

HEALTHY LEARNERS ASTHMA INITIATIVE
YEAR TWO: Pilot Test of the Healthy Learners Asthma Initiative

Outcome Evaluation Approaches & Questions to be Answered

A. School Attendance Study

1. *Is there evidence that the Healthy Learners Asthma Initiative has a significant effect on the school attendance of students with asthma?*
2. *What factors contribute to school absences for students with asthma?*

B. Healthcare Utilization Study

1. *What is the pattern of asthma-related hospitalizations and emergency department visits over two years for a cohort of Minneapolis school children identified with asthma?*
2. *Is exposure to the Asthma Initiative associated with changes in asthma-related hospital admissions and emergency department visits?*

C. Student Achievement Investigation

1. *Is student achievement in the 2000/2001 school year correlated with exposure to the Asthma Initiative (being in an Intervention School, and/or using asthma-related services of the school health office)?*
2. *What are other factors related to student achievement measures among students with asthma?*

D. Teacher/Staff Asthma Training Evaluation

1. *Can a 20-40 minute asthma training session positively impact the asthma knowledge of teachers and school staff?*
2. *Is asthma knowledge sustained over time?*

Final Conclusions from the Pilot Test of the Healthy Learner Asthma Initiative

YEAR TWO: Pilot Test of the Healthy Learners Asthma Initiative

Outcome Evaluation

A. School Attendance Study

Evaluation Question:

1. *Is there evidence that the Healthy Learners Asthma Initiative has a significant effect on the school attendance of students with asthma?*
2. *What factors contribute to school absences for students with asthma?*

Answers:

The results of the study indicate that a significant effect of the Asthma Initiative on attendance was experienced by the subgroup of students with asthma who used the health office for asthma-related care in Intervention Schools (assessment, peak flow measurement, medication administration, care coordination, etc, as needed). There is not a generalized effect of the Asthma Initiative across all students identified with asthma in the school. This finding is consistent with the final design of the Healthy Learners Asthma Initiative which was primarily delivered through the school health office and focused on students with poorly controlled, moderate to severe persistent asthma who were known to the health office.

Student factors related to poorer attendance for students with asthma in the 16 pilot schools were: attending more than one school in a year, poverty, and being Native American. Overall, having asthma was not a significant factor for poorer attendance.

Methods:

School enrollment and attendance files for the school year preceding the formal implementation of the Asthma Initiative (1999/2000) and the Asthma Initiative Pilot year (2000/2001) school years were made available by MPS Strategic Information Services. Data were available for all students enrolled in any of the 16 schools during the two year period. An attendance rate, “percent days attending” (days in attendance divided by days enrolled), was calculated for every student for each year. Each student was assigned to either the Intervention or Control group based on where the student was enrolled for the greatest number of days. (Approximately 10% of students attended multiple schools each year.) The attendance data were merged with demographic information for analysis. Data were available for approximately 1500 students with asthma and 11,000 students without asthma.

Because many factors are known to impact both asthma status and school attendance, and because Intervention (n=8) and Control (n=8) Schools were known to differ by race/ethnicity, income, and English Language Learner in spite of randomization; complex, multi-variate analyses were used. Multi-variate analysis is a statistical technique that can adjust for these difference to make the Intervention and Control Schools more comparable. The following school-level and student-level factors were included in the analysis.

School-level factors: average daily attendance of school in 2000/2001, percent students of color, percent qualifying for free or reduced school lunch, and stability (a measure of student turnover).

Student-level factors: age, sex, race/ethnicity, English language learner, and poverty (free or reduced school lunch eligibility).

Attendance outcomes were compared between: 1) all students in Intervention and Control Schools (asthmatics and non asthmatics), 2) students with and without asthma, 3) students with asthma that did and did not use the health office for any asthma-related care, and 4) students with asthma that did and did not receive asthma medications in the health office. Given the focus of the intervention, comparisons 3 and 4

is where we would expect to see differences resulting from the intervention. Factors predicting school attendance were also investigated.

Key Findings:

School Attendance during the Two Year Study Period

Table 1 presents the unadjusted school attendance (percent days attending) for students with and students without asthma in Control and Intervention Schools for the two school years.

