State of Asthma Hawaii 2010

Environmental Exposure Supplement

Hawaii Asthma Initiative

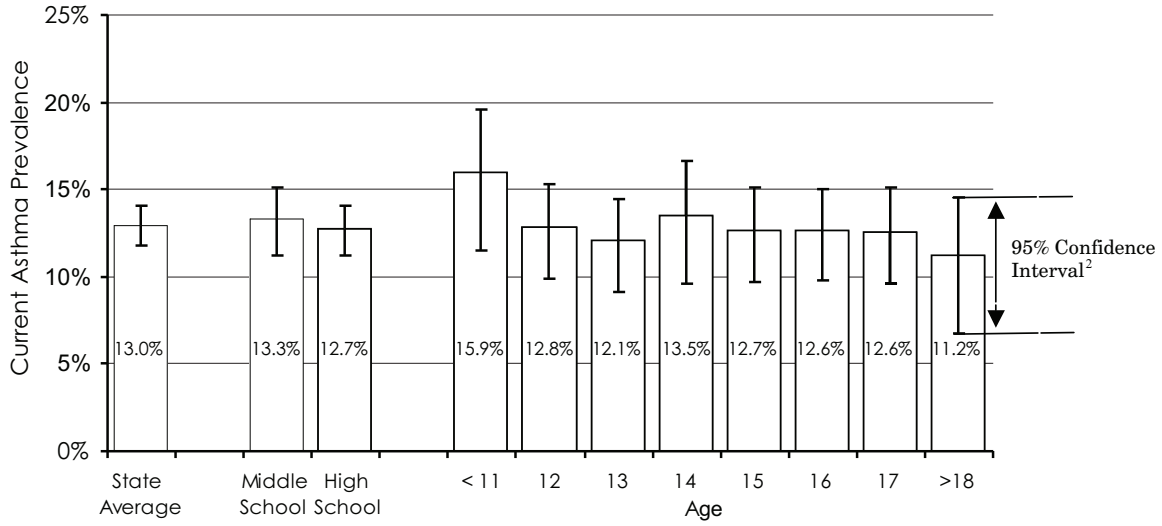
Aloha, The Hawaii State Department of Health, Asthma Control Program is pleased to present the State of Asthma – Hawaii 2010, Environmental Exposure Supplement. This report is a compilation of asthma-related data specific to Hawaii and presents the most recent information available for both indoor and outdoor environmental exposures such as tobacco, mold, cockroaches, and sulfur dioxide/particulate matter from both volcanic emissions as well as fireworks. Exposures to these known allergens and irritants (triggers) have been shown to increase asthma symptoms and exacerbations for people with asthma within the home, school and workplace. This report provides Hawaii-specific data on environmental exposures. We hope this report will provide you with an increased understanding of asthma-related environmental exposures and its application to program planning, implementation and evaluation.

The information presented in this report is based on the following Hawaii State Department of Health data sources: (1) Hawaii Behavioral Risk Factor Surveillance System (BRFSS) data for 2005-2009, (2) Hawaii Health Survey (HHS) data for 2003-2008, (3) Youth Tobacco Survey (YTS) data for 2007 and 2009, and (4) Outdoor air quality (Hawaii Department of Health, Clean Air Branch – HDOH CAB) data for 2000-2009. Detailed information on the data sources is available at http://hawaii.gov/health/. Due to limitations in the surveillance system and small sample sizes, statistically significant differences are difficult to detect; nevertheless, Hawaii follows national patterns where persistent differences can be seen between those exposed to environmental triggers and irritants and those who are not exposed.

ASTHMA PREVALENCE

Approximately 10.9% of children, ages 0-17 and 9.4% of adults living in Hawaii currently have asthma.[1]

Current Asthma Prevalence by Age among Middle and High School Students



Source: YTS 2007 and 2009[3]

