Asthma and Health Care Utilization

Asthma hospitalizations and emergency department (ED) visits are important indicators of asthma morbidity. Such events are potentially avoidable with appropriate health care, medication, and self-management. Being hospitalized or presenting at the ED for asthma-related care is serious and costly. The Connecticut DPH Asthma Program analyzes hospital and ED discharge data provided by acute care hospitals and the Connecticut Hospital Information Management Exchange (CHIME) to determine asthma-related health care utilization frequency and charges. These data are about *events* of hospitalization or ED visit. Therefore, the rates presented in this section should be interpreted as the number of events per population, not the number of affected individuals per population. All hospitalization and ED visit data were selected for analysis by the admission year. Consequently, rates for the most recently available year (2009) may not include events for persons discharged in the following year (2010).

An event of hospitalization for which asthma is the primary diagnosis at discharge is referred to as an *asthma hospitalization*. An ED visit for which asthma is the primary diagnosis at discharge is termed an *asthma ED visit*. Refer to Appendices E and F for detailed tables on asthma hospitalizations and Appendices G and H for detailed tables on asthma ED visits.

Hospitalizations

From 2005 to 2009, there were an average of 4,810 hospitalizations of Connecticut residents with a primary diagnosis of asthma and an average of 25,437 hospitalizations for which asthma was a secondary diagnosis. As depicted in Figure 16, from 2000 to 2009, the rates of hospitalization with a primary diagnosis of asthma increased 29.2% (from 11.3 per 10,000 to 14.6 per 10,000) while rates of hospitalization with a secondary diagnosis of asthma steadily increased 86.2% (from 38.5 per 10,000 to 71.7 per 10,000). Between 2005 and 2009, there was a 13.2% increase from 12.9 per 10,000 to 14.6 per 10,000 in asthma hospitalizations, and asthma hospitalization rates were higher for children than adults (Table 5). For the same time period, the rates of hospitalization for asthma as a secondary diagnosis were higher for adults than children.

Figure 16. Hospitalization Rates for Primary and Secondary Diagnoses of Asthma by Year, Connecticut, 2000 – 2009

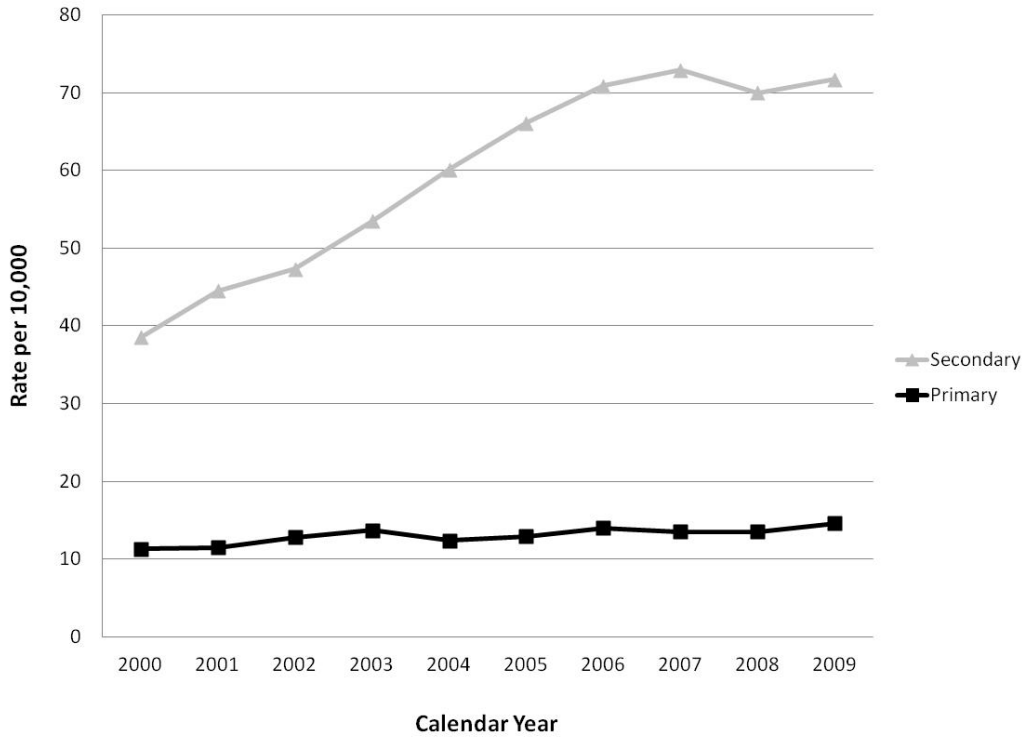


Table 5. Hospitalization Rates for Children and Adults by Primary and Secondary Asthma Diagnoses, Connecticut, 2005 – 2009

Year	Child (0 – 17 years)		Adult (18+ years)	
	Primary Age-adjusted rate per 10,000	Secondary Age-adjusted rate per 10,000	Primary Age-adjusted rate per 10,000	Secondary Age-adjusted rate per 10,000
2005	16.8	25.7	11.5	80.1
2006	19.2	27.3	12.2	86.1
2007	18.1	28.9	11.8	88.1
2008	16.5	26.8	12.5	85
2009	18.9	31.6	13.1	85.6

Asthma Hospitalizations

Rates of asthma hospitalization for 2005 – 2009 were calculated for the estimated Connecticut population for each year and stratified by age groupings, sex, race/ethnicity, and geographic designation (e.g., county, town). Descriptive statistics on temporal characteristics (e.g., month of admission, day of week of admission), admission sources, discharge destinations, and lengths of stay were generated for 2009 asthma hospitalizations. The rates presented in this section are age-adjusted. Overall, asthma hospitalization rates for 2005 – 2009 were highest among children less than five years old, females, non-Hispanic Blacks, and Hispanics. Cross tabulation revealed important details about subpopulations.

An event of hospitalization for which asthma is the primary diagnosis is referred to as an *asthma hospitalization.*

For the total population, females had higher rates of asthma hospitalization than males; however, among children, asthma hospitalization rates in 2005 – 2009 were higher for boys than girls (Figure 17). The hospitalization rate among boys was highest in 2006 at 24.2 per 10,000. The rates of asthma hospitalization for adult females were twice that of the rates for males from 2005 – 2009. The rate of asthma hospitalization for adult females increased 16.2% from 15.4 per 10,000 in 2005 to 17.9 per 10,000 in 2009. In comparison, the adult male asthma hospitalization rates in 2005 and 2009 were 7.3 per 10,000 and 8 per 10,000, respectively. Rates of adult asthma hospitalizations increased with increasing age. Among adults, asthma hospitalization rates were highest for those aged 65 years and older from 2005 to 2009 (Figure 18).

Figure 17. Asthma Hospitalization Rates for Children and Adults by Year and Sex, Connecticut, 2005 – 2009