- Average school attendance for the all students in the 16 schools over two years was 92.1% (plus or minus a standard deviation of 8.4%). (Note that the attendance goal set by the district is 95% of days.)
- Students in Control Schools had higher attendance than did students in Intervention Schools in both years. This was true for students with asthma as well as those without asthma. This finding is partially explained by differences in poverty and race/ethnicity between schools.
- Attendance for all students without asthma increased significantly from 1999/2002 to 2000/2001 by about 0.6%. The attendance tended to decrease for all students with asthma (regardless of exposure to the asthma interventions through the school health office), but the change did not reach statistical significance. (The MPS initiative to increase school attendance to 95% could account for the increase.)

Table 1. School Attendance Rates for MPS Students in the Asthma Initiative Pilot

	1999/2000	2000/2001	Change
Control Schools	92.46	92.46	
Students with Asthma (n=608)	92.72	92.15	-.57
Non asthma	92.19	92.77	+.58*
Intervention Schools	91.82	91.85	
Students with Asthma (n=885)	92.22	91.68	-.54
Non asthma	91.42	92.02	+.60*

* Differences significant at $p \leq 0.05$.

Impact of the Asthma Intervention on School Attendance

Differences in attendance outcomes were found to be a function of several student factors (attending multiple schools, poverty, race/ethnicity and gender) and one school-level factor (average daily attendance), and to a smaller degree asthma status (having or not having asthma); but statistically significant effects of the Asthma Initiative were found only in students with asthma who used the health office.

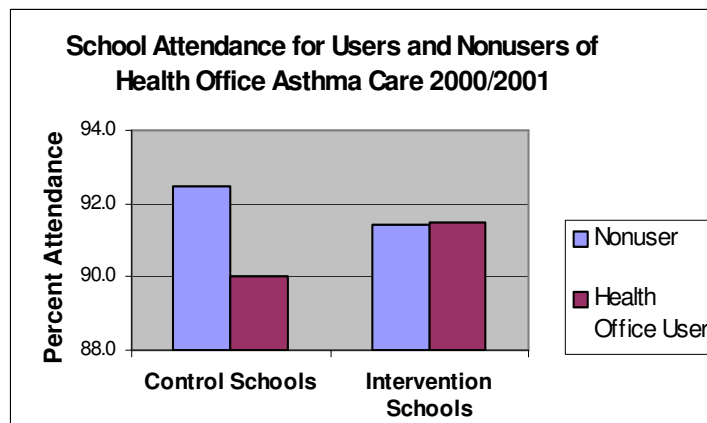
- During the pilot year (2000/2001), the attendance of all students with asthma in Intervention Schools was no better nor worse than the attendance of students with asthma in Control Schools, after adjusting for other factors. However, when the analysis considered the subgroup of students who used the health office for asthma-related care, and thus had greater exposure to the initiative interventions, a difference emerged. This point is expanded below.

Effect of Asthma Care in the School Health Office

Based on observations and data collected in health offices, approximately ¼ of students with asthma came to the health office with asthma symptoms sometime during the second semester of 2000/2001 (25.2% for Intervention Schools and 27.0% for Control Schools). In addition, other students, who did not have symptoms, came to receive routine or pre-exercise asthma medications (5.7% additional students in Intervention Schools and 7.6% additional students in Control Schools). In total, over 30% of students with asthma in Intervention Schools and 34% of those in Control Schools had one or more asthma-related visits to the school health office during the five month period of observation.

- Generally, students who used the health office for asthma-related care had lower attendance than students with asthma who did not receive care in the health office. This is consistent with the plan to focus asthma intervention on students with poorly controlled moderate to severe asthma. Students using the health office had the greatest opportunity for exposure to asthma care and the aspects of care that differentiated *usual care* in Control School health offices from *enhanced asthma management* offered in Intervention School health offices.
- For 2000/2001, asthma students using the health office in Intervention Schools where the Asthma Initiative was being implemented maintained the same attendance level as students with asthma that did not utilize the health office. In contrast, during the same year, there was a significant difference in attendance rates between users and non-users in Control Schools; students with asthma who used the health office had lower attendance. The differences are shown in Figure 1.
- This finding suggests that the enhanced asthma services offered to students in the Intervention Schools could be closing the gap and reducing absenteeism among those students with asthma who use the health office.

Figure 1



Access to Asthma Medications at School

Since assisting students with needed asthma medications during the school day is an important part of asthma management; the impact of receiving one or more doses of any asthma medication (controller medications and medications for pre-exercise or symptom relief) in the health office was examined.

