building problems
3) Links for Child Care Providers
    - additional resources to learn more about asthma, the indoor environment, and health and safety in child care

The Model Plan and Building Evaluation Procedure are available as both Microsoft Word documents and pdf documents. The materials can be used by anyone for educational purposes (i.e., not for profit). The MS Word option allows users to download and edit the document according to their particular needs and circumstances. The Model Plan is organized for maintenance staff, child care staff, and administrator as schedules for the completion of various activities. The Building Evaluation Procedure is available as a complete document, or individual sections can be downloaded separately, which are shown in Figure 9.

Figure 9. Sixteen Sections of the Building Evaluation Procedure

A: General Operations and Maintenance Practices and Procedures
B: Heating, Ventilation, Air Conditioning
C: Smooth Floors: Maintenance and Cleaning
D: Carpets, Area Rugs, Entry Mats: Maintenance, Cleaning and Locations
E: General Cleaning Activities
F: Disinfection and Sanitation
G: Pests and Pesticides
H: Chemicals
I: Construction/Renovation
J: Furnishing, Products and Materials
K: Plants and Animals
L: Smoking
M: Moisture
N: Hand Washing
O: Outdoor Pollutants and Allergens
Appendix A: Environmentally Preferable Cleaning Product Distributors and Primary References

The website "Links for Child Care Providers" provides further information on various topics related to asthma and asthma triggers. All the links are to governmental or non-profit agencies that provide expert information on topics beyond the scope of the Building Evaluation Procedure or Model Plan. The topics are organized as follow:

- Medications and Asthma Action Plans
- Indoor Environmental Quality and Asthma
- Art Supplies, Chemical Products, Pests
- Construction and Renovation
- Air Pollution

- Hand Washing, Disinfection, Sanitation
- Possible Grants and Loans to Address Hazards
- General Health and Safety Guidelines for Child Care

C. Use of Grant Funds

The use of grant funds is detailed in Figure 10. MDH has submitted the final financial forms to EPA.

Figure 10. Use of Grant Funds

Category	*Expenditure*
A. MDH Personnel	$22,701.71
B. MDH Indirect Costs	$8,451.43
C. Travel, Subsistence	$549.27
D. Equipment-Vacuum Cleaners (7)	$1,544.15
E. Supplies--Carbon Monoxide Alarms (100)	$4,654.43
F. Contracts	
'Caring for Kids with Asthma' Training, Minnesota Visiting Nurses Agency	$2,407.70
Allergen analysis, P&K Environmental Microbiology Laboratory	$9,100.00
G. Other	
Space Rental	$50.00
Training Refreshments	$256.00
Communications	$85.31
Employee Development	$200.00
Total	*$50,000.00*

D. Conclusions

MDH completed all the grant activities, objectives, and outcomes. We developed a Building Evaluation Procedure, surveys, and training materials. All of these new resources were successfully piloted in seven Minneapolis Child Care Centers. The pilot evaluations demonstrated that the draft building evaluation procedure can be utilized to assess buildings. Most the recommendations from the draft procedure were implemented, partially implemented, or expected to be implemented. Improvements were observed, reported, or measured after the center staff began implementing the recommendations. Attendance may have improved in some of the centers. Indoor allergen levels continued to decline one year later. In addition, child care staff that completed the trainings demonstrated an improved understanding on indoor asthma triggers.

After the pilot, minor modifications were made to the Building Evaluation Procedure and trainings, to make them more relevant, practical, and user-friendly. The resources were then utilized in 10 training events completed statewide. Attendance at these trainings was almost twice the goal of 120 attendees. Finally, a child care provider website was created with these new "Best Practices to Prevent Environmental Asthma Triggers in Child Care".

We expect to sustain our training and consultation project as part of a healthy child care facilities initiative, which currently also includes a radon testing and mitigation project of family child care homes. Child care providers in Minnesota need educational assistance regarding asthma triggers. They have received minimal educational services about environmental asthma triggers, compared to school staff and asthmatics' primary caregivers in Minnesota. Our PEAT project and other studies found that child care providers have limited knowledge and few resources to identify and address environmental asthma triggers, compared to K-12 schools. Moreover, we observed a greater incidence of potential asthma triggers—such as moisture, mold, chemicals, allergens, and dust accumulation—in child care facilities compared to K-12 schools that we had previously evaluated. Child care staff themselves demand this type of educational assistance. All the trainings offered were received with great interest and there were long wait-lists for many of the trainings. We continue to receive requests for trainings and expect to complete at least three and probably many more over the next year. Due to this great need and demand, the MDH Indoor Air Unit will prioritize training and consultation for child care providers, and advise other organizations that are beginning to assist child care providers with indoor air quality.

Appendix A. Primary References

The following references were relied upon the most for developing the Best Practices to Prevent Environmental Asthma Triggers in Child Care.

1. Greater Minneapolis Day Care Association, Healthier Housing Survey.
2. California Childcare Health Program. Health and Safety Policies Checklist. Available at http://www.ucsfchildcarehealth.org/.
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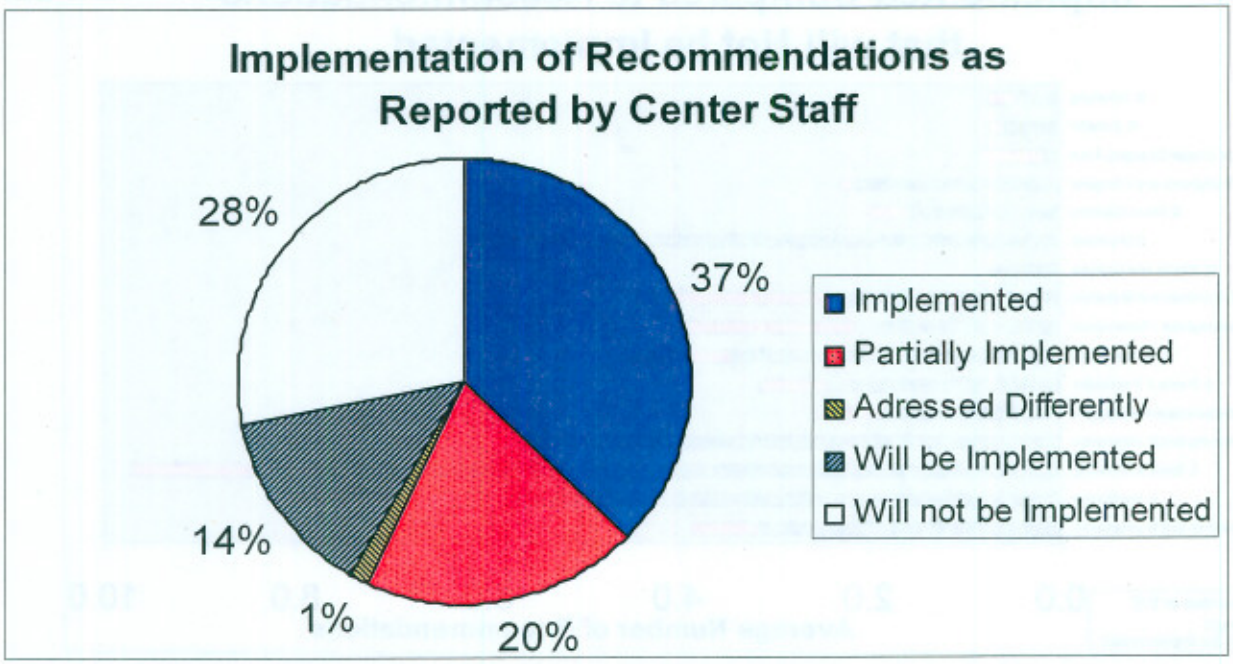
14. Connecticut Department of Public Health, Managing Asthma in Connecticut Schools: A Resource Manual. 2002.
15. Minnesota Department of Health Indoor Air Unit, Model School Environmental Asthma Management Plan: A New Tool to Evaluate and Improve the School Environment. 2005: St. Paul. Available at http://www.health.state.mn.us/divs/eh/indoorair/schools/plan/asthmaplan.htm

Appendix B. Details of Pilot Building Evaluation Results

Appendix B-1

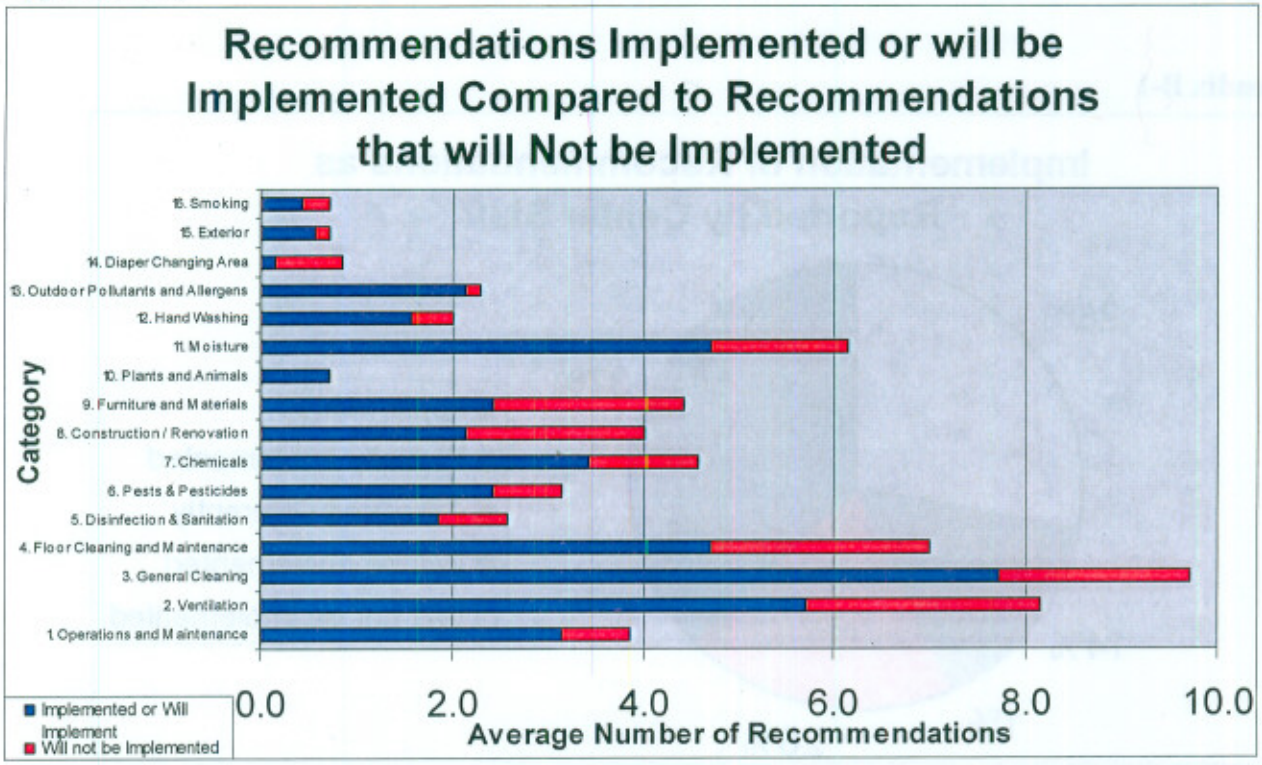


Child care center staff indicated they implemented or expected to implement about 2/3 of the recommendations provided to them. Following the baseline evaluation, each center was given a detailed report of findings and recommendations using the model plan. The building and center staff were given, on average, 61 recommendations to help address the issues identified (ranging from 42 to 80 recommendations per center). Center staff had about 3 months to try to implement the recommendations. After three months, center staff were interviewed about how they addressed issues, using an Environmental Action Log. The staff were given multiple choice options, as follows:

- "Implemented": the recommendation was fully implemented.
- "Partially Implemented": some parts of the recommendation were implemented.
- "Addressed Differently: the finding was addressed or corrected, but in a manner different than the recommendation.
- "Will be implemented": the recommendation will probably be implemented in the near future.
- "Will not be implemented": the recommendation was not implemented and will probably not be implemented. If the interviewee did not know whether a recommendation was implemented, it was assumed to be not implemented and will probably not be implemented.

Overall, an average total of 38 recommendations were implemented or will be implemented.

