Table S1. Summary of Articles Subjected To Full Coding and Analysis (N=39).

Citation	Description and Setting	Sample Characteristics	Study Design	Health Outcomes	Academic Outcomes	Limitations / Comments
EXPERIMENTAL						
Bartholomew LK, Sockrider M, Abramson SL, et al. Partners in school asthma management: evaluation of a self-management program for children with asthma. *J Sch Health.* 2006; 76(6):283-290.	**Description:** Evaluation of a multilevel school-based intervention to improve asthma self-management, medical care, and the school environment. **Setting:** Urban, elementary school.	**Treatment:** **N:** 515 **SES:** Free or reduced lunch 66%. **Ethnicity:** African American 45% Hispanic 51% Caucasian 3% Other 1%. **Control** **N:** 431 **SES:** (Same as above). **Ethnicity:** (Same as above).	**Study Design:** Experimental, (RCT). **Data Collection:** Parent and student questionnaires every semester from Fall 1997 to Spring 2000, school and district records on grades and absence data. **Enhanced Intervention Subset:** Students with persistent asthma in 15 schools were selected to have the opportunity to meet with a project physician, develop an asthma action plan, obtain a 1-month supply of medication, and	**Main Group** **Clinical Symptoms and Measurements:** Symptoms declined significantly over time (t_{691} = -3.31, *P* = .0016), but there were no differences between treatment and control groups on symptom level or rate of decline. **Medical Management:** N/A. **Utilization:** Hospitalizations were increasing over time (t_{710} = 12.63, *P* < .0001), but there was no difference in the level or rate of increase of hospitalizations at posttest by group. **Enhanced Intervention:** ***Utilization:** Both groups showed an increase in the	**Main Group** **Absenteeism:** Overall rates of absenteeism declined over the 3 years, but there were no differences by group in the frequency of absences over time. Overall rates of absenteeism declined over the 3 years of the study (t_{58} = -2.40, *P* = .0195). **Grades:** There were no differences between the intervention and control students on grades for any subject. Grade changes over time were flat for reading but were decreasing for mathematics (t_{58} = -3.26), *P* = .0019), science (t_{58} = -3.20, *P* = .0023), and social studies (t_{58} = -2.98, *P* = .0042) and tending to increase for language arts (t_{58} = 1.83, *P* = .0721). **Test scores:** State test scores did not differ by group.	Low participation rates—64% of parents returned case detection surveys and only half of those with probable asthma agreed to participate. Schools in study had 60%-80% rates of student turnover. Lack of available time for school nurses to contact physicians in an effort to change provider behavior.

			have a report sent to their community provider.	likelihood of being hospitalized over time, but for the enhanced intervention group, the rate of increase was slowing more rapidly.	**Enhanced Intervention: Absenteeism:** Less absenteeism (t_{755} = -2.47, *P* = .0138). **Grades:** Higher posttest grades for science (t_{1175} = 2.31, *P* = .0213), language arts (t_{444} = 2.05, *P* = .0410), and social studies (t_{1174} = 2.50, *P* = .0127) and nearly so for reading (t_{443} = 1.68, *P* = .0936), but not for math. **Test Scores:** Higher reading scores (t_{348} = 2.04, *P* = .0423) and writing scores (t_{15} = 2.77, *P* = .0143).	
Bruzzese JM, Evans D, Wiesemann S, et al. Using school staff to establish a preventive network of care to improve elementary school students' control of asthma. *J Sch Health*. 2006;76(6):307-312.	**Description:** To test the efficacy of a preventive care network for children with asthma, including school nurses providing care coordination between PCP, families and school personnel, and training for PCPs and school personnel regarding asthma	**Intervention** **N:** 30.7 **SES:** >50% FRL. **Ethnicity:** African American 38% Caucasian 21% Hispanic 47% Other 42%. **Control** **N:** 284 **SES:** >50% FRL. **Ethnicity:** African American 34% Caucasian 21% Hispanic 48% Other 45%.	**Study Design:** Experimental, (RCT). **Data Collection:** Telephone interviews with caregivers at baseline, 12, and 24 months. School records on absence data.	***Clinical Symptoms and Measurements:** Intervention had fewer days with symptoms that reduced activity in previous 6 months (9.5 fewer days, P < .05) and trend towards fewer symptoms (7.1 fewer days, P = .06). **Medical Management:** No difference between groups in medications prescribed at follow-up. ***Utilization:** At 2 years, control group had fewer hospitalizations in past 12 months (*P* < .05).	**Absenteeism:** Intervention group had significant reduction in self-reported asthma absences in previous 2 weeks (0.36 days, *P* = .053); however, there was no difference in overall school absences, per school records. **Grades:** N/A **Test Scores:** N/A	Sending forms home with students (may have missed that day or may not have given to parents). Time constraints for parents and teachers for health team as well as for school nurses with high student loads. Caregiver motivation to take children to PCP. Some students in both groups also received OAS (independent of this study).

	management. **Setting:** Urban, elementary school.					
Bruzzese JM, Sheares BJ, Vincent EJ, et al. Effects of a school-based intervention for urban adolescents with asthma: A controlled trial. *Am J Respir Crit Care Med.* 2011;183(8):998-1006.	**Description:** Randomized trial of the efficacy of Asthma Self-Management for Adolescents (AMSA) to evaluate asthma self-management, symptoms, frequency, quality of life, days of activity restriction and school absence. **Setting:** Urban, elementary school.	**Intervention (AMSA)** **N:** 175 **SES:** FRL 82% **Ethnicity:** African American 38% Hispanic 45% Mixed Race 10% Other 6%. **Control** **N:** 170 **SES:** FRL 82% **Ethnicity:** African American 36% Hispanic 46% Mixed Race 13% Other 4%.	**Study Design:** Experimental (RCT). **Data Collection:** Student questionnaires at baseline, 6, and 12 months. De-identified school attendance data for full sample by cohort, and identified data for those with parental permission.	**Clinical Symptoms and Measurements:** Over the 12-month assessment period, relative to control subjects, ASMA students reported a 31% reduction in night awakenings because of asthma and a 42% reduction in the number of days with activity restriction because of asthma in the previous 2 weeks. This difference translates to a relative reduction of almost 21 night awakenings and 13 days with activity restriction per student over 1 year for the intervention group. There was no significant difference between groups in days with asthma symptoms over the year. **Medical Management:** At 6 months, odds of using controller medication twice as high in AMSA. Use of written plan was three times higher in AMSA. At 12 months, no	**Absenteeism:** Both groups had reductions in self-reported absences over a 2-week period. Over 12-month period, 37% fewer self-reported absences in AMSA group or approximately 7 days saved per school year (*P* =.004). School de-identified records of absences for all reasons showed substantial increase at follow-up and with no significance between groups. AMSA students went from 26 to 42 days absent from year before intervention to follow-up year. Controls went from 24 to 35 days absent during the same time period. **Grades:** N/A **Test scores:** N/A	Self-report bias for case detection, attendance, and possibly other outcome data. Limited extrapolation to other populations (e.g., suburban, white, or those with mild asthma). Possible nonspecific therapeutic factors. Possible mitigation by attention to treating asthma in controls through consent and survey process. Interim treatments that were unaccounted for, or contamination of controls by AMSA students. Study did not assess smoking status or secondary exposure.

				difference between groups in use of controller meds. AMSA four times likely to have written treatment plan. **Utilization:** Treatment did not affect the sure zero population (those individuals who will not use the urgent care of interest), but it did affect the use in non-sure zero AMSA students (those with a nonzero probability of using urgent care) relative to controls. Acute medical visits reduced by 28%. ED visits reduced by 49%. Hospitalizations reduced by 76% (yearly = 625. Medical visits, 681. ED visits, and 180 hospitalizations per 1,000 students).		
Clark NM, Brown R, Joseph C, et al. Effects of a comprehensive school-based asthma program on symptoms, parent management, grades and absenteeism. *Chest.* 2004;125(5):1674-1679.	**Description:** To evaluate a comprehensive asthma program introduced into area with high asthma prevalence to reduce symptoms, improve school grades and reduce school	**Intervention** **N: 416** **SES:** Income <$15K yearly Medicaid: ND. **Ethnicity:** African American 98%. **Control** **N: 419** **SES:** Same as above.	**Study Design:** Experimental (RCT). **Data Collection:** Telephone interviews with caregivers at baseline, 12 and 24 months. Official school records on grades. Data for all absences from school records.	***Clinical Symptoms and Measurements:** At follow-up, treatment children with persistent disease had significant declines in both daytime (14% fewer, $P < 0.0001$) and nighttime (14% fewer, $P < 0.0001$) symptoms. Among children with both mild intermittent and persistent disease, those in the treatment	**Absenteeism:** No differences in school absences for all causes between groups were noted in school records. Parents of treatment group children reported fewer absences attributable to asthma in the previous 3 months (34% fewer, $P < 0.0001$) and 12 months (8% fewer, $P < 0.05$). **Grades:**	Official school records did not account for cause of absence. Perceptions or of students with asthma may have contributed to no difference in physical education grades. The program may have stimulated attention to symptoms at night by parents of children with mild intermittent disease.

