Stanislaus County Asthma Report Card 2010

Description of the Asthma Burden in Stanislaus County to Promote Policy Change and Support Interventions

Stanislaus County HEALTH SERVICES AGENCY

Public Health
Prevent. Promote. Protect.

Stanislaus County Asthma Coalition
"Better breathing for all..."

June 2010

Acknowledgements

The development of this report was supported in part by the California Asthma Public Health Initiative (CAPHI) and the California Department of Public Health (CDPH) with funding from the Cigarette and Tobacco Products Surtax Fund (Prop 99) Unallocated Account (UA). Stanislaus County is the recipient of an *Enhancing Local Capacity to Address Asthma Priorities (ELCAAP) Program* grant from CDPH for 2009-2012 and used ELCAAP funds, in part, to create this report.

In addition, technical assistance was received from state epidemiologists from the *California Breathing* project of the California Department of Public Health's Environmental Health Investigations Branch. This report is modeled after the county asthma profiles produced by *California Breathing*, but includes more county-specific and sub-county information than those reports. Readers may wish to refer to these or other publications produced by *California Breathing* which can be found at http://www.californiabreathing.org/.

Finally, the Central Valley Health Policy Institute (at CSU Fresno) provided assistance with obtaining and analyzing data not available directly to county staff.

The Stanislaus County Asthma Coalition, particularly its subcommittee, played a key role in designing the focus of and helping collect survey data for this report.

A special thank you is due to the following Stanislaus County Health Services Agency/Public Health staff for their contribution to the publication of this document:

Dolores Cisneros
Sharon Hutchins
Phoebe Leung
Cleopathia Moore-Bell
Olivia Tong
Joseph Wadley

****

Stanislaus County Board of Supervisors
Jeff Grover, Chairman, District Three
Dick Monteith, Vice-Chairman, District Four
William O'Brien, District One
Vito Chiesa, District Two
Jim DeMartini, District Five

Health Services Agency, Public Health Administration
Mary Ann Lee, Managing Director, HSA
Cleopathia Moore-Bell, Associate Director, Director of Public Health Services
John Walker, M.D., Public Health Officer, Stanislaus County
Nancy Fisher, Assistant Director, Director of Nursing
Phoebe Leung, Assistant Director, Public Information Officer

Table of Contents

Introduction

Purpose of Report

The purpose of this report is twofold: 1) to compile in a single location all existing relevant data about the burden of asthma in Stanislaus County, especially those highlighting health disparities, and 2) to support the development of policy and program interventions to reduce these health disparities and lighten the county's asthma burden. Thus, the report is intended to serve as a single source where stakeholders can find data to better understand the county's issues and needs, to apply for grant funds to address these issues and needs, to prioritize intervention activities and to evaluate the effectiveness of these intervention efforts.

The target audience for this report is that group of stakeholders working to reduce the asthma burden in the county, especially members of the Stanislaus County Asthma Coalition (SCAC). The authors of this report also created a companion *Executive Summary* of this report to present pertinent information to those making decisions and policies in the county, including political leaders and organization heads.

Roles of ELCAAP and Local Stakeholders

This report was made possible by an *Enhancing Local Capacity to Address Asthma Priorities* (ELCAAP) grant from the California Department of Public Health. As part of the ELCAAP grant, considerable technical assistance was given by staff of the *California Asthma Public Health Initiative* (CAPHI). In addition, technical assistance on data analysis was received from the California Department of Public Health's Environmental Health Investigations Branch.

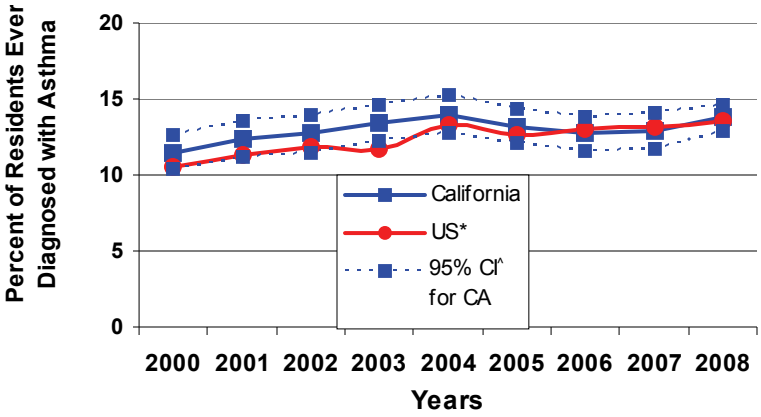
However, the structure of the ELCAAP grant ensured that the local stakeholders drove all decisions concerning the goals and products of the initiative. Over 100 individuals from over 50 organizations (including medical providers, clinics, hospitals, pharmacies, EMS authority, long-term care facilities, health plans, government agencies, non-profit, community-based and faith-based organizations, schools and school districts, child care centers, correctional facilities, emergency and transitional shelters, major employers, professional and agricultural organizations and the San Joaquin Valley Air Pollution District) participated in an eight-month long assessment and plan development process in 2008-2009, which resulted in a Scope of Work for the project in June 2009. Creation of the *Stanislaus County Asthma Report Card 2010* was Objective #3 in the Scope of Work.

National and State Context

Asthma is a serious and chronic health condition affecting the lungs, whose ultimate causes are not completely understood (NIH, 2010). Asthma is one of the most common chronic diseases in childhood, and is responsible for a large amount of school and work absenteeism (CDC, 2006).

Larger Context and Risk Factors

Lifetime asthma prevalence (for both children and adults) has been generally rising nationally (e.g. US EPA, 2010, based on data from the National Health Interview Survey) and in California (e.g. CDC, 2008, based on Behavioral Risk Factor Surveillance System data). California falls generally in the upper (worse) half of US states in its asthma prevalence (see the graph below).



Source: Behavioral Risk Factor Surveillance Survey Data, CDC
**US value is median of 50 states and Washington DC.*
^ 95% CI= 95% Confidence Interval for California data points. See Technical Notes .

Outdoor air quality plays a role in California's asthma burden. Eleven California Metropolitan Statistical Areas and 18 California counties are among the 25 worse in the nation for at least one pollutant category. Stanislaus County ranks as the 20th most polluted US county (out of 3,141 counties) based on short term particle pollution, while the capital, Modesto, ranks 17th worse among US Metropolitan Statistical Areas (ALA, 2009).

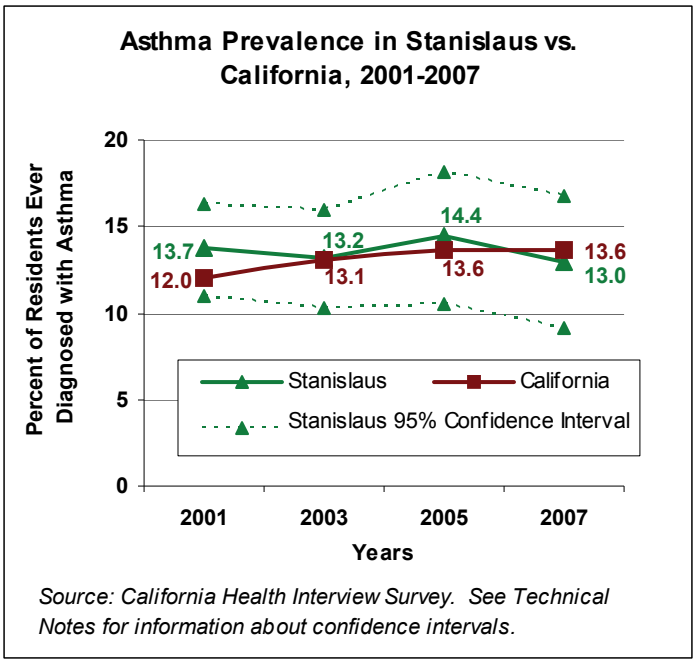
Health Disparities

After several decades, researchers now understand that one's socioeconomic status plays a large role in one's health (e.g. Brennan Ramirez et al, 2008). Asthma, and factors contributing to it, do not affect everyone equally. Some people—by reasons of genetics, general health, behavior, social status, income, geographic location, occupation or environment—are more likely to have asthma or suffer severe consequences of asthma.

Such differences across sub-groups of people are called ***health inequities*** or ***health disparities***. Some people (e.g. CDC, June 2010) reserve the term ***health disparity*** for situations in which the health differences are unfair and due to prejudice or the unjust distribution of resources. However, in this report, ***health disparity*** will be used in the more general sense of any difference in health status or outcomes across different groups.

Stanislaus County exhibits many health disparities related to asthma and the factors that contribute to it. Important differences among sub-groups must be understood when designing interventions to reduce asthma, its risk factors and consequences. Therefore, this report highlights health disparities to enable policy makers and those working to make Stanislaus County healthier to know where and on whom to focus particular programs to make the largest impact on the county's health.

Spectrum of Severity of Asthma

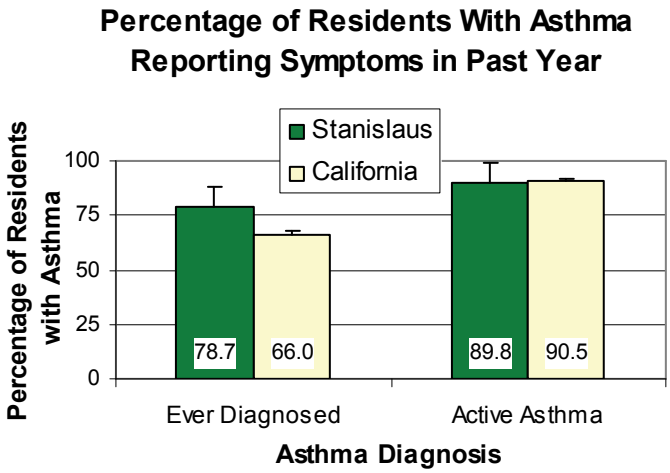


Source: California Health Interview Survey. See Technical Notes for information about confidence intervals.

Lifetime Asthma Prevalence

The percentage of residents who report ever being diagnosed with asthma has stayed approximately the same in Stanislaus County for the past six years, and is not statistically different from that for California residents as a whole. Approximately 13%-14% of Stanislaus County residents (across all ages) report ever being diagnosed with asthma by a medical provider. Not all of these individuals have continued to experience asthma symptoms or exacerbations. Those who have are considered to have *chronic*, *current*, or *active asthma*.

Individuals with active asthma vary in their experience of the condition, ranging from 1) occasional symptoms, to 2) absenteeism from school or work due to asthma exacerbations, 3) full-blown asthma attacks, 4) visits to an urgent care or emergency room due to an asthma attack, 5) hospitalization for asthma, or even 6) death from asthma. Generally, the better controlled and managed asthma is (both by the medical provider and by the individual with asthma), the less severe the consequences (ACAAI, 2008).



Source: California Health Interview Survey, 2007. Note: Error bars represent the 95th Confidence Interval. See Technical Notes for details.

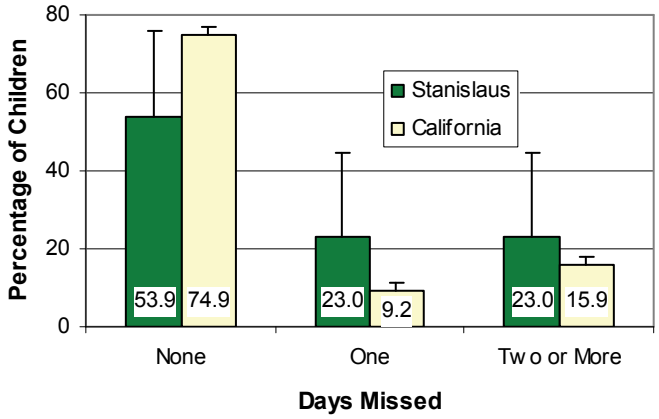
Experiencing Symptoms

As the graph to the left shows, a statistically significantly larger percentage of Stanislaus County residents ever diagnosed with asthma reported having experienced symptoms in the past year (79%) compared to California residents (66%). These percentage have remained fairly steady since 2003 (in years for which data are available). About 90% of residents with active asthma in both the county and state, reported experiencing symptoms in the past year.