- No difference in attendance was found for students who received asthma medications in the health office compared to those who did not receive asthma medication. This was true in Control and Intervention Schools. Because of small numbers the statistical power to detect differences was low.

Factors Predicting School Attendance Rate and Achievement of the 95% Attendance Goal

Because the effect of the Asthma Initiative on attendance was limited to a subset, we were interested in knowing what other factors were associated with attendance and how they might differ between students with asthma and students without asthma. The school-level and student-level factors listed above were examined. School level factors were found to explain only 5.2% of the variance in attendance, while student level factors explained 71.3% of the variance.

Student factors related to poorer attendance for students *without* asthma were:

- Attending more than one school in a year
- Poverty—free or reduced school lunch eligibility
- Race/ethnicity—Native American, Hispanic, and African American
- Sex—male

For students *with* asthma:
 same
 same
 only Native American
 not a significant factor

Student factors related to better attendance for students *without* asthma were:

- English language learner
- Race/ethnicity—Asian American and Caucasian

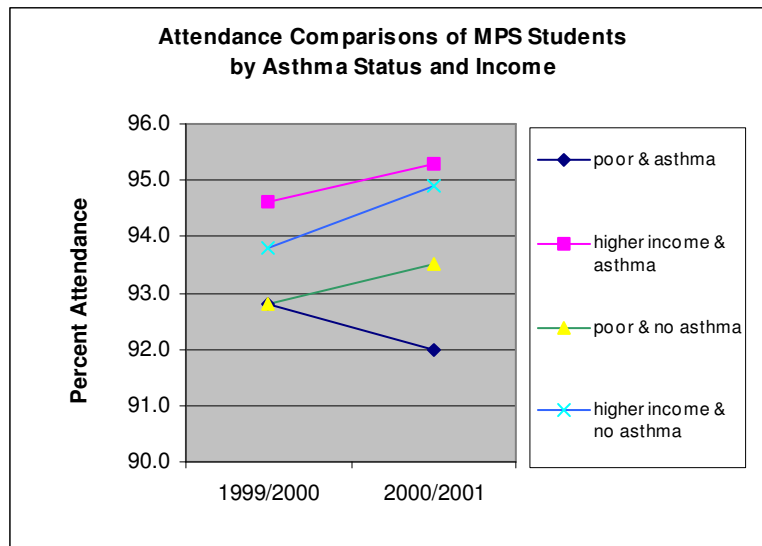
For students *with* asthma:
 not a significant factor
 only Caucasian

Interaction of Demographic Factors and Asthma Status

The demographic factors that were related to attendance are some of the same factors reported to be associated with asthma prevalence in urban communities. The interplay of poverty, race/ethnicity and other factors associated with asthma underscores the limitations of using school attendance as a measure of the effectiveness of the Healthy Learners Asthma Initiative. However, examination of these factors can help target and tailor interventions.

The interaction of poverty with asthma status and the impact on attendance is illustrated below in Figure 2. The other student-level factors (e.g., race/ethnicity) act in similar ways to moderate the attendance outcome for student with and without asthma. The highest attendance was achieved by students with asthma in the higher income category. The next best attendance was for students without asthma with higher income. Students from poorer families had lower attendance. Attendance showed an upward trend from 1999/2000 to 2000/2001 for these three groups. In contrast, attendance decreased for students who were poor and who had asthma. this suggests that different asthma interventions may be needed for students and families and poverty.

Figure 2



B. Healthcare Utilization Study

Evaluation Questions:

1. What is the pattern of asthma-related hospitalizations and emergency department visits over two years for a cohort of Minneapolis school children identified with asthma?
2. Is exposure to the Asthma Initiative (being in an Intervention school, and/or using asthma-related services of the school health office) associated with changes in asthma-related hospital admissions and emergency department visits?

Answers:

Over a two-year study period, 24% of the 323 students in the sample had one or more hospital-based events with an asthma diagnosis. These represented 23 hospitalizations and 102 emergency department visits. Students who had an event in the first year were no more or less likely than others to have an asthma event in the second year. The greatest predictor of having a hospital-based asthma event was low income (using free or reduced price school lunch eligibility as a marker for low income).