	absences among students with asthma in addition to their parents engaging in more asthma management activities. **Setting:** Urban, elementary school.	**Ethnicity:** Same as above.	Data for absence due to asthma from parent interviews.	group had 17% fewer daytime symptoms ($P < 0.0001$) but 40% more nighttime symptoms. **Medical Management:** N/A **Utilization:** N/A	Treatment children had higher grades for science ($P < 0.02$), but not reading, mathematics, or physical education. **Test Scores:** N/A	
Clark NM, Shah S, Dodge JA, Thomas LJ, Andridge RR, Little RJ. An evaluation of asthma interventions for preteen students. *J Sch Health*. 2010;80(2):80-87.	**Description:** To determine the effects of two interventions—Open Airways for Schools (OAS) adapted for preteens, with and without Peer Asthma Action (PA2). This is a proven intervention for older adolescents, on the academic performance, self-regulation, quality of life and asthma symptoms of middle school children with asthma. **Setting:**	**OAS** **N:** 468. **SES:** Income <%15K: 48%. **Ethnicity:** African American 90% Caucasian 1% Hispanic 2%. **OAS + PA2** **N:** 416. **SES:** Income <%15K: 50%. **Ethnicity:** African American 98% Caucasian 1% Hispanic 2%. **Control** **N:** 408 **SES:** Income < %15K: 44%. **Ethnicity:**	**Study Design:** Experimental (RCT). **Data Collection:** Student questionnaires. Official school records of academic grades.	**Clinical Symptoms and Measurements:** OAS: No significant effect on symptoms or quality of life at 12 or 24 months (OR = 1.1, $P > 0.5$). OAS+PA2: No significant effect on symptoms or quality of life at 12 or 24 months (OR = 1.3, $P = 0.3$). **Medical Management:** N/A **Utilization:** N/A	**Absenteeism:** N/A **Grades:** OAS: Mean positive change in GPA from 6^{th}-8th grade vs. controls (mean change 0.09, $P = .02$) in the overall picture of decline for all students. **Test scores:** N/A	Schools faced severe economic cuts during the study period, distracting teachers, counselors, and families, and possibly affecting the potential of the interventions and dropout from study.

	Urban, middle school.	African American 92% Caucasian 1% Hispanic 2%.				
Halterman JS, Szilagyi PG, Yoos HL, et al. Benefits of a school-based asthma treatment program in the absence of secondhand smoke exposure: results of a randomized clinical trial. *Arch Pediatr Adolesc Med*. 2004;158(5):460-467.	**Description:** Evaluate the impact of school based provision of inhaled corticosteroids vs. usual care in children with mild persistent to severe persistent asthma. **Setting:** Urban, elementary school.	**School-Based Care** **N:** 89. **SES:** FRL 87% Medicaid 76% CHIP 9%. **Ethnicity:** African American 57% Caucasian 12% Hispanic 33% Other 30%. **Usual Care** **N:** 9.1 **SES:** FRL 87% Medicaid 74% CHIP 4%. **Ethnicity:** African American 60% Caucasian 11% Hispanic 32% Other 29%.	**Study Design:** Experimental (RCT). Post hoc analysis of effectiveness of intervention among children with (n = 79) and without (n = 101) secondhand smoke exposure in the home. **Data Collection:** Monthly telephone interviews with caregivers regarding variables during the school year.	**School-Based Care vs. Usual Care** **Clinical Symptoms and Measurements:** No difference in symptom free days, symptom days, symptom nights between school-based care and usual care groups. When analyzed by months of follow-up, school-based care had increase in symptom free days in 2 weeks prior to interview during early winter months, Nov-Dec (9.2 vs. 7.3 days, $P = 0.02$). **Medical Management:** No difference in days with rescue medication between school-based care and usual care groups. **Utilization:** No statistical difference in acute office visits, ED visits, or hospitalization for asthma between school-based care and usual care groups. Children with smoke exposure vs. children without smoke	**Absenteeism:** School-based care group (n = 89) had decrease in absence because of asthma (6.8 vs. 8.8 days, $P = 0.047$). Children without smoke exposure (n = 101) had decrease in absence due to asthma (4 vs. 7.6 days, $P = 0.047$). Among children with smoke exposure (n = 79), no differences were found from intervention. **Grades:** N/A **Test Scores:** N/A	Parental reporting as sole source of data, no physiological measurements. Even the "usual care" group may have benefited from "enhanced awareness." Sample consisted only of young, urban children. Possible under treatment of smoke- exposed children being kept on the same dose of medication during the school year.

				exposure**.** Among children with smoke exposure (n = 79), no differences were found from intervention. Among children without smoke exposure (n = 101): ***Clinical Symptoms and Measurements:** Increase in symptom-free days (11.5 vs. 10.5, *P* = 0.046) in school-based care group. ***Medical management:** Decrease in days using rescue inhaler (1.6 vs. 2.3, *P* = 0.003) in school-based care group. ***Utilization:** Decrease in likelihood of having 3 or more acute office or ED visits for asthma (6 vs. 17 students, *P* = .03).		
Halterman JS, Szilagyi PG, Fisher SG, et al. Randomized controlled trial to improve care for urban children with asthma: results of the School-Based Asthma Therapy trial.	**Description:** To evaluate the impact of a school-based asthma therapy trial (SBAT) - directly observed therapy (DOT) using preventive asthma meds	**Treatment N:** 260. **SES:** Medicaid: 72% CHIP 12%. **Ethnicity:** African American 63% Caucasian 10% Hispanic 31% Other 27%.	**Study Design:** Experimental (RCT). **Data Collection:** Monthly telephone interviews with caregivers regarding variables during the school year. Families given diaries to	***Clinical Symptoms and Measurements:** During peak winter season, treatment group had more symptom-free days/2wks (11.6 vs 10.7) (*P* < .001). Fewer nights with symptoms (2.3 vs. 1.7, P < .001). Fewer days with activity limitation (1.3 vs. 1.8, P =.003).	**Absenteeism:** Children in the treatment group experienced fewer days absent from school because of asthma than controls (0.3 vs 0.5 days/2 weeks (*P* = .002). **Grades:** N/A **Test Scores:** N/A	Increased awareness by parents and PCPs likely caused some bias. Blinding was not possible and may account for some of the improvement in control group. Generalizability to urban population only—in contrast to author's previous study. Intervention effects were independent of cotinine measures, and

Arch Pediatr Adolesc Med. 2011;165(3):262-268.	by school nurses on asthma symptoms among urban children with persistent asthma. Replication study (original 2004 above) with larger sample, more stringent guidelines-based care with medication dose adjustments, ETS (environmental tobacco smoke) reduction program for children with smoke exposure. **Setting:** Urban, elementary school.	**Control** **N:** 263 **SES:** Medicaid: 74% CHIP 12% **Ethnicity:** African American 63% Caucasian 8% Hispanic 26% Other 29%	track information.	***Medical Management:** Students in treatment group had less rescue medication use (1.6 vs. 2.6 days, P < .001), and were less likely to have prednisone prescribed for acute exacerbation (12% vs. 18%, P = .05). 100% of treatment group was using preventive medications by end of the study (vs. 60% of the control group). **Utilization:** Treatment group had lower, but no significant difference in visit rates for acute office visits, ED, and hospitalizations. Both groups demonstrated improvement over time during peak winter season, but by February, treatment group was experiencing a mean 1.2 additional symptom free days/2wks (95% CI 0.59 - 1.80).		improvements were seen in children exposed to smoke.
Halterman JS, Fagnano M, Montes G, et al. The school-based	**Description:** To test the feasibility of the school-based	**Treatment** **N:** 48 **SES:** Medicaid 69% **Ethnicity:**	**Study Design:** Experimental (RCT). **Data Collection:**	***Clinical Symptoms and Measurements:** Over school year, treatment group had fewer nights with	**Absenteeism:** Treatment group had fewer days absent from school due to asthma (0.37 vs. 0.85, P = .034).	Small pilot study with limited power. Increased awareness by parents and PCPs likely caused some bias. Generalizability to