Missing School or Work

Asthma is a major cause of school and work absenteeism, affecting learning and productivity. According to the Centers for Disease Control and Prevention, "Asthma is the fourth leading cause of work absenteeism and diminished work productivity for adults, resulting in nearly 12 million missed or less productive workdays each year" (CDC, 2006). Unfortunately, not enough individuals were included in the California Health Interview Survey in 2003, 2005 and 2007 from Stanislaus County to reliably measure the percentage of county residents who missed work due to asthma.

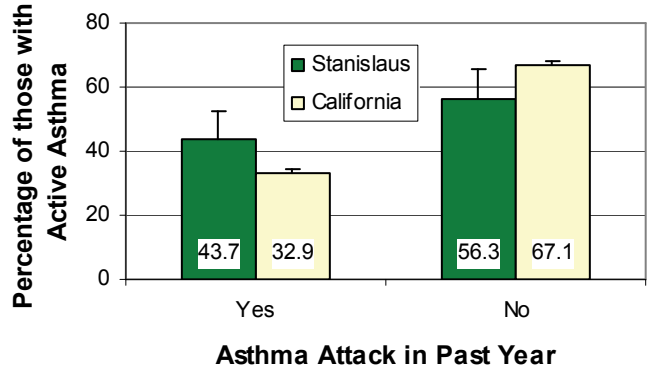
Percentage of Children with Asthma Who Missed School Due to Asthma in Past Year



Source: California Health Interview Survey, 2005 & 2007. Note: Error bars represent the 95% Confidence Interval. Stanislaus estimates for 1 and 2+ days are statistically unreliable (see Technical Notes).

However, as shown in the graph at left, Stanislaus County children tend to be more likely to miss school due to asthma than California children as a whole, although this difference is not statistically significant. The fairly large percentage of Stanislaus children with asthma who missed at least one day of school due to asthma (approximately 46%) may indicate that many county youth and their parents need additional assistance in managing this chronic condition.

Percentage of those with Active Asthma With an Asthma Attack in Past Year



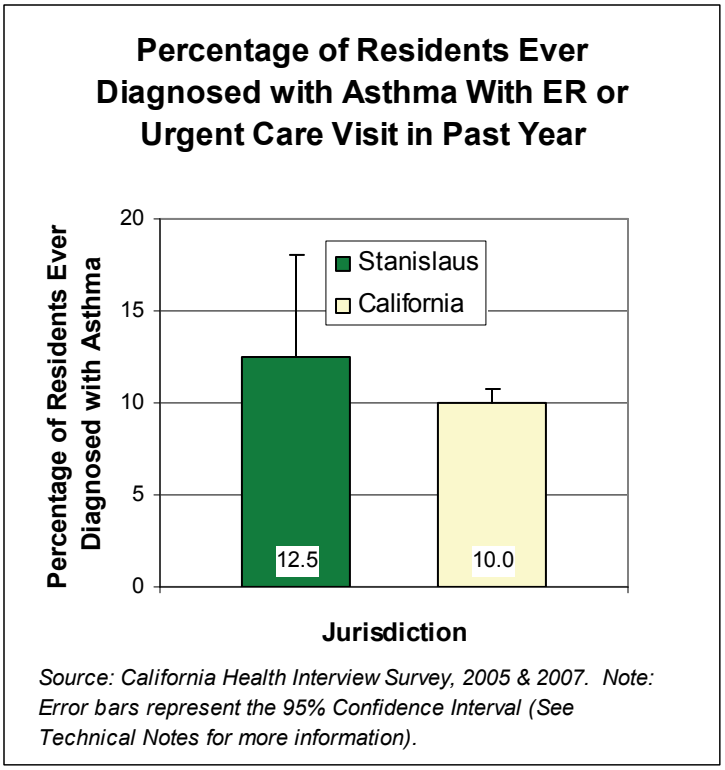
Source: California Health Interview Survey, 2005 & 2007. Note: Error bars indicate the 95% Confidence Interval (see Technical Notes).

Asthma Attacks

Nearly 44% of Stanislaus County residents with active asthma reported having experienced at least one asthma attack in the past year, a statistically significantly higher percentage than for California residents as a whole (33%). This finding suggests that Stanislaus County residents with active asthma may need further help in managing their asthma to prevent such attacks.

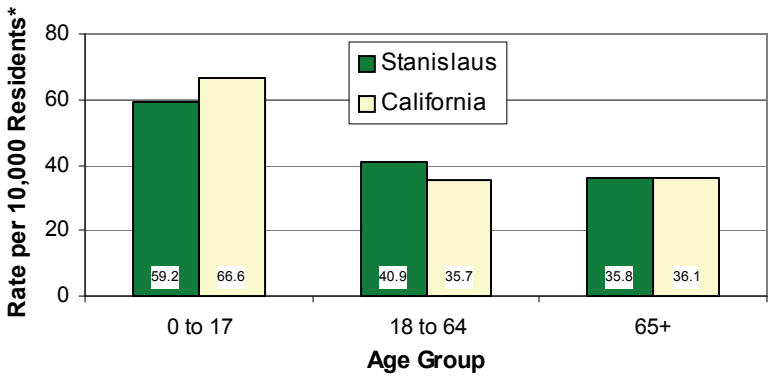
Severe Asthma Attacks

The need to seek care in an urgent care facility or emergency room (ER) is often an indication of poorly controlled asthma (as well as other factors such as lack of a personal medical provider or health insurance). As the graph below shows, the percentages of California residents ever diagnosed with asthma, who report having to visit an ER or urgent care facility for asthma in the past 12 months is slightly, though not statistically significantly lower than for Stanislaus County residents (see top graph).



Source: California Health Interview Survey, 2005 & 2007. Note: Error bars represent the 95% Confidence Interval (See Technical Notes for more information).

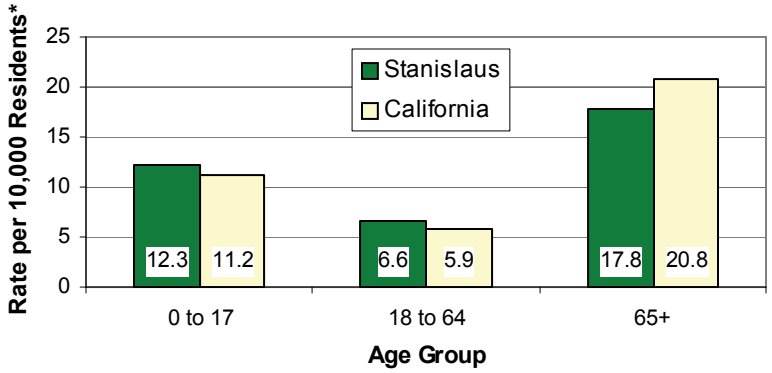
Hospital records of visits to ER facilities between 2005 and 2008 reveal that the overall age-adjusted rate of ER visitation due to asthma is very similar in Stanislaus County (44.9 per 10,000 visits) and in the state of California (43.7 per 10,000 visits; not shown in graph form). However, when examining the pattern of visits across age groups, differences emerge between the county and the state. While children (0 to 17 years) had the highest ER visit rate of all age groups for both jurisdictions, the ER visitation rate for asthma by California children is higher than for Stanislaus County children (see bottom graph). However, the asthma ER visitation rate for Stanislaus County adults is higher than for California adults. The rates of ER visits for seniors in the two jurisdictions are quite similar.



**Average annual ER visit rate per 10,000 residents, age-adjusted to the 2000 US standard population. ER visit data from the CA Office of Statewide Health Planning and Development. Population data from the CA Department of Finance projections, 2007 revision. Analysis provided by California Breathing, California Department of Public Health.*

Hospitalization for Asthma

Asthma is considered an ***ambulatory care sensitive condition***, meaning that most hospitalizations are preventable through good management by providers and individuals with asthma. Between 2005 and 2008, nearly 1,956 Stanislaus County residents were hospitalized with a primary diagnosis of asthma, an average of 489 people per year. Asthma may have played a role in the hospitalization of additional residents, but such data were unavailable for this report. The Stanislaus County age-adjusted asthma hospitalization rate was 9.5 per 10,000 during this period, very similar to the 9.3 per 10,000 for the state as a whole.



**Average annual ER visit rate per 10,000 residents, age-adjusted to the 2000 US standard population. ER visit data from the CA Office of Statewide Health Planning and Development. Population data from the CA Department of Finance projections, 2007 revision. Analysis provided by California Breathing, California Department of Public Health.*

The pattern of rates per age was very different for hospitalizations due to asthma than for visits to an ER due to asthma (see page 8). The age group with the highest (age-adjusted) rate of hospitalization was seniors (aged 65+ years), followed by children (aged 0–17 years), with adults of working age (18-64 years) having the lowest rate. The asthma hospitalization rates for children and working age adults were slightly higher for Stanislaus County than for California (see graph above), while seniors were hospitalized at a higher rate in California.

Death from Asthma

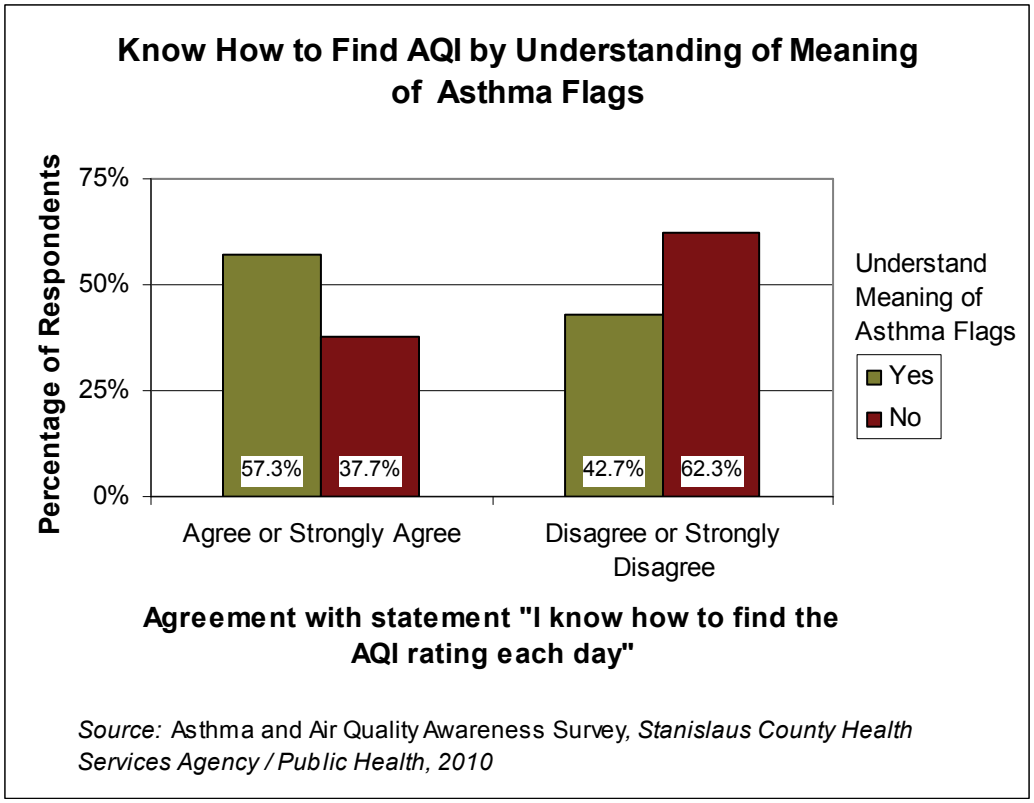
Between 2005 and 2007, 20 people in Stanislaus County died of asthma (i.e. the underlying cause of death on the death certificate was listed as asthma; analysis by *California Breathing*, California Department of Public Health). Asthma may have played a role in the deaths of additional people, but data on secondary causes of death were unavailable for this report. The age-adjusted asthma mortality rate for this period was 13.9 per million for Stanislaus residents, compared to 12.5 for California residents, while in 2006 it was 12.0 for Americans (Heron et al, 2006). Stanislaus residents who died from asthma between 2005 and 2007 did so at a mean of 63.0 years of age, ranging from 23 to 94 years of age. Thus, on average, people who died of asthma lost 15.5 years of potential life lost (YPLL), compared to the standard life length of 75 years. For the time period 2005-2007, a cumulative of 310 years of potential life was lost due to asthma in the county.

