Asthma Environmental Intervention Guide

for School-Based Health Centers

ramp
REGIONAL ASTHMA MANAGEMENT & PREVENTION
Working together to reduce the burden of asthma

CALIFORNIA SCHOOL-BASED HEALTH ALLIANCE
Putting Health Care Where Kids Are

Developed by Regional Asthma Management & Prevention (RAMP), a project of the Public Health Institute, in partnership with the California School-Based Health Alliance

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Introduction

Asthma is a chronic inflammatory disease of the airways characterized by recurrent episodes of wheezing, shortness of breath, and coughing. Asthma symptoms are triggered by a variety of environmental factors: allergens like pollens and cockroaches or irritants like tobacco smoke and air pollution. These environmental asthma triggers cause inflammation, obstruction, and constriction of the lungs' airways making it difficult—and sometimes impossible—to breathe. Reducing or eliminating exposure to these triggers can improve a patient's ability to manage their asthma symptoms.

Although there is a broad array of evidence-based interventions to address asthma triggers, many people with asthma continue to be exposed to the factors that make their asthma worse. School-based health centers (SBHCs) are uniquely positioned to address this gap in order to help children breathe easier. While many SBHCs across the country are already playing a key role in helping students manage their asthma by providing quality clinical care and education, there is an opportunity for SBHCs to also be leaders in managing the environmental factors that make asthma worse. This guide describes the types of interventions that SBHC staff can initiate or support to reduce exposure to environmental asthma triggers.

Asthma in the United States

Today approximately 7 million children under the age of 18 in the U.S. have asthma and low-income and minority children suffer a greater burden of the disease.[1] Asthma is the most common cause of disability among children in the U.S. and is the leading cause of school absences due to chronic disease. Despite advances in diagnosis and treatment, as well as increased attention to prevention, asthma prevalence has been rising for several decades[2] impacting nearly 1 out of 10 children in 2011.[3]

We do not yet know how to prevent or cure asthma but costly sick days, hospitalizations, and emergency room use due to asthma are largely preventable. The best practice guidelines, developed by the National Asthma Education and Prevention Program, describe four vital components of asthma management:

- Assessment of disease severity and control
- Comprehensive pharmacologic therapy
- Patient education
- Environmental control measures to avoid or eliminate factors that contribute to asthma onset and severity

This guide focuses primarily on the fourth component: environmental control measures. We know that many environmental triggers have been implicated in causing or worsening asthma. Even children with the best clinical management will continue to suffer asthma attacks if continuously exposed to triggers at school, in their homes, and in their communities. Fortunately, there are a number of evidence-based interventions that can be implemented to reduce exposure to environmental asthma triggers.

Asthma disparities

Asthma can affect children of all ages, races, and ethnic groups. However, asthma disproportionately affects minority children and children living below the national poverty line.[4] SBHCs are in a unique position to address some of the underlying causes of these health disparities.

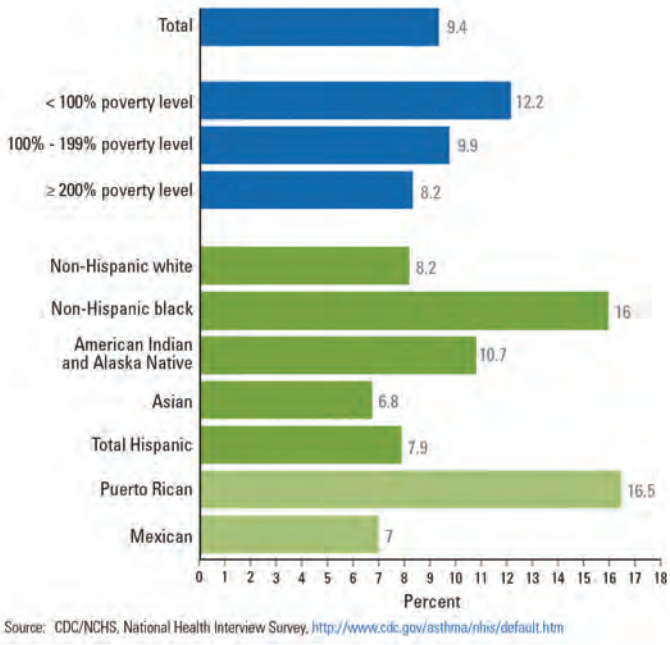
The graphic, from the Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities, shows significant disparities in asthma prevalence across income level and racial and ethnic groups. In addition to the disparities in prevalence shown in the diagram, there are significant disparities in asthma outcomes, such as: measures of asthma control, exacerbation of symptoms, quality of life, health care utilization, and death.[5] As just one example: black children are twice as likely to be hospitalized and four times as likely to die from asthma as white children.[6]

The distribution of asthma according to race and socio-economic status is influenced by larger inequalities in society.[7] Take health care: people of color make up the majority of uninsured Americans.[8] Even among those with access to health care, people of color experience disparities in care when compared to that received by whites.[9] African Americans and Latinos are less likely to receive appropriate asthma medications for preventive care, acute exacerbations, or post-emergency department care.[10] These differences in quality of care and treatment methods lead to consistently poorer health outcomes among people of color.[11] School-based health centers can address this gap by providing high quality health care for underserved students.

There are also significant inequities in exposure to environmental risks, both indoors and outdoors. Molds, rodents, and cockroaches are asthma triggers associated with physically deteriorating housing, schools, and child care settings—deterioration which is more common in low-income communities and communities of color. Similarly, outdoor air pollution is higher among African American and Latino communities due to the proximity of ports, freeways, and other polluting facilities.[12]

By becoming aware of and challenging the social and economic policies at the root of these inequities, it becomes possible to reduce disparities in access to quality clinical care and support for asthma management as well as disparities in exposure to environmental asthma triggers.

Current Asthma Prevalence Among Children, by percent of total population of 0 to 17 year olds, United States, 2007–2010



Source: CDC/NCHS, National Health Interview Survey, http://www.cdc.gov/asthma/nhis/default.htm

The important role of school-based health centers

School-based health centers (SBHCs) can take action to help children breathe easier. There are 2,200 school-based health centers (SBHCs) throughout the country serving an ethnically diverse population of more than two million children, primarily in low-income areas. Nearly 90% of these SBHCs offer chronic disease management, including asthma.

Research shows that SBHC users are less likely to visit the ER or to be hospitalized for asthma[13,14] and that when children with asthma have access to a SBHC fewer resources are spent on emergency department visits and hospitalizations.[15] As a result of receiving better care SBHC users with asthma are less likely to have asthma-related restricted activity days[16] and are less likely to miss school as a result of their asthma.[17]

In addition to providing quality clinical care and education, there is an opportunity for SBHCs to also be leaders in managing the environmental factors that make asthma worse. SBHCs can capitalize on their location in the school setting and their regular contact with students and parents to effectively reduce environmental asthma triggers. SBHCs provide an ideal setting in which to incorporate environmental components into existing chronic disease programs and can leverage the strong relationships the providers have with their patient population while building on their role as a strong link between the student, school, and home.

The guide

The purpose of this guide is to support SBHC staff in leading or supporting evidence-based strategies and promising practices to reduce exposure to environmental asthma triggers. The next section describes the relationship between asthma and a number of environmental asthma triggers and shares scientific evidence that SBHC staff can cite when educating others on the need to address environmental asthma triggers. The following five sections each tackle a strategy, or broad category of intervention, that SBHC staff could lead or support. They include:

Education

Case Management

Improving Indoor Air Quality in Schools

Improving the Students' Home Environments

Improving Outdoor Air Quality around the School and Community

Each section will provide an overview of the type of intervention, point to specific tools and resources, and suggest how SBHC staff can lead or support implementation. The array of interventions is intended to serve as a "menu" from which SBHC staff can choose depending on their interests, resources, and the particular needs of their student population. Be sure to check out the **At-A-Glance** near the back of the guide. While a comprehensive approach that works across settings and utilizes multiple strategies is likely most effective for reducing the burden of asthma, any step that SBHCs can take to reduce exposure to environmental asthma triggers will help students breathe easier. Reading this guide is the first step!

There is an opportunity for SBHCs to be leaders in managing the environmental factors that make asthma worse.

Asthma and Environmental Triggers

Environmental control measures which aim to avoid or eliminate factors that contribute to asthma onset and severity, are a vital component of effective asthma management. These factors, called "triggers," are things that can cause asthma symptoms, cause an episode or attack, or make asthma worse. There are a number of environmental factors that are asthma triggers, from allergens like pollens and cockroaches to irritants like tobacco smoke and air pollution. Reducing exposure to these environmental asthma triggers is essential for effective asthma management.

The table beginning on the next page provides an overview of many environmental asthma triggers and outlines scientific evidence that SBHC staff can cite when educating others on the need to address environmental asthma triggers. The table also describes where each environmental asthma trigger is commonly found so that SBHC staff can consider the best setting in which to implement an intervention.

There are some important considerations when discussing environmental asthma triggers:

- Environmental asthma triggers are generally divided into two categories: allergens, which are substances that can cause an allergic reaction, and irritants, which are substances that irritate the lungs. Allergens cause the body to mount an inappropriate immune response to a benign protein or allergen. Allergic reactions are caused by the body's own immune system. An irritant is a substance that causes inflammation and discomfort in the body. This reaction is *not* primarily a result of the body's immune system. An allergic reaction requires prior sensitization, whereas an irritant does not. The table on the following pages provides examples of each.
- It is important to distinguish between exacerbation and causation. Environmental asthma triggers, by definition, can trigger asthma symptoms or make asthma worse (exacerbation). Some environmental asthma triggers may also increase a child's risk of developing asthma (causation). Examples in which the scientific literature has demonstrated or suggested causation (that is, the trigger can lead to new onset of the disease) are included in the table. Keep in mind that scientific knowledge is constantly evolving so the information in this table represents research published at this point in time.
- Another important consideration is that people with asthma may react to just one trigger or they may find that several things act as triggers. It varies from one person to the next.

TRIGGER	DESCRIPTION	IMPACT ON ASTHMA	COMMON LOCATION AND CONTRIBUTING FACTORS
ALLERGENS			
Mold and moisture	Molds are microscopic fungi that live on plant and animal matter. Molds create tiny spores to reproduce just as plants produce seeds. Mold spores float through the indoor and outdoor air continually. When mold spores land on damp places indoors they may begin to grow.	Mold spores and bacteria found in the air, in settled dust, on surfaces, or behind walls have been significantly associated with increased prevalence of respiratory symptoms and decreased lung function among children with asthma.[18,19,20,21,22] There is also evidence of a relationship between exposure to mold and the development of asthma in children.[23,24]	Molds can be found almost anywhere when moisture is present. Excessive moisture from leaks, condensation, or other water damage often leads to mold growth in both homes and schools. Moisture-related problems can result from leaks or condensation under sinks, in roofs, under floors, or behind walls. Mold and bacteria problems are worse in certain conditions, such as when there is moisture damage, condensation, or higher indoor humidity. *For more information on how to address this trigger, go to sections on Homes and Schools.*
Dust mites	Dust mites are tiny bugs that are too small to see. Body parts and droppings from dust mites can trigger asthma in individuals with allergies to dust mites.	Dust mites have been consistently associated with both allergic sensitization and increased asthma symptom prevalence and severity, especially when there is inadequate ventilation and higher humidity.[25,26,27,28] Dust in schools has been associated with increases in allergic sensitization, asthma symptoms, and asthma medication use.[29,30,31] Exposure to dust mites can cause asthma in children who have not previously exhibited asthma symptoms.[32]	Every home and school has dust mites. They feed on human skin flakes. Allergens and toxins can collect in dust on surfaces in classrooms and homes. In homes they are found in mattresses, pillows, carpets, upholstered furniture, stuffed toys, fabric and fabric-covered items. In schools, dust is found on surfaces like bookcases and smooth flooring, as well as in carpets, rugs, curtains, and upholstered furniture. Studies have reported that allergen levels in dust were higher in carpets and rugs than on smooth floors.[33,34] *For more information on how to address this trigger, go to sections on Homes and Schools.*
Cock-roaches and rodents	Droppings or body parts of cockroaches and other pests can trigger asthma. Certain proteins are found in cockroach feces and saliva and can cause allergic reactions or trigger asthma symptoms in some individuals.	Cockroach and rodent (mouse, rat) allergens have been linked to increased asthma symptom prevalence and severity.[35,36,37] There is also evidence suggesting a causal relationship between cockroach allergens and asthma.[38]	Pest infestations can be found at both homes and schools. Food and water sources may be important factors for the proliferation of cockroaches. Humidity is also an important factor for cockroach allergens. [39] *For more information on how to address this trigger, go to sections on Homes and Schools.*

TRIGGER	DESCRIPTION	IMPACT ON ASTHMA	COMMON LOCATION AND CONTRIBUTING FACTORS
Pets	Proteins in pets' urine, feces, saliva, skin flakes, and fur can trigger asthma.	Dogs, cats, rodents (including hamsters and guinea pigs) and other warm-blooded mammals can trigger asthma in individuals with an allergy to animal dander.[40] There is consistent evidence that both cat and dog exposure is related to asthma exacerbations among sensitized individuals.[41,42] There is some evidence of a causal relationship between cat allergen and asthma in sensitized individuals.[43]	Home or classroom pets can lead to pet allergen exposure. Allergens from dogs, cats, and other furry pets can collect in dust on smooth floors, upholstered furniture, and especially on carpets or rugs. *For more information on how to address this trigger, go to sections on Homes and Schools.*
Pollen	Pollen is a very fine powder released by trees, weeds and grasses. It is carried to another plant of the same kind, to fertilize the forerunner of new seeds.	Pollen is a trigger for many people who have asthma. The types of pollens that are triggers vary from person to person and from region to region. Plants that may trigger asthma include: some trees, grasses, and weeds—particularly ragweed.[44]	On hot, dry, windy days more pollen is in the air. Different plants produce pollen at different times of the year. Most trees produce pollen in the spring. Grasses usually produce pollen during the late spring and summer. Ragweed and other late-blooming plants produce pollen during late summer and early fall.[45] *For more information on how to address this trigger, go to the section on Outdoor Air Quality.*

TRIGGER	DESCRIPTION	IMPACT ON ASTHMA	COMMON LOCATION AND CONTRIBUTING FACTORS
IRRITANTS / POLLUTANTS			
Environmental Tobacco Smoke	Environmental tobacco smoke (or secondhand smoke) is the smoke from a cigarette, cigar or pipe, and the smoke exhaled by a smoker.	Exposure to tobacco smoke has consistently been shown to increase both allergic sensitization and subsequent asthma attacks.[46,47,48,49] This is true for people who smoke tobacco as well as for those exposed to environmental tobacco smoke both in utero and in childhood. In addition, exposure to environmental tobacco smoke has been linked with the development of asthma in infants and young children.[50,51]	Children can be exposed to secondhand smoke anywhere others are smoking (homes, cars, parks, schools without smoke-free policies) and at multi-unit housing where smoking is permitted. Tobacco smoke from neighboring units or common areas can infiltrate into their homes. *For more information on how to address this trigger, go to the section on Homes.*
Chemical irritants from personal, consumer, household, and school products	Volatile Organic Compounds (VOCs), are respiratory irritants emitted into the air by cleaning products, building and interior finish materials, furnishings, and some teaching supplies such as paints and markers.[52,53]	Exposure to VOCs in classrooms and other indoor environments has been linked to exacerbation of asthma and other respiratory symptoms.[54,55] These chemicals often react with indoor ozone to have further negative health impacts.[56]	A wide range of products commonly found in classrooms across the country contain VOCs, including: cleaning products, paints, dry erase markers, furnishings, and building materials. Home and personal products including scented products like perfumes, incense, candles, laundry products, and scented personal care products can be respiratory irritants. *For more information on how to address this trigger, go to sections on Homes and Schools.*
Cleaning products	Cleaning products are chemical irritants that are particularly relevant to SBHCs due to their ongoing use in both schools and homes.	Several studies confirm that occupational and home use of conventional cleaning products is associated with increased risk of asthma development.[57,58,59] Cleaning products that contain bleach or are lemon or pine-scented are of particular concern because they are common and because they emit chemicals that have been linked with respiratory symptoms and asthma.[60,61,62]	A wide range of cleaning products that emit chemicals linked to respiratory symptoms can be found in both schools and homes. *For more information on how to address this trigger, go to sections on Homes and Schools.*

TRIGGER	DESCRIPTION	IMPACT ON ASTHMA	COMMON LOCATION AND CONTRIBUTING FACTORS
Pesticides	While, as noted above, pests pose significant health risks to those with asthma, there is increasing concern about the risks of exposure to the pesticides used to exterminate those pests.	Many pesticides are respiratory irritants and studies suggest that pesticide exposures may play a role in triggering asthma attacks, exacerbating symptoms, or heightening the overall risk of developing asthma.[63]	Pesticide residues may be found in schools or homes where pesticides have been used. *For more information on how to address this trigger, go to sections on Homes and Schools.*
Gas stoves and space heaters	Space heaters, furnaces, and gas stoves can emit nitrogen dioxide (NO_2), a common outdoor air pollutant.	Exposure to NO_2 indoors increases the likelihood, frequency, and severity of asthma symptoms.[64,65]	Many homes contain appliances such as space heaters, furnaces, and gas stoves that burn fuels like gas and kerosene. *For more information on how to address this trigger, go to the section on Homes.*
Wood smoke	Smoke from wood-burning stoves and fireplaces contain a mixture of harmful gases and small particles.	Breathing small particles from wood-burning can cause asthma attacks.[66]	Wood smoke exposure can occur in the home where wood is burned and outdoors. *For more information on how to address this trigger, go to the sections on Homes and Outdoor Air Quality.*
Outdoor air pollution (ozone, particulate matter, nitrogen dioxide, and sulfur dioxide)	Scientific studies have found strong relationships between asthma and four outdoor air pollutants: ozone (O_3), which is the chief component of urban smog; particulate matter (PM), which is a heterogeneous mixture of small solid or liquid particles that can be inhaled; nitrogen dioxide (NO_2), which is a brownish, acidic gas that reacts with other gases to form ozone; and sulfur dioxide (SO_2), which is formed by burning sulfur-containing fuels such as coal and oil.	These air pollutants cause the following asthma-related outcomes in young children and adolescents: reduced lung function and increased inflammation, an increase in asthma symptoms, increased hospitalization and ED visits, and missed school days.[67,68,69] In addition to exacerbating asthma, outdoor air pollution has been implicated in the development of new asthma cases.[70,71,72]	These pollutants are all found in the outdoor air and are linked to the sources described below. Ambient O_3 is formed by the reaction of sunlight with nitrogen oxides and hydrocarbons, both of which are emitted by motor vehicles and industrial sources. Fine particles ($PM_{2.5}$) are generated by combustion processes including diesel powered engines, power generation, and wood burning. Larger particles (PM_{10}) come from dust produced by construction, mining, and agricultural activities. The particles can also include dirt, soot, smoke, and even liquid droplets (aerosols) emitted from factory smokestacks and other sources. $PM_{2.5}$ penetrates deeper into the lung than does PM_{10}, potentially causing more severe adverse health effects.[73] NO_2 sources include fuel emissions from cars, trucks, and power plants. SO_2 sources include steel mills and paper mills. *For more information on how to address this trigger, go to the section on Outdoor Air Quality.*

The following sections recap the common triggers and then dive into the array of interventions designed to reduce exposure to those triggers.