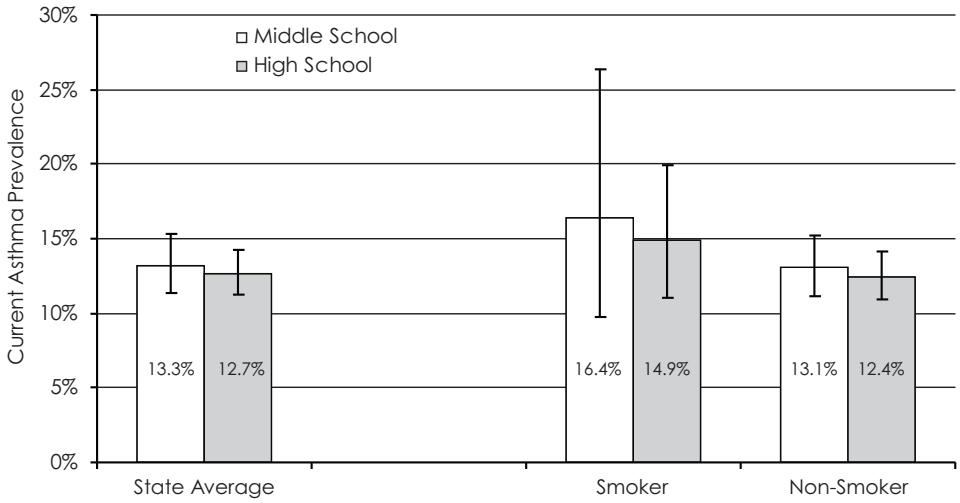
Finding
Approximately 13% of middle and high school students have asthma. Current asthma prevalence is highest among those 11 years old or younger.

CIGARETTE SMOKING AND ASTHMA

Tobacco smoke is an irritant to the lungs. People with asthma who smoke or are exposed to secondhand smoke have a higher risk for asthma attacks because their airways are overly sensitive. Approximately 15.4% of adults, 11.5% of public high school students and 4.8% middle school students report current smoking.[1, 3]

Asthma Prevalence by Smoking Status among Middle and High School Students

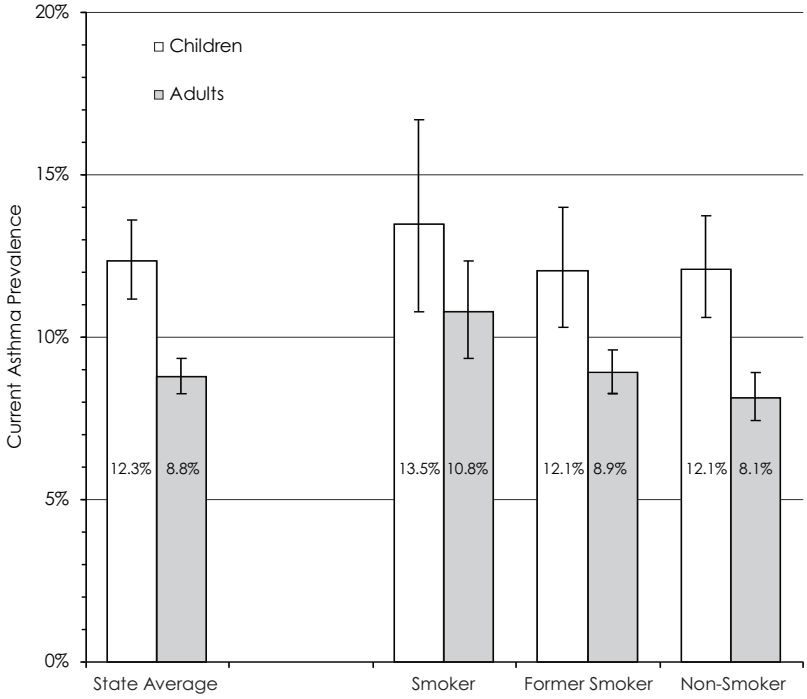
Finding
Current asthma prevalence among high school students who smoke (14.9%) is higher than non-smokers (12.4%).



Source: YTS 2007 and 2009

Asthma Prevalence by Adult Smoking Status

Finding
Adults who smoke are more likely to have asthma than non-smokers. Children whose parents smoke are more likely to have asthma than children from non-smoking families. One in seven children whose parent(s) smoke currently has asthma.