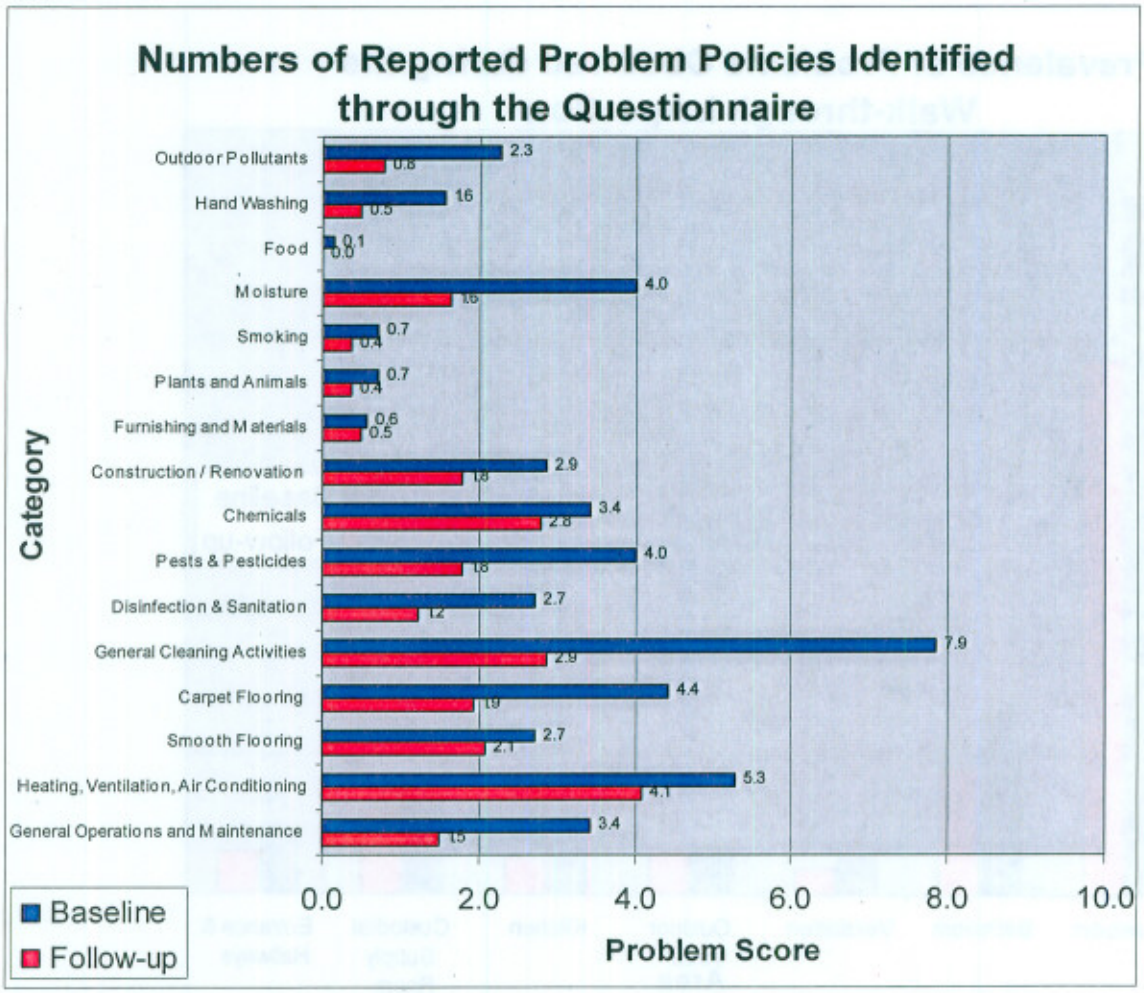
Appendix B-2



The reported rate of implementation of recommendations was similar in each category, although there was a large difference in the number of issues and associated recommendations for each category. Recommendations were presented to the centers in 16 different categories, listed on the y-axis. The greatest numbers of recommendations were presented in the areas of general cleaning, ventilation, floor cleaning and maintenance, and moisture. The total number of recommendations presented to the center staff is the sum of the two bars, and varies because assessment categories had different numbers of questions or checklist items and because more problems were identified in certain categories.

The average number of recommendations implemented, partially implemented, or expected to be implemented (blue) is shown in relation to the number of recommendations that will not be implemented (red). A higher rate of implementation was found in the plant, animal, and exterior recommendation categories, while a lower rate of implementation was found in the diaper changing, construction / renovation, and furniture and materials categories.

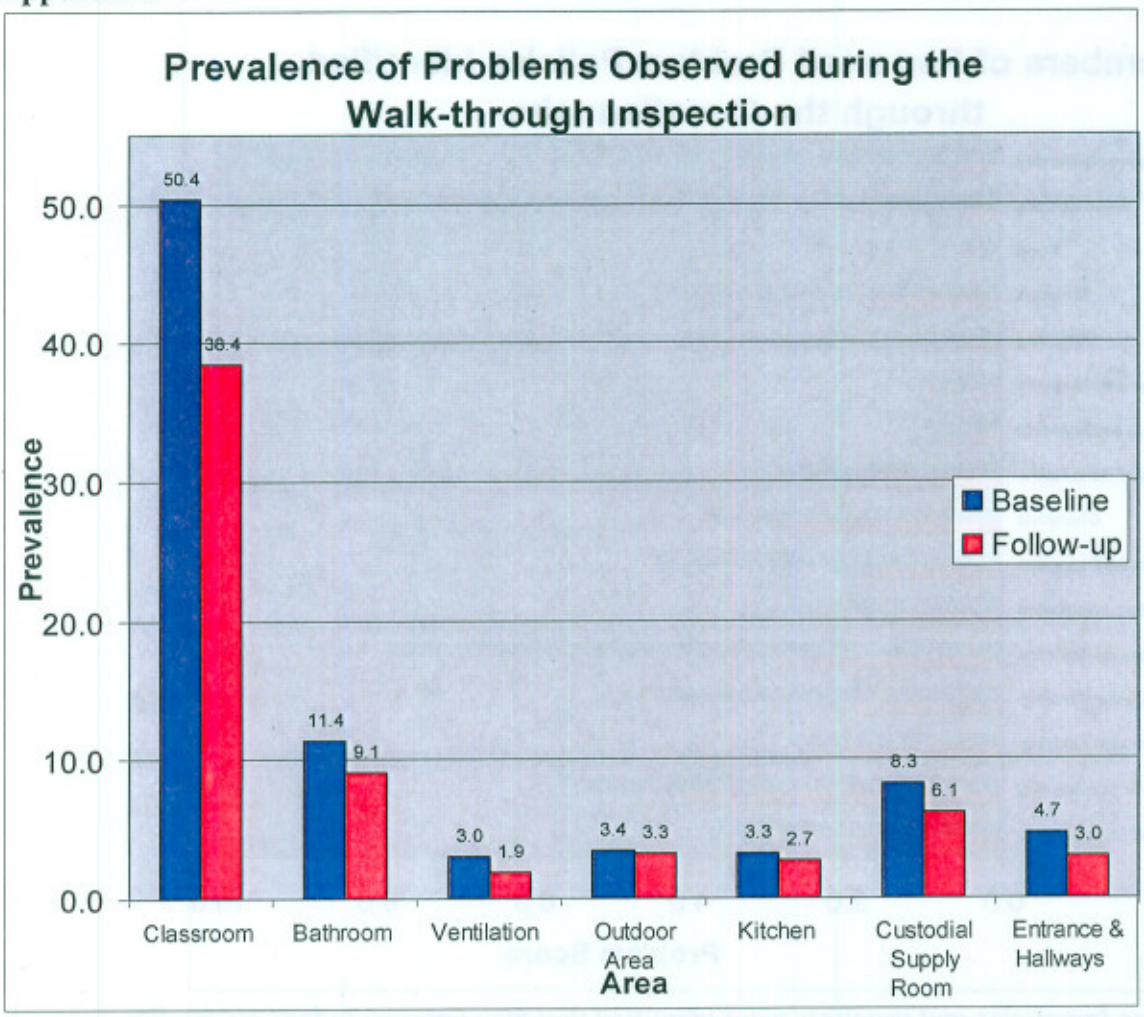
Appendix B-3



A large increase in policies and practices were identified that may improve indoor air quality. Overall, the average problem score declined from 47 to 24. Problem policies and practices were identified in every evaluation category. The most problems were identified in general cleaning activities, and the fewest problems were identified in food storage.

Center staff were interviewed at baseline and again at follow-up about their policies and practices. A problem score was assigned, which is the average number of 'not preferred' policies in effect at the centers. The total possible problem score for each center was 162. Each category had a different maximum possible problem score, because of a different number of questions. At follow-up, the problem score was calculated as follows: Score Problem Policies Follow-up = [Score Problem Policies Baseline] - [(Partial Improvement x 0.5) + (Complete Improvement)].

Appendix B-4



The frequency that problems were observed during the walk-through inspection declined at the seven child care centers. A number of problem types observed during the walk-through inspection were identified in several areas (e.g., stained ceilings, chemicals of concern. The problem prevalence refers to how many times the problem types were observed during the walk-through inspection. For example, stained ceiling tiles in classrooms is one "problem type"--when observed in three classrooms, the problem prevalence is assigned a 3. The problem prevalence does not include reported practices and policies. The total problem prevalence was 85 at baseline compared to 65 at follow-up.

Appendix B-5
Problems of Moderate Importance Identified at Baseline

Most of the individual problems identified in each center at baseline were "minor" and had a small impact on the child care center environment. In addition, each center had 2-3 problems of "moderate" importance. None of the centers had major problems that constituted a public health emergency. The "moderate" problems included issues related to moisture, ventilation, and general cleanliness.

- In five of the centers, moisture problems were present, including roof leaks, window leaks, plumbing leaks, and below grade water infiltration. Stained ceiling tiles, crumbling wall materials, and cracked ceilings were visibly apparent. These moisture problems were a concern because they contribute to the potential for mold, bacteria, and dust mites in the center. In addition, likely mold growth was identified in three centers.
- Ventilation problems were present in most centers. Only three buildings had mechanical ventilation that supplied outdoor air, while the other four relied on natural ventilation to bring in fresh outdoor air (openings windows and doors). Temperature, carbon dioxide, and humidity were frequently outside the recommended ranges in several buildings. Stuffiness and odors were noticeable in many rooms. In addition, heating and ventilation equipment had some maintenance deficiencies, such as filters that were warped, wet, or over-loaded.
- General cleanliness was a problem in all centers. Visible dust build-up, soiling, and staining were apparent in every center, to varying degrees, on flooring, fixtures, and furnishings.
- Other problems of moderate significance involved the presence of potential irritants. In two centers, there were a large variety of cleaning, pesticide, and art products that could be irritants. In one center, there was a large ceiling area covered with loose and crumbling fiber glass building material, which could be an irritant.

Appendix B-6

Issues that Had Sizable Improvements Observed During Walk-through

Assessment Area	Category	Sizable Specific Improvements
Classroom	Cleanliness	Fewer: dusty surfaces
	Furniture and Materials	Fewer: fleecy furniture, chalkboards used, open shelving
	Art Supplies	Removed: spray, solvent, powder, not 'non-toxic' products
	Renovation Needed	Repaired: cracks, holes in walls and floors
	Water Source	Repaired: leaky windows, roof leaks, poor site drainage
	Water stains or Microbial Growth	Removed: ceiling stains, mold on wall
Bathroom	Chemicals	Removed: air fresheners, not green chemicals
	Moisture Problems	Repaired: faucet leaks, stained ceiling
Ventilation	Filters	Replaced: warped, overloaded
Outdoor Area		*n/a*
Kitchen		*n/a*
Custodial Supply Room	Cleaning Supplies	Removed: pesticides, leaking chemicals, not green chemicals
	Vacuum Cleaner	Corrected: vacuums not HEPA, gaps in equipment, clogged filter
Entrance & Hallways	Floor Covering-Entrance	Corrected: missing entry mats, mats short
	Flooring-Hallway	Corrected: damaged flooring, carpeting in hallway, dirty/stained

Sizable specific improvements were observed during the follow-up walk-through inspection. The list comprises the more common problems that showed the largest change. These are listed by assessment area and category. Sizable is defined as a 0.5 or greater decline in average prevalence for the specific problem (follow-up vs. baseline). The largest specific improvement was for classroom dusty surfaces from an average problem prevalence of 14 to 8. The table does not show the specific problems that improved in some centers but worsened in other centers, nor does it show problems that showed less than a 0.5 improvement.

Appendix B-7

Environmental Sampling Result Interpretation Guidelines

In addition to the observational building evaluation procedure, a sampling protocol was researched and developed to measure asthma triggers and other indoor contaminants. The sampling helped to identify asthma triggers and to objectively evaluate outcomes associated with the pilot testing of the building evaluation procedure. The sampling protocol measured:

- carbon dioxide, temperature, relative humidity, carbon monoxide and nanoparticles in air.
- pressure differentials in areas that should have working exhaust ventilation (the kitchen, bathrooms, and custodial storage closets)
- levels of total dust, cat allergen, dog allergen, dust mite allergen, cockroach allergen, and relative moldiness present in carpets and furniture.

The sampling results were interpreted as follows:

Contaminant	*Preferable (low/normal)*	*Elevated*	*High*
Cat (Fel d 1)	<1 µg/g	1-7.9 µg/g [1]	≥8 µg/g [2]
Dog (Can f 1)	<2 µg/g	2-9.9 µg/g [1]	≥10 µg/g [2]
Dust Mite Allergen Der p 1 or Der f 1)	<2 µg/g	2-9.9 µg/g [1]	≥10 µg/g [2]
Cockroach (Bla g 1)	Not detectable	2-7.9 Units/g [1]	≥8 Units/g [2]
Environmental Relative Moldiness Index (ERMI)	<4 (<75th percentile of homes)	>4 (>75th percentile of homes)	n/a
Carbon Monoxide	+/- 3 ppm of outdoor	n/a	> 3 ppm greater than outdoor [4]
Carbon Dioxide	<700 ppm greater than outdoor	>700 ppm greater than outdoor [5]	n/a
Temperature	Winter: 68-75 F Summer 73-79	Outside range [6]	n/a
Sub-micron Particulates	Less than outdoor	Greater than outdoor [7]	n/a
Relative Humidity	Winter <30% Summer <60%	Winter >30% [8] Summer >60% [9]	n/a

The environmental sampling results were interpreted according to established guidelines. The allergic sensitization and asthma symptom risk levels are from: U.S. Department of Housing and Urban Development "Healthy Homes Issues: Residential Assessment", March 2006

[1] Risk level for allergic sensitization, above average level in homes with no pets (for cat and dog)
[2] Risk level for asthma symptoms
[3] Indication of current or recent cockroach infestation.
[4] Sampling error of measurement device, above which indicates indoor source
[5] ASHRAE comfort guideline
[6] ASHRAE comfort guideline, MN Rules require 68 F or more
[7] Indicates indoor source of particle pollution
[8] Increased risk of condensation and potential for microbial growth (winter only)
[9] Increased risk of dust mite growth

Appendix B-8

Air Contaminants in the Child Care Centers

	Number of Rooms
Total (all 7 centers)	41
Rooms >1000 ppm Carbon Dioxide Baseline	4
Rooms >1000 ppm Carbon Dioxide Follow-up	12
Rooms <73 or >79 °F Baseline	27
Rooms <68 or >75 °F Follow-up	9
Rooms >60% Relative Humidity Baseline	29
Rooms >30% Relative Humidity Follow-up	6
Sub-Micron Particle indoor>outdoor	0

Air sampling results were mostly in the normal range, with some notable exceptions. Appendix B-6 defines preferable and elevated levels for these air contaminants. The air sampling results suggested that air movement, temperature control, and dehumidification are less than ideal for the number of occupants present in certain rooms. The baseline and follow-up results are not directly comparable because the baseline evaluation was completed in the summer while the follow-up evaluation was completed the following winter.