Management and Treatment of Asthma

Management: Control of Asthma Triggers

Individuals living with asthma can help manage and control their condition. Doing so requires awareness of asthma triggers and how to reduce exposure to them. Outdoor air can be an important asthma trigger. Knowing the daily Air Quality Index (AQI) number can help individuals with asthma reduce their exposure to air that may cause symptoms or an attack. The daily AQI for Modesto and Turlock can be found online at http://www.valleyair.org/aqinfo/forecast.htm. However, not all Stanislaus County residents have easy access to this online source of information. To inform all residents of the AQI, the Stanislaus County Asthma Coalition sponsors the Asthma Flag Program, in which colored flags are flown daily at schools and other public buildings (including hospitals and government offices) to indicate the quality category of the air (e.g. green flag for good air) using a system pegged to the Air Quality Index (AQI). This program makes finding the daily AQI easier for residents to help them control their exposure to outdoor air that may trigger an asthma attack.

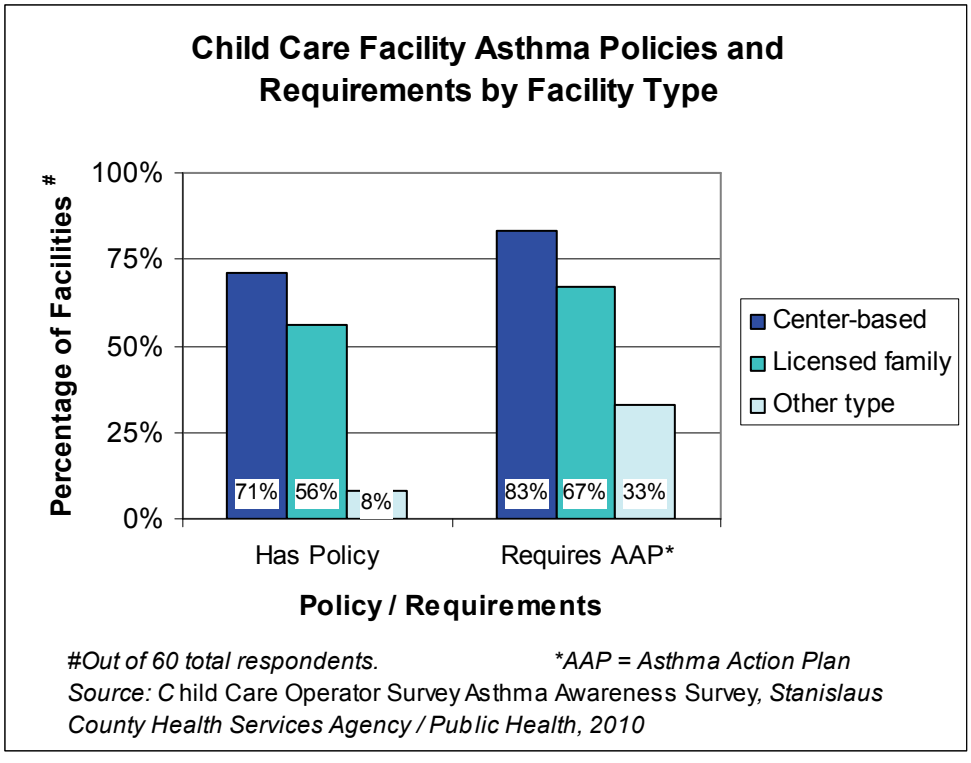
In the winter of 2010, 176 Stanislaus County residents were surveyed about their knowledge of asthma and air quality issues. Just under half (49%) of respondents indicated knowing how to find the daily Air Quality Index (AQI rating) to help them limit their exposure to poor quality air. These responses suggest the existence of a general lack of awareness among county residents about asthma and its control. However, respondents who reported being aware of the county asthma flag program were marginally statistically significantly more likely to report knowing how to find the AQI value each day (Chi-Square test result: $X^2(1) = 3.32, p<.07$). Respondents who reported understanding the meaning of flag's colors were statistically significantly more likely to report knowing how to find the AQI value, (Chi-Square test result: $X^2(1) = 17.3, p<.001$; see graph at left).



Source: Asthma and Air Quality Awareness Survey, *Stanislaus County Health Services Agency / Public Health, 2010*

Schools, child care facilities, workplaces and public institutions can assist asthma suffers to limit their exposure to potential asthma triggers. For instance, the Occupational Safety and Health Administration (OSHA) issued guidance on limiting exposure to asthma-causing agents and asthma triggers in the work environment (US Department of Labor, 2007) and the US Environmental Protection Agency (EPA) created resources to assist schools in reducing asthma triggers and develop asthma management plans (US EPA, 2005). The EPA recommends that schools develop school-wide asthma management plans that includes development of policies concerning the use of emergency controller medications, procedures for staff to follow in the event of an asthma attack, and use of Asthma Action Plans (AAPs) for students with asthma. Increasingly, Stanislaus County schools and school districts have asthma management plans in place, and encourage or require the registration of AAPs for students with asthma. Additionally, twenty-two of the twenty-six Stanislaus County School Districts or authorities have at least one school participating in the Asthma Flag Program, for a total of 190 of 254 total schools in the county.

In the winter of 2010, Stanislaus County child care facility operators were surveyed about their knowledge of and policies regarding asthma. Individuals representing 60 child care facilities completed the survey. Just over half (52%) of responding child care facilities have an asthma policy or procedure in place. 68% of respondents knew what an AAP is. 67% of facilities require an AAP for all children with asthma. Of those facilities with a policy or procedure, 40% address the control of indoor asthma triggers, 52% address exposure to outdoor air, and 53% address access to emergency asthma medications. As shown in the graph at left, larger commercial, center-based child care facilities are more likely to have an asthma management policy and require AAPs than were licensed family or other (e.g. informal) child care facilities.



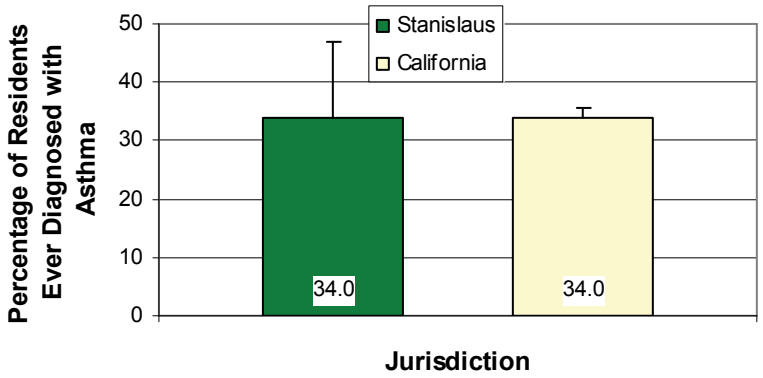
#Out of 60 total respondents. **AAP = Asthma Action Plan*

*Source: C*hild Care Operator Survey Asthma Awareness Survey, *Stanislaus County Health Services Agency / Public Health, 2010*

Self-Management: Partnering with a Healthcare Provider

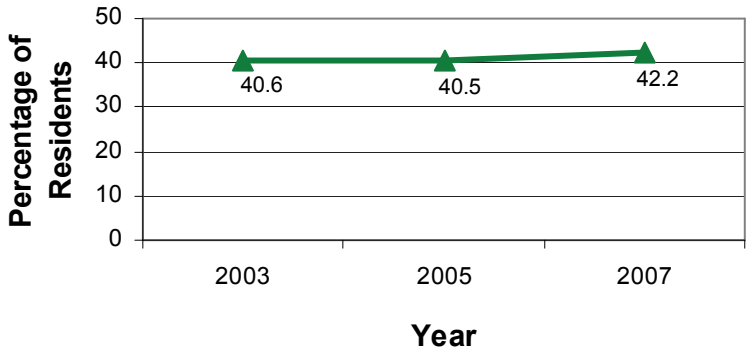
Methods for treating and managing asthma have improved over the past few de-cades (Global Initiative for Asthma, 2008). Many patients can benefit from asthma management plans and daily "controller" medications. However, indi-viduals with asthma need to work with their medical provider to take advantage of these methods. As the first graph below shows, about a third of both the Stanislaus and California residents ever diagnosed with asthma have been given an asthma management plan by a healthcare provider.

Percentage of Residents with Asthma Given an Asthma Management Plan by Jurisdiction



Source: California Health Interview Survey, 2007. Note: Error bars represent the 95th Confidence Interval (See Technical Notes for more information).

Stanislaus Residents with Active Asthma Who Take Daily Medication by Year



Source: California Health Interview Survey, 2003, 2005 & 2007.

As shown in the graph at the bottom left, just over 40% of Stanislaus residents with active asthma take a daily controller medication. This number has not changed statistically signifi-cantly over the past four years (for which there are data).

Data from a survey of 117 Stanislaus County residents with asthma (administered during the winter of 2010) found that 55% of the re-spondents believed that they do not have to take daily asthma medication when they feel good, while 41% thought they only needed to see a doctor when they feel bad. These responses indi-cate a lack of awareness about asthma and its most effective medical control and treatment.

Taken together, these findings indicate that the majority of Stanislaus County residents with asthma may benefit from (further) discussion with their health care provider(s) about how best to control and manage this condition.

Medical Management and Treatment

Healthcare providers are not required to report diagnoses of asthma to public health authorities under Title 17 of the California Health and Safety code, making detailed information on the medical treatment and management of asthma difficult to obtain. However, one large clinic system in Stanislaus County voluntarily provided aggregated information about care for asthma patients for this report. As the table below shows, approximately 44% of their asthma patients have active (or "persistent") asthma. However, only 1/3 of asthma patients received an influenza immunization during the previous 12 months (as recommended by CDC) and only 20% were given a severity assessment at their last visit. Still fewer were asked about symptom-free days, ER/urgent care visits, absenteeism from school or work, and exposure to environmental tobacco smoke or other asthma triggers, or had an asthma self-management goal set within the previous year. It is important to take into account that patients not receiving screenings or assessments during this time period may have had them during earlier time periods, and that not all visits received during this time period may have been due to asthma-related concerns. However, despite these data shortcomings, the data show that asthma treatment and management can be improved in Stanislaus County.

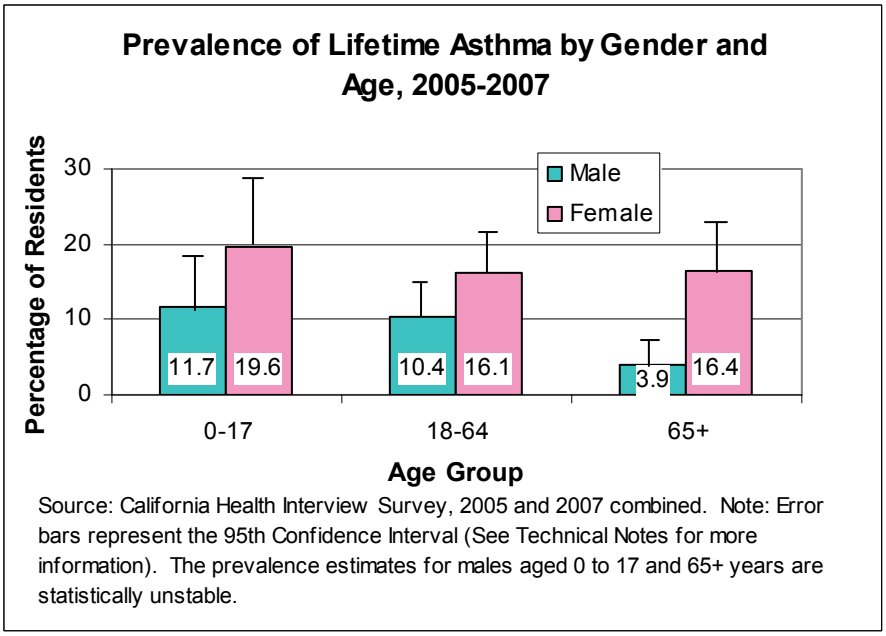
Asthma Management Data from a Large Clinic System