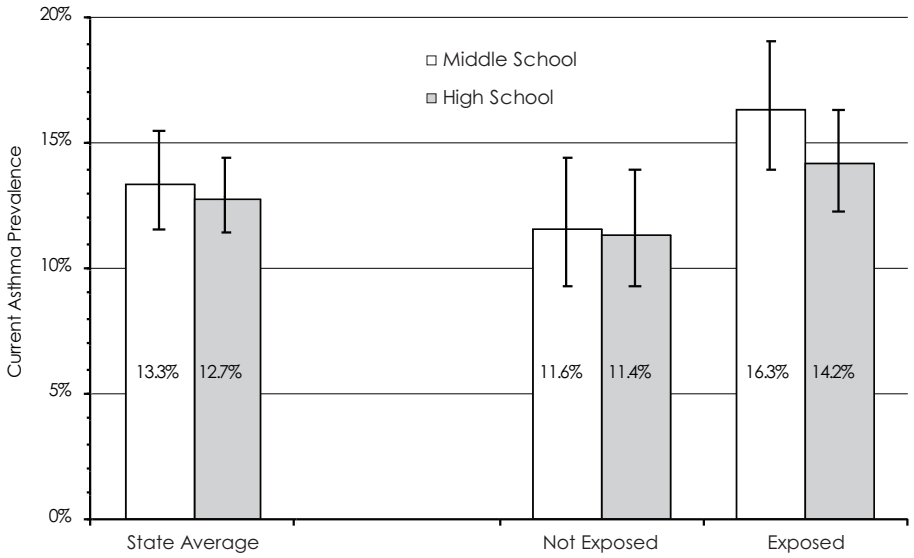
Source: BRFSS 2008-2009

SECONDHAND SMOKE AND ASTHMA

Children who are exposed to secondhand smoke can have more frequent and more severe asthma attacks.[4] One half of high school students (53%) and a third of middle school students (38%) are exposed to secondhand smoke in the same room at least one day per week. More than a quarter of middle school students (29%) and a third of high school students (34%) are exposed to secondhand smoke in a car at least one day per week.[3]

Asthma Prevalence by Exposure to Secondhand Smoke in a Room in the Past Week

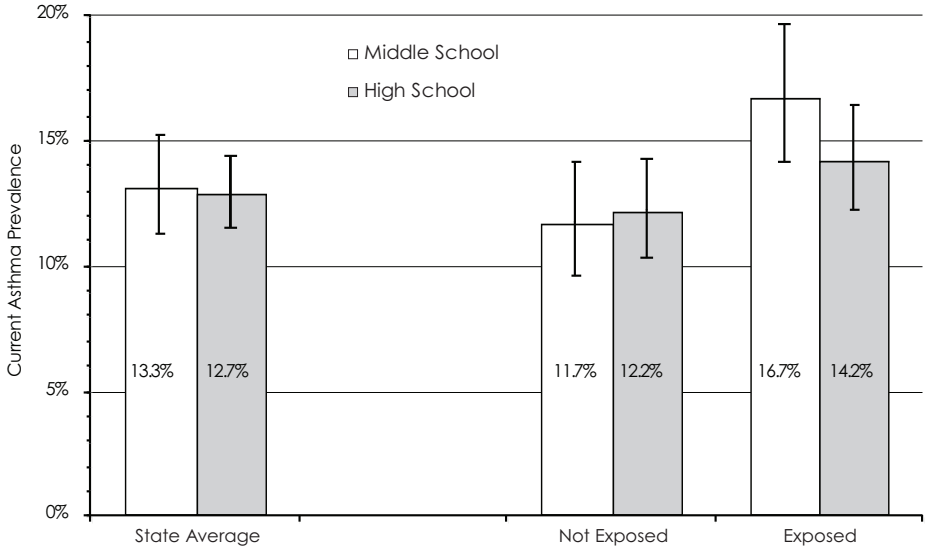
Finding
Children and youth who are exposed to secondhand smoke in a room are more likely tohave asthma.



Source: YTS 2007 and 2009

Asthma Prevalence by Exposure to Secondhand Smoke in Cars in the Past Week

Finding
Children and youth who are exposed to secondhand smoke in cars are more likely to have asthma.