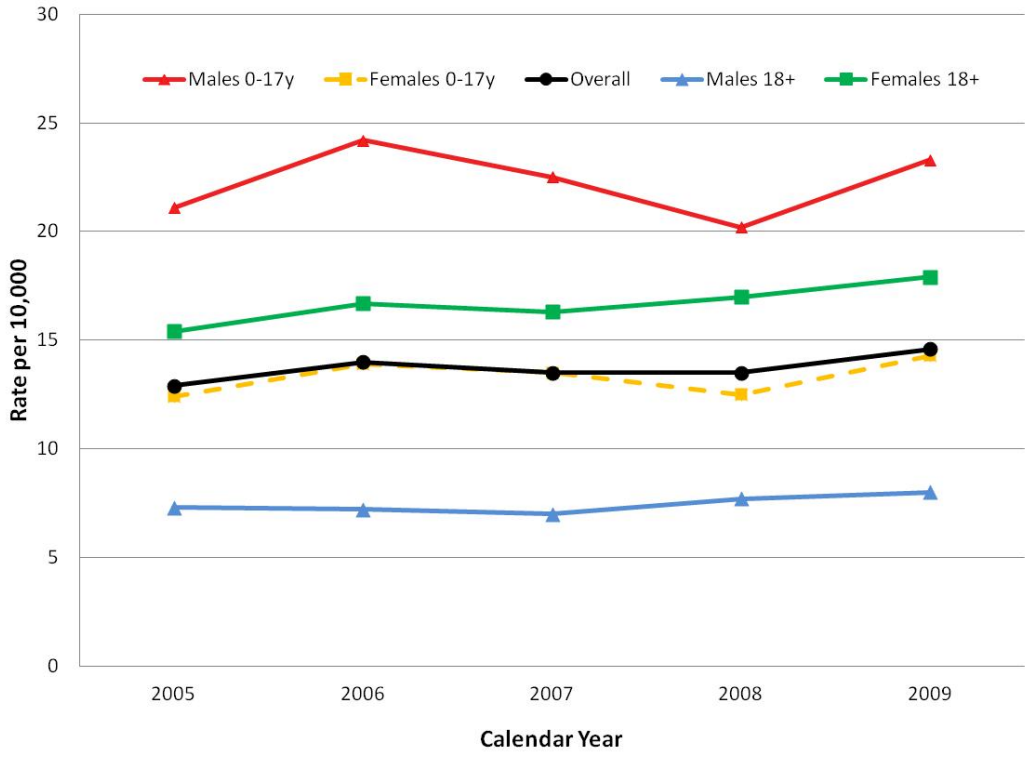
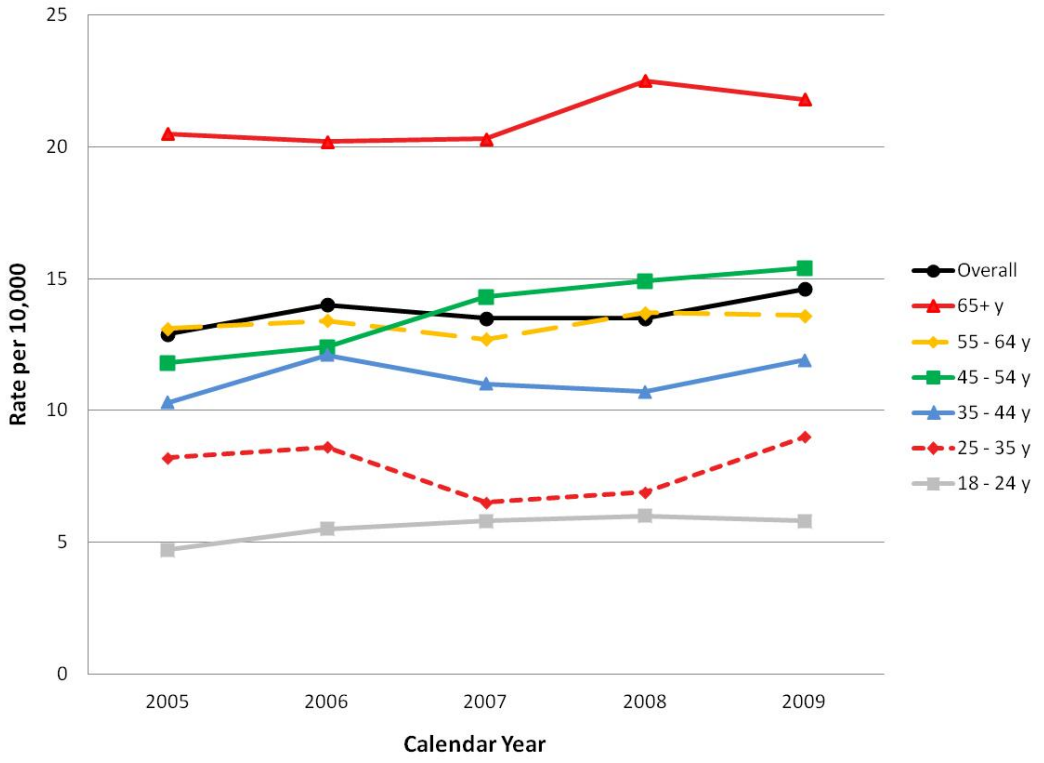
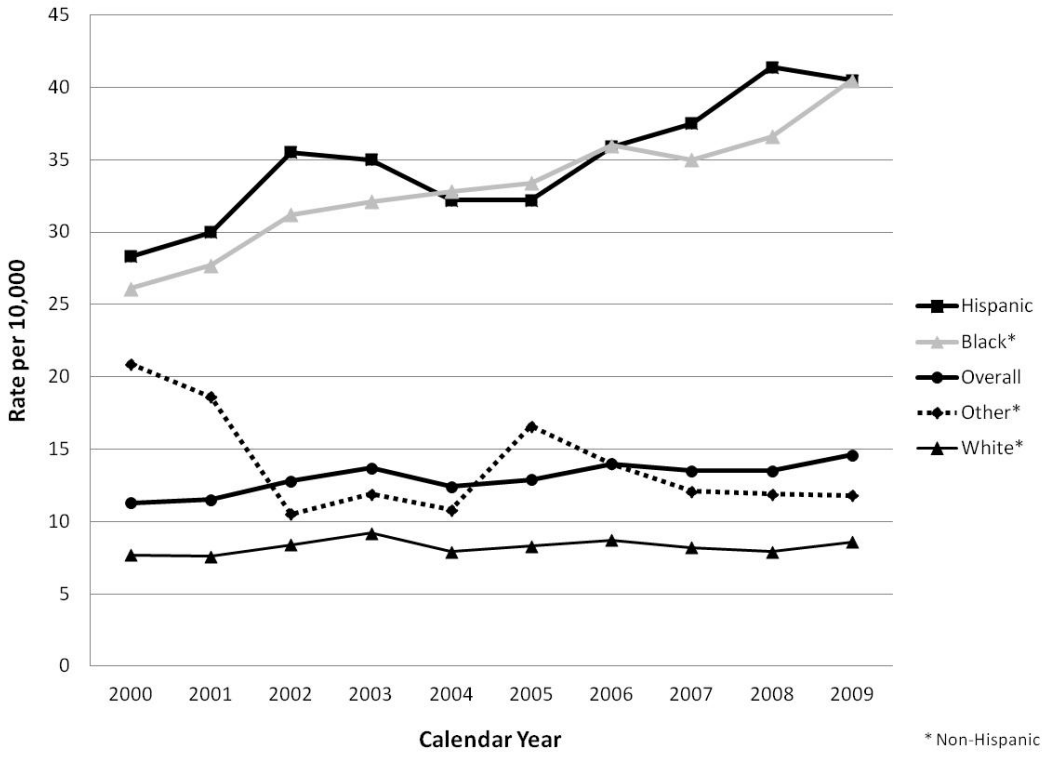


Figure 18. Asthma Hospitalization Rates for Adults by Age Group, Connecticut, 2005 – 2009



Between 2000 and 2009, asthma hospitalization rates for non-Hispanic Blacks and Hispanics were higher than those for non-Hispanic Whites or non-Hispanic Others (Figure 19). In 2009, the rates of asthma hospitalization for non-Hispanic Blacks and Hispanics were equal. The greatest increase in asthma hospitalization rates during 2005 – 2009 among racial/ethnic groups was experienced by Hispanics — there was a 25.8% increase in asthma hospitalizations from 32.2 per 10,000 in 2005 to 40.5 per 10,000 in 2009 for persons classified as Hispanic. Among non-Hispanic Blacks, there was a 21.3% increase in the rate of asthma hospitalization from 33.4 per 10,000 in 2005 to 40.5 per 10,000 in 2009.

Figure 19. Asthma Hospitalization Rates by Year and Race/Ethnicity, Connecticut, 2000 – 2009



From 2000 –2009, non-Hispanic Black children had the highest average annual rates of asthma hospitalizations across all other child and adult race/ethnicity groups (Figure 20). From 2005 – 2009, the average asthma hospitalization rate among non-Hispanic Black children was 4.7 times that of non-Hispanic White children, 1.6 times that of Hispanic children, and 2.7 times that of Other non-Hispanic children. The greatest increase in the rate of asthma hospitalizations among children was for Hispanics, with a 21% increase in hospitalization for asthma as the primary diagnosis from 25.7 per 10,000 in 2005 to 31.1 per 10,000 in 2009. Among adults in 2005 – 2009, Hispanics experienced 5.2 times the rate of hospitalizations as non-Hispanic White adults (Figure 21) with a 27% increase in the adult Hispanic rate from 34.5 per 10,000 to 43.8 per 10,000. However, the greatest increase in

hospitalization rates among adults from 2005 – 2009 was the 28.9% increase from 29.8 per 10,000 to 38.4 per 10,000 among non-Hispanic Black adults.

Figure 20. Asthma Hospitalization Rates for Children by Year and Race/Ethnicity, Connecticut, 2000 – 2009

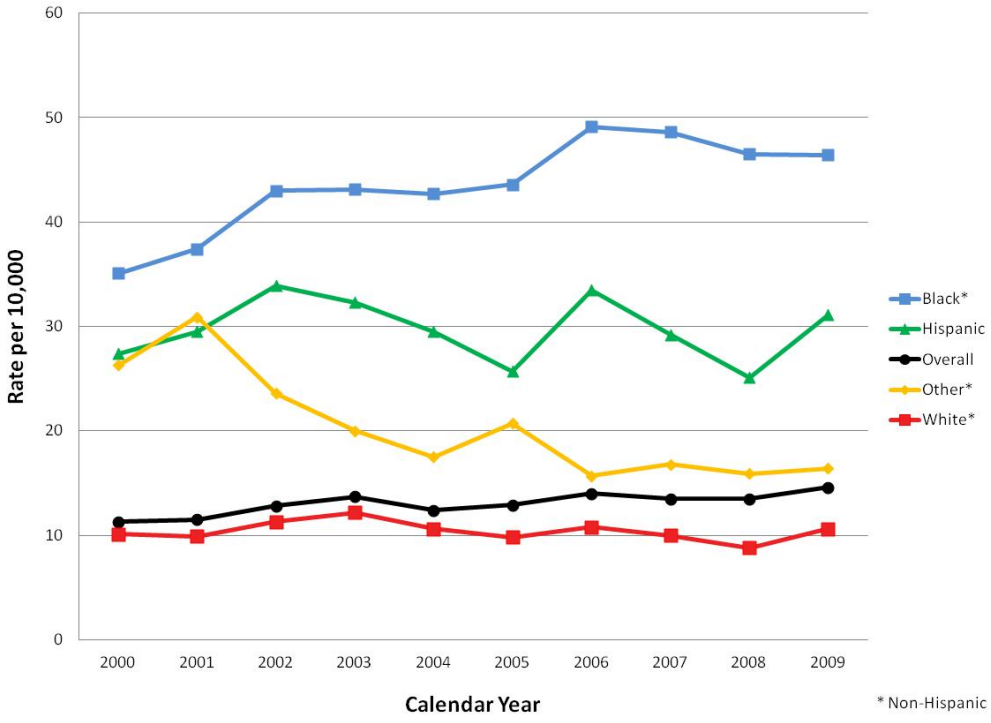
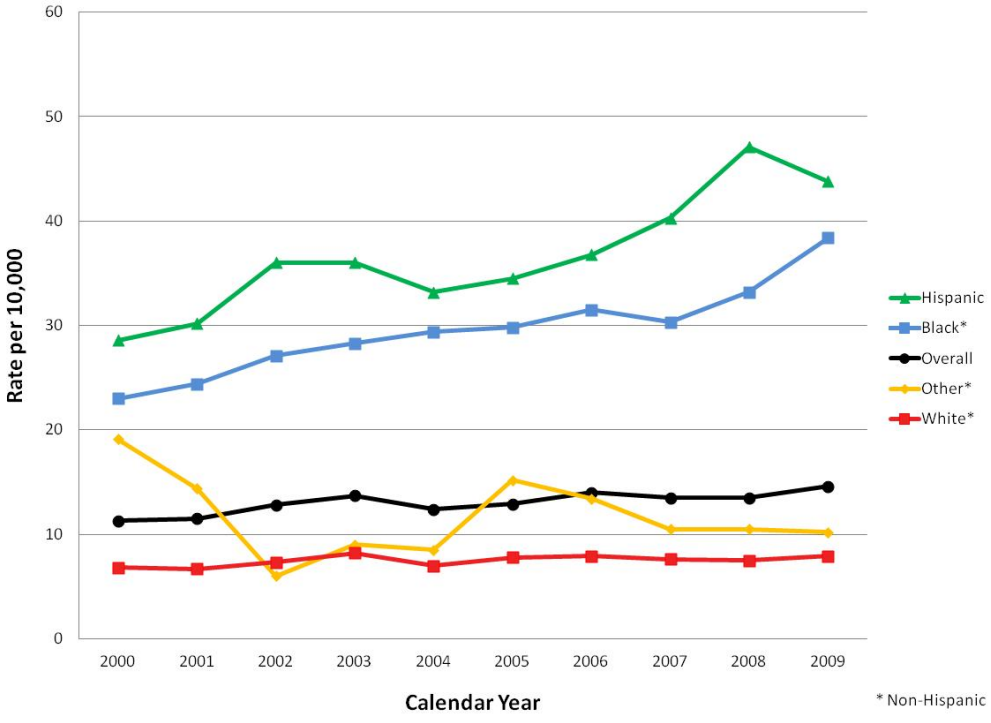