Category	Indicator	Percentage
Prevalence	Asthma patients with underlying NHLBI classification of persistent asthma	43.8%
Assessment	Asthma patients with severity assessment at last visit (during reporting period)	20.0%
	Asthma patients with symptom-free days documented during the reporting period	0.25%
	Asthma patients who received a depression screening in the past 12 months	3.0%
	Patients who have ever had a documented query about ER/Urgent Care visits.	0.02%
	Asthma patients with a documented environmental tobacco smoke (ETS) exposure status	0.8%
	Asthma patients with reported environmental tobacco exposure at last visit (during the reporting period)	0.0%
	Asthma patients who have ever been evaluated for environmental triggers other than ETS	0.0%
	Asthma patients who were asked during reporting period about work/school days lost in previous 30 days	0.3%
Treatment / Management	Asthma patients who are taking anti-inflammatory medication	0.05%
	Asthma patients with a self-management goal set during the reporting period	0.9%
	Asthma patients ≥ 5 years who established a personal best peak flow during the reporting period	0.7%
	Asthma patients who received a flu immunization in the past 12 months	33.3%

Note: *Data taken from internal clinic records for 4,808 asthma patients seen during the period 5/31/2008-5/31/2009.*

Health Disparities: Gender and Age

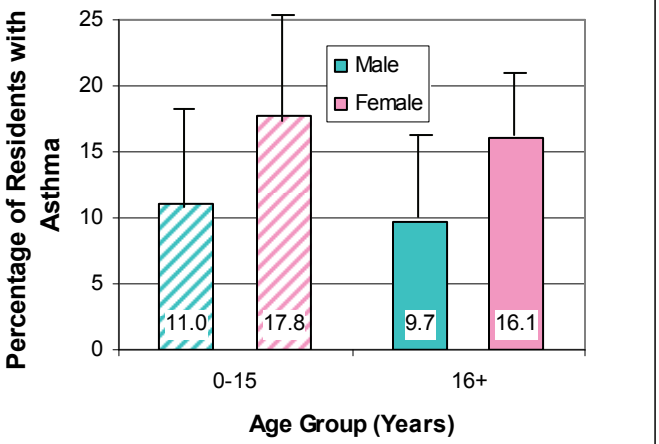
In Stanislaus County, more females (~41,000) than males (~24,000) have been diagnosed with asthma. This trend holds for all ages (see graph below).



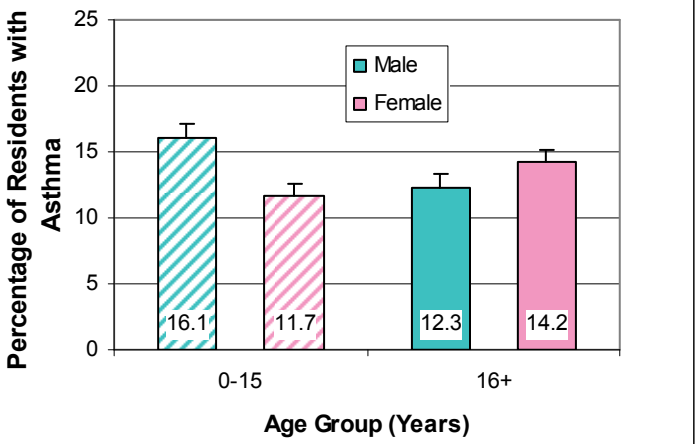
Source: California Health Interview Survey, 2005 and 2007 combined. Note: Error bars represent the 95th Confidence Interval (See Technical Notes for more information). The prevalence estimates for males aged 0 to 17 and 65+ years are statistically unstable.

The percentage of individuals ever diagnosed with asthma decreases with age, from 15.5% of those 0 to 17, to 13.3% for those 18 to 64, to 11.3% for those aged 65 or more (CHIS, 2005 & 2007). The declining lifetime prevalence with age is mirrored by that of the state as a whole. However, the interaction between age and gender is unusual (see graph on left below).

In California (and the nation as a whole), more male children and teens have been diagnosed with asthma than female children and teens, while more adult women have been diagnosed with asthma than adult men (see graph on the right below).



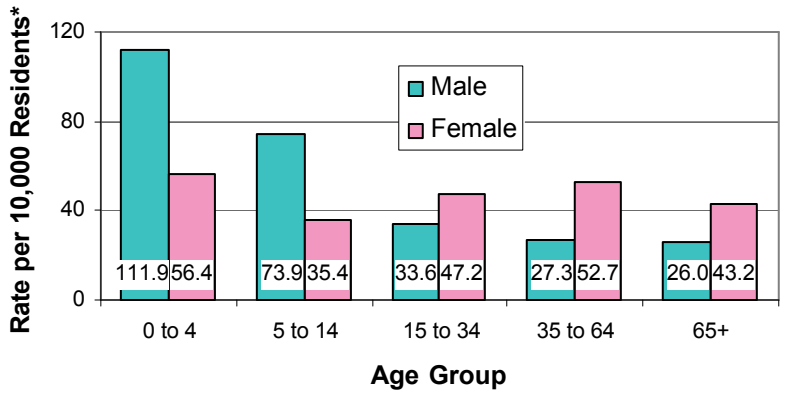
Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Note: Error bars represent the 95th Confidence Interval (See Technical Notes for more information).



Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Note: Error bars represent the 95th Confidence Interval (See Technical Notes for more information).

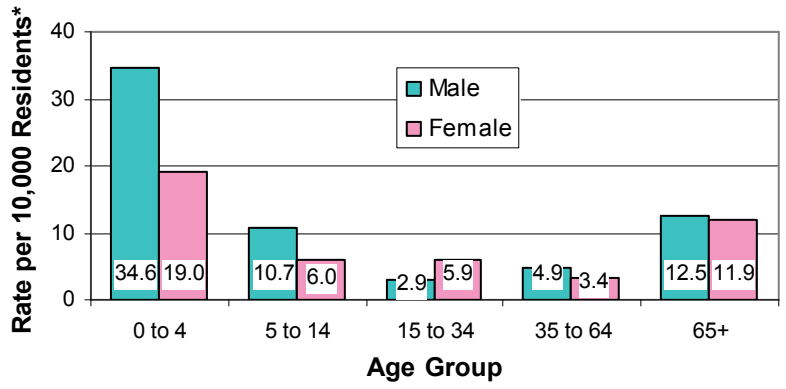
In Stanislaus County, the age group with the highest rate of ER visits for asthma is young children (aged 0 to 4 years), followed by the next youngest age (5 to 14 years; see top graph below). Young children bear a heavier burden of hospitalization as well, with the youngest group being hospitalized at the highest rate, followed by seniors (65+ years; see bottom graph below).

Rate of Asthma ER Visits by Gender and Age, 2005-2008



**Average annual ER visit rate per 10,000 residents, age-adjusted to the 2000 US standard population. ER visit data from the CA Office of Statewide Health Planning and Development. Population data from the CA Department of Finance projections, 2007 revision. Analysis provided by* California Breathing, *California Department of Public Health.*

Rate of Asthma Hospitalizations by Gender and Age per Jurisdiction, 2005-2008



**Average annual hospitalization rate per 10,000 residents, age-adjusted to the 2000 US standard population. Hospitalization data from the CA Office of Statewide Health Planning and Development. Population data from the CA Department of Finance projections, 2007 revision. Analysis provided by California Breathing, California Department of Public Health.*

Despite the fact that more county girls than boys have been diagnosed with asthma, boys (aged 0 to 14) have a higher rate of visits to an emergency room (ER). After age 15, however, females have a higher rate of ER visits (see first graph). This same age and gender pattern is seen for rates of hospitalization due to asthma (see second graph). Boys (up to age 14) are hospitalized at higher rates than girls, while women (starting at age 15) are hospitalized at greater rates than men.

The high rates of ER visits and hospitalizations for asthma in the youngest age group are cause for concern. It is important to recognize that diagnosis and treatment of asthma at this early age is especially challenging, but of great importance. Solutions to the problem will need to involve parents, child care providers and schools as well as medical providers.

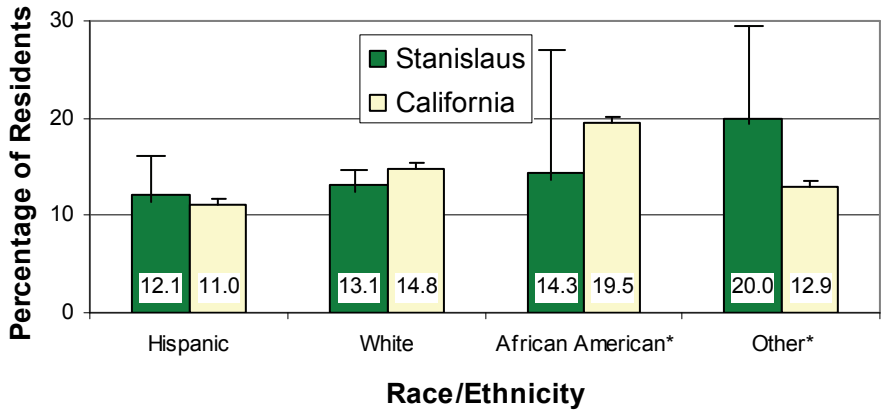
Health Disparities: Race and Ethnicity

Asthma Prevalence

Racial and ethnic differences are common across health conditions. Asthma is no exception, with African Americans having the highest prevalence in the US (CDC, 2010). However, due to the small sample sizes in the California Health Interview Survey (CHIS) for individuals of minority races and ethnic groups in Stanislaus County, it is difficult to determine whether racial and ethnic differences exist in the prevalence of lifetime (see top graph) or active asthma (see bottom graph).

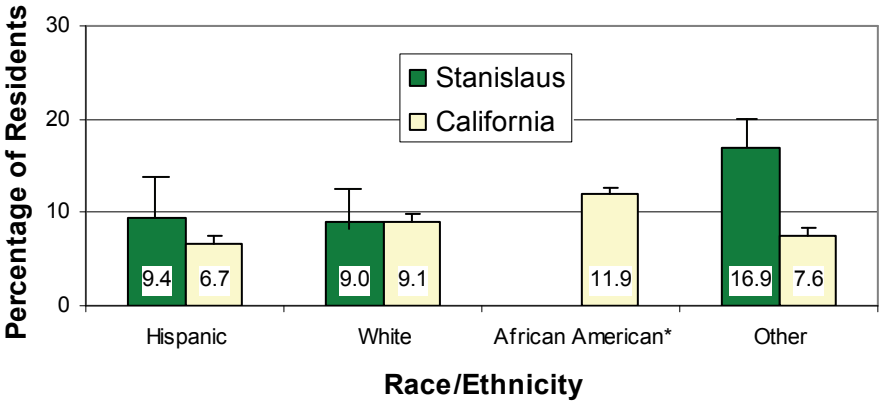
It is also important to keep in mind that diagnosis of asthma requires access to a health care provider. Thus, many people with asthma remain undiagnosed and the likelihood of non-diagnosis may be different for individuals of different races and ethnic groups (Quinn et al, 2006). According to CHIS (2003, 2005), for instance, a statistically significantly higher percentage of Stanislaus Hispanics do not have a regular source of healthcare than Non-Hispanics (19% vs. 8%), with African Americans having a statistically unstable estimate of 11.6%.