Strategy 1: Education

Overview of the strategy

Patient and family education is an essential strategy for the management of asthma. The National Asthma Education and Prevention Program Expert Panel, which developed the national best practice guidelines, found abundant scientific evidence that asthma education programs reduce urgent care visits and hospitalizations and improve overall health status.[74] The Expert Panel states: "Asthma self-management education should be integrated into all aspects of asthma care, and it requires repetition and reinforcement." The Panel further states: "With the support of clinicians, effective educational interventions should be provided at points of care outside the traditional health care setting, including schools."

While many clinical providers may already educate patients about the basic facts of asthma, proper use of medication, and self-management skills, the Expert Panel also recommends education about actions to reduce exposure to environmental asthma triggers. This recommendation provides an opportunity for SBHC staff to incorporate education about controlling environmental exposures into their existing one-on-one asthma education protocols and/or to support group education programs that include a component on environmental exposures. There can also be an important role for SBHC staff in educating school staff.

What are some of the most important environmental asthma triggers to address?

As you read this chapter use the **trigger table** as a reference. Often times, the presence of asthma triggers results from the behaviors of individuals with the best of intentions. Teachers may not realize that the cozy reading nook is a significant source of dust mites. Parents may not realize that their scented laundry detergent may be triggering their child's asthma. Students may not realize that cuddling with the classroom pet could make their asthma worse. Providing education through an array of activities described in this chapter can go a long way in changing the behaviors that increase exposure to environmental asthma triggers.

There are some environmental asthma triggers, such as outdoor air pollution, that cannot be reduced through education and behavior change alone. Even so, educating students and staff about all of the asthma triggers in the trigger table is important for increasing awareness and may ultimately lead to some of the advocacy strategies discussed later in this guide.

What are the types of interventions within the topic of Education that can reduce exposure to environmental asthma triggers?

This section includes information about four approaches to education:

- Conduct **one-on-one education** about environmental asthma triggers during patient visits
- Conduct, organize, or support school-based **group education for students**
- Provide **education for school staff**
- Print/order and distribute **materials, tools, and curricula** for educating students, families and school staff

Conduct one-on-one education about environmental asthma triggers during patient visits

One-on-one education should be a core component of any asthma related encounter at a SBHC. Just as clinicians educate patients about symptoms and medication, they should also provide education on environmental asthma triggers. The Expert Panel recommends that a partnership between the patient and clinician be established to promote effective asthma management. This requires that clinicians promote open communication and ensure that patients have a basic and accurate foundation of knowledge about asthma, understand the treatment approach, and have the self-management skills necessary to effectively manage their asthma, including skills to reduce exposure to environmental triggers.

Just as clinicians educate patients about symptoms and medication, they should also provide education on environmental asthma triggers.

GENERAL COMPONENTS OF ONE-ON-ONE ASTHMA EDUCATION

The following is a list of key educational messages that the national guidelines recommend be taught and reinforced at every opportunity. Those related to exposure of environmental asthma triggers are highlighted. [The full guidelines can be found at http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines/full-report.]

FIGURE 3–12. KEY EDUCATIONAL MESSAGES: TEACH AND REINFORCE AT EVERY OPPORTUNITY

Basic Facts About Asthma

- The contrast between airways of a person who has and a person who does not have asthma; the role of inflammation
- What happens to the airways in an asthma attack

Roles of Medications: Understanding the Difference Between:

- Long-term-control medications: prevent symptoms, often by reducing inflammation. Must be taken daily. Do not expect them to give quick relief.
- Quick-relief medications: short-acting beta$_2$-agonists relax muscles around the airway and provide prompt relief of symptoms. Do not expect them to provide long-term asthma control. Using quick-relief medication on a daily basis indicates the need for starting or increasing long-term control medications.

Patient Skills

- Taking medications correctly
  - Inhaler technique (demonstrate to patient and have the patient return the demonstration)
  - Use of devices, such as prescribed valved holding chamber (VHC), spacer, nebulizer
- Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke
- Self-monitoring to:
  - Assess level of asthma control
  - Monitor symptoms and, if prescribed, peak flow
  - Recognize early signs and symptoms of worsening asthma
- Using written asthma action plan to know when and how to:
  - Take daily actions to control asthma
  - Adjust medication in response to signs of worsening asthma
  - Seek medical care as appropriate

Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke

The guidelines recommend a plan for how education can be delivered across initial patient visits and follow-up visits:

"Are there things in your environment that make your asthma worse?"

Relevant environmental control/ avoidance strategies:

- How to identify home, work, or school exposures that can worsen asthma
- How to control house-dust mites, animal exposures if applicable
- How to avoid cigarette smoke (active and passive)

"Have you noticed anything in your home, work, or school that makes your asthma worse?"

"Have you noticed anything in your environment that makes your asthma worse?"

"Have you tried to control things that make your asthma worse?"

FIGURE 3–13. DELIVERY OF ASTHMA EDUCATION BY CLINICIANS DURING PATIENT CARE VISITS

Assessment Questions	Information	Skills
Recommendations for Initial Visit		
Focus on: ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life "What worries you most about your asthma?" "What do you want to accomplish at this visit?" "What do you want to be able to do that you can't do now because of your asthma?" "What do you expect from treatment?" "What medicines have you tried?" "What other questions do you have for me today?" "Are there things in your environment that make your asthma worse?"	**Teach in simple language:** ■ What is asthma? Asthma is a chronic lung disease. The airways are very sensitive. They become inflamed and narrow; breathing becomes difficult. ■ The definition of asthma control: few daytime symptoms, no nighttime awakenings due to asthma, able to engage in normal activities, normal lung function. ■ Asthma treatments: two types of medicines are needed: — Long-term control: medications that prevent symptoms, often by reducing inflammation. — Quick relief: short-acting bronchodilator relaxes muscles around airways. ■ Bring all medications to every appointment. ■ When to seek medical advice. Provide appropriate telephone number.	**Teach or review and demonstrate:** ■ Inhaler (see figure 3–14) and spacer or valved holding chamber (VHC) use. Check performance. ■ Self-monitoring skills that are tied to a written action plan: — Recognize intensity and frequency of asthma symptoms. — Review the signs of deterioration and the need to reevaluate therapy: ♦ Waking at night or early morning with asthma ♦ Increased medication use ♦ Decreased activity tolerance ■ Use of a written asthma action plan (See figure 3–10.) that includes instructions for daily management and for recognizing and handling worsening asthma.
■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life Ask relevant questions from previous visits and also ask: "Have you noticed anything in your home, work, or school that makes your asthma worse?" "Describe for me how you know when to call your doctor or go to the hospital for asthma care." "What questions do you have about the asthma action plan?" "Can we make it easier?" "Are your medications causing you any problems?" "Have you noticed anything in your environment that makes your asthma worse?" "Have you missed any of your medications?"	■ Self-assessment of asthma control, using symptoms and/or peak flow as a guide. ■ Relevant environmental control/avoidance strategies: — How to identify home, work, or school exposures that can cause or worsen asthma — How to control house-dust mites, animal exposures if applicable — How to avoid cigarette smoke (active and passive) ■ Review all medications.	■ Inhaler/spacer or VHC technique. ■ Peak flow monitoring technique. ■ Use of written asthma action plan. Review and adjust as needed. ■ Confirm that patient knows what to do if asthma gets worse.
Recommendations for All Subsequent Visits		
Focus on: ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life Ask relevant questions from previous visits and also ask: "How have you tried to control things that make your asthma worse?" "Please show me how you use your inhaled medication."	**Teach in simple language:** ■ Review and reinforce all: — Educational messages — Environmental control strategies at home, work, or school — Medications — Self-assessment of asthma control, using symptoms and/or peak flow as a guide	**Teach or review and demonstrate:** ■ Inhaler/spacer or VHC technique. ■ Peak flow monitoring technique, if appropriate. ■ Use of written asthma action plan. Review and adjust as needed. ■ Confirm that patient knows what to do if asthma gets worse.

- Environmental control strategies at home, work, or school

Sources: Adapted from Guevara et al. 2003; Janson et al. 2003; Powell and Gibson 2003; Wilson et al. 1993.

ENVIRONMENTAL COMPONENTS OF ONE-ON-ONE EDUCATION

As demonstrated by the highlighted sections on the two previous pages, one essential component of education is teaching relevant environmental control/avoidance strategies. SBHC clinicians can:

- **Teach** how environmental asthma triggers can make asthma worse as well as how to recognize both immediate and delayed reactions.
- **Teach** patients strategies for reducing exposure to environmental asthma triggers to which they are sensitive from their homes. The section on Improving the Students' Home Environment contains many strategies that SBHC staff can share with their patients.
- **Educate** teachers and other school staff about removing allergens and irritants to which they are sensitized from the classrooms.
- **Make it clear** to your patients that they can help prevent asthma episodes by staying away from things that make their asthma worse. They need to first find out what makes their asthma worse as what triggers asthma for some people does not for others.

Regarding that final point, there are numerous tools available that list potential asthma triggers. Clinicians can talk with their patients about their asthma history and then check-off those things that make the patient's asthma worse. Simple strategies for reducing those triggers are also listed. One example is the trigger list included in RAMP's Asthma Action Plan, available in four different languages at http://rampasthma.org/info-resources/asthma-action-plans/.

Controlling Things That Make Asthma Worse

❑ **SMOKE**

- Do not smoke. Attend classes to help stop smoking.
- Do not allow smoking in the home or car. Remaining smoke smell can trigger asthma.
- Stay away from people who are smoking.
- If you smoke, smoke outside.

❑ **DUST**

- Vacuum weekly with a vacuum with a high efficiency filter or a central vacuum. Try to make sure people with asthma are not home during vacuuming.
- Remove carpet if possible. Wet carpet before removing and then dry floor completely.
- Damp mop floors weekly.
- Wash bedding and stuffed toys in hot water every 1-2 weeks. Freeze stuffed toys that aren't washable for 24 hours.
- Cover mattresses and pillows in dust-mite proof zippered covers.
- Reduce clutter and remove stuffed animals, especially around the bed.
- Replace heating system filters regularly.

❑ **PESTS**

- Do not leave food or garbage out. Store food in airtight containers.
- Try using traps and poison baits, such as boric acid for cockroaches. Instead of sprays/bombs, use baits placed away from children, such as behind refrigerator.
- Vacuum up cockroach bodies and fill holes in with caulking or copper wool.
- Fix leaky plumbing, roof, and other sources of water.

❑ **MOLD**

- Use exhaust fans or open windows for cross ventilation when showering or cooking.
- Clean mold off hard surfaces with detergent in hot water and scrub with stiff brush or cleaning pad, then rinse clean with water. Absorbent materials with mold may need to be replaced.
- Make sure people with asthma are not in the room when cleaning.
- Fix leaky plumbing or other sources of water or moisture.

❑ **ANIMALS**

- Consider not having pets. Avoid pets with fur or feathers.
- Keep pets out of the bedroom of the person with asthma.
- Wash your hands and the hands of the person with asthma after petting animals.

❑ **ODORS/SPRAYS**

- Avoid using strongly scented products, such as home deodorizers and incense, and perfumed laundry products and personal care products.
- Do not use oven/stove for heating.
- When cleaning, keep person with asthma away and don't use strong smelling cleaning products.
- Avoid aerosol products.
- Avoid strong or extra strength cleaning products.
- Avoid ammonia, bleach, and disinfectants.

❑ **POLLEN AND OUTDOOR MOLDS**

- Try to stay indoors when pollen and mold counts are high.
- Keep windows closed during pollen season.
- Avoid using fans; use air conditioners.

❑ **COLDS/FLU**

- Keep your body healthy with enough exercise and sleep.
- Avoid close contact with people who have colds.
- Wash your hands frequently and avoid touching your hands to your face.
- Get an annual flu shot.

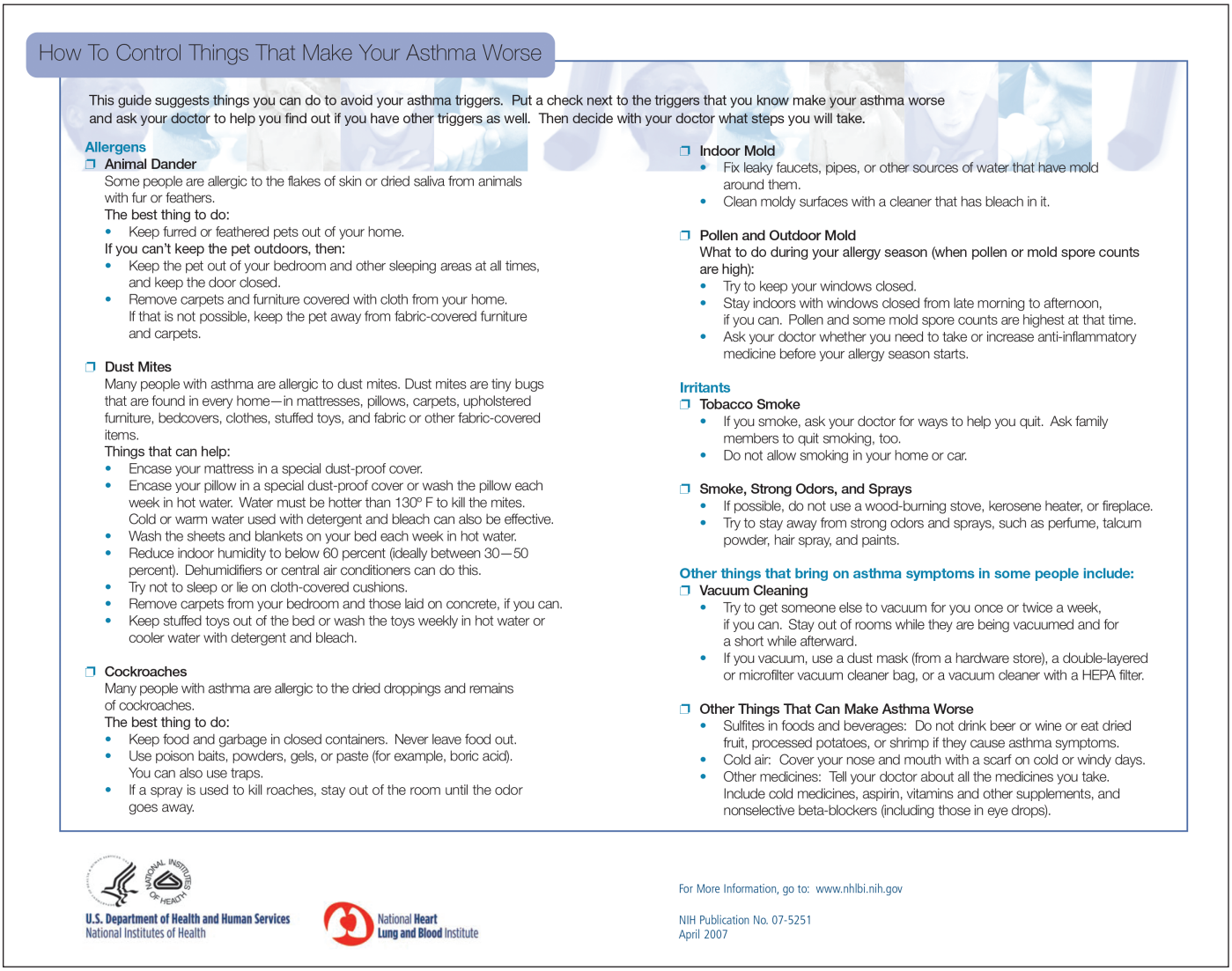
❑ **WEATHER AND AIR POLLUTION**

- If cold air is a problem, try breathing through your nose rather than your mouth and covering up with a scarf.
- Check for Spare the Air days and nights and avoid strenuous exercise at those times.
- On very bad pollution days, stay indoors with windows closed.