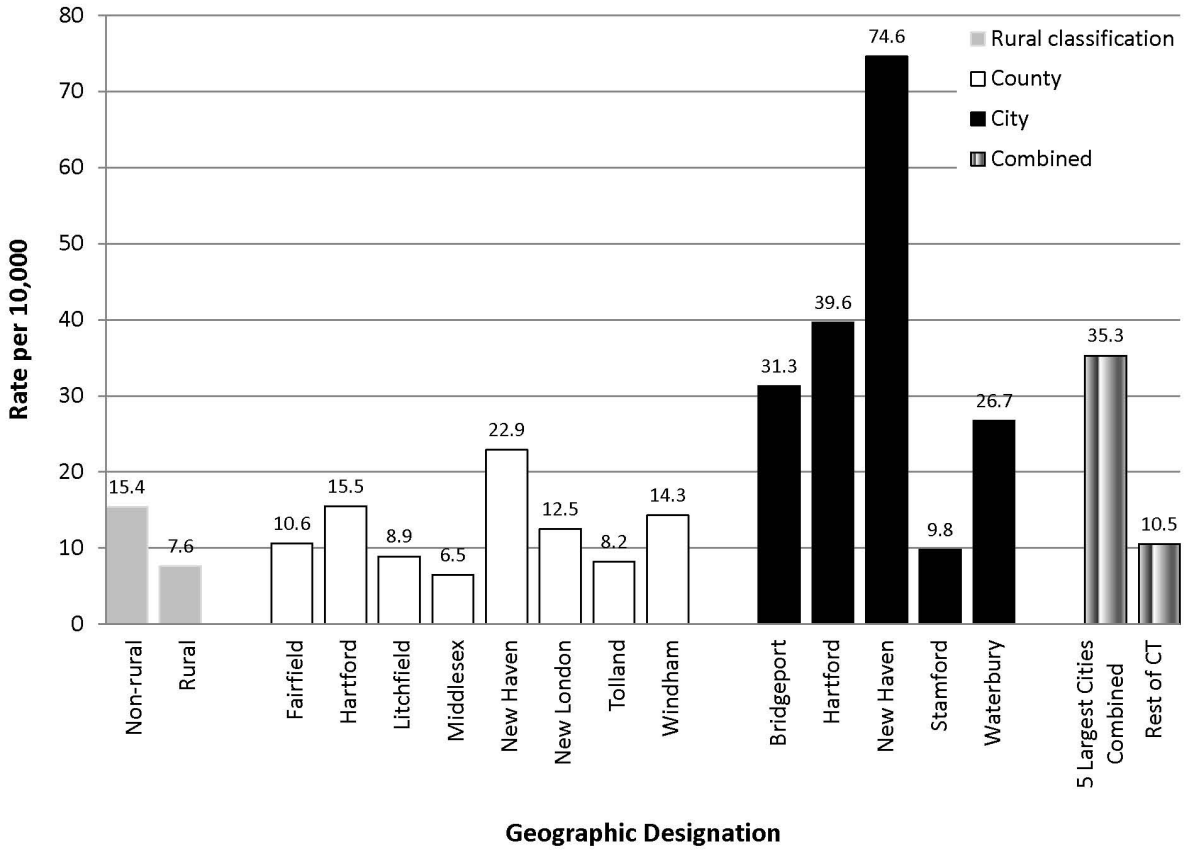
Figure 21. Asthma Hospitalization Rates for Adults by Year and Race/Ethnicity, Connecticut, 2005 – 2009



Place of Residence and Asthma Hospitalization

With regard to geography of residence, non-rural Connecticut residents had twice the asthma hospitalization rate as rural residents (15.4 per 10,000 versus 7.6 per 10,000) in 2009 (Figure 22). In the same year, New Haven County residents experienced the highest rate of asthma hospitalizations compared to state residents elsewhere. The rate of asthma hospitalizations among New Haven County residents was 22.9 per 10,000 persons, 3.5 times greater than the asthma hospitalization rate for Middlesex County residents (6.5 per 10,000 persons). Consistent with the differences observed in rates at the county and rural/non-rural classifications, four of Connecticut's largest cities had higher asthma hospitalization rates than the rest of the state combined in 2009. New Haven had the highest rate, with 74.6 events of asthma hospitalization per 10,000 persons. If the five largest Connecticut cities – Bridgeport, Hartford, New Haven, Stamford, and Waterbury – are considered together, their combined asthma hospitalization rate would be 35.3 per 10,000 for the year 2009, 3.4 times greater than the combined asthma hospitalization rate for the rest of the state. Asthma hospitalization rates by town of residence are listed in Appendix F.

Figure 22. Asthma Hospitalization Rates by Geographic Designation, Connecticut, 2009

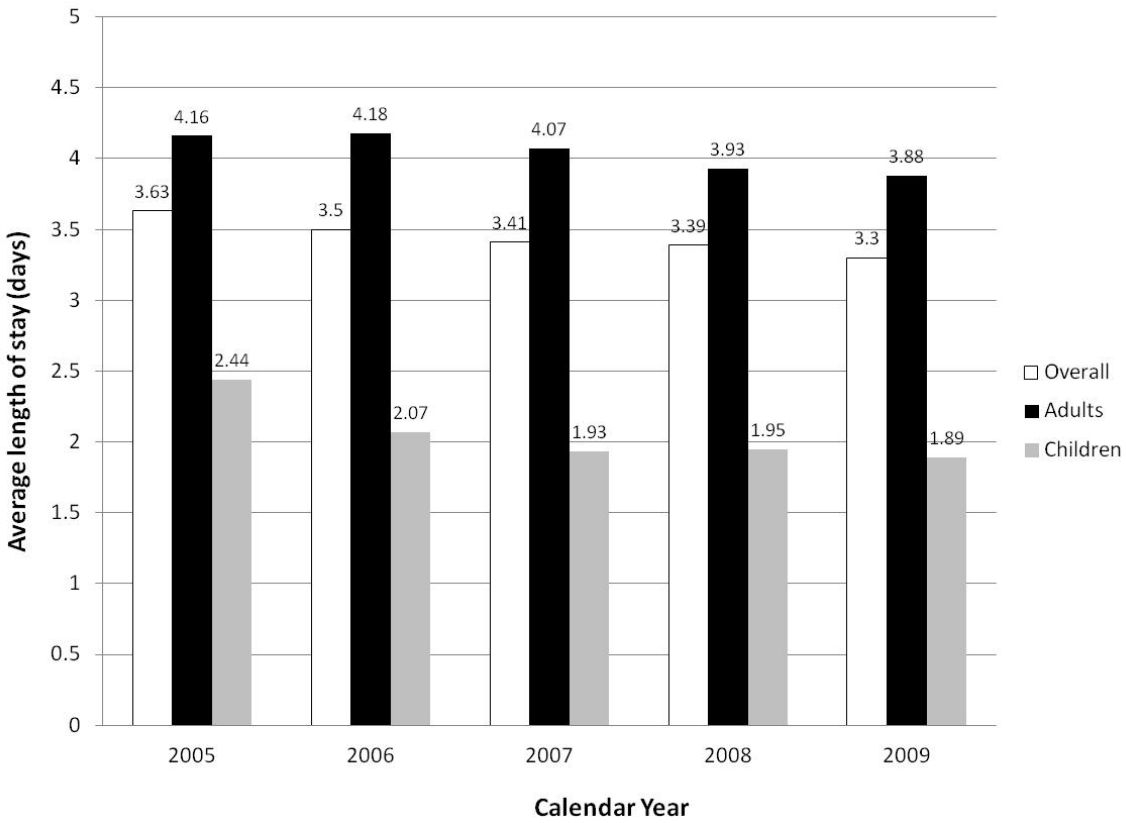


Temporality of Asthma Hospitalizations

The number of asthma hospitalizations in 2009 was highest from September to October and lowest from July to August. Asthma hospital admissions most often occurred on a Monday (17.3%) or Tuesday (15.4%) and were most frequent between 1pm to 6pm, with 36.2% of asthma hospitalizations recorded within that seven-hour period. The majority (74.6%) of persons hospitalized for asthma in 2009 was admitted from the ED. Most (92.3%) persons hospitalized with a primary diagnosis of asthma in 2009 were discharged to their homes.