Lifetime Asthma Prevalence by Race and Ethnicity per Jurisdiction, 2005-2007



** The estimates for African Americans and individuals of other races and ethnicites in Stanislaus County are statistically unstable due to small sample size. Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Analysis conducted by* California Breathing, *California Department of Public Health. Note: Error bars represent the 95th Confidence Interval (See Technical Notes).*

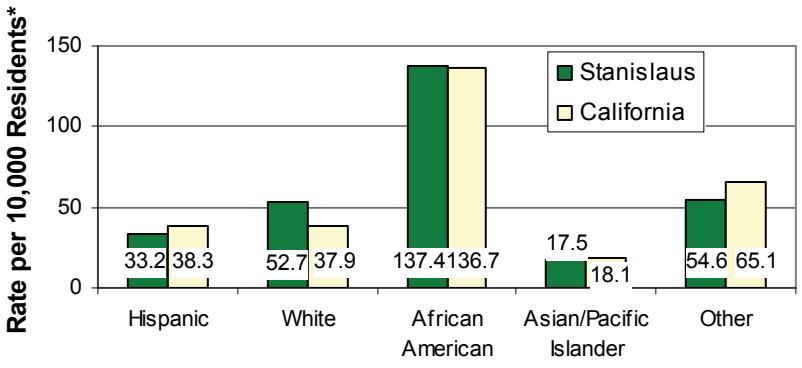
Active Asthma Prevalence by Race and Ethnicity per Jurisdiction, 2005-2007



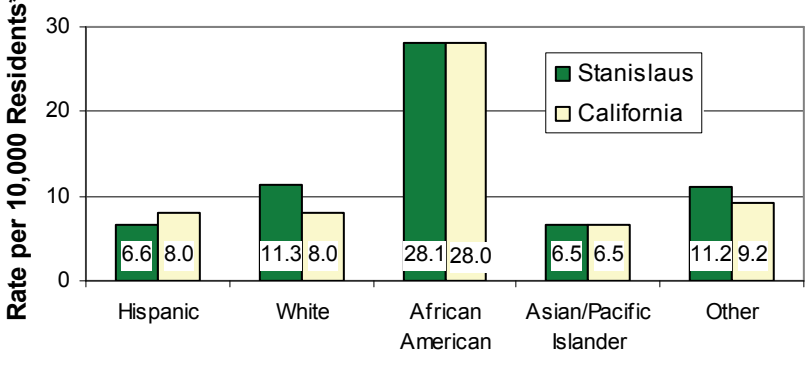
** An estimate for African Americans in Stanislaus County could not be calculated due to small sample size. Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Analysis conducted by* California Breathing, *California Department of Public Health. Note: Error bars represent the 95th Confidence Interval (See Technical Notes).*

ER Visits Due to Asthma

As mentioned earlier in this report, visits to an emergency room (ER) can be an indication of poorly controlled asthma (as well as other factors such as lack of a personal healthcare provider or health insurance). As the top graph below shows, African Americans have a much higher (age-adjusted) rate of ER visits due to asthma than other races and ethnic groups, both in Stanislaus County and in California as a whole.



**Average annual ER visit rate per 10,000 residents, age-adjusted to the 2000 US standard population. ER visit data from the CA Office of Statewide Health Planning and Development. Population data from ESRI. Analysis provided by* California Breathing, *California Department of Public Health.*



**Average annual asthma hospitalization rate per 10,000 residents, age-adjusted to the 2000 US standard population. Hospital data from the CA Office of Statewide Health Planning and Development. Population data from ESRI. Analysis provided by* California Breathing, *California Department of Public Health.*

Asthma Hospitalizations

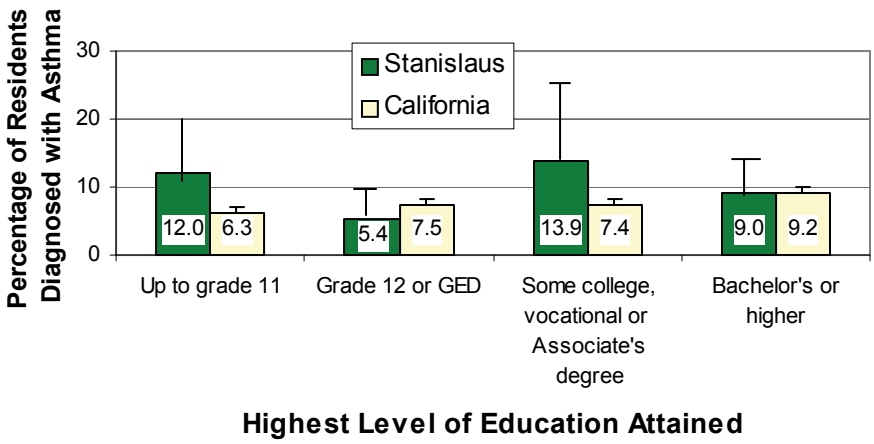
As the bottom graph shows, a very similar pattern of racial and ethnic differences is seen in the (age-adjusted) rates of hospitalization due to asthma. African Americans (followed by Non-Hispanic Whites and those of other races and ethnic groups) have the highest rates of hospitalization for asthma.

All these findings in combination indicate that African Americans have a higher burden of asthma. This higher burden may be due to a larger number of co-morbidities, greater exposure to asthma triggers, or delay in asthma diagnosis or treatment, leading to poorer asthma management and control, which results in increased risk of asthma attacks (seen in ER visits) and severe consequences (including hospitalizations).

Health Disparities: Education, Income & Poverty

Educational Attainment

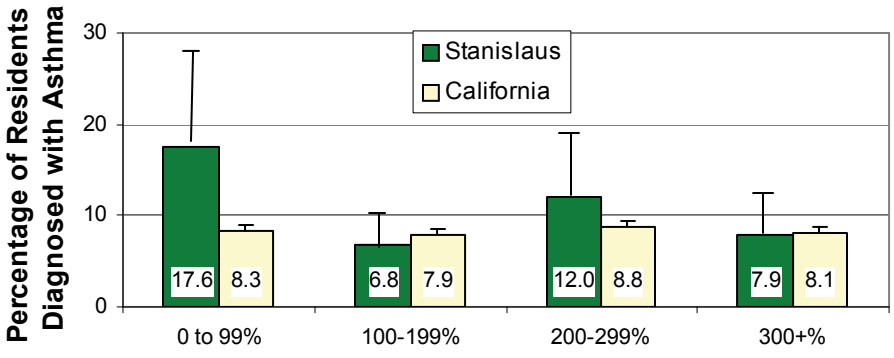
Low educational attainment often leads to poor health literacy—the understanding of how to care for oneself, when to see a healthcare provider, and how to follow medical recommendations. In addition, lower educational attainment often leads to a job without health insurance benefits and can increase the likelihood of occupational exposure to asthma causing agents or asthma triggers such as certain chemicals, cleaning agents or dust (CDC, 2004). However, as the top graph shows, there are no statistically significant differences in the percentage of Stanislaus County residents with active asthma across different levels of educational attainment as there are for California residents. This may be due to the relatively small sample size surveyed, to differences among these groups in access to health care providers in order to be diagnosed, or it may indicate that active asthma in the county is more related to other factors than general educational attainment.



Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Analysis conducted by California Breathing, *California Department of Public Health. Note: Error bars represent the 95% Confidence Interval (See Technical Notes for more information).*

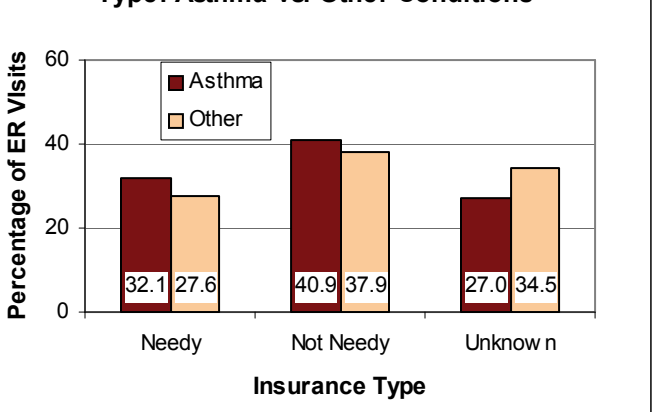
Income & Poverty

A person's income influences their health in a number of ways. Lack of resources and ability to meet one's basic needs causes stress, which undermines the body's immune system. In addition, individuals under such stress are usually focused on putting food on the table and ensuring a roof over their heads; they rarely can afford time for self care and healthy living (including regular exercise). Individuals with lower incomes are also more likely to lack health insurance or to be able to afford co-pays if they do have insurance. Moreover, those of lower income are more likely to have transportation challenges to get to health care appointments and facilities. Finally, individuals of lower income usually live in different areas from those of middle or upper incomes, areas often located nearer to pollution sources, which can serve as asthma triggers. Rental and multi-family housing may also contribute to higher exposure to indoor asthma triggers. These are all reasons why lower income has been linked to an increased asthma burden statewide (Babey et al, 2007) and nationally (Moorman et al, 2007).

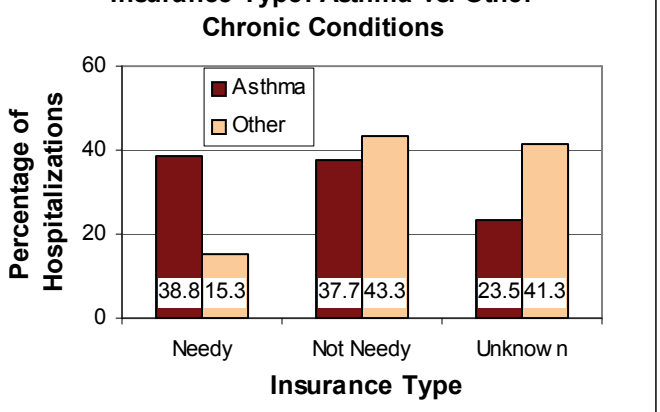


Source: California Health Interview Survey, 2003, 2005 and 2007 combined. Analysis conducted by California Breathing, *California Department of Public Health. Note: Error bars represent the 95th Confidence Interval (See Technical Notes for more information).*

As the graph above shows, statistically significantly more Stanislaus County residents whose household incomes place them below the Federal Poverty Level (FPL) have active asthma than those just above the FPL threshold, or those at 300% or more of the threshold. As the graph at left below shows, a higher percentage of individuals with an ER visit for asthma had that visit paid for by a type of insurance requiring lower income ("needy") than those individuals with ER visits for other chronic diseases. As the graph at right below shows, a statistically significantly higher percentage of individuals hospitalized for asthma were covered by an insurance program with income eligibility restrictions than for other chronic diseases.



Source: Emergency Department Files (1998-2006) from CA Office of Statewide Health Planning and Development, data courtesy of Central Valley Health Policy Institute



Source: Hospital Discharge Data Set (1998-2006) from CA Office of Statewide Health Planning and Development, data courtesy of the Central Valley Health Policy Institite

Health Disparities: Geographic Location

Communities within Stanislaus Counties are impacted differently by asthma. These communities also differ in a multitude of characteristics, including the proportions of younger vs. older individuals, the number of individuals of specific racial/ethnic and socioeconomic groups, common types of occupations, rates of health insurance among residents, risk of exposure to various indoor and outdoor asthma triggers and the proximity of medical facilities. In the interest of preserving the unique character of various communities while simultaneously being able to include enough individuals per group to obtain statistically stable findings, the County is divided into 9 regions for the purposes of this report. Each of these regions is based on zip code, has a Family Resource Center at its core, and is made up of communities that share some common features.