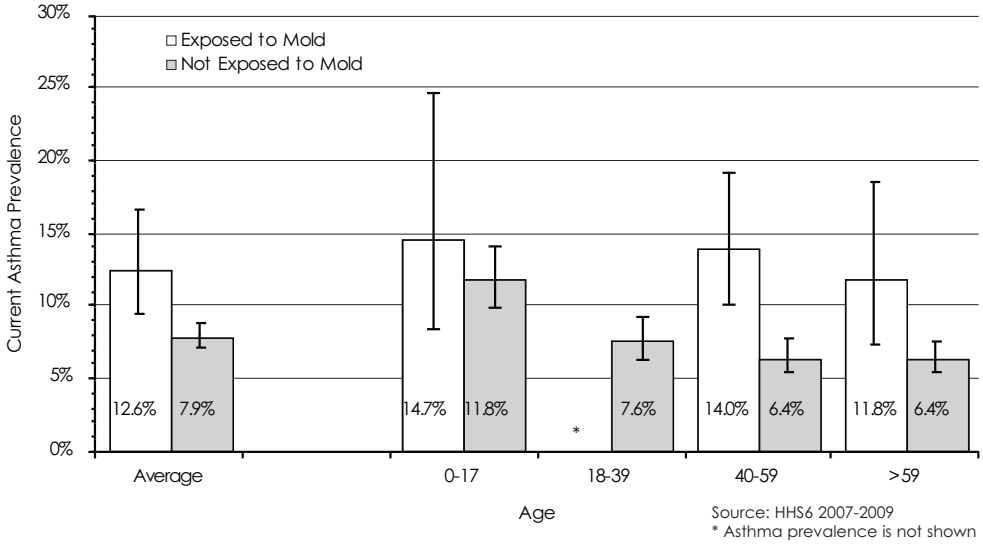
Source: YTS 2007 and 2009

MOLD AND ASTHMA

Molds are microscopic fungi that live on plant and animal matter. Molds can be found almost anywhere; they grow on virtually any substance when moisture is present. For people sensitive to molds, inhaling mold spores can cause an asthma attack.[5]

Asthma Prevalence by Exposure to Mold

Finding
Overall, people who are exposed to mold are 1.6 times more likely to have asthma than people who are not exposed.



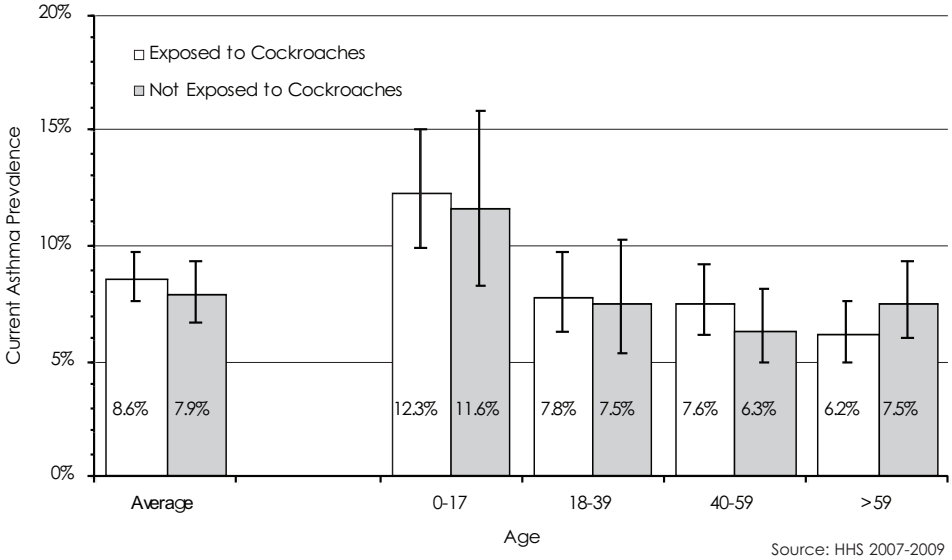
Source: HHS6 2007-2009
* Asthma prevalence is not shown due to small sample size (n<20)

COCKROACHES AND ASTHMA

Droppings or body parts of cockroaches and other pests can trigger asthma. Certain proteins found in cockroach feces and saliva can cause allergic reactions or trigger asthma symptoms in some individuals. Between 23% and 60% of urban residents with asthma are sensitive to the cockroach allergen.[7]

Asthma Prevalence by Exposure to Cockroaches

Finding
People who are exposed to cockroaches are more likely to have asthma than people who are not exposed. This difference is not statistically significant but it is persistent.



