

# State of Asthma Hawaii 2009



Hawaii Asthma Initiative





## Acknowledgements

The Hawaii State Department of Health (DOH), Community Health Division, Chronic Disease Management and Control Branch, Asthma Control Program would like to acknowledge the following organizations and entities who contributed to the *State of Asthma – Hawaii 2009*.

- Hawaii Health Information Corporation
- Hawaii State Department of Health Office of Health Status Monitoring
- Hawaii State Department of Health Office of Health Planning, Behavioral Risk Factor Surveillance System

*Suggested Citation:*

Krupitsky, D., Reyes-Salvail, F., Baker, Kromer K., and Pobutsky, A. (2009) *State of Asthma, Hawaii 2009*. Hawaii State Department of Health, Honolulu, HI





## A Message from the Director of Health

**Aloha kakou,**

The Hawaii State Department of Health is pleased to present the publication of the *State of Asthma – Hawaii 2009*. The report, produced under the direction of the Department's Asthma Control Program, compiles surveillance information and other data sources into a comprehensive document.

Asthma is a complex disease that is increasing in prevalence in the United States. Data from the 2005 - 2006 Hawaii Behavioral Risk Factor Surveillance System (BRFSS) survey show that approximately 12% or 36,000 children and 8% or 76,000 adults currently have asthma in Hawaii.

Healthcare costs associated with asthma are staggering. According to the Hawaii Health Information Corporation, total charges associated with hospitalizations due to a primary diagnosis of asthma amounted to more than \$18.2 million per year. This does not include healthcare costs associated with asthma-related outpatient and emergency department visits or prescription medications.

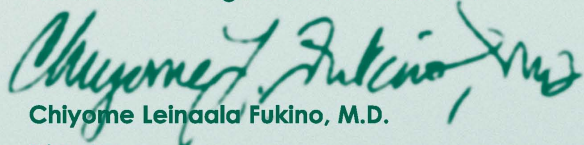
It is clear that the burden of asthma on Hawaii's population is significant. The public health response to this increasing burden of asthma has several key components, surveillance being the first. Surveillance allows us to quantify the extent of asthma in the population, how severe it is, how well it is being controlled and how much it costs. Sound data will allow us to better direct resources when developing asthma programs.

The *State of Asthma – Hawaii 2009* report is a compilation of surveillance data specific to Hawaii's population. This report is intended to provide decision makers, programs, agencies, organizations and anyone interested in asthma with relevant information necessary for asthma-related program planning and policy development.

Asthma is a serious, complex and costly disease, but by working together, we can create a healthier Hawaii. I invite you to join us in that effort.

Kuikahi kakou i ka puuwai,

Let us all work together from the heart,



**Chiyome Leinaala Fukino, M.D.**

Director

Hawaii State Department of Health



## Table of Contents



<b>Introduction</b>	<b>5</b>
<b>Health Surveys</b>	<b>5</b>
Behavioral Risk Factor Surveillance System (BRFSS)	6
Hawaii Health Survey (HHS)	6
<b>Highlights</b>	<b>7</b>
<b>Asthma Prevalence</b>	<b>10</b>
State Prevalence	10
Local Geographic Area Prevalence	11
Basic Demographic Characteristics	14
– Age, Gender and Ethnicity	
Socio-economic Characteristics	16
– Employment and Household Income among Adults	
Health Care Access	17
Risk Factors, Co-morbidities and Quality of Life	18
Tobacco Exposure and Asthma	18
Health Status and Health Related Quality of Life	19
Mental and Physical Health	21
Obesity and Asthma	22
Vaccination and Asthma	23
<b>Asthma Emergency Department Visits</b>	<b>23</b>
Methods	23
Emergency Department – Statewide	24
Local Geographic Area	25
Basic Demographic Characteristics – Age, Gender and Ethnicity	27
Emergency Department Costs	29
<b>Asthma Hospital Discharges</b>	<b>30</b>
Methods	30
Hospital Inpatient Discharges – Statewide	31
Basic Demographic Characteristics – Age, Gender and Ethnicity	34
Asthma Hospitalization Cost	36
Asthma Hospitalization Severity	36
<b>Asthma Mortality</b>	<b>38</b>
State Mortality	39
<b>Data Definitions</b>	<b>40</b>
Behavior Risk Factors Surveillance System (BRFSS)	40
Hawaii Health Survey (HHS)	42



FIGURES	PAGE
1 Prevalence of asthma for the population of Hawaii, by year, BRFSS 2001-2007 (excluding 2004).	10
2 Lifetime and current prevalence of asthma in Hawaii, BRFSS 2005-2006.	10
3 Current asthma prevalence among adults and children by county, BRFSS 2005-2006.	11
4 Children asthma prevalence by geographic area, BRFSS 2005-2006.	11
5 Adult asthma prevalence by geographic area, BRFSS 2005-2006.	11
6 Current asthma prevalence among children and adults, by gender, BRFSS 2005-2006.	14
7 Current asthma prevalence by age group, BRFSS 2005-2006.	14
8 Prevalence of current asthma by gender and age, HHS 2003-2005.	14
9 Current asthma prevalence among children and adults by ethnic group, BRFSS 2005-2006.	15
10 Employment by adult asthma status, BRFSS 2005-2006.	16
11 Annual household income by adult asthma status, BRFSS 2005-2006.	16
12 Prevalence of asthma by poverty status for children and adults, HHS 2003-2005.	17
13 Adults with no access to health care by asthma status, BRFSS 2005-2006.	17
14 Prevalence of asthma by insurance status for children and adults, HHS 2003-2005.	18
15 Adult smokers by asthma status, BRFSS 2005-2006.	18
16 Prevalence of other chronic health conditions by asthma for adults, HHS 2003-2005.	19
17 Percent of adults with at least 14 days of "health not good" and usual activities by asthma status, BRFSS 2005-2006.	20
18 Fair/poor health, limitations and use of special equipment due to health problems by adult asthma status, BRFSS 2005-2006.	20
19 Anxiety or depressive disorder and estimate of recent depression by asthma status for adults, BRFSS 2005-2006.	21
20 Distribution of mental health summary scores (SF-12®) by asthma status among adults, HHS 2003-2005.	21
21 Distribution of physical health scores (SF-12®) by asthma status among adults, HHS 2003-2005.	22
22 Prevalence of Body Mass Index categories by asthma status among adults, HHS 2003-2005.	22
23 Flu and pneumonia immunization by asthma status, BRFSS 2005-2006.	23
24 Children asthma ED visits per 10,000 children by geographic area, HHIC 2000-2005.	24
25 Adults asthma ED visits per 10,000 adults by geographic area, HHIC 2000-2005.	24
26 Annual average ED visit rates per 10,000 population by gender and age, HHIC 2000-2005.	27
27 Annual average ED visit rates per 10,000 children by ethnicity, HHIC 2000-2005.	27
28 Annual average ED visit rates per 10,000 adults by ethnicity, HHIC 2000-2005.	28

## List of Figures







FIGURES	PAGE
29 Annual average ED visit rates per 10,000 population by month and gender, HHIC 2000-2005.	28
30 Average annual ED visit costs for children and adults by payer, HHIC 2000-2005.	29
31 Repeated ED utilization in the past 12 months, HHIC 2000-2005.	29
32 Childhood asthma hospitalization discharge rate per 10,000 children by geographic area, HHIC 1995-2005.	31
33 Adult asthma hospitalization discharge rate per 10,000 adults by geographic area, HHIC 1995-2005.	31
34 Average hospitalization discharge rates per 10,000 population by gender and age, HHIC 1995-2005.	34
35 Average hospitalization discharge rates per 10,000 children by ethnicity, HHIC 1995-2005.	34
36 Average hospitalization discharge rates per 10,000 adults by ethnicity, HHIC 1995-2005.	35
37 Annual average hospitalization discharge rates per 10,000 population by month and gender, HHIC 1995-2005.	35
38 Average annual hospitalization cost by payer, HHIC 1995-2005.	36
39 Average annual asthma hospitalizations, the risk of mortality by year, HHIC 1995-2005.	36
40 Average annual asthma hospitalization discharges by severity value, HHIC 1995-2005.	37
41 Repeated hospitalizations in the past 11 years, HHIC 1995-2005.	37
42 Statewide asthma mortality (underlying cause) rates per 100,000 population, OHSM 1995-2004.	38
43 Statewide asthma mortality (non-underlying cause of death) rates per 100,000 population, OHMS 1999-2005.	39
<b>TABLES</b>	
1 Current asthma prevalence by sub-areas, BRFSS 2005-2006.	12
2 Prevalence of asthma by smoker and lives with a smoker for children and adults, HHS 2003-2005.	19
3 Annual asthma ED visits by geographic area, HHIC 2000-2005 and BRFSS 2005-2006.	25
4 Annual asthma hospitalization discharge rates by geographic area, HHIC 1995-2005, BRFSS 2005-2006.	32



## ***Introduction***

Public health surveillance is the ongoing, systematic collection, analysis, interpretation and dissemination of data regarding health-related events for use by communities to reduce morbidity and mortality and to improve health. Data from a public health surveillance system can be used for immediate public health action, program planning and evaluation, formulating research hypotheses and to:

- Measure the burden of a disease (or other health-related event), including changes in related factors, the identification of populations at high risk and the identification of new or emerging health concerns;
- Monitor trends in the burden of a disease (or other health-related event), including the detection of epidemics (outbreaks) and pandemics;
- Guide the planning, implementation and evaluation of programs to prevent and control disease, injury, or adverse exposure;
- Evaluate public policy;
- Detect changes in health practices and the effects of these changes;
- Prioritize the allocation of health resources;
- Describe the clinical course of disease; and
- Provide a basis for epidemiologic research.

The existence of an asthma surveillance system is vital for efficient planning, evaluation and program action. As such, the Hawaii State Asthma Control Program is currently engaged in the construction of Hawaii's Comprehensive State Asthma Surveillance System (CSASS) that will be designed to measure and track asthma burden through four key indicators: (1) asthma prevalence, (2) asthma severity, (3) asthma management and (4) asthma cost. Although Hawaii's CSASS is continually growing, meaningful asthma surveillance data is currently available for public dissemination. It is hoped that the information contained in this report will help guide and focus asthma program planning throughout Hawaii.

The information presented in this report is based on the following data sources: (1) Hawaii Behavioral Risk Factor Surveillance System (BRFSS) data for 2005-2006, (2) Hawaii Health Survey data for 1998-2007, (3) asthma hospitalization data for the years 1996 to 2005 and asthma emergency department visits for years 2000 to 2005 from the Hawaii Health Information Corporation, and (4) mortality data from Hawaii vital statistics records for the years 1995 to 2004.

## ***Health Surveys***

State of Hawaii has two ongoing telephone surveys BRFSS and Hawaii Health Survey, which provide estimates of many chronic diseases and their risk factors. These two surveys have different methods for data collection; findings of one survey are not necessarily more precise than the other. Examining data from both surveys provides better comprehensive understanding of the burden of asthma in our state.







### **Behavioral Risk Factor Surveillance System**

The Behavioral Risk Factor Surveillance System (BRFSS) is the largest continuously conducted landline telephone health survey in the world. The state of Hawaii has been an active participant in BRFSS since 1986. BRFSS enables the Centers for Disease Control and Prevention (CDC), state health departments and other health and education agencies to monitor risk behaviors related to chronic diseases, injuries and death. State health departments use BRFSS data to create annual and periodic reports, fact sheets, press releases, or other publications, which are used to educate the public, the professional health community and policy makers about the prevalence of modifiable behavioral risk factors and of preventive health screening practices and their associations with chronic conditions and diseases. Data collected through the BRFSS is routinely used to capture health information on demographically defined subgroups (gender, ethnicity, age, educational level, income level, geographic location).

The Hawaii BRFSS is a collaboration between the State Department of Health and the CDC. The Hawaii BRFSS follows all the protocols and guidelines of the CDC. The survey uses a complex random sample design. The adult participant is selected randomly when the number of adults in the randomly sampled telephoned household is more than one. In an effort to have a statewide population estimate of asthma prevalence among children age 17 or younger, two questions on childhood asthma were asked as state added questions in 2001. For more information, refer to the appendix and websites <http://hawaii.gov/health/statistics/brfss/index.html>.

### **Hawaii Health Survey**

The Hawaii Health Survey (HHS) was first conducted in 1968 as an "in person" household survey modeled after the National Health Interview Survey. Starting in 1996 the survey information was collected using Computer Assisted Telephone Interviewing (CATI). The 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). Asthma prevalence information from the CATI mode has been collected since 1996, and in recent years, current asthma has been gathered.

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.<sup>1</sup> For more information, refer to the appendix and websites <http://hawaii.gov/health/statistics/hhs/index.html>.

<sup>1</sup> *Hawaii Health Survey 2002, Procedure Manual. 2005. SMS Research & Marketing Services, Inc. and Hawaii Department of Health, Office of Health Status Monitoring.*



## Highlights

### State Prevalence

- It is estimated that 11.6% of children (<18 years) and 7.8% of adults (≥18 years) in Hawaii currently have asthma (Hawaii BRFSS, 2005-2006). This corresponds to 36,000 children and 76,000 adults (112,000 people with asthma).
- The prevalence of asthma in Hawaii's population has increased between 1998 and 2007.

### Local Geographic Area Prevalence

- The Nanakuli/Waianae sub-area in Honolulu County and the island of Molokai in Maui County have the highest childhood asthma prevalence compared to the rest of the state.
- The current asthma prevalence among children is highest in Hawaii County but is not statistically different from the other counties.
- Honolulu County overall, along with the Nanakuli/Waianae in Honolulu County sub-area, have the highest overall asthma ED visit and hospitalization rates per 10,000 population.
- The Kona sub-area in Hawaii County has the highest rates of ED visits among children with asthma; on average, 1 in 7 children with asthma visited the ED in the past 12 months.

### Basic Demographic Characteristics – Age, Gender and Ethnicity

- Boys have a higher current asthma prevalence than girls (14.2% vs. 8.9%) which increases the overall childhood asthma prevalence to nearly 12%.
- Women (females 18 years or older) are nearly twice as likely to have current asthma as men (10.2% vs. 5.3%).
- White adults reported the greatest number with asthma in comparison to other ethnic groups.
- Native Hawaiian adults have the highest current adult asthma prevalence (13.4%); their asthma prevalence is significantly higher than in other ethnic groups.
- Adults and children who are Native Hawaiian have the greatest asthma burden, as defined by: 1) asthma prevalence, 2) emergency department visit rates, and 3) hospitalization rate.
- Native Hawaiian children and adults have the highest ED visit and hospitalization rates compared to other ethnic groups
- The majority of asthma ED visits are by children under the age of five.
- The majority of asthma related hospitalizations occur among children 14 years and younger and adults 50 years and older, with the highest proportions at the very young and very old.







## ***Socio-economic Characteristics – Employment and Household Income***

- Asthma is more prevalent among adults who are unable to work or unemployed than adults that are employed.
- Asthma prevalence among those “living below the poverty level (<100%)” is significantly higher than those at the upper end of the poverty measurement (>199%) for both children and adults.<sup>2</sup>
- People of lower socio-economic status are not only more likely to have asthma, but more than half of the cost of ED visits and hospitalizations are paid by government programs (Medicare and Medicaid). Children with current asthma are more likely to live in lower socio-economic status households.

## ***Health Care Access***

- Asthma is more prevalent among adults who are uninsured compared to adults who are insured.
- Adults with current asthma are less likely to report not having a personal doctor or health care provider compared to adults without current asthma, but it is not significantly different.

## ***Tobacco Exposure and Asthma***

- Adults and youth who smoke have a higher prevalence of asthma than adults who do not smoke.
- More than one-third of children who have asthma live with individual(s) who smoke.
- In addition, children who smoke or who live with a smoker have a higher prevalence of asthma when compared to those children who do not smoke or live with a smoker.