At baseline and follow-up, carbon dioxide levels were above 1000 parts per million (ppm) in 4 and 12 rooms, respectively. The higher level at follow-up (winter) was primarily due to the buildings being were more closed up. It is likely that carbon dioxide levels routinely exceeded 1000 ppm in several rooms due to inadequate natural or mechanical outdoor air exchange. Carbon dioxide is exhaled by occupants, and it is used as an indicator for the amount of outdoor air coming into an occupied environment. At levels above 1000 ppm, people may begin to notice odors, stuffiness, and feel discomfort. As levels continue to increase further past 1000 ppm, an increase in humidity, odors, dust mites, fine dust, bacteria and particles, and chemical contaminants may also occur. This is because there isn't enough fresh air coming in to dilute the contaminated air relative to the number of people present.

Room temperatures were too low or too high in 27 rooms at baseline for summer conditions. In addition to affecting comfort, low temperatures can contribute to condensation on cold surfaces, while high temperatures may encourage certain microbial growth. At follow-up, temperatures were generally in the preferable range, with only 7 rooms outside the comfort range.

Relative humidity levels indoor were elevated in 29 rooms at baseline for summer conditions. This reflected outdoor conditions, the number of people in the room (people exhale humidity), the limited air conditioning equipment, the absence of working exhaust ventilation in many bathrooms and the kitchen, and various moisture problems in the building. This elevated humidity could increase mold and dust mites. At follow-up, only 6 rooms had elevated relative humidity for winter condition. This reflected the dryer air in the winter and some of the changes made to the buildings.

Nanoparticle levels indoors were lower indoors compared outdoor levels at all sampling times. This suggests that there were no significant sources of indoor nanoparticles (such as the combustion sources, chemicals, dry drain traps, copiers, or poorly maintained mechanical equipment).

Carbon monoxide levels were 0 ppm in the rooms. This indicates that there were no sources of carbon monoxide (such as poorly vented combustion appliances or idling vehicles).

Appendix B-9

The Number of Settled Dust Samples that Exceeded Risk Levels for Asthma

	Number of Samples in Various Risk Ranges		
Allergen	*Preferable-Low*	*Elevated – Allergic Sensitization*	*High – Asthma Symptoms*
Dust Mite - Der f 1	43	14	3
Dust Mite - Der p 1	60	0	0
Cockroach - Bla g 1	60	0	0
Cat- Fel d 1	17	30	13
Dog-Can f 1	27	26	7

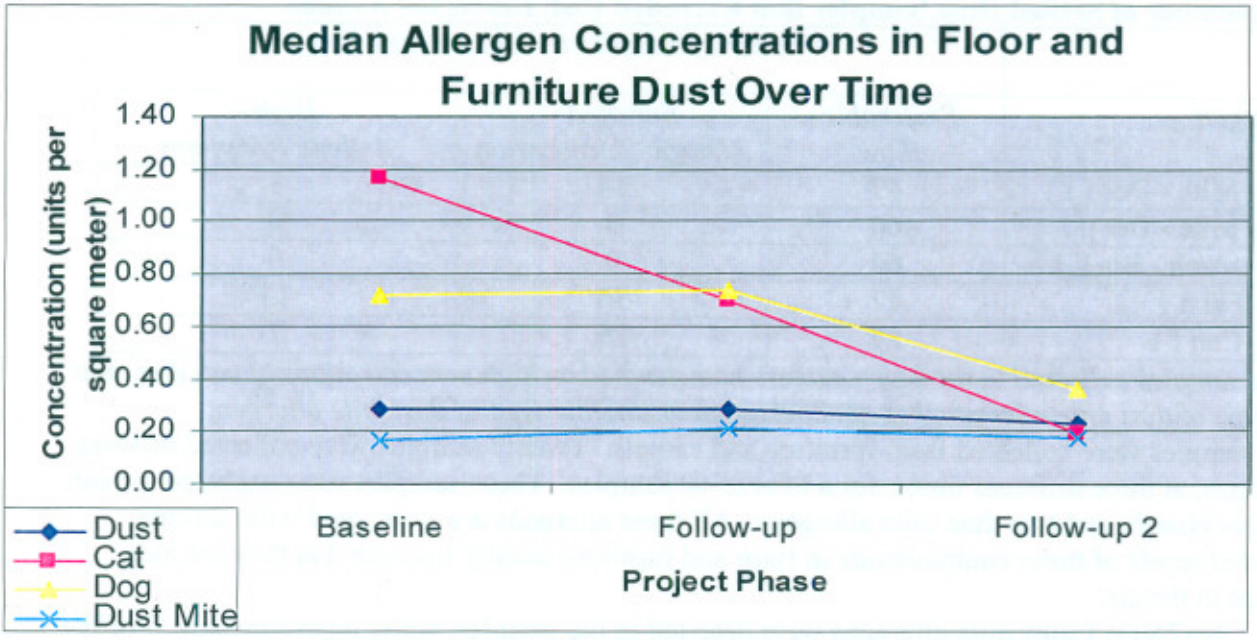
Many samples collected in the seven centers had elevated or high concentrations of cat, dog, and one type of dust mite allergen, but not cockroach or another type of dust mite allergen.

Dust samples were collected from furniture and carpets. Twenty samples were collected in seven buildings, at three different times, for a total of 60 samples. These samples were analyzed for cat, dog, cockroach, and two dust mite allergens. All these allergens are associated with asthma. Elevated levels of these contaminants in floor and furniture usually indicate that they are also present in the air.

No Der p 1 dust mite allergens were detected in the samples, while approximately ¼ of the samples had elevated Der f 1 dust mite levels. The difference between the Der f 1 and Der p 1 results are probably due to the differences in humidity needs—Der p 1 dust mites need consistently high absolute humidity while Der f 1 dust mites can thrive in lower humidity conditions.

Cockroach allergen levels were below the detection limit in all samples, except one sample which was still in the low range. This suggests that there were no German cockroaches present in the carpet and furniture in the center. This sampling did not measure other types of cockroaches, nor does it reflect levels that may be present in other areas (e.g., kitchens, boiler rooms).

More than half the dust samples had levels of cat or dog allergen that exceeded levels associated with increased risk of allergic sensitization or asthma symptoms. Cat and dog allergens are commonly found in public places that have many occupants or visitors. The presence of elevated cat and dog allergens are primarily due to these allergens being carried into the building on items from homes where pets are present, such as on people's clothes, shoes, jackets, bedding, toys, and furniture.



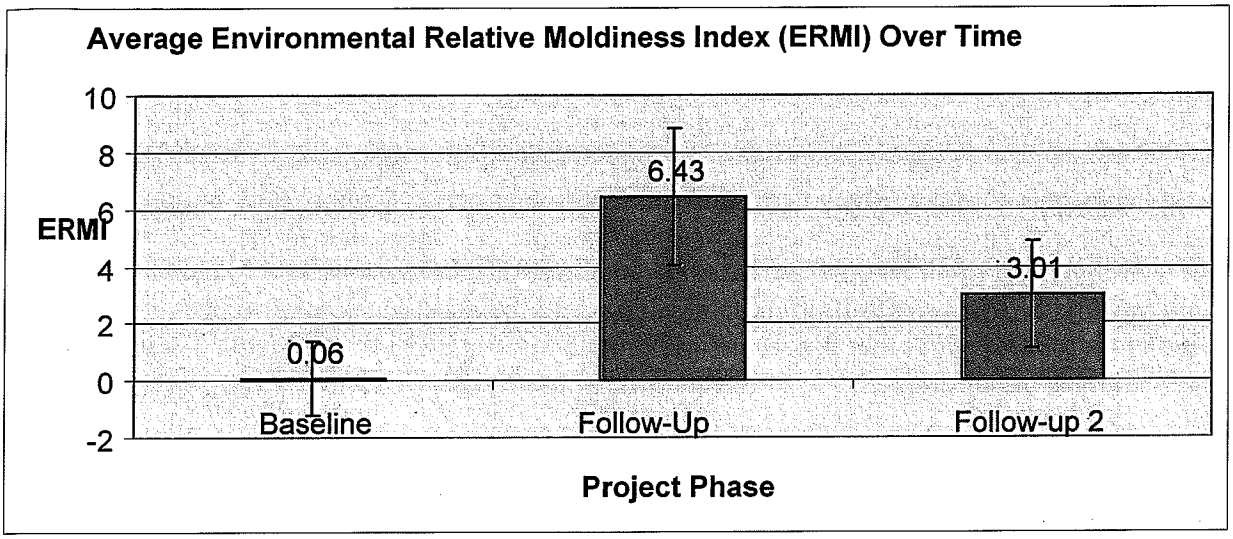
Cat and dog allergens declined sharply, while dust levels had a small decline and dust mites had no change. The second follow-up visit was completed to remove the influence of season (comparing Baseline (summer 06) to Follow-up (winter 07) may have been confounded by season change.

The average concentration of dust declined from 0.29 grams per square meter at baseline to 0.23 grams per square meter at the second follow-up. This dust contains a variety or allergens and irritants, from the outdoor air, occupants, and indoor sources and those generated indoors. Child care staff reported implementing recommendations and many areas seemed visibly less dusty at follow-up, which was consistent with the carpet and furniture dust measurements.

Cat allergen declined from 1.17 micrograms per square meter at baseline to 0.20 micrograms per square meter at the second follow-up. The change was statistically significant ($p=0.02$, analysis of variance). Dog allergen concentrations also declined, from 0.72 to 0.35 micrograms per square meter, but the change was not quite statistically significant. The decline suggests that the interventions had an impact on cat and dog allergens in particular. The interventions included improvements to walk-off mats, more frequent cleaning, use of HEPA vacuum cleaners, reduction in dust-catchers (clutter, fleecy items, stuffed toys, upholstered furniture), and improvements in ventilation (filtration efficiency and volume).

Dust mite levels did not change significantly from baseline to the follow-ups. The reason cat and dog allergen levels had a large decline while overall dust levels and dust mite allergens had a small or no decline may be that the interventions implemented by child care staff had a much greater impact on smaller particles. The dust analysis included all dust <300 microns in size and dust mite allergens tend be on particles 10-100 microns in size. By comparison, pet allergens are present on smaller particles (mostly <10 microns). Certain improvements (HEPA vacuuming, better HVAC filtration, damp cleaning) have a larger impact on smaller particles. Moreover, improvements in entry mats and dust-catchers would control the pet allergens brought in on peoples shoes and clothing. These improvements would not make a significant impact on dust mites because they are not tracked in (dust mite grow in fleecy materials). Dust mite populations are primarily dictated by seasonal and building humidity conditions.

Appendix B-11



The average Environmental Relative Moldiness Index (ERMI) changed significantly at different phases of the project. At baseline, the average ERMI was 0.064, which can be interpreted as average (~40th percentile of homes tested in US). It increased dramatically to 6.43 at follow-up, which can be interpreted as high, (~80th percentile of homes tested in US). Finally, it dropped to 3.01 at follow-up 2, which can be interpreted as moderately high (~65th percentile of homes tested in US). The three average ERMI are significantly different (analysis of variance p=0.0000465). Also individual comparisons of sampling occasions were also significantly different (t-Test: Paired Two Sample for Means p<0.0067). The error bars are the 95% confidence interval.

The increasing levels of moldiness in the building seem to contradict the improvements observed, policies adopted, and reduction in allergen levels. The primary changes that were implemented were related to cleaning, entry mats, cleaning products used, clutter, minor ventilation improvements, dust catchers, and other chemical products. These improvements would not be expected to influence the ERMI, because the ERMI is an index calculated by subtracting the quantity of molds generally present in buildings from molds that indicate water damage. Therefore, changes that impact all dust particles, including mold particles, would not result in a decline in the ERMI. Instead, correcting the source of water problems and removing mold growth in buildings following controlled and contained remediation practices would be the only changes that would be expected to reduce the ERMI.

The fluctuation in moldiness could be explained simply by new mold growth having developed after the baseline evaluation. This, however, is not the likely explanation, because the building was carefully evaluated for mold and moisture and no new mold or moisture problems were identified at follow-up and follow-up 2 (only improvements were observed). Nevertheless, the possibility of undetected new mold growth cannot be ruled out because other types of fungal sampling and certain types building diagnostics were not completed during the course of the project.

The more likely explanation for the trend is that spores were released into the air and subsequently settled onto sampling areas during the course of the project. Spores may have become airborne because of renovation or other activities during the interim period, and because of changes in temperature and humidity conditions from one sampling occasion to another. At follow-up 2, mold levels were lower than follow-up, but not back to the baseline levels. Renovations had been completed in two buildings between baseline and follow-up, but not between follow-up and follow-up 2. These two buildings had larger increases in ERMI than the other five buildings. So the findings are consistent that mold growth was disrupted during building renovation, and levels were

returning to normal baseline conditions by follow-up 2. However, 5 of 7 buildings had no reported significant renovations, and four of these building also had an increase in ERMI. Therefore, renovations alone do not appear to be the only explanation. Another possible explanation is that seasonal conditions influenced the release of spores. Humidity and temperatures were significantly lower in the building in the winter (follow-up) compared to summer (baseline and follow-up 2) due to the extremes in outdoor climate experienced in Minnesota. These climatic changes may have caused mold growth to dry out and become airborne. In addition, building operation changed with season, as heating began to be operated. Changes in heating and cooling may affect the movement of air through the building envelope, HVAC system, and foundation, which could introduce mold growth from these locations into the sampling area. If this hypothesis is true, it indicates that, as with other fungal sampling methods, the ERMI may fluctuate depending on seasonal variables in buildings.

