

EXPLORING THE FINANCIAL BURDEN OF ASTHMA IN FLORIDA

Charges Associated with Asthma Emergency Department Visits and Hospitalizations

June 2012



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**FLORIDA ASTHMA PREVENTION AND CONTROL PROGRAM
DIVISION OF DISEASE CONTROL AND HEALTH PROTECTION
FLORIDA DEPARTMENT OF HEALTH**



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EXECUTIVE SUMMARY

Asthma, especially uncontrolled asthma, creates a considerable economic burden at the national, state, community, and family level, and costs have been increasing significantly over time. This report details the substantial charges incurred to Florida's healthcare system from emergency department visits and hospitalizations due to asthma. In 2010, there were a total of 121,680 emergency department (ED) visits and hospitalizations in Florida with asthma listed as the primary diagnosis. The total charges associated with these visits were just under a billion dollars (\$952.6 million). These visits are largely preventable; therefore, this report also provides recommendations to the various entities that have an opportunity to help reduce that burden.

Asthma rates and associated costs have increased dramatically over the last thirty years in all populations in the United States, including among Floridians. A recent study estimated that in 2007, the total direct and indirect costs of asthma to society in the United States was \$56 billion. Asthma ED visits and hospitalizations, the focus of this report, accounted for approximately 12.5% of those total costs.¹

In Florida, total charges associated with ED visits and hospitalizations with asthma listed as the primary diagnosis (determined by ICD-9 code 493) are increasing disproportionate to the total number of visits. From 2005 to 2010, the total number of asthma ED visits and hospitalizations in Florida increased by 12.7% and 8.1%, respectively. However, the change in total charges was substantial.

- The total charges for emergency department visits approximately doubled from \$102.3 million in 2005 to \$204.1 million in 2010, a 99.6% increase.
- The total charges of asthma hospitalizations in Florida increased from \$471.5 million in 2005 to \$748.5 million in 2010, a 58.8% increase.

Looking at hospitalizations over the ten year time period (2000-2010) shows an even greater cost escalation.

- From 2000 to 2010, the total annual charges of asthma hospitalizations in Florida more than tripled, from \$210.8 million in 2000 to \$748.5 million in 2010, a 255% increase, while the total number of hospitalizations only increased 32.4%.

Providing treatment, support, and education to individuals with poorly controlled asthma can improve outcomes and reduce preventable costs. A notable indication of poorly controlled asthma is frequent or repeat visits to the ED or hospital for asthma care, as these visits should be avoidable with proper asthma management. In 2010, approximately 17% of the patients with asthma listed as the primary diagnosis had two or more ED visits or hospitalizations accounting for 36% of the total charges. Preventing the repeat visits could have led to \$153.8 million fewer charges in 2010.

The challenge of improving asthma outcomes and reducing costs rests on many shoulders. Lack of access to care, poor housing conditions, and lack of knowledge about the disease and benefits of management can be significant barriers to individuals with asthma. To help, insurance companies and employers can ensure self-management education is provided for individuals with asthma and that needed medications are covered. Pharmacists can educate patients on proper medication usage and inhaler techniques when medicines are picked up. Clinicians and hospitals should adhere to the national guidelines for the Diagnosis and Treatment of Asthma (EPR-3 Guidelines) and provide written asthma-management plans for patients. Childcare centers and schools can support children with asthma through care coordination, education, and environmental management. Working together across sectors can help individuals gain control over asthma and reduce rising costs.

I. INTRODUCTION

A. Purpose of this Report

This report is a continuation of the Florida Department of Health's exploration of the burden of asthma in Florida. The department's first comprehensive report on asthma, the *Burden of Asthma in Florida 2009*, contained information on asthma prevalence among adults, children, public middle and high schools students, risk factors associated with asthma, hospitalizations, and deaths from asthma in Florida. Subsequent reports and fact sheets provided point in time and trend data related to hospitalizations, emergency department visits, and other key indicators. This report expands on these efforts by exploring costs at the national level and presenting Florida specific charges related to asthma.

This broad presentation of charges is only a first step in helping community health partners understand the public health and financial impacts of asthma. Data can be used to identify target populations for interventions that can result in decreased direct and indirect costs. The report begins with information about asthma and asthma management, an overview of asthma prevalence and mortality, an overarching discussion of the financial burden of asthma, and a methodology section. A detailed review of the charges incurred by Florida's healthcare system due to emergency department visits and hospitalizations with asthma listed as the primary diagnosis follows. Trends over time are presented, as well as differences between demographic sub-populations such as age, gender, race, and ethnicity. Total and average charges are shown in addition to detailed descriptions of charges by payer and repeat patients. Lastly, the report provides sector by sector recommendations on data use and taking action, to underscore the importance of first learning the scope of the problem, then targeting resources, and conducting ongoing assessment for continuous improvement.

The additional direct and indirect costs of asthma in Florida NOT explored in this report are substantial, including doctor visits, ambulatory care, medication, school and work absenteeism and lost productivity. Recognizing the limitations of the charge data and the need for additional cost information in Florida, readers are encouraged to further explore financial impacts and work towards consistent implementation of the evidence-based asthma management guidelines as defined in the *Expert Panel Report 3 (EPR-3) Summary Report 2007: Guidelines for the Diagnosis and Management of Asthma*. Achieving compliance with the guidelines is a critical step in controlling some of asthma's financial burden and improving asthma outcomes in Florida.

B. About Asthma and Asthma Management

Asthma is a chronic lung disease characterized by inflammation of the airways and recurring attacks of symptoms such as wheezing, coughing, and chest tightness. Individuals with asthma are sensitive to various allergens and irritants in the environment, such as tobacco smoke, fragrances, dust mites, animal dander, pollen, mold, and diesel emissions, which cause airways to become inflamed. Asthma can also be triggered by exercise or by strong emotions such as laughing or crying. As each individual has their own specific set of asthma triggers that they need to identify and learn to avoid, treatment strategies and management plans need to be personalized to the individual's specific needs. While there is no cure for asthma, it can be controlled through proper clinical treatment and environmental management.

Asthma severity levels serve as a general guide for physicians. There are two categories of asthma; intermittent and persistent. Individuals with asthma symptoms less than 2 days a week or 2 nights per month, on average, are considered to have intermittent asthma. Individuals with asthma symptoms more often than 2 days a week or 2 nights per month, on average, are considered to have persistent asthma. Persistent asthma has three levels of severity; mild, moderate, and severe. Severity can change over time so regular checkups and reassessments of the patient's health are needed. However, in extreme instances even mild asthma can be deadly.

The *Expert Panel Report 3 (EPR-3) Summary Report 2007: Guidelines for the Diagnosis and Management of Asthma* was developed by an expert panel commissioned by the National Asthma Education and Prevention Program Coordinating Committee coordinated by the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health. The EPR-3 provides guidelines for treating and managing asthma. The updated guidelines were developed to support the efforts of those who already incorporate best practices and to help encourage primary care clinicians, asthma specialists, health care systems and providers, and communities to join together in making quality asthma care available to all people who have asthma. The goal, simply stated, is to help people with asthma control their asthma so that they can be active all day and sleep well at night.²

Strategies for managing asthma long term and for managing exacerbations are centered on four essential components of asthma care, namely: assessment and monitoring, patient education, control of factors contributing to asthma severity, and pharmacologic treatment. Adherence to national guidelines (EPR-3 Guidelines) by hospitals, clinicians, and patients would result in optimal circumstances where by most patients would meet regularly with a physician about their asthma, adhere to prescribed medication regimens, and have a long-term asthma management plan to help manage the symptoms of asthma sufficiently well that they do not have episodes requiring medical intervention in emergency rooms or as inpatients in hospitals.

Several comprehensive asthma management programs have shown dramatic declines in ED visits, hospitalizations, and overall health costs for asthma care. Some have focused school—based interventions, while others have placed more emphasis on increasing provider compliance to national guidelines.^{3,4} Most successful programs, have an emphasis on collaboration between sectors. In 2008, EPA presented a conceptual framework for delivering high-quality asthma care. This framework includes the following 5 key elements: 1) targeted environmental interventions, 2) strong community ties, 3) high-performing collaborations & partnerships, 4) committed program champions, and 5) integrated health care services.⁵

C. Asthma Burden in Florida: an Overview

Data presented in this section on the asthma burden in Florida provide context to the charge data presented later in the report. Asthma morbidity and mortality are monitored on an ongoing basis by the Florida Department of Health. More information about the burden of asthma in Florida can be found on the Florida Department of Health [Asthma Prevention and Control Program's website](#).

Prevalence

Asthma rates have increased dramatically over the last thirty years in all populations in the United States, including among Floridians. Asthma is the most common chronic illness in children and is the leading cause of school absences from a chronic illness among children

ages 5 to 17. According to the 2010 Florida Child Health Survey, 18% of children under the age of 18 in Florida have at some point in their life been told by a doctor, nurse, or other health professional that they have asthma, and approximately 60% of them currently have asthma. According to the 2010 Behavioral Risk Factor Surveillance System, 13.8% of Florida adults have at some point in their life been told by a doctor, nurse, or other health professional that they have asthma and approximately 60%, or 1 out of 12 adults in Florida currently have asthma. For a description of prevalence and data sources, see the Methods section.

Deaths

Approximately 80% of the deaths from asthma are preventable with proper education and management.⁶ Older adults are much more likely to die from asthma than children. In 2010, there were a total of 176 deaths in Florida with asthma listed as the underlying cause, almost all of which (95%) occurred among Florida adults ages 18 years and older. Residents 65 and older accounted for approximately half (47%) of the asthma deaths among Florida adults. For a description of mortality data, see the Methods section.

D. Financial Burden of Asthma

Asthma creates a significant economic burden at the national, state, community, and family level, and asthma costs have been increasing significantly over time. A recent study estimated that in 2007, the total cost of asthma to society in the United States, including direct and indirect costs, was \$56 billion. Asthma ED visits and hospitalizations, the focus of this report, were estimated to account for between 58% and 64% of the total direct costs of asthma, excluding prescription medications.¹

A large proportion of the total cost of asthma can be attributed to treating the consequences of poorly controlled asthma, including indirect costs such as school or work absences and direct costs such as ED visits and hospitalizations. The indirect costs of a disease are defined as resources that are lost, and include time off work as a result of the ill health of the patient, time spent by people looking after the patient in the home, and premature retirement or death.⁷ For example, in addition to missing work days due to one's own asthma, every time a child is absent from school, a parent must typically be absent from work to provide care for that child. Direct costs of a disease, defined as resources consumed, include costs associated with drugs and devices, physician office visits, urgent care visits, ED visits, and hospital costs.