❑ **EXERCISE**

- Warm up before exercising.
- Plan alternate indoor activities on high pollen or pollution days.
- If directed by physician, take medication before exercise. (See Green Zone of Asthma Action Plan.)

Another example is the asthma action plan developed by the National Heart Lung and Blood Institute: http://www.nhlbi.nih.gov/files/docs/public/lung/asthma_actplan.pdf



How To Control Things That Make Your Asthma Worse

This guide suggests things you can do to avoid your asthma triggers. Put a check next to the triggers that you know make your asthma worse and ask your doctor to help you find out if you have other triggers as well. Then decide with your doctor what steps you will take.

Allergens

❒ **Animal Dander**

Some people are allergic to the flakes of skin or dried saliva from animals with fur or feathers.

The best thing to do:

- Keep furred or feathered pets out of your home.

If you can't keep the pet outdoors, then:

- Keep the pet out of your bedroom and other sleeping areas at all times, and keep the door closed.
- Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet away from fabric-covered furniture and carpets.

❒ **Dust Mites**

Many people with asthma are allergic to dust mites. Dust mites are tiny bugs that are found in every home—in mattresses, pillows, carpets, upholstered furniture, bedcovers, clothes, stuffed toys, and fabric or other fabric-covered items.

Things that can help:

- Encase your mattress in a special dust-proof cover.
- Encase your pillow in a special dust-proof cover or wash the pillow each week in hot water. Water must be hotter than 130° F to kill the mites. Cold or warm water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.
- Reduce indoor humidity to below 60 percent (ideally between 30—50 percent). Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed or wash the toys weekly in hot water or cooler water with detergent and bleach.

❒ **Cockroaches**

Many people with asthma are allergic to the dried droppings and remains of cockroaches.

The best thing to do:

- Keep food and garbage in closed containers. Never leave food out.
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.
- If a spray is used to kill roaches, stay out of the room until the odor goes away.

❒ **Indoor Mold**

- Fix leaky faucets, pipes, or other sources of water that have mold around them.
- Clean moldy surfaces with a cleaner that has bleach in it.

❒ **Pollen and Outdoor Mold**

What to do during your allergy season (when pollen or mold spore counts are high):

- Try to keep your windows closed.
- Stay indoors with windows closed from late morning to afternoon, if you can. Pollen and some mold spore counts are highest at that time.
- Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts.

Irritants

❒ **Tobacco Smoke**

- If you smoke, ask your doctor for ways to help you quit. Ask family members to quit smoking, too.
- Do not allow smoking in your home or car.

❒ **Smoke, Strong Odors, and Sprays**

- If possible, do not use a wood-burning stove, kerosene heater, or fireplace.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

Other things that bring on asthma symptoms in some people include:

❒ **Vacuum Cleaning**

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you vacuum, use a dust mask (from a hardware store), a double-layered or microfilter vacuum cleaner bag, or a vacuum cleaner with a HEPA filter.

❒ **Other Things That Can Make Asthma Worse**

- Sulfites in foods and beverages: Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other medicines: Tell your doctor about all the medicines you take. Include cold medicines, aspirin, vitamins and other supplements, and nonselective beta-blockers (including those in eye drops).

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National Institutes of Health

National Heart Lung and Blood Institute

For More Information, go to: www.nhlbi.nih.gov

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COMMUNICATION FOR EFFECTIVE ONE-ON-ONE EDUCATION

Agreement on short and long term goals between the clinician and patient is a key component to building a strong relationship. If the SBHC is not the patient's primary provider, find out if the primary provider and patient have already established treatment goals. If the SBHC is the primary provider then staff can:

- **Ask** how asthma interferes with the patient's life (e.g. inability to sleep through the night, play a sport, etc.) and incorporate responses into personal treatment goals.
- **Share** the general goals of asthma treatment with the patient and family. Examples of goals include for the patient to: be free from troublesome symptoms day and night, including sleeping through the night; be able to participate fully in any activities of their choice; not miss school because of asthma symptoms; avoid urgent care visits or hospitalizations for asthma.

- **Agree** on goals of the treatment. The clinician, the patient, and the patient's family should agree on the goals of asthma management.
- **Ensure** that the patient has a written asthma action plan being sure to use one that includes actions to reduce exposure to environmental asthma triggers.
- **Assess** and **encourage** adherence during all visits. In order to encourage adherence:
  - Assess the patient's level of social support and encourage family involvement. Encourage patients to identify an asthma "partner" among their family or friends who is willing to be educated and provide support. When working with children it is very important to educate parents or other caregivers as partners in asthma management.
  - Assess levels of stress, family disruption, anxiety, or depression and, when appropriate, refer the patient or caregiver to a psychologist, social worker, other licensed professional, or local support group.
- **Tailor** education to the needs of the individual patient. Any program needs to be culturally relevant for providers and patients. Cultural competency is the provider's ability to work effectively in situations where the language, customs, beliefs, or values of the provider differ from that of the patient. An awareness of these different beliefs among ethnic groups, along with an awareness that diversity also exists within ethnic groups, can improve communication. The University of California, San Francisco and RAMP partnered to create a module on cultural competency for the Physician Asthma Care Education Program, which can be found here: http://campuslifeservices.ucsf.edu/upload/chipper/documents/UCSF_RAMP_APPUC_Manual.pdf
- Educational efforts should be continuous in order to **reinforce** key messages.

The importance of an Asthma Action Plan

The Expert Panel recommends that clinicians provide to all patients who have asthma a written asthma action plan that includes instructions for daily management and recognizing and handling worsening asthma including adjustment in medication dosage. The plan should be reviewed and refined at follow-up visits. The asthma action plan also provides a very important opportunity to identify asthma triggers and discuss approaches for reducing exposure to those triggers. Several asthma action plans, including the one developed by RAMP (http://rampasthma.org/info-resources/asthma-action-plans/), include trigger information which is important for ensuring that the provider, patient, and family all see environmental control measures as an essential component of effective asthma management. It is also helpful to share a copy of the Asthma Action Plan with a point person at the school site such as the student's teacher or a school nurse.

Conduct, organize, or support school-based group education for students

In addition to providing one-on-one education, SBHC staff can conduct, organize, or otherwise support school-based group education for students. There are numerous school-based asthma education programs that have been evaluated and shown to be effective in improving knowledge, reducing missed school days, reducing asthma symptoms, and improving health outcomes. Some programs have been used and/or adapted widely whereas others target specific age groups within a school-aged population or a specific geographic area. Some target only students diagnosed with asthma whereas others provide asthma education to all students attending the school. Below we describe some school-based asthma education programs that have been evaluated with positive findings. The list is not exhaustive but is intended to show the range of options and to provide a starting point for SBHCs wishing to implement a group education program.

EDUCATIONAL PROGRAMS FOR ELEMENTARY SCHOOLS

Asthma Awareness Curriculum for the Elementary Classroom: This teaching tool was developed by the National Heart Lung and Blood Institute for use with elementary school children. The lessons are easily integrated into a comprehensive health education curriculum and/or into science as it relates to body systems and the environment. They can also be integrated into social sciences as they relate to getting along with others and learning about community resources. The lessons include suggestions for math, art, and language arts activities. There are two lessons for grades K–3 and two lessons for 4–6, each requiring about 30 minutes per session. The lessons are designed to: develop a basic understanding of asthma and help correct misinformation; inform students about

appropriate actions that can help people with asthma; and provide resources to share with parents and other family members. For more information, visit: http://www.nhlbi.nih.gov/health-pro/resources/lung/asthma-curriculum-elementary-class/contents.

Fight Asthma Now (FAN) for Youth: Through FAN programs, asthma educators use engaging and active lesson plans to give children the tools and knowledge they need to identify and avoid triggers, manage asthma episodes, and control asthma on a long-term basis. FAN for Youth is intended for children in third through sixth grades. The program is broken into three 60-minute sessions or four 45-minute sessions and the structure of the program allows trainers to teach at the children's learning pace. For more information, visit: http://www.lungchicago.org/fight-asthma-now/.

Open Airways for Schools (OAS): This school-based curriculum educates and empowers children through a fun and interactive approach to asthma self-management. It teaches children with asthma ages 8–11 how to detect the warning signs of asthma, avoid their triggers, and make decisions about their health. OAS is also designed to raise asthma awareness among parents/guardians and to promote coordination between physicians, parents, and school officials. OAS is taught by a

trained facilitator who can be school personnel, parents, community volunteers, or anyone interested in helping children learn about asthma. The American Lung Association offers training for those who are interested in becoming facilitators. For more information, visit: www.lung.org.

Roaring Adventures of Puff (RAP): This childhood asthma education program targets children with asthma ages 7 to 11 years of age and their families. RAP is adaptable to a variety of settings and is most commonly delivered by health care professionals in a group setting. Although usually delivered over six sessions, the creators also suggest alternative settings and timing with a discussion about advantages and disadvantages of each option. Planning tools, presentation examples, evaluation measures, communication tools, and best-practice resources are all included and are updated regularly. One of the six sessions is "What Makes Your Asthma Worse?" and includes information about trigger identification, control, and avoidance. RAP instructors use a detailed instructor's manual, lesson checklists, and other materials outlining the course content and the specific learning goals for each session. Each session is interactive, with teaching strategies including puppetry, games, role-play, model building, discussions, and asthma diary recording. For more information, visit: http://www.educationforasthma.com/.

You Can Control Asthma: This research-validated asthma education program was designed to educate children with asthma, ages 6 to 12, and their parents/guardians about managing asthma, coping with the challenges associated with asthma, and providing a healthy home environment. The creators indicate that instructors of the education sessions should be trained health professionals such as nurses, respiratory therapists, health educators, or social workers. The program includes low-literacy culturally appropriate booklets, available in English and Spanish, which can be used alone or with the Implementation Guide in a formal educational program. The illustrations, messages, vocabulary, and layout of the booklets have been extensively tested with children and adults who have reading limitations. The curriculum has five modules, one of which is "Asthma Triggers". For more information, visit: http://www.aafa.org/display.cfm?id=4&sub=79&cont=433.

EDUCATIONAL PROGRAMS FOR MIDDLE AND HIGH SCHOOLS

Adolescent Asthma Action (Triple A): This peer-led asthma educational program, developed in Australia, aims to improve asthma self-management in young people and create a supportive school environment for asthma. There are three stages. First, Triple A Educators (asthma educators and university students) train volunteers, older high schools students to be Triple A Peer Leaders during a one-day workshop. Peer Leaders acquire skills in

group facilitation and leadership. Second, peer leaders deliver four lessons to younger high school students using the peer leader's manual as a guide. Students learn about asthma and self-management through videos, games, and activities. Third, wider dissemination of Triple A messages occur when these younger students relay what they have learned to members of the school community through creative arts or social media. For more information, visit: http://www.asthma.org.au/Programs/TripleAProgram.aspx.

Fight Asthma Now (FAN) for Teens: This FAN program is intended for teens in 7th through 12th grades. The program is catered to a teen audience and helps teens to understand how to make health a priority despite social pressures such as the pressure to smoke. The program is typically taught in four 45-minute sessions or three 60 minute sessions. For teens in 11th and 12th grades, the program includes activities to prepare them to care for their asthma as they transition to living away from home. For more information, visit: http://www.lungchicago.org/fight-asthma-now/.

Kickin' Asthma: This program addresses the needs of kids with asthma aged 11–16 (6th–10th grade). The goal of Kickin' Asthma is to empower kids to take control of their asthma so they can grow up with the skills needed to manage their symptoms and live a full and active life. The program is specially geared toward teens living in low-income neighborhoods who face social and economic challenges every day. Kickin' Asthma is intended to be taught by trained facilitators such as school personnel, parents, community volunteers, or anyone interested in helping teens learn how to take better control of their asthma. The American Lung Association provides training for interested facilitators. For more information, visit: www.lung.org.

Power Breathing: This program provides a basic understanding of asthma and its management in a peer-friendly environment. It empowers and motivates adolescents, ages 11–19, to take control of their asthma on a personal level addressing teens' social and lifestyle concerns. The program is presented in three 90-minute sessions or alternately six 45-minute sessions suitable for school settings. An additional fourth session is designed for older teens leaving home or entering the workforce. Each session includes: hands-on instruction, discussion and strategic thinking, video animation, and "Class Dismissed!," a board game to test asthma knowledge. The Power Breathing Program Facilitator Manual and Implementation Guide are designed for the preparation of new facilitators. These materials provide information on the characteristics, educational needs, and compliance issues unique to adolescents with asthma; strategies for communicating with adolescents; the goals and content of the Power Breathing Program; recruiting strategies; conducting a session; and follow-up activities. For more information, visit: http://www.aafa.org/display.cfm?id=4&sub=79&cont=436.

Provide education for school staff

In addition to educating students and families SBHC staff can educate school staff. Below are some links to sample educational tools. The section on Improving Indoor Air Quality in Schools points to some additional tools that may be useful for increasing awareness.

- The National Asthma Education and Prevention Program has developed a ***"School Asthma Education Slide Set,"*** a two-part slide presentation offering background information about the growing problem of asthma in the US, what asthma is, and what school staff should know about helping students manage their asthma including triggers and warning signs of asthma episodes: http://www.nhlbi.nih.gov/health-pro/resources/lung/asthma-basics-for-schools.
- The National Association of School Nurses developed a ***training program*** to educate school personnel about managing asthma triggers in schools: https://www.pathlms.com/nasn/courses/607.
- The North Carolina Asthma Program developed a ***training curriculum*** to educate school nurses and other staff: http://www.asthma.ncdhhs.gov/docs/asthmaeducationcurriculumforschoolnursesandotherelementaryandmiddleschoolprofessionals.pdf.
- The Minnesota Department of Health Asthma Program (MDH) and the Utah Department of Health Asthma Program (UDOH) collaborated to develop ***Winning with Asthma***, an educational program specifically designed for PE teachers and coaches. http://www.winningwithasthma.org/
- The California School Environmental Health and Asthma Collaborative developed ***QuickTakes*** which are short videos for school staff about air quality and asthma at schools: http://www.californiabreathing.org/collaborations/sehac/.

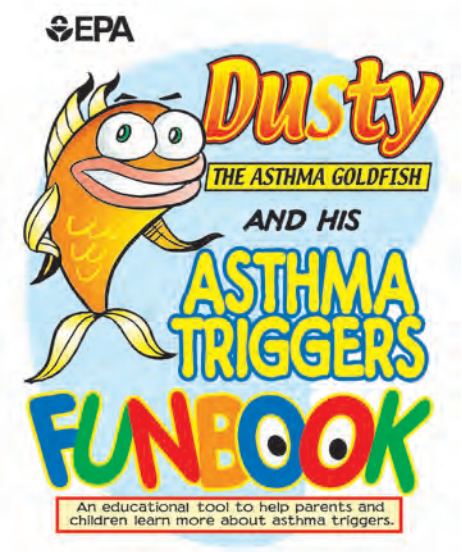
Print/order and distribute materials, tools and curricula for educating students and school staff

There are many educational materials that SBHC staff can distribute to students. Below are some examples:

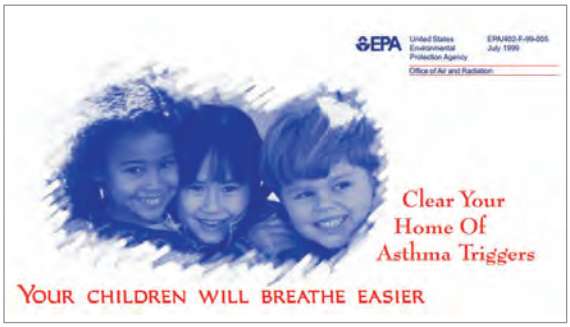
- ***Breathe Easies videos*** The US Environmental Protection Agency in partnership with the Advertising Council has developed an educational campaign focused on trigger reduction, featuring The Breathe Easies, the world's most famous (and only) asthma rock band. The array of videos can be found here: http://www.noattacks.org/breathe-easies.