From 2005 to 2009, the average length of stay (LOS) for persons hospitalized with asthma declined by 9.1% from 3.63 days in 2005 to 3.3 days in 2009. During that time period, the average length of stay for adults was twice as long as the average length of stay for children (Figure 23). In 2009, the average LOS was greatest for persons aged 65 years and older; thus, for adults, the LOS increased with increasing age. Among children, 12 – 17 year olds had the longest asthma hospitalization stays. In 2009, publicly-insured persons experienced longer asthma hospitalization stays (3.49 days) than the self-pay/uninsured (2.63 days) and the privately-insured (2.89 days).

Figure 23. Average Length of Stay for Asthma Hospitalization for Adults and Children by Year, Connecticut, 2005 – 2009



Excess Asthma Hospitalizations

The hospital discharge data demonstrate that during 2000 – 2009, Hispanics and non-Hispanic Blacks were hospitalized with a primary diagnosis of asthma at higher rates than non-Hispanic Whites or non-Hispanic Others. By comparing the age-adjusted asthma hospitalization rates for these race/ethnicity groups, the number of excess asthma hospitalizations was determined.

Using non-Hispanic Whites as the reference population, the number of excess asthma hospitalizations for other race/ethnicity groups was calculated for the year 2009. As shown in Table 6, if non-Hispanic Blacks, Hispanics, and non-Hispanic Others had experienced hospitalization at the same rate as non-Hispanic Whites in 2009, there would have been a total of 2,157 fewer asthma hospitalizations in that year.

Table 6. Asthma Hospitalizations and Hospitalization Rates by Race/Ethnicity, Connecticut, 2009

Race/Ethnicity	Number of Hospitalizations	Age-Adjusted Hospitalization Rate (per 10,000)	Relative Risk (Minority/White) [a]	Excess [b] (Fewer) Events
White, Non-Hispanic	2,280	8.6	1.0	0
Black, Non-Hispanic	1,300	40.5	4.7	1,024
Hispanic	1,373	40.5	4.7	1,081
Other, Non-Hispanic	192	11.8	1.4	52

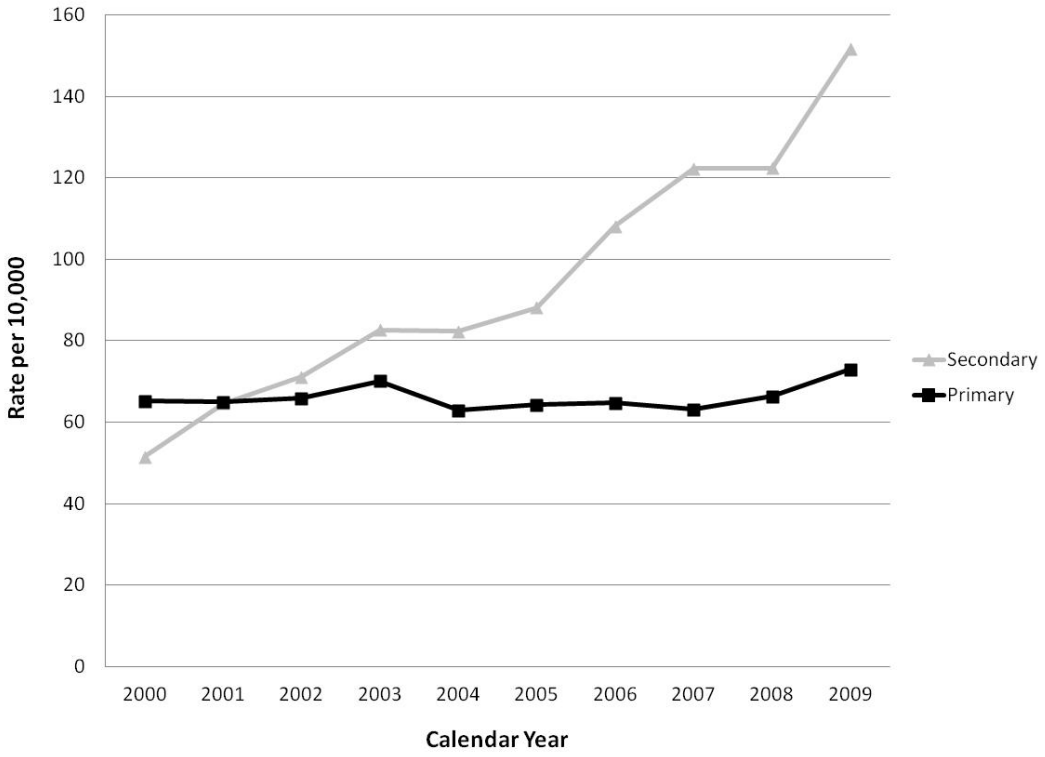
[a] "Relative risk" is estimated to be the ratio of the minority group to the non-Hispanic White group.

[b] "Excess events" are the hospitalizations that would not have occurred if the hospitalization rate for the minority group was the same as the hospitalization rate for the non-Hispanic White group.

Emergency Department Visits

From 2005 to 2009, there were on average 22,133 ED visits each year for Connecticut residents with a primary diagnosis of asthma. During the same five-year period, there was an average of 39, 944 ED visits per year for which asthma was a secondary diagnosis. In 2009, the rates of ED visit for asthma as the primary and a secondary diagnosis were the highest observed between 2000 – 2009 (Figure 24). With regard to the rate of ED visits for which asthma was the primary diagnosis during 2005 – 2009, there was a 13.5% increase from 64.3 per 10,000 to 73 per 10,000. From 2000 to 2009, the rates per 10,000 of ED admissions for asthma as a secondary diagnosis tripled from 51.5 per 10,000 to 151.6 per 10,000. From 2005 – 2009, the rate of ED visits for which asthma was a secondary diagnosis increased 72.1% from 88.1 per 10,000 to 151.6 per 10,000.

Figure 24. ED Visit Rates for Primary and Secondary Diagnoses of Asthma by Year, Connecticut, 2000 – 2009



Asthma ED visit rates were consistently higher for children than adults from 2005 – 2009. The rate of asthma ED visit per 10,000 for children was 107.1 in 2009, 1.75 times greater than the asthma ED visit rate for adults in the same year. There was a 33.5% increase in the ED for asthma as primary diagnosis visit rate among children and a 4.1% increase in the rate among adults from 2005 – 2009. The rates of ED visit for a secondary diagnosis of asthma were slightly higher for children than adults from 2005 – 2009. There was a remarkable 99.3% increase from 98.4 per 10,000 to 196.1 per 10,000 in the asthma secondary diagnosis ED rate for children from 2005 to 2009. For the same period, there was a 61.1% increase in the asthma secondary diagnosis ED rate for adults (Table 7).

Table 7. ED Visits Rates for Children and Adults by Primary and Secondary Asthma Diagnoses, Connecticut, 2005 – 2009

Year	Child (0 – 17 years)		Adult (18+ years)	
	Primary	Secondary	Primary	Secondary
	Age-adjusted rate per 10,000	Age-adjusted rate per 10,000	Age-adjusted rate per 10,000	Age-adjusted rate per 10,000
2005	80.2	98.4	58.8	84.5
2006	86.7	120.7	57.2	103.7
2007	85.9	140.4	55.3	116.1
2008	91.8	133.2	57.4	118.6
2009	107.1	196.1	61.2	136.1

Asthma ED Visits

Asthma ED visit rates for 2005 – 2009 were calculated for the estimated Connecticut population for each year and stratified by age groupings, sex, race/ethnicity, and geographic designation. The rates presented in this section are age-adjusted. Descriptive statistics on temporal characteristics, admission sources, and discharge destinations were generated for 2009 asthma ED visits. Overall, asthma ED visit rates for 2005 to 2009 were highest among children, females, and Hispanics. Stratified analyses demonstrated that Hispanic children were the group most disproportionally represented in the asthma ED visit dataset.

An ED visit for which asthma is the primary diagnosis is referred to as an *asthma ED visit*.

Children ≤ 4 years old had the highest rates of asthma ED visits during 2005 – 2009 compared to all other age groups. They experienced a 38.2% increase in the rate of asthma ED visits from 108.6 per 10,000 in 2005 to 150.1 per 10,000 in 2009. Among adults, there was an inverse relationship between age and the rate of asthma ED visits. Persons aged 65 years and older had the lowest rates of asthma ED visits of any age group with a decline of 14.7% from 21.7 per 10,000 to 18.5 per 10,000 from 2005 to 2009. In contrast, the rates of asthma ED visits among adults were highest for 18 – 24 year olds and 25 – 34 year olds. Rates for these two young adult groups were similar between 2005 and 2009 (Figure 25).