More students attending Intervention Schools had hospital-based events (28% vs. 17% of Control School students) over the two years. The higher rate of low income students attending Intervention Schools and their higher rate of asthma management problems (determined from the Parent/Guardian Asthma Survey) contributes to this difference. In the second year, Control School students had fewer hospitalizations than Intervention School students. Students who had one or more hospital-based event in year two were more likely to be followed up by the school health office if they attended an Intervention School.

Method:

Sample. Students and parents from the 16 schools receiving the Parent/Guardian Asthma Survey (n=1443 on mailing list) in January 2001 were informed of the healthcare utilization study and invited to participate. Students were eligible for the healthcare utilization study if they and their parents gave consent and submitted signed Authorization for Release of Information forms for healthcare data (n=327). Four records were excluded from analysis due to missing data resulting in 190 Intervention School students and 133 Control School students in the Healthcare Utilization Study.

Hospitals. Hospitals serving relatively large numbers of MPS students with asthma were invited to collaborate with Minneapolis Public Schools, Health Related Services Department. Four hospitals (Children's Hospitals and Clinics—Minneapolis, Fairview University Medical Center, Hennepin County Medical Center and North Memorial Health Care) agreed, following review by relevant committees, to abstract data on hospitalizations and emergency department (ED) visits of students with asthma over a two-year period from September 1999 through August 2001.

Procedure. The list of students and copies of the release of information forms were provided to the hospitals. The hospitals searched computerized admission/discharge files to determine if each individual student had inpatient hospital admissions or emergency department visits with asthma as the principle diagnosis or first-listed secondary diagnosis. Eligible codes were 481.9 Chronic Bronchitis, nos; 493.xxx Asthma; and 786.09 Respiratory Abnormal nec (wheezing). The occurrence of an event, date and diagnosis codes were submitted for analysis.

Healthcare utilization data were merged with student demographic information and selected items from the Parent/Guardian Asthma Survey for analysis. Because of small numbers of events, hospitalizations and ED visits were examined together as “hospital-based events” for many analyses. Events were examined for the total cohort of students, by Control and Intervention Schools, and by year (September 1999 through August 2000 as year 1, and September 2000 through August 2001 as year 2).

Sample Characteristics. Students with consent to be included in the Healthcare Utilization Study are significantly different in some ways from those who declined to participate. The participating students include a higher proportion of American Indian, Hispanic and white students, more have English as the language spoken at home, and their asthma is in better control compared to non-participants.

Among participants, there are also significant differences between students from Intervention and Control Schools. The Intervention group included more African American and American Indian students and fewer Asian, Hispanic American, and white students; more students from homes where English as not the spoken language; and a higher proportion eligible for free or reduced price school lunch. They also had worse asthma control and were more likely to report having had an asthma checkup in the past six months. Thus, while study participants have somewhat lower risk than non-participants; the participating students from the Intervention School have higher risk than students form Control Schools. These differences must be kept in mind when considering the following findings.

Key Findings:

Hospital and Emergency Department Visits Over Two Years

Table 1 shows the number and percent of students with a hospital-based event and the number of events by primary and first-listed secondary diagnosis.

Table 1. Hospital-Based Events by Year for a Subset of MPS Students (N=323) with Asthma

Study Period	Event Type	Number Students with any occurrence (%)	Number of Events		
			Total	Asthma as Primary Dx	Asthma as 2 nd Dx
1999/2000	All Events	42 (13%)	61	42	19
	ED	34 (10%)	48	34	14
	Hospital	12 (4%)	13	8	5
2000/2001	All Events	46 (14%)	64	46	18
	ED	38 (12%)	54	38	16
	Hospital	9 (3%)	10	8	2
2 Year Period Total	All Events	77 (24%)	125	88	37
	ED	65 (20%)	102	72	30
	Hospital	19 (6%)	23	16	7

- Of 323 students, 77 (24%) had a total of 125 hospital-based events with asthma as the principle or secondary diagnosis (102 emergency department and 23 hospital visits) over the two years. Of these events, 70% (88) were for a primary diagnosis of asthma.
- 4% and 3% of students were hospitalized and 10% and 12% of students had one or more ED visits in 1999/2000 and 2000/2001, respectively.
- There were few repeaters from year 1 to year 2. Four (3.0%) of Control students and 7 (5.3%) of Intervention students had events in both years. Only one student had events at two hospitals.

Intervention and Control School Differences

The rates of hospital-based events for Control and Intervention School students each year are shown on the following table.