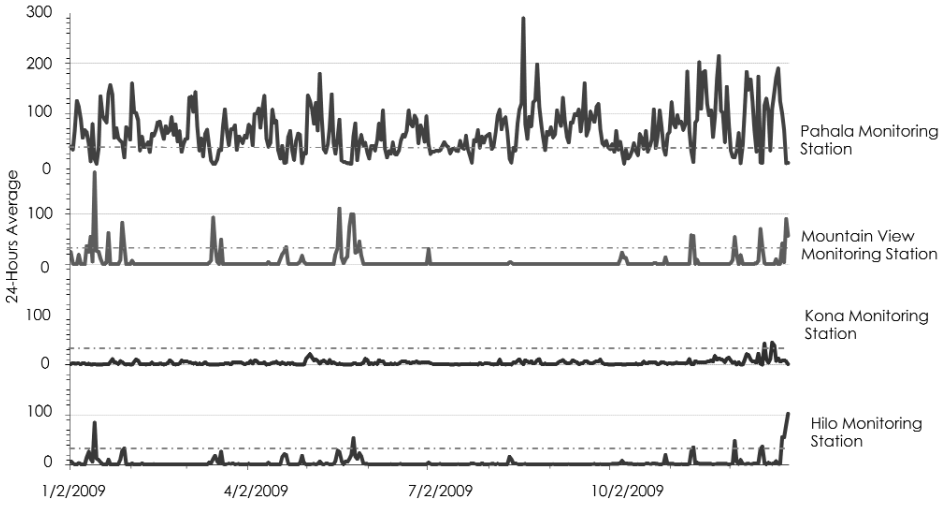
Source: HHS 2007-2009

VOG AND ASTHMA

Elevated levels of sulfur dioxide and particulate matter, components of volcanic fog (vog) havebeen linked to breathing problems in individuals, especially those with preexisting respiratory conditions, such as asthma, emphysema, and bronchitis, and an increase in emergency department (ED) visits.8-12 The eruption of Kilauea volcano, located in the Hawaii Volcanoes National Park (HVNP), has expelled steam, gas or lava since 1983. Since 1986, approximately 1,000-2,000 tons of sulfur dioxide have been released into the air daily from Kilauea, mostly from the Puu Oo vent. Kilauea also emits many gases and particles such as mercury, ash, carbon dioxide and hydrogen sulfide. In March of 2008, a new vent opened at Halemaumau Crater. The sulfur dioxide emission rate from Halemaumau has been measured as high at 2,200 tons/day compared with a background rate of 150-200 tons/day. The recent hourly sulfur dioxide levels have reached 3,000 parts per billion (ppb) in some residential areas (Pahala, Wood Valley, etc), whereas previously (in 2000) the maximum hourly sulfur dioxide reached only 1,200 ppb in the HVNP Visitor Center, located 2.3 miles away from Halemaumau vent and 10.6 miles away from Puu Oo vent.[13]

24-hour Average Sulfur Dioxide (SO_2) on Hawaii Island

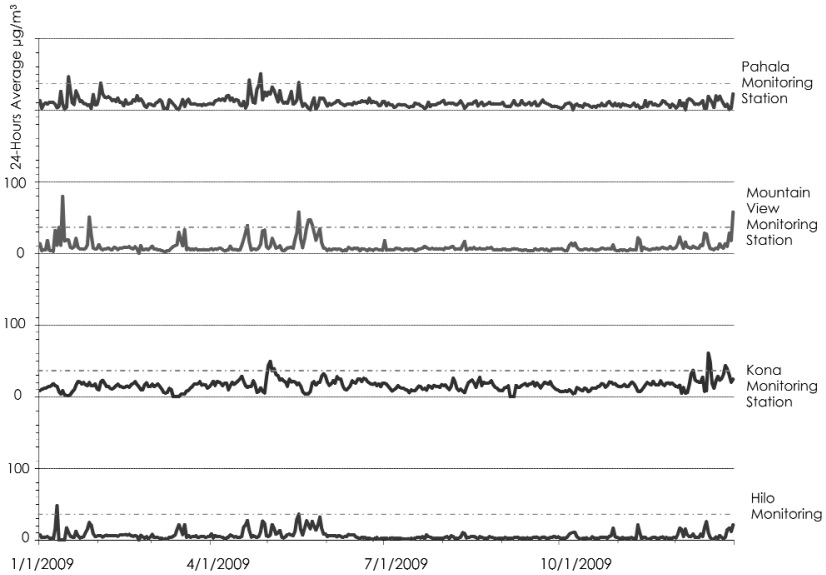
Finding
The Pahala monitoring station in Kau District has the highest daily average of sulfur dioxide, exceeding the national standards more often than other locations.[14, 15]