Appendix C. Recruitment Letter, Informed Consent form and Application Questionnaire

March 29, 2006

Address

Re: Preventing Environmental Asthma Triggers in Child Care Centers

Dear «Salutation»:

In recent years, there has been a dramatic increase in the number of children with asthma. The American Lung Association has estimated that 8.6 million children in the United States have been diagnosed with asthma, and 10 million school days are lost due to asthma attacks. In Hennepin County, boys up to the age of four have the highest asthma hospitalization rates, so asthma is also having an impact on early education. Asthma attacks have been linked to indoor environmental triggers such as dust mites, mold, tobacco smoke, pet dander, cockroaches, and viruses.

In an effort to reduce asthma symptoms in children, we at Greater Minneapolis Day Care Association (GMDCA) in partnership with the Minnesota Department of Health (MDH) invite you to participate in a new pilot project: "Preventing Environmental Asthma Triggers in Child Care Centers". We are limited to enrolling seven childcare centers in Minneapolis. These centers will receive consultation services from MDH to help you create an asthma-friendly childcare center as well as providing information on how to improve indoor environmental quality within your facility. The project will begin in June 2005 and end in March 2006.

MDH and GMDCA will:

- Conduct environmental evaluations of your center,
- Provide suggestions to address existing and potential asthma triggers,
- Offer a continuing education class to train your staff, and
- Administer a survey of parents about their children's asthma.

The Center will:

- Complete a questionnaire on building issues related to the indoor environment,
- Record asthma symptoms that occur at your center,
- Attend two presentations,
- Allow MDH staff to administer a survey to parents during drop-off or pick-up of their children, and
- Attempt to follow some of our suggestions to create a more asthma-friendly environment for your staff and children, if it is possible and affordable.

If you are selected, your center may benefit in many ways. You and your staff will gain insight and awareness of asthma and how to minimize asthma triggers. We will work with you to find resources you need to address the recommendations made in this study. After the initial environmental evaluation, your center will be provided a new vacuum cleaner designed to reduce allergens. We will work with you to inform parents about asthma and indoor air quality by providing fact sheets. We will be available to answer questions by phone, from you, your staff, and the parents you serve.

If your center is interested in participating, please complete the enclosed application questionnaire, read and sign the center participant consent form, and mail these documents using the postage paid envelope ***by Friday April 21, 2006.*** You should also review the enclosed parent consent form, so you know about the parent survey and what the parents will be told about the project. Participants will be informed by early May regarding selections. If you have any additional questions about the project, contact Dan Tranter, Kathy Norlien, or Ed Petsche.
Thank you for considering this project.

Sincerely,

Preventing Environmental Asthma Triggers (PEAT) in Child Care Centers
Applicant Questionnaire

The following questionnaire will help the Minnesota Department of Health determine the suitability of your child care center for this project.

Do you agree to participate in this project knowing that the information is public data? Review informed consent form. Call MDH regarding any concerns.
Yes No

Occupant Information:

Name of Center:
Primary Contact Person (does not have to be director):
Signature
Address:
Phone Number:
Email:
Do you check email daily?
Yes No

Number of Staff at Center: _____

Number of Children at Center--break down by ages and room(s) they are in:

Age Range	Number of Children
Infant (six weeks – 16 months)	
Toddler (16 - 33 months)	
Preschooler (33 months and over)	
School Age (attended kindergarten)	

What are the hours of your child care center? open _____ close _____

Do you expect any children to start or leave your center between January and May 2006?
Yes No
If yes, about how many will start or leave? _____

Do you know if any children in your center have asthma or wheezing problems?
Yes No
If yes, how many children? _____

Do any staff have asthma or wheezing problems?
Yes No
If yes, how many staff? _____

Can most the parents of the children read English?

Yes No

Do you keep current attendance records for children?
Yes No
If yes, how long are the attendance records kept? _____

Do you still have attendance records going back to January 2004?
Yes No

Facility Information

Does the center lease the facility or own?
Lease___ Own___

How old is the building? _____ years

What floor of the building is your center located? _____ floor

Is your center the only occupant in the building?
Yes No

Circle the type of building (circle all that apply):
Stand-alone
Office
Multi-tenant
Church
Community Center
School
Store Front
Other _____

Who is responsible for maintenance, cleaning, and daily up-keep of the center and building? Check off in the table below.

Work	Center staff or personnel contracted by center	Landlord or personnel contracted by landlord
Floor cleaning		
Tables/shelves		
Laundry		
Sanitation of items		
Bathroom cleaning		
Kitchen cleaning		
Ventilation, heating, cooling		
Entrances, exterior, rooftop		

Where do maintenance staff and center staff get their cleaning supplies? Circle all that apply.

Retail stores
Supermarkets
Coops
Hardware stores
Commercial vendors

Does your building have a history of problems? Circle all that apply.

Moisture
Mold
Odors
Ventilation
Renovations
Cleanliness
Pests
Widespread allergy symptoms
Poor maintenance

Center Staff's Responsibilities (if chosen for the project)

Can the primary contact person complete another questionnaire regarding conditions in your facility and staff practices?

Yes No

Is the center staff or director willing to record asthma symptoms and related outcomes that occur at the center (using a log provided by MDH)? Information that could identify individuals will NOT be collected.

Yes No

Can you distribute a survey to parents at your center? This would be done once, in early February.

Yes No

Are the center staff open to suggestions, possibly including changes in cleaning, sanitation practices, replacing certain chemicals, controlling pests, better food storage, and addressing moisture problems?

Yes No

Are the facility management staff open to suggestions on a trial basis for four months? Suggestions could include cleaning, replacing certain chemicals, controlling pests, better food storage, and addressing moisture issues.

Yes No Don't Know

Can all center staff attend a two-hour presentation on controlling asthma triggers in February (in the evening or other convenient time)? Continuing education credits will be provided.

Yes No

Can students and staff participate in a one-hour hand-washing demonstration class during the day?

Yes No

Has your staff had any prior hand-washing trainings?

Yes No

Walk-through Evaluation

Can MDH scientists perform a walk-through evaluation during the day in January and again in April?

Yes No

Are facility management or center staff available to show us the ventilation, heating and cooling equipment and the roof area?

Yes No

Are there pillows present at the center that children sleep on every day?

Yes No

Is there an area rug or wall-to-wall carpet?

Area Rug___ Wall-to-wall carpet___ Other (specify):

Is there a couch, armchair, or other similar furniture?

Yes No

If yes, does the furniture have a fleecy fabric? Not leather, vinyl or microfiber.

Yes No

Minnesota Department of Health – Indoor Air Unit
Preventing Environmental Asthma Triggers in Child Care – Final Report

December 2005

Informed Consent for Child Care Center Directors who Wish to Participate in the Preventing Environmental Asthma Triggers (PEAT) Project

The Minnesota Department of Health would like your child care center to participate in the Preventing Environmental Asthma Triggers (PEAT) Project. This informed consent form, which is required by law, should be reviewed by child care center directors. If you understand and consent to the various stipulations of this project, please sign this document and return a copy with your applicant questionnaire.

The center staff are expected to participate for a period of 11 months, beginning in December 2005 and ending in September 2006. Participation in this project is voluntary and centers may discontinue participation at any time.

The PEAT project will involve collecting data. A variety of procedures will be followed to collect environmental, health, and attendance data, which are described in the cover letter and applicant questionnaire. These data will be used to provide suggestions to the center staff about asthma and environmental conditions in their buildings, and to determine the feasibility and challenges of collecting and interpreting such data.

An environmental assessment will be completed in winter 2006. MDH will provide suggestions for improvements to the center staff, such as changes in maintenance and cleaning, renovations, and new administrative policies. The centers will benefit in a number of ways. Staff will have a better understanding of the facility condition. They will learn about asthma, the asthma triggers in the center, and methods to control these asthma triggers.

MDH will provide each center a report detailing findings and recommendations. Most of the recommendations will focus on staff behavior change. There may be a few recommendations that have a cost to the center. MDH and GMDCA will try to find funding to pay for repairs and other improvements. There is, however, no guarantee of funding assistance for any remediation that may be suggested as a result of the environmental assessment.

The information collected during the project will be considered public data. We do not intend to distribute the data, but must provide it to interested parties if requested. Sharing such information with the public does present some potential risk to your center such as inappropriate interpretation of the data. MDH will make every effort to explain the collected data to interested parties requesting the data, to minimize misunderstandings.

The centers participating in the project will receive no direct monetary compensation, but will receive a free vacuum cleaner and pest management supplies from MDH. In addition, the centers will receive consultation services and training.

Minnesota Department of Health – Indoor Air Unit
Preventing Environmental Asthma Triggers in Child Care – Final Report

Pertinent questions about the project, your rights, and any project-related injuries should be directed to: Dan Tranter at 651-201-4618, daniel.tranter@health.state.mn.us, or Minnesota Department of Health, PO Box 64975, MN St Paul, 55164-0975 .

I have read this informed consent form and agree to participate in the project.

Director's Name	Signature	Date

Appendix D Parent Survey

Introduction

The goal of the parent survey was to collect baseline data on children from the seven child care centers that were part of this project. Indoor air quality staff researched tools currently available to collect baseline asthma-related data because of the need to get information regarding the number of children with asthma and asthma-like symptoms and potential environmental asthma triggers for those children. It was decided that the parent questionnaire should be based on the International Study of Asthma and Allergies in Childhood (ISAAC) phase three tool.[1] This questionnaire was designed for parents to answer questions on behalf of their 6-7 year old children for an international study of the trends and determinants of the prevalence of asthma and allergies in children. It has a "track record." Only portions of the ISAAC phase three tool that were applicable to our narrow study were used. While the children in this study were younger than children for whom the ISAAC study this was originally drafted, many of the questions remained pertinent and surveys were completed by the parents for their own child/children just as the tool was designed for. In addition to the basic questions regarding asthma, an additional question was added about the environmental triggers of asthma that may be present in child care settings.

Once the parent survey tool was presented to the Minnesota Department of Health Institutional Review Board, an "Informed Consent for Parent Survey" form was drafted. The parent survey was modified in response to IRB suggestions as well to ensure that the data would be maintained as "private" and the children would not be identifiable. This document informed each family about the study, study related activities in his/her child's child care center and reiterated that their participation was voluntary. Administration of the parent survey tool had to be completed in person and targeted follow-up to those parents who did not complete the survey was not an option as originally planned. The modifications that were made decreased the success in getting a high response that would have been possible with targeted reminders. As an incentive for parents to complete the surveys, treats were provided for the parents each was given a dollar for completing each survey. MDH staff was available with surveys two different time-frames at each child care center, one time in the morning to catch those dropping off their children and one time in the afternoon to cover child pick-up times.

Survey

The final survey consisted of eight initial questions to discern whether or not the child had asthma or asthma-like symptoms. If initial screening questions indicated that the child has asthma or asthma-like symptoms, the parent was asked to complete part 2 of the survey—consisting of twelve additional questions to further discern how often asthma-like symptoms occurred, whether or not the symptoms occurred at the child care center, missed days due to asthma or asthma-like symptoms, number of emergency department visits in the past year, and environmental triggers of asthma. A copy of the survey can be found at the end of this appendix.

[1] http://isaac.auckland.ac.nz/

During September 2006, to provide baseline data on the children, parents of children attending the seven participating child care centers completed a total of 254 surveys, one survey per child. One of the surveys was disqualified because it was a repeat (a parent filled out two surveys on the same child) and another 33 surveys were disqualified because the child was over 5 years of age (some of the child care centers provided before and after school care, and those children were not spending a large amount of time in the childcare center.) Six centers out of the seven childcare centers that participated in our study had a total estimated average enrollment of 344 children (infants, toddlers and preschoolers). The one child care center for which we received no enrollment/absenteeism data from was one of the larger childcare centers that participated in our PEAT study. Our final analysis consisted of 220 surveys collected from the 7 childcare centers for children ages 5 and under.

Results

Of the 220 surveys completed on behalf of the children, 114 (52%) surveys were filled out for males, 105 (48%) were filled out for females, and 1 was not specified. Of the 220 children that were surveyed, 83 (38%) were reported to have experienced wheezing in the past and 64 (29%) reported to have experienced within the past 12 months. When asked whether or not your child has ever had asthma, one additional child was identified as having asthma where the parents did not indicate that wheezing was experienced at some time during the child's lifetime. Therefor, the total number of children identified as ever having asthma was 84. The high numbers of children with wheezing is not surprising since children 5 years and under commonly have wheezing and asthma-like symptoms due to a variety of lower respiratory infections and other conditions.

Of the 64 children reported to have experienced wheezing in the past 12 months, 42 of the children were reported to have experienced wheezing attacks 1-3 times within that year. Only 8 children were reported to have experienced between 4 and 6 episodes of wheezing within the past year and 3 of the children experienced more than 12 wheezing attacks within that year. Parents reported that 32 of the 64 children who had experienced wheezing within the past year experienced wheezing at night. One would expect that we were targeting between 3 and 11 severe asthmatics if we judge severity by answering this question. Wheezing that impaired speech was reported in 11 children and exercise-induced wheezing was identified in 29 children.