The US EPA has numerous additional educational resources available for use. They can be found at http://www.epa.gov/asthma/publications.html. Some examples are:

- ***Dusty The Asthma Goldfish and His Asthma Triggers Funbook:*** This educational activity book helps children learn more about asthma triggers. It is available in both English and Spanish.



- ***Clear Your Home of Asthma Triggers: Your Children Will Breathe Easier:*** This brochure is a handy resource for parents and caregivers of children with asthma. It explains common indoor asthma triggers and how to control them in homes. It is available in English, Spanish, Vietnamese, Chinese, and Korean.



- ***Clearing the Air: 10 Steps to Making Your Home Asthma-Friendly:*** This one-page, simple-to-follow guidance document lists recommended actions to help control asthma triggers in the home. Available in English and Spanish.

- ***Why is Coco Orange?*** Coco the chameleon can't change colors, and his asthma is acting up. Read how Coco and his friends solve this mystery as they learn about air quality and how to stay healthy when the air quality is bad. This picture book is for all children, especially those with asthma, and their caregivers. Available in Spanish and English.

- ***Breathing Freely: Controlling Asthma Triggers Video:*** Featuring conversations with medical professionals and parents of children with asthma, this video presents the role of the environment in triggering and worsening asthma attacks and offers ways to manage asthma to help children lead normal, healthy lives. Available in English and Spanish.

Children and adolescents may also appreciate the opportunity to learn about asthma through online games. Some examples are:

- ***Quest for the Code*** is an online interactive game that helps kids learn how to manage their asthma. Quest for the Code challenges players to outsmart a team of asthma villains in order to win back the pieces of the secret code. Knowledge of asthma, including asthma triggers and medications, is the secret weapon in challenging the villains. http://asthma.starlight.org/

- ***Lungtropolis Kids*** is an interactive, web-based game for children and Lungtropolis Parents provides information and resources to caregivers of children with asthma. By playing the game children learn about asthma and how to manage it. http://www.lung.org/assets/documents/lungtrop.pdf

- PBS developed an ***interactive website and apps*** including games featuring the television character Arthur aimed at teaching children about asthma. http://pbskids.org/arthur/health/asthma/

- ***Wellapets*** is an app through which kids learn to control their asthma by caring for a pet that also has asthma. http://www.wellapets.com/#sthash.SnW4MzLH.dpuf

How can SBHCs engage in these interventions?

- SBHC staff can and should **incorporate** one-on-one education about reducing exposure to environmental asthma triggers into their interactions with students with asthma.
- SBHC staff can **conduct**, **organize**, or **support** group education programs through a variety of ways:
  - Support existing asthma education programs at your school by helping to teach the curriculum. Alternatively, you can be a guest speaker at one of the sessions educating students about the asthma management services they can access at the SBHC.
  - If your school is not already conducting group education, SBHC staff can initiate and/or lead a group education program.
    - You may want to identify a champion at your school who would lead this effort (a school nurse, a parent, a teacher, etc.) and support them in establishing a group education program.
    - You may identify a group in your community that is interested in providing the group education program (for example: a chapter of the American Lung Association) and serve as the liaison between them and the school in order to initiate the program.
    - You may seek permission from the school administrators to start the group education program yourself. You can select a program from the list provided in this chapter or through other means, acquire the curriculum, and/or go through the training of the trainer. Then, you are ready to start!
- SBHC staff can **educate** the broad array of school staff about the importance of reducing exposure to environmental asthma triggers and utilizing existing curricula and materials.
- SBHC staff can **order** and/or **print** free educational materials focused on asthma environmental triggers to make available to their students and families at the health center and elsewhere on campus and direct students to online educational games.

Strategy 2: Case Management

Overview of the strategy

Asthma is a complex chronic disease that requires a comprehensive approach to management and prevention. As described throughout this guide, managing asthma is not just about prescribing the right medications but also about supporting self-management and finding ways to reduce exposure to environmental asthma triggers. As such, students with asthma greatly benefit from proactive case management. As part of the SBHC team, you can play an important role in fulfilling that approach.

Broadly defined, case management is a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual's and/or family's comprehensive health needs through communication and available resources to promote quality, cost-effective outcomes.[75] Case management serves as a means for achieving patient wellness through advocacy, communication, education, identification of service resources, and service facilitation. For the purposes of this guide, we talk about case management for asthma in the more narrow context of environmental triggers.

Please note: Because case management can either directly or indirectly involve education, some of the resources listed below may overlap with those listed in the Education and other sections of this guide.

What are some of the most important environmental asthma triggers to address?

As you read this chapter use the **trigger table** as a reference. Like education, the strategy of case management can be used to find solutions to the broad array of environmental asthma triggers.

One of the most important initial steps related to case management is to help identify a patient's asthma triggers and the components of the environment that are causing a problem. There are many existing trigger lists to help SBHC staff work with the patient to identify triggers. One example is the trigger list included in RAMP's Asthma Action Plan available in four different languages at http://rampasthma.org/info-resources/asthma-action-plans/. Another example is the asthma action plan developed by the National Heart Lung and Blood Institute: http://www.nhlbi.nih.gov/files/docs/public/lung/asthma_actplan.pdf.

What are the types of interventions within the topic of Case Management that can reduce exposure to environmental asthma triggers?

Once triggers specific to the patient are identified SBHC staff can utilize case management approaches including:

- Communicate/Educate
- Identify/Facilitate Services
- Advocate

Communicate/Educate

If the patient's environmental asthma triggers are found in the school environment, you can communicate that information to school staff (teachers, principal, maintenance staff, afterschool staff, and others) and educate them, if necessary, about the impact of those triggers and ways to reduce them. For example: if a student's asthma is triggered by furry animals in the classroom there is an opportunity to educate the teacher and have the animals removed. As another example: if a student's asthma is triggered by the use of bleach to clean the bathrooms there is an opportunity to educate the maintenance staff about the risks of bleach for both students and staff and the existence of safe alternatives. (The San Francisco Asthma Task Force created a guide on alternatives to bleach: http://www.rampasthma.org/2011/03/9258/).

If a patient's asthma is triggered by components in the home environment there are opportunities to educate the patient and family about some of the behaviors that can reduce exposure to asthma triggers. For example: they can keep family pets out of the child's bedroom; they can cover the mattress and pillows with dust mite covers; and they can choose cleaning products that will not exacerbate asthma. There may be other triggers that cannot be addressed by the family members' behavior changes (e.g., mold created by a perennially leaky roof). See "Identify/Facilitate Services" below, as well as the section on Improving the Students' Home Environment for strategies for addressing these and other factors.

Identify/Facilitate Services

Sometimes the family needs more than education in order to change behaviors. For example: it can be difficult for parents or guardians to quit smoking even if they receive education about the effects of secondhand smoke on their child's asthma. As another example: if the family is renting their unit it is the landlord who is responsible for the structural repairs that may be necessary to reduce exposure to asthma triggers such as unrepaired leaks that can lead to mold. Additionally, structural deficiencies may lead to pest infestations or secondhand smoke may enter the family's residence from smokers in other units. In these types of cases SBHC staff can identify service resources and facilitate services for the parents. It is beneficial to build community partnerships with organizations that can provide service resources to families. Below are but a few examples:

CEASE—the Clinical Effort Against Secondhand Smoke Exposure is an innovative program to reduce the burden of secondhand smoke on children by training pediatric providers to help parents quit smoking using the Ask, Assist, Connect model. The CEASE program was founded in 2005 by Dr. Jonathan Winickoff MD, MPH at Massachusetts General Hospital (http://www2.massgeneral.org/ceasetobacco/index.htm). Health care providers who work with children and adolescents have a unique and powerful opportunity to reduce secondhand smoke exposure in children by helping their caregivers quit smoking. CEASE gives pediatric providers the tools to help parents quit smoking and reduce the burden of second and third-hand smoke on their children. The intervention has 3 simple steps:

- **ASK:** Put a system in place to ensure that exposure to secondhand smoke becomes one of the vital signs—i.e. the medical assistants ask "do you live with anyone who smokes cigarettes?" at every visit for every patient.
- **ASSIST:** Provider prescribes nicotine replacement dual therapy (patch & gum) to the parent using a simple and easy to use dosing guide which the CEASE training team will provide. This can be done even if the parent is not the provider's own patient.
- **CONNECT:** Provider connects the family to the State Smokers' Helpline at 1-800-QUIT-NOW.

School-based health centers interested in implementing the CEASE program should contact Regina Shaefer (rshaefer@aap.org), Director of the Division of Tobacco Control for the American Academy of Pediatrics.

For housing-related challenges SBHC staff may connect a patient's family with legal aid services: http://lsc.gov/find-legal-aid. Legal aid providers can help families understand their rights under state and federal laws. For example, asthma is considered a disability under the Americans with Disabilities Act and, as such, tenants with asthma have a right to reasonable accommodations that do not worsen their asthma. Under this law, the National Center for Law and Economic Justice and the Natural Resources Defense Council filed a suit against the New York City Housing Authority on behalf of people with asthma. (http://www.nclej.org/nychamold.php)

There may also be local programs that provide in-home remediation. One place to identify programs is through the US Department of Housing and Urban Development: http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhi. For additional services, see the section on Improving the Students' Home Environment.

Advocate

To complement the teacher and staff education mentioned above, SBHC staff may also find it effective to advocate for systems or policy changes at the school district level in order to better protect all students and staff. For example: you could advocate that the entire district go "furry pet free" or that the district adopt and implement certified green cleaning purchasing policies to reduce exposure to asthma triggers and chemicals that can cause new onset of asthma. (RAMP created a guide for advocates on green cleaning in schools: http://www.rampasthma.org/2010/03/green-cleaning-in-schools-a-guide-for-advocates/.)

You can also consider a role for your SBHC in advocating for policy changes that affect your students' home environments. For instance: many community and advocacy groups have successfully pushed for smoke-free policies in multi-unit housing (the American Lung Association provides a guide for success in doing so: http://www.lung.org/stop-smoking/about-smoking/smokefree-housing.html). Many kinds of policy successes are often achieved through collaboration; you can search for an asthma coalition or tobacco coalition in the area for additional support.

If the patient's environmental asthma triggers are found in the outdoor air, as a SBHC representative you can play an important role in advocating for broad reductions in exposure to air pollution. For example: if a student's asthma is triggered by playing outside on poor air quality days there is an opportunity to talk with the school principal about implementing an Air Quality Flag program so that indoor alternatives are provided (the EPA created a guide on how to implement such a program: http://www.epa.gov/airnow/school_flag/sfp-coordinator-handbook-2014.pdf).

There may also be programs that the school can adopt like rules against idling near the school (the EPA Region 8 created the Idle Free Schools Toolkit for creating an effective idling reduction campaign at school in order to reduce student exposure to toxic vehicle exhaust. http://www2.epa.gov/region8/idle-free-schools). SBHC staff can play a key role in the creation of such policies. You can also serve as experts and advocates to help support healthy outdoor air quality policies. For example, Physicians for Social Responsibility has a Health Voices for Clean Air program (http://www.psr.org/environment-and-health/climate-change/air-pollution/health-voices-for-clean-air.html) and the American Lung Association has the Health Professionals for Clean Air Program (http://www.lung.org/associations/states/california/advocacy/health-professionals.html.) For more information, see the section on Improving Outdoor Air Quality around the School and Community.

How can SBHCs engage in these interventions?

SBHC staff can incorporate strategies to reduce exposure to environmental asthma triggers into their case management approach to students with asthma. As SBHC staff in the case management role, you can facilitate connections to resources that exist, communicate with and educate other partners critical to effective asthma management (parents, school staff, etc.), and identify when direct advocacy is needed.

Strategy 3: Improving Indoor Air Quality in Schools

Overview of the strategy

Children spend much of their time at school and the school environment often contains environmental asthma triggers that make asthma worse. During their time in school, students and staff can be exposed to a wide range of indoor environmental asthma triggers that can lead to missed school days and decreased academic performance.

Because environmental asthma triggers are airborne or inhaled, they are closely linked to air quality. If an indoor environment (such as a school) has numerous environmental asthma triggers (such as chemical irritants or mold) it has poor indoor air quality (IAQ). According to the U.S. Environmental Protection Agency (EPA), indoor air is 2 to 5 times more polluted, and in some cases 100 times more polluted, than outdoor air.[76]

A recent assessment of the condition of public schools conducted by the National Center for Education Statistics found that many public schools reported poor indoor air quality. In their assessment environmental factors in permanent buildings were rated as unsatisfactory in 17% of schools. For portables, 28% were reported as unsatisfactory.[77] Overall, the American Society of Civil Engineers gives school facilities in the U.S. a "D" in their 2013 infrastructure report card.[78]

Importantly, studies have demonstrated that improved IAQ and a reduction in asthma triggers in school facilities often can be addressed at little or no cost and will have a positive impact on student health and achievement as well as staff well-being. In this light, focusing on the quality of indoor environments in schools is an essential part of creating asthma-friendly schools.

According to the U.S. Environmental Protection Agency (EPA), indoor air is 2 to 5 times more polluted, and in some cases 100 times more polluted, than outdoor air.

What are some of the most important environmental asthma triggers to address?

There is a wide range of preventable asthma triggers found in schools. As you read this section use the **trigger table** as a reference and to find more information on the triggers below which are listed in the same order here as they are in the table.

- **Mold** and **moisture** may occur wherever there are water leaks, condensation, or other water damage.
- **Dust mites** can collect on classroom surfaces particularly when there is clutter, carpet, or upholstered surfaces.
- **Cockroaches** and **rodents** are often found in school settings. They may be caused or worsened by a variety of conditions such as plumbing leaks, moisture problems, and improper food handling and storage practices.
- **Pets** commonly lead to allergens on the clothing of staff and children who handle them. If an animal is present in the school there is a possibility of direct, daily exposure to the animal's dander and bodily fluids.
- **Chemical irritants from school and personal products** can be emitted by paints, dry erase markers, furnishings, building materials, and scented personal products, to name a few.
- **Cleaning products** used by school staff can emit chemicals linked with asthma.
- **Pesticide** residues are often found in classrooms when used to control pests at schools.

Inadequate Ventilation*:* While not an asthma trigger, inadequate ventilation contributes to poor indoor air quality and is associated with negative health effects such as respiratory illnesses, allergies, and asthma.[79,80,81] Children in classrooms with inadequate ventilation miss more school[82] and perform less well on school work and standardized tests.[83,84] A number of studies have documented the widespread prevalence of inadequate ventilation in school classrooms.[85,86,87] There is evidence that improving ventilation by replacing and upgrading ventilation systems improves air quality and provides health benefits.[88,89,90]

What are the types of interventions within the topic of Indoor Air Quality in Schools that can reduce exposure to environmental asthma triggers?

While SBHC staff members are not responsible for maintaining healthy indoor environments in schools, as the resident health experts for school communities there is a role you can play to help ensure students and staff are afforded the right to healthy learning and working environments. Specifically, SBHC staff can:

- **Increase awareness** of issues related to indoor air quality
- **Conduct** or **facilitate** an indoor air quality assessment
- **Support** or **lead** an intervention
  - Implement comprehensive approaches
  - Implement specific interventions to address:
    - Mold and moisture
    - Dust mites
    - Cockroaches and rodents / Pesticides
    - Pets
    - Chemical irritants from school and personal products
    - Cleaning products
    - Ventilation

Increase Awareness

One of the steps that SBHC staff can take to help reduce indoor asthma triggers in schools is to ensure the entire school community can identify the sources of asthma triggers on campus and can take simple steps to improve indoor air quality. The following resources tailored to school audiences can help in approaching teachers, school officials, maintenance staff, and other school staff about what they can do about asthma triggers in the school environment.

The U.S. EPA's "Creating Healthier Indoor Environments in Schools" website (http://www.epa.gov/iaq/schools/index.html) is the go-to source for easy-to-use information, tools, guides, and resources on indoor air quality in schools with information tailored to specific school employees including school officials, facilities staff, teachers, students, and parents. While there is extensive information, it is easy to find the specific information you are looking for including fact sheets, webinars, case studies, and toolkits. Below are a few of the key components of their website that are particularly useful for increasing awareness among school staff:

At this link, http://www.epa.gov/iaq/schools/student_performance/index.html, you will find an overview of the impact of unhealthy indoor air quality on academic achievement. This information is useful when educating teachers and school officials on the importance of improving indoor air quality.

Below are some excerpts from the EPA's website, providing recommended actions that you can share with teachers, facilities staff and school officials:

TOP ACTIONS TEACHERS CAN TAKE TO ADDRESS INDOOR AIR QUALITY (IAQ)

- Keep ventilation units in classrooms free of clutter.
- Report any IAQ issues and maintenance problems occurring in classrooms and hallways immediately.
- If classroom pets cause allergic reactions or trigger asthma attacks, either relocate the pet away from sensitive students or consider replacing the animal with a classroom fish, or an animal that will not trigger allergy and asthma attacks in any students.
- Reduce the number of items made of cloth in your classroom, including furniture, draperies or stuffed animals.