As mentioned, this report primarily focuses on a specific aspect of direct costs, namely charges associated with emergency department visits and hospitalizations. It is important to note that the data set used, the Agency for Health Care and Administration's (AHCA) patient discharge data, provides total undiscounted charges for services rendered by the reporting entity, rather than cost information. This distinction will be discussed in more detail in the Methods section.

To lend perspective to of the rate of increase, change in asthma charges over a five year span were compared to changes in Florida ED and hospital charges overall. From 2005 to 2009, the total charges of all Florida ED visits and hospitalizations combined increased from \$80.2 billion to \$116.5 billion, a 45% increase.⁸ During this same time, the combined charges of asthma emergency department visits and hospitalizations increased from \$574 million in 2005 to \$877 million in 2009, a 53% increase. It's important to note that during this time, increases in number of visits did not differ between all Florida visits and asthma visits (9.9% vs. 10.1%, respectively).

II. METHODOLOGY

Hospitalizations and Emergency Department Visits

In Florida, the Agency for Health Care Administration (AHCA) is tasked with collecting patient discharge data from all Florida hospitals for emergency department visits and hospitalizations. However, there are some hospitals in Florida, such as state operated, federally funded, or Shriner's hospitals, that are not required to report to AHCA.

Asthma emergency department (ED) visits result when asthma episodes cannot be managed by the patient or family members sufficiently well to provide relief to the patients. The patient may be experiencing a life-threatening episode, or a relatively mild episode on arrival to the emergency room. Hospitalization occurs when the patient requires care beyond what can be provided in the emergency room including specific therapies, observation, or care that requires a longer period to provide.

AHCA's ED Visit dataset and Hospital Inpatient (HI) dataset have a detailed record for each visit or admission including time and date, demographics of the patient, primary and additional diagnoses, procedures, charges, and payer information. The ED dataset allows for 9 additional diagnoses to be reported and the HI dataset allows for an additional 30 diagnoses to be reported. The ED and HI datasets are mutually exclusive. If a patient enters into the ED and is then admitted to the hospital, their record for that visit is removed from the ED dataset and transferred to the HI dataset. The data were collected by hospitals primarily for the purpose of medical billing and therefore clinical accuracy may vary.

Cases with asthma listed as the primary diagnosis (determined by ICD-9 code 493) were the main focus of this report. These data were analyzed by age group, race, gender, ethnicity, and payer. Asthma cases frequently have additional diagnoses reported, often related to co-morbid conditions. The secondary and tertiary diagnoses of cases with a primary diagnosis of asthma are also discussed.

Race and Ethnicity

Race and ethnicity were analyzed independent of each other. Race groups were restricted to white, black, and other. Ethnicity groups include Hispanic and non-Hispanic. Beginning in 2010, race and ethnicity were captured as two separate measures. Prior to 2010, race and ethnicity were collected as one combined measure. Steps have been taken to make the previous years data compatible with present data, but there is some variability in each of the race groups and ethnicity groups that can likely be attributed to this change in collection.

Charges

This report presents charge data derived from AHCA's ED Visit and HI data discussed above. Charges are the focus of this report because they are readily available in the existing datasets. Charges are the total undiscounted amount that a facility bills for all care and services provided. It must be noted that charges differ from costs in that determination of costs requires additional special analyses of resource consumption and likely varies by hospital. Charges also differ from the amount received by a hospital for services provided. Furthermore, hospital costs and payments received may reflect provider price shifting and other factors (such as negotiated discounts, bad debt, and charitable care) and are often lower than charges.

Total, average (mean), and median charges are presented in this report. The mean and median charges were compared and significant differences existed between the two values. The

median values were determined to be a more accurate representation of the average charge per visit than the mean value due to extreme outliers, and therefore will be used throughout this report, unless otherwise specified.

Repeat Patients

Repeat patients (patients with two or more ED visits or two or more hospitalizations with asthma listed as the primary diagnosis) were matched using a masked or de-identified social security number. Analysis of repeat patients was restricted to patients discharged in 2010. First, patients with two or more ED visits and patients with two or more hospitalizations were identified. The two complete datasets were also merged to identify individuals who had one ED visit and one hospitalization. Repeat patients' visits were sorted chronologically; the first visit was assigned as the index visit and any other visits were termed subsequent visits.

Prevalence

Several population-based surveys provide the prevalence of asthma among Florida's residents. The survey data included in this report use complex sampling and surveying methodology and all data have been weighted to be representative of the state population. Weighting is a procedure that adjusts for the chance of being selected to participate in the survey and for discrepancies between those who complete the survey and the overall population of Florida. The data were weighted to the respondent's probability of selection by county, as well as age and gender, based on 2010 population estimates.

The Behavioral Risk Factor Surveillance System (BRFSS) is a telephone-based survey that uses a random-digit dial sampling methodology to select respondents age 18 and above from households across the state. It has been conducted annually in Florida since 1986. BRFSS respondents with asthma who agreed to be called back for future studies made up the sampling frame for the Asthma Call Back Survey (ACBS). BRFSS respondents with children under the age of 18 in the household who agreed to be called back for future studies make up the sampling frame for the Florida Child Health Survey.

The ACBS has been administered annually in Florida since 2007 with a target sample size of 600. All respondents of the ACBS are individuals who have been diagnosed with asthma at some point in their life. The FCHS has been administered annually in Florida since 2008, with a target sample size ranging from 800 to 1,500. In 2010, the FCHS sampled parents or guardians of approximately 1,500 children in Florida, however only 263 of those children had asthma. The small sample size can affect the precision of prevalence estimates, and limits the ability to do more detailed analyses such as comparing sub-populations or assessing the co-occurrence with other diseases or behaviors. Despite this limitation, these are still very valuable data sources as they collect a series of asthma specific questions from the target populations (Floridian adults and children with asthma) that are not otherwise available.

Deaths

The mortality data in this report are derived from the Florida Department of Health, Bureau of Vital Statistics and only include cases with asthma listed as the underlying cause of death (determined by ICD-10 codes J45-J46).

Rates

Rates were calculated using population estimates provided by the Florida Legislature, Office of Economic and Demographic Research. Rates take into consideration the total population -- not just individuals with asthma.

III. DIRECT CHARGES TO THE HEALTH SYSTEM IN FLORIDA

The following section includes a detailed review of the charges incurred by Florida's healthcare system due to ED visits and hospitalizations with asthma listed as the primary diagnosis. As mentioned in the methods section, charges are looked at because of their availability in the AHCA data set. Section A covers ED charges for 2010 and trends for 2005-2010. Section B covers hospitalization charges for 2010 and trends for 2000-2010. In both sections, trends over time are presented for total charges and median charge per visit, as well as differences between demographic sub-populations such as age, gender, race, and ethnicity, and differences by payer. Section C covers patients with more than one asthma ED visits and/or hospitalizations in 2010.

A. Asthma Emergency Department (ED) Charges in Florida

In this section, data on the charges of ED visits with asthma listed as the primary diagnosis (ICD-9 code 493) are presented. First, the most recent year for which data are available (2010) are examined. A summary of 2010 asthma ED charges, rates, number of visits, and additional diagnoses is followed by a detailed examination of the service categories of charges such as pharmacy, laboratory, or radiology charges. The total annual charges and median charge per ED visit are then presented for all available years, 2005 to 2010. Data are presented for Florida overall, broken down by 5 age groups, by gender, by race, and by ethnicity. Finally, charges by payer type, such as Medicare, Medicaid, or commercial insurance are explored.

1. Summary of Total 2010 Charges

In 2010, there were a total of 90,770 ED visits in Florida with asthma listed as the primary diagnosis. While this report only focuses on charges associated with these visits, it's important to note that in 2010 there were an additional 80,015 ED visits with asthma listed as the secondary diagnosis and an additional 54,059 ED visits with asthma listed as the tertiary diagnosis. A portion of the charges associated with these visits logically adds to the overall economic burden of asthma on Florida's health care system and residents.

The median charge per ED visit with asthma listed as the primary diagnosis was \$1,618 and the total combined charges incurred by the healthcare system for these visits was \$204.1 million. Table 1 below provides a summary of asthma ED visits, rates, and charges by age group, gender, race, and ethnicity for 2010.

Table 1. Summary of Florida Asthma ED Visits, Rates, and Charges, 2010

Demographic Groups		Number of ED Visits	Percent of Total Visits	Rate of Visits (per 10,000)	Median Charge per Visit	Highest Visit Charge	Total Charges (Millions)
Age Groups	0-4	18,003	19.8%	158.4	\$1,337	\$83,120	\$29
	5-17	24,641	27.1%	82.5	\$1,334	\$20,367	\$40
	18-34	20,189	22.2%	50.9	\$1,701	\$53,313	\$46
	35-64	24,117	26.6%	32.7	\$2,252	\$49,507	\$74
	65+	3,820	4.2%	11.5	\$3,079	\$65,776	\$16
Gender	Female	48,490	53.4%	50.6	\$1,736	\$83,120	\$119
	Male	42,280	46.6%	45.9	\$1,506	\$53,313	\$85
Race	White	48,290	58.9%	31.9	\$1,627	\$83,120	\$110
	Black	33,659	41.1%	108.3	\$1,549	\$65,776	\$72
Ethnicity	Non-Hispanic	67,993	74.9%	46.4	\$1,596	\$83,120	\$152
	Hispanic	21,875	24.1%	52.8	\$1,684	\$42,606	\$50

When comparing charges between groups, it is important to keep in mind that there are several factors that impact the average and total charges, including number of visits, patient demographics, and additional diagnoses. Looking at the charge data without considering these factors can lead to misconceptions about the burden of asthma within and between groups. Rates, which take into consideration the total population, were included to provide a clearer picture of the burden of asthma between groups.

Groups with the largest number of visits also had the highest number of charges. Among the five age groups, the highest total charges occurred among adults ages 35-64 (\$74 million). Females (\$119 million) had higher total charges than males. Comparing between race groups, whites had the highest total charges (\$110 million). Comparing ethnicity, non-Hispanics had the highest charges (\$152 million), although the average charge per visit was not statistically different.