Asthma Prevalence, Symptoms, Absenteeism, and Asthma Attacks

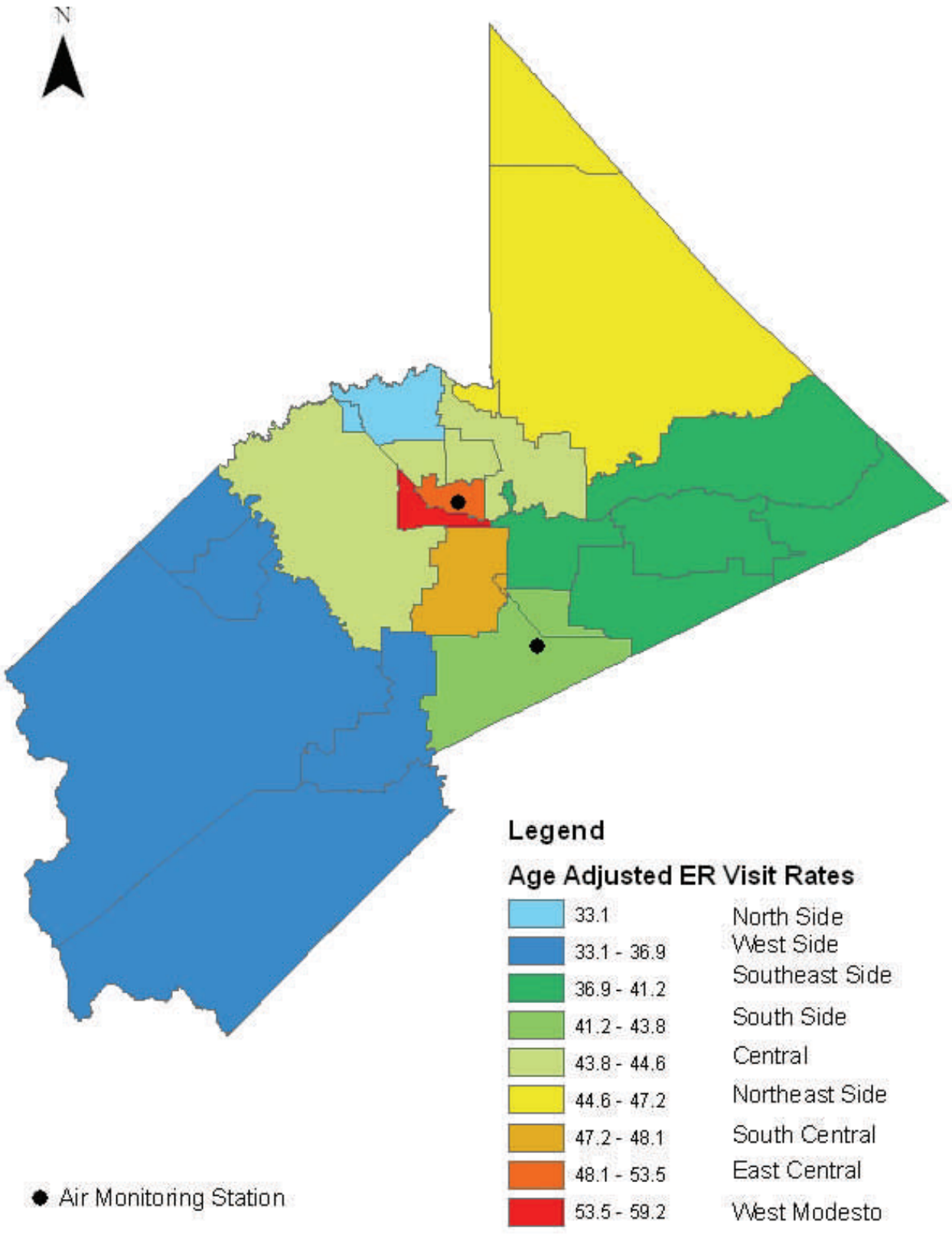
Unfortunately, data on the number of individuals who have ever been diagnosed with asthma, currently have asthma, or who are affected by asthma symptoms or attacks per county region are unavailable. The California Health Interview Survey (CHIS) is the primary source of data for these variables, however it is not possible to obtain CHIS data by zip code to look at geographic differences below the county level. Data shedding light on these questions is not currently available from other possible sources, such as doctor's offices and clinics.

ER Visits for Asthma

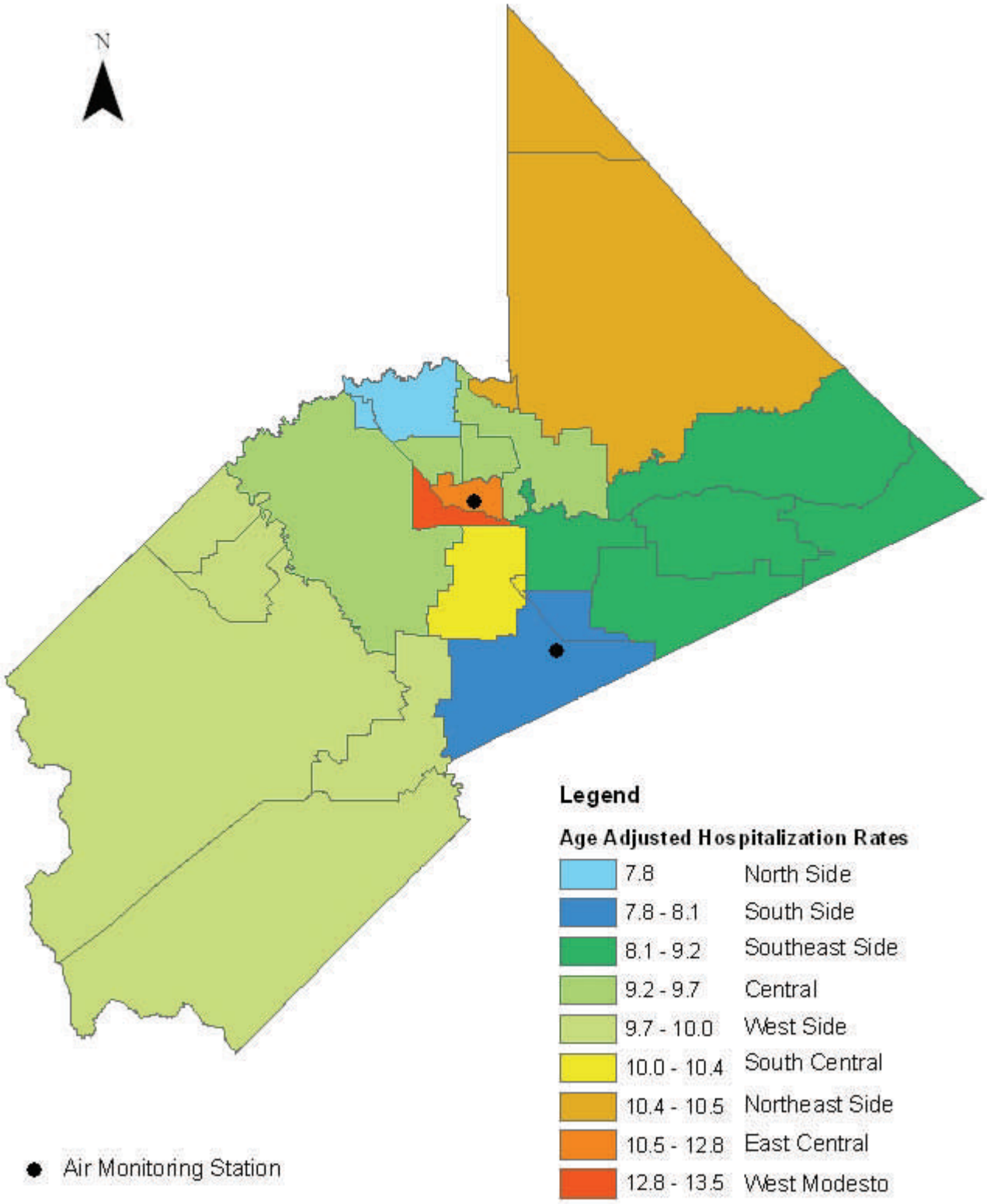
On the following page (page 21), the average annual age-adjusted rates of visits to Emergency Rooms (ERs) for asthma per 10,000 people (based on 2005-2008) are mapped. The region with the highest age-adjusted rate of asthma ER visits is West Modesto at 59.2 visits per 10,000 residents, followed by the East Central Region (including the Airport Neighborhood) at 53.5 visits per 10,000 residents, and the South Central Region (including Ceres and Keyes) at 48.1 per 10,000. The region with the lowest age-adjusted rate is the North Side (including Salida and Del Rio) with 33.1 ER visits per 10,000 residents, followed by the West Side (including Patterson, Newman, Grayson, Westley and Crows Landing) with 36.9 per 10,000, and then the Southeast Side (including Denair, Empire, Hughson, Hickman, La Grange and Waterford) with 41.2 per 10,000.

As discussed earlier in this report, the need to seek care at an ER is often an indication of poorly controlled asthma, as well as other factors such as lack of a personal medical provider or health insurance. All the reasons for differences in ER visit rates across Stanislaus County regions are not known, particularly whether the differences are due to real differences in the underlying prevalence of asthma and incidence of asthma attacks or due to factors that affect care-seeking behavior (such as insurance coverage, proximity of medical facilities and transportation options). It is interesting that the regions with the highest ER visit rates are in the most highly urbanized areas in the county, in or near Modesto. Perhaps not coincidently, three of the five hospitals ERs are located in Modesto.

Age-Adjusted Asthma Emergency Room Visit Rates per 10,000 Population
All Ages. 2005-2008



Age-Adjusted Asthma Hospitalization Rates per 10,000 Population
All Ages. 2005-2008



Hospitalizations for Asthma

On the previous page (page 20), the average age-adjusted rates of asthma hospitalizations per 10,000 people (based on 2005-2008) are mapped. The region with the highest age-adjusted rate of hospitalizations due to asthma is West Modesto at 13.5 hospitalizations per 10,000 residents, followed by the East Central Region (including the Airport Neighborhood) at 12.8 per 10,000 residents, and the Northeast Side (including Knights Ferry, Oakdale and Riverbank) at 10.5 per 10,000 residents). The region with the lowest age-adjusted asthma hospitalization rate is the North Side (including Salida and Del Rio) with 7.8 hospitalizations per 10,000 residents, followed by the South Side (including Turlock) with 8.1 per 10,000 residents, and then the Southeast Side (including Denair, Empire, Hughson, Hickman, La Grange and Waterford) with 9.2 per 10,000 residents.

As discussed earlier in this report, asthma is considered an ***ambulatory care sensitive condition***, meaning that most hospitalizations are preventable through good management by health care providers and people living with asthma. Once again, the reasons for the observed differences in asthma hospitalization rates across county regions are unknown. However, it is interesting that two of the three regions with the highest asthma hospitalization rates are in the most highly urbanized areas in or near Modesto.

Deaths from Asthma

Death from asthma is rare enough in Stanislaus County (approximately 6 to 7 deaths per year occur) to make it impossible to calculate statistically stable region-specific mortality rates or years of potential life lost (YPLLs) due to asthma.

Conclusions and Recommendations

Major Findings and Conclusions

Stanislaus vs. California: The burden of asthma in Stanislaus County is different from that of the state as a whole in several important ways. First, a statistically significantly higher percentage of county residents with lifetime asthma (i.e. ever diagnosed with asthma) report having experienced symptoms in the past year (79% vs. 66%). Similarly, a statistically significantly higher percentage of residents with active, or current, asthma, report having had at least one asthma attack in the past year (44% vs. 33%). The higher asthma burden in the county may be the result of greater exposure to asthma triggers (e.g. outdoor air pollution, indoor cleaning agents, dust or pests), less effective control and management of the condition (e.g. self care or use of asthma controller medications), access to health insurance and healthcare, or other factors.

Stanislaus County also differs from the state of California in the distribution of asthma among individuals of different demographic characteristics. Notably, more females overall in Stanislaus County have been diagnosed with asthma than males (~41,000 vs. ~24,000), and this difference is true for each age group (children, working-age adults and seniors). In California (and the nation as a whole), however, more male children and teens have ever been diagnosed with asthma than females in these age groups, while more adult women have been diagnosed with asthma than adult men. Again, the reasons for this difference are unknown, but may involve exposure to asthma-causing agents and triggers, likelihood of diagnosis, access to healthcare, and/or personal or caregiver awareness of the condition.

Asthma Management and Treatment: The data reviewed by this report indicate that asthma management and treatment can be improved in Stanislaus County. While guidelines and resources exist to help schools and workplaces reduce exposure to asthma-causing agents or asthma triggers, not all of the operators and managers of such facilities are aware of, or make use of, these tools. For example, just over half (52%) of child care facilities whose operators responded to a recent local survey have an asthma management policy in place. In addition, the findings discussed in this report indicate that many individuals are unaware of how best to control their exposure to asthma-causing agents or triggers. For example, another local survey found that less than half (49%) of respondents reported knowing how to find the daily Air Quality Index (AQI) rating that could help them limit their exposure to air pollution. Moreover, data reviewed here showed that a majority of individuals with asthma also have significant misunderstandings of how to manage their own condition. For example, the majority (55%) of respondents of a third local survey who self-identified as having asthma reported believing that it is unnecessary to take daily asthma medication when they feel good, while a substantial minority (41%) reported believing that they only need to see a healthcare provider when they feel bad. Finally, the finding from California Health Interview Survey (CHIS), that a statistically signifi-

cantly higher percentage of Stanislaus County than California residents with active asthma reported at least one asthma attack in the previous 12 months supports the idea that asthma management and control can be improved in the county. Education of individuals with asthma about effective control measures and how to comply with medications and guidance issued healthcare providers is likely to be productive.

Additional training for healthcare providers on the latest developments in treatment and management may also be useful. According to the CHIS, only about a third (34%) of Stanislaus County residents ever diagnosed with asthma report having been given an asthma management plan by their healthcare provider. Similarly, less than half (~42%) of county residents with active asthma take daily medications to control their condition. Finally, the high rates of ER visits and hospitalizations for asthma among very young children (0-4) indicate that healthcare providers may benefit from additional specialized training on the diagnosis and management of this unique population.