TOP ACTIONS FACILITIES STAFF CAN TAKE TO ADDRESS IAQ

- Implement policies and procedures to make IAQ management actions sustainable, and openly communicate your steps to success.
- Ensure routine inspection and maintenance policies.
- Train custodial staff to respond quickly to IAQ-related issues and building occupants' concerns, and communicate with teachers and other staff when issues have been addressed.

TOP ACTIONS SCHOOL OFFICIALS CAN TAKE TO ADDRESS IAQ

- Understand the effects of poor IAQ on student and staff productivity and health. Review the IAQ and Student Performance information.
- Support and promote a district-wide IAQ management program through policies and plans.

The website also provides actions that various school staff can take to improve indoor air quality. These quick lists may be useful for you to share with staff when increasing their awareness about indoor air quality and how they can have a role in creating healthy indoor air for themselves and students.

Other useful tools and resources for increasing awareness including posters, videos, guides, and brochures can be found in the **Appendix**.

Additionally, the section on **Education** provides links to tools to educate school staff on asthma, all of which include components about indoor air quality.

Conduct or Facilitate an Assessment

Students and school staff, armed with knowledge about IAQ and indoor asthma triggers, become the best advocates for monitoring indoor air quality in schools. SBHC staff can share some simple assessment tools to help organize and focus these efforts.

- An "assessment" may seem daunting, but can be as simple as providing teachers with a checklist for evaluating conditions in their classroom (http://epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf) or providing maintenance staff with a methodical way to examine school conditions (http://www.epa.gov/iaq/schools/pdfs/kit/checklists/bldgmaintchklst.pdf).

- A more comprehensive tool geared for school facility staff is the Healthy School Environments Assessment Tool, or HealthySEAT (http://www.epa.gov/schools/guidelinestools/healthySEAT/). This free, customizable software available from the U.S. EPA is designed to help school districts evaluate and manage the environmental health and safety of school facilities.

HealthySEAT
Healthy School Environments Assessment Tool

- The EPA also created an "Environmental Assessment Checklist for Healthy Schools" with the goal of protecting children from harmful environmental exposures in school settings. http://www.epa.gov/region10/pdf/childrenshealth/schools_assessment_checklist_110812.pdf

SBHC staff can also play a unique role in assessing air quality problems. You are uniquely positioned to track common problems even without a formal assessment tool. Do you have more students coming to you with asthma problems after playing outside on poor air quality days? Do you have an unusually high number of students coming to you with asthma problems from a particular classroom or a particular area within the school? You may not always see patterns among students visiting the SBHC but staying aware will help you identify patterns when they exist.

Support or Lead an Intervention

Once SBHC staff have raised awareness about indoor air quality and gathered information through formal or informal assessments, you can work to improve indoor air quality. SBHC staff can partner with appropriate school staff to implement a wide range of activities, programs, and policies to both address existing problem areas and prevent new ones from arising.

Many states have laws related to IAQ in schools. Some require or encourage the use of an IAQ Management Plan or components thereof. As a starting point SBHC staff can learn about the laws in their state and determine whether the school or district is in compliance with the law. The Environmental Law Institute has a regularly updated database of IAQ laws by state at http://www.eli.org/sites/default/files/eli-pubs/2015-iaq-database.pdf. Another important law is Section 504 of the Rehabilitation Act of 1973 which prohibits discrimination on the basis of disability in employment and education in agencies, programs, and services that receive federal money. Since asthma is considered a disability under the Americans with Disabilities Act, Section 504 could require schools to provide classrooms that are free of allergens and irritants for students with asthma. The Asthma and Allergy Foundation of American has developed a fact sheet on this issue: https://www.aafa.org/display.cfm?id=9&sub=19&cont=255.

Whether required by law or not, SBHC staff can encourage the school to develop a comprehensive IAQ Management Plan in order to ensure that policies and practices promote healthy air quality in the school. The US EPA provides a model IAQ Management Plan based on several plans currently in use by schools and school districts: http://www.epa.gov/iaq/schools/tfs/coord_section_3.html. The model plan includes specific IAQ policies on such topics as: animals in the classroom, food in the classroom, integrated pest management, non-smoking, and anti-idling. It also includes recommended practices for things such as: cleaning and chemicals, preventive maintenance and operations, staff education, and communication. An example of a state plan is the Minnesota IAQ Management Plan Development Package, which can be found at http://www.health.state.mn.us/divs/eh/indoorair/schools/plan/index.html.

IMPLEMENT COMPREHENSIVE APPROACHES

There are a range of comprehensive approaches to managing indoor environments in schools:

- **The U.S. EPA's Indoor Air Quality (IAQ) Tools for Schools (TfS) program** offers the most comprehensive guide and toolkit for maintaining healthy schools. EPA developed the TfS program to reduce exposure to indoor environmental contaminants in schools through the voluntary adoption of sound and effective IAQ management practices. The TfS resources are designed to help schools create and maintain healthy indoor learning environments by identifying, correcting, and preventing common issues.

Whether required by law or not, SBHC staff can encourage the school to develop a comprehensive IAQ Management Plan in order to ensure that policies and practices promote healthy air quality in the school.

- The *Framework for Effective IAQ Management: Key Drivers and Technical Solutions* provides the building blocks for developing a system of IAQ success, based on lessons learned by the EPA and its school partners over time. http://www.epa.gov/iaq/schools/excellence.html

- *The IAQ Tools for Schools Action Kit* provides simple, easy-to-follow guidance that will help you put the Key Drivers and Technical Solutions into action in your school district. The resources, checklists, and publications compiled into the Action Kit assist school districts in identifying the actions they can take to successfully plan and implement an effective IAQ management program. In addition to an IAQ Coordinator's Guide, the kit includes checklists and backgrounders for administrative staff, school officials, school nurses, and teachers. It also includes checklists and backgrounders on the topics of grounds maintenance, classroom maintenance, ventilation, integrated pest management, waste management, and renovation and repairs. They also provide a problem-solving tool and a video. http://www.epa.gov/iaq/schools/actionkit.html

TfS offers many low-to-no cost solutions to IAQ challenges. While TfS offers a wide range of resources, the guide and toolkit have resources which can be used together or individually. Once you have identified your school's needs, you can easily find the activities which will support your efforts to improve indoor air quality.

- The American Lung Association has a comprehensive program called the **Asthma-Friendly Schools Initiative** (http://www.lung.org/lung-disease/asthma/creating-asthma-friendly-environments/asthma-in-schools/asthma-friendly-schools-initiative/toolkit/provide-a-healthy-learning.html) with a component on "Providing a Healthy Learning Environment." This section includes information on such approaches as ensuring a tobacco-free campus, utilizing integrated pest management, and other aspects of indoor air quality.

- Another comprehensive approach is offered by the **Collaborative for High Performance Schools** (CHPS). CHPS provides resources to schools, school districts, and professionals about all aspects of high performance school design and construction. The design and construction of systems are as important as the operation and maintenance of them. While it is unlikely that SBHCs would be directly involved in CHPS, it may be helpful to know about it and advocate for its use when schools are considering renovations or construction. The CHPS resources include a six-volume best practices manual, training and conferences, a high performance building rating and recognition program, and other tools for creating healthy, green schools. These resources include approaches to improving indoor air quality within a broader context of high performing schools. More information can be found at www.chps.net.

IMPLEMENT SPECIFIC INTERVENTIONS

To improve indoor air quality, SBHC staff and their partners can implement the comprehensive programs above in their entirety or you can implement specific interventions to target one or more particular environmental asthma triggers. There are many reasons to consider starting with a specific intervention that targets a particular asthma trigger. It may be that one particular trigger (e.g. mold) is causing significant asthma problems in the school. Or, if you do not have support from school officials to implement a comprehensive approach, you may be able to start by addressing a specific trigger and then adding on components from there. Or you may have community partners that are willing to volunteer their time around a specific project. Ultimately, reducing exposure to any environmental asthma trigger in schools will improve indoor air quality.

Mold and moisture

While it is impossible to eliminate all molds and mold spores in the indoor environment, mold growth can be controlled indoors by controlling moisture. Moisture problems may be caused by many things: uncontrolled humidity; lack of adequate ventilation; roof or plumbing leaks; landscaping or gutters that direct water into or under the building; or delayed or insufficient maintenance. It is important for schools to address the source of the moisture problem in addition to any resulting mold. Below are some resources that SBHC staff can share with school and district staff.

- The EPA has created a guide called "Mold Remediation in Schools and Commercial Buildings" (http://www.epa.gov/mold/pdfs/moldremediation.pdf) that outlines both prevention and remediation.
- The EPA's Tools for Schools program has an Appendix on Moisture and Mold http://www.epa.gov/iaq/schools/tfs/guideh.html.
- The CDC has a comprehensive web page about mold: http://www.cdc.gov/mold/.

Dust mites

Reducing exposure to dust mites at schools requires simple, routine practices that support cleanliness and maintenance. For example: to reduce the amount of dust, schools can use vacuums with high-efficiency filters, place barrier floor mats at all building entrances to reduce the amount of dust and dirt that enter the school, or remove dust from desks, chairs, and other items with a damp microfiber cloth.[91] Teachers can contribute by reducing clutter. SBHC staff can educate school staff, like teachers and maintenance staff, about actions they can take to reduce dust. Two helpful resources come from the TfS toolkit:

- Background Information for Building and Grounds Maintenance Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/bldgmaintchklstbkgd.pdf
- The Teacher's Classroom Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf

Cockroaches and rodents/Pesticides

Integrated Pest Management (IPM) reduces children's exposure to pests and pesticides. In the EPA's recommendation that schools use IPM they explain: "Put simply, IPM is a safer, and usually less costly option for effective pest management in a school community."[92] IPM is sensible because it promotes practical strategies that eliminate food sources and pathways that lead to infestations. Strategies include: install door sweeps; block pest entries with steel wool or screening; and ban pets, plants and food from classrooms. IPM is sustainable because this prevention-based approach results in a 78–90% reduction in pest complaints, with no long-term increases in costs. SBHC staff can educate school and district staff about the benefits of IPM, point them to resources to make the use of IPM easy, and encourage them to adopt IPM policies. There are many resources to help schools understand and begin using IPM. Just a few are listed below:

- The EPA's brochure, "Protecting Children in Schools from Pests and Pesticides" provides resources, success stories, and examples of IPM practices for safer pest management within our Nation's schools. A copy of the brochure may be obtained on-line by contacting the National Service Center for Environmental Publications (NSCEP) at http://www.epa.gov/ncepihom/ordering.html or by phone at 1-800-490-9198.
- The EPA booklet, "Pest Control in the School Environment: Adopting IPM" is designed to encourage and assist school officials in examining and improving their pest management practices. It identifies ways to reduce the use of pesticides in school buildings and landscapes, as well as alternative methods of managing pests commonly found in schools. A copy of the booklet may be obtained on-line by contacting the NSCEP or by phone at 1-800-490-9198.

- The California Department of Pesticide Regulations has a series of videos on IPM for Schools at http://apps.cdpr.ca.gov/schoolipm/managing_pests/video_series.cfm.
- Additional resources on IPM in Schools can be found in the **Appendix**.

Pets

The most effective method to control exposure to animal allergens in schools is to keep the school free of warm-blooded animals. It is important to realize that, even after extensive cleaning, pet allergens may stay in the indoor environment for several months after the animal is removed. In addition, animal allergens can readily migrate to other areas of the school environment through the air and on the clothing of staff and children who handle pets. The EPA's Model IAQ Management Plan has a policy on Animals in the Classroom: http://www.epa.gov/iaq/schools/tfs/coord_section_3.html#Animals. If pets are allowed, selecting pets that do not shed hair, removing carpeting or rugs, and seating sensitive students away from where the pet is housed are effective strategies to reduce the risk of this exposure. More information can be found in the Teacher's Classroom Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf.

Chemical irritants from school and personal products

Research suggests that using building and other interior materials with low-VOC emissions can reduce concentrations of VOCs in classrooms. Additionally, to the extent that it's possible, schools should purchase art and classroom supplies with low-VOC emissions. The Healthy Schools Network developed a guide on *Healthy Purchasing for Healthy Schools*: http://www.healthyschools.org/documents/CHS_healthypurchasinghealthyschools.pdf. Additionally, teachers should be cautious about the products they bring to the classroom from home and scented personal products. The American Lung Association has a sample policy on Fragrance-Free Schools: http://www.healthyschools.org/documents/fragrance-free-policy-sample-updated.pdf.

Cleaning products

Developing healthy cleaning practices in schools is one strategy for improving indoor air quality. Some schools have adopted the exclusive use of certified green cleaning products. "Environmentally Preferable" and "Green Cleaning Products" are terms often used to describe the newly formulated cleaning products that are alternatives to conventional cleaning products. Recognizing that neither of these labels eliminates all health and environmental risks, switching to third-party certified green cleaning products provides schools with a straight forward way of identifying and using the least toxic products available. Third-party certifiers establish health and environmental standards for products through a transparent process that includes stakeholder involvement. Products must meet these published standards in order to receive the certified label. Two certifiers with standards for institutional cleaners used in schools are Green Seal (www.greenseal.org) and UL ECOLOGO (http://industries.ul.com/environment/certificationvalidation-marks/ecologo-product-certification). Each certification program is different, so it is important to familiarize yourself with the various standards if you are going to suggest that schools use them (The *Healthy Cleaning & Asthma Safer Schools* guide described below can help you do this). SBHC staff can play an important role in educating school and district staff about the importance of asthma-friendlier cleaning, sharing key resources and tools with them, and suggesting policy changes. Below are some helpful resources:

- The Green Cleaning for Healthy Schools Toolkit (http://www.cleaningforhealthyschools.org/) includes free educational materials: Power Point presentations for general audiences and for custodial workers new to green cleaning; tip sheets for parents, teachers, and vendors; and school checklists. Also free: a Cleaning for Healthy Schools poster, a poster from the National Association of School Nurses, guidance from the National Institute for Occupational Safety and Health, model state/district policies, cost reports, and, for a healthier home, how to make your own nontoxic cleaning products for home use.
- The Work-Related Asthma Prevention Program (WRAPP) of the California Department of Public Health developed the *Cleaning for Asthma-Safe Schools (CLASS)* project to assist schools in adopting safer cleaning methods that help protect workers and students from asthma. In October 2014 they published *Healthy Cleaning & Asthma-Safer Schools: A How-To Guide*. The guide outlines steps and numerous resources to help school facilities departments transition to asthma-safer products and practices. http://www.cdph.ca.gov/programs/ohsep/Documents/CLASSguidelines.pdf. The site also includes a video, factsheets, webinars and additional resources. http://www.cdph.ca.gov/programs/ohsep/Pages/class.aspx.

- Additional resources can be found in the **Appendix**.

Ventilation

Well-maintained ventilation systems are an important component of promoting a healthy school environment as they can capture and remove airborne vapor, mold, and particles. There is growing evidence to suggest that improving ventilation can improve student and teacher performance, increase test scores, and reduce airborne transmission of infection.[93] SBHC staff can work with school maintenance staff to encourage them to take the following steps:

- Follow the industry's ventilation standards to provide adequate outdoor air, control moisture and minimize energy costs. They can be found at https://www.ashrae.org/standards-research--technology/standards--guidelines.
- Comply with your state's relevant environmental health policies and emergency management protocols when conducting ventilation and filtration maintenance activities.
- Read the "Ensure Good Ventilation" section of EPA's model K–12 school environmental health program for specific steps to improve the school's ventilation systems. Some simple but impactful suggestions include: implementing a regular schedule for inspecting and changing filters; keeping unit ventilators clear of books, papers, and other items; and educating teachers and school staff on the importance of keeping the HVAC system on to ensure classrooms are properly ventilated.[94]

The EPA also provides a ventilation backgrounder and ventilation checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/ventchklstbkgd.pdf http://www.epa.gov/iaq/schools/pdfs/kit/checklists/ventchklst.pdf.

How can SBHCs engage in these interventions?

- One of the most important steps for SBHC staff is to ensure that the entire school community is aware of the importance of indoor air quality and can identify the asthma triggers that are a concern in their school by utilizing the tools in this guide.
- SBHC staff can be on the lookout for asthma triggers and help facilitate or conduct an assessment using some simple checklists.
- SBHC staff can encourage the school to utilize a comprehensive approach to improve indoor air quality in schools, like the US EPA's Tools for Schools Program, or to adopt a comprehensive policy on IAQ in Schools. Additionally, staff may choose to implement specific interventions targeting particular environmental asthma triggers. The role of SBHC staff can be to encourage the school to implement the program or to work side-by-side with school staff as partners in supporting the implementation.