Records of ED visits with asthma listed as the primary diagnosis often include additional (secondary and/or tertiary) diagnoses. In 2010, approximately 58% of asthma ED visits (52,286) had a secondary diagnosis listed and 29% (26,378) had a tertiary diagnosis listed. The median charge per asthma ED visit with a secondary diagnosis (\$1,765) was 20% higher than an individual with only a primary diagnosis (\$1,463), and the median charge for a patient with a tertiary diagnosis was 33% higher (\$1,949).

The occurrence of additional diagnoses increases as age increases. In 2010, approximately half of the asthma ED visits among children under the age of 18 (52%) had a secondary diagnosis compared to four out of five (81%) of the asthma ED visits among adults 65 and older. The occurrence of additional diagnoses also varies by gender. Approximately one third of female asthma ED visits (32%) had a secondary diagnosis compared to one out of four (25%) male asthma ED visits.

Approximately one third (32%) of the 52,286 secondary diagnoses fell under the category of “Diseases of the Respiratory System (ICD-9 Codes 460-519)”. However, the category with the most secondary diagnoses was “Symptoms, Signs, and Ill-Defined Conditions (ICD-9 Codes 780-799)”, accounting for 35% of all secondary diagnoses. Falling under this category were symptoms such as cough (n=5,465), shortness of breath (n=3,230), other respiratory distress (n=2,278), and chest pain, tightness, or painful respiration (n=1,584).

2. Charges by Type of Service Category, 2010

The total charges of asthma ED visits in Florida represent the total undiscounted charges for services rendered by the reporting hospital. Total charges are calculated by summing the charges of the 14 different service categories provided in the AHCA ED dataset. Many asthma ED visits will not incur charges for each of these categories. In fact, 99% of asthma ED visits in 2010 had no charges in seven of the categories.^a These charge categories were added into the existing “other” category for the analysis below.

For each category of charges, the following table shows the number and percent of visits with charges in that category, the mean charge per services rendered, the highest single visit charge, and the total annual charges (in millions). The mean charge per services rendered restricts the denominator to the number of visits in which charges were incurred in that category. This approach provides a clearer picture of the average charge for that type of service per patient (Table 2).

Table 2. Asthma ED Visits and Charges by Charge Category, 2010

Type of Service Charge Categories	Number of Visits Charged	Percent of Visits Charged	Mean Charge (per Services Rendered)	Highest Visit Charge	Total Charges (Millions)
Pharmacy Charges	77,498	85.4%	\$141	\$75,793	\$12.8
Medical and Surgical Supply Charges	28,708	31.6%	\$40	\$5,297	\$3.7
Laboratory Charges	29,674	32.7%	\$319	\$14,858	\$29.0
Radiology and Other Imaging Charges	53,185	58.6%	\$353	\$22,334	\$32.1
Emergency Room Charges	90,554	99.8%	\$1,022	\$9,151	\$92.8
Treatment or Observation Room Charges	1,976	2.2%	\$31	\$10,892	\$2.8
Other Charges	71,861	79.2%	\$341	\$30,880	\$30.9

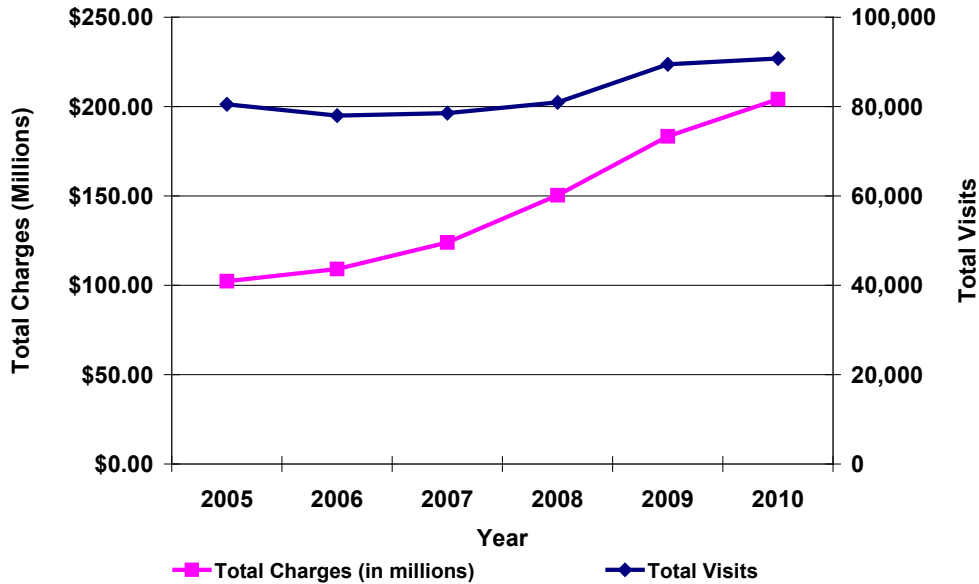
From 2005 to 2010, the largest increase in charges occurred in the Emergency Room category. The total Emergency Room Charges increased from \$40.2 million in 2005 to \$92.8 in 2010, a 131% increase. The mean Emergency Room Charge per visit (in which services were rendered) increased by 100.8% from \$511 in 2005 to \$1,025 in 2010. However, there are several factors that could have impacted charges associated with this category such as changes in coding for specific procedures or the types of services included.

^a Charge categories combined into “other” include: Cardiology, Operating Room, Anesthesia, Recovery Room, Trauma Response, Gastro-Intestinal, and Extra-Corporeal Shock-Wave Therapy Charges.

3. Statewide Trends over Time, 2005-2010

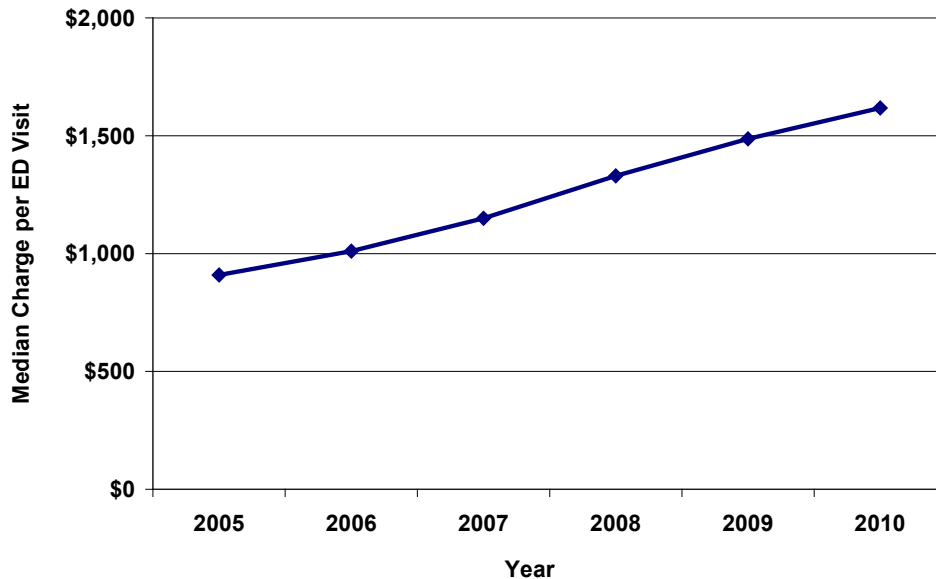
The total annual charges for ED visits with asthma listed as the primary diagnosis in Florida just about doubled from \$102.3 million in 2005 to \$204.1 million in 2010, a 99.6% increase. However, during this same time period, the total number of asthma ED visits in Florida only increased by 12.7%, from 80,518 visits in 2005 to 90,770 visits in 2010 (Figure 1).

Figure 1. Florida Asthma ED Visits, Total Charges and Total Visits, 2005-2010



The median charge per visit increased from \$909 in 2005 to \$1,618 in 2010, a 78% increase (Figure 2).

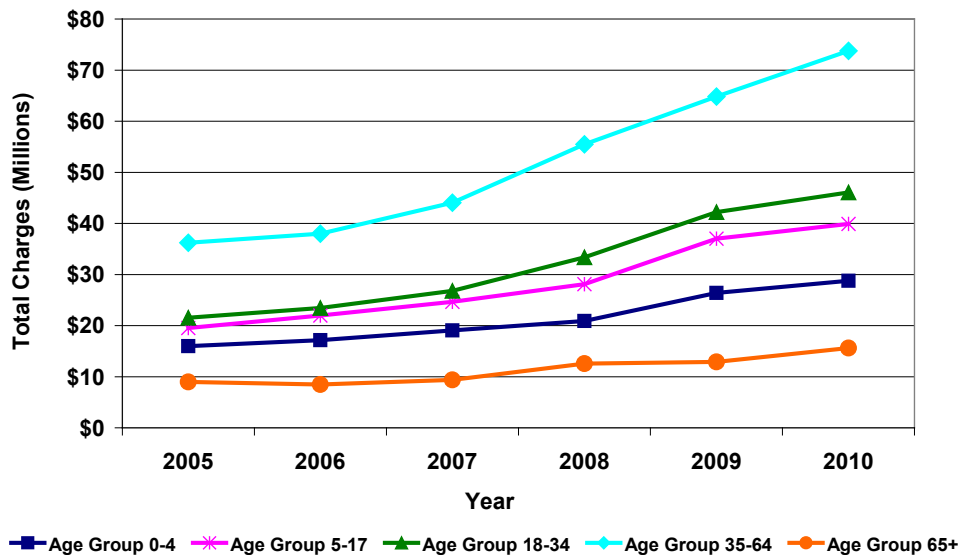
Figure 2. Median Charge per Florida Asthma ED Visit, 2005-2010