**Table 2. Hospital-Based Events by Principle and Secondary Asthma Diagnosis
(Number events per 100 Students)**

		<i>Intervention Group (n=190)</i>		<i>Control Group (n=133)</i>		<i>Combined (n=323)</i>	
		Primary Dx	2 nd Dx	Primary Dx	2 nd Dx	Primary Dx	2 nd Dx
<i>Sept 1999- August 2000</i>	<i>All events</i>	14.2	7.9	11.3	3.0	13.0	5.9
	<i>ED visit</i>	11.6	6.8	9.0	0.8	10.5	4.3
	<i>Hospital admit</i>	2.6	1.1	2.3	2.3	2.5	1.5
<i>Sept 2000- August 2001</i>	<i>All events</i>	17.4	6.8	9.8	3.8	14.2	5.6
	<i>ED visit</i>	13.2	6.3	9.8	3.0	11.8	5.0
	<i>Hospital admit</i>	4.2	0.5	0.0	0.8	2.5	0.6

Data in Table 2 indicate that for each 100 students identified with asthma, we could expect 10-12 visits to a ED with the primary diagnosis of asthma, plus 4-5 more ED visits with asthma as the first-listed secondary diagnosis, annually.

Based on these data, we could also expect each 100 students with asthma to produce 2.5 hospitalizations with asthma as the primary diagnosis, plus 1 additional admission with asthma as the first-listed secondary diagnosis.

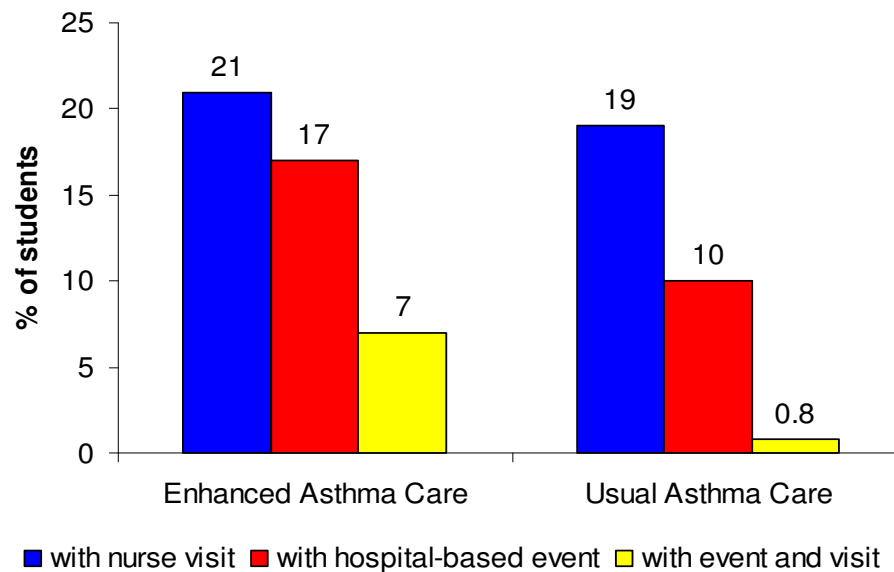
- 28% (54) of Intervention students and 17% (23) Control School students had one or more hospital-based events over the two-year period. The difference approached significance in year 2 when the Control group had no hospitalizations with a primary diagnosis of asthma.

Services from the School Health Office

Since the asthma intervention was delivered through the school health office, we examined the possibility of an association between using the health office for acute episodic care (nurse visit) and having a hospital-based event during year 2.

As illustrated in the following figure, more Intervention than Control School students had both a hospital-based event during year 2 and a school health office visit during the second semester of the 2000/2001 school year (7% and 0.8%, respectively).

Figure 2: School Health Office (Nurse) Visits and Hospital-based Events by Treatment Group



- This illustrates Intervention School health office staffs’ success in identifying and following up with students having severe asthma problems that require hospital-based care.

Predictors of Hospital-Based Events

Merging demographic, Parent/Guardian Asthma Survey, school health office use, and healthcare utilization data files allowed exploration of factors associated with the occurrence of a hospital-based events using the multivariate analysis technique of logistic regression. This analysis is especially helpful when study participants in the Intervention and Control groups are known to have significant differences in important characteristics at baseline. The degree of association of each variable with the dependant variable (hospital-based events) can be separated out statistically.