## ***Health Status and Health Related Quality of Life***

- Adults with asthma are more likely to have other health conditions than adults without asthma (arthritis, diabetes, high blood pressure and high blood cholesterol).

## ***Mental and Physical Health***

- Depressive and anxiety symptoms are higher among adults with current asthma when compared to adults without current asthma.
- Adults with asthma have more days of poor physical or mental health compared to those without asthma.
- Nearly one in four people with asthma reported that their health is either fair or poor.
- Nearly one in four people with asthma reported that their activities were limited due to poor health.

<sup>2</sup> Poverty status takes into account family size and family income (refer to appendix for detailed descriptions of poverty status), based on guidelines published annually by the U.S. Department of Health and Human Services. Below Poverty-Poor <100% is defined as household income for the families below poverty level.



## **Obesity and Asthma**

- Adults with current asthma have a significantly higher prevalence of obesity compared to adults without current asthma.
- Overweight and obese adults are more likely to have current asthma.

## **Vaccination**

- Flu shot and pneumococcal pneumonia vaccine rates are higher among adults with current asthma when compared to adults without current asthma; however, the rates are still below Healthy People 2010 Objectives.
- During the cooler season (December-January) when flu is more prevalent, ED visit and hospitalization rates are the highest.

## **Asthma Severity**

- Statewide pediatric hospitalization rates for asthma may be slightly decreasing (1996-2005), whereas asthma ED visits have been increasing (2000-2005).
- Statewide asthma mortality trends (asthma as an underlying cause of death) may be decreasing (1995-2004).
- 36% of asthma hospitalizations are of moderate severity, and 12% of asthma hospitalizations are of major or extreme severity.
- 15% of asthma hospitalizations have moderate risk for mortality, while 5% of asthma hospitalizations have major or extreme mortality risks

## **Cost**

- The total annual asthma ED costs for the state of Hawaii is \$4.2 million and asthma hospitalization is \$14 million per year.
- Private insurance paid 45% of the asthma total hospitalization costs for children and 31% for adults, private insurance paid 41% of ED asthma claims for children and 36% for adults.
- Almost half of the ED visits for both children and adults are paid by government programs (Medicaid and Medicare), whereas two thirds of asthma hospitalizations are paid by these programs.

## **Mortality**

- The underlining cause of mortality rate for asthma seems to be decreasing from 1995 to 2004; whereas, the non-underlying cause of mortality rate for asthma is slightly increasing from 1999 to 2005.
- During the 1995 to 2004 time period, on average 30 people per year died due to their asthma complications and another 48 died with asthma as non-underlying cause; most of these deaths occurred in elders.



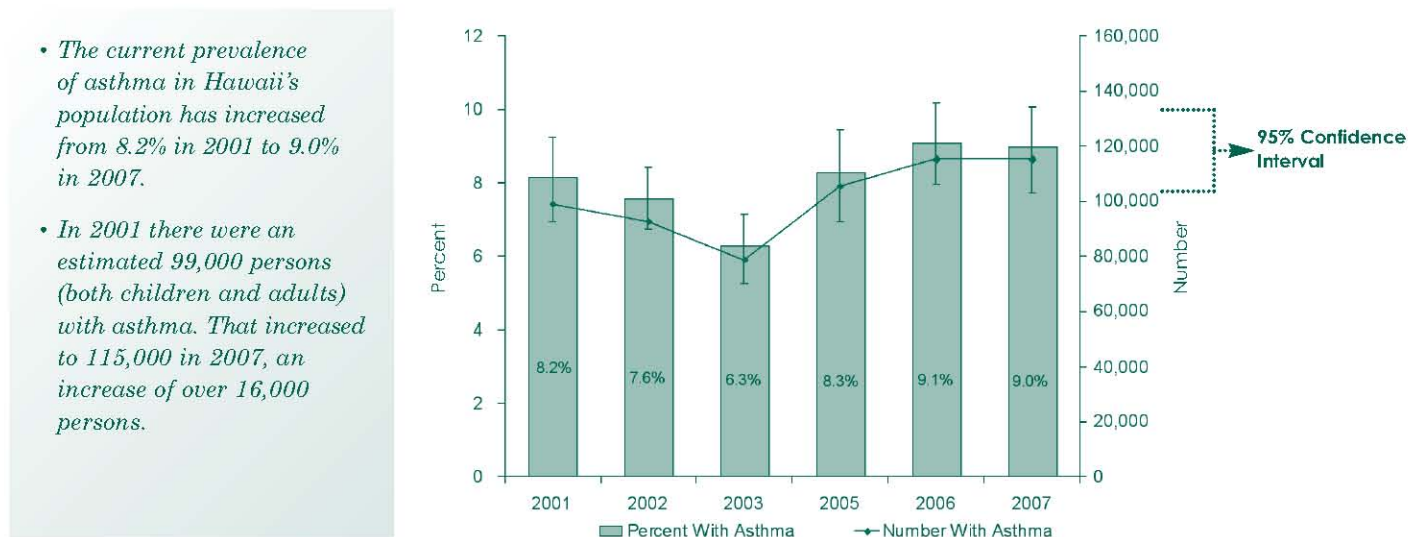


# Asthma Prevalence

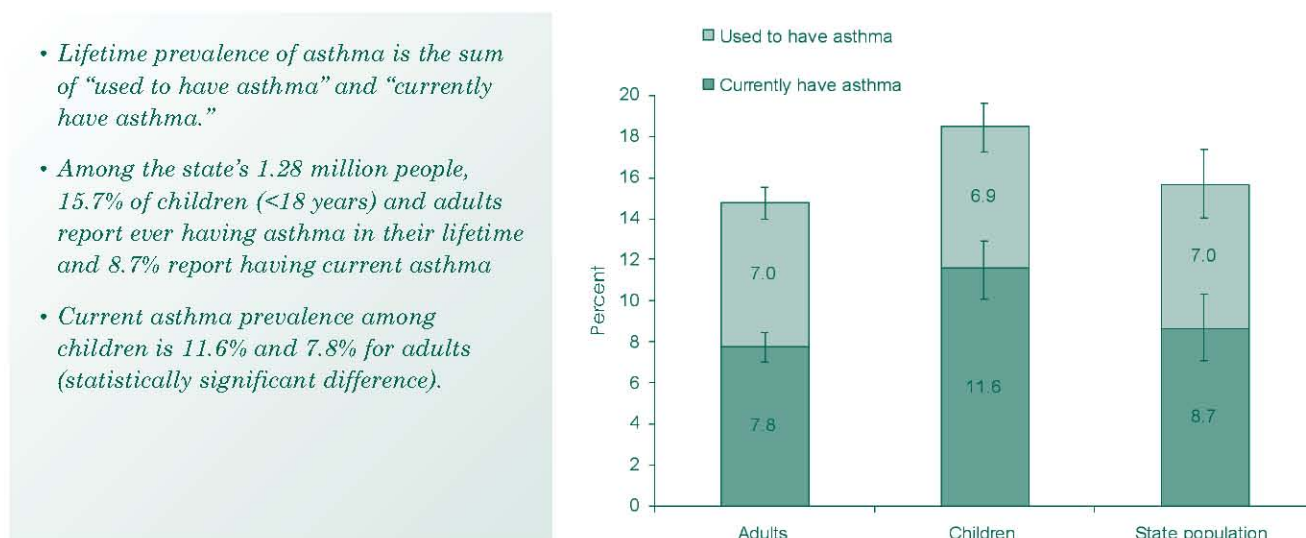
During the 2001-2007 time period, the lifetime<sup>3</sup> adult asthma prevalence in Hawaii (13.2%) was higher than the nation (12%); however, the current adult asthma prevalence in Hawaii (7.2%) was similar to the nation (7.8%). Both lifetime and current childhood<sup>4</sup> asthma prevalence in Hawaii were higher than the nation.

## State Prevalence

**Figure 1.** Prevalence of asthma for the population of Hawaii by year, BRFSS 2001-2007 (excluding 2004<sup>5</sup>).



**Figure 2.** Lifetime and current prevalence of asthma in Hawaii, BRFSS 2005-2006.



<sup>3</sup> The BRFSS core has two asthma related questions. These questions are: (1) "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" – lifetime prevalence (2) if the respondent answered "yes" to the lifetime question, a second question asked, "Do you still have asthma?" – current asthma prevalence

<sup>4</sup> Nationwide data on asthma prevalence limited to selected states (less than 37) since child asthma prevalence data are produced from the responses to two asthma questions on the BRFSS Childhood Asthma Optional Module.

<sup>5</sup> 2004 was excluded because data were only collected for 2.5 months; CDC does not report the Hawaii BRFSS data for that year.

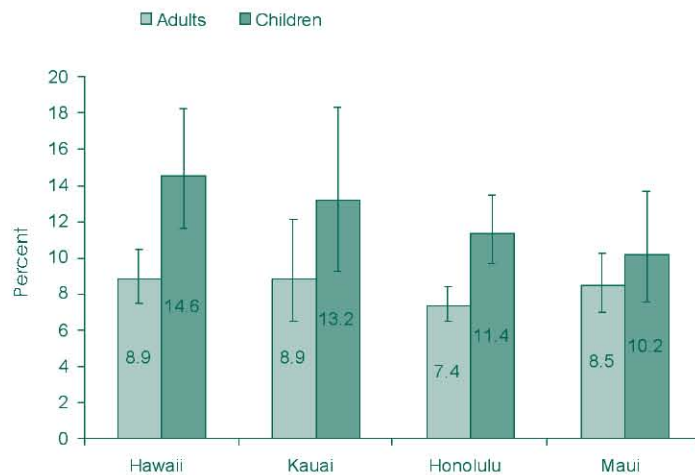


# Asthma Prevalence

## Local Geographic Area Prevalence

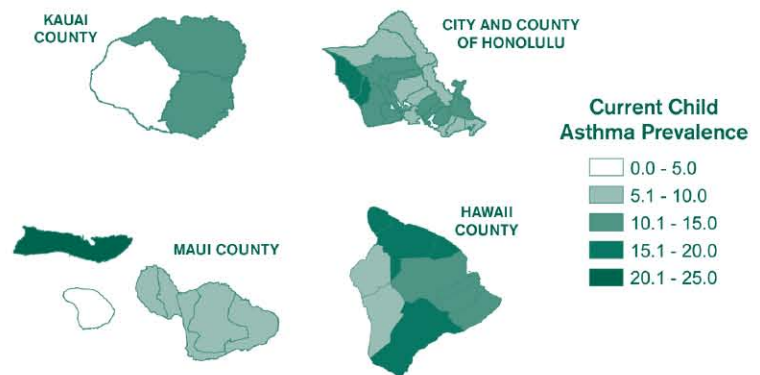
**Figure 3.** Current asthma prevalence among adults and children by county, BRFSS 2005-2006.

- Each county has higher current asthma prevalence among children than among adults.
- There is a statistically significant difference in current asthma prevalence between adults and children in Hawaii County (14.6% for children and 8.9% for adults) and Honolulu County (11.4% for children and 7.4% for adults).
- While Hawaii County has the highest total current asthma prevalence, the difference compared to other counties is not statistically significant.



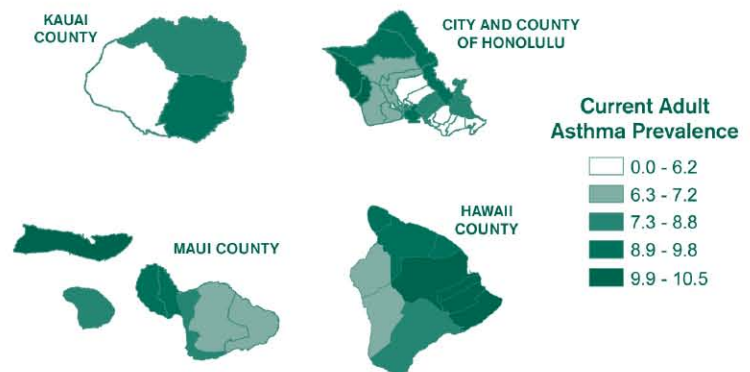
**Figure 4.** Children asthma prevalence by geographic area, BRFSS 2005-2006.

- On average, Hawaii County has the highest asthma prevalence among children compared with other counties and the state average.
- At the sub-county level, children residing in Nanakuli/Waianae, Molokai, North Hawaii and Puna/Kau have higher asthma prevalence than other sub-counties.



**Figure 5.** Adult asthma prevalence by geographic area, BRFSS 2005-2006.

- On average, Hawaii County has the highest asthma prevalence among adults compared with other counties and the state average.
- At the sub-county level, adults residing in Nanakuli/Waianae, Molokai and Hilo have higher asthma prevalence than other sub-counties.





# Asthma Prevalence

**Table 1.** Current asthma prevalence by sub-areas, BRFSS 2005-2006.

Child (<18)	Estimated Number of People with Asthma	Current Asthma Prevalence		
		Current Asthma %	Lower 95% limit	Upper 95% limit
HONOLULU COUNTY				
Aiea/Pearl City	1472	7.6	3.9	14.5
Ala Moana <sup>6</sup>	-	-	-	-
Kaawa/Kahaluu/Kaneohe	1054	8.6	4.2	16.8
Kailua/Waimanalo	1738	11.5	5.7	21.8
Kaimuki/Palolo/Waikiki	827	6.9	3.2	14.1
Manoa/Upper Makiki	1082	11.8	5.6	23.1
Milliani/Wahiawa	3773	14.2	9.5	20.5
Nanakuli/Waianae	2704	17.5	10	29
North Shore/Laie	651	7.1	3	15.9
Nuuuanu/Kalihi/Moanalua	2483	12.5	7.4	20.4
Salt Lake/Foster Village	1519	8	4.3	14.4
Wailae/Kahala/Hawaii Kai	825	8.1	3.5	17.8
Waipahu/Kapolei/Ewa	5176	12.8	8.8	18.2
HAWAII COUNTY				
Kona	574	7.3	3.5	14.6
Hilo	1486	12.8	7.9	20
Puna/Kau	1945	16.2	10.5	24.1
North Hawaii	2113	18.6	12.7	26.6
KAUAI COUNTY				
Hanalei/Kapaa	811	11.5	6.6	19.4
Lihue/Waimea	1227	13.9	8.8	21.2
MAUI COUNTY				
Kahului	1004	8.8	4.7	16.1
Lahaina/Wailuku	959	9.5	5.7	15.2
Lanai	34	4	1.7	8.9
Molokai	491	23.8	15.1	35.5
Upcountry/Hana	968	9.6	5	17.6

<sup>6</sup> The sample size is less than 50 thus not shown.



# Asthma Prevalence

Adult (≥18)	Estimated Number of People with Asthma	Current Asthma Prevalence		
		Current Asthma %	Lower 95% limit	Upper 95% limit
HONOLULU COUNTY				
Aiea/Pearl City	4254	6.2	4	9.5
Ala Moana	2984	8.9	5.6	13.7
Kaawa/Kahaluu/Kaneohe	4692	9.8	6.5	14.5
Kailua/Waimanalo	4052	8.5	5.5	13
Kaimuki/Palolo/Waikiki	3036	4.9	3.2	7.5
Manoa/Upper Makiki	2594	5.7	3.4	9.4
Milliani/Wahiawa	4679	7.2	4.9	10.5
Nanakuli/Waianae	3163	10.1	6	16.2
North Shore/Laie	2187	9.8	5.2	17.7
Nuuanu/Kalihi/Moanalua	5956	8	5.2	12.1
Salt Lake/Foster Village	3087	9	5	15.6
Wailae/Kahala/Hawaii Kai	2180	5.1	2.9	8.9
Waipahu/Kapolei/Ewa	8650	7.1	5.2	9.7
HAWAII COUNTY				
Hilo	3607	10.5	7.8	13.9
Kona	1959	6.9	4.6	10.3
North Hawaii	2848	9.7	6.8	13.5
Puna/Kau	2529	8.2	5.8	11.4
KAUAI COUNTY				
Hanalei/Kapaa	1523	7.6	4.9	11.6
Lihue/Waimea	2727	9.8	6.4	14.7
MAUI COUNTY				
Kahului	3042	8.8	6.1	12.5
Lahaina/Wailuku	3130	9.7	6.9	13.5
Lanai	178	7.3	4.5	11.5
Molokai	596	9.9	6.6	14.4
Upcountry/Hana	2071	6.7	4.3	10.3

Table 1 presents asthma prevalence among adults and children at the sub-county level. Analysis indicates that the asthma prevalence among adults as well as among children varies from area to area but the differences in prevalence in many of the areas are not statistically different from each other as can be seen in the overlapping confidence intervals. It should be noted that although Molokai has the highest current asthma prevalence among children (23.8%), the 95% confidence interval is also widest (15.1%-35.5%) and should be interpreted with caution. North Hawaii (Hawaii County) has the second highest asthma prevalence among children (18.6%).