preventive asthma care trial: results of a pilot study. *J Pediatri*. 2012;161(6):1109-1115.	Preventive Asthma Care Technology program (SB-PACT) and directly observed therapy (DOT) of preventive asthma meds in school facilitated by web-based technology. Built on SBAT trial (above) to overcome barriers of sustainability. **Setting:** Urban, elementary school.	African American 62% Caucasian 6% Hispanic 25% Other 31% **Control** **N:** 51 **SES:** Medicaid 71% **Ethnicity:** African American 51% Caucasian 8% Hispanic 28% Other 41%	Telephone interviews with caregivers at 1, 2, and 4 months post-baseline and an in home visit at the end of school year. Exhaled nitric oxide at baseline and final follow-up assessments.	symptoms (1.52 vs. 2.34, P = .023). Fewer days requiring change of family plans (0.12 vs. 0.39, *P* =.020). Greater decrease in exhaled nitric oxide (*P* = .033). There was a nonsignificant decrease of nearly 1 additional symptom free day in the treatment group (11.33vs. 10.40, P = .137). ***Medical Management:** Treatment group had fewer days with rescue medication (1.66 vs. 2.4, P = 0.012). **Utilization:** No differences between groups in the proportion of children presenting for health care visits.	**Grades:** N/A **Test Scores:** N/A	urban population only.
Levy M, Heffner B, Stewart T, Beeman G. The efficacy of asthma case management in an urban school district in reducing school absences and hospitalizations for asthma. *J Sch Health.* 2006; 76(6):320-324.	**Description:** To evaluate the effectiveness of a school-based nurse case management (CM) approach to asthma in students with poor asthma control vs usual care (UC).	**Year 1—Case Management** **N: 115.** **SES:** FRL > 85% Medicaid 81% **Ethnicity:** African American 97% **Year 1—Usual Care** **N: 128** **SES:** FRL >85%	**Study Design:** Experimental (RCT). **Data Collection:** During October-May for 2 years, hospital records reviewed for utilization and a weekly review of school records was conducted for absences.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A ***Utilization:** **Year 1:** Students in CM schools had significantly fewer urgent care or ED visits for each semester (1.36 vs. 1.59, P < .001) and over the entire year (*P* <	**Absenteeism:** **Year 1:** Students in CM schools had fewer absences (mean 4.38 vs 8.18 days). **Year 2:** Data not obtained. **Grades:** N/A **Test scores:** N/A	Larger number of intervention schools because of request of school district. Relying on parental report of registration which did not identify severity of asthma. May have minimized difference between CM and UC schools. Self-selection of participants as well as responders to parental post-survey.

	Setting: Urban, elementary school.	Medicaid 85% **Ethnicity:** African American 99% **Year 2—Case Management** **N: 124** **SES:** FRL >.85% Medicaid 79% **Ethnicity:** African American 97% **Year 2—Usual Care** **N: 86** **SES:** FRL > 85% Medicaid 78% **Ethnicity:** African American 94%		.0001). Students in CM schools had fewer hospital days (0.18 vs. 0.45, P < = .05). **Year 2:** Previous UC schools became new CM schools and showed improvements in urgent care and ED visits (*P* < .001), hospitalizations (*P* < .01).		
Srof BJ, Velsor-Friedrich B, Penckofer S. The effects of coping skills training among teens with asthma. *West J Nurs Res*. 2012;34(8):1043-1061.	**Description:** To determine the effects of school-based Coping Skills Training (CST) on asthma self-efficacy, social support, QOL, peak expiratory flow, asthma symptoms, and rescue medication use. **Setting:** Mixed urban	**Treatment** **N:** 21. **SES:** ND. **Ethnicity:** ND. **Control** **N:** 18 **SES:** ND. **Ethnicity:** ND.	**Study Design:** Experimental (RCT). **Data Collection:** Student questionnaires and asthma diary entries before and after five-session intervention.	**Clinical Symptoms and Measurements:** Treatment group had improvement in diary symptom score that approached significance (*P* = .07). No significant difference in pulmonary function tests (trended towards increase for treatment group). **Medical Management:** Medication score did not vary between groups. Treatment group showed lower rescue medication use,	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Small pilot study—lack of participants at 1 high school. Schedule conflict affecting attendance at all 5 sessions. Limited generalizability. Peak flow measurement may be unreliable diagnostically.

	and rural, high school.			but did not reach significance. **Utilization:** N/A		
QUASI-EXPERIMENTAL						
Bray MA, Kehle TJ, Peck HL, et al. Written emotional expression as an intervention for asthma: a replication. *J Appl Sch Psychol*. 2006;22(1):41-165.	**Description:** To examine written emotional expression as an intervention for asthma in school-aged children. **Setting:** Suburban, K-12.	**Sample:** **N:** 4 **SES:** ND. **Ethnicity:** ND.	**Study Design:** Quasi-experimental **Data collection:** Baseline, intervention and follow-up over 6 month period. Daily asthma diary and intermittent pulmonary functioning via spirometry.	**Clinical Symptoms and Measurements:** Three students had decrease in asthma attacks and physical symptoms. Positive effects for all students on activity limitations. Clinically significant increased lung function in 2 of 4 participants (improvements in all). **Medical Management:** Three reduced inhaler use. **Utilization:** N/A	**Absenteeism:** Diaries revealed three students missed fewer days of school during study than previous to study. **Grades:** N/A **Test Scores:** N/A	Very small sample size. No control group. Unclear feasibility in other school settings. Threats to internal validity based on participant effort. One participant had limited number of diary entries. Two students had only 2 weeks of follow-up because of school calendar.
Dobson RL, Bray MA, Kehle TJ, Theodore LA, Peck HL. Relaxation and guided imagery as an intervention for children with asthma: a replication. *Psychol Sch*. 2005 2005;42(7):707-720.	**Description:** To determine the effects of Relaxation and Guided Imagery (RGI) on lung function, anxiety, QOL, life satisfaction and happiness in elementary children with asthma. **Setting:** Suburban, elementary	**Sample:** **N:** 4. **Ethnicity:** Caucasian 100%.	**Study Design:** Quasi-experimental. **Data Collection:** Baseline, intervention and follow-up over 4 month period. Daily asthma diary and intermittent pulmonary functioning via spirometry.	**Clinical Symptoms and Measurements:** Three in four participants improved lung function (although 2 were already within normal range). **Medical Management:** N/A **Utilization:** N/A	**Absenteeism:** N/A **Grades:** N/A **Test Scores:** N/A	Very small sample size. No control group. Unclear feasibility in other school settings. Threats to internal validity based on participant effort. Student's cognitive ability and presence of researcher.

	school, 4th grade.					
Engelke MK, Swanson M, Guttu M. Process and outcomes of school nurse case management for students with asthma. *J Sch Nurs*. 2014;30(3):196-205.	**Description:** To describe the process of case management used by school nurses and its effect on parent perceptions—QOL as reported by the child, and academic achievement. **Setting:** K-12, 71% in grades 1-5.	**Sample:** **N:** 143 **SES:** Medicaid 64% **Ethnicity:** African American 38% Caucasian 41% Hispanic 7%	**Study Design:** Quasi-experimental. **Data Collection:** Parent and student questionnaire in schools. Academic performance measured by comparison with grades from the previous year to those earned at the year that the student received case management.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A **Utilization:** N/A	**Absenteeism:** N/A **Grades:** Nonsignificant reduction in GPA of 0.11 points. Largest average gain in GPA was when goal of improving psychosocial support of the family was met. Largest decrease was when children did not meet the goal of disruptive classroom behavior. 35 in 58 students met goal of improving academic performance. **Test Scores:** N/A	Could not control for confounders like other interventions provided by PCP or academic enrichment programs etc. Academic outcomes difficult to measure and some indicators measured differently in each school district.
Guo JJ, Jang R, Keller KN, McCracken AL, Pan W, Cluxton RJ. Impact of school-based health centers on children with asthma. *J Adolesc Health*. The Journal of adolescent health. 2005;37(4):266-274.	**Description:** Assess the impact of SBHC on risk of hospitalization, ED visits, and estimate impact of costs for hospitalization and ED visits for children with asthma. **Setting:** Urban, elementary, and middle school.	**SBHC** **N:** 196 **SES:** FRL ≥ 30% public assistance 90% CHIP 35% **Ethnicity:** African American 42% Caucasian 55% **Control:** **N:** 77 **SES:** FRL ≥ 30% Public Assistance 90% CHIP 35% **Ethnicity:** African	**Study Design:** Quasi-experimental. **Data Collection:** Annual school enrollment databases provided by SBHC and non-SBHC schools from 2000 to 2003, Ohio Medicaid medical claims databases, and summary data from the SBHC's encounter databases.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A ***Utilization:** ED visits: 33% decrease after opening. SBHC students had 43% lower ED visits compared with non-SBHC ($P <$ .05). SBHC group had a 2.4-fold decrease in risk of hospitalization. MCO/CHIP subset of students in SBHC had ED risk decreased by	**Absenteeism:** N/A. **Grades:** N/A **Test Scores:** N/A	Accuracy of ICD-9 codes in encounter data. Unable to assess children with other insurance besides Medicaid. Unable to measure proportion of children with asthma that received their primary care SBHC. Did not differentiate between students treated by SBHC and students in intervention schools that were not treated. Could not measure clinical parameters of asthma treatment in Medicaid data.