- Only two of the examined factors (from the variables listed in Table 3) were associated with having a hospital-based event in 2000/2001.
 - Students eligible for free/reduced school lunch were 8.7 times more likely to experience a hospital-based event than student who were not eligible.
 - Students whose parents reported a written treatment plan from the healthcare provider for medication use on non-attack days were 2.2 times more likely to have a hospital-based event than student without such a plan.
- After adjusting for the effect of other factors, the likelihood of having an event was not associated with being in an Intervention or Control School and it was not related to visiting the health office for episodic asthma care or to receive asthma medications during the period of January to June 2001.

Table 3. Variables Tested for Association with a Hospital-Based Event in Year 2 Using Stepwise Logistic Regression

Demographics	
• age	years at beginning of year 2
• gender	male, female
• race/ethnicity	Caucasian, African American, Other
• non English spoken at home	yes, no
• poverty/income	free/reduced lunch eligibility, not eligible
School Intervention	
• group	Intervention, Control School
Health Office Use February to June 2001	
• health office visit for asthma distress “nurse visit”	yes, no
• received any asthma medication for HO	yes, no
• received controller medication from health office	yes, no
Asthma Survey Responses	
• insurance coverage	yes, no
• written plan from Dr if asthma attack	yes, no
• written plan from Dr on meds for non-attack days	yes, no
• regular clinic or doctor for asthma	yes, no
• routine asthma check in last six months when well	yes, no
• calculated “current level of asthma control”	score (0-5), lower score is better control
Previous hospital-based event	
• Hospital-based event in year 1	yes, no

Discussion:

The reported healthcare utilization findings are informative but cannot be used to draw conclusions about the effectiveness of the Healthy Learners Asthma Initiative. Healthcare utilization outcomes were measured over a period of time that was concurrent with the implementation of the Asthma Initiative pilot. A longer evaluation period is needed before the true impact of the Asthma Initiative on hospital admissions and ED visits can be assessed. The study was also limited by consent and confidentiality requirements that resulted in a restricted sample, and by institutional constraints regarding access to diagnostic codes.

The design of the study and the sources of data combined for the analysis preclude establishing a time-ordered sequence for key events. For example, the significant association between parent’s report of having a written treatment plan for asthma medication and hospital-based events could reflect that the hospitalization or ED visit is a point when a parent is given a written treatment plan for managing the child’s asthma. The greater number of students with hospital-based events who are known to the health office is congruent with the process evaluation data indicating greater case finding efforts in Intervention Schools.

The finding of a strong relationship between income and hospital-based events for asthma after adjusting for treatment group and other factors is consistent with the school attendance findings. This is also in line with numerous research studies examining the association of economic status and asthma management.

C. Student Achievement Investigation

Evaluation Questions:

1. *Is student achievement in the 2000/2001 school year correlated with exposure to the Asthma Initiative (being in an Intervention School, and/or using asthma-related services of the school health office)?*
2. *What factors are related to the student achievement measures among students with asthma?*

Answers:

We were not able to detect a relationship between the Asthma Initiative and school achievement in math or reading measured on the Northwest Achievement Levels Test.

Students who were low income, African American, American Indian, Hispanic, or were English language learners had significantly lower math and reading achievement scores. Girls had significantly higher reading scores and students attending multiple school had significantly lower reading scores.

Methods:

Some school-based asthma studies have found effects for asthma interventions on school achievement even in the absence of detectable changes in attendance. With this in mind, we explored the types of standardized tests given to elementary and middle school students in successive years. The test that met these criteria was the Northwest Achievement Levels Test (NALT). MPS students in grades 2 through 7 and 9 take the NALT in late winter of each year. This nationally normed test is also a predictor of passing the Minnesota Basic Standards Test (MBST).

Three years of NALT test data were abstracted by MPS Research, Evaluation and Assessment department for students identified with asthma in the 16 study schools. Data included the NALT scale score, normal curve equivalent score (NCE), and growth scores in math and reading. Of 1561 students originally identified with asthma in fall 2000, 1233 remained enrolled in fall 2001. Test scores were available for 963, 1065, and 851 of these students, respectively for 1999, 2000 and 2001.

The scores most appropriate for examination over time were the NCE scores and the analysis was limited to this indicator.