Similar to the trend observed with asthma hospitalization rates among children, asthma ED visit rates in 2005 – 2009 were higher for boys than for girls. In 2009, the asthma ED visit rate for boys was 127.9 per 10,000 and 84.9 per 10,000 for girls. Among adults, the female rate of asthma ED visits from 2005 to 2009 was higher than the rate for males (Figure 26). During 2005 – 2009, Hispanic adults had the highest rates of asthma ED visits, ranging from 4.4 times the non-Hispanic White rate in 2005 to five times the ED visit rate for non-Hispanic Whites in 2009. Among Hispanics, the asthma ED visit rate per 10,000 increased 17.2% from 145.5 to 170.5 between 2005 and 2009. In contrast, the asthma ED visit rate per 10,000 for non-Hispanic Whites during the same period increased by 4% from 32.9 to 34.2 (Figure 27).

From 2000 to 2009, Hispanic children had the highest asthma ED visit rates of all race/ethnicity subgroups. Non-Hispanic Black children experienced the second highest asthma ED visit rates for that ten-year period. Examination of 2005 – 2009 asthma ED visit data demonstrate that there was a 50.9% increase in asthma ED visits for Hispanic children from 146.6 per 10,000 in 2005 to 225.4 per 10,000 in 2009 (Figure 28). Among adults, Hispanics had highest asthma ED visit rates from 2000 to 2009. During the period of 2005 – 2009, the rate of asthma ED visits per 10,000 for Hispanic adults was highest in 2008 at 154.7, almost five times greater than the rate for non-Hispanic White adults in the same year.

Figure 25. Asthma ED Visit Rates Among Adults by Year and Age Group, Connecticut, 2005 – 2009

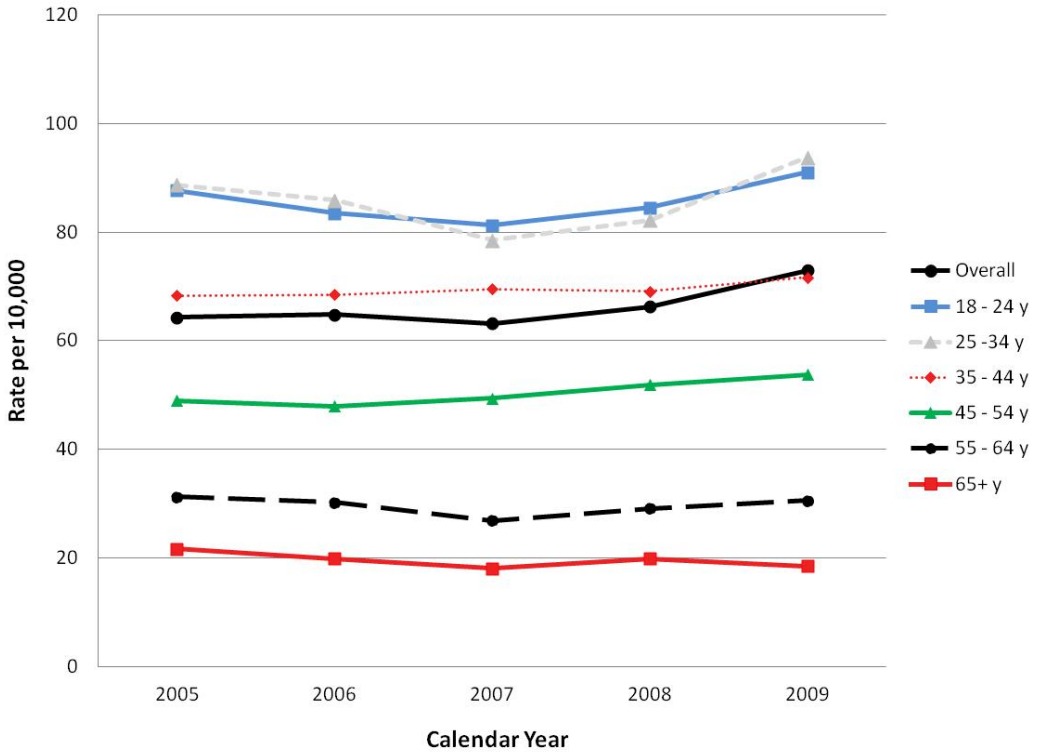


Figure 26. Asthma ED Visit Rates for Children and Adults by Year and Sex, Connecticut, 2005 – 2009

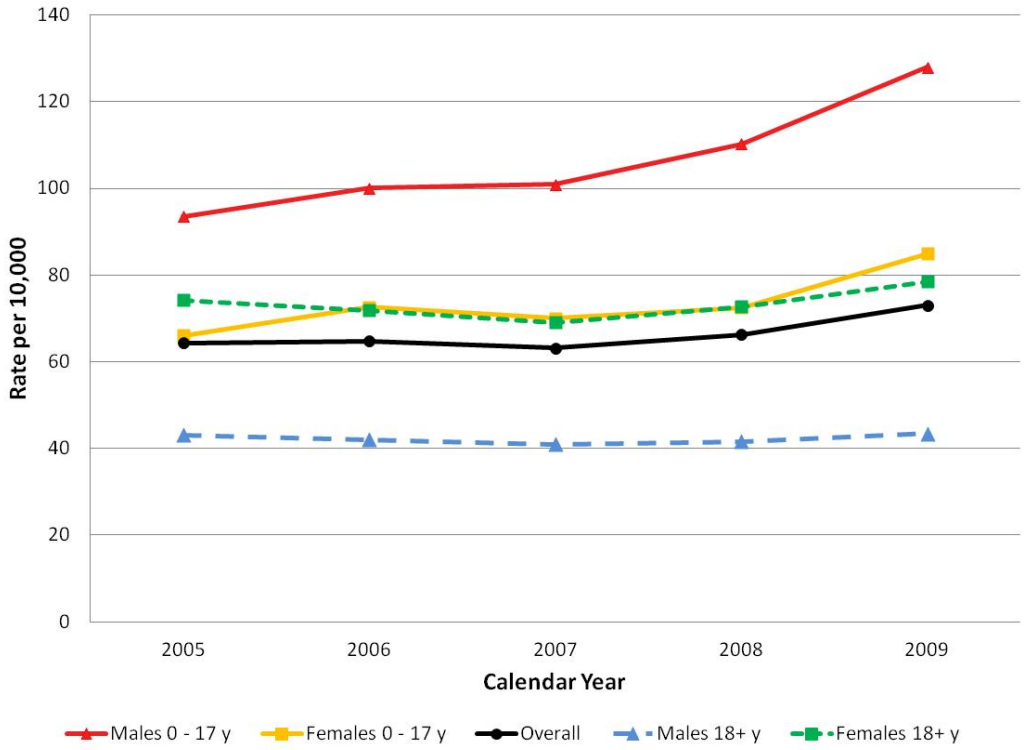


Figure 27. Asthma ED Visit Rates for Adults by Year and Race/Ethnicity, Connecticut, 2005 – 2009

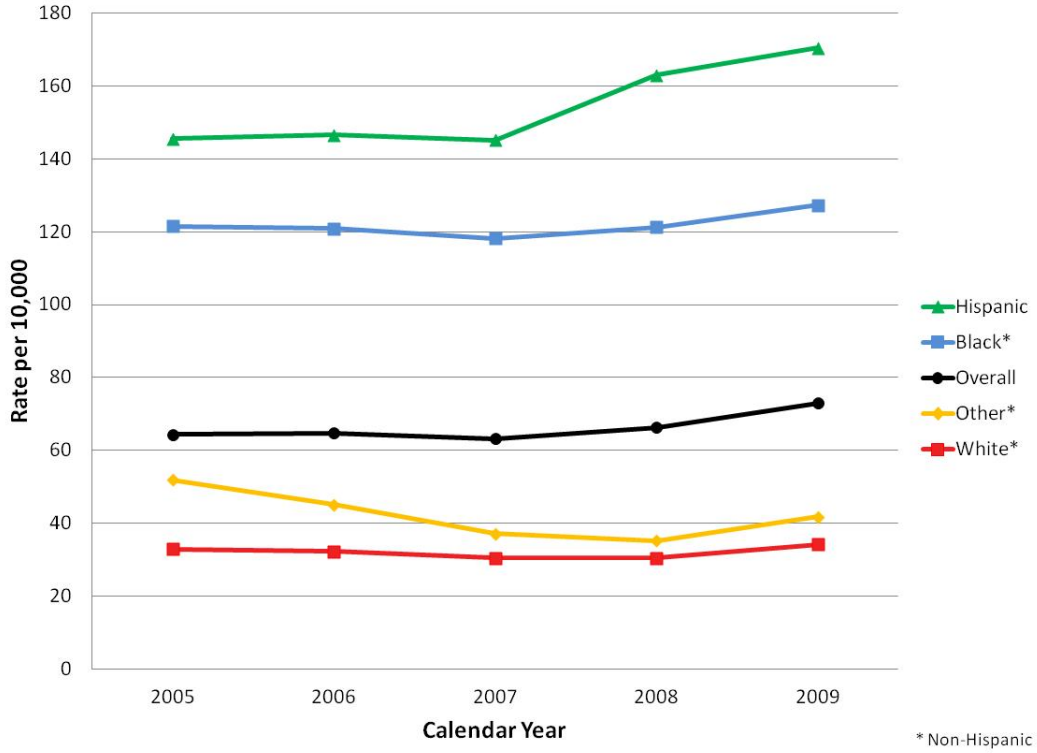
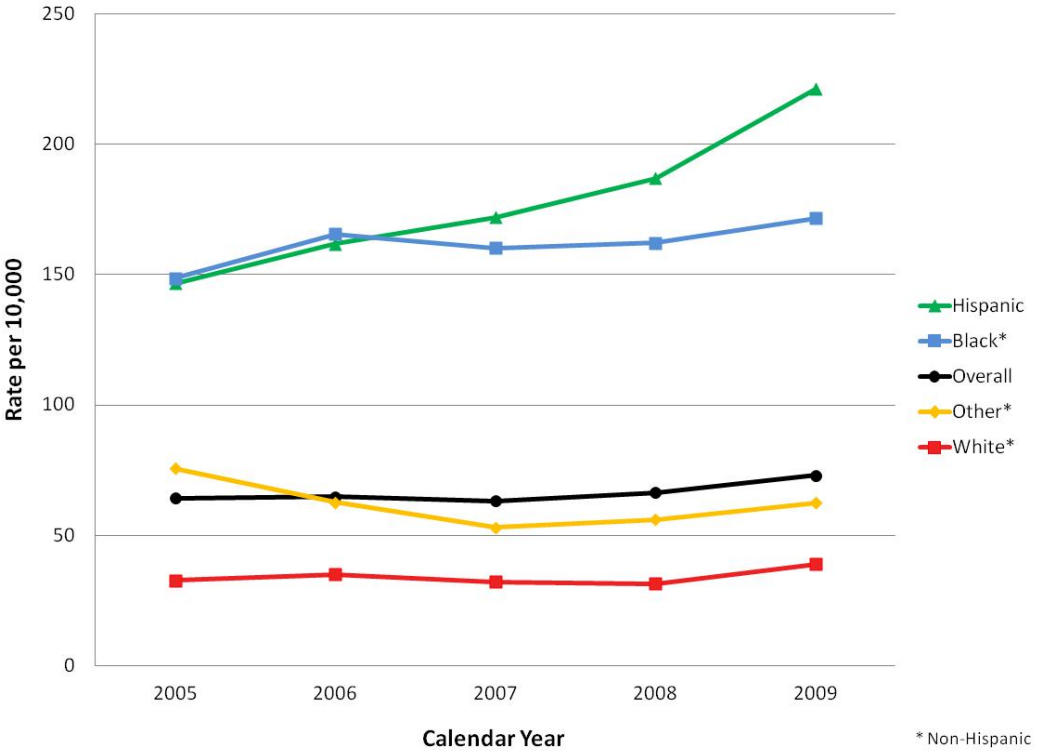