		American 42% Caucasian 55%		5.7% and 24%, respectively versus "other" Medicaid students ($P < .05$).		
Horner S, Brown A. Evaluating the effect of an asthma self-management intervention for rural families. *J Asthma*. 2014;51(2):168-177.	**Description:** To present the results of an asthma self-management intervention designed to improve rural parents and children's work to manage childhood asthma. **Setting:** Rural, elementary school.	**Sample:** **N:** 81 **SES:** ND. **Ethnicity:** African American 22% Caucasian 30% Hispanic 47% Other 1% **Control** **N:** 72 **SES:** ND. **Ethnicity:** Same as above.	**Study Design:** Quasi-experimental. **Data Collection:** Parent and student questionnaires at baseline home visit and 1, 4, and 7 months after intervention was completed.	**Clinical Symptoms and Measurements:** N/A ***Medical Management:** Significant within individual growth occurred for inhaler skill in treatment group (B = 0.47, P < .001). Only a significant time by group effect was found for inhaler skills in treatment group (B = 0.41, $P = .007$). ***Utilization:** Hospital stays (B = -0.07, P = .004) and ED visits (B = -0.13, P = .013) decreased significantly over time when individual growth trajectories were considered. There were no differences between treatment and control groups.	**Absenteeism:** No significant trends, time by group interactions, or covariates were related to absentee rates. **Grades:** N/A **Test Scores:** N/A	Self-reported data—randomization not blinded since controls had to commit to 2 years vs. 1 year. Other exposures to home visits or survey booklets over the course of the year may have sensitized both groups to asthma related messages. Low student-teacher ratio may have improved the communication and problem solving skills overall. Higher SES in white children may have reduced negative effects of asthma on QOL. Girls may learn better in small group sessions.
Kouba J, Velsor-Friedrich B, Militello L, et al. Efficacy of the I Can Control Asthma and Nutrition Now	**Description:** To determine the effectiveness of the I Can Control Asthma and	**Sample:** **N:** 25 **SES:** ND. **Ethnicity:** African American 92% Hispanic 4%.	**Study Design:** Quasi-experimental. **Data Collection:** Asthma Control Test—additional	***Clinical Symptoms and Measurements:** Improvement in percentage of students who were in control of their asthma from baseline to second	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Small nonrandomized pilot study. Competing activities during lunch period limited participation. Possible characteristics of the students or their families may have influenced

(ICAN) pilot program on health outcomes in high school students with asthma. *J Sch Nursing*. 2013;29(3):235-247.	Nutrition Now (ICAN) program on nutrition knowledge, dietary behaviors, self-asthma care, asthma related QOL, asthma knowledge, coping, asthma health outcomes and weight status. **Setting:** Urban, high school.		information related to symptoms, asthma related ED visits and hospitalizations, and school absences collected at baseline, 8 and 14 weeks.	posttest from 56% to 76% using Asthma Control Test ($X^2 = 5.25$, $P < .05$). **Medical Management:** N/A **Utilization:** N/A		outcomes (e.g., more family support or better able to manage their illness).
Moricca ML, Grasska MA, M BM, Morphew T, Weismuller PC, Galant SP. School asthma screening and case management: attendance and learning outcomes. *J Sch Nursing*. 2013;29(2):104-112.	**Description:** To determine whether school nurse case management in children identified with asthma impacts academic performance and absenteeism. **Setting:** Urban, elementary school.	**Case Management** **N: 40** **SES:** 100% FRL. **Ethnicity:** Hispanic 97% **Control** **N: 76** **SES:** Same as above. **Ethnicity:** Same as above. **Nonresponsive and At-Risk** **N: 26** **SES:** Same as above. **Ethnicity:** Same as above.	**Study Design:** Quasi-experimental. **Data Collection:** Parent survey; student records of standardized test scores and absenteeism records from district.	**Clinical Symptoms and measurements:** N/A **Medical Management:** N/A **Utilization:** N/A	**Absenteeism:** **Post-Intervention Absenteeism (Total):** No differences between groups. **Post-Intervention Absenteeism Due to Illness:** On average, all students missed one less day of school due to illness in post-intervention period (4.9 vs 3.7 days, P = .003). Students with asthma in CM group had reduction from 5.8 days to 3.7 days (slightly over 2 days) compared with about 2/3 of a day in the control and nonresponsive groups. Grade and gender did not alter these findings, although younger children	School nurse had large caseload of students (2:300). Difficulty in reaching parents during the day. Multiple attempts to interact with PCP. Small groups limited generalizability. Difficult to determine effect of intervention with lengthy period to post-intervention measurement. Level of nursing and medical intervention not controlled for an evaluation of absence and academic performance.

					missed approximately 2 days more than older children (5.2 vs. 3.4 days, *P* = .007). **Grades:** N/A **Test scores:** No differences between groups in standardized test scores for English or math.	
Pulcini J, DeSisto MC, McIntyre CL. An intervention to increase the use of Asthma Action Plans in schools: a MASNRN study. *J Sch Nursing*. 2007:23(3):170-176.	**Description:** To determine if the provision of peak-flow (PF) readings directly to PCP with request for an Asthma Action Plan by the school nurse would increase compliance vs request for AAP by parents **Setting:** Middle school.	**Sample:** **N:** 20 **SES:** ND. **Ethnicity:** ND. **Control** **N:** 20 **SES:** ND. **Ethnicity:** ND.	**Study Design:** Quasi-experimental. **Data Collection:** Asthma Action Plan Data report to document receipt by school nurse.	**Clinical Symptoms and Measurements:** N/A ***Medical Management:** AAPs received for 10/20 (50%) of intervention group vs. 2/20 (10%) of controls ($X^2 = 7.62$, *P* = .006) **Utilization:** N/A	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Pilot study with small sample size. Close proximity of intervention and control groups may have led to possibility of same PCP or specialists. Controls may have sought out AAPs by knowledge of study procedures.
Rodriguez E, Rivera DA, Perlroth D, Becker E, Wang NE, Landau M. School nurses' role in asthma management, school absenteeism, and cost savings: a demonstration project.	**Description:** To examine the extent to which asthma is associated with absenteeism, the change in absenteeism patterns after full-time school nurses are added, and a cost savings	**Demonstration Schools** **N:** 2,877 **SES:** FRL 82% **Ethnicity:** Hispanic 82% **Comparison Schools** **N:** 3,204 **SES:** FRL 72%	**Study Design:** Quasi-experimental. **Data Collection:** Parent surveys on utilization. Absenteeism data via parental report from school attendance records verified by school attendance clerk in	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A **Utilization:** For every 1,000 children, there were an estimated 15.15 ED visits for students in schools with full-time	**Absenteeism:** **Absenteeism Rates Due to Illness:** Students in demonstration schools missed average of 0.48 days less than during intervention year than comparison schools vs. 0.26 days in previous time period (*P* < .05). **Likelihood of Absence Due to Illness:** Students in	Schools were chosen based on high need. Differences may not be reproducible in higher SES populations. Health condition and absence data based on parental and physician report. ED charges vary significantly across hospitals. Additional costs not included (e.g., costs to businesses for parents missing work).

J Sch Health. 2013; 83(12):842-850.	analysis for impact of placing school nurses in undeserved schools. **Setting:** Urban, elementary, and middle school.	**Ethnicity:** Hispanic 73% Other. **School with SBHC** **N:** 583 **SES:** ND. **Ethnicity:** ND.	each school. Absence due to illness included parented-reported excused illness and doctor-verified excused illness (not included with parent-reported absences).	nurses vs. 26.68 ED visits in other schools.	demonstration schools were less likely than control schools to miss 1+ days due to illness (OR = 0.88, P < .05). Students in clinic school less likely than controls to miss 1+ due to illness (OR = 0.66, P < .000). Students with asthma more likely to miss 1+ days of school than students without (OR = 1.99, P < .000). Significance remained with students in demonstration schools and students in clinic school less likely to miss 3+ days of school than 1-2 days of school when compared with students in control. Students with asthma more likely to miss 3+ days than 1-2 days due to illness compared with students without chronic condition. **Grades:** N/A **Test scores:** N/A	
Velsor-Friedrich B, Pigott TD, Louloudes A. The effects of a school-based intervention on the self-care and health of African-American inner-city children with asthma.	**Description:** To examine the effect of school-based intervention Open Airways on self-care abilities, practices and health outcomes of children with	**Treatment:** **N: 40** **SES:** Public assistance 100%. **Ethnicity:** African American 100%. **Sample:**	**Study Design:** Quasi-experimental. **Data Collection:** Parent and student questionnaires at baseline, 2-week and 5-moth post program completion. My Asthma Diary	***Clinical Symptoms and Measurements:** Treatment group had larger increase in peak flow readings than controls (*P* = .046) (7.5% vs. 2.9%), fewer days with asthma symptoms ($F_{1, 91}$ = 4.05, P = .047). **Medical Management:**	**Absenteeism:** Treatment group had trend towards fewer number of school days absent than controls after the intervention (9.03 vs. 14.4 days); however, not statistically significant. **Grades:** N/A **Test Scores:** N/A	Not randomized. Reading level and age may have affected outcomes on psychosocial assessments.

