

Child TRENDS[®] FACT SHEET

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WHAT WORKS FOR ASTHMA EDUCATION PROGRAMS: Lessons from Experimental Evaluations of Social Programs and Interventions for Children

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OVERVIEW

Asthma is a chronic respiratory disease that affects millions of children and adolescents each year. In 2009, 7.1 million children ages 0 to 17 years were reported to have asthma.¹ Unfortunately, when children and teens are unable to manage and cope with their disease, it can compromise their physical, academic, and social development. Therefore, it is vital that effective, evidence-based asthma education programs are identified to promote the well-being of children and youth.

This Fact Sheet reviews seventeen random assignment intent-to-treat asthma education programs that are geared toward educating children and youth on ways to effectively manage their chronic condition. Overall, 13 of the 17 programs had a positive impact on at least one child/adolescent outcome area, three programs had mixed results, and one program was not found to work.

INTRODUCTION

In this Fact Sheet, findings from seventeen random assignment experimental evaluations of asthma education programs are presented to examine the impact these programs have on outcomes for child, adolescent, and youth health. All of the identified programs were drawn from Child Trends' database of random assignment, intent-to-treat² studies of social interventions for children and youth – LINKS (Lifecourse Interventions to Nurture Kids Successfully).³ Note that medical treatments are not reviewed. Findings for the programs in this study are reported in the following five outcome areas:

- **Education** (e.g., academic achievement and school attendance)
- **Psycho-emotional health** (e.g., quality of life ratings and locus of control)
- **Medical** (e.g., hospitalization, emergency department visits, urgent calls to the health services/acute visits, and seeing a primary care physician)
- **Physical** (e.g., experiencing asthma symptoms, restricted activity, lung function, and less use of corticosteroids/inhalers/oral steroids/nasal sprays)
- **Self-management** (e.g., asthma knowledge, appropriate behaviors/taking steps to manage asthma/managing asthma symptoms, adolescent autonomy of taking and remember asthma medications, adherence to inhaler use/using daily controller medication, and availability of rescue inhaler).

¹ Akinbami, L. J., Moorman, J. E., & Liu, X. (2011). Asthma prevalence, health care use, and mortality: United States, 2005-2009. *National Health Statistics Report, 32*, 1-16. Retrieved from, <http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf>

² Including all randomized subjects' data in the analysis, regardless of their compliance with the protocol of the study

³ <http://www.childtrends.org/links>

If programs evaluated with a random assignment, intent-to-treat evaluation have been overlooked, please submit the evaluation at <http://mercury.charlesworks.com/~admin23/LINKS/PS/index.php>.

Positive impacts were found for a number of programs. *Table 1: Select Impacts of Asthma Education Programs* identifies which programs were *found to work*, which programs had *mixed findings*, and which programs were *not proven to work* for specific outcomes. The definitions for these categories, defined for Table 1, are offered below.

- **Not Proven to Work.** Programs in this category have *non-statistically significant* or *marginally significant* impacts on particular child or youth outcomes.
- **Mixed Findings.** Programs in this category have *varied impacts* either on particular outcomes or at different times or for varied subgroups. For example, a program that results in statistically significant improvements in nighttime symptoms but has no impact on daytime symptoms would be rated as having “mixed findings.” A program that works for one subgroup of participants but not for another subgroup (on a particular outcome) would also receive a “mixed findings” rating.
- **Found to Work.** Programs in this category have *positive and statistically significant* impacts on a particular infant, child, or youth outcome.⁴

RESULTS

Education

- **Impacts on school attendance are infrequent.** Two⁵ of the ten programs reduced the number of missed school days, while one program had mixed findings; and seven programs were found not to affect attendance. Both programs that were effective were implemented in the school and had minimal parental interaction; one used a behavioral therapy strategy⁶ and the other was a web-based program⁷.

Psycho-emotional health

- **Impacts of asthma education programs on psycho-emotional health outcomes are not common.** Of the eight programs that aimed to improve psycho-emotional health outcomes, only one⁸ program was able to improve asthma locus of control⁹. One program had mixed results, and the other six programs were not found to work. The program that improved asthma locus of control was a home-based, computer game that required little parental involvement.