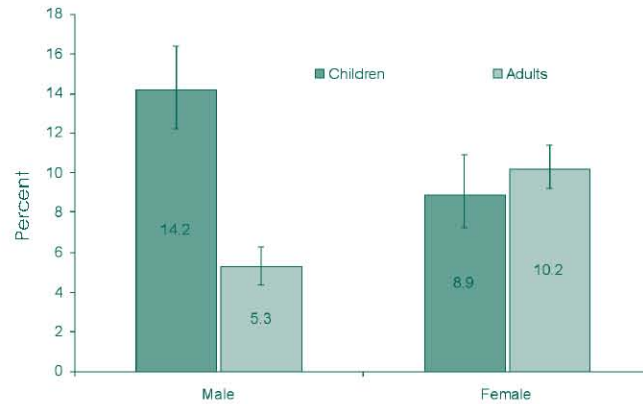


# Asthma Prevalence

## Basic Demographic Characteristics - Age, Gender and Ethnicity

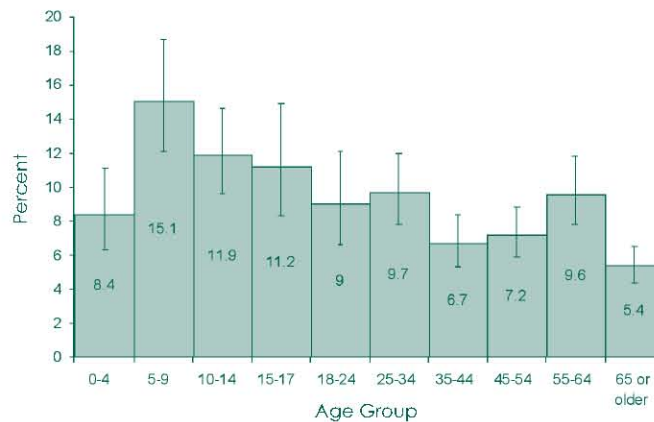
**Figure 6.** Current asthma prevalence among children and adults, by gender, BRFSS 2005-2006.

- Among adults, females are more likely to have current asthma than males (10.2% vs. 5.3%).
- Among children, boys are more likely to have current asthma than girls (14.2% vs. 8.9%).



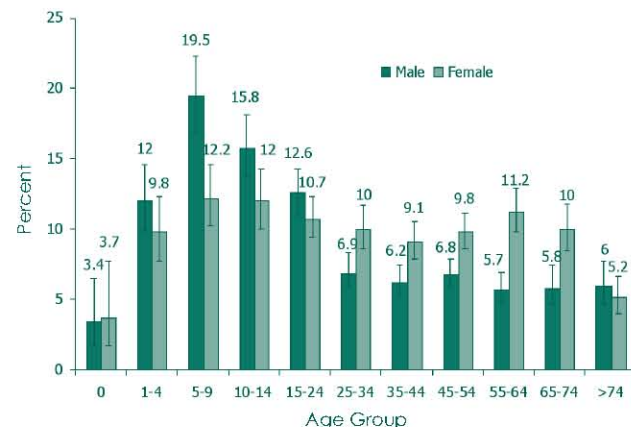
**Figure 7.** Current asthma prevalence by age group, BRFSS 2005-2006.

- Current reported asthma is lowest among those aged 0-4 years and aged 65 years or older. The prevalence among the younger ages 0-4 is higher than among those 65 years or older (8.4% vs. 5.4%).
- In the younger age groups, there is a significant rise in asthma prevalence from ages 0-4 to ages 5-9 (8.4% vs. 15.1%) and then prevalence drops among those aged 10-14 and 15-17.



**Figure 8.** Prevalence of current asthma by gender and age, HHS 2003-2005.

- The pattern of asthma by age and gender indicates that prevalence is highest among male children (statistically significant).
- Among adults, asthma prevalence is highest among women and is statistically significant.





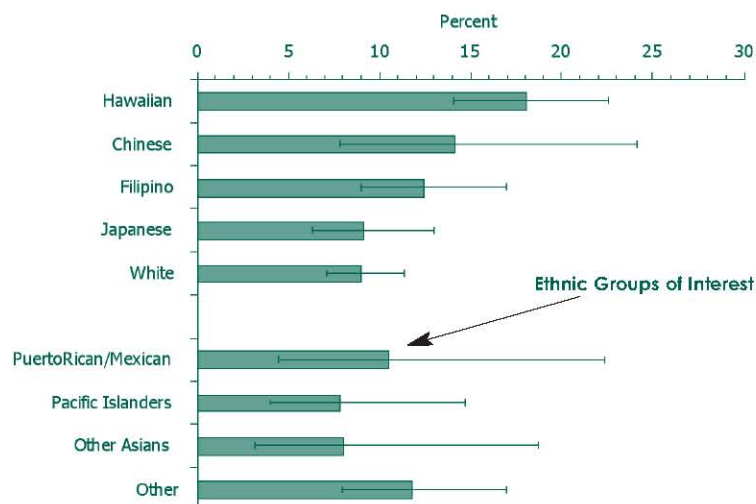
# Asthma Prevalence

Both BRFSS 2005-2006 and HHS 2003-2005 consistently found that asthma prevalence is the highest among children between 5 and 9 years old. Asthma prevalence decreases and levels off with increased age, except for a slight rise at among those 55-64 years in age.

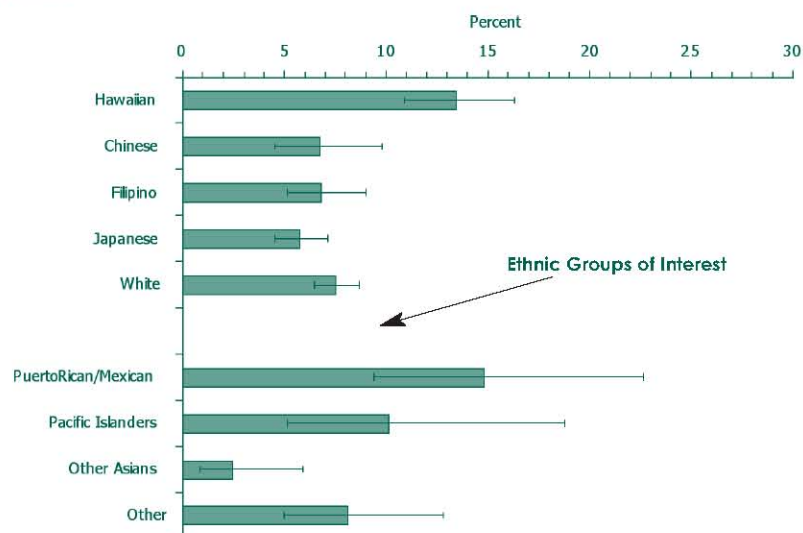
**Figure 9.** Current asthma prevalence among children and adults by ethnic group, BRFSS 2005-2006.

- *Native Hawaiians have significantly higher current asthma prevalence among both children (18.0%) and adults (13.4%) compared to Whites (9.0% children and 7.5% adults) and Japanese (9.1% children and 5.7% adults).*
- *Among adults, Puerto Ricans and Mexicans<sup>7</sup> have the highest prevalence of asthma (14.8%) but this is not significantly higher than that of Native Hawaiians (13.4%) or Other Pacific Islanders (10.1%).<sup>8</sup>*
- *Yet, asthma prevalence among adult Native Hawaiians (13.4%) and among adult Puerto Rican and Mexicans (14.8%) is statistically significantly higher than Chinese (6.7%) and Filipino adults (6.8%).*
- *Asthma prevalence among Filipino children (12.4%) is significantly higher than that among Filipino adults (6.8%).*
- *The remaining children in the 'Others'\* ethnic group (11.8%) have an asthma prevalence that is higher than that of the 'Others' adult ethnic group (8.1%), but not statistically significantly higher.*

## Children



## Adults



<sup>7</sup> The ethnic groups such as Puerto Ricans/Mexicans, Other Pacific Islanders and "Others" all together represent a population of less than 10%. Correspondingly their respective sample size is also smaller. The sample size for these groups range from 124 to 317, thus their respective confidence intervals are wide and should be interpreted with caution. However, so as not to overlook the health of any ethnic group, the prevalence among these groups are also reported when possible.

<sup>8</sup> Ethnic groups of interest constitute those other ethnic populations in Hawaii with smaller proportions in the state population, but with presumed or known disproportionate risk for chronic diseases such as asthma. Such groups deserve examining in Hawaii for known risk for asthma elsewhere in the United States (e.g. Puerto Ricans) or for factors that are associated with asthma such as poverty or poor housing (Pacific Islanders such as Micronesians). Such groups deserve attention since they may constitute a small proportion of the overall population but may disproportionately need services or interventions. Ensuring such groups are included in surveillance efforts can better assist in determining this.

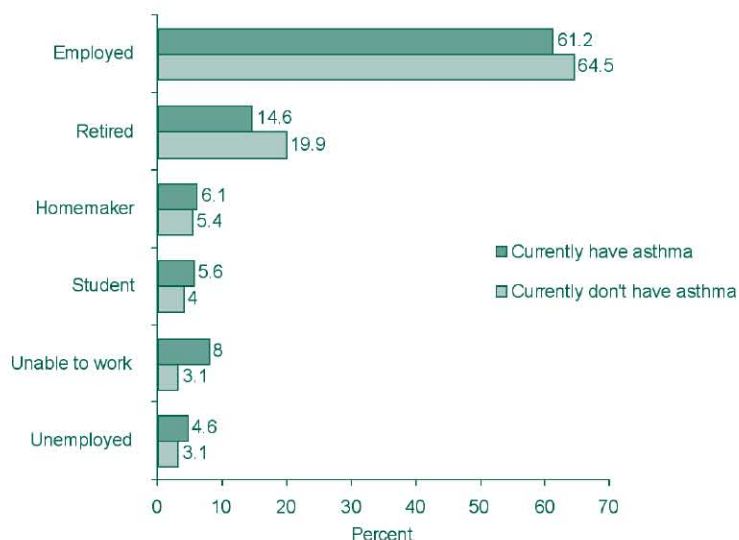


# Asthma Prevalence

## Socio-economic Characteristics – Employment and Household Income among Adults

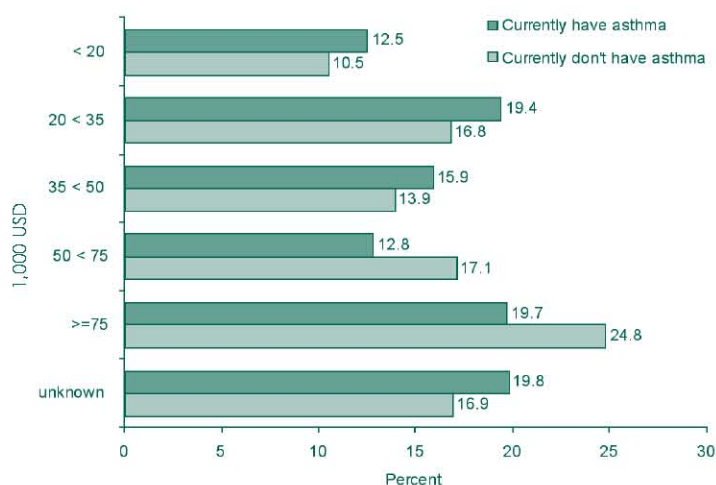
**Figure 10.** Employment by adult asthma status, BRFSS 2005-2006.

- Adults with current asthma are more likely to be unemployed, unable to work, homemakers or students compared to adults who report not currently having asthma.
- Among those who are unable to work, there is a statistical difference between those who have and don't have asthma.



**Figure 11.** Annual household income by adult asthma status, BRFSS 2005-2006.

- Adults with current asthma are more likely to report living in households with an annual income below \$50,000 (47.8%) compared to adults without asthma (41.1%; statistically significant).
- Only 32.4% of adults with asthma live in households with an annual income of \$50,000 or higher which is lower than that among adults without asthma, 41.8% (statistically significant).
- Note: Children with current asthma are also more likely to be in lower income households (below \$50,000 annually) than children without asthma (49.0% versus 42.2%; statistically significant). Chart not shown.

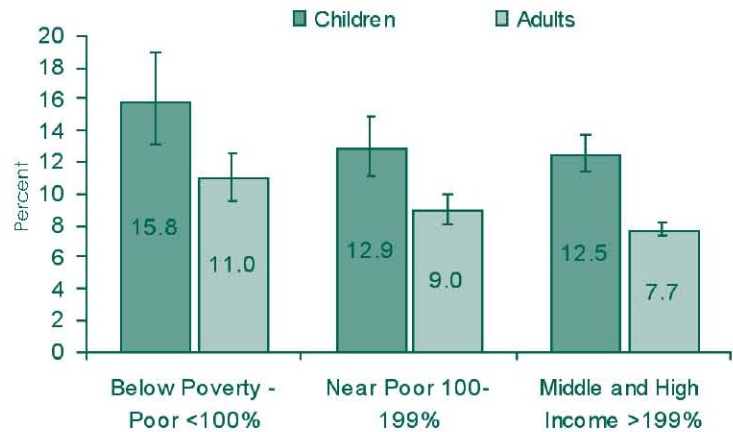




# Asthma Prevalence

**Figure 12.** Prevalence of asthma by poverty status<sup>9</sup> among children and adults, HHS 2003-2005.

- Children (15.8%) and adults (11.0%) living below the poverty level have the highest prevalence of asthma compared to those that are near poor or those that are >199% of the poverty level (middle and high income).
- For all three poverty levels children have the highest prevalence of asthma.
- Adults at the highest level of middle and high income >199% have the lowest prevalence of asthma (statistically significant).

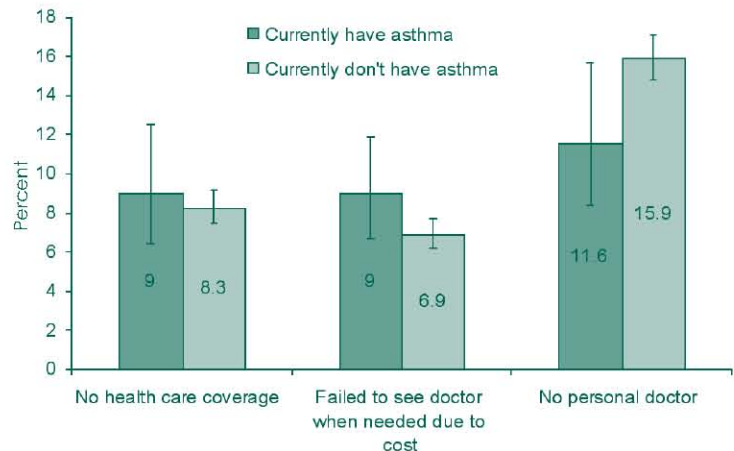


Whereas the BRFSS estimates the socioeconomic status using annual household income and the HHS estimates poverty level, results from both surveys consistently indicate that lower income families tend to have asthma more often than higher income families.