Source: 2009, HDOH, Clean Air Branch[13]

24-hour Average Particulate Matter ($PM_{2.5}$) on Hawaii Island

Finding
Particulate matter concentrations are highly variable from day to day. The Kona monitoring station measured the highest daily average concentration of particulate matter.[16, 17]

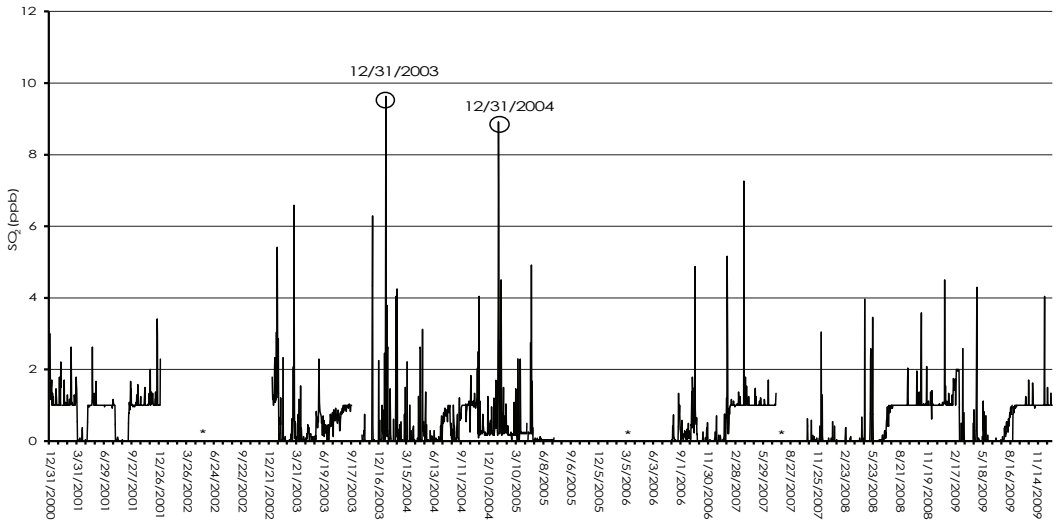


Source: 2009, HDOH CAB

FIREWORKS AND ASTHMA

The smoke from fireworks consists mainly of fine toxic dusts that can easily enter the lungs exacerbating pre-existing asthma and emphysema. Smoke from fireworks combustion may contain a mixture of sulfur-coal compounds, traces of heavy metals, and other toxic chemicals or gases. Air quality also depends on wind speed and direction, as well as the location, amount and types of fireworks.

24-hour Average Outdoor Sulfur Dioxide (SO_2) as an Indicator of Fireworks on Oahu



* some SO_2 data are missing.
Source: 2009, HDOH CAB

Finding
Overall particulate matter seems to be higher during New Years' firework celebrations. This is especially evident in years 2003 and 2004.

SUMMARY

Asthma remains one of the most common chronic conditions in both children and adults. Strong evidence has linked exposure to allergens and/or triggers to asthma morbidity. This report illustrates that current smoking, secondhand smoke, mold and cockroaches are associated with current asthma prevalence in Hawaii. Data in this report on vog and and fireworks are difficult to correlate with overall asthma prevalence or increase in asthma attacks. A growing body of evidence has demonstrated that reduction in the exposure to allergens and irritants along with appropriate use of medications is an effective method to decrease symptoms and urgent health care use and increase quality and years of healthy life.[18]

This report is also available on the Hawaii Department of Health website at http://hawaii.gov/health/family-child-health/chronic-disease/asthma/index.html. For more information on the State of Asthma – Hawaii 2010, Environmental Exposure Supplement, other reports and supplements or to receive additional copies, please contact the Hawaii State Asthma Control Program at 808-692-7472 or by e-mail at asthma@doh.hawaii.gov.

Suggested Citation

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Acknowledgment

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Reference

[1] Behavioral Risk Factor Surveillance System (BRFSS) 2009 is an annual telephone survey of civilian, non-institutionalized adults (>18 years) in the United States which has been conducted in all the states and territories since 1988. The BRFSS assesses risk factors for disease(s) and conditions related to the ten leading causes of death in the U.S. population.