Medical

- **Reducing hospitalization among children with asthma is uncommon.** Only one¹⁰ of the eight programs significantly reduced the frequency of hospitalization among program participants, while the other seven had no impact on hospitalization. The successful program is a school-based, computer program.

⁴ Where evaluations have assessed three or more measures of a particular construct or assessed a particular outcome three or more times, we have calculated the proportion of the potential impacts that are positive and statistically significant. For example, if 4 of 7 or 5 of 9 measures for an outcome are positive and statistically significant, this would be defined as a statistically significant impact on a particular outcome. The purpose is to avoid putting programs with multiple measures either at an advantage or at a disadvantage.

⁵ [Behavior Treatment Program for Children with Asthma, Puff City](#)

⁶ [Behavior Treatment Program for Children with Asthma](#)

⁷ [Puff City](#)

⁸ [The Asthma Files](#)

⁹ The extent to which one believes he/she can control or influence his/her asthma management and symptoms.

¹⁰ [Puff City](#)

- **Impacts on emergency department visits are not common.** Of the eight programs that targeted a reduction in emergency department visits, three¹¹ programs were able to significantly reduce the number of visits, and the other five programs were not found to work. All of the successful programs had a family/parent component. Two¹² of the three successful programs were a home-visitation program, while the other was a clinic-based, computer program.¹³
- **Asthma education programs that reduce urgent calls to the health services are possible.** Four programs examined the frequency of urgent calls to the doctor. Two¹⁴ of the four programs had a positive impact, while two programs had no statistically significant impact. Though both of the effective programs were home-based, one was a home visiting program that had a parent/family component¹⁵ while the other was a communication device that monitored asthma symptoms and required minimal parental participation.¹⁶

Physical

- **Reduction of experienced asthma-related symptoms is possible.** Eleven programs sought to reduce the frequency of asthma-related symptoms during the day and/or night. Five¹⁷ of the eleven programs were successful in reducing the number of symptoms, two had mixed results, and four were not found to work. Of the five effective programs, three programs¹⁸ used a computer/interactive technology. Just two¹⁹ of the five effective programs required parental involvement.
- **Impacts on improving lung function are infrequent.** Of the five programs that were geared toward improving lung function, only one program²⁰ was successful in improving lung function of program participants. The successful program used a communication device that connected to the telephone and monitored asthma symptoms.
- **Using less corticosteroid medication among children with asthma is possible.** Three²¹ of the six programs were successful in reducing the use of corticosteroids among children with asthma, while the other three programs were not found to work. Two²² of the three successful asthma education programs had a parental/family component woven into the program.

¹¹ [Asthma Adherence Monitoring with Feedback, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\), Parent Mentors for Children with Asthma](#)

¹² [Asthma Adherence Monitoring with Feedback, Parent Mentors for Children with Asthma](#)

¹³ [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#)

¹⁴ [Health Buddy, Inner-City Asthma Study](#)

¹⁵ [Inner-City Asthma Study](#)

¹⁶ [Health Buddy](#)

¹⁷ [Asthma Basic Care, Asthma Command, Behavior Treatment Program for Children with Asthma, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\), Puff City](#)

¹⁸ [Asthma Command, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\), Puff City](#)

¹⁹ [Asthma Basic Care, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#)

²⁰ [Health Buddy](#)

²¹ [Asthma Basic Care, Behavior Treatment Program for Children with Asthma, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#)

²² [Asthma Basic Care, IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#)

Self-management

- **Asthma education increases asthma knowledge.** Of the five²³ programs evaluated, all of them demonstrated a significant increase in asthma-related knowledge. All but one of these programs²⁴ used a computer/online program or interactive electronic device. All of the programs except for one²⁵ were school and/or clinic-based, and only two²⁶ of the five programs required parental participation.

Outcomes with fewer than four evaluation studies are not summarized, due to insufficient evidence. They are, however, outlined in Table 1. These outcomes included:

- Academic achievement (one program)
- Seeing a primary physician (three programs)
- Restricted activity (two programs)
- Appropriate behaviors (three programs)
- Adolescent autonomy (two programs)
- Adherence to inhaler use (two programs)
- Availability of rescue inhaler (two programs)

PROMISING APPROACHES RELATED TO OUTCOMES

When examining the program components that were related to positive outcomes, common themes emerged within three of the five outcome areas.