## Health Care Access

**Figure 13.** Adults with limited access to health care by asthma status, BRFSS 2005-2006.

- The percent of respondents reporting no health care coverage or who failed to see a doctor when needed due to cost is slightly higher among those with asthma than among those without asthma (9% vs. 8.3%, 9% vs. 6.9% respectively), but this is not significantly higher.
- The percent reporting not having a personal doctor or health care provider is slightly lower among those with asthma than those without asthma (11.6% vs. 15.9%), but this is not significantly lower.



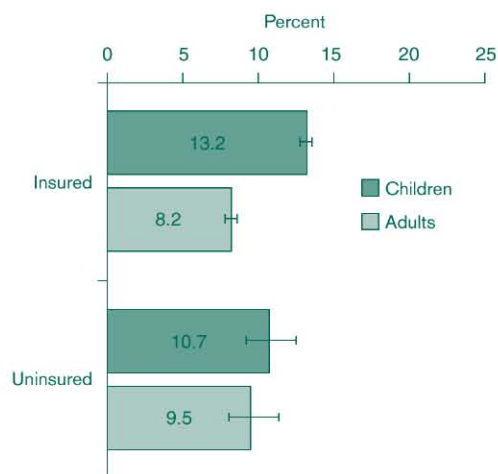
<sup>9</sup> Poverty status takes into account family size and family income (refer to appendix for detailed descriptions of poverty status), based on guidelines published annually by the U.S. Department of Health and Human Services. Below Poverty-Poor <100% is defined as household income for the families below poverty level.



# Asthma Prevalence

**Figure 14.** Prevalence of asthma by insurance status among children and adults, HHS 2003-2005.

- Children that are uninsured have a lower prevalence of asthma (10.7%) compared to children that are insured (13.2%; not statistically significant).
- The actual prevalence of asthma among uninsured children may be higher, given that the uninsured children may not have access to medical professionals and thus, being diagnosed for asthma.

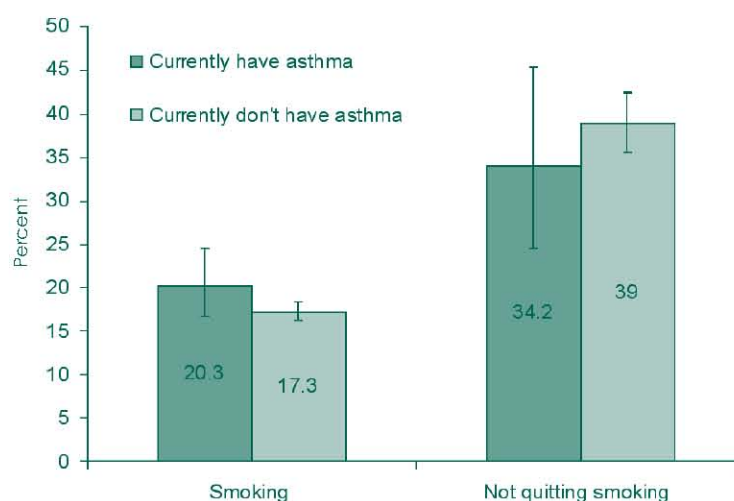


## Risk Factors, Co-morbidities<sup>10</sup> and Quality of Life – Tobacco Exposure and asthma

Second hand tobacco smoke (SHS) exposure is widespread, affecting many Hawaii adults and children. Because it contains potent respiratory irritants, SHS is perceived as a potentially important aggravating factor for adults and children with asthma. In children, substantial evidence indicates that SHS exposure increases asthma severity.

**Figure 15.** Adult smokers by asthma status, BRFSS 2005-2006.

- The prevalence of smoking among those with asthma is higher than among those without asthma (20.3% vs. 17.3%; not significantly significant).
- Among current smokers, more adults with current asthma are trying to quit than adults without asthma (34.2% vs. 39.0%; not significantly significant).



<sup>10</sup> Co-morbidities are defined as presence of one or more disorders (or medical conditions) in addition to asthma diagnosis.



# Asthma Prevalence

**Table 2.** Prevalence of asthma by smoker and lives with a smoker among children and adults, HHS 2003-2005.

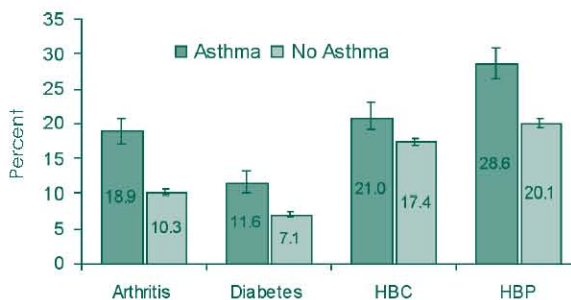
- Adults and youth who smoke also report higher proportions of having current asthma (statistically significant).
- Children (23.9%) and adults (9.6%) who live with people who smoke have a much higher prevalence of asthma than those who do not live with people who smoke. Among children, there is a statistically significant difference.
- There is not a significant difference between the numbers of people per household who smoke in relation to asthma prevalence.

Variable	Prevalence of Asthma			
	Child		Adult	
	%	95% CI	%	95% CI
Smoker	23.9	12.1 - 41.9	9.6	8.6 - 10.7
Non Smoker Total	13.0	12.1 - 14.0	8.0	7.6 - 8.4
No Smoker in Household	11.6	10.6 - 12.7	7.8	7.4 - 8.3
Lives with 1 Smoker	16.4	14.2 - 18.9	8.9	7.8 - 10.1
Lives with >1 Smoker	16.4	13.3 - 19.9	8.4	6.5 - 10.7

## Health Status and Health Related Quality of Life

**Figure 16.** Prevalence of other chronic health conditions by asthma for adults, HHS 2003-2005.

- Adults with asthma have a higher prevalence of other chronic conditions such as arthritis, diabetes, high blood cholesterol (HBC) and high blood pressure (HBP) (statistically significant).

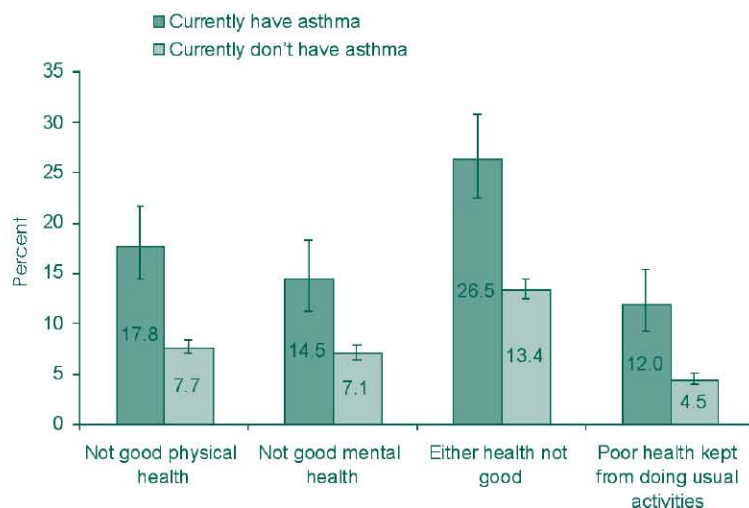




# Asthma Prevalence

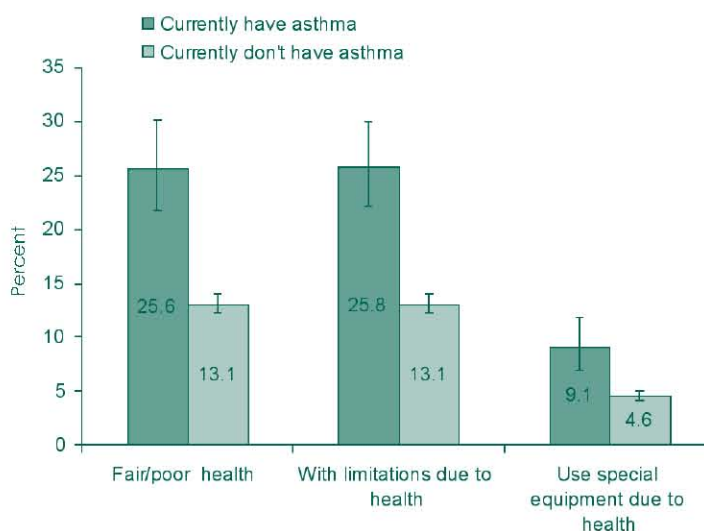
**Figure 17.** Percent of adults with at least 14 days of “health not good” and usual activities by asthma status, BRFSS 2005-2006.

- The proportions of adults reporting at least 14 days of not good physical or mental health is at least twice as high among those with asthma (26.5%) compared to those without asthma (13.4%).
- The proportion of adults with asthma reporting not being able to do their usual activities due to poor health is much higher among adults with asthma than adults without asthma (12.0% versus 4.5%).



**Figure 18.** Fair/poor health, limitations and use of special equipment due to health problems by adult asthma status, BRFSS 2005-2006.

- About one in four adults with asthma (25.6%) reports that their general health is fair or poor in contrast to about one in eight adults without asthma (13.1%).
- Similarly, one in four adults with asthma (25.8%) reports they are limited in their activities because of physical, mental, or emotional problems in contrast to about one in eight adults without asthma (13.1%).
- The percent of adults that use special equipment (such as a cane, a wheelchair, a special bed, or a special telephone) due to health problems among those with current asthma is more than twice as high than among those without asthma (9.1% vs. 4.6%).





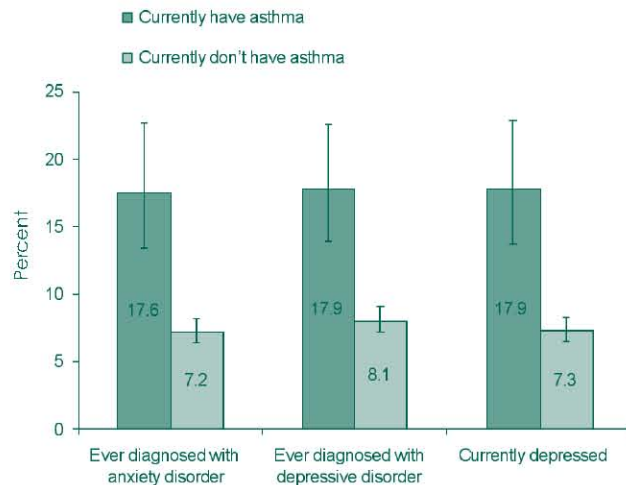
# Asthma Prevalence

## Mental and Physical Health

Asthma can impair health-related quality of life and is consistently associated with an increased prevalence of depressive disorders. Depression among those with asthma is associated with poor adherence to medication regimens, more severe asthma, and poorer disease outcomes.<sup>11</sup>

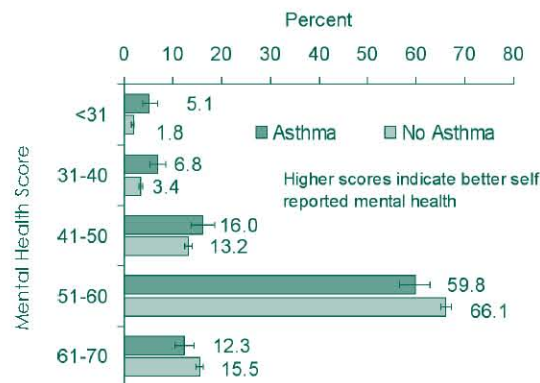
**Figure 19.** Anxiety or depressive disorder and estimate of recent depression by asthma status for adults, BRFSS 2005-2006.

- The percent of adults reporting a diagnosis of anxiety, lifetime depression or recent depression is twice as high among those with asthma as among those without asthma.
- The proportion of adults with both anxiety and depressive disorder and with asthma is at least two times greater than those without asthma (10.1% vs. 3.9%).



**Figure 20.** Distribution of mental health summary scores (SF-12®)<sup>12</sup> by asthma status among adults, HHS 2003-2005.

- Adults with asthma are more likely to report poorer mental health (summary mental health scores below 51) than adults with no asthma (27.9% vs. 18.4%; statistically significant).



Results from both the BRFSS 2005-2006 and the HHS 2003-2005 consistently indicate that adults with asthma are more likely to have poorer mental health than adults without asthma.

<sup>11</sup> Scott KM, Von Korff M, Alonso J, Angermeyer MC, Benjet C, Bruffaerts R, de Girolamo G, Haro JM, Kessler RC, Kovess V, Ono Y, Omel J, Posada-Villa J. Childhood Adversity, Early-Onset Depressive/Anxiety Disorders, and Adult-Onset Asthma. *Psychosom Med*. 2008 Oct 21.

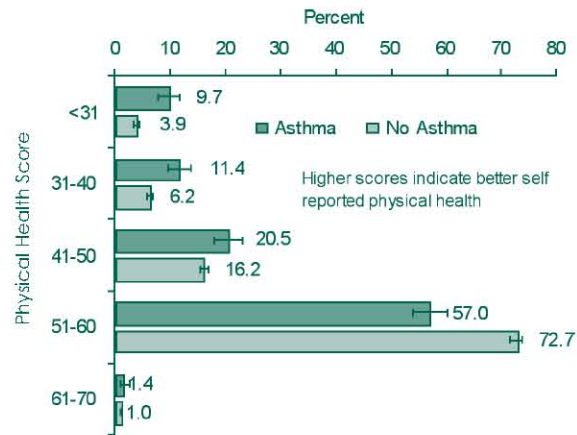
<sup>12</sup> Health Related Quality of Life was measured by questions from the SF-12® Version One (a shortened 12 questionnaire from the SF-36® questionnaire). Questions were related to self-reported general health, limitations caused by physical and/or emotional problems, pain limiting activities, limitations to amount and type of work and limitations in social activities due to health problems. Scoring for the summary scales MCS-12 (mental component summary scale) and PCS-12 (physical component summary scale) from the twelve questions on health are outlined in the SF-12® manual. The SF-12® scoring algorithm is a composite score of weighted item responses to twelve questions on self-reported physical and mental health status. A higher summary scale value indicates better health for both the mental and physical summary scale. The scores are standardized so that the mean equals 50 and the standard deviation 10 for the general U.S. population.



# Asthma Prevalence

**Figure 21.** Distribution of physical health scores (SF-12®) by asthma status among adults, HHS 2003-2005.

- Adults with asthma are more likely to report poorer physical health (summary physical health scores below 51) than adults with no asthma (41.6% vs. 26.3%; statistically significant).
- See appendix for description of physical health score (SF-12)

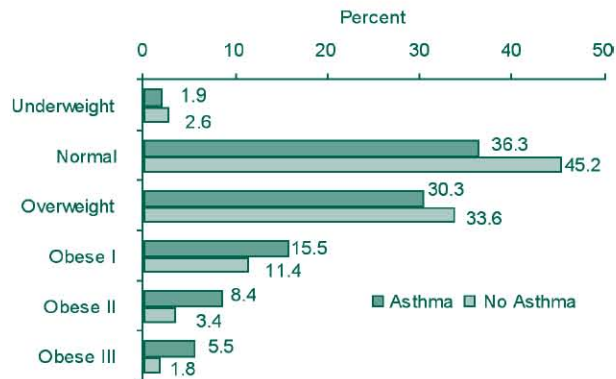


## Obesity and Asthma

Obesity is a risk factor for developing asthma. Reports have shown that nearly 75% of emergency department (ED) visits for asthma have been among obese individuals, and studies have shown that obesity pre-dates asthma. The risk for developing asthma increases with increasing obesity among individuals.<sup>13</sup>

**Figure 22.** Prevalence of Body Mass Index<sup>14</sup> categories by asthma status among adults, HHS 2003-2005.

- Adults with asthma are more likely to report being obese in comparison to those without asthma (statistically significant).