4. Sub-Population Trends, 2005-2010: Age Group

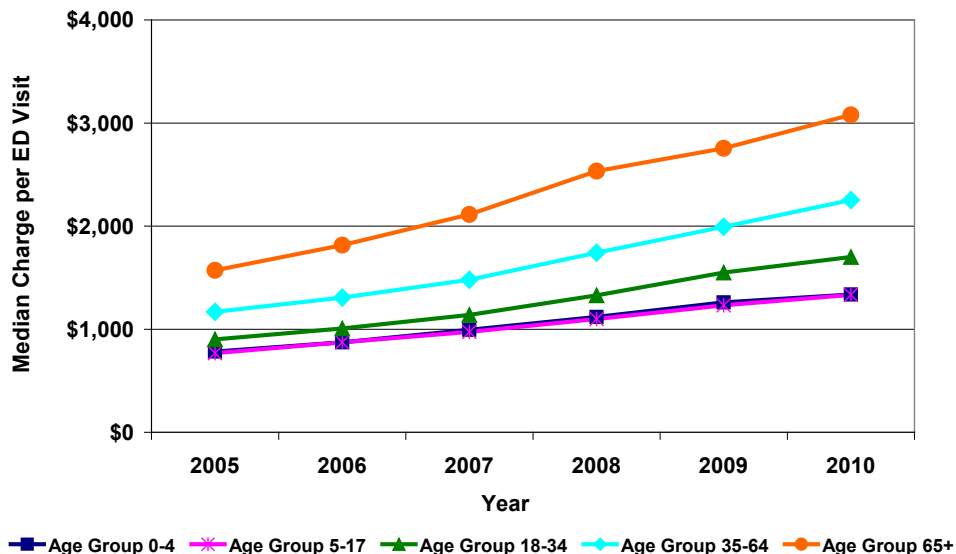
From 2005 to 2010, the total charges for asthma ED visits increased among all age groups. The largest increase of total charges of any specific age group occurred among adults aged 35 to 64. Charges in this age group grew from \$36.2 million in 2005 to \$73.8 million in 2010, a 104% increase (Figure 3). Florida adults ages 65 and older consistently had the lowest number of visits and the lowest total charges of all the age groups, perhaps because these individuals are often transferred to the hospital.

Figure 3. Florida Asthma ED Visits, Total Charges by Age Group, 2005-2010



While the largest increase in total charges was seen among Florida adults ages 35-64, the largest increase in the median charge per visit occurred among adults ages 65 and older. The median charge per asthma ED visit for this group increased from \$1,572 in 2005 to \$3,079 in 2010, a 96% increase. In 2010, the lowest median charge per visit was observed among children under the age of 18 at approximately \$1,335 per asthma ED visit (Figure 4).

Figure 4. Median Charge per Florida Asthma ED Visit by Age Group, 2005-2010



Gender

From 2005 to 2010, the total charges for asthma ED visits increased for both males and females. Males had more ED visits under the age of 18, but females consistently had more asthma ED visits overall and therefore a higher total charge than males during this time period. The total charges for female asthma ED visits in Florida increased from \$59.2 million in 2005 to \$119.2 million in 2010, a 101% increase. The total charges for male asthma ED visits in Florida increased from \$43.1 million in 2005 to \$84.9 million in 2010, a 97% increase.

From 2005 to 2010, females consistently had a higher median charge per ED visit than males, likely due to the differences in age. The median charge per female asthma ED visit in Florida increased from \$950 in 2005 to \$1,736 in 2010, an 83% increase. The median charge per male asthma ED visit in Florida increased from \$865 in 2005 to \$1,506 in 2010, a 74% increase.

Race

From 2005 to 2010, the total charges for asthma ED visits increased among all race groups. Whites had the largest number of visits and the highest total cost during this time period. The total charges for whites increased from \$65.5 million in 2005 to \$110.1 million in 2010, a 68% increase. The total charges for blacks increased from \$34.1 million in 2005 to \$71.9 million in 2010, a 101% increase. The largest increase was seen among the "Other" group whose total charges increased from \$2.7 million in 2005 to \$21 million in 2010, a 679% increase. However, these data need to be interpreted carefully. Prior to 2010, race and ethnicity were collected in one combined measure. Beginning in 2010, race and ethnicity were captured as two separate measures. Steps have been taken to make the previous years' data compatible with present data, but there is some variability in each of the race groups and ethnicity groups that can likely be attributed to this change in collection.

During this time period, the largest increase in median charge per visit was seen among the "Other" group, likely due to the reclassification of the race variable mentioned above. The median charge per ED visit among the "Other" group increased from \$870 in 2005 to \$1,893 in 2010, a 118% increase. The median charge per ED visit among whites increased from \$901 in 2005 to \$1,627 in 2010, an 81% increase. The median charge per ED visit among blacks increased from \$925 in 2005 to \$1,549 in 2010, a 68% increase.

Ethnicity

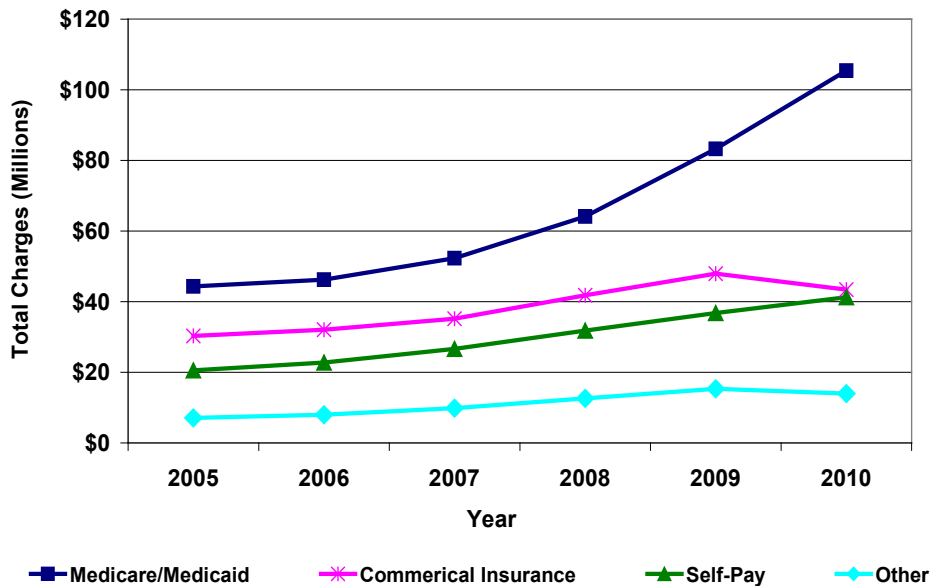
From 2005 to 2010, the total charge of asthma ED visits increased among both Hispanics and non-Hispanics. Non-Hispanics have consistently had a larger number of visits and a higher amount of total charges than Hispanics. The total charges for non-Hispanics increased from \$82.9 million in 2005 to \$151.6 million in 2010, an 83% increase. The total charges for Hispanics increased from \$19 million in 2005 to \$50.4 million in 2010, a 166% increase. As above with race, the amount of increase within ethnicity groups needs to be interpreted carefully. Prior to 2010, ethnicity was collected combined with race. Beginning in 2010, ethnicity was captured as a stand-alone measure. Steps have been taken to make the previous years' data compatible with present data, but there is some variability that can likely be attributed to this change in collection.

The median charge per asthma ED visit did not differ much based on ethnicity. The median charge per asthma ED visit among non-Hispanics in Florida increased from \$872 in 2005 to \$1,684 in 2010, a 93% increase. The median charge per asthma ED visit among Hispanics in Florida increased from \$917 in 2005 to \$1,596 in 2010, a 74% increase.

5. Trends by Payer, 2005-2010

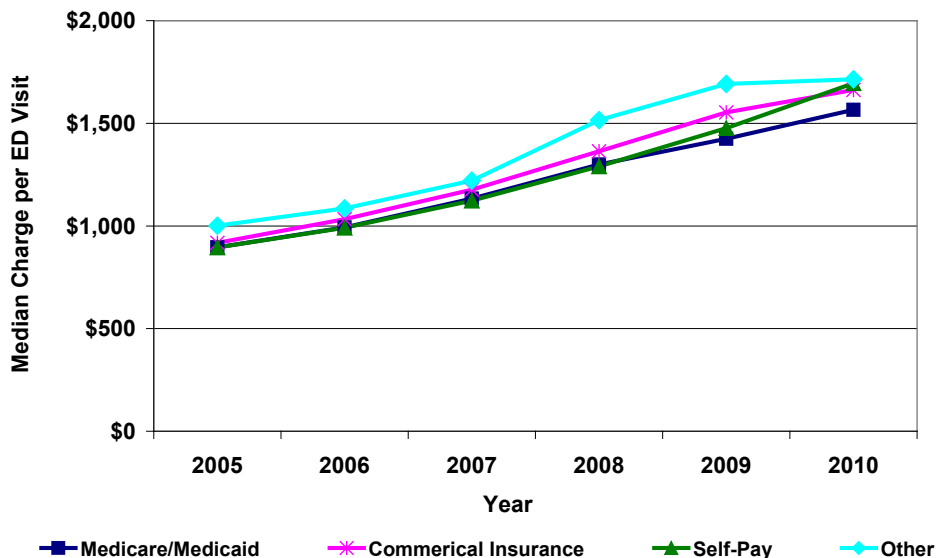
For this analysis, payer was grouped into four categories, representing the expected primary source of reimbursement for services rendered. During this time period, the number of visits covered by commercial insurance decreased by 21% while increases were seen among the number of visits covered by self-pay (7%), other (16.4%), and Medicare/Medicaid (37.7%). The largest increase in total charges (and total visits) occurred among those paid for by Medicare or Medicaid. The total charges for asthma ED visits in Florida covered by Medicare/Medicaid increased from \$44.3 million in 2005 to \$105.4 million in 2010, a 138% increase (Figure 5).

Figure 5. Florida Asthma ED Visits, Total Charges by Payer, 2005-2010



The average charge per asthma ED visit did not differ much based on payer (Figure 6). In general, the increase in the average charge per visit by payer matched the increase seen at the state level from 2005 to 2010.

Figure 6. Median Charge per Florida Asthma ED Visit by Payer, 2005-2010



B. Asthma Hospitalization Charges in Florida

In this section, data on the charges of hospitalizations with asthma listed as the primary diagnosis (ICD-9 code 493) are presented. First, the most recent year for which data are available (2010) will be examined. A summary of 2010 asthma hospitalization charges, rates, number of visits, and additional diagnoses is followed by a detailed examination of the service categories of charges, such as pharmacy, room and board, or laboratory charges. The total annual charges and median charge per hospitalization are then presented for the years 2000 to 2010. Data are presented for Florida overall, broken down by 5 age groups, by gender, by race, and by ethnicity. Finally, charges by payer type, such as Medicare, Medicaid, or commercial insurance are explored.