Strategy 4: Improving the Students' Home Environments

Overview of the strategy

A student's home environment may contain environmental asthma triggers that make asthma worse. Homes may contain allergens like mold, dust mites, cockroaches and other pests, as well as pets. They may also contain indoor air pollutants like tobacco smoke or chemical irritants found in many cleaning products or personal care products. When indoor pollutants are emitted they are partially trapped inside homes and other buildings and people's activities put them very near indoor sources. Consequently, some scientists estimate that pollutants emitted indoors are about 1,000 times more likely to be inhaled than comparable outdoor emissions.[95]

SBHC staff have an important role in improving the students' home environments. It may initially appear that there is no role for SBHC staff in addressing the students' home environments because SBHC staff rarely go to the students' homes and many do not even have the opportunity to talk with parents or other family members. However, as health care providers, educators and case managers, there are many ways that SBHC staff can support healthy home environments.

What are some of the most important environmental asthma triggers to address?

There is a wide range of preventable asthma triggers found in homes. As you read this section use the **trigger table** as a reference and to find more information on the triggers below which are listed in the same order here as they are in the table.

- **Mold and moisture** may occur wherever there are leaks, condensation, or other water damage.
- **Dust mites** are found in every home and are common in mattresses, pillows, carpets, upholstered furniture, clothes, stuffed toys, and fabric.
- **Cockroaches and rodents** are found in many homes, particularly if there are cracks or openings that allow pests inside, food and water sources, and high humidity.
- **Pets** can trigger asthma through proteins in their urine, feces, saliva, skin flakes, and fur.
- **Environmental tobacco smoke**, or secondhand smoke, is found in any home where smoking is allowed. It may also be found in multi-unit housing where smoke from one unit reaches other units.

- **Chemical irritants from personal, consumer, and household products** can be emitted by such products as cleaners, paints, adhesives, pesticides, cosmetics, perfumes, and air fresheners.
- **Cleaning products** used in homes can emit chemicals linked with asthma.
- **Pesticides** used in or around homes can emit chemicals linked with asthma.
- **Gas stoves and space heaters** can emit nitrogen dioxide, a common pollutant.
- **Wood smoke** from wood burning-stoves and fireplaces contains a mixture of harmful gases and small particles.

What are the types of interventions within the topic of Improving the Students' Home Environments that can reduce exposure to environmental asthma triggers?

SBHCs aim to improve the health of the students they serve. Given the importance of the home environment in affecting asthma there is an important role for SBHC staff in ensuring that students can go home to healthy environments. Specifically, SBHC staff can:

- **Establish referral systems** for in-home asthma education and environmental remediation programs in the community
- **Educate** students and families
- **Provide** supplies to students and families
- **Utilize** case management strategies to connect families with resources

Some scientists estimate that pollutants emitted indoors are about 1,000 times more likely to be inhaled than comparable outdoor emissions.

Establish referral systems for in-home asthma education and environmental remediation programs in the community

There is robust evidence of the effectiveness of home-based asthma interventions that include environmental remediation. The gold standard is the systematic review of evidence-based asthma interventions by the US Centers for Disease Control and Prevention's Community Preventive Services Task Force. Based on that review, the Task Force recommends the use of home-based, multi-trigger, multicomponent interventions specifically for children and adolescents with asthma as a means of effectively improving overall quality of life and productivity, improving asthma symptoms, and reducing the number of school days missed due to asthma.[96] These interventions involve home visits by trained personnel to do the following activities:

- **Assessment** of the home environment
- **Changing** the indoor home environment to reduce exposure to asthma triggers
- **Education** about the home environment

Most programs also included one or more of the following additional non-environmental activities:

- **Training and education** to improve asthma self-management
- General asthma **education**
- **Social services** and support
- **Coordinated care** for the asthma client

Given the strong evidence in support of this type of intervention, one of the most important things that SBHC staff can do to help reduce their patients' exposure to environmental asthma triggers is to find out whether such programs exist in your community and, if so, establish a system for referring patients. One place to identify programs is through the US Department of Housing and Urban Development (http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhi). You may also want to contact your local or state housing department to learn what's available in your community.

Educate students and families

Even if in-home asthma programs are not available to students in your area, SBHC staff can accomplish a lot through home-focused education. If a patient's asthma is triggered by aspects of the home environment there are opportunities to educate the patient and family about changes they can make to create a healthier home environment. Below is a list of actions that families can take to address the common asthma triggers found in homes. Additionally, some of the necessary steps may involve a family's landlord. Discuss this with the families, as some landlords may not be supportive of such measures and care may be needed in reaching out to a landlord.

MOLD

Actions families can take or ask their landlords to take:

- **Clean up the mold** and eliminate sources of moisture. Clean it up with soap and water. Let the area dry completely. Absorbent materials with mold may need to be replaced.
- **Use exhaust fans** or open a window in the bathroom and kitchen when showering, cooking or washing dishes, long enough to remove the accumulated excess moisture in the air.
- **Fix water leaks** as soon as possible to keep mold from growing.
- **Dry damp or wet things** completely within one to two days to keep mold from growing.

- **Use a dehumidifier** or air conditioner to maintain low indoor humidity, ideally between 30–50% relative humidity. Humidity levels can be measured by hygrometers which are available at local hardware stores. Do not use a humidifier.
- For more information, read the US EPA's *A Brief Guide to Mold, Moisture, and Your Home*: http://www.epa.gov/mold/moldguide.html.

DUST MITES

Actions families can take or ask their landlords to take:

- **Wash bedding** in hot water once a week. Dry completely.
- **Use dust proof covers** (allergen-impermeable covers) on pillows and mattresses.
- **Vacuum carpets and furniture** every week. Use a vacuum with a HEPA filter on carpet and fabric-covered furniture to reduce dust build-up. People with asthma or allergies should leave the area being vacuumed.
- **Damp mop floors** weekly.
- **Choose stuffed toys** that can be washed. Wash them in hot water and dry completely before the child plays with the toy. Freeze stuffed toys that aren't washable for 24 hours to kill dust mites.
- **Dust often** with a damp cloth. Dry cloths just stir up dust mite allergens.
- **Avoid the use of humidifiers**. Reduce indoor humidity to or below 60 percent, ideally between 30–50%.
- **Avoid use of ozone generators** and ionic air cleaners which can actually generate harmful ozone, a respiratory irritant.
- **Remove carpets** from bedrooms.
- **Replace heating system filters** regularly.

COCKROACHES AND RODENTS/ PESTICIDES

Actions families can take or ask their landlords to take:

- **Keep counters, sinks, tables, and floors clean** and free of clutter.
- **Clean dishes**, crumbs and spills right away.
- **Take out garbage** daily.
- **Store food**, including pet food, in airtight containers.
- **Eliminate water sources** that attract pets such as leaky faucets and drain pipes.
- **Seal cracks** or openings around or inside cabinets. Fill holes with caulking or copper wool.
- **Use Integrated Pest Management** (IPM) which is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. Insecticides and pesticides are not only toxic to pests—they can harm people too. Try to use pest management methods that pose less of a risk. For example: use traps and poison baits and gels, such as boric acid for cockroaches, instead of sprays or bombs. More resources on IPM are available at the University of California Davis's website (http://www.ipm.ucdavis.edu/GENERAL/whatisipm.html) and the Northeastern Integrated Pest Management Center's website (http://www.northeastipm.org/ipm-in-action/what-is-ipm/).

Integrated Pest Management is an environmentally sensitive approach to pest management that relies on a combination of common sense practices.

PETS

Actions families can take:

- **Find another home** for furry pets.
- **Keep pets outside** if possible.
- If the pet needs to be kept inside **keep it out of the bedroom** of the person with asthma.
- **Keep pets off of the furniture**.
- **Vacuum carpets** and furniture when the person with asthma is not around.
- **Wash hands** after petting animals.

ENVIRONMENTAL TOBACCO SMOKE

Actions families can take:

- **Stop smoking**. Attend classes to help stop smoking or call the state's QuitLine at 1-800-QUIT-NOW.
- **Do not smoke** in the home or car. If parents do smoke, they should smoke outside and change clothes before returning to the house as clothing may contain thirdhand smoke, which is residual nicotine and other chemicals left on surfaces by tobacco smoke.
- **Set "smoke-free rules"** for anyone in your home or car.
- **Support advocacy efforts** that push for smoke-free policies in multi-unit housing. The American Lung Association provides a guide for success in doing so: http://www.lung.org/stop-smoking/about-smoking/smokefree-housing.html.
- For more information, visit: http://smokefree.gov/secondhand-smoke.

SBHC staff can educate family members about the dangers of secondhand smoke and encourage them to keep the home and car smoke-free. However, it can be difficult for parents or guardians to quit smoking even if they receive education about the effects of secondhand smoke on their child's asthma; sometimes additional help is needed. SBHC staff can identify service resources and facilitate connections for the parents. One such program called CEASE is designed for this purpose.

CEASE—the Clinical Effort Against Secondhand Smoke Exposure

is an innovative program to reduce the burden of secondhand smoke on children by training pediatric providers to help parents quit smoking using the Ask, Assist, Connect model. The CEASE program was founded in 2005 by Dr. Jonathan Winickoff MD, MPH at Massachusetts General Hospital (http://www2.massgeneral.org/ceasetobacco/index.htm). Health care providers who work with children and adolescents have a unique and powerful opportunity to reduce secondhand smoke exposure in children by helping their caregivers quit smoking. CEASE gives pediatric providers the tools to help parents quit smoking and reduce the burden of second and thirdhand smoke on their children. School-Based Health Centers interested in implementing the CEASE program should contact Regina Shaefer (rshaefer@aap.org), Director of the Division of Tobacco Control for the American Academy of Pediatrics.

CHEMICAL IRRITANTS FROM PERSONAL, CONSUMER AND HOUSEHOLD PRODUCTS

Actions families can take:

- **Avoid the use of scented products** like perfumes, incense, candles, laundry products, and scented personal care products.
- **Avoid aerosols**.
- If you must use a product, then you should **make sure your child is not around** and open windows or doors, or use an exhaust fan.

CLEANING PRODUCTS

Actions families can take:

- When cleaning, **open windows or doors** or use an exhaust fan.
- When cleaning, always **follow the instructions** on the product label.
- **Avoid ammonia, bleach, or disinfectants**.
- **Use cleaning products that are certified as environmentally friendly**. Third-party certifiers establish health and environmental standards for products through a transparent process that includes stakeholder involvement. Products must meet these published standards in order to receive the certified label. Two certifiers are Green Seal (www.greenseal.org) and UL ECOLOGO (http://industries.ul.com/environment/certificationvalidation-marks/ecologo-product-certification). Additionally, the Rhode Island Department of Public Health developed a tool on Safe Cleaning for People with Asthma (http://www.health.ri.gov/publications/instructions/SafeCleaningForPeopleWithAsthma.pdf).

GAS STOVES AND SPACE HEATERS

Actions families can take:

- **If there is an exhaust fan in the kitchen use it when cooking**. Never use the stove to heat the house.
- If using unvented kerosene or gas space heaters **use the proper fuel** and keep the heater adjusted per the device's instructions. Open a window slightly or use an exhaust fan when using the heater.

WOOD SMOKE

Actions families can take or ask landlords to take:

- To help reduce smoke, make sure to **burn dry wood** that has been split, stacked, covered, and stored for at least 6 months.
- **Have the stove and chimney inspected every year** by a certified professional to make sure there are no gaps, cracks, or unwanted drafts or to remove dangerous creosote build-up.
- If possible, **replace the old wood stove with a new, cleaner heating appliance**. Newer wood stoves are at least 50% more efficient and pollute 70% less than older models. This can help make the home healthier and safer and help cut fuel costs. For more information, visit: www.epa.gov/burnwise.

Provide supplies to students and families

Some of the actions to reduce exposure to triggers described in this section require purchasing specific products. As this may place a financial burden on the families, some asthma programs have been able to acquire donations or grants to purchase products for the families. Examples include:

- Allergen impermeable mattress and pillow covers
- Vacuums with HEPA filters
- Non-toxic cleaning supplies
- Supplies for integrated pest management (e.g. pest traps, caulking)

Utilize case management strategies to connect families with resources

Sometimes the family needs more than education in order to reduce the environmental asthma triggers found inside the home. If the family is renting their unit, it is the landlord who is responsible for the structural repairs that may be necessary to reduce exposure to asthma triggers. For example: unrepaired leaks can lead to mold. Structural deficiencies may lead to pest infestations. Secondhand smoke may enter the family's residence from smokers in other units.

There are opportunities for SBHC staff to connect families with services and resources that can help them (as was described in the section on Case Management). For example: the SBHC staff member can connect the family with legal aid services (http://lsc.gov/find-legal-aid). Legal aid providers can help families understand their rights under state and federal laws. For example: asthma is considered a disability under the Americans with Disabilities Act and, as such, tenants with asthma have a right to reasonable accommodations that do not worsen their asthma. As another example: families may fear eviction as a form of retaliation by landlords and legal aid providers can identify laws that offer protection.

How can SBHCs engage in these interventions?

- SBHC staff can find out whether there are any in-home asthma education and environmental remediation programs in your community and, if so, establish a system for referring patients.
- SBHC staff can educate students and families about the changes they can make to reduce exposure to environmental triggers in the home.
- With additional resources SBHC staff can provide supplies to the families to help them make changes to reduce exposure to environmental triggers in the home.
- SBHC staff can utilize case management strategies to connect families with resources.

Strategy 5: Improving Outdoor Air Quality Around the School and Community

Overview of the strategy

Every year, millions of pounds of dangerous chemicals, gases, and particles are released into the air by vehicles, power plants, and industrial and agricultural activities. Scientific studies conducted throughout the U.S., as well as in other countries, have found strong relationships between four outdoor air pollutants (NO_2, PM, O_3, and SO_2) and asthma exacerbation in young children and adolescents.[97,98,99]

Additionally, outdoor air pollution has been implicated in the development of new asthma cases.[100,101,102] Outdoor air pollution is a serious problem in most urban areas as well as in many rural areas of the United States. According to the American Lung Association's *State of the Air 2014*, more than 147.6 million people—47 percent of the nation—live where pollution levels are too often dangerous to breathe.[103]

While it may seem at first glance that SBHCs don't have a significant role to play in improving outdoor air quality and reducing exposure to pollution, there is in fact a lot you can do for both schools and the surrounding community. Whether conducting an assessment, increasing awareness, or advocating for policy changes SBHC staff can serve an important role in improving outdoor environments.

What are some of the most important environmental asthma triggers to address?

As you read this chapter use the **trigger table** to use as a reference and to find more information on the following asthma triggers.

- **Outdoor air pollution** has been implicated in both asthma exacerbation and causation. The four main components of outdoor air pollution associated with asthma are:
  - *Ozone (O_3),* a colorless and odorless gas and the chief component of smog.
  - *Particulate matter (PM),* a heterogeneous mixture of small solid or liquid particles that can be inhaled.
  - *Nitrogen dioxide (NO_2),* a brownish acidic gas that reacts with other gases to form ground-level ozone (smog).
  - *Sulfur dioxide (SO_2).* Pollution "point sources" such as power plants produce SO_2 or acid sulfate particles.
- **Pollen** is a trigger for many people with asthma. Plants that may trigger asthma include some trees, grasses, weeds, and ragweed.

What are the types of interventions within the topic of Outdoor Air Quality around the School and Community that can reduce exposure to environmental asthma triggers?

While SBHC staff members are not responsible for maintaining healthy outdoor air quality, as the resident health experts for school communities, there is a role you can play to help ensure students and staff are afforded the right to healthy environments. Specifically, SBHC staff can:

- **Conduct an assessment** of local air quality
- **Partner with the school** to implement programs and policies to reduce exposure to outdoor triggers near the school
  - Increase awareness and protect students on high pollution days
  - Develop anti-idling education and policies
  - Develop approaches to reduce pollen exposure
- **Partner with others** in the community to advocate for clean air

Conduct an assessment of local air quality

Conducting a quick assessment of the outdoor air pollution in your community can provide important information about the sources and the scope of the problem. Such an assessment can be useful for increasing general awareness about air quality. It can also help interested staff and students select an air pollution intervention or an advocacy target.

An important tool called the Air Quality Index (AQI) provides real-time local, regional, or state air pollution information and is available for a great portion of the United States. Developed by the U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, National Park Service, tribal, state, and local agencies, the AQI indicates how clean or polluted the air is as well as the associated health effects an individual may experience within a few hours or days after breathing the polluted air. The AQI incorporates ozone and particulate matter—two key asthma triggers—into its calculations. The AQI is an air pollution yardstick that runs from zero to five hundred. The higher the number, the higher the pollution, and thus the higher the health concern. There are several ways to access the AQI including the following:

- **AirNow** (http://www.airnow.gov/index.cfm?action=airnow.main), run by the EPA and other government agencies, provides daily air quality forecasts and useful maps.
- AQI information may also be available through state and local air pollution control agencies. To locate yours, visit the **National Association of Clean Air Agencies**, www.4cleanair.org.

According to the American Lung Association's *State of the Air 2014*, more than 147.6 million people—47 percent of the nation—live where pollution levels are too often dangerous to breathe.

- Many of the institutions that provide AQI also provide different avenues for receiving that information. Many of the sites provide updates via **email**, **Facebook**, **Twitter**, and **homepage "widgets."** These tools allow SBHC staff to easily stay updated on local air quality conditions.