<sup>13</sup> Tompson CC, Clark S, Chamargo CA Jr. Body mass index and asthma severity among adults presenting to the emergency department. Chest 2003; 124: 795-802

<sup>14</sup> Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems.



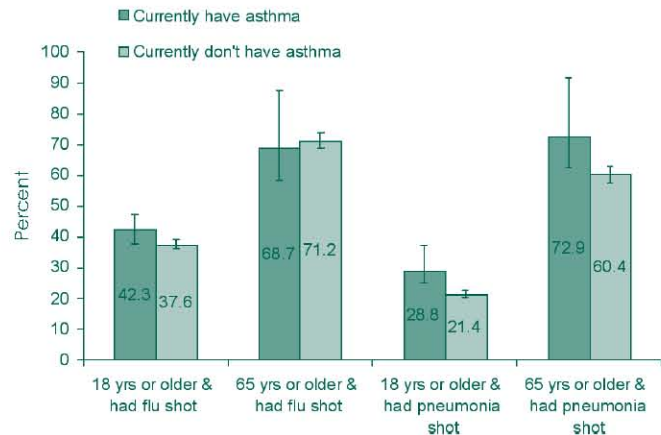
# Asthma Prevalence

## Vaccination and Asthma

Adults with asthma are at high risk of developing major problems after contracting the flu, yet many adults with asthma do not receive an annual flu vaccination.

**Figure 23.** Flu and pneumonia immunization by asthma status, BRFSS 2005-2006.

- *Hawaii's flu vaccine rates among adults with asthma are lower than the Healthy People 2010 goal of 60% (high-risk adults).*
- *For flu immunizations, there are no statistically significant differences in rates between adults with asthma and those without asthma.*
- *Adults with asthma report much higher rates of immunization for pneumonia than among those without asthma, particularly among the elderly 65 years or older (72.9% vs. 60.4%).*



## Asthma Emergency Department Visits

Asthma is a chronic yet manageable disease, which can be controlled through appropriate medical treatment and the avoidance of triggers. The majority of emergency department (ED) visits and hospitalizations could be avoided with appropriate management. Despite this fact, each year many patients seek care at EDs for their symptoms.

In the United States, there are approximately 1.8 million visits for asthma each year. Data from ED can be used to examine the severity and management of asthma in terms of morbidity and overall cost on society. Management of asthma according to established National Asthma Education and Prevention Program guidelines can prevent a large number of emergency department visits for this disease.

### Methods

In this section, data on ED visits for asthma for the state of Hawaii from 2000 to 2005 are presented. The focus covers five major issues: asthma severity, disparity, cost, trends and season of the year. The Hawaii data are compared to the Healthy People 2010 goals for asthma emergency department visit rates to assess our progress toward achieving the goals.

For the purpose of this report, asthma was defined as primary diagnosis with ICD-9 code 493. The definition excludes newborns, pregnancy-related admissions and patients admitted through a transfer from another facility. The ED data represent the number of visits (rather than persons) for asthma in the emergency department, thus any multiple events by an individual are recorded as separate events. The ED visit rate was derived by dividing the number of asthma visits for a given year by the specific population obtained from BRFSS 2005-2006.

Data were received from Hawaii's non-federal, hospital-based ED, with the exception of (1) Kahuku Hospital ED, (2) hospitalizations via ED and (3) Straub Hospital ED before 2005. ED visit data were obtained from Hawaii Health Information Corporation (HHIC). HHIC's mission is to collect, analyze and disseminate statewide health information to support efforts to continuously improve the quality and cost-efficiency of Hawaii's health care services. A private, not-for-profit corporation established in 1994, HHIC maintains one of Hawaii's largest healthcare databases, which contains nearly 1,000,000 inpatient discharge records collected from Hawaii's 22 acute care hospitals for each year since 1993. HHIC has the ability to generate comparative information using the extensive records in this database.



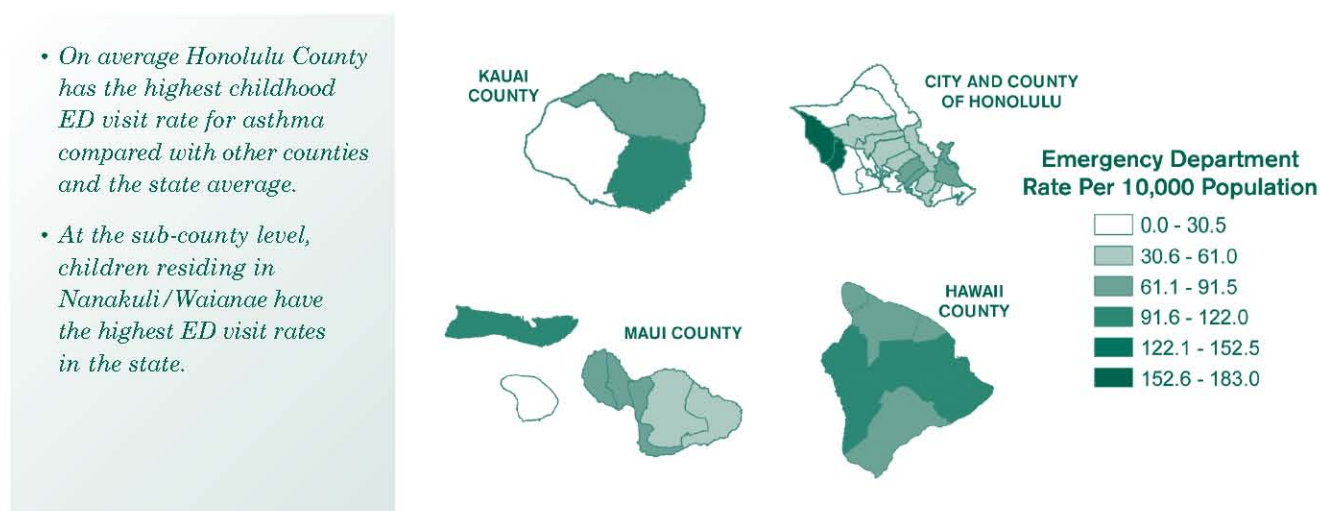
# Asthma Emergency Department Visits

Asthma emergency department (ED) visits are expensive and may be preventable. Many of these ED visits could be avoided with better access to primary care physicians, health education and preventive medicine.

## Children:

There were on average 4,810 ED visits per year<sup>15</sup> with a primary diagnosis of asthma (ICD-9 code: 493); 1,850 (38%) of them were children under 18 years old during 2000-2005.

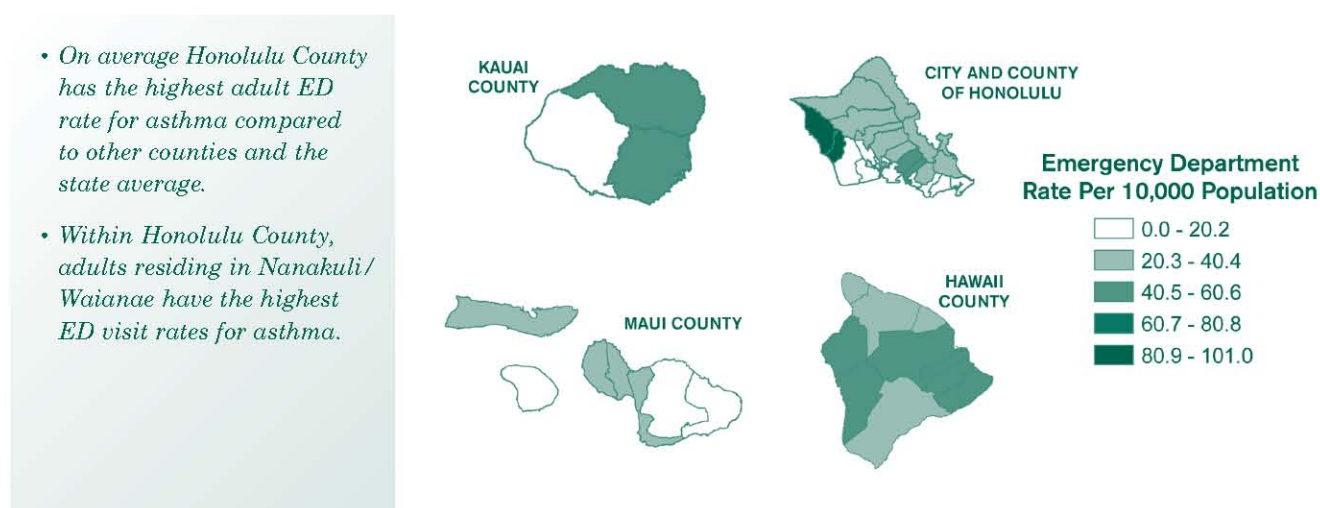
**Figure 24.** Asthma ED visits per 10,000<sup>16</sup> children by geographic area, HHIC 2000-2005.



## Adults:

There were on average 4,810 annual ED visits per year with a primary diagnosis of asthma (ICD-9 code: 493); 2,960 (62%) were adults during 2000-2005.

**Figure 25.** Asthma ED visits per 10,000 adults by geographic area, HHIC 2000-2005.



<sup>15</sup> Hospitalization admissions via ED were excluded.

<sup>16</sup> Average number of ED visits during 2000-2005 was multiplied by 10,000 and was divided by population size for the specific geographic areas obtained from BRFSS.



# Asthma Emergency Department Visits

## Local Geographic Area Prevalence

**Table 3.** Annual asthma ED visits<sup>17</sup> by geographic area, HHIC 2000-2005 and BRFSS 2005-2006.

Child (<18)	ANNUAL AVERAGE		
	Number of ED Visits	Number of ED Visits Per 10,000 population <sup>18</sup>	Estimated Percent of People with Asthma visit ED <sup>19</sup>
<b>HONOLULU COUNTY</b>			
Aiea/Pearl City	111	57	7.5%
Ala Moana	35	-	-
Kaawa/Kahaluu/Kaneohe	70	57	6.6%
Kailua/Waimanalo	101	67	5.8%
Kaimuki/Palolo/Waikiki	41	34	5.0%
Manoa/Upper Makiki	48	52	4.4%
Milliani/Wahiawa	110	41	2.9%
Nanakuli/Waianae	282	183	10.4%
North Shore/Laie	25	27	3.8%
Nuuuanu/Kalihi/Moanalua	138	70	5.6%
Salt Lake/Foster Village	39	21	2.6%
Wailae/Kahala/Hawaii Kai	18	18	2.2%
Waipahu/Kapolei/Ewa	61	15	1.2%
<b>HAWAII COUNTY</b>			
Hilo	123	106	8.3%
Kona	79	101	13.8%
North Hawaii	82	72	3.9%
Puna/Kau	90	75	4.6%
<b>KAUAI COUNTY</b>			
Hanalei/Kapaa	55	78	6.8%
Lihue/Waimea	107	121	8.7%
<b>MAUI COUNTY</b>			
Kahului	77	67	7.7%
Lahaina/Wailuku	69	69	7.2%
Lanai	1	12	3.0%
Molokai	23	112	4.7%
Upcountry/Hana	50	49	5.1%

Table continued on next page.

<sup>17</sup> [average number of ED visits during 2000-2005]\*10,000/ [population size for the specific geographic areas obtained from BRFSS 2005-2006].

<sup>18</sup> [average number of ED visits during 2000-2005]\*100/ [number of people with asthma reside in the specific geographic areas obtained from BRFSS 2005-2006].

<sup>19</sup> Hospitalization admissions via ED and out of state residents were excluded.

# Asthma Emergency Department Visits

Adult (≥18)	ANNUAL AVERAGE		
	Number of ED Visits	Number of ED Visits Per 10,000 population <sup>18</sup>	Estimated Percent of People with Asthma visit ED <sup>19</sup>
<b>HONOLULU COUNTY</b>			
Aiea/Pearl City	148	22	3.5%
Ala Moana	81	24	2.7%
Kaawa/Kahaluu/Kaneohe	105	22	2.2%
Kailua/Waimanalo	150	31	3.7%
Kaimuki/Palolo/Waikiki	125	20	4.1%
Manoa/Upper Makiki	110	24	4.2%
Milliani/Wahiawa	169	26	3.6%
Nanakuli/Waianae	317	101	10.0%
North Shore/Laie	50	22	2.3%
Nuuanu/Kalihi/Moanalua	310	42	5.2%
Salt Lake/Foster Village	48	14	1.5%
Wailae/Kahala/Hawaii Kai	30	7	1.4%
Waipahu/Kapolei/Ewa	99	8	1.1%
<b>HAWAII COUNTY</b>			
Hilo	192	56	5.3%
Kona	120	42	6.1%
North Hawaii	95	32	3.3%
Puna/Kau	125	40	4.9%
<b>KAUAI COUNTY</b>			
Hanalei/Kapaa	87	43	5.7%
Lihue/Waimea	142	51	5.2%
<b>MAUI COUNTY</b>			
Kahului	79	23	2.6%
Lahaina/Wailuku	68	21	2.2%
Lanai	2	7	0.9%
Molokai	23	38	3.9%
Upcountry/Hana	52	17	2.5%

- Honolulu County overall, along with the Nanakuli/Waianae sub-area, has the highest overall asthma ED visit rates per 10,000 population, and residents (adults and children) with asthma are more likely to visit the ED for their condition.
- The Kona sub-area in Hawaii County has the highest ED visit rate for children with asthma. On average, one in seven children with asthma residing in Kona visited the ED in the past 12 months.
- Although the Molokai sub-area has the highest childhood asthma prevalence in the state (Table 1), the childhood asthma ED visit rate is around the state average.

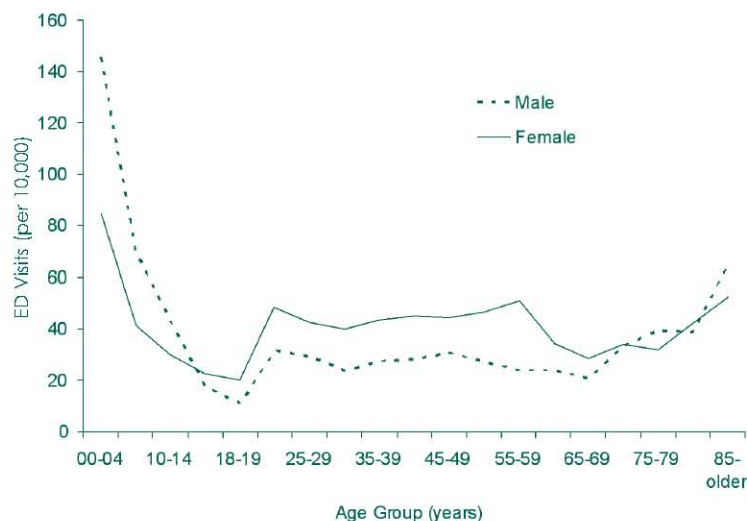


# Asthma Emergency Department Visits

## Basic Demographic Characteristics - Age, Gender and Ethnicity

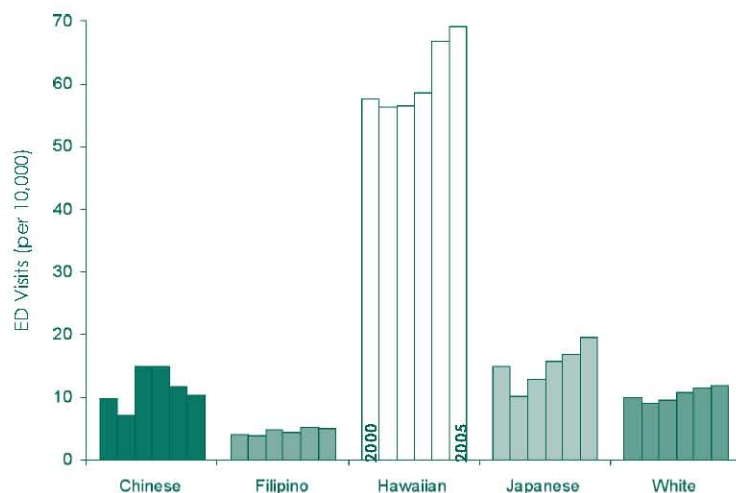
**Figure 26.** Annual average ED visit rates per 10,000 population by gender and age, HHIC 2000-2005.