1. Summary of Total Charges, 2010

In 2010, there were a total of 30,910 hospitalizations in Florida with asthma listed as the primary diagnosis. While this report only focuses on charges associated with these cases, it's important to note that in 2010 there were an additional 21,975 hospitalizations with asthma listed as the secondary diagnosis and an additional 19,721 hospitalizations with asthma listed as the tertiary diagnosis. A portion of the charges associated with these visits logically adds to the overall economic burden of asthma on Florida's health care system and residents.

The median charge per hospitalization with asthma listed as the primary diagnosis was \$17,310 and the total combined charges incurred by the healthcare system for these visits was \$748.5 million. Table 3 below provides a summary of asthma hospitalization visits, rates, and charges by age group, gender, race, and ethnicity for 2010.

Table 3. Summary of Florida Asthma Hospitalization Visits, Rates, and Charges, 2010

Demographic Groups		Number of Hospitalizations	Percent of Total Visits	Rate of Visits (per 10,000)	Median Charge per Visit	Highest Visit Charge	Total Charges (Millions)
Age Groups	0-4	4,281	13.8%	37.7	\$9,216	\$158,140	\$51
	5-17	3,671	11.9%	12.3	\$10,808	\$1,182,728	\$55
	18-34	2,461	8.0%	6.2	\$14,011	\$432,231	\$47
	35-64	12,241	39.6%	16.6	\$19,653	\$2,297,658	\$326
	65+	8,256	26.7%	24.8	\$24,522	\$1,605,560	\$270
Gender	Female	19,649	63.6%	20.5	\$19,189	\$2,297,658	\$515
	Male	11,261	36.4%	12.2	\$14,336	\$1,605,560	\$234
Race	White	19,435	62.9%	12.8	\$18,327	\$1,182,728	\$492
	Black	8,669	28.0%	27.9	\$15,100	\$2,297,658	\$184
Ethnicity	Non-Hispanic	23,849	77.2%	16.3	\$17,146	\$2,297,658	\$573
	Hispanic	6,692	21.6%	16.1	\$17,990	\$737,777	\$168

When examining charges between groups, it is important to keep in mind that there are several factors that impact the average and total charges, including number of visits, patient demographics, and additional diagnoses. Looking at the charge data without considering these other factors can lead to misconceptions about the burden of asthma within and between

groups. Rates, which take into consideration the total population, were included to provide a clearer picture of the burden of asthma between groups.

Groups with the largest number of visits also had the highest number of charges. Among the five age groups, the highest total charges occurred among adults ages 35-64 (\$326 million). Females (\$515 million) had higher total charges than males. Whites (\$492 million) had higher total charges than blacks, and non-Hispanics (\$573 million) had higher total charges than Hispanics.

Records of hospitalizations with asthma listed as the primary diagnosis often include secondary and/or tertiary diagnoses. In 2010, approximately 86% of asthma hospitalizations (26,523) had a secondary diagnosis listed and 73% (22,654) had a tertiary diagnosis listed. The average charge per asthma hospitalization with a secondary diagnosis (\$18,702) was 72% higher than an individual with only a primary diagnosis (\$10,867), and the average charge for a hospitalization with a tertiary diagnosis was 87% higher (\$20,353).

The occurrence of additional diagnoses increases as age increases. In 2010, approximately 70% of asthma hospitalizations among children under the age of 18 had a secondary diagnosis, compared to 96% of asthma hospitalizations among adults 65 and older. The occurrence of additional diagnoses also varies by gender. Approximately 89% of female asthma hospitalizations had a secondary diagnosis compared to 81% of male asthma hospitalizations.

In 2010, among the 26,523 secondary diagnoses, the largest number belong to the category “Diseases of the Respiratory System (ICD-9 Codes 460-519)” accounting for 31.5% of all secondary diagnoses. The most common secondary diagnoses within this category were pneumonia (n=2,542), acute respiratory failure (n=855), acute bronchitis (n=723), acute upper respiratory infections (n=619), and obstructive chronic bronchitis with exacerbation (n=547).

2. Charges by Type of Service Category, 2010

The total charges of asthma hospitalizations in Florida represent the total undiscounted charges for services rendered by the hospital excluding professional fees. Total charges are calculated by summing the charges of the 25 different categories provided in the AHCA Hospital Inpatient dataset. Many asthma hospitalizations will not incur charges in each category. In 2010, 92% of asthma hospitalizations had no charges in 13 categories.^a For this analysis, these were combined with the existing “other” category, along with an additional three categories.^b Each of the 16 combined categories accounted for less than 3.5% of the total annual charges.

The following table shows for each category of charges, mean charge per services rendered, total charges (in millions), highest single visit charge, and the number and percent of visits with charges in that category. The mean charge per services rendered restricts the denominator to the number of visits in which charges were incurred in that category. This approach provides a clearer picture of the average charge for that type of service per patient (Table 4).

^a Charges combined into “other” include: Nursery Level I, II, and III, Trauma Response, Oncology, Labor Room, Behavioral Health, Speech Therapy, Anesthesia, Recovery Room, Occupational Therapy, Operating Room, Treatment or Observation Room, Coronary Care, Physical Therapy, and Cardiology Charges.

^b Coronary Care (11.1%), Physical Therapy (12.8%), and Cardiology (17.0%)

Table 4. Asthma Hospitalization Visits and Charges by Charge Category, 2010

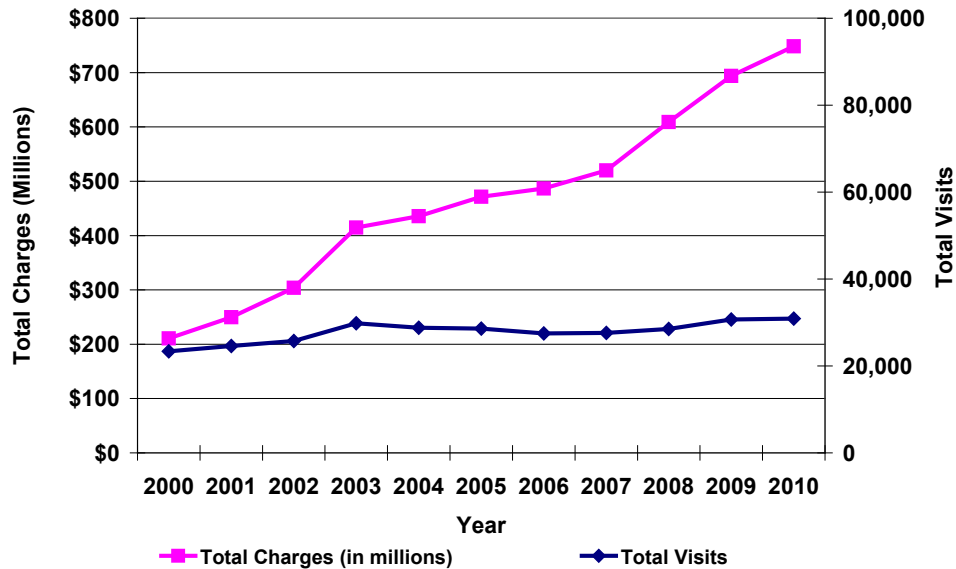
Type of Service Charge Categories	Number of Visits Charged	Percent of Visits Charged	Mean Charge (per Services Rendered)	Highest Visit Charge	Total Charges (Millions)
ICU Charges	9,320	30%	\$7,154	\$228,378	\$66.7
Room and Board Charges	21,774	70%	\$3,491	\$64,144	\$76.0
Medical and Surgical Supply Charges	25,479	82%	\$1,203	\$125,393	\$30.7
Emergency Room Charges	26,261	85%	\$1,894	\$27,341	\$49.7
Radiology and Other Imaging Charges	29,202	94%	\$2,413	\$141,017	\$70.5
Laboratory Charges	29,459	95%	\$4,201	\$291,968	\$123.8
Respiratory Charges	30,638	99%	\$3,441	\$393,975	\$105.4
Pharmacy Charges	30,904	100%	\$4,659	\$1,059,359	\$144.0
Other Charges	9,320	30%	\$8,771	\$320,512	\$81.7

From 2000 to 2010, the largest increases occurred in the categories of Radiology Charges (813.3% increase), ICU Charges (471% increase), and Emergency Room Charges (468.1% increase). The total Radiology Charges increased from \$7.7 million in 2000 to \$70.5 in 2010. The mean Radiology Charge per visit (in which services were rendered) increased by 573.6% from \$358 in 2000 to \$2,413 in 2010.

3. Statewide Trends over Time, 2000-2010

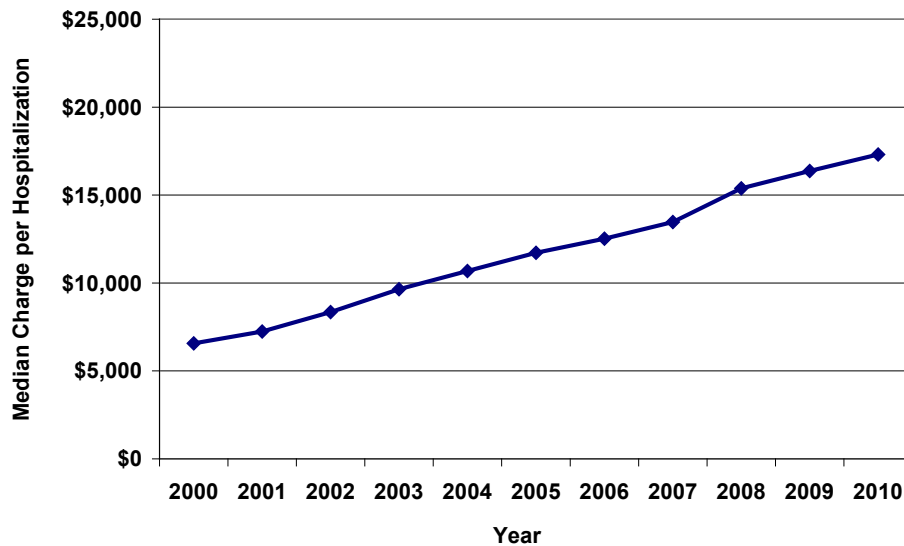
The number of asthma hospitalizations in Florida increased by 32.4% from 23,347 in 2000 to 30,910 in 2010. During this same time period, the total annual charges of asthma hospitalizations increased from \$210.8 million in 2000 to \$748.5 million in 2010; a 255% increase (Figure 7).