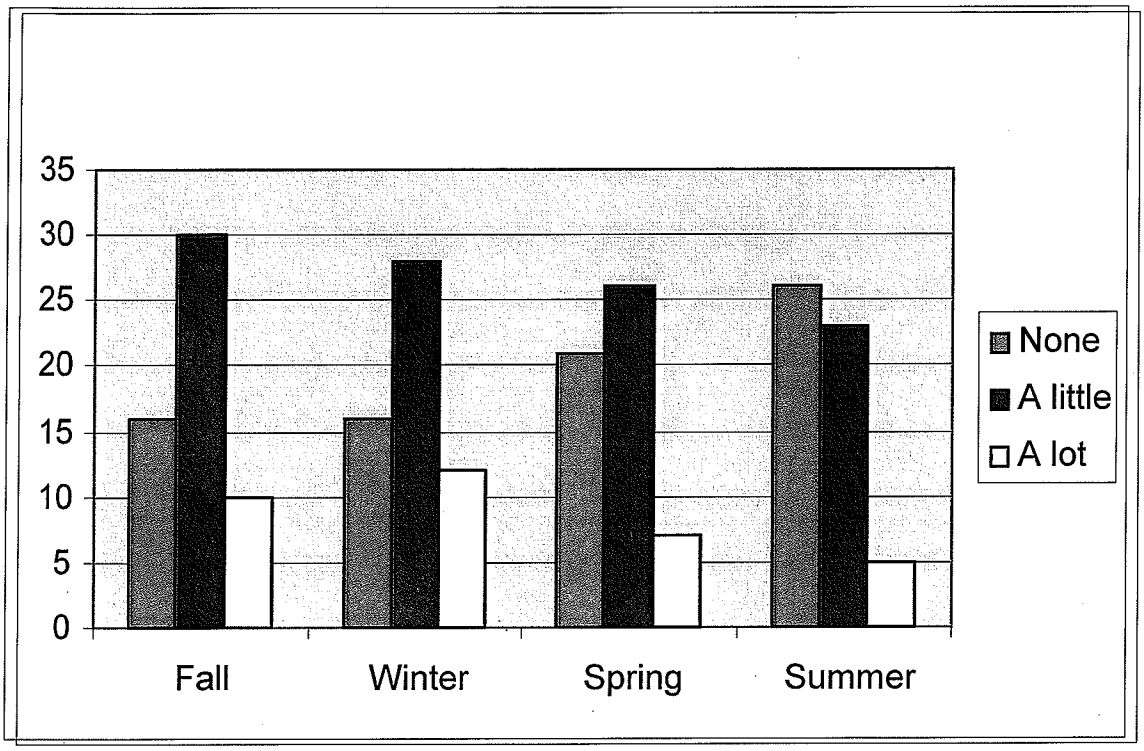
Out of 220 completed surveys, 68 (31%) completed the second part regarding environmental triggers of asthma. An additional 20 surveys should have been completed but were not. Either parents were not clear as to move on or, more likely, the parent just didn't want to take the time to complete part 2. (If 88 had completed this it would have provided us with 40% response which would be much higher than the background (1 in 12 or about 8% of Americans experience asthma symptoms each year). Roughly 10% of adult Minnesotans report that they have ever experienced asthma at some time in their lives.[2] The high response rate is most likely to be a factor of the "broad" definition of asthma or asthma-related symptoms in this survey. The survey had parents of young children complete the second portion of the survey if: 1) they had been told that they had asthma; 2) if the child had wheezing in the past or; 3) if the child experienced wheezing within the past 12 months. Also, because the survey was voluntary, it

[2] http://www.health.state.mn.us/asthma/documents/AsthmaPlan.pdf

may have attracted more parents who were either concerned about asthma or those who had children who had respiratory problems in the past.

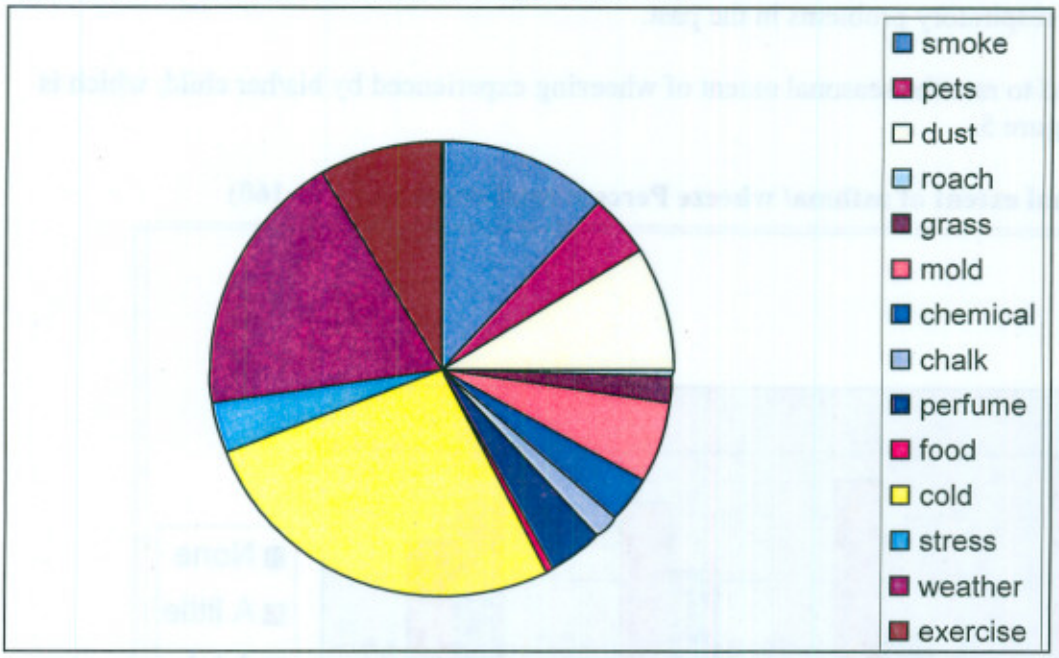
Parents were asked to rate the seasonal extent of wheezing experienced by his/her child, which is summarized in Figure 5.

Figure 5. Seasonal extent of asthma/ wheeze Percent total responses (N= 160)



In the identification of asthma triggers, parents were asked to identify "any or all" of the triggers listed. Some responses indicated that there were multiple triggers for a specific child. The three areas that were most often cited as being a trigger for asthma or wheeze were 1) colds (viral infections); 2) weather; and 3) smoke. The Minnesota Freedom to Breathe Act and additional attention given to the health benefits of avoiding second-hand smoke may help reduce the incidence of smoke as a trigger for asthma. In addition, current attention/work is being done on wood smoke, outdoor water boilers and other sources of outdoor smoke. Other more common triggers of asthma identified through this survey include dust, exercise, and mold.

Figure 6. Environmental Asthma Triggers (N=68)



A total of 16 children out of the 68 parent surveys were reported to have been tested for allergies. Of the 16 children "tested for allergies," 13 had also been told by a physician that their child has asthma. An additional 2 children, who had not been told that their child had asthma, had been prescribed "Zyrtec" which is given for "seasonal or perennial allergic rhinitis."[3] No additional information was available for the last child. It is not surprising that many of the children with asthma have also been evaluated for allergies. In the new Guidelines for the Diagnosis and Management of Asthma published by the National Institutes of Health, Section 3, "Control of Environmental Factors and Comorbid Conditions That Affect Asthma" states that:[4]

> Exposure of patients who have asthma to allergens or irritants to which they are sensitive has been shown to increase asthma symptoms and precipitate asthma exacerbations; and
>
> For at least those patients who have persistent asthma, the clinician should evaluate the potential role of allergens, particularly indoor inhalant allergens.

Six other children had never been diagnosed with asthma, however, were prescribed nebulizers, although many of the "nebulizers" were not designated with a specific medication, except for one designated as "albuterol." Overall it was not very helpful to have parents designate whether or not their child was taking a rescue/reliever versus control medications because most of the parents simply wrote down what his/her child was on, and in some cases, such as use of a steroid, it is not always clear whether or not it is being used as a rescue/reliever medication versus a control medication.

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[3] PDR, Asthma/Allergy Pocket Guide (Compliments of Genetech/Novartis). Second Edition. Genetech, Inc., 2006.
[4] http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf

Parent Survey

Preventing Environmental Asthma Triggers (PEAT)
Parent/Guardian Asthma Survey
Part 1

Please complete a survey for each of your children attending this child care center. Thank you for your cooperation.

Today's date:_____

Name of child care center your child attends:_____

Age of child: _____

Is your child a:

male ☐
female ☐

1. Has your child ever had wheezing or whistling in the chest at any time in the past?

Yes
No ☐

IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6 (back page).

2. Has your child had wheezing or whistling in the chest in the past 12 months?

Yes ☐
No

IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6 (back page).

3. How many attacks of wheezing has your child had in the past 12 months?

None
1-3 ☐
4-6 ☐
More than 12 ☐

4. In the past 12 months, how often, on average, has your child's sleep been disturbed due to wheezing?

Never woken wheezing ☐
Less than one night per week ☐
One or more nights per week ☐

5. In the past 12 months, has wheezing ever been severe enough to limit your child's speech to only one or two words at a time between breaths?

Yes ☐
No ☐

6. Has your child ever had asthma? Yes ☐ No ☐

7. In the past 12 months, has your child's chest sounded wheezy during or after exercise? Yes ☐ No ☐

8. In the past 12 months, has your child had a dry cough at night, apart from a cough associated with a cold or chest infection? Yes ☐ No ☐

If you have answered "yes" to questions #1, #2, or #6, please continue with Part 2 of this survey, otherwise, you may stop here.

Parent/Guardian Asthma Survey
Part 2

1. In the past 12 months, during day, how often has your child had a hard time with asthma, wheezing or breathing?

Never ☐
2 times a week or less ☐
More than 2 times a week ☐
Every day (at least once a day) ☐
Constantly (all the time) ☐

Did any of these episodes occur while your child was at child care?

Yes ☐ No ☐

If yes, how many times? _____

2. In the past 12 months, how many days did your child miss child care due to his/her asthma, wheezing or breathing?

0 days ☐
1-2 days ☐
3-5 days ☐
6-9 days ☐
10-14 days ☐
15 or more days ☐

3. In the past 12 months, has your child's asthma or wheezing ever stopped him/her from taking part in child care activities including sports-related activities?

Yes ☐
No ☐

If yes, how many times? _____

4. In the past 12 months, how many times have you taken your child in to see a doctor related to your child's asthma, wheezing or breathing?

None ☐
1 time ☐
2 times ☐
3 times ☐
4 times ☐
5 or more times ☐

6. In the past 12 months, how many times has your child been hospitalized overnight or longer for asthma, wheezing or breathing?

None ☐
1 time ☐
2 times ☐
3 times ☐
4 times ☐
5 or more times ☐

7. In the past 12 months, how many times has your child been treated in the Emergency Department for asthma, wheezing or breathing?

None ☐
1 time ☐
2 times ☐
3 times ☐
4 times ☐
5 or more times ☐

8. For each season of the year, to what extent does your child have a hard time with asthma, wheezing or breathing?

	A lot	A little	None
Fall	☐	☐	☐
Winter	☐	☐	☐
Spring	☐	☐	☐
Summer	☐	☐	☐

9. What triggers your child's asthma, wheezing or breathing difficulties and makes it worse? (check any or all factors that apply)

- ☐ Smoke
- ☐ Animals/ pets
- ☐ Dust/ dustmites
- ☐ Cockroaches
- ☐ Grass/ flowers
- ☐ Mold
- ☐ Exercise, sports, or playing hard
- ☐ Cleaning supplies
- ☐ Chalk/ chalk dust
- ☐ Strong smells/ perfume
- ☐ Foods (which ones? _____)
- ☐ Having a cold/ respiratory illness
- ☐ Stress or emotional upsets
- ☐ Changes in weather/ very cold or hot air

10. Has your child been tested for allergies? Yes ☐ No ☐

11. Has a physician ever told you that your child has asthma? Yes ☐ No ☐

12. Does your child take medication for his/her asthma, wheezing or breathing? Yes ☐ No ☐

If so, what kind?

Rescue/Reliever ☐
Control ☐
Other (describe) ☐

Preventing Environmental Asthma Triggers (PEAT) Project
Informed Consent

Your child's childcare center is one of seven centers participating in a project designed to see if it is useful to collect data related to asthma-related illness and environmental triggers found in child care centers. The goal of the Preventing Environmental Asthma Triggers (PEAT) project is to reduce missed at childcare centers due to asthma-related illness, unscheduled doctor visits and the number of asthma attacks.

This project is being done by the Minnesota Department of Health and will take place over the next several months. If you agree to participate, a parent questionnaire will be filled out to help us learn how many children have asthma-related conditions. The questionnaire should take about 10 minutes of your time to complete. Upon completion of the parent questionnaire, you will be given a dollar to thank you for your time.

Later, childcare facilities will be inspected to identify specific building-related issues that may trigger asthma attacks. During the inspections, environmental (dust) samples will be taken from various rooms in the child are center and analyzed for a variety of allergens that can trigger asthma attacks. Childcare center staff will be trained on issues related to asthma and actions that can reduce environmental asthma triggers at childcare centers. Because viruses have been demonstrated to be an asthma trigger, providers and children will be trained on effective hand washing and "cover your cough" to help prevent the spread of colds and chest infections that can trigger asthma. This should be a fun learning experience for the children. Hand washing techniques will potentially become a habit for children both at childcare, at home and away. Childcare center staff will be asked to track asthma-related symptoms before and after the training and absentee records will also be checked to make comparisons between the situation before and after the educational interventions.

Near the end of the project a final walk through will be completed to identify building issues that may have been repaired or fixed. The interventions that will be proposed to the center staff are safe, known to improve indoor environments, and not experimental in nature. This project may result in a healthier environment for your child. Participants and children should not experience any health risk or discomfort as a result of taking part in this project.

Records of parents or children's names will not be obtained at any time during the project. The only data that will be kept is the month and year of birth of the child. This data will be used to group children into certain age categories and will not be published as identifying data.

Participation in this project is voluntary. Refusal to participate in this project will not result in penalties or loss of benefits to you or your child, nor will it affect your

childcare status. This project involves no procedures that normally require written consent and the project presents minimal risk of harm to participants.

If you have questions regarding this project please contact Kathleen Norlien (651) 201-4613 or Daniel Tranter (651) 201-4618. If you have questions regarding your rights as a study participant, please contact Cindy Turnure, Ph.D., MDH Institutional Review Board Administrator at (651) 296-6351 or toll free at 1-888-262-0684.

Procedures for Obtaining Informed Consent

Once the participating child care centers have been recruited, there will be a day when an MDH investigator (Dale Dorschner, Daniel Tranter or Kathleen Norlien) will be present to hand out informed consent/asthma information sheets to parents of children that will be part of our investigation. There will be coffee and doughnuts available for those parents willing to stay and fill out the asthma information sheet. The parental consent form will be attached to each asthma information sheet to be completed by the parent.

For parents that choose to take the survey home and fill it out later, a reminder will be posted at the childcare center near the sign-in book to remind parents to submit the completed form. The reminder will state that participation is voluntary.