- Children have higher rates of asthma ED visits compared to adults, specifically among young boys (higher than HP 2010 Objective 24-3a).<sup>20</sup>
- Female adults are more likely to visit the ED for asthma than adult males.
- These findings are similar to the trends found in the BRFSS (Figure 4).



**Figure 27.** Annual average ED visit rates per 10,000 children by ethnicity, HHIC 2000-2005.

- Among children, Native Hawaiians have the highest ED visit rates than any other ethnic group for all years; the rate seems to be increasing.<sup>21</sup>
- The rate seems to be increasing for Japanese and Whites but not for Chinese or Filipinos.



<sup>20</sup> Healthy People 2010 Objective 24-2: Reduce hospital ED visits for asthma (Rate per 10,000) by 2010:

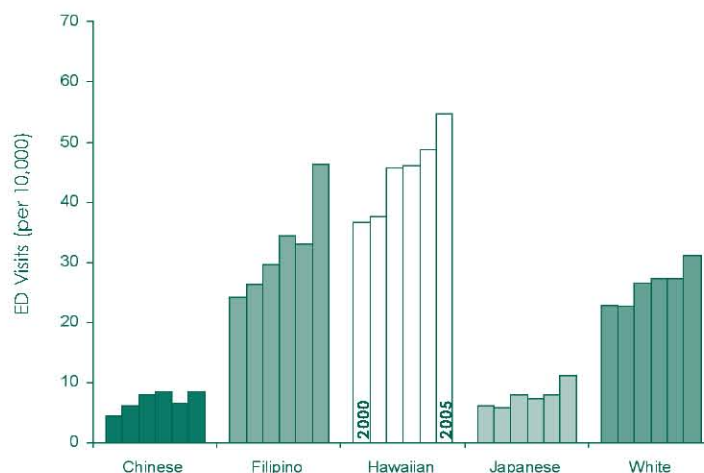
24-3a. Children under age 5 years	80
24-3b. Children and adults aged 5 to 64 years	50
24-3c. Adults aged 65 years and older	15

<sup>21</sup> Disclaimer: The race/ethnicity data are not collected in a standardized format by the hospitals in Hawaii. However, because of the interest in race/ethnicity data, HHIC has attempted to distill data that might be useful. We have derived what we refer to as the conformed race data, i.e. if a race/ethnicity category is collected by all hospitals it is available for reporting purposes. If the race/ethnicity grouping is not collected/reported by all hospitals it is classified within the category "other". Hospitals that do not collect race/ethnicity for a patient ('Data not collected') or report race/ethnicity as 'Unknown' are classified as submitted. Hospitals that collect incomplete race/ethnicity data that do not conform to the minimum HHIC groupings are classified 'Not applicable'. The graphs exclude 'other', 'not applicable', 'unknown', and 'data not collected'.

# Asthma Emergency Department Visits

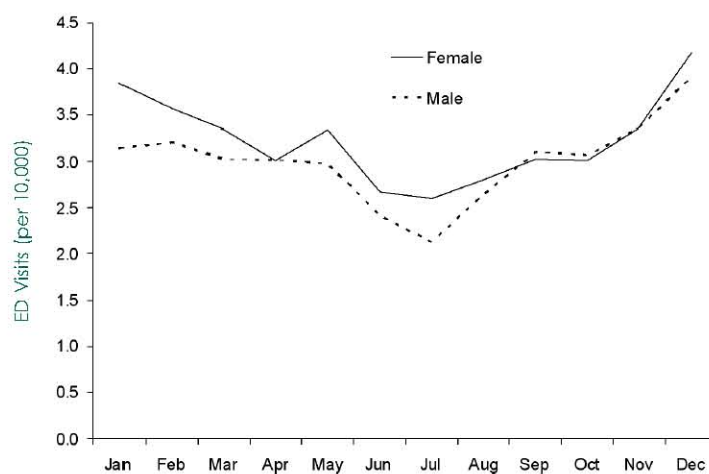
**Figure 28.** Annual average ED visit rates per 10,000 adults by ethnicity, HHIC 2000-2005.

- Among adults, ED visits seem to be increasing for all ethnic groups except among the Chinese from 2000-2005.
- Native Hawaiian, Filipino, and White adults have higher rates of ED visits compared to other ethnic groups.



**Figure 29.** Annual average ED visit rates per 10,000 population by month and gender<sup>22</sup>, HHIC 2000-2005.

- Asthma ED visits for both males and females increase during the cooler season when flu is more prevalent.



<sup>22</sup> Annual average asthma related ED visit rates per 10,000 population by month and gender was derived from  $\{([10,000] * [\text{total number of gender specific visits for the given month}]) / ([\text{US Census 2000 gender specific Hawaii population}] * [\text{number of year data is available} = 6 \text{ years}])\}$ .

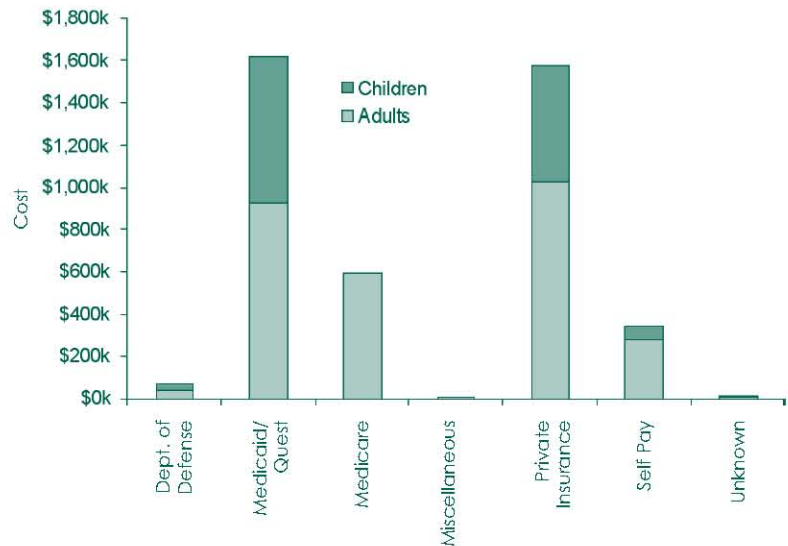


# Asthma Emergency Department Visits

## Emergency Department Costs

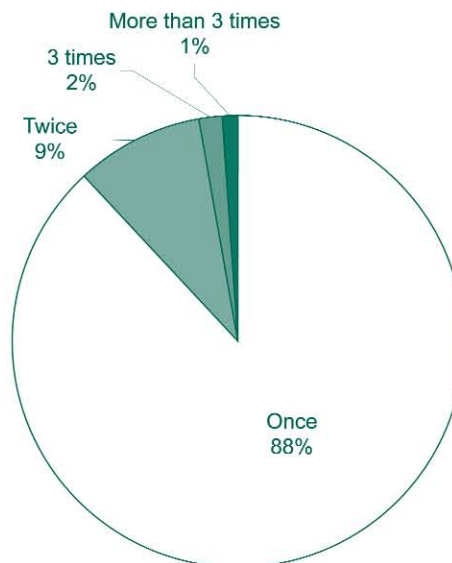
**Figure 30.** Average annual ED visit costs for children and adults by payer, HHIC 2000-2005.

- Almost half of the asthma ED visits for both children and adults are paid by government programs (Medicaid and Medicare).
- 37% of the asthma ED visits are paid by private insurance
- Annual cost of asthma ED visits for the state of Hawaii is around \$4.2 million dollars per year.



**Figure 31.** Repeated ED utilization in the past 12 months, HHIC 2000-2005.

- At least 12 % of ED visits are repeat ED utilizations<sup>23</sup> within the past 12 months.



<sup>23</sup> Based on the unique patient ID assigned by the HHIC; some patients that visited multiple hospitals might have more than one unique ID which leads to underestimation of the true ED visit rate.

# Asthma Hospital Discharges

In the United States, approximately 500,000 (or 17 per 10,000 people) are hospitalized for asthma each year. Similar to ED visits, hospitalization data can be used to examine the severity and management of asthma in terms of morbidity and overall burden on society. Management of asthma according to established National Asthma Education and Prevention Program guidelines can prevent a large portion of hospitalization for this disease.

## Methods

Asthma-related hospital discharge data for the State of Hawaii from 1995 to 2005 are presented (while ED data only covered 2000-2005). The focus covers five major issues: asthma severity, disparity, cost, trends and season of the year. The Hawaii data are compared to the Healthy People 2010 goals for asthma hospital discharge rates to assess our progress toward achieving the goals.

For the purpose of this report, asthma was defined as a primary diagnosis with ICD-9 code 493. The definition excludes newborns, pregnancy-related admissions and patients admitted through a transfer from another facility. The hospital discharge data represent the number of hospitalizations (rather than persons) who sought medical assistance for their asthma in the hospital, thus any multiple events by an individual are recorded as separate events. The hospital discharge rate was derived by dividing the number of asthma discharges for a given year by the specific population obtained from BRFSS 2005-2006.

The hospital discharge data were obtained from the Hawaii Health Information Corporation database (page 23).



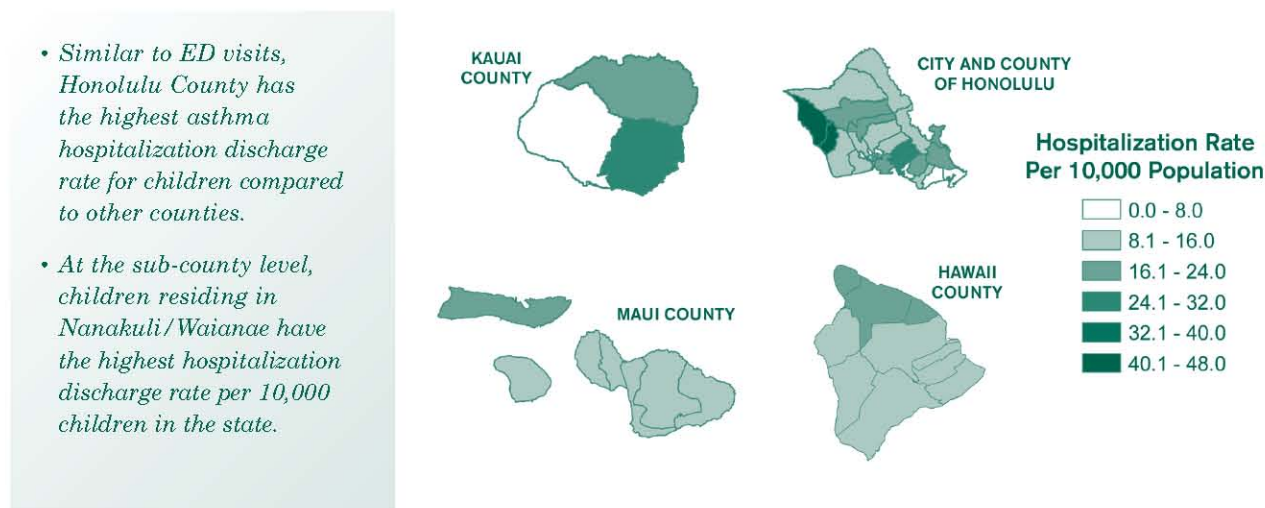
# Asthma Hospital Discharges

Between 15% and 54% of childhood asthma hospitalizations could be prevented if children with asthma, particularly teens, took their medications as prescribed and scheduled, avoided asthma triggers and visited their doctor regularly.<sup>24</sup>

## Children:

During the period 1995-2005, there were on average 1,600 hospital inpatient discharges per year with a primary diagnosis of asthma (ICD-9 code: 493); 554 (35%) of them were children.

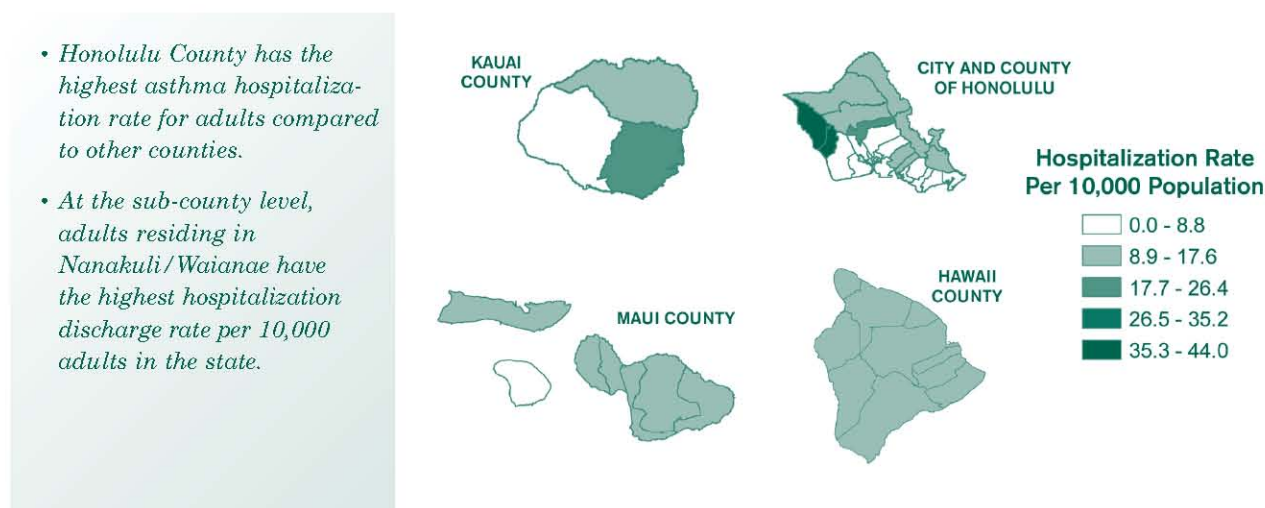
**Figure 32.** Childhood asthma hospitalization discharge rates per 10,000 children by geographic area, HHIC 1995-2005.



## Adults:

During the period 1995-2005, there were on average 1,600 hospital inpatient discharges per year with a primary diagnosis of asthma (ICD-9 code: 493); 1,046 (65%) were adults.

**Figure 33.** Adult asthma hospitalization discharge rates per 10,000 adults by geographic area, HHIC 1995-2005.



<sup>24</sup> Flores, G., Areu M., Tomany-Koman, S., Meurer, J. Keeping children with asthma out of hospitals: Parents' and physicians' perspectives on how pediatric asthma hospitalizations can be prevented. Pediatrics 2005, vol. 116, no4, pp. 957-965

# Asthma Hospital Discharges

## Local Geographic Area Prevalence

**Table 4.** Annual asthma hospitalization discharge rates by geographic area, HHIC 1995-2005, BRFSS 2005-2006.

Child (<18)	ANNUAL AVERAGE		
	Number of Hospitalizations	Number of Hospitalizations Per 10,000 population <sup>25</sup>	Estimated Percent of People with Asthma Hospitalized <sup>26</sup>
<b>HONOLULU COUNTY</b>			
Aiea/Pearl City	31	16	2.1%
Ala Moana	10	-	-
Kaawa/Kahaluu/Kaneohe	20	16	1.9%
Kailua/Waimanalo	26	17	1.5%
Kaimuki/Palolo/Waikiki	17	14	2.1%
Manoa/Upper Makiki	17	18	1.5%
Milliani/Wahiawa	54	20	1.4%
Nanakuli/Waianae	73	48	2.7%
North Shore/Laie	14	16	2.2%
Nuuuanu/Kalihi/Moanalua	61	31	2.5%
Salt Lake/Foster Village	44	23	2.9%
Wailae/Kahala/Hawaii Kai	6	6	0.8%
Waipahu/Kapolei/Ewa	45	11	0.9%
<b>HAWAII COUNTY</b>			
Hilo	18	15	1.2%
Kona	10	13	1.8%
North Hawaii	19	17	0.9%
Puna/Kau	15	13	0.8%
<b>KAUAI COUNTY</b>			
Hanalei/Kapaa	17	23	2.0%
Lihue/Waimea	23	26	1.9%
<b>MAUI COUNTY</b>			
Kahului	17	15	1.7%
Lahaina/Wailuku	16	16	1.7%
Lanai	1	10	2.6%
Molokai	5	23	1.0%
Upcountry/Hana	12	12	1.2%

<sup>25</sup> [average number of hospital discharges during 1996-2005]\*10,000/[population size for the specific geographic areas obtained from BRFSS 2005].