J Pediatr Nurs. 2004;19(4):247-256.	asthma **Setting:** Urban, elementary, and middle school.	**Control** **N: 62** **SES:** Same as above. **Ethnicity:** Same as above.	completed for 2 weeks during each data collection period.	N/A ***Utilization:** Treatment group had more urgent medical visits than controls ($F_{1, 91}$ = 6.83, P = .01).		
Velsor-Friedrich B, Pigott T, Srof B. A practitioner-based asthma intervention program with African American inner-city school children. *J Pediatr Health Care*. 2005;19(3):163-171.	**Description:** To examine the effect of a school-based intervention program, Open Airways, combined with 5 monthly follow-up visits with a nurse practitioner, on selected psychosocial and health outcomes of minority children with asthma. **Setting:** Urban, elementary and middle school.	**Treatment** **N:** 28 **SES:** Public Assistance 100%. **Ethnicity:** African American 100% **Control** **N:** 24 **SES:** Same as above. **Ethnicity:** Same as above.	**Study Design:** Quasi-experimental. **Data Collection:** Student questionnaires at baseline, 2-week and 5-month and 12-month post program completion. Asthma Diary completed for 2 weeks during each data collection period.	***Clinical Symptoms and Measurements:** Both groups had peak flow increase over time with no significant differences between groups ($F_{2, 94}$ = 15.62, P = .000). **Medical management:** Nonsignificant changes in medication use in treatment or control group. **Utilization:** At 12 months no statistically significant differences in asthma symptoms or urgent care use between groups.		Possible ceiling effect in children who were already stable with respect to their asthma. Possible that respondents were adequately managed. Children may not reliably report variations from "normal" even if it includes undesirable symptoms such as chest tightness or nighttime cough. Larger percentage of symptoms at baseline and 12 month possibly due to seasonal influence. Cause of absence not delineated as due to asthma vs. other causes.
Yawn BP, Wollan P, Scanlon P, Kurland M. Are we ready for universal school-based asthma screening? An outcomes	**Description:** Controlled trial of the effectiveness and feasibility of implementing a simple asthma	**Sample: Intervention—Public School** **N: 4,243.** **SES:** FRL 15%. **Ethnicity:** African American 7%	**Study Design:** Quasi-experimental. **Data Collection:** Parent surveys. County database that links all health care visits	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A **Utilization:** Screening results:	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Nonrandomized. Lower survey return rate for higher risk group may have lowered potential benefit of program. Limited generalizability of this population (low diversity, high rate diagnosis of asthma). Questionnaire not

evaluation. *Arch Pediatr Adolesc Med*. 2002;156(12):1256-1262.	screening/case ID process based on parent surveys. **Setting:** Urban, K-12.	Caucasian 83% Hispanic 2% Asian 9% **Sample: Intervention—Catholic School** **N: 2,146** **SES:** FRL 0% **Ethnicity:** African American 1% Caucasian 95% Hispanic 1% Asian 3% **Sample: Control—Public School** **N: 2,906 (50% of sample reviewed).** **SES:** FRL 14% **Ethnicity:** African American 6% Caucasian 81% Hispanic 2% Asian 10%	regardless of site of care.	19.4% of respondents reported ever being diagnosed with asthma. 11.6% of respondents with no known asthma initiated physician visits based on referrals for possible unrecognized asthma. There were 0.9% new physician diagnoses of asthma in screened children vs. 1.2% in controls (*P* = .25).		validated. Medical record review may not have picked up undocumented calls from parents to query providers about referral recommendations. Assumption that gap in diagnoses is with parents vs. with providers.
Yawn BP, Wollan P, Scanlon PD, Kurland M. Outcome results of a school-based screening program for undertreated asthma. *Ann Allergy Asthma Immunol*.	**Description:** To study the effectiveness and feasibility of school-based asthma screening /case ID process that targets undertreated asthma.	**Sample: Intervention—Public School** **N: 4,243** **SES:** FRL 15% **Ethnicity:** African American 7% Caucasian 83% Hispanic 2% Asian 9%	**Study Design:** Quasi-experimental. **Data Collection:** Parent surveys. County database that links all health care visits regardless of site of care.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** Medication change in 18% of those referred for potentially undertreated asthma—most commonly to add anti-inflammatory or daily bronchodilators.	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Parent response cards for intended follow-up might under or overestimate impact of program.

2003;90(5):508-515.	**Setting:** Urban, K-12.	**Sample: Intervention—Catholic School N: 2,146** **SES:** FRL 0% **Ethnicity:** African American 1% Caucasian 95% Hispanic 1% Asian 3% **Sample: Control—Public School N: 2,906 (50% of sample reviewed).** **SES:** FRL 14% **Ethnicity:** African American 6% Caucasian 81% Hispanic 2% Asian 10%		***Utilization:** Screening results: 19.4% of respondents reported ever being diagnosed with asthma. 49.2% of all children with previously diagnosed asthma were sent referral letter to address under-treatment. Asthma-related visits after referral confirmed in 31.2. Younger children (P = .02), those with parent-reported regular care asthma physician (P = .003). Those visiting ED in past year (P = .0009). Those reporting more medication use (P < .0001) were more likely to make a post-referral asthma visit. More children in the intervention group made an asthma related visit (P = .0004) and higher rates of medication changes (P = .002) than in the control group during the 6 month obs. period. Twenty new cases were diagnosed.		
LONGITIDUNAL COHORT						
DePue JD, McQuaid EL, Koinis-Mitchell D, Camillo C, Alario A, Klein RB.	**Description:** To assess outcomes of an intervention	**Sample:** **N:** 559 **SES:** 75% FRL	**Study Design:** Longitudinal cohort.	***Clinical Symptoms and Measurements:** Mean asthma morbidity decreased from 1.63 to	**Absenteeism:** School days missed decreased from 48% to 20% (P < .001).	Response rate decreased from 60% after years 1 and 2 to 51% in year 3. Not randomized. No control

Providence school asthma partnership: school-based asthma program for inner-city families. *J of Asthma*. 2007;44(6):449-453.	designed to deliver educational workshops for children and their families measured by asthma status, and health care utilization. **Setting:** Urban, elementary school.	77% Medicaid. **Ethnicity:** African American 9% Caucasian 7% Hispanic 73%	**Data Collection:** Parent report at baseline (12 months before workshop) and follow-up interview 12 months after workshop. Asthma Functional Severity Scale.	0.62 days per week (*P* < .001) ***Medical Management:** Oral steroid use decreased from 35% to 12% (X^2 = 84.9, P < .001). ***Utilization:** ED use decreased from 35% to 4% (X^2 = 135.01, P < .001). Hospitalization decreased from 11% to 2% (X^2 = 35.21, P < .001).	**Grades:** N/A **Test Scores:** N/A	group. Parent report on outcomes, fiscal incentives provided.
Halterman JS, Riekert K, Bayer A, et al. A pilot study to enhance preventive asthma care among urban adolescents with asthma. *J Asthma*. 2011;48(5):523-530.	**Description:** To examine the effectiveness of the adaptation of the school-based asthma therapy trial (SBAT) for adolescents to include directly observed therapy (DOT) and MI (motivational interviewing). **Setting:** Urban, middle and high School (12-15 years of age).	**Sample:** **N:** 28 **SES:** ND **Ethnicity:** African American 53% Hispanic 33% Other 47%	**Study Design:** Cohort. **Data Collection:** Baseline and final assessments (6-7 months after enrollment) during home visits. Structured telephone interviews 2 months after baseline. Portable Exhaled Nitric Oxide (FeNO) machine.	***Clinical Symptoms and Measurements:** Overall reduction of asthma symptoms with increase in the number of symptom-free days at 2 months (10.79 days, P = 0.46) and at final assessment (12.89 days, P = .004) vs. baseline (8.71 days). Fewer days of slowing down or stopping usual activities at 2 months (0.89 vs. 2.93 days, P = .01). At final assessment fewer symptom days (1.0 vs 3.3 days, P = .002). FeNO levels decreased at 2 month assessment vs. baseline (*P* = .012). ***Medical Management:**	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Single group. Convenience sample with no control. Small sample size. Possible seasonal variations. Outcome assessments at 3 points in time. Funding limitations.