Health Disparities: In addition to disparities due to age and sex reviewed above, this report documents disparities in the asthma burden on individuals of different racial and ethnic groups, income levels and geographic area. Despite evidence that racial and ethnic minorities are less likely to have a regular source of medical care (and thus are less likely to be diagnosed with asthma), neither the prevalence of lifetime nor active asthma in Stanislaus County differs statistically significantly by race or ethnicity. However, the (age-adjusted) rate of asthma ER visits and hospitalizations are significantly higher for African Americans than Whites, indicating a higher burden of complications in this group. All the reasons for this higher burden are not known, though stress, socio-economic status, co-morbidities, health insurance and healthcare access all likely play a significant role.

In Stanislaus County, as in California and the nation as a whole, individuals with lower incomes (especially those living under the Federal Poverty Level) have a higher prevalence of asthma than individuals with greater financial resources. In addition, a larger percentage of those hospitalized for asthma qualify for insurance programs with low income requirements than those hospitalized for other chronic diseases. Again, there are likely many factors contributing to this health disparity, including type of housing (and exposure to indoor asthma triggers), occupation, and outdoor air quality). In addition, poverty is more common among racial and ethnic minorities.

This report also documents health disparities in different communities within Stanislaus County. The asthma burden, at least of ER visits and hospitalizations, is greatest in the Central part of the county (West Modesto, East Central Modesto and Airport Neighborhood), the South Central region (Ceres and Keyes) and the Northeast side (Oakdale, Riverbank and Knights Ferry). The North, South, West and Southeast sides of the county have a lower burden of ER visits and hospitalizations. The location of county hospitals may play a role in the asthma burden.

Two of the county's five hospitals are located in the four regions with the highest rates of ER visits and hospitalizations, and the other two are located nearby. However, physical proximity to medical facilities is unlikely to explain all the variation in these rates. Outdoor air quality likely varies quite a bit across the county, but with only two air monitors in the county, it is impossible to correlate local air conditions with asthma prevalence or incidence of attacks or hospitalizations. The regions also differ in many social and economic characteristics, including median income, racial and ethnic composition, age distribution, common occupations, and many other variables. Interestingly, the percentage of families living in poverty (from the 2000 US Census) for each region is statistically significantly correlated with both the ER visit rate (Pearson correlation coefficient: $r=0.88, p < .01$) and the hospitalization rate ($r=0.76, p < .02$). The higher the percentage of families living below the poverty line, the higher the rates of ER visits and hospitalizations.

Recommendations

Expansion of Asthma Flag Program and Awareness of Air Quality: As discussed earlier in the report, the Asthma Flag Program is a program sponsored by the Stanislaus County Asthma Coalition in which colored flags are flown daily at schools and other public buildings (including hospitals and government offices) to inform residents about air quality. A total of 190 schools in 22 (of 26) Stanislaus County School Districts participate in the Asthma Flag Program. Evidence reviewed from recent surveys in Stanislaus County revealed that residents who are aware of the program and who understand the meaning of the flags are more likely to report knowing how to find the daily Air Quality Index (AQI) rating to help them limit their exposure air likely to trigger asthma. Thus, the Asthma Flag Program has proven successful in providing residents access to AQI information. The Stanislaus County Asthma Coalition, school boards and administrators, and managers of hospitals and clinics or other public institutions should consider expanding participation in the asthma flag program.

Media Campaign to Increase Awareness About Asthma Management and Control: Recent surveys reviewed in this report revealed that a majority (55%) of Stanislaus County residents with asthma do not take prescribed daily asthma control medications on a daily basis, and a large minority (41%) misunderstand when they ought to see a healthcare provider. A media campaign focused on effective self-management of asthma is warranted, particularly to encourage individuals to take medications as prescribed and regularly see a healthcare provider. The health disparities documented in this report also suggest that such a media campaign would have the most impact if directed at populations with the highest asthma burden, including lower income individuals, African American residents, and those living in West Modesto, the East Central region (including Airport Neighborhood), the South Central region (including Ceres and Keyes) and the Northeast Side (including Oakdale, Knights Ferry and Valley Home) of the county.

Support for Initiatives to Improve Access to Healthcare: The 2008 Stanislaus County Community Health Assessment revealed many obstacles to effective asthma management in the county, including a large percentage of residents lacking health insurance, a regular source of care, and/or coverage for prescription medications (e.g. for daily asthma controllers). These issues can lead to delay in diagnosis and treatment of asthma, which in turn can lead to negative consequences ranging from work and school absenteeism (decreasing economic productivity and educational attainment), increased use of urgent care facilities and emergency rooms, avoidable hospitalizations and preventable deaths.

Additional Healthcare Provider Continuing Education Opportunities: The Stanislaus County Asthma Coalition conducts a Physician Roundtable annually, at which continuing education credits for physicians, nurses, and respiratory therapists are provided. The findings of this report on asthma prevalence, severe consequences and the medical treatment and control of asthma suggest that review of the usage of asthma management plans, daily controller medications, and the diagnosis and treatment of asthma in very young children would be productive future topics for this series.

Expansion of Asthma Policies at Child Care Facilities, Schools and Work Settings: Findings from a recent local survey of child care facility operators revealed that nearly half (48%) of the facilities surveyed do not have an asthma management plan to help reduce exposure to asthma triggers and promote effective response to an asthma-related emergency at the center. While data on asthma management plans and policies in schools and workplaces were not reviewed, it is likely that many such facilities do not follow the latest recommendations from agencies such as OSHA and the EPA. Stanislaus County Health Services Agency/Public Health, the Stanislaus County Asthma Coalition, the Stanislaus County Office of Education, and employer associations may wish to consider increasing outreach to schools, child care facilities and employers to help improve these environments to prevent and control asthma.

Support for Initiatives to Improve Outdoor Air Quality: The poor air quality of the San Joaquin Valley is a challenge to asthma prevention efforts and will continue to be so as the population increases. In addition, significant changes in behavior, policy and infrastructure will be required to meet California Assembly Bill 32's new air quality targets. Local initiatives that might help meet AB 32 requirements as well as reduce the burden of asthma include considering adopting policies limiting the idling of emergency and/or commercial vehicles similar to policies in place that restrict the idling of school buses. Policy makers may also wish to explore other ways to protect vulnerable populations, including children, from air pollution sources, such as setting minimum distances between new school, childcare facilities and residences and highways and major roadways.

Technical Notes

Data Sources

Data from several existing sources were compiled for this report. In addition, findings from three new surveys conducted in Stanislaus County were reported for the first time.

Air Quality Data (American Lung Association): Each year, the ALA compiles data on air quality and other factors from multiple sources for their report, *State of the Air*. Air quality data for this report was obtained from *State of the Air* 2009.

Behavioral Risk Factor Surveillance Survey (BRFSS; Centers for Disease Control and Prevention): This is a national telephone survey conducted monthly (and aggregated yearly) to assess health conditions, and behavioral risk and demographic factors that contribute to them in all 50 states, the District of Columbia and some US territories. Stanislaus County Public Health staff obtained prevalence data for lifetime asthma during the time period 2000-2008 for California and the US via CDC's on-line web portal for BRFSS prevalence and trends data.

California Health Interview Survey (CHIS; UCLA Center for Health Research): This is a large-scale telephone survey of California residents that gathers self-report data about diagnoses, illness, healthcare access and health behaviors every two years. For this report, CHIS data related to asthma were obtained from the 2003, 2005, and 2007 surveys. When necessary for statistical stability and possible given the survey contents, two or three years of data were aggregated. Three year aggregations and some additional analyses were performed and made available for this report by *California Breathing* staff of the California Department of Public Health (CDPH). Other analyses were performed by Stanislaus County Public Health staff using the AskCHIS web interface.

Death Statistical Master File (California Department of Public Health): Deaths that occur in California must be registered with public health authorities in the jurisdiction where the death occurred. In turn, local jurisdictions report deaths to CDPH, which reassigns cases to the county of residence of the decedent, receives notice of deaths outside of California, and codes the underlying cause of death using the International Classification of Disease-Revision 10 (ICD-10) before compiling the data annually (without certain identifiers) into the Death Statistical Master File. Stanislaus County Public Health staff obtained subsets of Death Statistical Master Files containing only records of deaths of Stanislaus County decedents for the years 2005 to 2007. Deaths with an underlying cause code of J45-J46 were classified as being due to asthma. Average annual mortality rates per 1,000,000 residents were calculated using California Department of Finance (DOF) population figures.

Emergency Department Data File (California Office of Statewide Health Planning and Development): OSHPD collects mandated information from hospital and ER facilities yearly and from this assembles a dataset containing information about ER visits without personal identifiers. Staff from *California Breathing* at CDPH analyzed 2005-2008 ER data for Stanislaus and California residents for comparison, including performing age-adjustment to the 2000 US Standard Population, and provided the results for this report. For all analyses, primary diagnoses using ICD-9 code 493 (including 493.0 through 493.9) were used to indicate an ER visit for asthma. For most variables, the rate of visits with a primary diagnosis of asthma were calculated per 10,000 visits using California Department of Finance (DOF) population figures. However, ER visit rates by geographic area were calculated using population data from the Economic and Social Research Institute (ESRI).

Technical Notes

Internal Clinic Records (Anonymous): A large clinic system operating in Stanislaus County provided a report from internal billing and quality assurance data for asthma patients seen during the time period 5/31/2008-5/31/2009. Staff from Stanislaus County Public Health calculated percentages from the data provided.

Patient Discharge Dataset (California Office of Statewide Health Planning and Development): OSHPD collects mandated information from hospital facilities yearly and from this assembles a dataset containing information about hospitalizations without personal identifiers. Data about hospitalizations of Stanislaus County residents with a primary diagnosis of asthma (ICD-9 code 493, including 493.0 through 493.9) and other chronic disease were obtained for 1998-2006 by the Central Valley Health Institute. These data were then analyzed by Stanislaus County Public Health Staff for this report. Staff from *California Breathing* at CDPH analyzed 2005-2008 hospitalization data for Stanislaus and California residents, including age-adjustment to the 2000 US Standard Population for comparison, and provided the results for this report. For all analyses, primary diagnoses using ICD-9 code 493 (including 493.0 through 493.9) were used to indicate a hospitalization for asthma. For most variables, the rate of hospitalizations with a primary diagnosis of asthma were calculated per 10,000 visits using California Department of Finance (DOF) population figures. However, asthma hospitalization rates by geographic area were calculated using population data from the Economic and Social Research Institute (ESRI). In addition, the expected source of payment was used as a proxy for socioeconomic status, with the existing variables recoded into three categories as follows:

New Category	*Original Category*
Needy	MediCal, Title V
Not Needy	Preferred Provider Organization, Point of Service, Exclusive Provider Organization, Automobile Medical, Blue Cross/Blue Shield, Commercial Insurance Company, Health Maintenance Organization, Workers' Compensation Health Claim
Unknown	Self Pay, Other Non-Federal Programs, Health Maintenance Organization/Medicare Risk, CHAMPUS (TRICARE), Disability, Medicare Part A, Medicare Part B, Other Federal Program, Veterans Affairs Plan, Other, Invalid/Unknown

Stanislaus County Asthma and Air Quality Survey (Stanislaus County Health Services Agency/Public Health): In winter 2010, surveys concerning knowledge about asthma and air quality issues were conducted at H1N1 vaccination clinics offered by Public Health throughout the county, as well as on-line through Survey Monkey. A total of 176 residents completed surveys. Due to the data collection method, this survey is not necessarily representative of Stanislaus County residents as a whole.

Stanislaus County Asthma Awareness Survey (Stanislaus County Health Services Agency/Public Health): In winter 2010, surveys concerning knowledge about asthma and asthma management issues were conducted with individuals self-identifying as having asthma. Surveys were collected at multiple sites located throughout the county, including medical offices, H1N1 vaccination clinics offered by Public Health, and on-line through Survey Monkey. A total of 117 individuals with asthma completed the survey. Due to the data collection method, this survey is not necessarily representative of all Stanislaus County residents living with asthma.

Stanislaus County Child Care Operator Asthma Awareness Survey (Stanislaus County Health Services Agency/Public Health): In winter 2010, child care operators listed with the Stanislaus County Office of Education's Children and Family Services Department were mailed a survey or emailed a link to an electronic version of the survey using Survey Monkey. The survey concerned knowledge about asthma issues and existence of asthma plans and policies. A total of 60 individuals each representing a different child care facility completed the survey. Due to the data collection method, this survey is not necessarily representative of Stanislaus County child care facilities as a whole.