<sup>26</sup> [average number of hospital discharges during 1996-2005]\*100/[number of people with asthma reside in the specific geographic areas obtained from BRFSS 2005]



# Asthma Hospital Discharges

Adult (≥18)	ANNUAL AVERAGE		
	Number of Hospitalizations	Number of Hospitalizations Per 10,000 population <sup>25</sup>	Estimated Percent of People with Asthma Hospitalized <sup>26</sup>
<b>HONOLULU COUNTY</b>			
Aiea/Pearl City	30	4	0.7%
Ala Moana	25	8	0.8%
Kaawa/Kahaluu/Kaneohe	41	9	0.9%
Kailua/Waimanalo	45	9	1.1%
Kaimuki/Palolo/Waikiki	46	7	1.5%
Manoa/Upper Makiki	37	8	1.4%
Milliani/Wahiawa	67	10	1.4%
Nanakuli/Waianae	138	44	4.4%
North Shore/Laie	31	14	1.4%
Nuuanu/Kalihi/Moanalua	116	16	2.0%
Salt Lake/Foster Village	26	8	0.9%
Wailae/Kahala/Hawaii Kai	18	4	0.8%
Waipahu/Kapolei/Ewa	72	6	0.8%
<b>HAWAII COUNTY</b>			
Hilo	55	16	1.5%
Kona	31	11	1.6%
North Hawaii	26	9	0.9%
Puna/Kau	32	10	1.3%
<b>KAUAI COUNTY</b>			
Hanalei/Kapaa	23	11	1.5%
Lihue/Waimea	51	18	1.9%
<b>MAUI COUNTY</b>			
Kahului	34	10	1.1%
Lahaina/Wailuku	32	10	1.0%
Lanai	1	4	0.6%
Molokai	9	14	1.4%
Upcountry/Hana	28	9	1.4%

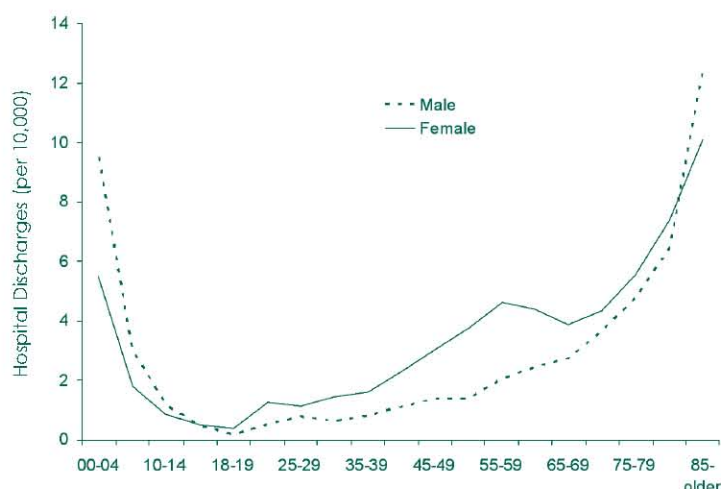
- Honolulu County overall, along with the Nanakuli/Waianae sub-area, has the highest overall asthma hospitalization rates per 10,000 population, and residents (adults and children) with asthma are more likely to be hospitalized for their condition.
- The Lanai sub-area in Maui County has the highest hospitalization rates among children with asthma; however, childhood asthma prevalence in this sub-area is the lowest in the state (4%). Only 6 children were hospitalized for asthma in the Lanai sub-area during 2000-2005; therefore, data should be interpreted with care.
- Although the Molokai sub-area has the highest childhood asthma prevalence in the state (Table 1), the childhood asthma hospitalization rate is around the state average.

# Asthma Hospital Discharges

## Basic Demographic Characteristics – Age, Gender and Ethnicity

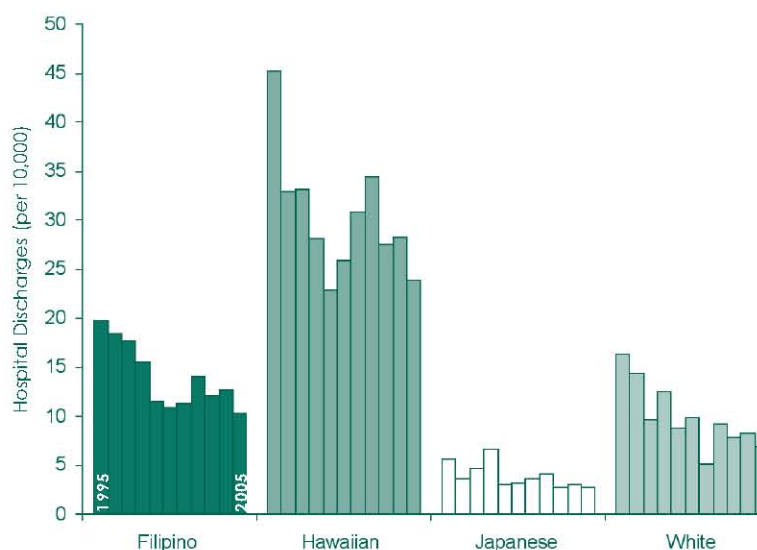
**Figure 34.** Average hospitalization discharge rates per 10,000 population by gender and age, HHIC 1995-2005.

- Children have higher rates of asthma hospitalization compared to young adults (higher than HP 2010 Objective 24-2a).<sup>27</sup>
- Female adults are more likely to be hospitalized for asthma than adult males
- The elderly and young children are more likely to be hospitalized for asthma than younger adults
- These findings are supported by results presented earlier that asthma is significantly higher among boys than girls and women compared to men (BRFSS and HHS).



**Figure 35.** Average hospitalization discharge rates per 10,000 children by ethnicity, HHIC 1995-2005.

- Hospitalization for children with asthma seems to be decreasing for all ethnic groups.<sup>28</sup>
- Among children, Native Hawaiians have the highest hospitalization rate followed by Filipino and Whites, with the lowest rate among the Japanese.



<sup>27</sup> Healthy People 2010 Objective 24-2: Reduce hospitalizations for asthma (Rate per 10,000)

24-2a. Children under age 5 years	25.0
24-2b. Children and adults aged 5 to 64 years	7.7
24-2c. Adults aged 65 years and older	11.0

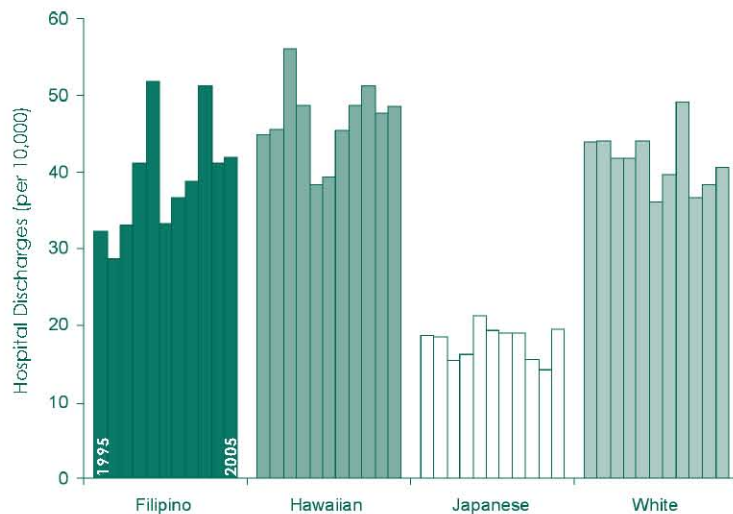
<sup>28</sup> Disclaimer: The race/ethnicity data are not collected in a standardized format by the hospitals in Hawaii. However, because of the interest in race/ethnicity data, HHIC has attempted to distill data that might be useful. We have derived what we refer to as the conformed race data, i.e. if a race/ethnicity category is collected by all hospitals it is available for reporting purposes. If the race/ethnicity grouping is not collected/reported by all hospitals it is classified within the category "other". Hospitals that do not collect race/ethnicity for a patient ('Data not collected') or report race/ethnicity as 'Unknown' are classified as submitted. Hospitals that collect incomplete race/ethnicity data that do not conform to the minimum HHIC groupings are classified 'Not applicable'. The graphs exclude 'other', 'not applicable', 'unknown', and 'data not collected'.



# Asthma Hospital Discharges

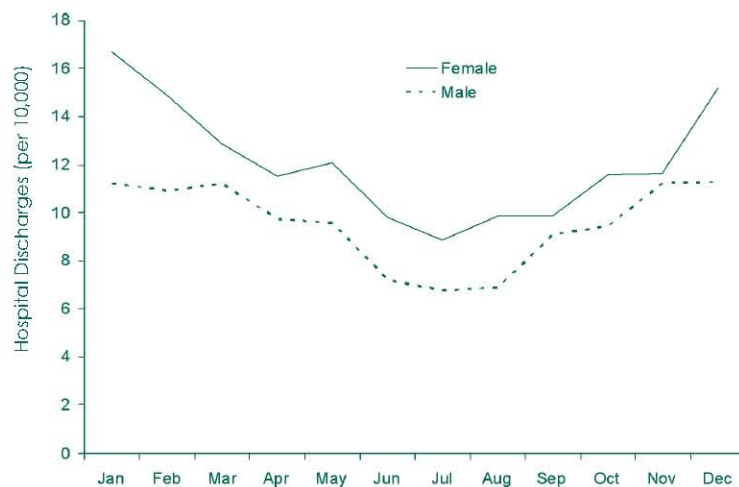
**Figure 36.** Average hospital discharge rates per 10,000 adults by ethnicity, HHIC 1995-2005.

- Adult asthma hospitalization rates do not show a change in overall trends, with the exception of the rate among Filipinos which seems to be increasing.
- Among adults, Native Hawaiians have the highest hospitalization rate followed by Whites and Filipinos, with the lowest rate among the Japanese.



**Figure 37.** Annual average hospital discharge rates per 10,000 population by month and gender<sup>29</sup>, HHIC 1995-2005.

- Asthma ED hospitalizations for both males and females increase during the cooler season when flu is more prevalent.



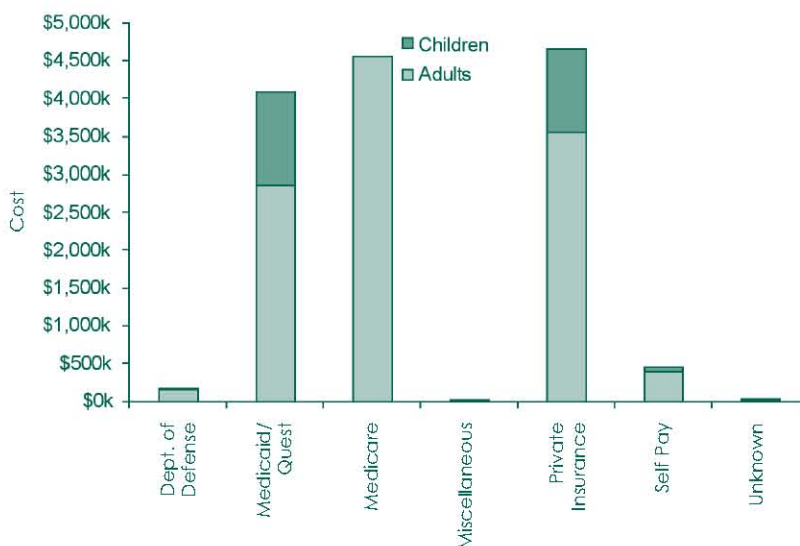
<sup>29</sup> Annual average asthma related hospitalization rate per 10,000 population by month and gender was derived from  $\{[10,000] \times [\text{total number of gender specific asthma hospitalizations for the given month}] / [(\text{US Census 2000 gender specific Hawaii population}) \times (\text{number of year data is available} = 11 \text{ years})]\}$ .

# Asthma Hospital Discharges

## Asthma Hospitalization Cost

**Figure 38.** Average annual hospitalization cost by payer, HHIC 1995-2005.

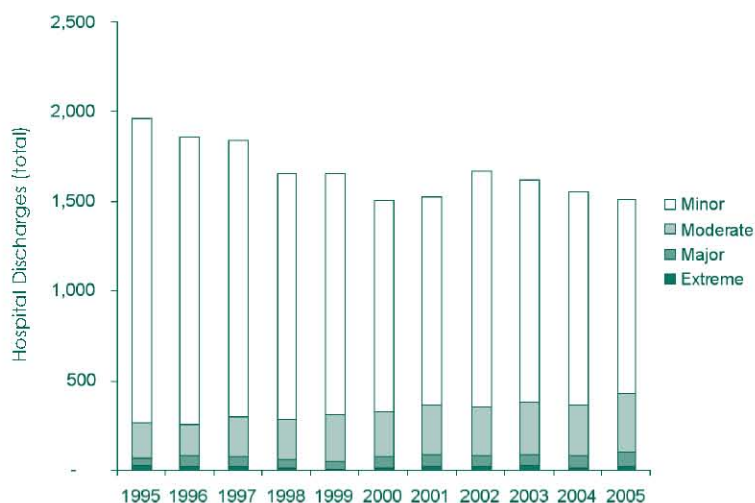
- Two-thirds of asthma hospital charges are paid by government programs (Medicaid and Medicare).
- The vast majority (83%) of asthma hospitalization costs are incurred by adults.
- Private insurance paid 45% of asthma hospitalization costs for children and 31% for adults.



## Asthma Hospitalization Severity

**Figure 39.** Average annual asthma hospitalizations, the risk of mortality<sup>30</sup> by year, HHIC 1995-2005.

- The majority of asthma-related hospitalizations (80%) have minor mortality risk.
- 15% of asthma hospitalizations have moderate risk for mortality and 5% of asthma hospitalizations have major or extreme mortality risks.



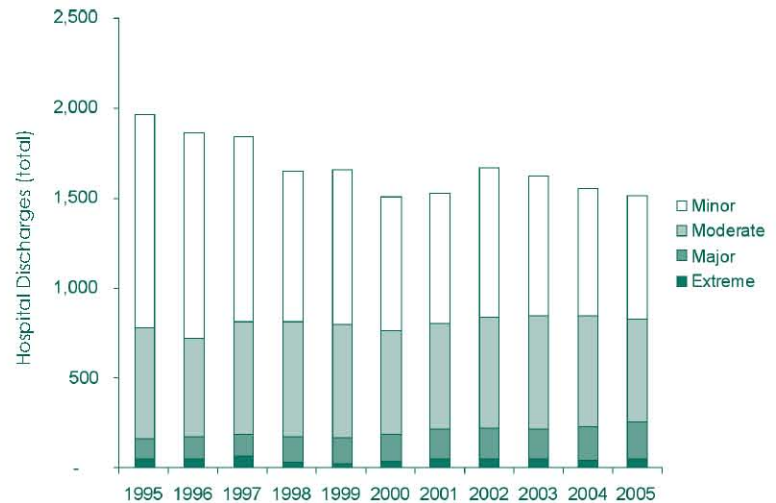
<sup>30</sup> Risk of mortality is defined as the likelihood of dying as defined by the HHIC.