The investigators will emphasize to the childcare center administrator that parent participation in filling out the survey is voluntary.

Appendix E. Knowledge Quiz

The "Preventing Environmental Asthma Triggers" training was evaluated with a knowledge quiz administered before and after the training. Knowledge quizzes were graded and entered into a data base. A consistent and significant improvement was observed in the quiz scores for providers in each child care center. A total of 51 childcare providers were tested and the overall average improvement across childcare centers was an average of 17 percentage points better on the post-test as compared with the pre-test. Interestingly there were 5 test scores that declined after training although that decline was slight (2-4 percentage total points per test). It would have been interesting to investigate this further as there may have been a language barrier with some of the child care workers in some of these facilities—i.e. English may not have been their primary language. This information could have been gathered as part of the initial quiz but was not. Further follow-up testing was not done to measure the retention of the facts and concepts learned during the training session but scores from the knowledge quizzes indicate improvement on learning what environmental factors contribute to the exacerbation of asthma symptoms.

Asthma Knowledge Quiz

Check the correct answer (Check all that apply).

1. Which of the following can trigger an asthma attack in a child who is susceptible?
   - ☐ Apple/Orange juice
   - ☐ Childhood immunization
   - ☐ Cleaning products
   - ☐ Cockroaches
   - ☐ Cold temperatures outside
   - ☐ Dust mites
   - ☐ MSG
   - ☐ Soft drinks
   - ☐ Strenuous exercise
   - ☐ Viral infection (Colds)

2. What can you do to prevent mold growth in the child care center?
   - ☐ Repair any plumbing and roof leaks as soon as possible.
   - ☐ Clean up food and water spills immediately.
   - ☐ Use a humidifier.
   - ☐ Increase the ventilation of the building.
   - ☐ Minimize the frequency of wet mopping of the hard surface floors.

3. Which of the following cleaning habits/procedures can minimize the adverse health effects to children with asthma?
   - ☐ Use environmentally friendly cleaning supplies.
   - ☐ Use an ozone generator to kill germs and clean the indoor air.
   - ☐ Use air and fabric fresheners to get rid of an unpleasant odor.
   - ☐ Use HEPA vacuum cleaner.
   - ☐ Sweep the hard-surfaced floors with a broom.
   - ☐ Keep the ventilation on or windows open where possible until all daily cleaning activities are done.

4. What is the recommended practice for cleaning all horizontal surfaces such as bookcases, cabinet tops, and window ledges?
   - ☐ Dust with a feather/static duster during nap time every day.
   - ☐ Dust with a feather/static duster after child care hours every day.
   - ☐ Wipe with a dry rag before child care hours at least once a week.
   - ☐ Wipe with a dry microfiber cloth during nap time every day.
   - ☐ Wipe with a damp microfiber cloth after child care hours at least once a month.

5. Which of the following in a building may negatively affect the health of children with asthma and other building occupants?
   - ☐ Openable windows
   - ☐ Number of emergency exits
   - ☐ Location of restrooms
   - ☐ Poorly ventilated room
   - ☐ Many indoor plants

6. Spread of viral infection (colds) among children in child care centers can be reduced by:
   - ☐ limiting the activities outdoors.
   - ☐ washing hands.
   - ☐ cover their cough and sneeze.
   - ☐ cooking meat thoroughly.

7. Which of the following animal(s) is (are) <u>least</u> likely to cause asthma symptoms?
   - ☐ Hamsters

- ☐ Birds
- ☐ Fish
- ☐ Gerbils
- ☐ Frogs

8. The "Air Quality Index" is a tool that can tell us:
   - ☐ when the indoor air should be ventilated because the indoor air may be unhealthy to breathe.
   - ☐ the indoor humidity level to prevent mold growth indoors due to excess moisture.
   - ☐ when the outdoor air may be unhealthy to breathe.

9. Portable ozone-generating air cleaners are strongly recommended to reduce chemical pollution in the air.
   - ☐ True
   - ☐ False

10. Cat and dog allergens can be found in child care centers that do not allow pets.
    - ☐ True
    - ☐ False

Appendix F. Asthma Log

Child care center:
Name of person completing log:

Date (day/mo/yr)	Asthma Symptoms (check all that apply)	Student or Staff Diagnosed with Asthma by a Doctor?	Symptom(s) Started while in School Building?	Likely cause of symptoms (check all that may apply)	Outcome of Office Visit (check all that apply)
	[ ] wheezing (whistling sound in chest) [ ] difficulty breathing [ ] coughing that won't go away [ ] shortness of breath [ ] chest tight or heavy [ ] other (describe) ________	[ ] yes [ ] no [ ] don't know	[ ] yes [ ] no [ ] don't know	[ ] exposure at home [ ] exposure to cold air [ ] exercise [ ] outdoor air pollution [ ] respiratory infection [ ] something in school air [ ] other (describe) ________	[ ] symptoms controlled with medication [ ] returned to class / work [ ] monitored or stayed in office [ ] went home early [ ] went to urgent care/emergency department [ ] 911 called and transported [ ] end of day; went home [ ] other ________
	[ ] wheezing (whistling sound in chest) [ ] difficulty breathing [ ] coughing that won't go away [ ] shortness of breath [ ] chest tight or heavy [ ] other (describe) ________	[ ] yes [ ] no [ ] don't know	[ ] yes [ ] no [ ] don't know	[ ] exposure at home [ ] exposure to cold air [ ] exercise [ ] outdoor air pollution [ ] respiratory infection [ ] something in school air [ ] other (describe) ________	[ ] symptoms controlled with medication [ ] returned to class / work [ ] monitored or stayed in office [ ] went home early [ ] went to urgent care/emergency department [ ] 911 called and transported [ ] end of day; went home [ ] other ________
	[ ] wheezing (whistling sound in chest) [ ] difficulty breathing [ ] coughing that won't go away [ ] shortness of breath [ ] chest tight or heavy [ ] other (describe) ________	[ ] yes [ ] no [ ] don't know	[ ] yes [ ] no [ ] don't know	[ ] exposure at home [ ] exposure to cold air [ ] exercise [ ] outdoor air pollution [ ] respiratory infection [ ] something in school air [ ] other (describe) ________	[ ] symptoms controlled with medication [ ] returned to class / work [ ] monitored or stayed in office [ ] went home early [ ] went to urgent care/emergency department [ ] 911 called and transported [ ] end of day; went home [ ] other ________
	[ ] wheezing (whistling sound in chest) [ ] difficulty breathing [ ] coughing that won't go away [ ] shortness of breath [ ] chest tight or heavy [ ] other (describe) ________	[ ] yes [ ] no [ ] don't know	[ ] yes [ ] no [ ] don't know	[ ] exposure at home [ ] exposure to cold air [ ] exercise [ ] outdoor air pollution [ ] respiratory infection [ ] something in school air [ ] other (describe) ________	[ ] symptoms controlled with medication [ ] returned to class / work [ ] monitored or stayed in office [ ] went home early [ ] went to urgent care/emergency department [ ] 911 called and transported [ ] end of day; went home [ ] other ________

Comments (No personal information that could identify the individual)

Directions

Do NOT write any personal information that could in any way identify the person whom you are describing on this form.
All child care center staff that receive child and staff office medical visits should have a copy of this log.
Keep it in handy place where you will remember to use it when a child or staff visits you with asthma type health problems.
Only record visits to your office after symptoms start to occur. Do not record any visits from children or staff who have used medication for prevention of symptoms.
Always keep a blank copy to make photocopies for new logs.
Make copies of completed charts to keep with your records before mailing.

1) Record any office/nurse visit by any child or staff member with symptoms resembling asthma.
2) Write down date of visit.
3) Check off symptoms.
4) Check if child or staff has been diagnosed with asthma by a doctor.
5) Check if symptoms began while subject was in the child care center.
6) Ask child or staff what was likely cause of symptoms. Go through the list of options and check off all those that may be relevant.
7) Check off outcome(s).

If you have any questions, contact Dan Tranter (651) 201-4618 or Kathy Norlien (651) 201-4613. Thank you!

Appendix G. Attendance Data

Absentee records were requested for the months of September-December of 2005 and September-December of 2006 so that absences from these years could be compared. Six of the seven childcare centers provided these records to us. The six centers alone had a total estimated average enrollment of 344 children, although it is difficult to really get a solid number because enrollment fluctuated over time. One of the larger child care centers was the center for which we failed to obtain absentee/attendance data for, although numerous attempts were made to collect that data. For each month the percentage attendance is the total number of "enrolled" days minus the holidays as the denominator. The numerator consisted of the denominator minus the days absent.

Findings for Each Center

Childcare Center A

For child care center A, the overall monthly percentage attendance improved in 2006 as compared with the same month attendance in 2005. Improvements during the months of September and November were the greatest, with a nine percent improvement in attendance for both of these months. For the month of November, an attendance of 82 percent in November of 2005 improved to 91 percent in November of 2006. In October of 2006 there was an increased attendance of 5 percent as compared with attendance from October of 2005 and attendance for December of 2006 was up 8 percent from the previous December (2005). Numbers of children registered during this time period averaged 50 children, however the registrations ranged from 47 to 58.

Childcare Center B

The overall monthly percentage attendance improved only for the month of October when comparing absentee data from 2005 to that of 2006 for this child care center and the improvement was only 1 percent. Attendance for September of 2006 was down 3 percent from September of 2005 and a 2 percent decrease in attendance was noted for the months of November and December 2006 as compared with those same months in 2005. The number of children registered during this time period averaged 50 children, however many of these registrations were for school-aged children. The registrations for toddlers and preschoolers in 2005 and 2006 ranged from 14 to 22 children.

Childcare Center C

The overall monthly percentage attendance improved each month in 2006 as compared with the same month attendance from 2005. Improvement during the month of October was the greatest, with a twenty-six percent improvement in attendance for October 2006 from attendance during October 2005. For the months of September, November, and December, attendance improved between 2 and 4 percentage points when comparing 2005 data with that of 2006. Numbers of children registered during this time period averaged 30-40 children, however about half of those were school-aged children who are at the child care center only before and/or after school. Because of the very small numbers of children attending this child care center, our attendance data was more easily skewed by any child who may not have been attending child care on a regular basis.

Childcare Center D

The overall monthly percentage attendance improved in 2006 as compared with 2005 attendance. Improvements during the months of September and November were the greatest, with a four percent improvement in attendance for September and a five percent improvement in attendance for November.

For the month of November, an attendance of 87 percent in November of 2005 improved to 92 percent in November of 2006. All months experienced better attendance in 2006 compared to 2005 with a 1 percent increase attendance in October and December. This was one of the larger child care centers in our study and with numbers of children registered during this time period averaging 137 children, with registrations ranging from 133 to 141, the attendance would be less likely to be swayed by one or two children that may not be regularly attending child care. The improvements in attendance for this child care center are more likely to indicate "real" changes.

Childcare Center E

The overall monthly percentage attendance remained relatively stable from 2005 until 2006. A 1 percent decrease in attendance was noted in September and October 2006 as compared with those same months in 2005. Attendance at this child care center was better and experienced less overall change than in any of the other child care centers that participated in this project. The one percent difference may have been the result of a child who was enrolled in 2006 but not in 2005 and who was absent many days in any given week.

Childcare Center F

The overall monthly percentage attendance remained relatively stable from 2005 as compared with 2006. A 1% increase in attendance was noted in September 2006 as compared with attendance data from the same month in 2005. Attendance in November and December of 2006 was improved 4% over attendance for those same months in 2005. The percent attendance in October 2006 was down 4% from the previous October. Attendance in November and December of 2006 was small enough (20 infants/children) that even small differences in percentages could be due to one or more children who were not brought to child care on a regular basis.

Conclusions

Missed days are very difficult to judge in the child care centers. One child who may be taken care of, in part, by grandparents or other relatives may throw off the general absentee/attendance data. We should have looked only at those children whose parents went on to fill out the remainder of the survey as indicated by their child/children either being diagnosed with asthma or having wheezing and/or allergy problems.

If we had looked at this "targeted" data, we may have been more successful at noting trends or changes. This was prohibited by our IRB and the restrictions placed on us by keeping anonymity of each and every child in this study.

MDH continues to review the data and we are breaking out the attendance data, a tedious process at best, to make sure that we are not missing any correlations of attendance with outdoor air pollution triggers of asthma.