				Fewer days using rescue medications at final assessment (0.50 vs. 2.54 days, P = .015). **Utilization:** N/A		
Liao O, Morphew T, Amaro S, Galant SP. The Breathmobile: a novel comprehensive school-based mobile asthma care clinic for urban underprivileged children. *J Sch Health*. 2006;76(6):313-319.	**Description:** To report the outcomes of a school-based model using a mobile asthma clinic and pediatric asthma specialist as a possible solution to epidemic of inner city asthma. **Setting:** Urban, K-12.	**Intermittent** **N: 215** **SES: ND.** **Ethnicity:** Hispanic 82% **Persistent** **N: 897** **SES: ND.** **Ethnicity:** Hispanic 80%	**Study Design:** Cohort. **Data Collection:** Parent recall and patient self-report.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** Children with persistent asthma on daily controller meds increased from 24% to 78%. ***Utilization:** ED visits decreased from 38% to16%. Multiple ED visits (≥ 2) decreased from 23% to 6%. Hospitalization rate decreased from 19% to 3%. Children in program at least 1 year showed improvement in ED visits and hospitalizations (*P* < .001).	**Absenteeism:** Overall decrease of children missing school days from 60% to 26%. Decrease in number of students missing > 10 days from 27% to 1%. No change in children missing 1-4 days. Children in program at least 1 year showed improvement in number of school days missed (*P* < .001). Greatest improvement in those with severe persistent asthma. **Grades:** N/A **Test scores:** N/A	Parent and child recall (may not be accustomed to monitoring symptoms). Difficulty in confirming daily controller medication compliance. Heavy dependence on samples for uninsured. Some families may be susceptible to fear regarding income documentation or immigration status for insurance enrollment.
Magzamen S, Patel B, Davis A, Edelstein J, Tager IB. "Kickin' Asthma": school-based asthma education in an urban community.	**Description:** To evaluate the first 3 years of a school-based asthma education program, "Kickin' Asthma,"	**Sample:** **N:** 397 **SES:** ND **Ethnicity:** African American 45% Caucasian 5% Hispanic 31% Asian 17%	**Study Design:** Longitudinal cohort. **Data Collection:** Student baseline and 3 month follow up survey.	***Clinical Symptoms and Measurements:** Average number nights of sleep disruption: Year 1: 0.99 (SE 0.293, P < .006) Year 2: 0.68 (SE 0.269, P < .0001) Year 3: 0.43 (SE 0.404,	**Absenteeism:** Average missed days of school: Year 1: decrease by 0.54 days (*P* < .03). Year 2: decrease by 0.26 days (*P* < .01). Year 3: small and NS change.	Measurement of symptoms and behaviors at only two time intervals. Self-report report of health care utilization and absence data. Question on medication use asked if they used any meds when they felt well—may have

J Sch Health. 2008;78(12):655-665.	targeting middle and high school students to ascertain a reduction in asthma symptoms, acute care, utilization, and school absences. **Setting:** Urban, middle, and high school.			P = .0055). Average days with activity limitations: Year 1: 0.70 (SE 0.363, P < .015) Year 2: 0.62 (SE 0.338, P < .0001) Year 3: 1.12 (SE 0.370, P < .0001). Individual morbidity scores: 72%, 70%, and 63% of students had a change in score that indicated improvement in years 1, 2, and 3, respectively. ***Medical Management:** Medication use when asymptomatic: Year 1: N/A. Year 2: OR 1.63 (1.08-2.88). Year 3: NS. ***Utilization:** Physician visits for asthma symptoms: Year 1: OR 3.00 (1.41-6.39). Year 2: OR 2.5 (1.59-3.93). Year 3: NS. ED and hospital visits: Year 1: OR 3.13 (1.41-6.92). Year 2: OR 3.83(2.03-7.23). Year 3: OR 2.36 (1.26-	**Grades:** N/A **Test scores:** N/A	been misinterpreted. Summary score gave equal weight to each of the 11 questions. Many who were eligible did not enroll. Did not include confounders such as age, sex, number of sessions attended, or time of year in outcomes.

				4.40).		
Nelson S, Mandelaris J, Ferretti G, Heima M, Spiekerman C, Milgrom P. School screening and parental reminders in increasing dental care for children in need: a retrospective cohort study. *J Public Health Dent*. 2012;72(1):45-52.	**Description:** To assess follow-up dental care received by children with positive school based dental screening and referrals. **Setting:** Urban, elementary school.	**Baseline Referral** **N:** 126 **SES:** > 95% FRL > 80% Medicaid. **Ethnicity:** African American 96% **No Baseline Referral** **N:** 177 **SES:** Same as above. Medicaid. **Ethnicity:** Same as above.	**Study Design:** Longitudinal cohort (retrospective). **Data Collection:** Parent questionnaire. Baseline and follow-up dental examinations (did not have access to initial exam results).	***Clinical Symptoms and Measurements:** Referred children had more DMFT (Decayed, Missing, and Filled) primary teeth (3.17 vs. 0.10, P = .0000). **Medical Management:** N/A ***Utilization:** 19% of referred children (n = 24) were observed to have evidence of having received care at school dental follow-up exam in June. Referrals for urgent care visits were more likely to have received care (33% vs. 15%, P = .022).	**Absenteeism:** N/A. **Grades:** N/A **Test scores:** N/A	Could have been seen by dental provider that gave diagnostic and preventive care but not restorative care.
Patel B, Sheridan P, Detjen P, et al. Success of a comprehensive school-based asthma intervention on clinical markers and resource utilization for inner-city children with asthma in Chicago: the Mobile C.A.R.E. Foundation's asthma management program.	**Description:** To examine and evaluate clinical changes, resource, utilization, and medication use in response to asthma education and treatment and to create a budget impact model to analyze costs	**Sample:** **N:** 677 **SES:** FRL <50% Medicaid 54% **Ethnicity:** African American 40% Caucasian 4% Hispanic 56%	**Study Design:** Longitudinal cohort (retrospective). **Data Collection:** Caregiver questionnaire, spirometry, and reports in database for those completing at least 4 follow-up visits, approximating at least 1 year of follow-up.	***Clinical Symptoms and Measurements:** Improvement in daytime symptoms (*P* < .01). Night time symptoms (*P* < .05 - .01). Exercise symptoms improved (*P* < .01). Pulmonary function tests improved (*P* < .01.) 82% of children felt better. ***Medical Management:**	**Absenteeism:** Nonsignificant decline in school days missed per month (0.36 to 0.24 days). **Grades:** N/A **Test scores:** N/A	Lack of true control group. Cannot separate effect from intervention and treatment. Since asthma is an intermittent disease, may have had improved outcome anyway. Covariates were not adjusted for (e.g., allergic status, beta agonist with exercise, medication use before entry, treatment compliance rate).

J Asthma. 2007;44(2):113-118.	and offset costs. **Setting:** Urban, K-12.			Beta agonist use decreased for both daytime and night time ($P < .01$). ***Utilization:** Clinic visits did not show significant decline. Mean ED visits ($P < .05$) and hospitalizations ($P < .01$) decreased at follow up. ICU admissions did not show significant decline.		
Patel Shrimali B, Hasenbush A, Davis A, Tager I, Magzamen S. Medication use patterns among urban youth participating in school-based asthma education. *J Urban Health*. 2011;88 (Suppl 1):73-84.	**Description:** To assess whether participation in "Kickin' Asthma" curriculum improved appropriate asthma medication use and improvements in asthma related symptoms. **Setting:** Urban, elementary school.	**Sample:** **N:** 579 **SES: ND.** **Ethnicity: ND.**	**Study Design:** Longitudinal cohort. **Data Collection:** Student survey.	***Clinical Symptoms and Measurements:** Symptom improvement was not significantly associated with overall medication use score ($P = .047$). ***Medical Management:** Program participation resulted in improvements in appropriate use across all three medication use categories. 20.0% of students initiated appropriate reliever use when "feeling symptoms" ($P < 0.001$). 41.6% of students reporting inappropriate medication use "before exercise" initiated reliever use ($P < 0.001$). 26.5% of students reporting inappropriate medication use when	**Absenteeism:** N/A **Grades:** N/A **Test scores:** N/A	Almost half did not complete post survey (43%). No clinical measures of persistent or exercise induced asthma. Self-reported data from 6th grade students. No control group. Possible heightened staff and parent awareness. Additional information not available as to why some students' symptoms improved when they started or continued inappropriate medications.