# Asthma Hospital Discharges

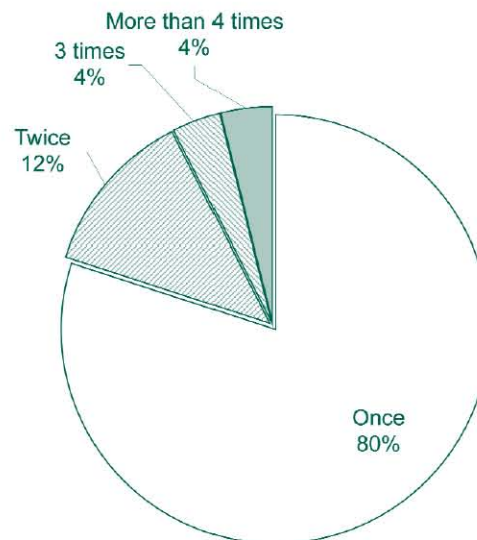
**Figure 40.** Average annual asthma hospitalization discharge by severity value<sup>31</sup>, HHIC 1995-2005.

- The majority of asthma hospitalizations (52%) are classified as minor patient severity.
- 36% of asthma hospitalizations are of moderate severity; while 12 % of asthma hospitalizations are of major or extreme severity.



**Figure 41** Repeated hospitalization<sup>32</sup> in the past 11 years, HHIC 1995-2005.

- At least 20% of asthma hospitalizations are repeat patients in the past 11 years.



<sup>31</sup> Severity of illness is defined as the extent of physiologic decompensation or organ system loss of function as defined by the HHIC.

<sup>32</sup> Based on the unique patient ID assigned by the HHIC; some patients that visited multiple hospitals might have more than one unique ID which leads to underestimation of the true ED repeated utilization rates.

# Asthma Mortality

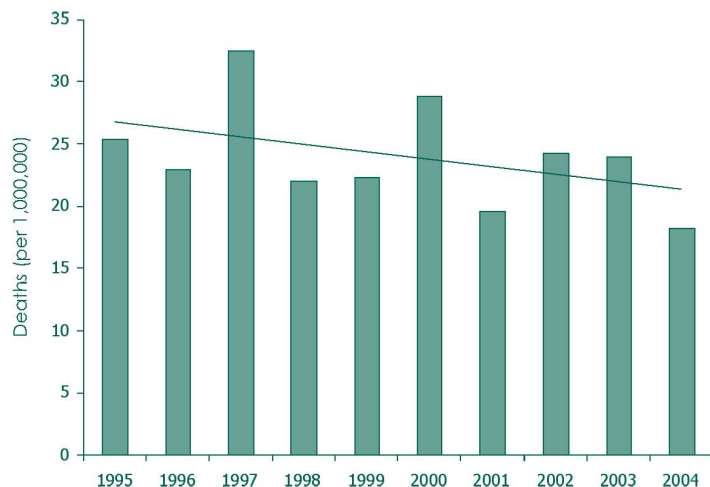
The Office of Health Status Monitoring (OHSM) of the Hawaii Department of Health collects, processes, analyzes and disseminates relevant, population-based data in a timely fashion in order to assess the health status of Hawaii's population and to fulfill health statistics legal requirements. The office also provides vital statistics, demographic and health data for use in identifying state and community health trends, identifying population groups at risk for serious health problems and evaluating program effectiveness. Other OHSM activities include maintaining health surveys for the purpose of collecting data on health conditions not otherwise monitored within the state, yet needed to analyze health status; disseminating information through published reports and through visual presentations such as charts, graphs and maps; and coordinating the integration and linkage of departmental databases with external databases. The OHSM also provides a repository for vital event records with the state such as births, deaths and marriages and provides copies to the general public on a timely basis. OHSM also issues marriage licenses as well as marriage, birth and death certificates.

To understand the succeeding discussion the following terms are being defined.

- Mortality Rate expresses the number of deaths occurring in a particular population during a given period of time.
- Underlying Cause of Death is the disease/condition that initiated the train of events leading to death.
- Contributory Causes of Death are diseases/conditions that did not initiate the train of events leading to death, but resulted in death directly or indirectly, or any other significant conditions, which unfavorably influenced the course of the morbid process and thus contributed to the fatal outcome.

**Figure 42.** Statewide asthma mortality (underlying cause) rates per 100,000 population, OHSM 1995-2004.

- *There is an overall downward trend in asthma mortality rates for underlying cause from 1995 to 2004.*
- *In 2004, 18 people died from asthma in the state of Hawaii.*



Source: Office of Health Status Monitoring, Hawaii State Department of Health Rates were calculated by the Hawaii State Asthma Control Program

\*The Estimated Comparability Ratio was used to allow comparisons to be made across all years

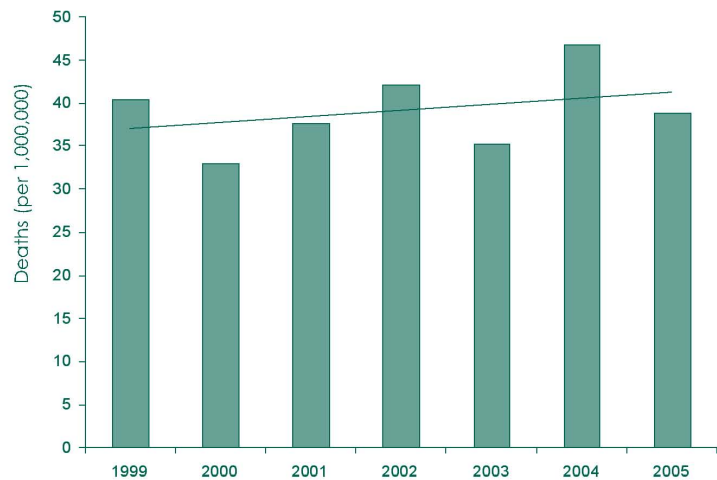


# Asthma Mortality

## State Mortality

**Figure 43.** Statewide asthma mortality (non-underlying cause of death) rates per 100,000 population, OHMS 1999-2005.

- *There is an overall slight upward trend in asthma mortality rates for non-underlying cause of death from 1999 to 2005.*
- *In 2005, 49 people died where asthma was a non-underlying cause of death in the state of Hawaii.*



Source: Office of Health Status Monitoring, Hawaii State Department of Health Rates were calculated by the Hawaii State Asthma Control Program



## *Glossary*

**Prevalence** is the number of existing cases of a disease present in a population (or the proportion of individuals in a population who have a disease) at a specific time

A **confidence interval** is a range that contains the true population prevalence estimate with a certain degree of assurance when repeated sampling of the population is performed. The degree of assurance commonly used is 95%. For example, if we set our confidence interval at 95%, then we can expect that 5 out of 100 times the estimates coming from our samples will fall outside the range that contains the true population value. However, 95% of the time our estimates will fall within the correct range. This is known as a 95% confidence interval. Confidence intervals are used to assess if there are differences in prevalence among defined subgroups. It is a quick and simple way to determine if such differences are potentially significant (statistically). Confidence intervals have been provided in the BRFSS and HHS section of this report as an efficient way to look for differences among subgroups on important health issues and serves as an important tool when it comes to looking for patterns in BRFSS and HHS reports.

For example based on BRFSS 2005-2006, the analysis of current asthma prevalence by gender shows that adult females have a higher current asthma prevalence when compared with adult males (10.2% versus 5.3%) and the confidence intervals around these prevalence estimates do not overlap (Figure 4). Based on this finding, it is reasonable to say that "likely significant differences" of current asthma prevalence exist between females and males in this state. However, in order to say that there are statistically significant differences of current asthma prevalence between females and males, a formal test of significance would have to be conducted (e.g., t-test, chi-square test).

ED, hospital discharge and mortality rates were not derived from samples, instead they represent the complete number of claims (the true population average), confidence intervals were not computed.

## *Behavior Risk Factors Surveillance System (BRFSS) Definitions*

Since calendar year 2000, two questions on adult asthma have been part of the BRFSS core. These questions are: (1) 'Did a doctor ever tell you that you had asthma?' (2) 'Do you still have asthma?'

However in 2001, the first question was changed to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"

In an effort to have a statewide population estimate of asthma prevalence among children age 17 or younger, two questions on childhood asthma were asked as state added questions in 2001. These questions are:

(1) "Earlier you said there were [fill in number from core Q13.6] children age 17 or younger living in your household." How many of these children have ever been diagnosed with asthma? If yes, the following question was asked: (2) "[fill in (Does this child/How many of these children) from Q10] still have asthma?"



These two questions on child asthma were asked up to calendar year 2004. However, in 2005 a procedural change occurred in that a child is randomly selected if there are children living with the respondent. Asthma information on the randomly selected child was asked from the adult respondent. To accommodate this procedural change, the wording of the child asthma questions were modified as: (1) 'Has a doctor, nurse or other health professional EVER said that the child has asthma?' (2) 'Does the child still have asthma?'

**Adult Asthma Prevalence** is defined by the Hawaii BRFSS as those who responded "yes" to the question, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"

**Adult Current Asthma Prevalence** is defined by the Hawaii BRFSS as those who responded "yes" to the Adult Lifetime Asthma Prevalence question and who responded "yes" to the question, "Do you still have asthma?"

**Child Lifetime Asthma Prevalence** is defined by the Hawaii BRFSS by asking this question to adult respondents with a child or children in the household: "Has a doctor, nurse or other health professional EVER said that the child has asthma?"

**Child Current Asthma Prevalence** is defined by the Hawaii BRFSS by asking adult respondents who reported having a child or children in the household that have been diagnosed as "ever" having asthma the following question: "Does the child still have asthma?"

**Community** (sub-county geographic areas) in this report is defined by the aggregation of adjacent zip codes with at least one school complex in the area. A list of the community zip codes can be found on the following web site:

<http://hawaii.gov/health/statistics/brfss/others/subarea.html>

**Ethnicity** respondents are asked to choose up to six ethnicities from the ethnicity list following the question: "Which one or more of the following would you say is your ethnicity?" This question is followed up by another question when more than one ethnicity is mentioned: "Which one of these groups would you say best represents your ethnicity?" The ethnicity list includes Caucasian, Hawaiian, Chinese, Filipino, Japanese, Korean, Samoan, Black, American Indian/Alaska Native/Eskimo/Inuit, Vietnamese, Asian Indian, Portuguese, Guamanian/Chamorro, Puerto Rican, Mexican, Tongan, Laotian, Cambodian, Malaysian, Fijian, Micronesian and other Asian. In addition, a respondent can specify their own ethnicity if it is not listed, or they can say they don't know, they are not sure, or they refuse to answer. For simplicity, this document re-categorizes race/ethnicity into White (includes Portuguese), Hawaiian, Filipino, Japanese and "Others" (includes Chinese).

**Frequent mental distress** is at least 14 days of not good mental health. This 14-day minimum period was selected because physicians and clinical researchers often use a similar period as a marker for clinical depression and anxiety disorders.

**Smoking Status** is defined as a current smoker as a person who responds "yes" to currently smoking every day or some days. The Hawaii BRFSS defines a former smoker as a person who has smoked at least 100 cigarettes in their lifetime, but no longer smokes.







## *Hawaii Health Survey (HHS) Definitions*

To determine household members with asthma, the adult respondent was asked, "Has anyone in the household been told by a physician or medical professional that they have asthma?" Answers to the question for each household member were categorized as yes, no, don't know or refused to answer.

**Asthma prevalence** was calculated by combining data from two or more years. The weight applied was averaged by the number of years of data combined. Calculating averages by combining years tends to smooth trend lines and decrease the range of the 95% confidence interval. In addition, adjusting prevalence values by the age structure of the groups being compared allows the comparison of groups with different age structures.

**Age** at last birthday was provided for each household member by the adult respondent. If age is missing, it is imputed using a "hot deck" method. The missing ages are less than 2.0% of the sample.

**Body Mass Index (BMI)** was defined as weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Height and weight were asked only of the respondent, thus data are only for the population aged 18 years and up. The National Heart, Lung and Blood Institute (June 17, 1998) released the federal guidelines for the "clinical definition" of overweight and obese:

<i>Underweight</i>	<18.5
<i>Normal</i>	18.5-25.0
<i>Overweight</i>	25.0-30.0
<i>Obese I</i>	30.0-35.0
<i>Obese II</i>	35.0-40.0
<i>Obese III</i>	>40.0

**Educational status** was provided by the adult respondent for everyone aged eighteen years and greater in the household. The responses were coded not a high school graduate, high school graduate/GED, 1-3 years of college, college graduate and unknown.

**Ethnicity** was described by the respondent for each household member and his or her mother and father. Up to four ethnicities were listed for each household member. The responses were coded to White/Caucasian, Hawaiian, Chinese, Filipino, Japanese, Korean, Samoan/Tongan, Black/African American, Native American/Aleut/Eskimo/Inuit, Vietnamese, Asian Indian, Portuguese and/or Guamanian/Chamorro. In 2000, the responses Puerto Rican, Mexican, other Pacific Islander and Other Asian were added. The respondent could also specify another ethnicity if it is not listed, reply they do not know, or refuse to answer.



OHSM codes these eight possible responses for each individual to one ethnicity in order to comply with prior Census rules coding race/ethnicity. Specifically, if Hawaiian is listed for the mother or father, the person is coded to Hawaiian. Otherwise, the person is coded to the first ethnicity listed (other than Caucasian or unknown) for the father. If the father's responses are Caucasian or unknown, the person's ethnicity is coded to the first ethnicity listed (other than Caucasian or unknown) for the mother. Lastly, if there are no other responses other than Caucasian or unknown, the person is coded to Caucasian. Otherwise, the person is coded to "do not know," refused, or missing.

**Health Related Quality of Life** was measured by questions from the SF-12® Version One (a shortened 12 questionnaire from the SF-36® questionnaire). Questions were related to self-reported general health, limitations caused by physical and/or emotional problems, pain limiting activities, limitations to amount and type of work and limitations in social activities due to health problems.

Scoring for the summary scales MCS-12 (mental component summary scale) and PCS-12 (physical component summary scale) from the twelve questions on health are outlined in the SF-12® manual. The SF-12® scoring algorithm is a composite score of weighted item responses to twelve questions on self-reported physical and mental health status. A higher summary scale value indicates better health for both the mental and physical summary scale. The scores are standardized so that the mean equals 50 and the standard deviation 10 for the general U.S. population.

**Marital status** was provided by the adult respondent for everyone aged fifteen years and greater in the household. The responses were coded into married, divorced, separated, never married and too young to be married.

**Poverty status** was determined by using the "poverty guidelines" and took into account not only income, but also household size supported by the income. Thus, it is a more useful indicator of actual personal income. It was reported for the household and/or the household members.

Poverty guidelines are updated annually in the Federal Register by the U.S. Department of Health and Human Services. The poverty guidelines are designated for the year in which they are issued and reflect price changes for the prior year. The Hawaii Health Survey income question is asked also of the prior year. Thus, the 2004 Federal Poverty Guidelines were used for 2004 income data to compute percent poverty levels for 2004. Households below 100% of the guideline are said to be below the poverty guideline. Individuals in those households are said to be "living below the poverty line." Poverty levels for persons of unknown income were listed as unknown.

**Smoking status** was determined by several questions including: "Does anyone in your household smoke cigarettes?" "What are the names (initials) of those household members?" "In the past 30 days, has anyone, including yourself, smoked cigarettes, cigars or pipes inside your home?"





35 U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Poverty Guidelines - Research and Measurement. 2000;1-2. <http://aspe.hhs.gov/poverty/poverty.htm>.









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**Published by:**

The Hawaii State Department of Health  
Community Health Division  
Chronic Disease Management and Control Branch  
Hawaii State Asthma Control Program  
March 2009

**Funded by:**

This publication was supported by cooperative agreement number 3U59EH925028-03S1  
from the Centers for Disease Control and Prevention (CDC). Its contents are solely the  
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