Self-management Outcomes. When examining the eight programs²⁷ that measured at least one positive outcome related to self-management, six²⁸ of the programs were school- and/or clinic-based. Six²⁹ of the eight programs successful in improving one child outcome related to self-management were computer/interactive device asthma education programs. In addition, five³⁰ of the eight asthma education programs that had at least one positive self-management related outcome also had minimal parental participation. Of the five programs that had minimal parental participation and measured at least one positive self-management outcome, all of the child participants were older than five years of age.

Physical Outcomes. Six programs³¹ demonstrated at least one measurable physical improvement, and of those programs, four³² were school- or clinic-based. Four³³ of the six programs that

²³ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [SHARP](#), [The Asthma Files](#)

²⁴ [SHARP](#)

²⁵ [The Asthma Files](#)

²⁶ [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [SHARP](#)

²⁷ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [Asthma: It's a Family Affair](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#), [SHARP](#), [The Asthma Files](#)

²⁸ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [Asthma: It's a Family Affair](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#), [SHARP](#)

²⁹ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#), [The Asthma Files](#)

³⁰ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [Health Buddy](#), [Puff City](#), [The Asthma Files](#)

³¹ [Asthma Basic Care](#), [Asthma Command](#), [Behavior Treatment Program for Children with Asthma](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#)

³² [Asthma Command](#), [Behavior Treatment Program for Children with Asthma](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#)

demonstrated at least one physical improvement were computer-based. In addition, four³⁴ of the six programs that had limited parental involvement impacted at least one physical outcome, and all of the four programs were geared towards elementary or school-aged children.

Medical Outcomes. Of the six programs³⁵ that demonstrated at least one medical improvement, three³⁶ were home-visiting asthma education programs, and the other three programs³⁷ were computer/web-based. Four³⁸ of the six programs had a parental component, and of those four programs, three³⁹ included children younger than three years old.

FURTHER RESEARCH NEEDED

- **There is little evidence on whether behavioral therapy and/or peer mentorship intervention strategies are effective.** Out of the seventeen programs, only two⁴⁰ programs focused on either behavioral therapy or peer mentorship strategies. More programs that use such strategies need to be identified and evaluated.
- **More information is needed about comprehensive asthma education programming.** Only two programs⁴¹ used a comprehensive approach when teaching children, youth, families, and schools about asthma. Comprehensive asthma education programs actively involve and provide asthma education to all of the child's networks (e.g., family, school, and community). Therefore, there is a need for more research that evaluates programs that use a comprehensive approach when providing asthma education.
- **Levels of parental involvement need to be furthered examined.** Throughout the analysis, the absence of parental participation did not appear to be associated with poorer child or teen outcomes. However, most of the programs that had minimal parental participation seemed to involve school-aged children. Therefore, more research needs to examine how differing levels of parental involvement can either enhance or inhibit asthma-related child outcomes for children of varying ages.
- **Current programs do not examine how parental participation with their child at younger ages can impact subsequent outcomes.** Most studies do not follow the children over time and, as a result, they do not examine whether having parental participation early in a child's life is more beneficial than during adolescence.

³³ [Asthma Command](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#)

³⁴ [Asthma Command](#), [Behavior Treatment Program for Children with Asthma](#), [Health Buddy](#), [Puff City](#)

³⁵ [Asthma Adherence Monitoring with Feedback](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Inner-City Asthma Study](#), [Parent Mentors for Children with Asthma](#), [Puff City](#)

³⁶ [Asthma Adherence Monitoring with Feedback](#), [Inner-City Asthma Study](#), [Parent Mentors for Children with Asthma](#),

³⁷ [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#),

³⁸ [Asthma Adherence Monitoring with Feedback](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Inner-City Asthma Study](#), [Parent Mentors for Children with Asthma](#)

³⁹ [Asthma Adherence Monitoring with Feedback](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Parent Mentors for Children with Asthma](#)

⁴⁰ [Behavior Treatment Program for Children with Asthma](#), [Triple A Program](#)

⁴¹ [SHARP](#), [Untitled Comprehensive School-based Asthma Program](#)

DISCUSSION

Asthma education programs are a way to teach children and youth, as well as families and school personnel, about asthma management. The studies reviewed in this Fact Sheet generally demonstrated a degree of success. Thirteen of the seventeen programs achieved at least one positive outcome in the five outcome areas, and all outcome areas had at least one successful program.