Figure 7. Florida Asthma Hospitalizations, Total Charges and Total Visits, 2000-2010



The median charge per visit increased from \$6,566 in 2000 to \$17,310 in 2010, a 164% increase (Figure 8).

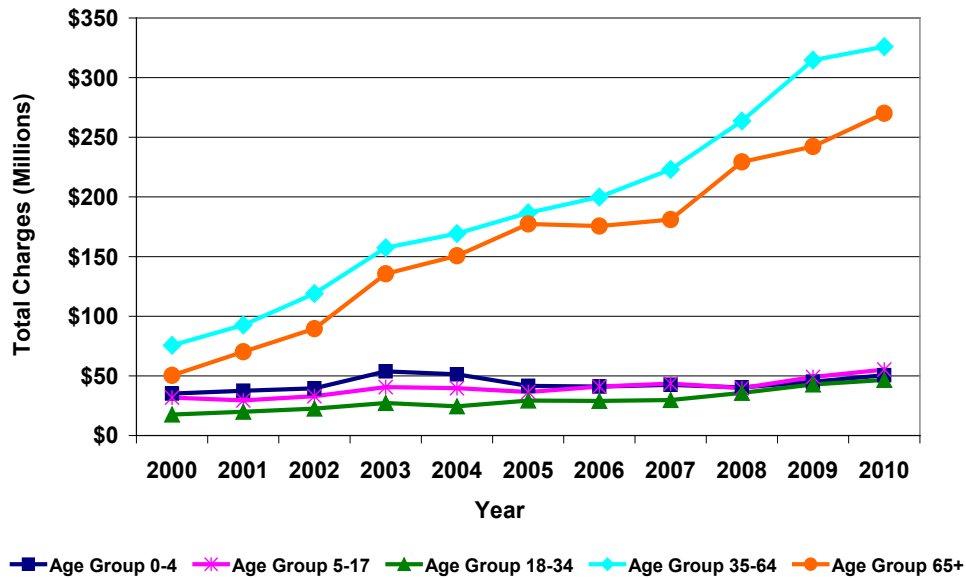
Figure 8. Median Charge per Florida Asthma Hospitalization, 2000-2010



4. Sub-Population Trends, 2000-2010: Age Groups

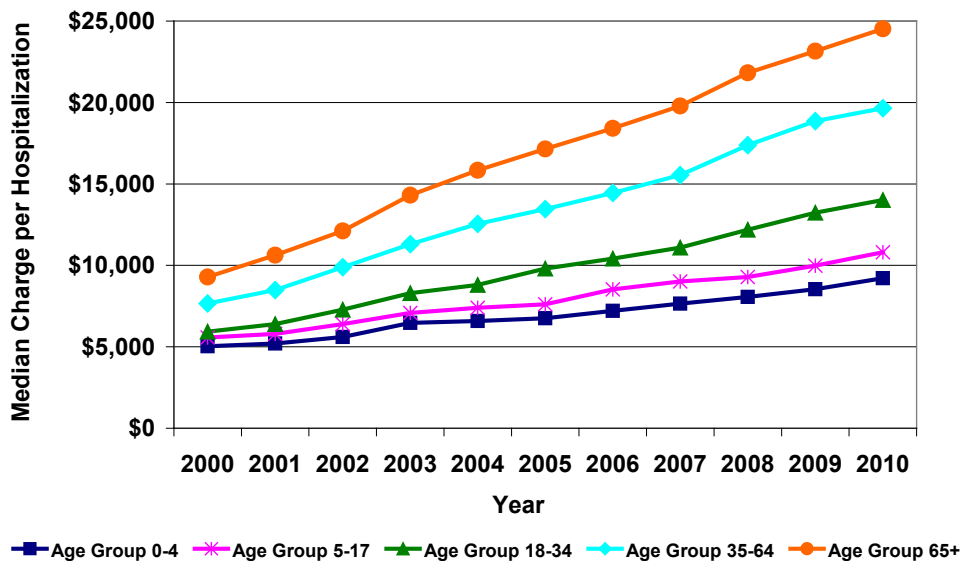
From 2000 to 2010, the total charges for asthma hospitalizations increased among all age groups. The largest increases of total charges occurred among adults ages 35-64 and those ages 65 and older. The total charges for adults between the ages of 35 and 64 increased by 331% from \$75.7 million in 2000 to \$325.9 million in 2010. The total charges for adults ages 65 and older increased by 435% from \$50.5 million in 2000 to \$270 million in 2010 (Figure 9).

Figure 9. Florida Asthma Hospitalizations, Total Charges by Age Group, 2000-2010



From 2000 to 2010, the median charge per hospitalization increased by 160% among adults over the age of 35. The median charge per hospitalization for ages 35-64 increased from \$7,663 in 2000 to \$19,653 in 2010 and the median charge per hospitalization for ages 65 and older increased from \$9,287 in 2000 to \$24,522 in 2010 (Figure 10).

Figure 10. Median Charge per Florida Asthma Hospitalization by Age Group, 2000-2010



Gender

From 2000 to 2010, the total charges for asthma hospitalizations increased for both males and females. Males had more asthma hospitalizations under the age of 18, but females consistently had more hospitalizations overall and therefore a higher total charge during this time period. The total charges for female asthma hospitalizations in Florida increased from \$135.8 million in 2000 to \$514.7 million in 2010, a 279% increase, while the total charges for male asthma hospitalizations increased from \$75 million in 2000 to \$233.7 million in 2010, a 212% increase.

Females consistently had a higher median charge per asthma hospitalization than males, likely due to the differences in age. The median charge per female asthma hospitalization in Florida increased by 167%, from \$7,183 in 2000 to \$19,189 in 2010, while the median charge among males increased by 149%, from \$5,764 in 2000 to \$14,336 in 2010.

Race

From 2000 to 2010, the total charges for asthma hospitalizations increased among all race groups. Whites have had the largest number of hospitalizations and the highest total charges during this time period. The total charges for whites increased from \$146.9 million in 2000 to \$492 million in 2010, a 235% increase. The total charges for blacks increased from \$57.6 million in 2000 to \$184.1 million in 2010, a 220% increase. The largest increase was seen among the other group whose total charges increased from \$6.3 million in 2000 to \$67.1 million in 2010, a 972% increase. As discussed, these data need to be interpreted carefully. Prior to 2010, race and ethnicity were collected as one combined measure. Beginning in 2010, race and ethnicity were captured as two separate measures. Steps have been taken to make the previous years' data compatible with present data, but there is some variability in each of the race groups and ethnicity groups that can likely be attributed to this change in collection.

During this time period, the largest increase in median charge per hospitalization was seen among the "Other" group, likely due to the reclassification of the race variable mentioned above. For this group, the median charge per hospitalization increased from \$6,118 in 2000 to \$18,173 in 2010, a 197% increase. The median charge per hospitalization among whites increased by 172% (\$6,733 in 2000 to \$18,327 in 2010) and among blacks by 141% (\$6,278 in 2000 to \$15,100 in 2010).

Ethnicity

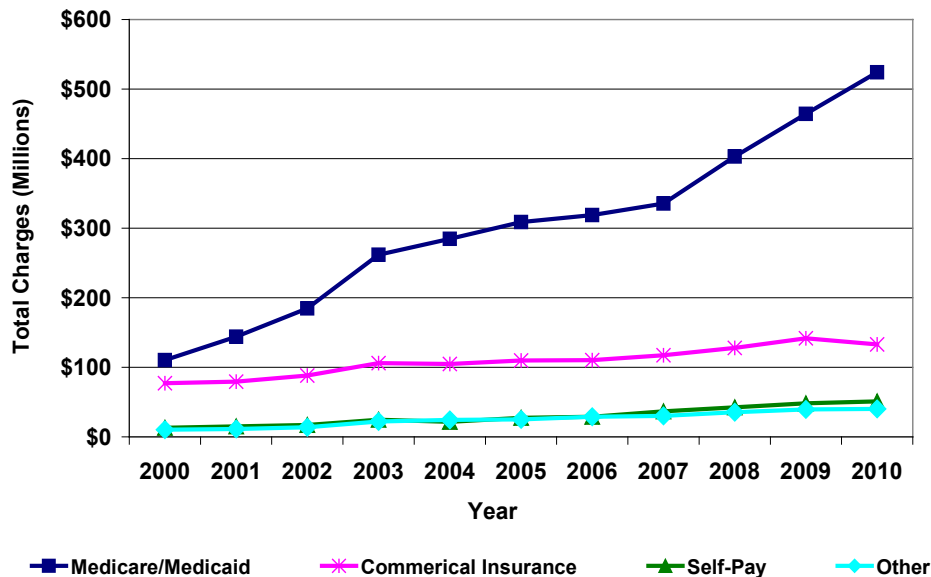
From 2000 to 2010, the total charge of asthma hospitalizations increased among both Hispanics and non-Hispanics. Non-Hispanics consistently had a larger number of hospitalizations and a higher amount of total charges than Hispanics. The total charges for non-Hispanics increased from \$172.7 million in 2000 to \$573 million in 2010, a 232% increase. The total charges for Hispanics increased from \$36.6 million in 2000 to \$167.9 million in 2010, a 359% increase. As above with race, the amount of increase within ethnicity groups needs to be interpreted carefully. Prior to 2010, ethnicity was collected combined with race. Beginning in 2010, ethnicity was captured as a stand-alone measure. Steps have been taken to make the previous years' data compatible with present data, but there is some variability that can likely be attributed to this change in collection.

Median charge per hospitalization did not differ much by ethnicity. The median charge per asthma hospitalization among non-Hispanics in Florida increased from \$6,473 in 2005 to \$17,146 in 2010, a 165% increase. The median charge per asthma hospitalization among Hispanics in Florida increased from \$7,027 in 2005 to \$17,990 in 2010, a 156% increase.