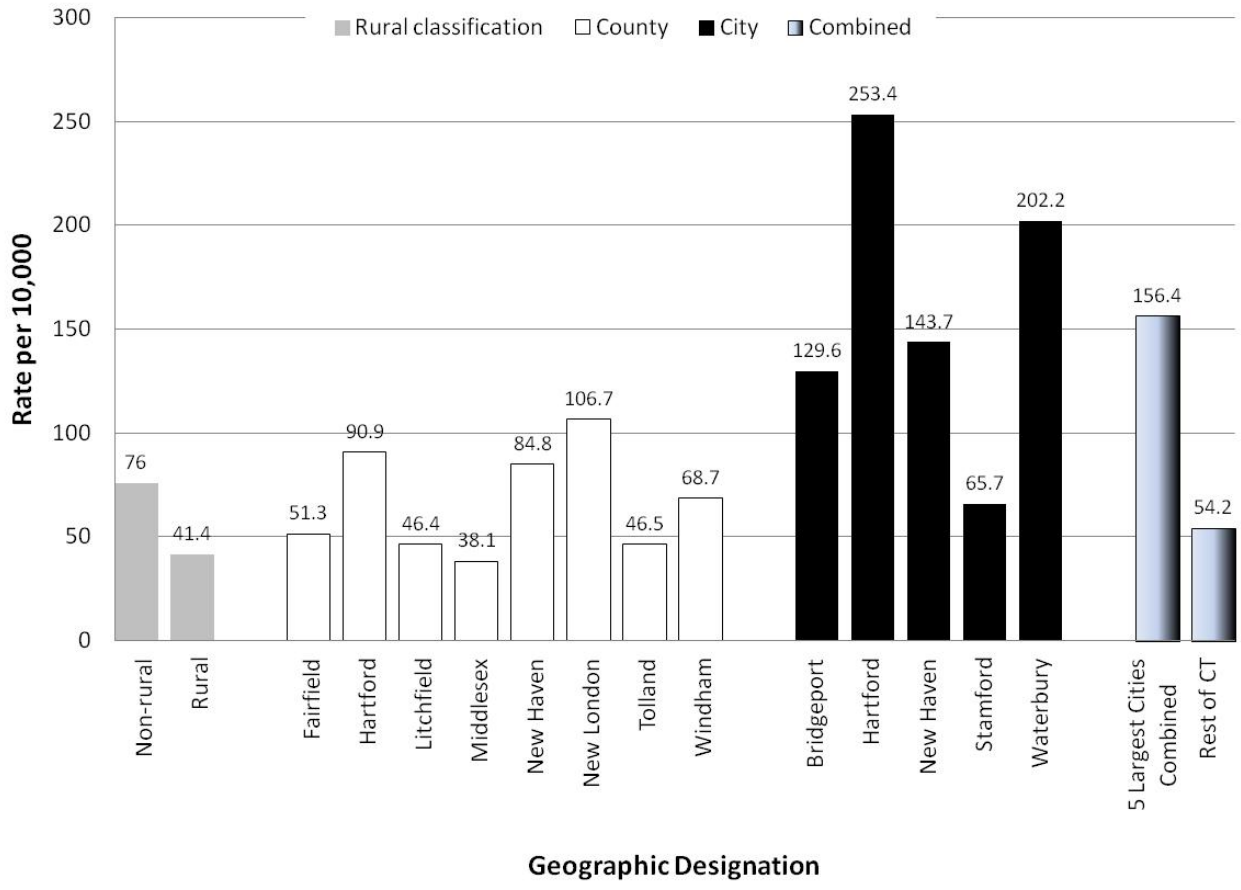
Figure 28. Asthma ED Visit Rates for Children by Race/Ethnicity, Connecticut, 2005 – 2009



Place of Residence and Asthma ED Visits

Similar to the distribution of asthma hospitalizations, the rate of asthma ED visits was lower for rural areas than for non-rural areas in 2009 (Figure 29). Asthma ED visits among non-rural Connecticut residents was 76 per 10,000 compared to 41.4 per 10,000 for rural residents. In 2009, the highest rate of asthma ED visits was among residents of New London County, with a rate of 106.7 asthma ED visits per 10,000 population. Middlesex County residents had the lowest rate of asthma ED visits at 38.1 per 10,000 population. The rate of asthma ED visits for the five largest Connecticut cities exceeded that of the rate for the rest of the state in 2009. The asthma ED visit rates per 10,000, in order from highest to lowest, were: 1) 253.4 for Hartford; 2) 202.2 for Waterbury; 3) 143.7 for New Haven; 4) 129.6 for Bridgeport; and 5) 65.7 for Stamford. In comparison, the asthma ED visit rate was 54.2 for the rest of Connecticut. The combined five-cities rate of asthma ED visits per 10,000 was 156.4, almost three times that of the rest of the state. Asthma ED visit rates by town are listed in Appendix H.

Figure 29. Asthma ED Visit Rates by Geographic Designation, Connecticut, 2009



Selected Characteristics of Asthma ED Visits

The number of asthma ED visits in 2009 was highest from September to October and lowest from July to August. Most asthma ED visits occurred on Sundays (16.3%) and Mondays (16%). Asthma ED visits were most frequent from 8 am to 11pm; morning visits to the ED were most frequent between 9 – 11am; and evening ED visits were most numerous between 6 – 9 pm. Almost all (98.3%) of all asthma ED visit patients in 2009 were discharged to their homes. One percent was sent to another medical facility. The remainder (0.8%) left the ED against medical advice.

Excess Asthma ED Visits

The hospital discharge data demonstrate that during 2000 – 2009, Hispanics and non-Hispanic Blacks had higher rates of ED visits with a primary diagnosis of asthma than persons classified as non-Hispanic Whites or non-Hispanic Others. By comparing the age-adjusted asthma ED visit rates for these race/ethnicity groups, the number of excess asthma ED visits was determined.

Using non-Hispanic Whites as the reference population, the number of excess asthma ED visits for the other race/ethnicity groups was calculated for the year 2009. As shown in Table 8, if Hispanics had ED visits for which asthma was the primary diagnosis at the same rate as non-Hispanic Whites in 2009, there would have been 6,358 fewer asthma ED visits among Hispanics. Likewise, there would have been 3,208 and 144 fewer asthma ED visits among non-Hispanic Blacks and non-Hispanic Others, respectively.

Table 8. Asthma ED Visits and ED Visit Rates by Race/Ethnicity, Connecticut, 2009

Race/Ethnicity	Number of ED Visits	Age-Adjusted ED Visit Rate (per 10,000)	Relative Risk (Minority/White) [a]	Excess [b] (Fewer) Events
White, Non-Hispanic	7,937	34.2	1.0	0
Black, Non-Hispanic	4,387	127.3	3.7	3,208
Hispanic	7,953	170.5	5.0	6,358
Other, Non-Hispanic	800	41.7	1.2	144

[a] "Relative risk" is estimated to be the ratio of the minority group to the non-Hispanic White group.

[b] "Excess events" are the ED visits that would not have occurred if the ED admission rate for the minority group was the same as the ED admission rate for the non-Hispanic White group.