There were commonalities among the asthma education programs that impacted self-management, physical, and medical outcomes. Successful programs that aimed to improve self-management or physical outcomes were either school or clinic-based; whereas, medical outcomes were associated with home-based programs. In addition, computer-based asthma education programs were associated with self-management, physical, and medical outcomes for school-age children. Parental participation was associated with medical outcomes but not with self-management and physical outcomes. Of the ten programs⁴² that measured at least one positive self-management or physical outcome, six⁴³ required limited parental participation. However, of the six programs that did not have a parental component in the asthma education program, none of the programs involved children younger than six years old. Therefore, it could be suggested that the type of approach that is most age appropriate may influence the impact on asthma outcomes.

There is a need for further research to examine how asthma education can impact seeing a primary physician, academic achievement, restricted physical activity, and behaviors related to managing asthma (e.g., taking steps to manage asthma symptoms), adolescent autonomy, adherence to inhaler use, and availability of a rescue inhaler. In addition, more research needs to examine how comprehensive programs and varying levels of parental involvement during different stages of a child's life can impact child outcomes. Further research from experimentally-evaluated studies could help clinicians and policy makers assess what types of asthma education programs are successful and would enable millions of children with asthma to live healthy and successful lives.

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⁴² [Air Academy: The Quest for Airtopia](#), [Asthma Basic Care](#), [Asthma Command](#), [Asthma: It's a Family Affair](#), [Behavior Treatment Program for Children with Asthma](#), [Health Buddy](#), [IMPACT \(Interactive Multimedia Program for Asthma Control and Tracking\)](#), [Puff City](#), [SHARP](#), [The Asthma Files](#)

⁴³ [Air Academy: The Quest for Airtopia](#), [Asthma Command](#), [Behavior Treatment Program for Children with Asthma](#), [Health Buddy](#), [Puff City](#), [The Asthma Files](#)

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Table 1: Select Impacts of Asthma Education Programs