5. Trends by Payer, 2000-2010

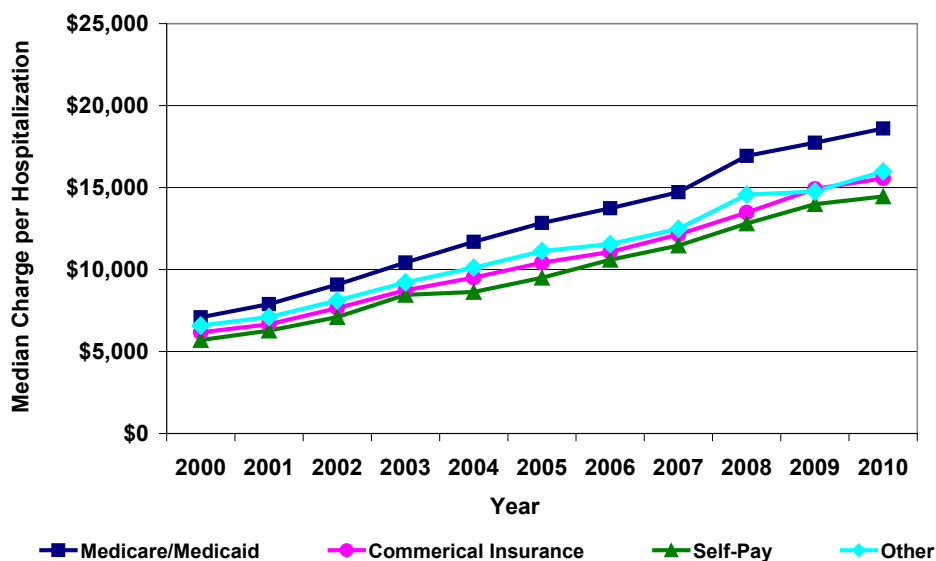
For this analysis, payer was grouped into four categories, representing the expected primary source of reimbursement for services rendered. During this time period, the number of visits covered by commercial insurance decreased by 33.3% while increases were seen among the number of visits covered by Medicare/Medicaid (79.8%), self-pay (61.1%), and other (61.7%). The largest increase in total charges (and total visits) occurred among visits paid for by Medicare or Medicaid, increasing from \$110.4 million in 2000 to \$524.2 million in 2010, a 375% increase (Figure 11).

Figure 11. Florida Asthma Hospitalizations, Total Charges by Payer, 2000-2010



From 2000 to 2010, patients covered by Medicare/Medicaid had a higher median charge per asthma hospitalization than the other payer categories. The median charge per asthma hospitalization in Florida covered by Medicare/Medicaid increased from \$7,087 in 2000 to \$18,598 in 2010, a 162% increase (Figure 12).

Figure 12. Median Charge per Florida Asthma Hospitalization by Payer, 2000-2010



C. 2010 Repeat Asthma Patients and Visits

When working to improve asthma outcomes and reduce costs, a good place to start is with those individuals whose asthma is poorly controlled. One indication of poorly controlled asthma is frequent or repeat visits to the ED or hospital for asthma care, as these should be avoidable with proper asthma management. Repeat ED visits will be discussed first, followed by repeat hospitalizations. In the third section, ED visits and hospitalizations were combined to include individuals with at least one ED visit and one hospitalization. Repeat patients' visits were sorted chronologically; the first visit was assigned as the index visit and any other visits were termed subsequent visits.

1. Repeat Asthma ED Visits

In this section, individuals with two or more ED visits with asthma listed as the primary diagnosis in 2010 are discussed, regardless of hospitalizations. Repeat patients were assessed by matching masked, or de-identified, social security numbers (SSN). There were 13,470 records with unknown SSN that were excluded from this analysis because it cannot be determined if these individuals had one or more visits. This left a remainder of 62,206 patients and a total of 77,300 asthma ED visits for this analysis.

Of the 62,206 patients, there were 53,096 patients (85.4%) who only had one asthma ED visit and 9,110 patients (14.6%) who had two or more asthma ED visits, i.e. repeat patients. Repeat patients accounted for 31.3% of asthma ED visits (77,300) and 30.1% of the total charges while only accounting for 14.6% of the total patients (62,206).

The majority of repeat patients (69.5%) had only two asthma ED visits for the year, but 17.4% had three visits, and 13.1% had four or more visits with nine patients having 20 or more ED visits. Assuming that providing medical treatment, management plans, and education at discharge per the EPR-3 guidelines could prevent future visits, the repeat patients' first visits were separated from their subsequent visits to assess the opportunity for cost savings. There were 9,110 first visits among repeat ED patients and 15,094 subsequent visits. Preventing these subsequent visits would have led to \$29.6 million fewer charges in 2010.

2. Repeat Asthma Hospitalizations

In this section, individuals with two or more hospitalizations with asthma listed as the primary diagnosis in 2010 are discussed, regardless of ED visits. Repeat patients were assessed by matching masked SSN. There were 3,062 records with unknown SSN that were excluded from this analysis because it cannot be determined if these individuals had one or more visits. This left a remainder of 23,530 patients and a total of 27,848 asthma hospitalizations for this analysis.

Of the 23,530 patients, there were 20,608 patients (87.6%) who had only one asthma hospitalization and 2,922 repeat patients (12.4%) who had two or more asthma hospitalizations. Repeat patients accounted for 26% of asthma hospitalizations (27,848) and 27% of the total charges (\$190.2 million) while only accounting for 12.4% of the total patients (23,530)

The majority of repeat patients (58.8%) had only two asthma hospitalizations for the year, but 20.3% had three, and 20.9% had four or more hospitalizations with ten patients having more than 10 hospitalizations. Assuming that providing medical treatment, management plans, and education at discharge could prevent future visits, the repeat patients' first visits were separated

from their subsequent visits to assess the opportunity for cost savings. There were 2,922 first visits among repeat patients and 4,318 subsequent visits. Preventing these subsequent visits would have led to \$111.6 million fewer charges in 2010.

3. Repeat Asthma ED Visits and Hospitalizations Combined

Previously, repeat ED patients and visits were discussed separately from repeat hospitalization patients and visits. In this section, the ED visit and the hospitalization datasets for 2010 were combined to identify the number of patients who had one ED visit and one hospitalization with asthma listed as the primary diagnosis in 2010. Some of the patients with 2 or more asthma ED visits mentioned above also had one or more asthma hospitalizations. Some of patients with 2 or more hospitalizations mentioned above also had one or more ED visits. In the combined dataset, there were 16,532 records with unknown SSN, leaving a remainder of 81,158 patients and a total of 105,148 ED visits and hospitalizations for this analysis. By combining the two datasets, an additional 1,845 repeat patients with only 1 ED visit and 1 hospitalization in 2010 were identified.

The table below shows the different visit categories distributed across age groups. It should be noted that young children are the most likely to not have a SSN reported, and therefore may account for a larger proportion of the repeat visits than presented below (Table 5).

Table 5. Unknown, Single, and Repeat Asthma ED Visit and Hospitalizations, 2010

Age Groups	Unknown Visits	Single Visits	Repeat Visits
0-4	50.7%	13.6%	12.5%
5-17	39.6%	21.4%	19.4%
18-34	4.1%	20.1%	22.3%
35-64	4.3%	31.5%	38.1%
65+	1.3%	13.3%	7.7%

Of the 81,158 patients, there were 67,281 patients (82.9%) who had only one asthma ED visit or hospitalization and 13,877 repeat patients (17.1%) who had more than one asthma ED visit and/or hospitalization. Repeat patients accounted for 36.0% of asthma ED visits or hospitalizations (105,148) and 35.9% of the total charges while only accounting for 17.1% of the total patients (81,158).

The total amount of charges for 2010 for ED visits and hospitalizations with asthma listed as the primary diagnosis was \$952.6 million. Assuming that providing medical treatment, management plans, and education at discharge could prevent future visits, the repeat patients' first visits were separated from their subsequent visits to assess the opportunity for cost savings. There were 13,877 first visits among repeat patients and 23,990 subsequent visits. Preventing these subsequent visits would have led to \$153.8 million fewer charges in 2010.

IV. A CALL TO ACTION: ASSESSING COSTS & IMPLEMENTING EVIDENCE-BASED SOLUTIONS SECTOR BY SECTOR

Complimentary efforts by institutions and organizations are needed to improve asthma control and reduce the associated direct and indirect costs. The following sector specific recommendations were compiled from multiple sources including published literature, the CDC's Vital Signs Report on Asthma⁹, and the National Asthma Control Initiative's *Take Action: Stop Asthma Today*. All of these recommendations align with the goal of promoting compliance with the evidence-based EPR-3 guidelines. Tips are categorized in two areas, data use and taking action. This distinction serves to underscore the importance of first learning scope of the problem, second targeting resources and cooperating across sectors, and third conducting ongoing assessment for continuous improvement.

A. State and Local Public Health Agencies

Use Your Data:

- Track asthma rates and communicate findings.
- Encourage ongoing assessment of the effectiveness of asthma control measures so that continuous improvements can be made.

Take Action and Collaborate Across Sectors:

- Use data to engage stakeholders from various sectors including health care providers, people with asthma, schools and school nurses, employers, and insurers.
- Facilitate collaboration and coordination between partners through coalitions or other arrangements. Use the coalition to enable peer support and rapid transfer of best practices between similar entities. Coalitions also make collaboration between sectors easier. Cross sector partnerships, such as those between primary providers and schools, are critical to successful community-wide asthma management.
- Promote the influenza and pneumonia vaccination for people with asthma as well as improvements in indoor air quality for people with asthma through measures such as smoke-free air laws and policies, healthy schools and workplaces, and improvements in outdoor air quality.

B. Health Plans / Insurers

Use Your Data:

- Assess the number of individuals with asthma covered by your plan.
- Use existing data on office visits, urgent care visits, ED visits, hospitalizations, pharmacy orders, refills, and pick ups, to identify those at higher risk for poor asthma outcomes who may benefit the greatest from evidence-based interventions to support disease management.
- Use data to conduct ongoing monitoring and to obtain feedback of asthma care processes, quality, and outcomes. Produce quality reports that help ensure positive outcomes such as provider performance profiles, health plan report cards, and consumer satisfaction reports.
- Use clinical information systems, including electronic medical records and decision support programs, to enhance adherence to clinical practice guidelines.

Take Action and Collaborate Across Sectors:

- Help your members, especially those at higher risk for poor asthma outcomes, improve control of their asthma symptoms and reduce asthma attacks through disease

management programs consistent with the EPR-3 guidelines, including establishing requirements for the provision of asthma-action plans and self-management education for every patient with asthma.