The NCE scores for math and reading were examined over three school years (1998/1999, 1999/2000 and 2000/2001) to explore trends associated with the introduction of the Asthma Initiative. Factors investigated in the analysis included Intervention or Control School, time, health office visit for asthma symptoms, and receiving any asthma medication or asthma controller medication in the health office. Other factors known to be related to asthma and associated with school performance, including race/ethnicity, income (free/reduced lunch eligibility), English language learner, and attending multiple schools were included in the analysis.

Key Findings:

Change in Achievement Scores Over Time

Statistical analysis shows significant changes in reading and math score over time. However, the NCE measure was renormed in 2000, so 1999 scores may not be directly comparable to those for 2000 and 2001.

- Reading scores, but not math scores, are significantly different between Control and Intervention Schools. Scores are shown in Table 1.

Table 1. Math and Reading Scores for Students with Asthma in MPS Asthma Initiative Pilot Schools (Normal Curve Equivalent Score)

	Math			Reading		
	Unadjusted Mean Scores			Unadjusted Mean Scores		
	1999	2000	2001	1999	2000	2001
Control Schools	52.1	48.6	47.8	43.7	45.8	45.8
Intervention Schools	47.4	45.4	45.6	39.8	41.9	42.2

Factors Associated with School Achievement in Math and Reading

Using data only for years 2000 and 2001, predictor variables (factors) related to achievement outcomes could be investigated. Those found to be related to school achievement in math and reading for students with asthma were as follows.

Student factors related to lower score in *reading*:

- Poverty—free or reduced school lunch eligibility
- Race/ethnicity—Native American, Hispanic, and African American
- English language learner
- Attending more than one school in a year
- Sex—male

Lower score in *math*:

- same
- same
- same
- not a significant factor
- not a significant factor

There was no effect for time (performance did not change between years), Intervention or Control Schools, or using the health office for asthma-related care during January to June 2001. Thus the difference in reading scores noted in the above paragraph is attributed to differences in demographics between Control and Intervention Schools, and cannot be attributed to the Asthma Initiative.

Correlation of School Achievement and Attendance

As expected, in this sample of students known to have asthma, achievement on NALT math and reading NCE scores was highly correlated (p=0.000) with school attendance.

Discussion:

The absence of an effect of the Asthma Intervention on school achievement is not surprising because the implementation of the intervention and the timing of the 2001 achievement test overlapped. Effects of the Healthy Learners Asthma Initiative on school achievement may be seen two to three years out if enhanced asthma management activities in the school health office continue to reach students with poorly controlled moderate to severe persistent asthma and reduce school absences among students with asthma.

D. Teacher/Staff Asthma Training Evaluation

Evaluation Question:

1. *Can a 20-40 minute asthma training session positively impact the asthma knowledge of teachers and school staff?*
2. *Is asthma knowledge maintained over time?*

Answer:

Posttests given at 6 weeks and 5-6 months after the teacher/staff asthma education session revealed significant increases in asthma knowledge and maintenance of that knowledge over time.

Methods:

A teacher and staff training session on asthma was conducted by the school nurse in 7 of the 8 Intervention schools between October 2000 and January 2001. The sessions were 20-40 minutes long and were a condensed version of a previously tested 4-hour asthma training (Brottman, 1999). A pre-test questionnaire followed by posttests at 6 weeks (post 1) and 24 weeks (post 2) were used to measure improvement in asthma knowledge and the maintenance of asthma knowledge over time.

The pre/post knowledge questionnaires were a compilation of a survey tool developed by Eisenberg et al. (1993) with additional questions added by Brottman (1999). It included three knowledge scales and demographic information. The first scale measured knowledge of proper inhaler technique as well as what to do if a child has an asthma attack (14 possible points). The second scale measured knowledge of: changes that occur in a child's airways during an asthma attack, common asthma triggers, symptoms of an asthma attack, and asthma control medications (11 possible points). The third scale, largely taken from the Eisenberg et al. (1993) survey, tested a wide range of asthma knowledge areas, including: popular myths about asthma, asthma symptoms, asthma treatment, and prevalence of asthma (25 possible points). The rest of the questionnaire gathered information about respondent demographics, prior or current experience with asthma, and, attitudes toward dealing with students that have asthma.