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Education			
Academic achievement	<p>Untitled Comprehensive School-based Asthma Program is a comprehensive asthma education program that provides disease management and asthma trigger education to children with asthma, their peers, school officials, and parents. No significant differences in the overall grade index were found among the treatment group.</p>		
School Attendance	<p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. No significant impacts were found on school attendance.</p> <p>Emergency Department-Based Asthma Intervention is an emergency-based intervention that is designed to help families participate in follow-up visits with their physician. No significant impact was found on school attendance.</p> <p>Health Buddy is an interactive device that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. There were no impacts on school attendance.</p>	<p>Triple A Program is a peer-led asthma education program for 7th, 10th, and 11th grade students. The program consists of games, videos, worksheets, performances, and discussion. A significant decrease in the median number of missed school days among the 10th grades in the intervention group was found. No impact for 7th grade students.</p>	<p>Behavior Treatment Program for Children with Asthma is a behavioral therapy program that provides social skill training and consequences for those that request hospital admission even if they are not experiencing significant airflow obstruction as well as teaches children how to measure their airflow, coping techniques to use when they are experience asthma-related symptoms, and how to work through asthma-related fears. The group receiving the behavioral treatment had significantly less number of missed school days when compared to their peers.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Education			
School Attendance (continued)	<p>Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. The program had no impact on school attendance.</p> <p>School-based Supervised Asthma Therapy is a school-based asthma therapy that supervises and corrects children's inhaler use. There was no significant on school attendance according to school records.</p> <p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. Impacts on school attendance were only marginally significant at the intent-to treat level.</p> <p>Untitled Comprehensive School-based Asthma Program is a comprehensive asthma education program that provides disease management and asthma trigger education to children with asthma, their peers, school officials, and parents. No significant differences were found when looking at school absence records.</p>		<p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. At 12 months, treatment students reported fewer missed school days than the control group.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
<p>Psycho-emotional Health</p>	<p>Asthma Command is a clinic-based computer game that teaches children about asthma and asthma management. No significant differences were found on any of the psychological variables.</p> <p>Emergency Department-Based Asthma Intervention is an emergency-based intervention designed to help families participate in follow-up visits with their physician. No significant impact was found on quality of life ratings.</p> <p>IMPACT (Interactive Multimedia Program for Asthma Control and Tracking) a clinic-based program that uses an interactive CD to teach children and their parents way to improve asthma control. There was no impact on quality of life.</p> <p>Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. There was no impact on children's quality of life scores.</p> <p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. No impact was found among quality of life scores.</p>	<p>Triple A Program is a peer-led asthma education program for 7th, 10th, and 11th grade students. The program consists of games, videos, worksheets, performances, and discussion. There was a positive impact on overall quality of life ratings on the intervention group. These findings were significant at the 10th grade level but only marginally significant among 7th graders. No impact was found among males.</p>	<p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. Significant impacts on asthma locus of control measures were found among the treatment group.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Psycho-emotional Health (continued)	<p>SHARP is a school-based program developed by school personnel and members from an asthma coalition that focuses on teaching acceptance of asthma as well as self-management. The asthma program had no impact on students' acceptance of their condition.</p>		
Medical			
Hospitalization	<p>Asthma Adherence Monitoring with Feedback is a home-based asthma education program where children and families receive visits from a trained asthma educator that provided both asthma education and medicine adherence monitoring and feedback education. The program had no impact on hospitalizations of children with asthma.</p> <p>Asthma Basic Care is a home-based asthma education program where families receive home visits from a trained asthma educator that provided asthma education. No impact was found on hospitalizations.</p> <p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. There were no significant impacts on number asthma related hospitalizations.</p>		<p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. The number of asthma-related hospitalizations at the 12-month follow-up was significantly less among youth receiving the treatment.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Medical			
Hospitalization (continued)	<p><u>Emergency Department-Based Asthma Intervention</u> is a emergency-based intervention that is designed to help families participate in follow-up visits with their physician. No significant impact was found on number of asthma-related hospitalizations.</p> <p><u>Health Buddy</u> an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. No impact on asthma related hospitalizations.</p> <p><u>Parent Mentors for Children with Asthma</u> is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. There were no significant impacts on asthma-related hospitalizations.</p> <p><u>The Asthma Files</u> is an interactive computer game that teaches children about asthma self-management. No impact on hospitalization was found.</p>		

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Medical			
Emergency department visits	<p>Asthma Basic Care is a home-based asthma education program where families receive home visits from a trained asthma educator that provided asthma education. No impact was found on frequency of emergency department visits.</p> <p>Emergency Department-Based Asthma Intervention is an emergency-based intervention that is designed to help families participate in follow-up visits with their physician. No significant impact was found on total number of asthma-related emergency department visits.</p> <p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. No impact on asthma related emergency department visits.</p> <p>Inner-City Asthma Study is an asthma education where environmental counselors educate parents on ways to reduce environmental allergens in the home. The program had no impact on the frequency of emergency department visits.</p>		<p>Asthma Adherence Monitoring with Feedback is a home-based asthma education program where children and families receive visits from a trained asthma educator. Emergency department visits for children in the program decreased significantly faster than the usual care group.</p> <p>IMPACT (Interactive Multimedia Program for Asthma Control and Tracking) a clinic-based program that uses an interactive CD to teach children and their parents way to improve asthma control. The program was found to reduce the number of emergency department visits.</p> <p>Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. The program decreased the number of asthma-related emergency department visits.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Medical			
Emergency department visits (continued)	Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. Impacts on asthma-related emergency department visits at the 12-month follow up were only marginally significant among the treatment group.		Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. The program decreased the number of asthma-related emergency department visits.
Urgent calls to health services/ acute visits	<p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. There were no significant impacts on number of acute visits related to asthma.</p> <p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. There were no significant impacts on reporting any unscheduled doctor visits.</p>		<p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. Children in the treatment group had fewer urgent calls to health services.</p> <p>Inner-City Asthma Study is an asthma education where environmental counselors educate parents on ways to reduce environmental allergens in the home. The number of unscheduled hospital visits was significantly less among those in the treatment group.</p>
Seeing primary care physician	Inner-City Asthma Study is an asthma education where environmental counselors educate parents on ways to reduce environmental allergens in the home. The program had no impact on scheduled medical visits.	Emergency Department-Based Asthma Intervention is an emergency-based intervention designed to help families participate in follow-up visits with their physician. One study found the program to improve reports of seeing a physician while another study found no impact.	