Asthma ED Visits that Result in Hospitalization

Data on the instances wherein a person visiting the ED with a primary diagnosis of asthma was admitted to the hospital as an inpatient with a primary diagnosis of asthma were analyzed for 2006 – 2009.[22] These instances are referred to as *resultant asthma hospitalizations* (RAHs). On average, 4,079 or 16% of persons with a primary diagnosis of asthma were admitted to the hospital from the ED each year (Figure 30). Adults were more likely to experience RAH than children. Overall, there was a decline in the percent of inpatient hospital admissions from the ED during the four-year period (Figure 31). Among children, there was a 23.5% decrease in the number of RAHs; among adults, there was a 2.8% decrease in the number of RAHs between 2006 and 2009.

In 2009, 3,837 or 13.7% of asthma ED visits resulted in asthma hospitalizations. The percent of females admitted as inpatients with a primary diagnosis of asthma from the ED was 1.3 times greater than the percent of males (15.2% versus 11.7%). Hispanics were less likely than non-Hispanic White, non-Hispanic Blacks, and non-Hispanic Others to be admitted as hospital inpatients. Non-Hispanic Blacks were almost twice as likely to be hospitalized for asthma from the ED as Hispanics (19.1% of resultant hospitalizations versus 10.8%). With regard to age groups, persons $\geq$ 65 years old had the highest percentage of resultant asthma hospitalizations (46.8%) while 18 – 24 year olds had the lowest percentage, 4.9%, of asthma inpatient admissions from the ED. Table 9 summarizes this information.

The percentages of asthma hospitalizations from asthma ED visits in 2009 were roughly equivalent for rural and non-rural areas. Of the asthma ED visits by rural residents, 14% resulted in inpatient hospital admissions; of the asthma ED visits by non-rural residents, 13.7% resulted in hospitalization with asthma as the primary diagnosis. New Haven County had the highest percent of resultant asthma hospitalizations (17.5%) followed by: Windham County (15.7%); Fairfield County (14.6%); Middlesex County (13.3%); Litchfield County (12.7%); Tolland County (11.7%); Hartford County (11%); and New London County (9.3%). Among the five largest cities, New Haven had the largest percentage of resultant asthma hospitalizations (25.7%) followed by: Bridgeport (14.3%); Stamford (12.4%); Hartford (11.7%); and Waterbury (9.1%). For the rest of Connecticut cities and towns combined, the percent of resultant asthma hospitalizations was 13%. See Appendix I for information resultant asthma hospitalizations by town of patient residence.

[22] Hospital discharge data for 2005 were not included in the analysis because there was a mid-year change in the coding of the variable that indicates the source of hospital admission. Therefore, the selection of cases would have been imprecise and not comparable to the subsequent years of data.

Figure 30. Frequency of Asthma Admissions to Hospital from the ED, Connecticut, 2006 – 2009

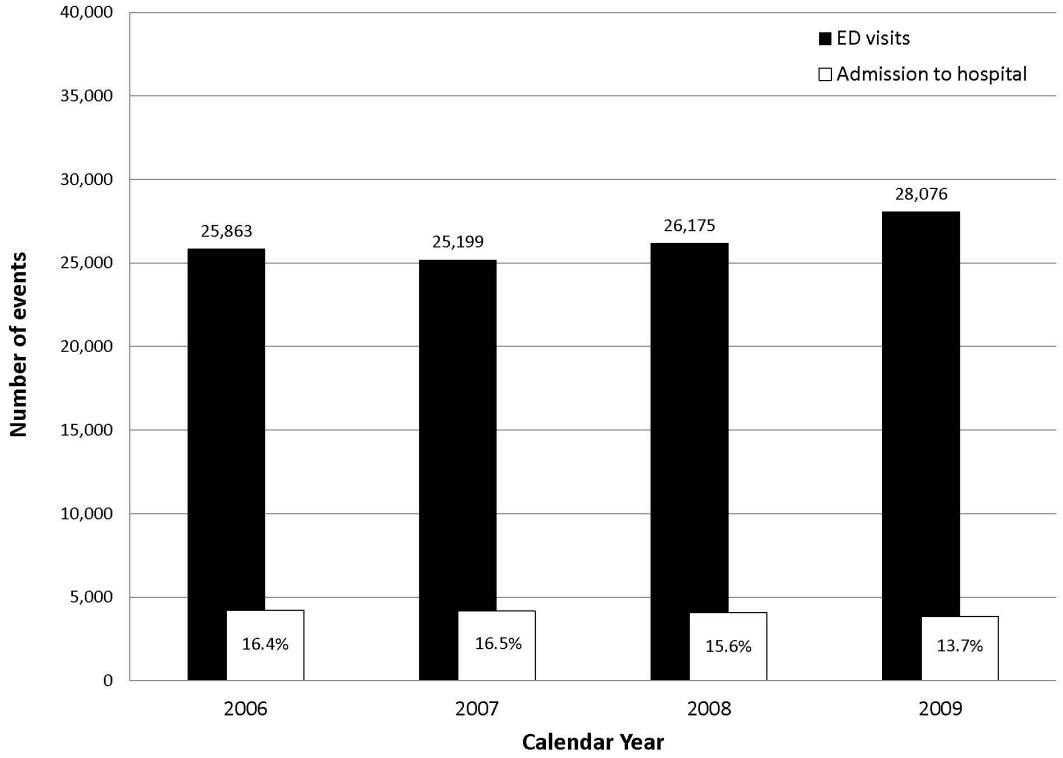


Figure 31. Resultant Asthma Hospitatlizations for Adults and Children by Year, Connecticut, 2006 – 2009

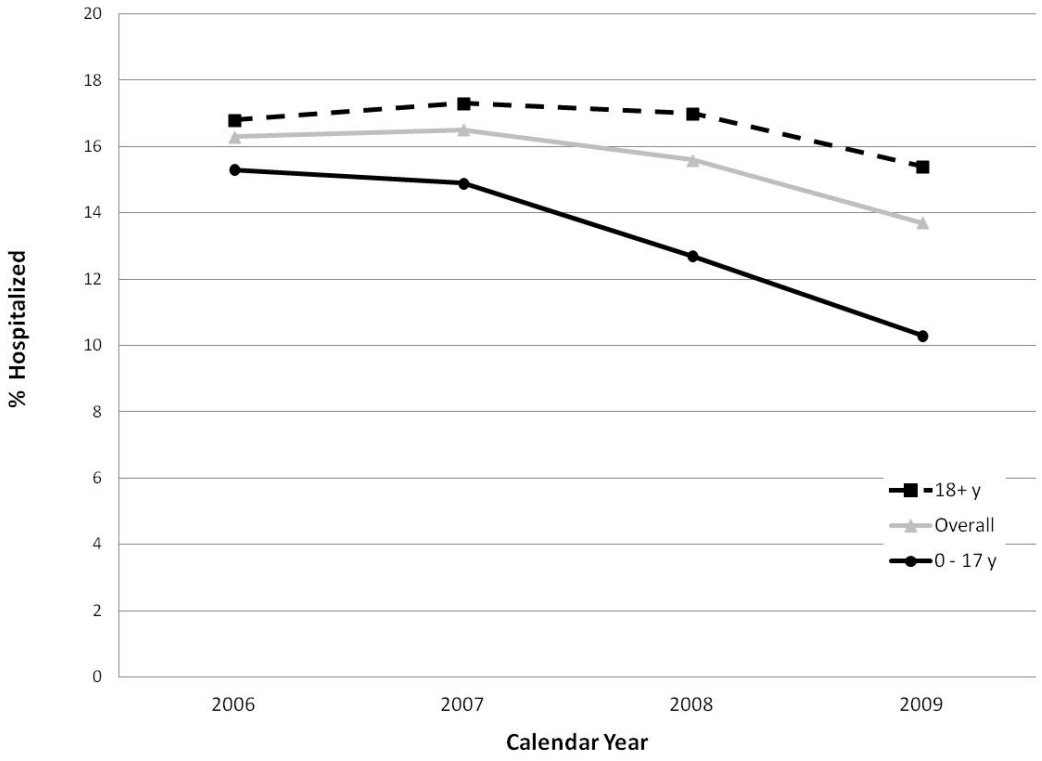


Table 9. Asthma ED Visits and Resultant Asthma Hospitalizations by Selected Demographic Characteristics, Connecticut, 2009