- Several organizations provide **smart phone apps** with frequently updated air quality information. Two examples are the US EPA: http://developer.epa.gov/category/apps/?_ga=1.26577405.1368038673.1423785311 and the American Lung Association: http://www.lung.org/healthy-air/outdoor/state-of-the-air/app.html

- Air quality forecasts may also be available as part of your **local weather forecast** on TV, radio, or newspaper.

While the AQI is very useful, it only represents a snapshot in time. One healthy air day doesn't necessarily reflect air quality conditions over the course of months or years. To get a much better sense of the air quality trends in your region try these resources:

- **AirNow** (http://www.airnow.gov/index.cfm?action=airnow.main), mentioned above, provides historical data on air quality for a particular area. For example: you can find the monthly average number of unhealthy days in a particular county.

- The American Lung Association analyzes data across multiple years from air quality monitors across the nation and publishes the results in easy-to-digest **State of the Air** reports. Visit http://www.stateoftheair.org/ and enter your zip code for county, regional and/or state information.

If you are interested in drilling down to find out about specific air pollution sources—typically "point source" pollutants that come from larger industrial facilities (as opposed to more dispersed or smaller stationary sources of pollution like vehicles or wood-burning stoves)—extensive data are available online. Two useful sources are:

- **The National Air Toxics Assessment**. The NATA provides emissions and health risk information on 33 air toxics that present the greatest threat to public health in the largest number of urban areas. Maps and lists are available and can be requested by state or county level: http://www.epa.gov/ttn/atw/natamain/.

- **Toxics Release Inventory**. The TRI database includes information for the public about releases of toxic chemicals from manufacturing facilities into the environment through the air, water, and land. You can access the data by typing in your zip code: http://www.epa.gov/tri/.

Regardless of the source you pursue, air quality data can and should be complemented by your own observations and knowledge of your school and nearby community. Some questions to consider: On the school site itself, is there traffic congestion during pick-up and drop-off times? Do school buses line up and idle? Is a school near a major roadway or freeway? Are there any nearby industrial facilities such as ports and petroleum refineries? How close are more common facilities such as gas stations and dry cleaning operations? During the winter do nearby residents burn wood for warmth? Building your awareness of what is near your school can help you better understand the potential exposures students and staff experience. For additional information on how the features of a community contribute to air pollution see the California Air Resources Board's "Air Quality and Land Use Handbook: A Community Health Perspective" (http://www.arb.ca.gov/ch/landuse.htm).

Conducting an assessment of local air quality presents some excellent opportunities to collaborate with students and school staff. Whether you organize an effort or act in a supportive role there are a variety of resources to help students better understand air quality generally as well as gain insights into the level of air pollution in their community. Following are just a few:

- **The AirNow website** mentioned above also includes Teacher's Air Quality Resources, which has presentation materials, educational activities, information on building your own particulate matter sensor, and links to other curricula, which you can share with teachers in your school: http://www.airnow.gov/index.cfm?action=learning.forteachers.

- If you're interested in more information on measuring air quality directly there are new and increasingly inexpensive means to do so. Some high school science teachers may be interested in taking this on as a class project or you could lead a SBHC peer program. The EPA's **"Citizen Science Opportunities for Monitoring Air Quality" fact sheet** is a good place to start for an overview; it also has links to additional information: http://www.epa.gov/research/priorities/docs/citizen-science-fact-sheet.pdf.

- Several non-governmental organizations also can help students and communities with air quality monitoring projects. For example: **Global Community Monitor** provides air quality assessment kits and guidance for a variety of community-led efforts: http://www.gcmonitor.org/communities/start-a-bucket-brigade/community-monitoring-tool-kit/. You may also find other helpful sources of support locally. For example: the **East Bay Academy for Young Scientists (EBAYS)**, affiliated with the Lawrence Hall of Science at UC Berkeley, provides underserved and marginalized communities in the East Bay Area access to innovative, hands-on science research activities so that they can develop important science, technology, engineering, and mathematics (STEM) skills as well as become young community leaders. Programs such as EBAYS can facilitate student-led projects and inquiries such as air quality monitoring in a particular location or neighborhood. Similar programs may be offered in your community.

Partner with the school to implement programs and policies to reduce exposure to outdoor triggers near the school

While the assessment will likely show that many sources of outdoor air pollution come from outside of the school environment (freeways, industries, ports, etc.), there are still interventions and policies that can happen right at your school site. Three of them are described below.

INCREASE AWARENESS AND PROTECT STUDENTS ON HIGH POLLUTION DAYS

Understanding air pollution sources and levels is a great start; it's also important to share that information with students, families, and school staff to help individuals better protect themselves as well as to raise awareness about air quality generally. A helpful tool to accomplish both goals is the EPA's Flag Program. The Flag Program uses different colored flags to inform students, school staff, and the community of daily air quality conditions. The flag colors correspond to the colors used in EPA's Air Quality Index (AQI), which tells how clean or polluted the air is for that day. Sharing the daily air quality through these highly visible flags increases awareness about air pollution.

In addition to raising awareness, the flag program also serves as important guidance for modifying physical activity in order to protect the health and well-being of students. As a representative of a SBHC, you can play a key role in working with the school to develop modified or alternative exercise activities to protect the health of students with asthma or all students, as necessary. The EPA provides recommendations related to outdoor activity in the table below that your school could adopt or tailor.

When outdoor air pollution is particularly bad, indoor exercise may be a necessary alternative. As a SBHC representative, you can help a school with

the implementation. The EPA recommends "activities that include aerobic exercise as well as muscle and bone strengthening components (e.g., jumping, skipping, sit-ups, pushups). If a gymnasium or open space is accessible, promote activities that use equipment, such as cones, hula hoops, and sports balls. If restricted to the classroom, encourage students to come up with fun ways to get everyone moving (e.g., act out action words from a story). Teachers and recess supervisors [and SBHC staff!] can work with PE teachers to identify additional indoor activities."[104]

The role of a SBHC in a flag program could range from introducing the idea to the school principal to leading implementation using the tools referenced in this guide. A project of this nature can also be coordinated with health education and science teachers as an adjunct to the curriculum. To learn more about the flag program and how to implement it in collaboration with your school see these helpful resources:

- **School flag program homepage**: http://www.airnow.gov/index.cfm?action=school_flag_program.index
- **Fact sheet**: http://www.epa.gov/airnow/school_flag/SchoolFlag-2013-final.pdf
- **Flag program coordinator handbook**: http://www.epa.gov/airnow/school_flag/sfp-coordinator-handbook-2013.pdf

Air Quality and Outdoor Activity Guidance for Schools

Regular physical activity — at least 60 minutes each day — promotes health and fitness. The table below shows when and how to modify outdoor physical activity based on the Air Quality Index. This guidance can help protect the health of all children, including teenagers, who are more sensitive than adults to air pollution. Check the air quality daily at www.airnow.gov.

Air Quality Index	Outdoor Activity Guidance
green GOOD	Great day to be active outside!
yellow MODERATE	Good day to be active outside! Students who are unusually sensitive to air pollution could have symptoms.*
orange UNHEALTHY FOR SENSITIVE GROUPS	It's OK to be active outside, especially for **short activities** such as recess and physical education (PE). For **longer activities** such as athletic practice, take more breaks and do less intense activities. Watch for symptoms and take action as needed.* Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy.
red UNHEALTHY	For **all outdoor activities**, take more breaks and do less intense activities. Consider moving **longer or more intense activities** indoors or rescheduling them to another day or time. Watch for symptoms and take action as needed.* Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy.
purple VERY UNHEALTHY	Move **all activities** indoors or reschedule them to another day.

*** Watch for Symptoms**

Air pollution can make asthma symptoms worse and trigger attacks. Symptoms of asthma include coughing, wheezing, difficulty breathing, and chest tightness. Even students who do not have asthma could experience these symptoms.

If symptoms occur:
The student might need to take a break, do a less intense activity, stop all activity, go indoors, or use quick-relief medicine as prescribed. If symptoms don't improve, get medical help.

Go for 60!

CDC recommends that children get 60 or more minutes of physical activity each day. www.cdc.gov/healthyyouth/physicalactivity/guidelines.htm

Plan Ahead for Ozone

There is less ozone in the morning. On days when ozone is expected to be at unhealthy levels, plan outdoor activities in the morning.

DEVELOP ANTI-IDLING EDUCATION AND POLICIES

For many schools across the nation the single greatest source of outdoor air pollution emanating from the school site itself is the rows of school buses and personal vehicles that line up and idle while dropping off and picking up students. According to the EPA, monitoring at schools has shown elevated levels of benzene, formaldehyde, acetaldehyde, and other air toxics during the afternoon hour coinciding with parents picking up their children.[105]

Idling school buses may be a particular concern as most run on diesel fuel. Diesel emissions are a particularly potent air pollutant as they are a mixture of gases and solids including particulate matter, sulfur oxides, and chemicals that contribute to ozone. The EPA has declared diesel pollution to be a likely human carcinogen, and studies have linked it to asthma, cardiovascular disease, and other illnesses.

The risks associated with exposure to idling buses and vehicles can be greatly reduced by one simple action: shutting off idling engines. Changing driver behavior repeatedly and consistently, however, requires implementing a mix of education and policy change—activities that SBHCs are well-positioned to do. There are many resources available to assist in these efforts.

Here is a sampling:

- EPA Region 8 created the **Idle Free Schools Toolkit** for creating an effective idling reduction campaign at school. It also provides the resources to create a student-run science or community involvement project, providing students with the opportunity to learn how to run a public service campaign while expanding their science and math skills. http://www2.epa.gov/region8/idle-free-schools
- The nonprofit Clean Air Campaign's **Clean Air Kids—No Idling** encourages parents and school bus drivers to turn off their engines while waiting in the pick-up/drop-off line. This program comes with free in-ground signage and a how-to toolkit with educational materials and tracking surveys. http://www.cleanaircampaign.org/Your-Schools/About-Clean-Air-Campaign-Schools/Clean-Air-Campaign-Schools-Programs/Clean-Air-Kids-Pre-K-8-Programs
- The EPA's **Clean School Bus Idling Reduction Campaign** has a variety of background information, policies, and marketing materials to support school bus drivers in reducing idling. See http://www.epa.gov/cleanschoolbus/antiidling.htm for more information and http://www.epa.gov/cleandiesel/sector-programs/form.htm to order materials.

Additional resources on anti-idling programs can be found in the **Appendix**.

DEVELOP APPROACHES TO REDUCE POLLEN EXPOSURE

Pollen is a trigger for many people who have asthma. The types of pollens that are triggers vary from person to person and from region to region. Though there will be some times of the year when pollen in the air is unavoidable, there are still things that schools can do to help reduce exposure.

First, SBHC staff may want to track the pollen count in their community. The American Association of Allergy, Asthma & Immunology has a website called the AAAAI's National Allergy Bureau, which tracks pollen levels: http://www.aaaai.org/global/nab-pollen-counts.aspx. SBHC staff can work with the school or school district to change practices and policies to promote allergy (and asthma) friendly landscaping in and around the school. For example: when planting new trees, schools can select tree types that will not make allergies worse (crape myrtle, dogwood, fig, fir, palm, pear, plum, redbud, and redwood trees, or female cultivars of ash, box elder, cottonwood, maple, palm, poplar or willow trees).[106] Additionally, because grass pollen is a common asthma trigger, the school can adopt

policies on the timing of grass cutting with the goal of avoiding student and staff exposure. The school can also alert staff when grass cutting is conducted so that they can keep windows and doors closed. Schools could also replace grass with a ground cover that does not produce much pollen, such as Irish moss, bunch grass, or dichondra.[107] Additional information can be found at the following sites:

- **Society for Allergy Friendly Environmental Gardening**: http://www.safegardening.org/
- **Healthy Schoolyards**: http://www.healthyschoolyards.org/index.php

Partner with others in the community on clean air advocacy

In addition to playing a key role in protecting the health of students and staff and reducing pollution on a school campus, SBHC staff can also be effective advocates for cleaner air in the surrounding community. Whether taking the lead on a specific effort or serving as a supportive partner in a larger process, a SBHC representative is first and foremost a trusted, respected medical expert who lends authority to public health issues like air quality.

There are numerous outdoor air quality issues in which a SBHC could get involved. On the next page is a table showing just a small sampling of various efforts that unfold at the local, state, or national levels, each with one or two resources or project examples to spur your thinking.

An important thing to keep in mind is that SBHC staff don't have to *lead* these advocacy efforts. Indeed, there are many different groups with which to form partnerships and alliances from the local to the national levels. Here are a few general types of groups to look for as well as a few specific examples to check out:

- **Local asthma coalitions and programs**: There may be an asthma coalition in your community. The Asthma Community Network, supported by the EPA in partnership with Allies Against Asthma, a program of the Robert Wood Johnson Foundation and the Merck Childhood Asthma Network, Inc. (MCAN), lists local contacts and other resources on their website: http://www.asthmacommunitynetwork.org/.
- **Local environmental and civic groups**: From small community-based environmental justice organizations to chapters of traditional environmental groups, there are likely some in your community that you already know about or can find through referrals or a quick web search.
- **Associations of medical professionals concerned about environmental issues**: For example: Physicians for Social Responsibility has a Health Voices for Clean Air program designed to raise the voices of health professionals in support of clean air (http://www.psr.org/environment-and-health/climate-change/air-pollution/health-voices-for-clean-air.html). The California chapter of the American Lung Association convenes the Health Professionals for Clean Air Program (http://www.lung.org/associations/states/california/advocacy/health-professionals.html).

AIR QUALITY STRATEGY	RESOURCES AND EXAMPLES
Promote siting of schools, playgrounds, athletic fields, and subsidized housing away from major outdoor air-pollutant sources such as high-traffic roads and freeways	› Air Quality and Land Use Handbook: A Community Health Perspective (http://www.arb.ca.gov/ch/landuse.htm)
Reduce exposure to harmful particulate matter through the adoption of wood-burning reduction programs and policies	› EPA's Burn Wise Program for consumers and policymakers: http://www.epa.gov/burnwise/index.html
Replace older, more polluting school buses with newer, alternative-fuel vehicles	› EPA's Clean School Bus Program http://www.epa.gov/cleanschoolbus/csb-overview.htm › Your state may also have funding for school-bus cleanup. In California for example: http://www.arb.ca.gov/msprog/schoolbus/schoolbus.htm
Institutionalize and enforce diesel emissions–reduction policies and procedures with an emphasis on freight-related infrastructure such as ports, truck routes, train yards, etc.	› The EPA's National Clean Diesel Campaign (NCDC) promotes clean air strategies by working with manufacturers, fleet operators, air quality professionals, environmental and community organizations, and state and local officials to reduce diesel emissions. The website is an excellent portal into programs, incentives, policies, and regional and local efforts to clean up diesel: http://www.epa.gov/cleandiesel/index.htm
Support the strengthening of federal air quality standards such as ozone, particulate matter, etc.	Such federal standards are updated on an ongoing basis, typically over many years. See the links below for two examples. › Ozone: http://www.epa.gov/airquality/ozonepollution/actions.html › Particulate matter: http://www.epa.gov/airquality/particlepollution/actions.html

How can SBHCs engage in these interventions?

- SBHC staff can conduct an assessment of local air quality.
  - You can use the array of web-based resources to access the Air Quality Index.
  - You can use the resources listed to get a better sense of air quality trends or drill down to find out about specific air pollution sources near the school.
  - You can collaborate with school staff and students on these projects. It could even be turned into a science class project or a SBHC peer group project.
- SBHC staff can partner with the school to implement programs and policies to reduce exposure to outdoor triggers near the school.

  Your role can range from introducing the idea to the school principal to leading implementation using the tools referenced in this guide. Specific interventions include:
  - Increase awareness and protect students on high pollution days
  - Develop anti-idling education and policies
  - Develop approaches to reduce pollen exposure
- SBHC staff can partner with others in the community on clean air advocacy. Often, there are existing efforts and adding your voice as a health expert can make a big difference!

Conclusion

School-based health centers are already at the forefront of promoting health for all students. By providing care onsite to hundreds of thousands of children and adolescents in need of health care and education, SBHCs are proving to be an effective and essential cornerstone of our nation's health care and public health systems. By taking on the challenge of environmental asthma triggers, SBHCs have the potential to help all of our children breathe easier.

Following this conclusion is an "At-A-Glance" tool which can serve as a menu for the wide array of wonderful strategies that SBHCs can use to reduce exposure to environmental asthma triggers.

At-A-Glance: How can SBHCs engage in interventions to reduce exposure to environmental asthma triggers?

As School-Based Health Center staff, you can…

Strategy 1: Education

- Conduct one-on-one education about environmental asthma triggers during patient visits.
- Conduct, organize, or support school-based group education for students.
- Provide education for school staff.
- Print/order and distribute materials, tools and curricula for educating students, families and school staff.

