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.*