- Consider measures that prevent asthma attacks such as eliminating co-payments for inhaled corticosteroids and other prescribed medicines.
- Use reimbursements as an incentive to ensure delivery of self-management education and home environmental assessments conducted by clinicians, health educators, and other health professionals both within and outside of the clinical setting.

C. Employers / Workplaces

Use Your Data:

- In 2010, approximately one third of Florida adults with current asthma report missing one or more work days due to asthma.¹⁰ Partner with your human resources office and health care plans to explore how data may be used to assess, improve and monitor asthma outcomes for your employees.

Take Action and Collaborate Across Sectors:

- Promote a healthy workplace by reducing or eliminating known asthma triggers.
- Schedule an asthma presentation or training session at a staff meeting, brown bag lunch, or workplace health fair.
- Work with your health plans to ensure reimbursement is available for long-term control medicines, self-management education conducted by clinicians, health educators, and other health professionals, and services to identify and reduce asthma triggers in homes of patients with asthma.
- Visit the [Occupational Safety and Health Administration website](#) for a wealth of information on asthma in the workplace and how to avoid hazards and how to train workers to take precautions when they are unavoidable.

D. Physicians and Other Primary Care Providers

Use Your Data:

Use patient management information systems to assess and track asthma patient care.

Three out of four adults in Florida with asthma (75.3%) report never having received an asthma action plan from a doctor or other health professional⁵. Use your data systems to track and monitor this and other components of asthma care.

Take Action and Collaborate Across Sectors:

- Make asthma self-management a priority for your patients, their families, and their caregivers.
- Assess asthma severity at the initial visit to determine initial treatment and monitor your patient's level of control during follow-up asthma visits.
- Develop an asthma action plan and review it with each patient to ensure the patient understands daily medications and proper usage techniques, how to avoid asthma triggers, and how to identify warning signs that require quick-relief medications or additional medical interventions.
- For children, obtain parental permission and provide a copy of the asthma action plan to their school and/or childcare center.
- For children, obtain parental permission to collaborate with school nurses to share and obtain information about asthma episodes and treatments at school.
- Train staff on how to apply the asthma guidelines routinely in your practice setting. Many online training programs are available free of cost for all levels of medical

professionals. Visit the [Florida Asthma Coalition's website](#) for a comprehensive listing of on-line trainings for physicians and other health care providers.

E. Hospitals and Emergency Departments

Use Your Data:

- Assess readmission rates (ED and hospitalizations separately and combined) at various time intervals. As was noted in the previous section of this report, 17.1% of patients accounted 35.9% of the total annual charges of ED visits and hospitalizations with asthma as the primary diagnosis.
- Performance improvement offices are in an excellent position to review these data to see how many patients with an initial asthma visit returned to the ED or hospital within 7 days, 30 days, or other time intervals. The need for this type of assessment aligns with changes to Medicaid reimbursement policies related to readmission.

Take Action and Collaborate Across Sectors:

- Ensure patients have an asthma action plan, provide or make referrals to self-management education, provide education and resources on managing environmental triggers in the home, and communicate with primary care and community care providers as needed.
- Train staff on how to apply the asthma guidelines routinely in the hospital or ED setting. Many online training programs are available free of cost for all levels of medical professionals. Visit the [Florida Asthma Coalition's website](#) for a comprehensive listing of on-line trainings for physicians and other health care providers.
- Reach out to the community to provide education sessions to childcare centers, school nurses, and others who can help individuals with asthma better manage their disease. Non-profit hospitals can make these efforts part of their routine activities related to community benefit.

F. Schools & Childcare Organizations

Use Your Data:

- Identify school children with asthma. Schools can then track percent absenteeism, health room visits, 911 calls and times sent home sick for children with asthma to monitor and identify students in need for additional asthma management support.

Take Action and Collaborate Across Sectors:

- Identify & track children with asthma. Request a written asthma action plan for each student with asthma. Work with the child, family, health care provider to help the child stick to the plan.
- Make students' quick-relief inhalers readily available for them to use at school as needed. This includes allowing them to carry the inhaler on their person, in accordance with Florida Law, when provider and parent deem this appropriate.
- Create an indoor air quality management plan. Get help at: <http://www.epa.gov/iaq/schools/index.html>
- Fix indoor air quality problems like mold and address outdoor air quality problems such as idling school buses.
- Make education on asthma and steps to follow for an asthma episode part of routine training for all school staff, from bus drivers to school administrators. Low cost training programs are available through the American Lung Association and many local children's hospitals.
- School administrators and leaders should visit the [Florida Asthma Coalition's Asthma-Friendly School Webpage](#) and download resources to put together a comprehensive

plan of your own to meet the needs of children with asthma and obtain the Asthma-Friendly School Recognition.

- Childcare center administrators and staff can visit the [Florida Asthma Coalition's Asthma-Friendly Childcare Initiative website](#) for resources and an opportunity to obtain recognition for efforts to improve asthma management at your center.

G. Pharmacists

Use Your Data:

- Monitor your pharmacy's asthma medication order and refill intervals to identify patients with poorly controlled asthma. Contribute to the asthma management team by alerting prescribers about patients whose asthma may be poorly controlled.

Take Action and Collaborate Across Sectors:

- Instruct patients about the proper use of medications (e.g. quick relief vs controller) and techniques for using different devices.
- Help patients use peak flow meters appropriately.
- Encourage patients purchasing over the counter (OTCs) asthma tablets to seek medical care.
- Help patients discharged from the hospital understand their asthma management plan.
- Share information about the EPR-3 Guidelines with prescribers.
- Collaborate with primary providers and hospitals by alerting prescribers about patients whose asthma may be poorly controlled.
- For more tips, review National Institute of Health and NHLBI's document on the Role of the Pharmacist in Improving Asthma Care.
<http://www.nhlbi.nih.gov/health/prof/lung/asthma/asmapmcy.pdf>

H. Health Care Professional Associations

Use Your Data:

- Encourage your members to use the data they have to monitor and improve asthma care, quality, and outcomes.

Take Action and Collaborate Across Sectors:

- Include a link to the National Asthma Control Initiative on your website and promote the six priority action messages amongst your members.
 1. Prescribe inhaled corticosteroids as indicated by the guidelines.
 2. Use written asthma action plans to guide patient self-management.
 3. Assess asthma severity at the initial visit to determine initial treatment.
 4. Assess and monitor asthma control and adjust treatment if needed.
 5. Schedule follow-up visits at periodic intervals.
 6. Act to control environmental exposures that worsen asthma.
- Engage members in self-assessment, professional development, and quality improvement efforts related to asthma management and control.
- Promote educational seminars and on-line trainings related to the EPR-3 Guidelines such as the [Physician Asthma Care Education \(PACE\) Program](#) and "[Asthma in the Primary Care Practice](#)" on-line training.

V. CONCLUSION

Cost and charge data help community health partners assess the public health impact of asthma, identify target populations for interventions to improve health and decrease direct healthcare costs. This report included cost and charge data providing an additional dimension to the previously released point in time and trend epidemiologic data related to asthma prevalence, risk factors, and interventions. The findings underscore what we already knew; asthma causes significant morbidity in Florida and places a significant burden on the healthcare system as a whole.

Charges related to ED visits and hospitalizations with asthma listed as the primary cause have been increasing significantly over the past 5 and 10 years respectively. The total charges of asthma ED visits increased by 99.6% from 2005 to 2010 and the total amount of charges for asthma hospitalizations increased by 255% from 2000 to 2010. The total amount of charges for ED visits and hospitalizations with asthma listed as the primary diagnosis was \$952.6 million in 2010. Whites, females, and non-Hispanics had the highest total number of visits to the ED and/or hospital, and therefore also incurred the largest amount of charges. Young adults have the largest number of visits to the ED, but the total and average charges for this population have consistently been lower than for older adults.

Further exploration is needed to determine how public health interventions, such as those focusing on schools, childcare centers, hospitals, and a person's home environment can reinforce and compliment individual patient care. Future analyses should consider the direct medical costs not included in this report such as physician visits, ambulatory care, and prescription medication along side the indirect costs to individuals and organizations such as productivity loss due to asthma morbidity and mortality.

We ask for the assistance of every reader in reaching the ultimate goal: improving asthma care and quality of life for Floridians with asthma.

References

- ¹ Barnett, S. L., and Nurmagambetov, T. A. Costs of asthma in the United States: 2002-2007. *Journal of Clinical Immunology* 2011;127:145-52.
- ² National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007. Accessed online from: <http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf>
- ³ Wheeler, L., Buckley, R., Gerald, L. B., Merkle, S., and Morrison, T. A. Working with Schools to Improve Pediatric Asthma Management. *Pediatric Asthma, Allergy, and Immunology*. 2009; 22:4
- ⁴ Williams, D., Portnoy, J. M., and Meyerson, K. Strategies for Improving Asthma Outcomes: A Case-Based Review of Successes and Pitfalls. *Journal of Managed Care Pharmacy*. 2010. 16:1-c
- ⁵ 2008 National Asthma Forum Change Package: The System for Delivering High Quality Asthma Care. Accessed online from: https://www.epaasthmaforum.com/Documents/Resources2008/Asthma_Forum_Change_Package.pdf
- ⁶ Source: Banh, H. L. Unconventional Treatment Options in Severe Asthma: An Overview. *Journal of Pharmacy and Pharmaceutical Sciences*. 2011. 14(3) 387-399.
- ⁷ Barnes, P. J., Jonsson, B., and Klim, J. B. The Costs of Asthma. *European Respiratory Journal*. 1996; 9: 636-42.
- ⁸ AHCA Data Summaries and Reports. Accessed online from: <http://www.floridahealthfinder.gov/researchers/QuickStat/quickstat.aspx>
- ⁹ Zahran, H. S., Bailey, C., Garbe, P. Vital Signs: CDC VitalSigns. Asthma in the US: Growing every year. May 2011. Accessed online from: <http://www.cdc.gov/VitalSigns/pdf/2011-05-vitalsigns.pdf>
- ¹⁰ 2010 Florida Adult Asthma Callback Survey, Florida Department of Health, Bureau of Chronic Disease Surveillance and Evaluation.