Strategy 2: Case Management

- Incorporate strategies to reduce exposure to environmental asthma triggers into your case management approach to students with asthma.
- Facilitate connections to resources that exist, communicate with and educate other partners critical to effective asthma management (parents, school staff, etc.), and identify when direct advocacy is needed.

Strategy 3: Improving Indoor Air Quality in Schools

- Increase awareness.
- Conduct or facilitate an assessment.
- Support or lead a comprehensive approach to improving indoor air quality.
- Support or lead an intervention to address specific triggers or other factors (such as mold and moisture, chemical irritants from school and personal products, and ventilation.)

Strategy 4: Improving the Students' Home Environments

- Establish referral systems for in-home asthma education and environmental remediation programs in the community.
- Educate students and families.
- Provide supplies to students and families.
- Utilize case management strategies to connect families with resources.

Strategy 5: Improving Outdoor Air Quality around the School and Community

- Conduct an assessment of local air quality.
- Partner with the school to implement programs and policies to reduce exposure to outdoor triggers near the school.
  - Increase awareness and protect students on high pollution days.
  - Develop anti-idling education and policies.
  - Develop approaches to reduce pollen exposure.
- Partner with others in the community on clean air advocacy.

Appendix: Resources and Tools

Strategy 1: Education

ASTHMA ACTION PLANS

- National Heart Lung and Blood Institute Asthma Action Plan http://www.nhlbi.nih.gov/files/docs/public/lung/asthma_actplan.pdf
- RAMP Asthma Action Plan http://rampasthma.org/info-resources/asthma-action-plans/

SCHOOL-BASED GROUP EDUCATION FOR STUDENTS

- Adolescent Asthma Action (Triple A) http://www.asthma.org.au/Programs/TripleAProgram.aspx
- Asthma Awareness Curriculum for the Elementary Classroom http://www.nhlbi.nih.gov/health-pro/resources/lung/asthma-curriculum-elementary-class/contents
- Fight Asthma Now (FAN) for Teens http://www.lungchicago.org/fight-asthma-now/
- Fight Asthma Now (FAN) for Youth http://www.lungchicago.org/fight-asthma-now/
- Kickin' Asthma http://www.lung.org
- Open Airways for Schools (OAS) http://www.lung.org.
- Power Breathing http://www.aafa.org/display.cfm?id=4&sub=79&cont=436
- Roaring Adventures of Puff (RAP) http://www.educationforasthma.com/

EDUCATION FOR SCHOOL STAFF

- California School Environmental Health and Asthma Collaborative's QuickTakes, http://www.californiabreathing.org/collaborations/sehac/
- National Association of School Nurses' Managing Asthma Triggers in Schools https://www.pathlms.com/nasn/courses/607
- National Asthma Education and Prevention Program's School Asthma Education Slide Set http://www.nhlbi.nih.gov/health-pro/resources/lung/asthma-basics-for-schools
- North Carolina Asthma Program's Asthma Education Curriculum for School Nurses and Other School Professionals http://www.asthma.ncdhhs.gov/docs/asthmaeducationcurriculumforschoolnursesandotherelementaryandmiddleschoolprofessionals.pdf
- Winning with Asthma http://www.winningwithasthma.org/

EDUCATIONAL MATERIALS TO DISTRIBUTE

- Breathe Easies Videos http://www.noattacks.org/breathe-easies
- Lungtropolis Kids http://www.lung.org/assets/documents/lungtrop.pdf
- PBS interactive website and apps including games featuring the television character, Arthur http://pbskids.org/arthur/health/asthma/
- Quest for the Code http://asthma.starlight.org/
- US EPA Publications on Asthma http://www.epa.gov/asthma/publications.html

- Wellapets http://www.wellapets.com/#sthash.SnW4MzLH.dpuf
- You Can Control Asthma http://www.aafa.org/display.cfm?id=4&sub=79&cont=433

OTHER

- National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines/full-report
- Physician Asthma Care Education Program, module on cultural competency http://campuslifeservices.ucsf.edu/upload/chipper/documents/UCSF_RAMP_APPUC_Manual.pdf

Strategy 2: Case Management

ASTHMA ACTION PLANS WITH TRIGGER LISTS

- National Heart Lung and Blood Institute Asthma Action Plan http://www.nhlbi.nih.gov/files/docs/public/lung/asthma_actplan.pdf
- RAMP Asthma Action Plan http://rampasthma.org/info-resources/asthma-action-plans/

TOOLS TO EDUCATE SCHOOL STAFF

- Bleach-free Disinfection and Sanitizing for Child Care http://www.rampasthma.org/2011/03/9258/
- See also: Strategy 1: Education

TOOLS TO FACILITATE SERVICES

- Clinical Efforts Against Secondhand Smoke Exposure (CEASE) http://www2.massgeneral.org/ceasetobacco/index.htm
- Legal Aid Services http://lsc.gov/find-legal-aid
- US Department of Housing and Urban Development programs http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhi

TOOLS TO ADVOCATE

- Green Cleaning in Schools: A Guide for Advocates : http://www.rampasthma.org/2010/03/green-cleaning-in-schools-a-guide-for-advocates/
- Idle Free Schools http://www2.epa.gov/region8/idle-free-schools
- School Flag Program Coordinator Handbook http://www.epa.gov/airnow/school_flag/sfp-coordinator-handbook-2014.pdf
- Smokefree Policies in Multi-Unit Housing: Steps for Success http://www.lung.org/stop-smoking/about-smoking/smokefree-housing.html

Strategy 3: Improving Indoor Air Quality in Schools

TOOLS FOR INCREASING AWARENESS

- Breathe Better at School from the Allergy and Asthma Network http://www.allergyasthmanetwork.org/cms/wp-content/uploads/2015/02/BreatheBetter_SCHOOL.pdf
- California School Environmental Health and Asthma Collaborative's Asthma QuickTake on indoor asthma triggers in schools http://www.sehac.org/#!quicktake2/ckan
- Improve Your IAQ poster (http://media.wix.com/ugd/43bb02_fc55f28d2c2044d5aca96546a0d31f57.pdf)
- Parent's Guide to School Indoor Air Quality, created by the Healthy Schools Network http://www.healthyschools.org/downloads/IAQ_Guide.pdf
- Triggers in Your School http://www.noattacks.org/triggers-in-your-school

- U.S. EPA's Creating Healthier Indoor Environments in Schools website (http://www.epa.gov/iaq/schools/index.html
- U.S. EPA's Student Health and Academic Performance http://www.epa.gov/iaq/schools/student_performance/index.html

TOOLS TO CONDUCT OR FACILITATE AN ASSESSMENT

- Building and Grounds Maintenance Checklist http://www.epa.gov/iaq/schools/pdfs/kit/checklists/bldgmaintchklst.pdf
- Environmental Assessment Checklist for Healthy Schools http://www.epa.gov/region10/pdf/childrenshealth/schools_assessment_checklist_110812.pdf
- Healthy SEAT http://www.epa.gov/schools/guidelinestools/healthySEAT/
- Teacher's Classroom Checklist http://epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf

POLICIES RELATED TO INDOOR AIR QUALITY

- Americans with Disabilities Act: How it Affects You https://www.aafa.org/display.cfm?id=9&sub=19&cont=255
- Environmental Law Institute Database of State Indoor Air Quality Laws http://www.eli.org/sites/default/files/eli-pubs/2015-iaq-database.pdf
- U.S. EPA's Model IAQ Management Plan http://www.epa.gov/iaq/schools/tfs/coord_section_3.html

COMPREHENSIVE APPROACHES TO IMPROVING IAQ IN SCHOOLS

- U.S. EPA's Indoor Air Quality (IAQ) Tools for Schools (TfS) program http://www.epa.gov/iaq/schools/actionkit.html and http://www.epa.gov/iaq/schools/excellence.html
- Asthma Friendly Schools Initiative http://www.lung.org/lung-disease/asthma/creating-asthma-friendly-environments/asthma-in-schools/asthma-friendly-schools-initiative/toolkit/provide-a-healthy-learning.html
- Collaborative for High Performance Schools www.chps.net

TOOLS TO ADDRESS MOLD AND MOISTURE

- Mold Remediation in Schools and Commercial Buildings http://www.epa.gov/mold/pdfs/moldremediation.pdf
- IAQ Tools for Schools: Mold and Moisture http://www.epa.gov/iaq/schools/tfs/guideh.html

TOOLS TO ADDRESS DUST MITES

- Background Information for Building and Grounds Maintenance Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/bldgmaintchklstbkgd.pdf
- The Teacher's Classroom Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf

TOOLS TO ADDRESS PESTS THROUGH INTEGRATED PEST MANAGEMENT

- California Department of Pesticide Regulations: IPM for Schools video series http://apps.cdpr.ca.gov/schoolipm/managing_pests/video_series.cfm
- Northeastern Integrated Pest Management Center http://www.northeastipm.org/bmps-for-school-ipm/
- Purdue University's IPM for Schools Technical Resource Center http://extension.entm.purdue.edu/schoolipm/
- Texas A&M University http://schoolipm.tamu.edu/
- University of Florida's IPM in Schools Program http://schoolipm.ifas.ufl.edu/INDEX.html

TOOLS TO ADDRESS PETS

- EPA's Model IAQ Management Plan has a policy on Animals in the Classroom: http://www.epa.gov/iaq/schools/tfs/coord_section_3.html#Animals
- Teacher's Classroom Checklist: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/teacherchklst.pdf

TOOLS TO ADDRESS CHEMICAL IRRITANTS FROM SCHOOL AND PERSONAL PRODUCTS

- Fragrance-Free School Policy http://action.lung.org/site/DocServer/fragrance-free-policy-sample-updated.pdf
- Healthy Purchasing for Healthy Schools http://www.healthyschools.org/documents/CHS_healthypurchasinghealthyschools.pdf

TOOLS ON ASTHMA-FRIENDLIER CLEANING PRODUCTS

- Breathing Easier: School Districts Make the Switch to Certified Green Cleaning Products www.rampasthma.org/2009/05/breathing-easier/
- California School Environmental Health and Asthma Collaborative also developed a quick video on asthma-safer cleaning: http://www.sehac.org/#!quicktake-5/c7t0
- The Green Cleaning for Healthy Schools Toolkit http://www.cleaningforhealthyschools.org/
- Green Schools Initiative http://www.greenschools.net/article.php?id=245
- Green Seal www.greenseal.org
- Healthy Cleaning & Asthma-Safer Schools: A How-To Guide http://www.cdph.ca.gov/programs/ohsep/Documents/CLASSguidelines.pdf
- UL ECOLOGO http://industries.ul.com/environment/certificationvalidation-marks/ecologo-product-certification

TOOLS ON VENTILATION

- ASHRAE Ventilation Standards https://www.ashrae.org/standards-research--technology/standards--guidelines
- Ventilation Backgrounder http://www.epa.gov/iaq/schools/pdfs/kit/checklists/ventchklstbkgd.pdf
- Ventilation Checklist http://www.epa.gov/iaq/schools/pdfs/kit/checklists/ventchklst.pdf

Strategy 4: Improving the Students' Home Environments

TOOLS TO ADDRESS MOLD AND MOISTURE

- A Brief Guide to Mold, Moisture, and Your Home http://www.epa.gov/mold/moldguide.html
- See also: Strategy 3: Improving Indoor Air Quality in Schools

TOOLS TO ADDRESS PESTS THROUGH INTEGRATED PEST MANAGEMENT

- Northeastern Integrated Pest Management Center http://www.northeastipm.org/ipm-in-action/what-is-ipm/
- University of California Davis Integrated Pest Management http://www.ipm.ucdavis.edu/GENERAL/whatisipm.html
- See also: Strategy 3: Improving Indoor Air Quality in Schools

TOOLS TO ADDRESS ENVIRONMENTAL TOBACCO SMOKE

- Clinical Efforts Against Secondhand Smoke Exposure (CEASE) http://www2.massgeneral.org/ceasetobacco/index.htm
- Protect Your Loved Ones from Secondhand Smoke http://smokefree.gov/secondhand-smoke
- Smokefree Policies in Multi-Unit Housing: Steps for Success http://www.lung.org/stop-smoking/about-smoking/smokefree-housing.html

TOOLS ON ASTHMA-FRIENDLIER CLEANING PRODUCTS

- Green Seal www.greenseal.org
- Safe Cleaning for People with Asthma http://www.health.ri.gov/publications/instructions/SafeCleaningForPeopleWithAsthma.pdf
- UL ECOLOGO http://industries.ul.com/environment/certificationvalidation-marks/ecologo-product-certification
- See also: Strategy 3: Improving Indoor Air Quality in Schools

TOOLS ON WOOD SMOKE

- U.S. EPA's Burn Wise Program http://www.epa.gov/burnwise/

OTHER

- US Department of Housing and Urban Development http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhi
- Legal Aid Services http://lsc.gov/find-legal-aid

Strategy 5: Improving Outdoor Air Quality around the School and Community

TOOLS FOR CONDUCTING AN ASSESSMENT OF LOCAL AIR QUALITY

- Air Quality and Land Use Handbook: A Community Health Perspective http://www.arb.ca.gov/ch/landuse.htm
- AirNow http://www.airnow.gov/index.cfm?action=airnow.main
- Air Toxics Website: State, Local, Tribal Resources http://www.epa.gov/airtoxics/stprogs.html
- The Association of Air Pollution Control Agencies http://www.csg.org/aapca_site/index.aspx
- Citizen Science Opportunities for Monitoring Air Quality fact sheet http://www.epa.gov/research/priorities/docs/citizen-science-fact-sheet.pdf
- Community Monitoring Toolkit http://www.gcmonitor.org/communities/start-a-bucket-brigade/community-monitoring-tool-kit/
- National Association of Clean Air Agencies http://www.4cleanair.org/
- State of the Air http://www.stateoftheair.org
- National Air Toxics Assessment http://www.epa.gov/ttn/atw/natamain/
- Teacher's Air Quality Resources http://www.airnow.gov/index.cfm?action=learning.forteachers
- Toxics Release Inventory Program http://www2.epa.gov/toxics-release-inventory-tri-program

TOOLS ON SCHOOL FLAG PROGRAMS

- School Flag Program Coordinator Handbook http://www.epa.gov/airnow/school_flag/sfp-coordinator-handbook-2014.pdf
- School Flag Program Fact Sheet http://www.epa.gov/airnow/school_flag/SchoolFlag-2013-final.pdf
- School Flag Program http://www.airnow.gov/index.cfm?action=school_flag_program.index

TOOLS ON ANTI-IDLING PROGRAMS

- Airwatch Northwest Anti-Idling Programs http://www.airwatchnw.org/anti-idling-programs/
- Clean Air at Schools (CASEO) Anti-Idling Program http://enginesoff.com/2_4_schools.htm
- Clean Air Kids: No Idling http://www.cleanaircampaign.org/Your-Schools/About-Clean-Air-Campaign-Schools/Clean-Air-Campaign-Schools-Programs/Clean-Air-Kids-Pre-K-8-Programs
- Clean Air Partnership's Idle-Free Campaign Kit http://www.cambridge.ca/relatedDocs/Idle%20Free%20Kit%20for%20Schools.pdf
- Clean Air Zone Montana Anti-Idling Program http://deq.mt.gov/Recycle/CleanAirZone.mcpx
- The Cool Mom No-Idle Program http://www.coolmom.org/programs/no-idle
- EPA Region 8's Idle Free Schools Toolkit http://www2.epa.gov/region8/idle-free-schools
- The Idle Free Utah Program: http://utahcleancities.org/idlefree-utah
- San Francisco Bay Area's Ditching Dirty Diesel Collaborative (DDDC)'s The Anti-Idling Toolkit for Schools http://ditchingdirtydiesel.org/publicatoins-press
- U.S. EPA's Clean School Bus Idling Reduction Campaign http://www.epa.gov/cleanschoolbus/antiidling.htm

TOOLS ON POLLEN

- AAAAI's National Allergy Bureau: http://www.aaaai.org/global/nab-pollen-counts.aspx
- Healthy Schoolyards: http://www.healthyschoolyards.org/index.php
- Society for Allergy Friendly Environmental Gardening: http://www.safegardening.org/

TOOLS FOR CLEAN AIR ADVOCACY

- Air Quality and Land Use Handbook: A Community Health Perspective http://www.arb.ca.gov/ch/landuse.htm
- Asthma Community Network http://www.asthmacommunitynetwork.org/
- Ground Level Ozone Regulatory Actions http://www.epa.gov/airquality/ozonepollution/actions.html
- Health Professionals for Clean Air http://www.lung.org/associations/states/california/advocacy/health-professionals.html
- Health Voices for Clean Air http://www.psr.org/environment-and-health/climate-change/air-pollution/health-voices-for-clean-air.html
- Particulate Matter Regulatory Actions http://www.epa.gov/airquality/particlepollution/actions.html
- U.S. EPA's Burn Wise Program http://www.epa.gov/burnwise/
- U.S. EPA's Clean Diesel Campaign Clean Diesel Grants http://www.epa.gov/cleandiesel/index.htm
- U.S EPA's Clean School Bus Program http://www.epa.gov/cleanschoolbus/csb-overview.htm

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