Appendix H. Air Quality Index

The Air Quality Index (AQI) was developed by the U.S. Environmental Protection Agency (EPA) to provide a simple, uniform way to report daily air quality conditions. In Minnesota, the Minnesota Pollution Control Agency (MPCA) maintains a series of monitoring stations both in the St. Paul/Minneapolis area as well as in other non-Metro areas of the State. The MPCA also maintains an Air Quality Index and provides this information on their website at: http://aqi.pca.state.mn.us/hourly/

The MPCA describes their AQI as:

> The Air Quality Index (AQI) reports daily air quality conditions. In Minnesota, four pollutants are used to calculate the AQI: ground-level ozone, sulfur dioxide, carbon monoxide and fine particles (PM2.5). Not all pollutants are monitored at each location. The pollutant with the highest value determines the AQI for that hour.
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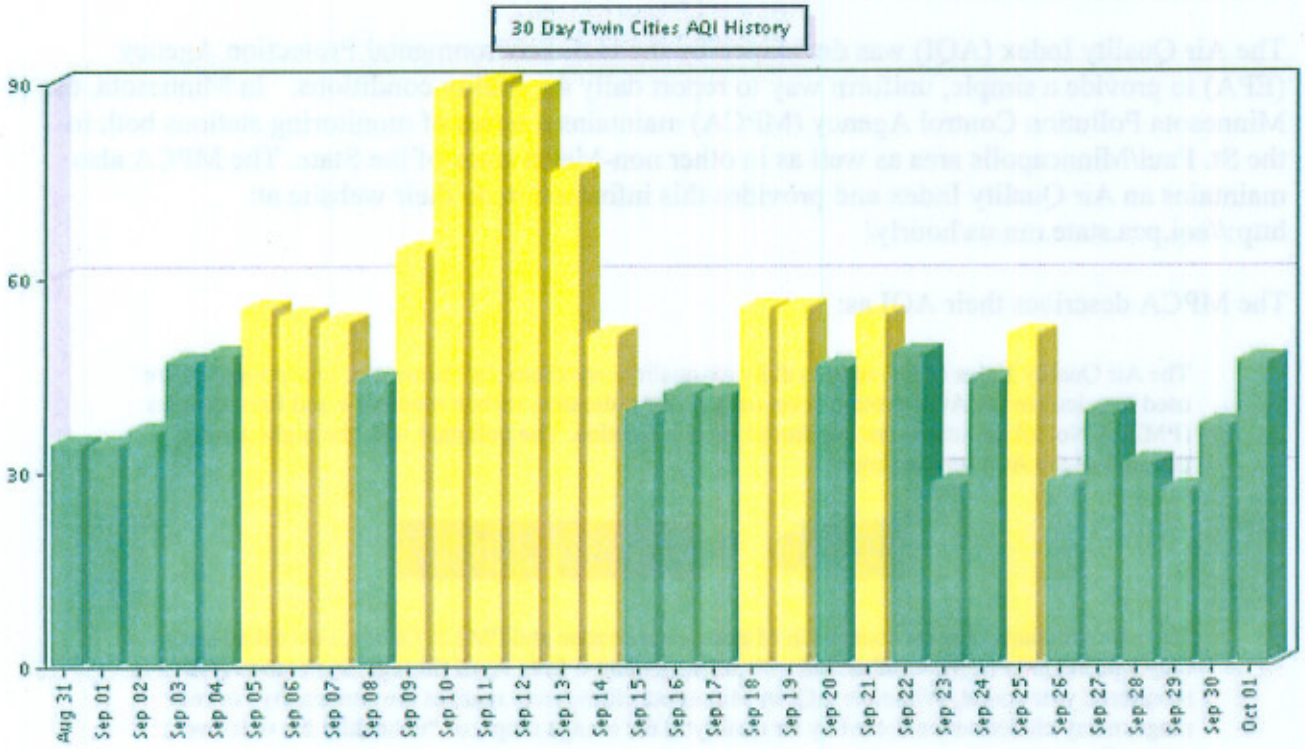
>
> The two pollutants of most concern in Minnesota are ozone and PM2.5. Ozone, also called smog, is only a problem in warm weather and so is only monitored from April through September. PM2.5 is monitored year-round. While the AQI in Minnesota cities rarely reaches the "unhealthy" or red range, many citizens are affected by air quality in the orange range, or "unhealthy for sensitive groups."

The AQI in Minnesota is determined by measuring four pollutants: ozone, sulfur dioxide (SO2), fine particulate matter ($PM_{2.5}$), and carbon monoxide. Not all pollutants are measured at each location. The Minnesota Pollution Control Agency (MPCA) takes hourly measurements of these pollutants at air quality sites located throughout the state. Ozone levels, which are only elevated in warm weather, are measured from April through September in Minnesota.

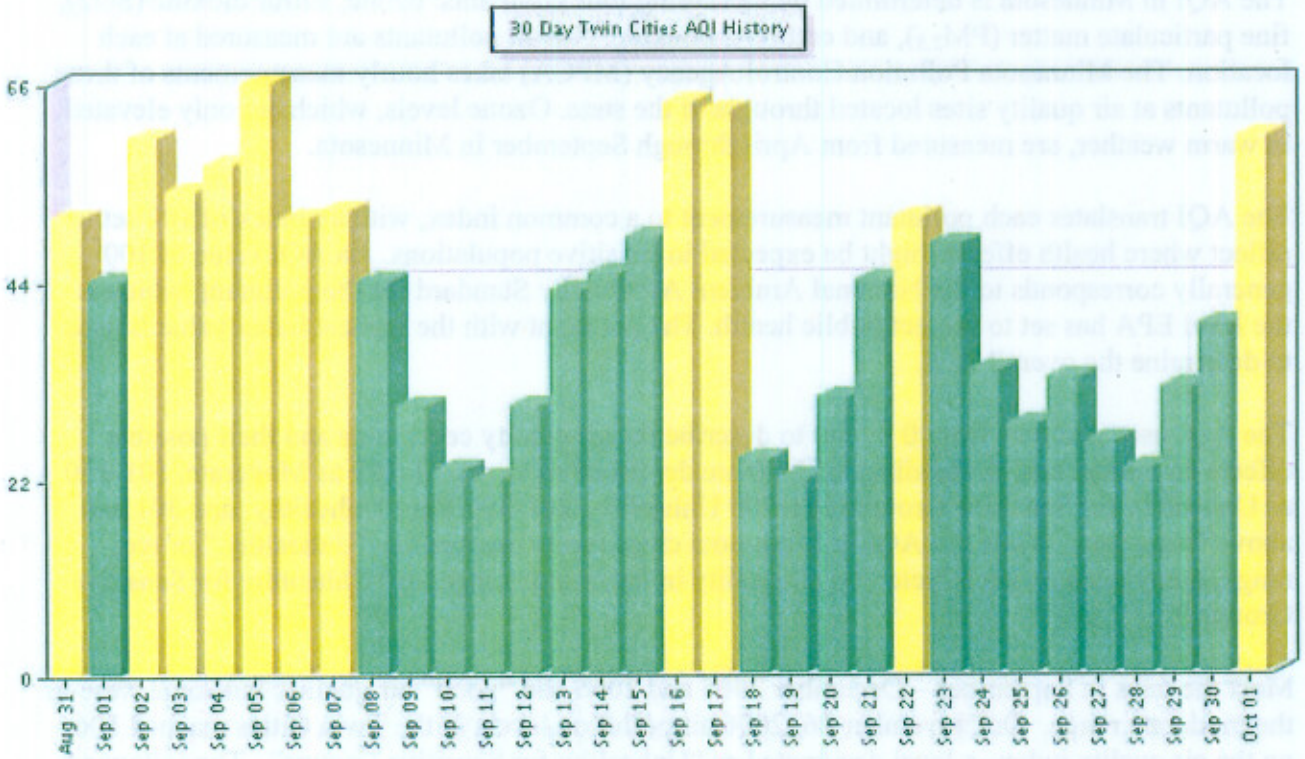
The AQI translates each pollutant measurement to a common index, with an index of 100 set to reflect where health effects might be expected in sensitive populations. An AQI value of 100 generally corresponds to the National Ambient Air Quality Standard for the pollutant, which is the level EPA has set to protect public health. The pollutant with the highest index value is used to determine the overall AQI.

The AQI uses numbers from 0 to 500 to describe the air quality conditions and their possible effects on human health. Readings of 0-50 are described as Good, 51-100 as Moderate, 101-150 as Unhealthy for Sensitive Groups, 151-200 Unhealthy, 201-300 Very Unhealthy, and 301 and above Hazardous. While the AQI in Minnesota cities rarely reaches the "Unhealthy," or red, range, many citizens are affected by air quality in the orange range, or "Unhealthy for Sensitive Groups."

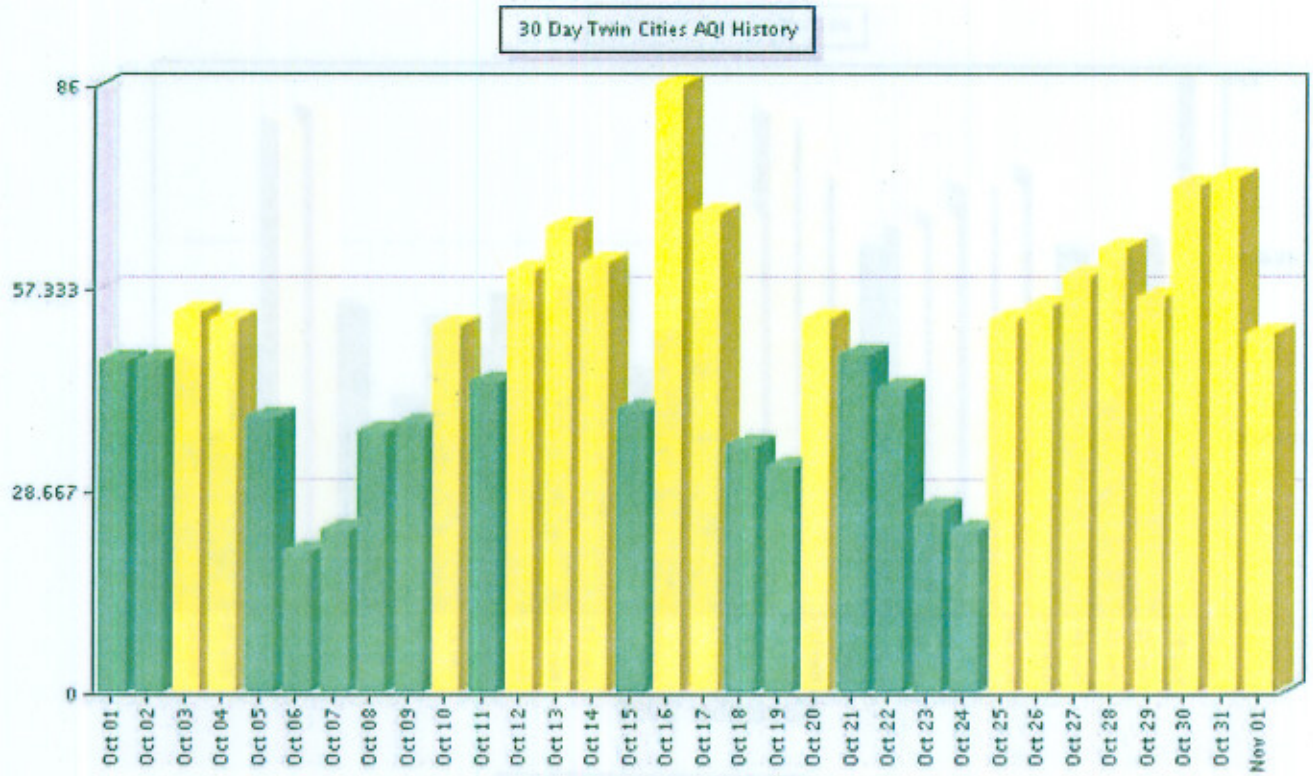
Most the days in September – December 2005 and 2006 had "good" air quality, but some were in the moderate range. On November 26, 2006 air pollution levels in the Twin Cities reached 106 on the air quality index--a level designated as "Unhealthy for Sensitive Groups". The following graphs show all the air quality data for periods.