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Medical			
Seeing primary care physician (continued)	<p>Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. There was no impact on asthma-related doctor visits.</p>		
Experiencing asthma symptoms (daytime and/or nighttime symptoms)	<p>Asthma Adherence Monitoring with Feedback is a home-based asthma education program where children and families receive visits from a trained asthma educator. No impact on the frequency of experienced asthma-related symptoms.</p> <p>Emergency Department-Based Asthma Intervention is a emergency-based intervention that is designed to help families participate in follow-up visits with their physician. No significant impact was found on reports of experiencing asthma-related symptoms.</p> <p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. No impact on experienced symptoms or daytime symptoms.</p>	<p>Asthma: It's a Family Affair is a school-based program behavioral asthma management program. Adolescents experienced less nighttime symptoms but there was no impact on daytime symptoms.</p> <p>Untitled Comprehensive School-based Asthma Program is a comprehensive asthma education program that teaches children with asthma and their peers as well as parents, teachers, principals, and custodians how to provide a healthy environment for children with asthma. Treatment participants experienced significantly fewer annual daytime symptoms but significantly more annual nighttime symptoms.</p>	<p>Asthma Basic Care is a home-based asthma education program where families receive home visits from a trained asthma educator. The program significantly reduced asthma-related symptoms.</p> <p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. Parents of children in the treatment group reported their children experienced fewer asthma attacks.</p> <p>Behavior Treatment Program for Children with Asthma is a behavioral therapy program that provides social skills training and consequences for those that request hospital admission even if they are not experiencing significant airflow obstruction and teaches children how to measure their airflow, coping techniques when they are experience asthma-related symptoms, and how to work through asthma-related fears. The behavioral treatment group experienced significantly less symptoms when compared to their peers.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Physical			
Experiencing asthma symptoms (daytime and/or nighttime symptoms) (continued)	<p>Parent Mentors for Children with Asthma is an asthma education program that provides children and families with a parent mentor to help manage the child's condition. The intervention group experienced significantly less rapid-breathing and asthma exacerbations but no impact was found on episodes of wheezing, coughing, rapid-breathing or chest-tightness.</p>		<p>IMPACT (Interactive Multimedia Program for Asthma Control and Tracking) a clinic-based program that uses an interactive CD to teach children and their parents way to improve asthma control. The program was successful in decreasing the number of asthma symptoms days.</p> <p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. At the 12-month follow-up, significantly fewer reported symptom days and nights in the past two weeks were made by treatment students when compared to the control group.</p>
Restricted activity			<p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. The intervention group had significantly less restricted activity days related to asthma when compare to the other group.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Physical			
Restricted activity (continued)			<p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. At the 12-month follow-up, significantly fewer reported restricted activity days in the past two weeks were made by treatment students when compared to the control group.</p>
Lung function	<p>Behavior Treatment Program for Children with Asthma is a behavioral therapy program that provides social skill training and consequences for those that request hospital admission even if they are not experiencing significant airflow obstruction as well as teaches children how to measure their airflow, coping techniques to use when they are experience asthma-related symptoms, and how to work through asthma-related fears. No significant differences on lung function were found among the two groups.</p> <p>School-based Supervised Asthma Therapy The Asthma Files is a school-based asthma therapy that supervises and corrects children’s inhaler use. No significant improvement on lung function was found.</p>		<p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. The program improved children’s lung function.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Physical			
Lung function (continued)	<p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. No impact on lung function was found.</p> <p>Triple A Program is a peer-led asthma education program for 7th, 10th, and 11th grade students. The program consists of games, videos, worksheets, performances, and discussion. No significant improvements in lung function were found.</p>		
Less use of corticosteroid/oral steroids/inhalers/nasal sprays	<p>Asthma Adherence Monitoring with Feedback is a home-based asthma education program where children and families receive visits from a trained asthma educator. The program had a marginal impact on the reduced use of corticosteroids.</p> <p>Inner-City Asthma Study is an asthma education where environmental counselors educate parents on ways to reduce environmental allergens in the home. Only one of the three inhalers were used significantly less than the control group.</p> <p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. Impacts on school oral steroid use were only marginally significant at the intent-to treat level.</p>		<p>Asthma Basic Care is a home-based asthma education program where families receive home visits from a trained asthma educator that provided asthma education. The program reduced the use of corticosteroids.</p> <p>Behavior Treatment Program for Children with Asthma is a behavioral therapy program that provides social skills training and consequences for those that request hospital admission even if they are not experiencing significant airflow obstruction, teaches children how to measure their airflow, coping techniques when they are experience asthma-related symptoms, and how to work through asthma-related fears. The behavioral treatment group experienced significantly less symptoms when compared to their peers.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Physical			
Less use of corticosteroid/ oral steroids/ inhalers/nasal sprays (continued)			<p>IMPACT (Interactive Multimedia Program for Asthma Control and Tracking) a clinic-based program that uses an interactive CD to teach children and their parents way to improve asthma control. Children in the control group used a significantly lower dose of daily steroids.</p>
Self-management			
Asthma knowledge			<p>Air Academy: The Quest for Airtopia is a school-based program that uses a computer game to teach elementary children about asthma. From pre- to post-test, program participants demonstrated an improvement in asthma knowledge.</p> <p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. Impacts on asthma knowledge were found.</p> <p>IMPACT (Interactive Multimedia Program for Asthma Control and Tracking) a clinic-based program that uses an interactive CD to teach children and their parents way to improve asthma control. The program increased asthma –related knowledge of the children.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Physical			
Asthma knowledge (continued)			<p>SHARP is a school-based program developed by school personnel and members from a asthma coalition that focuses on teaching acceptance of asthma as well as self-management. The program improved asthma knowledge of children in the treatment group.</p> <p>The Asthma Files is an interactive computer game that teaches children about asthma self-management. Impacts on asthma knowledge were found.</p>
Appropriate behaviors (e.g., taking steps to manage symptoms and managing symptoms once they occur)		<p>Asthma: It's a Family Affair is a school-based program that provides behavioral asthma management education for adolescents and training for parents. The program had an impact on the steps adolescents took to manage their asthma. However, there was no impact on managing symptoms once they occur.</p> <p>SHARP is a school-based program developed by school personnel and members from an asthma coalition that focuses on teaching acceptance of asthma as well as self-management. The program improved the steps children took to manage their asthma but there was no impact on managing symptoms once they occur.</p>	<p>Asthma Command is a clinic-based computer game that aims to teach children about asthma and asthma management. The program improved children's behaviors related to asthma.</p>