				"feeling fine" initiated controller use ($P < 0.02$). More than half (61.6%) of participants reported fewer symptoms at post-survey. **Utilization:** N/A		
Taras H, Wright S, Brennan J, Campana J, Lofgren R. Impact of school nurse case management on students with asthma. *J Sch Health*. 2004;74(6):213-219.	**Description:** To evaluate the feasibility of asthma tracking and management by school nurses. **Setting:** Urban, K-12	**Sample:** **N:** 1,094 **SES:** ND. **Ethnicity:** ND.	**Study Design:** Longitudinal cohort. **Data Collection:** Asthma Tracking Survey based on parent health history forms, and school nurse paper-based records of case management interventions over 3-year period. Absence data from district asthma surveillance records cross-matched with school attendance data for same year period (days absent due to all illnesses).	***Clinical Symptoms and Measurements:** Severity classifications both increased and decreased as a result of CM in years 1-2 and 2-3 ($P < .001$). ***Medical Management:** Students with at least 1 nurse CM intervention in years 1 and 2 were more likely to have medications and peak flow measured at school in the following year for mild asthma ($P < .05$) and for moderate/severe asthma ($P < .001$). **Utilization:** N/A	**Absenteeism:** Students with asthma were absent significantly more often than those without asthma: Year 1: $t = 2.1$, $P < .05$. Year 2: $t = 8.0$, $P < .001$. Year 3: $t = 5.3$, $P < .001$. Increased rate of absenteeism for students with asthma, ranging from 0.3% to 0.7% of enrolled school days, was equivalent to between .5 and 1.25 days per year. Change in absentee rate from Year 1 to Year 2, and Year 2 to Year 3, showed no significant association with nurse case management the previous year. **Grades:** N/A **Test scores:** N/A	Retrospective analysis of school records. No newly diagnosed students after initial capture in year 1. Severity class defined according to nurse perception. Did not ask about frequency of symptoms at school or about provider completed AAP on school files. Measured all days of illness, not just asthma days. Large number of Mexican American students with often undiagnosed asthma.
Tinkelman D, Schwartz A. School-based asthma disease management. *J Asthma*.	**Description:** To determine if a comprehensive school-based asthma management program in	**Sample** **N:** 41 **SES:** "Lower SES." **Ethnicity:** "Mostly Hispanic."	**Study Design:** Longitudinal cohort. **Data Collection:** My Asthma Diary completed by students. Caregiver	***Clinical Symptoms and Measurements:** **At 6 months:** 62% decrease in daytime symptoms ($P < .07$). 34% decrease in nighttime symptoms (*P*	**Absenteeism:** **At 6 months:** Missed school days decreased by 66% ($P < .01$). **At 12 months:** Similar trends as 6 months,	No control group. Comprehensive program with outside agency (National Jewish School-Based Asthma Disease Management Program) providing support for time consuming tasks such as

2004;41(4):455-462.	addition to conventional program can reduce asthma control measures, student absenteeism, and worker lost days. **Setting:** Urban, elementary and middle school (Texas and Colorado).		telephone interviews. Health care utilization survey.	< .03). ***At 12 months:** 69% decrease in daytime symptoms (*P* < .001). 100% decrease in nighttime symptoms (*P* < .001). **Medical Management:** **At 6 months:** Long term control medications increase by 30%. Nonsignificant decrease in oral steroids. **At 12 months:** Similar trends, nonsignificant. ***Utilization:** **At 6 months:** Unscheduled physician visits decreased by 66% (*P* < .01) Nonsignificant decreases in ED visits and hospital admissions. **At 12 months:** Similar trends as 6 months, but nonsignificant.	but nonsignificant. **Grades:** N/A **Test scores:** N/A	contacting caregivers. Urban, low income may be not be generalizable.
Webber MP, Carpiniello KE, Oruwariye T, Lo Y, Burton WB, Appel DK. Burden of asthma in inner-city elementary school	**Description:** Reports asthma symptoms and illness burden, and examines differences in ED visits, hospitalizations, medication	**Schools with SBHC (4)** **N:** 645 **SES:** FRL 91% **Ethnicity:** African American 17% Hispanic 59%	**Study Design:** Longitudinal cohort. **Data Collection:** Caregiver survey. Absenteeism records from all schools except one	**Clinical Symptoms and Measurements:** No significant differences in symptoms or in activity limitation by sex, race, ethnicity, insurance, or availability of SBHC.	**Absenteeism:** Students in schools without SBHC had more missed days of school (*P* < .001). Among asthmatics, 3 more days of school were missed (21 vs 18 days, P = .02). **Grades:** N/A	Baseline data taken prior to intervention to better engage students and families. Urban, low income may be not be generalizable. Not all populations have access to SBHCs.

children: do school-based health centers make a difference? *Arch Pediatr Adolesc Med*. 2003;157(2):125-129.	use by sex, race, ethnicity, insurance, and availability of SBHC. **Setting:** Urban, Elementary School	**Schools without SBHC (2)** **N:** 304 **SES:** FRL 88% **Ethnicity:** African American 20% Hispanic 59%	comparison school.	**Medical Management:** N/A ***Utilization:** No significant differences in ED use by sex, race, ethnicity, insurance, or availability of SBHC. Children attending the comparison schools were more likely than those in schools with SBHCs to have been hospitalized for asthma, 17.1% vs. 10.5% respectively. RR, 1.6; 95% CI, 1.2-2.3). No statistically significant associations were noted between hospitalization and sex, race, or ethnicity, and health insurance coverage.	**Test scores:** N/A	
Webber MP, Hoxie AM, Odlum M, Oruwariye T, Lo Y, Appel D. Impact of asthma intervention in two elementary school-based health centers in the Bronx, New York City. *Pediatr Pulmonol*. 2005;40(6):487-493.	**Description:** To test if there could be a reduction in asthma morbidity and concomitant ED use, community provider use, and hospitalizations for asthma in the previously identified cohort	**SBHC – Intervention Schools (2)** **N:** 185 **SES:** FRL 91%. **Ethnicity:** African American 17% Hispanic 59%. **SBHC Non-intervention. Schools (2)** **N:** 163. **SES:**	**Study Design:** Longitudinal cohort (retrospective). **Data Collection:** Caregiver interviews during 9 months preceding intervention and at least 6 months after intervention.	**Clinical Symptoms and Measurements:** N/A ***Medical Management:** Students in intervention SBHC schools were less likely to be on daily nebulizer for rescue medication (OR 0.08, CI 0.01-0.79), or with inhaler form (OR 0.01, CI 0.18-0.50) than children in non-SBHC control schools.	**Absenteeism:** N/A **Grades:** N/A **Test Scores:** N/A	Loss to follow-up. Before and after study periods were not strictly comparable and months of high morbidity (e.g., January, February) were excluded from analysis.

	(Webber 2003). **Setting:** Urban, elementary school.	FRL 88%. **Ethnicity:** African American 20% Hispanic 59%. **Non-SBHC Control Schools (2)** **N:** 99. **SES:** ND. **Ethnicity:** ND.		***Utilization:** Intervention SBHC students showed 31% decrease in provider use, 59% decrease in ED use, and 41% decrease in hospitalizations. Intervention SBHC schools showed statistically significant reduced number of community provider visits compared to non-SBHC control (RRR 0.52, CI 0.30-0.88). Also showed statistically significant halving of ED use compared with non-SBHC control school (OR 0.44, CI 0.14-1.38, P = .059).		
Wilson KD, Moonie S, Sterling DA, Gillespie KN, Kurz RS. Examining the consulting physician model to enhance the school nurse role for children with asthma. *J Sch Health*. 2009;79(1):1-7.	**Description:** To explore whether adding physician consulting model decreases school absenteeism or the number of children sent home for asthma symptoms. **Setting:** Urban, elementary	**Sample:** **N:** 1,364. **SES:** FRL 82%. **Ethnicity:** African American 95%.	**Study Design:** Longitudinal cohort. **Data Collection:** School absenteeism data electronically send from school district and linked similarly for children with and without asthma.	**Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A **Utilization:** N/A	**Absenteeism:** **For All children:** Total missed school days decreased from 7.1 to 6.4 days. When not exposed to physician, 44% were more likely to be sent home because of asthma symptoms (OR 1.44, CI 1.31-1.58). **For Children with Asthma:** Total missed school days decreased from 8.9 to 7.5 days. Trend towards reduction of	Diagnostic confirmation or screening of undiagnosed asthma was not performed. Normal absenteeism variance not accounted for. Previous absenteeism rates not available. Small sample size of asthma students being sent home. May not be generalizable based on one school district experience.