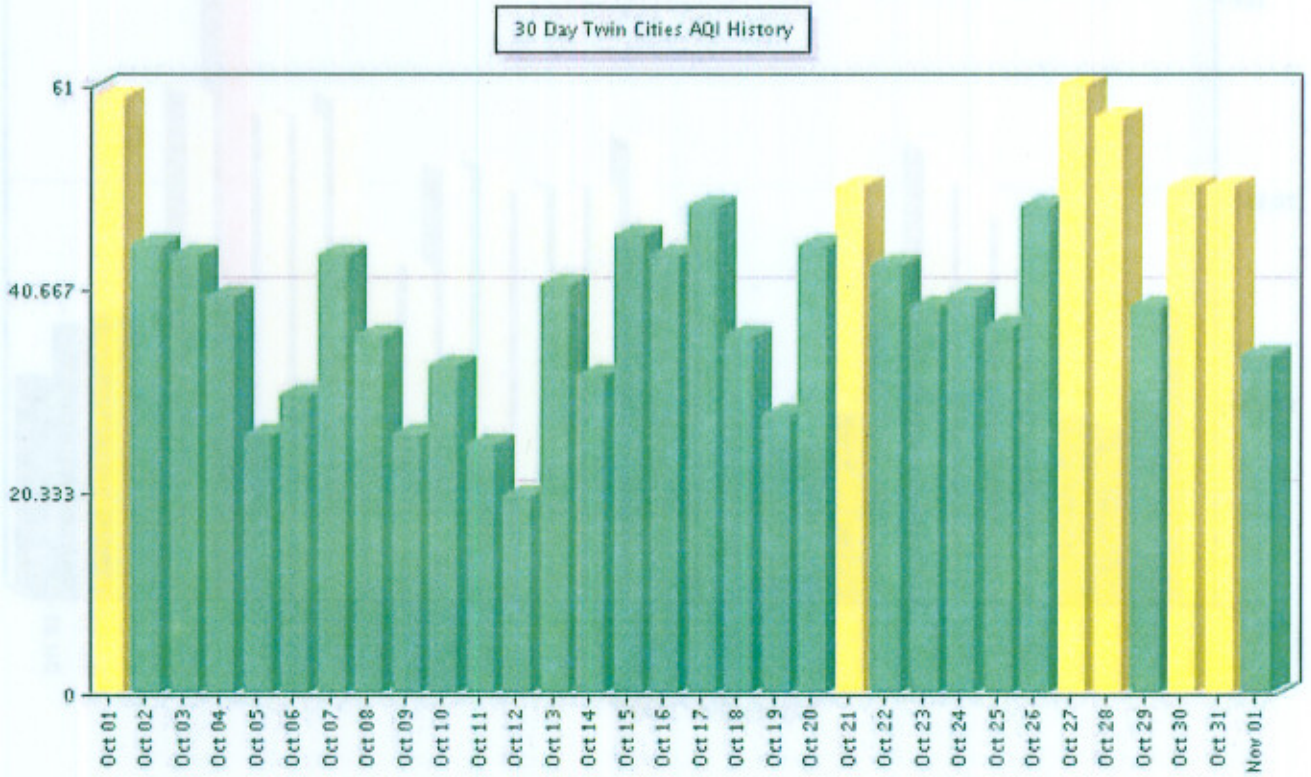
September 2005



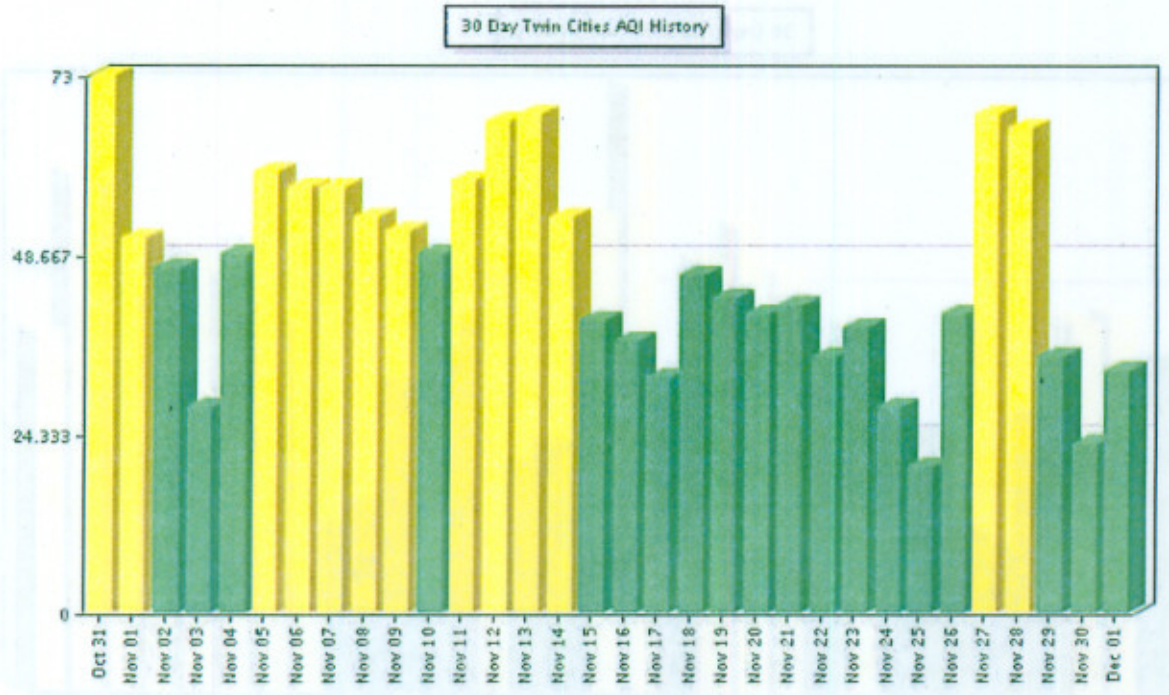
September 2006



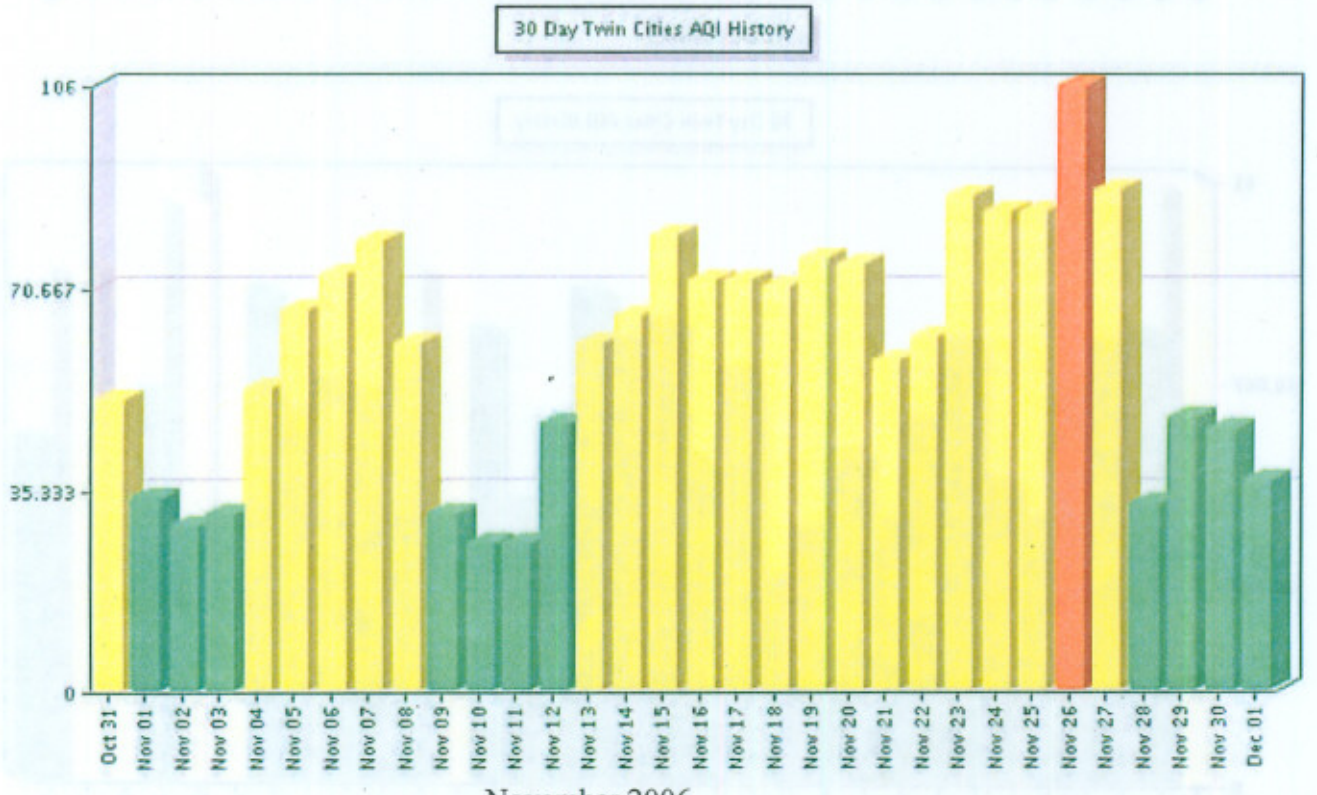
October 2005



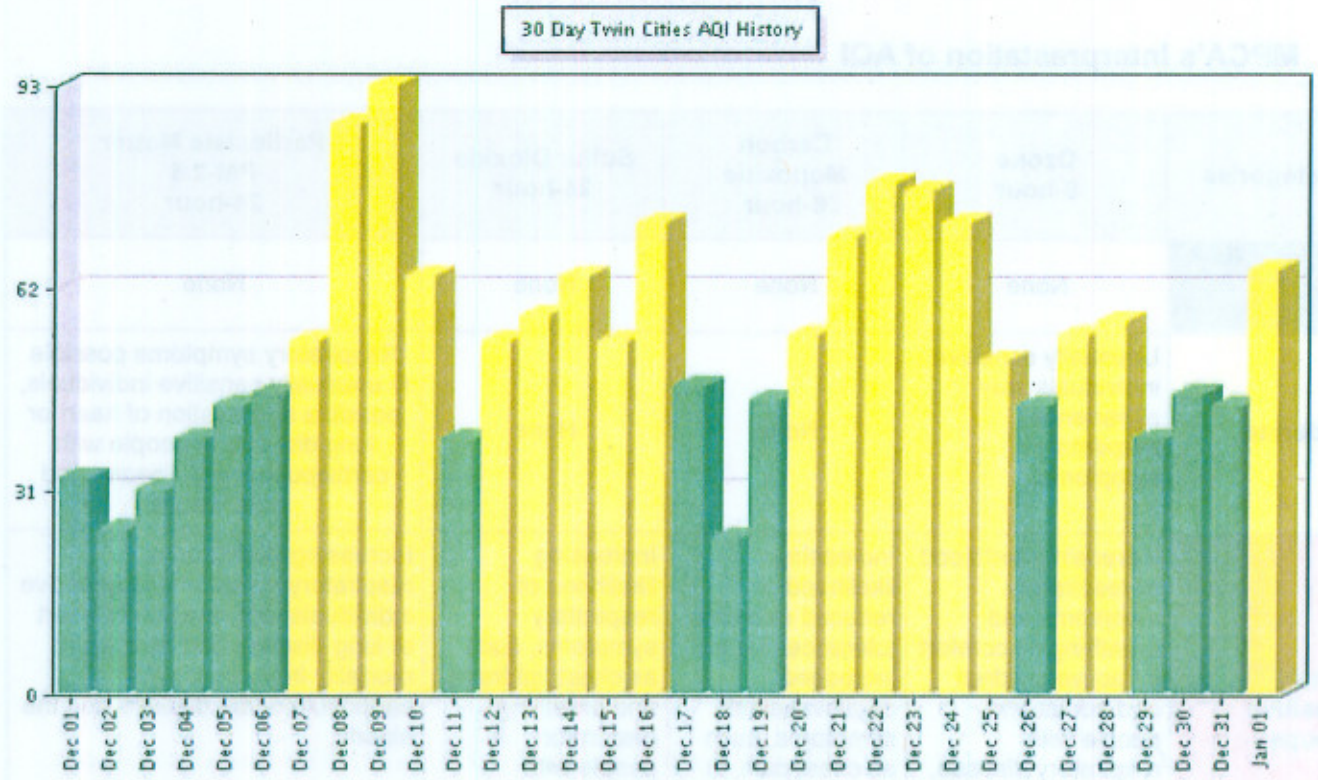
October 2006



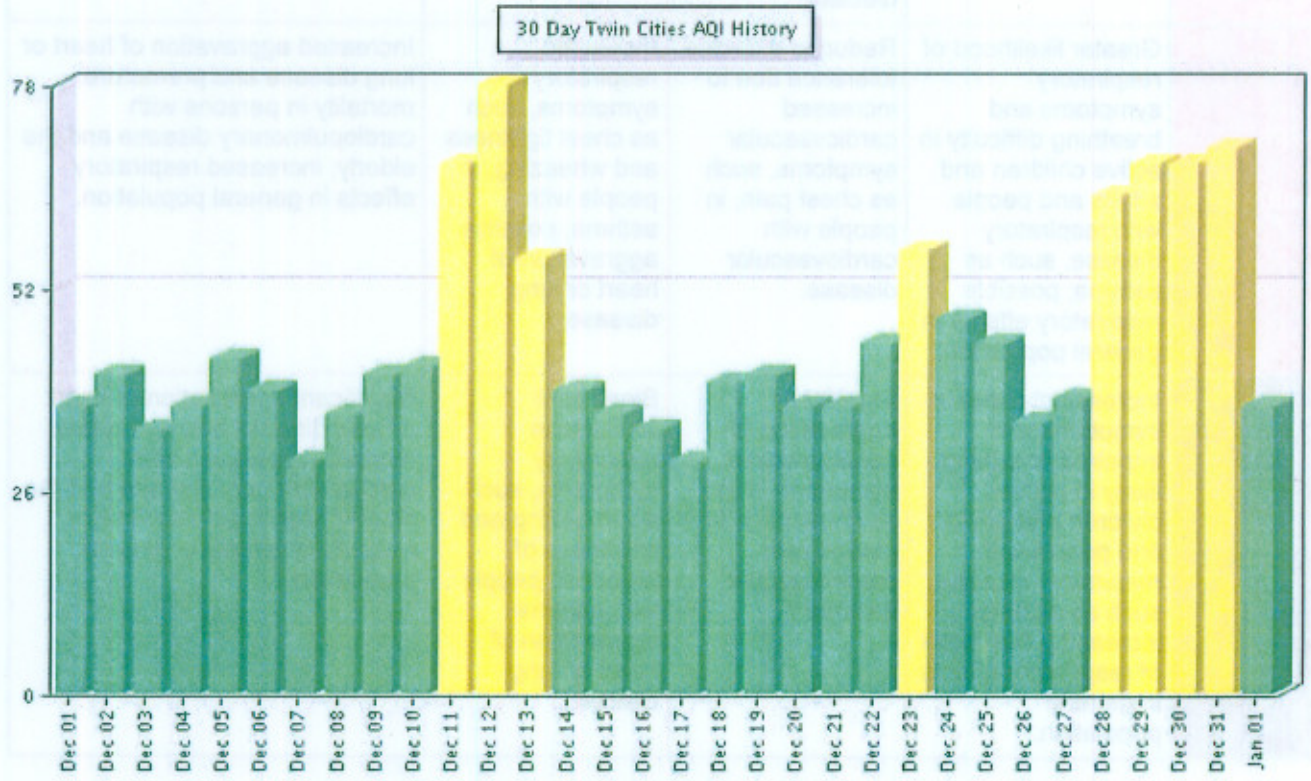
November 2005



November 2006



December 2005



December 2006

MPCA's Interprestation of AQI

Categories	Ozone 8-hour	Carbon Monoxide 8-hour	Sulfur Dioxide 24-hour	Particulate Matter PM-2.5 24-hour
Good	None	None	None	None
Moderate	Unusually sensitive individuals may experience respiratory symptoms.	None	None	Respiratory symptoms possible in unusually sensitive individuals, possible aggravation of heart or lung disease in people with cardiopulmonary disease and older adults.
Unhealthy for Sensitive Groups	Increasing likelihood of respiratory symptoms and breathing discomfort in active children and adults and people with respiratory disease, such as asthma.	Increasing likelihood of reduced exercise tolerance due to increased cardiovascular symptoms, such as chest pain, in people with cardiovascular disease.	Increasing likelihood of respiratory symptoms, such as chest tightness and breathing discomfort, in people with asthma.	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.
Unhealthy	Greater likelihood of respiratory symptoms and breathing difficulty in active children and adults and people with respiratory disease, such as asthma; possible respiratory effects in general population.	Reduced exercise tolerance due to increased cardiovascular symptoms, such as chest pain, in people with cardiovascular disease.	Increased respiratory symptoms, such as chest tightness and wheezing, in people with asthma; possible aggravation of heart or lung disease.	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.
Very Unhealthy	Increasingly severe symptoms and impaired breathing likely in active children and adults and people with respiratory disease, such as asthma; increasing likelihood of respiratory effects in general population.	Significant aggravation of cardiovascular symptoms, such as chest pain, in people with cardiovascular disease.	Significant increase in respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; aggravation of heart or lung disease.	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population.