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Self-management			
<p>Adolescent autonomy (e.g., taking asthma medications without reminders and being responsible for asthma medication)</p>			<p>Asthma: It's a Family Affair is a school-based program that provides behavioral asthma management education for adolescents and training for parents. Impact on adolescents remembering to carry their asthma medication was found.</p> <p>Health Buddy an interactive device that is connected to the telephone that enables children to record their asthma symptoms, peak flow readings, use of asthma medication, use of health services, and any activity restrictions related to their asthma. The children in the intervention group were more likely to take their medication without being reminded.</p>
<p>Adherence to inhaler use/using daily controller medication</p>	<p>Emergency Department-Based Asthma Intervention is an emergency-based intervention that is designed to help families participate in follow-up visits with their physician. No significant impact was found on using a daily controller medication.</p> <p>Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. The treatment group demonstrated a marginal increase in adherence to controller medication at the 12-month follow-up.</p>		

OUTCOME AREA	NOT FOUND TO WORK	MIXED FINDINGS	FOUND TO WORK
Self-management			
Availability of rescue inhaler	School-based Supervised Asthma Therapy is a school-based asthma therapy that supervises and corrects children's inhaler use. No impact was found on availability of rescue inhaler availability.		Puff City is a web-based program conducted in schools that focus on controller medication adherence, rescue inhaler availability, and smoking cessation. Significantly less negative change of rescue inhaler availability among treatment student was observed.