	school.				sent home days due to asthma symptoms from 14% to 13% after 1 year of physician consultation implementation. **Grades:** N/A. **Test scores:** N/A.	
Other Study Designs						
Anderson ME, Freas MR, Wallace AS, et al. Successful school-based intervention for inner-city children with persistent asthma. *J Asthma*. 2004;41(4):445-453.	**Description:** To assess the potential health related benefits, of enrollment in The Kunsberg School (a school for children with chronic health conditions) on utilization for asthmatic children. **Setting:** Urban, elementary, and middle school.	**Kunsberg School:** **N:** 18. **SES:** Medicaid 89%. **Ethnicity:** African American 61% Hispanic 33%. **Control:** **N:** 36. **SES:** Medicaid 72%. **Ethnicity:** African American 14% Hispanic 80%.	**Study Design:** Case control. **Data Collection:** Denver Health and Hospital Authority medical records audited for utilization before and after school enrollment date. **<u>At Risk Subset</u>:** Previously hospitalized Kunsberg children (n = 8) compared before and after enrollment.	**<u>Main Group:</u>** **Clinical Symptoms and measurements:** N/A. **Medical Management:** N/A. ***Utilization:** Follow-up asthma visits in Kunsberg children decreased by 76% (3.3 to 0.8 visits/year per child) compared with controls (2.0 to 2.3 visits/year per child during post-enrollment period (*P* = .01). ED visits in Kunsberg children decreased by 55% (1.1 to 0.5 visits/year per child) compared with controls (1.3 visits in pre- and post-periods) (*P* = .04). Hospitalizations— year lower in Kunsberg children as compared with controls during post-enrollment period	**Absenteeism:** N/A. **Grades:** N/A. **Test Scores:** N/A.	Small sample in a highly specialized setting with resources beyond typical public schools. Utilization cost did not include personnel in the school setting that provided asthma care.

				(0.89 vs 0.55) vs. pre-enrollment (0.94 for both groups) (*P* = .05). **<u>At Risk Subset</u>: Clinical Symptoms and Measurements:** N/A **Medical Management:** N/A ***Utilization:** Follow-up asthma visits decreased 69% (*P* = .02). ED visits decreased 71% (*P* = .02). Mean inpatient hospital days decreased 97% (3.5 days/year to 0.1 days/year (*P* <.01). Eliminated ICU stays (1.0 to zero ICU days/year) (*P* < .004).		
Lurie N, Bauer EJ, Brady C. Asthma outcomes at an inner-city school-based health center. *J Sch Health*. 2001;71(1):9-16.	**Description:** To assess outcomes after the initiation of a school-based health center with special emphasis on asthma. **Setting:** Urban, elementary, and middle school.	**Longitudinal N:** 67. **SES:** Medicaid 61%. **Ethnicity:** African American 60% Caucasian 18% Native American 15% Hispanic 7%. **Cross-Sectional N: 114 SES:**	**Study Design:** Mixed methods—cohort/cross-sectional. **Data Collection:** Baseline and 9 months follow-up surveys.	***Clinical Symptoms and Measurements: Longitudinal Population:** Decreased nighttime awakenings (1.27 vs. 3.37 days, P ≤ .05) and changes in family plans (0.67 vs 2.33 days, P ≤ .10). **Cross-Sectional Population:** Decreased night time awakenings (1.17 vs.	**Absenteeism:** No change in absenteeism. **Grades:** N/A. **Test scores:** N/A.	Short period of time. Small sample size. Student turnover. Identification of asthma at baseline and follow-up was different (schoolwide screening vs. randomly administered survey). No comparison group. Unable to adjust for seasonality.

		Ethnicity: African American 62% Caucasian 12% Native American 21% Hispanic 4%.		2.94 days, P ≤ .01). **Medical Management:** N/A. ***Utilization:** **Longitudinal Population:** Increased specialist visits (44.8% vs 28.4%, P ≤ .01). Decreased admissions (14.9% vs. 3%, P ≤ .05). **Cross-Sectional Population:** Increase in physician visits for asthma check-up, without asthma symptoms (39.5% vs. 19.9%, P ≤ .01). Increased physician visits for asthma symptoms (43.9% vs. 30.8%, P ≤ .01). Increased specialist visits (36.8% vs. 25%, P ≤ .01). Decreased admissions (1.8% vs. 9.6%, P ≤ .01).		
Oruwariye T, Webber MP, Ozuah P. Do school-based health centers provide adequate asthma care? *J Sch Health*. 2003;73(5):186-190.	**Description:** To assess SBHC adherence to NHBLI asthma care guidelines and association between provider adherence, patient demographics,	**Sample:** **N:** 415. **SES:** ND. **Ethnicity:** Hispanic 55%.	**Study Design:** Cross-sectional. **Data Collection:** SBHC chart review and abstraction. Parent surveys. Absenteeism data from each school including number of days student enrolled and	***Clinical Symptoms and Measurements:** Older children more likely to have— Documented peak flow (OR 1.9, 95% CI 1.3-2.8). More follow-up visits (OR 2.6, 95% CI 1.5-4.6). Asthma education (OR 1.7, 95% CI 1.0-2.9).	**Absenteeism:** N/A. Mean number of school days missed was 17.6 (SD +/- 12.2) among 267 children for whom data was available. No association between provider adherence and school days absent. However, children < 8 years had more school absences than older children (20.0 ± 11.8 vs.	Cross-sectional design cannot infer causality. Chart review may not completely reflect practices. Severity based on clinician assignment vs objective measurement such as spirometry.

	hospitalizations, ED visits, and school absenteeism. **Setting:** Urban, elementary school.		number of days student absent.	Nonsignificant trend towards increasing provider adherence. Documentation of tobacco exposure (OR 1.58 95% CI 1.05-2.34). ***Medical Management:** Among all children, 69% (92/133) were on appropriate medications. For children with persistent asthma, 55% were on appropriate medications (OR 0.43, 95% CI 0.19-0.96). Older children more likely to have written action plans (OR 2.3, 95% CI 1.0-4.9). ***Utilization:** Specialist care: 16 children referred to pulmonologist, 3 kept appointment, 2 received appropriate meds. ED visits—use of peak flow meters associated with greater likelihood to have 1 or more ED visit in past year (OR 1.53, 95% CI 1.02-2.32) as well as seen a specialist (OR 3.65, 95% CI 1.05-12.6). Hospitalization: No statistically significant associations with	16.1 ± 12.2, $P < .002$). **Grades:** N/A. **Test Scores:** N/A.	

				provider adherence.		
Rasberry CN, Cheung K, Buckley R, et al. Indicators of asthma control among students in a rural, school-based asthma management program. *J Asthma*. 2014;51(8):876-885.	**Description:** To examine whether a comprehensive model of a school-based asthma management program in a small rural school district helped improve asthma control. **Setting:** Rural, K-12	**Intervention** **N:** 299. **SES:** Medicaid 50%. **Ethnicity:** African American 40% Caucasian 55% Hispanic 4%. **Control** **N:** 157. **SES:** Medicaid 50%. **Ethnicity:** African American 34% Caucasian 64% Hispanic 2%.	**Study Design:** Mixed Methods—quasi-experimental/cross-sectional. **Data Collection:** Student questionnaires, spirometry and administrative records on age, sex, and race.	***Clinical Symptoms and Measurements:** **Quasi-Experimental:** Asthma Control Questionnaire (ACQ) scores (lower score = better control) lower in intervention students than in comparison (average score 0.21 points lower) (*P* = .0085). Asthma control classification: 52% from intervention district well controlled vs. 40% of controls (X^2 = 4.1479, *P* = .0417). Odds of being well-controlled was 55% higher in intervention group (OR= 1.548, 95% CI 1.017-2.358). **Cross-Sectional:** Forced expiratory volume in on second (FEV1). Among all students in asthma program, no significant difference in mean % predicted FEV1 between baseline and follow-up. Among poorly controlled asthma students, there was a mean increase of 10.11 percentage points at follow-up (*P* < .01). Among well-controlled asthma students, there was a mean decrease of 6.33 percentage points	**Absenteeism:** N/A. **Grades:** N/A. **Test Scores:** N/A.	Flooding affected data collection in May 2011, with comparison district cancelling classes because of road closures; therefore, intervention district had data collection twice vs. once in comparison district. Response rate higher in intervention district. Existing asthma records had substantial amounts of missing data. 127 had records missing data; however, critical values regarding asthma control was not significant during analysis of "missingness." No baseline data from comparison site because of initiating evaluation with asthma program already underway. Did not measure "dosage" of individual program components or access to health care. No control for natural decline in asthma symptoms that may occur during childhood.

				at follow-up ($P < .01$). No significant difference in Asthma Control Classification. Descriptive frequencies showed 44.3% of students moved from poorly to well-controlled classification. 17.5% of students moved from well to poorly controlled classification. **Medical Management:** N/A. **Utilization: N/A.**		

*Statistically significant at $P \leq 0.5$ level.