Two schools were excluded from the analysis because they had also participated in the previous 4-hour training program. Tests with many missing answers were also excluded. The data were analyzed two ways. First, a cross-sectional analysis was done using all respondents from 5 schools at three time periods (n=238 for pretest, n=108 for post 1, and n=56 for post 2). The second analysis used the tests of 42 teachers and staff from 4 schools that could be matched from pre to post 1 to post 2.

Key Findings:

The majority of the participants in the training sessions were teachers (72%). Approximately 40% had previous experience with asthma because of a family member (relative, child or self) with asthma; and 75% previously had students with asthma in their classrooms.

Significant knowledge gains were achieved

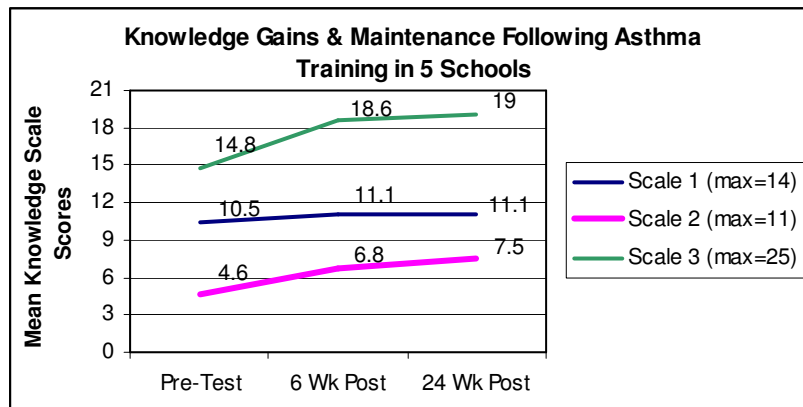
Figure 1 shows test scores for the three knowledge scales at the three time points for all respondents in 5 schools (cross-sectional analysis). A similar pattern of results was found for the matched subset.

- The level of asthma knowledge significantly increased on Scale 2 and Scale 3 following the training. Five months later, at posttest 2, knowledge scores did not change significantly from the 6 week posttest.
- The in-service training sessions appear effective in increasing asthma knowledge among participants.
- These results are important in verifying that a well-planned, condensed session, which is more feasible for scheduling, can be as effective as a much longer asthma training session.

Areas for intervention

Analysis of individual test items identified areas with greatest knowledge deficits at baseline. These included symptoms of an asthma episode (attack), misconceptions about physical activity and asthma, changes in airways caused by an asthma episode, understanding how different types of asthma medications are used, and possible side effects of asthma medications. This information could be used to focus the content of future staff asthma training sessions.

Figure 1. Asthma Knowledge Gains and Maintenance Following Teacher and Staff Asthma Training



Discussion:

There was a large drop off in completion of posttests. This raises self-selection bias as a concern when interpreting the results. Those who completed posttests could be different from non-respondents in ways that could affect their learning and retention. For example, they could be more interested or motivated to learn because of personal experience with asthma. A comparison of the demographics of those who completed post 2 with those who completed the pretest found no major differences. However, prior familial and classroom experience with asthma was correlated with knowledge scores in the pretest suggesting that these persons could have less knowledge to gain.

It could have been the case that those who attended the asthma training were more interested in asthma because of personal experience with the condition. However, they still achieved significant knowledge gain as a result of the training (much of which was basic asthma information).

Final Conclusions from the Pilot Test of the Healthy Learner Asthma Initiative

Evaluation Conclusions:

- *The findings of the Healthy Learners Asthma Initiative evaluation show that school health staff can adopt best practices for asthma management consistent with the National Institutes of Health Asthma Guidelines.*
- *Adoption was facilitated by a well-designed system with explicit policies and procedures, easy-to-use forms, available asthma equipment and supplies, systematic training and mentoring, and on-going evaluation with regular feedback.*
- *Clinic-based performance improvement focused on development of Asthma Action Plans (AAP) and a streamlined communication system that significantly increased the number of AAPs available at school.*
- *Students in schools that implemented enhanced asthma care were more likely to have a written AAP from their medical provider and asthma medication at school.*
- *Students receiving enhanced asthma care required fewer return visits to the school health office because of asthma symptoms. Care shifted from episodic visits for asthma distress to routine visits for more preventive care.*
- *Attendance data suggest that students who receive enhanced asthma care through the school health office have reduced school absences.*
- *An extended evaluation period is necessary to determine the if the Asthma Initiative has an effect on healthcare utilization.*