Stanislaus County Community Health Assessment, 2008 (Applied Survey Research): In 2008, ASR complied data on health conditions and broad determinants of health from over 35 existing secondary data sources as well as new data from a face-to-face survey conducted in July 2008 with over 3,000 county residents. Findings were published by ASR in November, 2008. Stanislaus County Public Health staff conducted additional analyses using the face-to-face survey data for the purposes of this report.

US Census 2000 (US Census Bureau): Every decade, the US Census Bureau attempts a complete county of US residents as mandated by the US Constitution. Certain types of information (including gender, age, residence, income) are asked of everyone. Data from the 2000 Census used in this report include population figures for Stanislaus County and zip codes within it, income and poverty status of families in the county.

Definitions and Formulas

Active Asthma: Someone with active asthma is someone who has been diagnosed by a medical provider with asthma and still has the condition. In CHIS, this information is obtained by first asking respondents whether they (or their child) have ever been diagnosed with asthma by a doctor (lifetime asthma). All those answering "yes" to that question are then asked whether they (or their child) still have asthma. Those that answer "yes" are considered to have active asthma. Other terms for this concept include *current asthma* and *chronic asthma*.

Age-Adjusted Rate: See *Incidence Rate*.

Current Asthma: See *Active Asthma*.

Chi-Square Test: The Chi-square test of independence is a common statistical test used to determine whether two categorical variables are related to one another or are independent. Information on how to calculate the test can be found from many books and websites on general statistics.

Chronic Asthma: See *Active Asthma*.

Confidence Interval (CI): A CI is a range of values that bracket an estimated value of a variable that help describe the level of confidence we have in that estimated value. CIs take into account the fact that when we measure something we rarely measure it completely accurately, particularly when we have a small sample. A CI contains a low value ("lower limit") and a high value ("upper limit") that surround the estimated value of the variable. A 95% CI means that if we measured this variable the same way 100 times, its true value would "be captured" by the CI (i.e. be larger than the lower limit and smaller than the upper limit) 95 times out of the 100 measurements. The greater the difference between the upper and lower limits of a confidence interval (the width), the less sure we are that we have estimated or measured the real value correctly and precisely. The width of the CI is affected by the sample size (smaller samples have wider CIs) and the degree of variability in the sample (samples with higher variability have wider CIs).

The formula used in this report to calculate the 95% Confidence Interval for a percentage is: $95\%\ CI = p \pm 1.96 * SE$ *where* $SE = \sqrt{((p*(1-p))/n)}$

p = the estimated percentage, and

n = the number of individuals in the sample

Federal Poverty Level (FPL): The federal Department of Health and Human Services defines the FPL each year as a way to identify those individuals and families without the minimum annual income needed to meet certain basic needs. FPL calculations depend on the size of the household and the state of residence (continental US states differ from Alaska, Hawaii and the District of Columbia). CHIS calculates the FPL for respondents by combining responses questions about income and family and household size.

Incidence Rate: The incidence rate is a frequency with which new cases of a particular health condition occurs in a specific population in a defined time period. Three types of incidence rates appear in this report—average annual hospitalization rates, average annual ER visit rates, and average annual mortality rates due to asthma. Population numbers to calculate incidence rates were obtained from California Department of Finance figures, with the exception of rates calculated by geographic region for which the Economic and Social Research Institute (ESRI) was the source. The formula used to calculate incidence rates in this report is:

Incidence rate = $i / (n) * c$ *where i = the number of new individuals who develop the condition during the time period,*

n = the number of individuals in the population of interest who have developed the condition during the time period in question or who are at risk for developing it, and

c = a constant (10,000 is used for hospitalization and ER visit rates while 1,000,000 is used mortality rates

All analyses involving ER visit and hospitalization rates performed by CDPH California Breathing staff were age-adjusted to the 2000 US Standard Population. Age adjustment is a way to more fairly compare estimates across populations that differ in their age structures.

Lifetime Asthma: Someone with lifetime asthma is someone who has ever been diagnosed by a medical provider with asthma, whether or not he or she still has the condition. In CHIS, this information is obtained by asking respondents whether they (or their child) have ever been diagnosed with asthma by a doctor (lifetime asthma). All those answering "yes" to that question are considered to have lifetime asthma.

Pearson Product-Moment Correlation Coefficient: This is a statistic commonly calculated to determine the strength and direction of the correlation between two variables. The value, usually denoted as *r*, can range from −1.0 to 1.0. The further away from zero, the stronger the correlation between the two variables. A positive correlation coefficient indicates that the two variables are positive correlated (as one increases in value so does the other), while a negative correlation coefficient indicates that the variables are inversely correlated (as one increased the other decreases). Information on how to calculate the correlation coefficient can be found from many books and websites on general statistics.

Prevalence: Prevalence is a term from epidemiology and medicine that refers to the number of individuals living with a specific health condition at a specific point or during period of time. The formula used to calculate prevalence in this report is:

Prevalence = a / (a+b) *where a = the number of individuals with the condition in the population of interest, and b = the number of individuals in the population of interest who do not have the condition but are at risk of developing it*

Rate: See *Incidence Rate*.

Statistical Instability: Statistical instability is a common problem when dealing with small numbers. It means that we are *not confident* of the reliability of the number(s) or our measurements. The California Department of Public Health (CDPH) uses the size of the sample, the size of the estimate, and the size of the standard error of the estimate to determine whether the estimate is statistically stable. If fewer than 20 ER visits, hospitalizations or deaths occur, CDPH defines the estimate as statistically unstable. For CHIS data, CDPH uses a rule of thumb that estimates are statistically unstable when the standard error is greater than 30% of the estimate, and will not present an estimate if the standard error is greater than 50% of the estimate.

Years of Potential Life Lost (YPLL): The YPLL is a measure premature mortality. It measures the average years that a person would have lived if he or she had not died prematurely from a particular condition. The average YPLL tells us the relative impact that a specific condition has on the population and at what age people typically die from that condition. For purposes of calculating YPLL, the age 65 or 75 is typically used to define premature death (occurring before that age). To calculate the average annual YPLL for this report, the age at death for each Stanislaus County resident dying of asthma before age 75 in 2005, 2006 and 2007 was subtracted from 75, added together, and divided by the number of individuals who died from asthma during this three year period.

Data Sources and Citations

American College of Allergy, Asthma & Immunology (2008). *Asthma Management and the Allergist: Better Outcomes at Lower Cost*, available at http://www.acaai.org/Patients/Documents/Allergists%20Achieve%20Best%20Asthma%20Treatments%20Outcomes%20at%20Lower%20Cost.pdf.

American Lung Association (2009). *State of the Air 2009*, available from http://www.stateoftheair.org/2009/states/california/.

Applied Survey Research (2008). *Stanislaus County Community Health Assessment 2008*, available from www.healthierstanislaus.org.

Babey, SH, Hastert, TA, Meng, Y-Y, and Brown, ER (February 2007). *Low-Income Californians Bear Unequal Burden of Asthma,* UCLA Health Policy Research Brief, available at http://www.healthpolicy.ucla.edu/pubs/files/Low-Income_Asthma_PB_022707.pdf.

Brennan Ramirez LK, Baker EA, Metzler M (2008). Promoting Health Equity: A Resource to Help Communities Address Social Determinants of Health. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, available at http://www.cdc.gov/NCCDPHP/DACH/chaps/pdf/SDOHworkbook.pdf.

California Department of Public Health (September, 2009). *Asthma Emergency Department Visits: Results from 2005-2007*. California Asthma Facts, 4(1).

California Office of Statewide Health Planning and Development, Patient Discharge Files, 1998-2006, data run courtesy of the Central Valley Health Policy Institute, Fresno.

California Office of Statewide Health Planning and Development, Patient Discharge Files, 2005-2008, data run courtesy of *California Breathing* staff of the California Department of Public Health.

California Office of Statewide Health Planning and Development, Emergency Department Files, Stanislaus County residents only, 2006-2008.

Centers for Disease Control and Prevention (no date). *America Breathing Easier*, available from http://www.cdc.gov/asthma/pdfs/breathing_easier_brochure.pdf.

Centers for Disease Control and Prevention (2004). *Worker Health Chartbook*, available at http://www.cdc.gov/niosh/docs/2004-146/pdfs/2004-146.pdf.

Centers for Disease Control and Prevention (October, 2008). *Behavioral Risk Factor Surveillance System: Prevalence and Trends Data*, available from http://apps.nccd.cdc.gov/brfss/.

Centers for Disease Control and Prevention (April, 2009). Current Asthma Prevalence Percents by Age, Sex and Race, United States, 2007, from *Asthma: Management and Treatment*, available from http://www.cdc.gov/asthma/management.html.

Centers for Disease Control and Prevention (October, 2009). *Asthma: Basic Facts*, available from http://www.cdc.gov/asthma/faqs.htm.

Centers for Disease Control and Prevention (April, 2010) *Asthma: Data and Surveillance,* available from http://www.cdc.gov/asthma/asthmadata.htm.

Centers for Disease Control and Prevention (June 2010). Healthy Youth: Health Disparities: An Introduction, available at http://www.cdc.gov/HealthyYouth/healthtopics/disparities.htm.

Fiore, AE, Shay, DK, Broder, K, Iskander, JK, Uyeki, TM, Mootrey, G, Bressee, JS, and Cox, NJ (June, 2009). *Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009*, Morbidity and Mortality Weekly, 58: 1-52, available from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr58e0724a1.htm.

Global Initiative for Asthma (2008). *Global Strategy for Asthma Management and Prevention*, available from http://www.ginasthma.com/Guidelineitem.asp??l2=1&intld=1561.

Kung, H-C, Hoyert, DL, Xu, J, and Murphy, SL (April, 2009). *Deaths: Final Data for 2005*, National Vital Statistics Reports, 56(10), available from http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf.

Heron, M, Hoyert, DL, Murphy, SL, Xu, J, Kochanek, KD & Tejada-Vera, B (April, 2008). *Deaths: Final Data for 2006*, National Vital Statistics Reports, 57(14), available from http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf.

Moorman, JE, Rudd, RA, Johnson, CA, King, M, Minor, P, Bailey, C, Scalia, MR, & Akinbami, LJ (October, 2007). *National Surveillance for Asthma --- United States, 1980--2004*, Mortality and Morbidity Weekly Report, 56(SS08);1-14;18-54, available at http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5608a1.htm.

National Institutes of Health (September, 2008). *Asthma*, available from http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html.

Quinn, K, Shalowitz, MU, Berry, CA, Mijanovich, T, & Wolf, RL (2006). *Racial and Ethnic Disparities in Diagnosed and Possible Undiagnosed Asthma Among Public-School Children in Chicago*, American Journal of Public Health, 96: 1599-1603, available at http://www.bvsde.paho.org/bvsacd/cd67/RacialEthnic.pdf.

UCLA Center for Health Policy Research (2003). *California Health Interview Survey, 2003*, available from http://www.chis.ucla.edu/.

UCLA Center for Health Policy Research (2005). *California Health Interview Survey, 2005, available from http://www.chis.ucla.edu/.*

UCLA Center for Health Policy Research (2007). *California Health Interview Survey, 2007*, available from http://quickfacts.census.gov/qfd/.

US Census Bureau (2001). United States Census 2000: State and County Quick Facts, available at http://www.census.gov/main/www/cen2000.html.

US Department of Labor/Occupational Safety and Health Administration (August, 2007). *Occupational Asthma: Possible Solutions*, available at http://www.osha.gov/SLTC/occupationalasthma/solutions.html.

US Environmental Protection Agency (August, 2005). *IAQ Tools for Schools: Managing Asthma in the School Environment*, available at http://www.epa.gov/iaq/schools/pdfs/publications/managing_asthma.pdf.

US Environmental Protection Agency (March, 2010). *Report on the Environment: Asthma Indicator*, available at http://cfpub.epa.gov/eroe/index.cfm fuseaction=detail.viewMidImg&ch=49&lShowInd=0&subtop=381&lv=list.listByChapter&r=219646#11788.

Xu, J, Kochanek, KD & Tejada-Vera, B. (August 2009). *Deaths: Preliminary Data for 2007*, National Vital Statistics Reports, 58(1), available from http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58_01.pdf.