[2] A 95% confidence interval is range that contains the true population prevalence estimate with 95% certainty. For a more complete explanation of this confidence internal, please refer to the State of Asthma Hawaii 2009 burden report.

[3] Youth Tobacco Survey (YTS) is a school-based survey of students in public school in grades 6 through 12. Schools are randomly selected with probability proportional to enrollment size and classrooms are chosen randomly within selected schools, and all students in selected classes eligible to participate. This survey is anonymous and self-administered questionnaire. To examine secondhand tobacco exposure, YTS middle and high school data sets for 2007 and 2009 were combined into one dataset. Secondhand exposure in both cars and homes were first examined by middle and high school datasets and were not found to be sufficiently different.

[4] Environmental Protection Agency. website http://www.epa.gov/asthma/shs.html (2010)

[5] Environmental Protection Agency. website http://www.epa.gov/asthma/molds.html (2010)

[6] Hawaii Health Survey (HHS) provides information for demographic, socio-economic and specific health characteristics, e.g. island, zip code, gender, age, income/poverty, ethnicity, education, household size, insurance status, general physical and mental health status and selected chronic conditions including asthma. Calculated variables are created from detailed questions pertaining to the specific topic (e.g. insurance status is coded from 17 possible questions). The HHS differs from the BRFSS in that a knowledgeable adult member (respondent aged 18 years or older) of the household is asked questions relating to the household and each household member. Thus, data can be reported for the household, population, children and/or adult population. Sample size for respondents is approximately 6,000 per year with a total of 15,000 household members including children. Data are weighted to estimate the households, adult population, or total population of Hawaii. In addition, data are adjusted as households without telephones, group quarters, homeless and the island of Niihau are not sampled. For more information, refer to the appendix and websites http://hawaii.gov/health/statistics/hhs/index.html.

[7] Asthma and Allergy Foundation of America (AAFA) website http://www.aafa.org (2010)

[8] Krupitsky, D and Michaud, JP. Effects of Volcanic Fog (Vog) on the Health of Hawaii Volcano National Park Workers. APHA 2007

[9] Longo, BM, Yang, W, Green, JB, Crosby, FL & Crosby, VL. (2010) Acute Health Effects Associated with Exposure to Volcanic Air Pollution (vog) from Increased Activity at Kilauea Volcano in 2008. Journal of Toxicology and Enviromental Health, Part A, 73: 20, 1370 - 1381.

[10] Longo, BM, Yang, W. Green, JB, Longo, AA, Harris, M. & Biblone, R. (2010). Indoor air quality for vulnerable populations at Kilauea Volcano, Hawaii. Family and Community Health, 22(1), 21-31.

[11] Michaud JP, Grove JS, Krupitsky D. Emergency department visits and "vog"-related air quality in Hilo, Hawai'i. Environmental Research. 2004 May; 95(1):11-9

[12] Michaud JP, Krupitsky D, Grove JS and Anderson BS, Volcano related atmospheric toxicants in Hilo and Hawaii Volcanoes National Park; implications for human health. Special Issue: Infant and Child Neurotoxicity. Studies: Twenty-first International Neurotoxicology Conference, Edited by J.M. Cranmer, L.R. Goldman, D.R. Mattison and D.C. Rice, 26/4 pp. 555-563, 2005.

[13] Air quality data in this report are from the Hawaii State Department of Health, Clean Air Branch (HDOH CAB), which has monitors in multiple locations throughout Hawaii Islands (www.airnow.gov) and provides air quality data on an hourly basis.

[14] National Ambient Air Quality Standards for 24 hours Sulfur Dioxide is 140 ppb (parts per billion).

[15] National Ambient Air Quality Standards for Annual Sulfur Dioxide is 30 ppb (parts per billion).

[16] National Ambient Air Quality Standards for 24 hours Particulate Matter 2.5 is 35 µg/m3

[17] National Ambient Air Quality Standards for Annual Particulate Matter 2.5 is 15 µg/m3

[18] Krieger J. Home Is Where the Triggers Are: Increasing Asthma Control by Improving the Home Environment. Pediatric Allergy, Immunology, and Pulmonology. Volume 23, Number 2, 2010

HAWAII STATE DEPARTMENT OF HEALTH