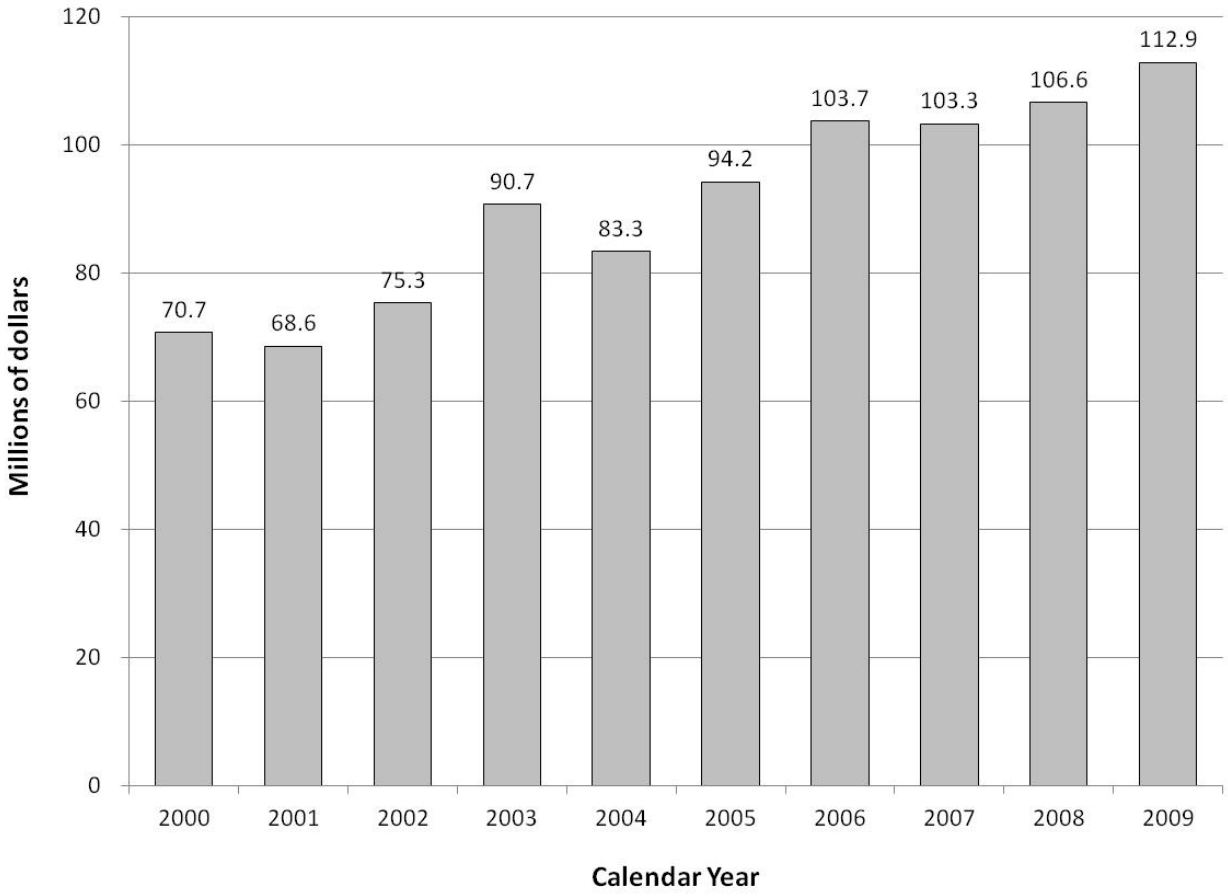
Characteristics	No. Went to ED	No. (%) Hospitalized
Total	28,076	3,837 (13.7)
Sex		
Male	12,132	1,420 (11.7)
Female	15,895	2,417 (15.2)
Race/Ethnicity		
White, non-Hispanic	9,634	1,697 (17.6)
Black, non-Hispanic	5,422	1,035 (19.1)
Hispanic	8,914	961 (10.8)
Other race, non-Hispanic	944	144 (15.3)
Age group		
0-4 years	3,639	480 (13.2)
5-11 years	3,777	374 (9.9)
12-17 years	2,140	131 (6.1)
18-24 years	3,258	159 (4.9)
25-34 years	4,151	293 (7.1)
35-44 years	3,961	460 (11.6)
45-54 years	3,715	691 (18.6)
55-64 years	1,738	455 (26.2)
65+ years	1,697	794 (46.8)

Asthma Healthcare Charges

The hospital discharge data provide information on the charges associated with the health care services provided to individuals who are hospitalized or visit the ED (see Appendix J). The charges discussed in this section are inflation-adjusted to 2009 dollars. The combination of ED visit and inpatient hospitalization charges are referred to as *hospital healthcare charges*. Please note that charges are not the same as cost – charges are not necessarily equal to the actual cost of a service (Finkler, 1982).

In 2009, the combined, inflation-adjusted charges for asthma ED visit and inpatient hospitalizations were $112,854,345 ($32,593,946 for ED visits and $80,260,399 for hospitalizations). This is equivalent to almost one percent of the total hospital healthcare charges in Connecticut in 2009. From 2000 to 2009, the asthma hospital healthcare charges increased 1.6 times from $70,719,238 to $112,854,345 (Figure 32). From 2005 – 2009, there was a 19.8% increase in asthma hospitalization and ED visit charges from $94,199,808 to $112,854,345.

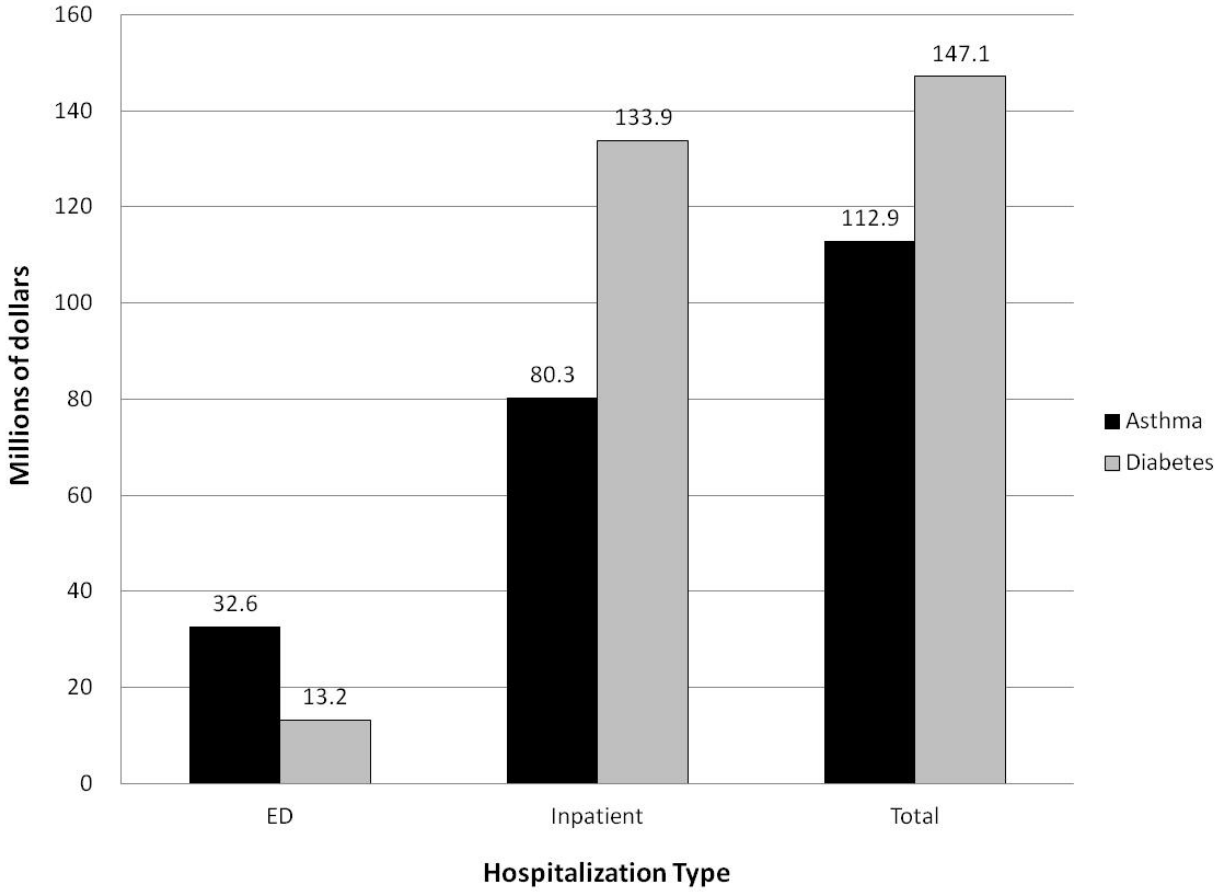
Figure 32. Asthma Hospital Healthcare Charges* by Year, Connecticut, 2000 – 2009



*Charges are inflation-adjusted to 2009 dollars.

To place the 2009 asthma hospital healthcare charges in the larger context of chronic disease care costs, they were compared to the 2009 hospital healthcare charges associated with primary diagnosis of diabetes.[23] In 2009, the combined charges for diabetes ED visits and hospitalizations were $147,138,697 ($13,238,116 for ED visits and $133,900,581 for hospitalizations). Asthma ED visits were 2.5 times the cost of diabetes ED visits and asthma hospitalizations were 0.6 times the cost of diabetes hospitalizations. Overall, asthma hospital healthcare charges were 0.8 times that of diabetes hospital healthcare charges (Figure 33).

Figure 33. Hospital Health Care Charges for Asthma and Diabetes, Connecticut, 2009



[23] According to 2009 BRFSS data analyses published online by the CDC, 6.7% (CI_{95} 6.0 – 7.4) of Connecticut residents ≥ 18 years old have ever been told that they had diabetes and 15.3% (CI_{95} 13.8 – 16.8) have ever been told that they had asthma. 2009 BRFSS Prevalence and Trends available online at http://apps.nccd.cdc.gov/brfss/page.asp?cat=AS&yr=2009&state=CT#AS.

Asthma inpatient and ED hospital healthcare charges

On average, from 2005 – 2009 asthma inpatient hospitalization charges were 2.6 times that of asthma ED charges (Figure 34). For the same five-year period, asthma hospital healthcare charges for adults were 3.4 times greater than the charges for children (Table 10). In 2009, adults ≥ 65 years old accounted for 28.5% of all asthma inpatient hospitalization charges (Figure 35). The asthma ED visit charges associated with adults aged 25 – 34 years and 35 – 44 years accounted for 15.7% and 15.6%, respectively, of all asthma ED visit charges (Figure 36). In terms of overall asthma hospital healthcare charges in 2009, adults ≥ 65 years old who were inpatients accounted for $22,908,484 or 20.3% of the charges, the largest proportion of charges across all hospitalization types and age groups.

Figure 34. Asthma Hospital Healthcare Charges by Hospitalization Year and Type, Connecticut, 2005 – 2009

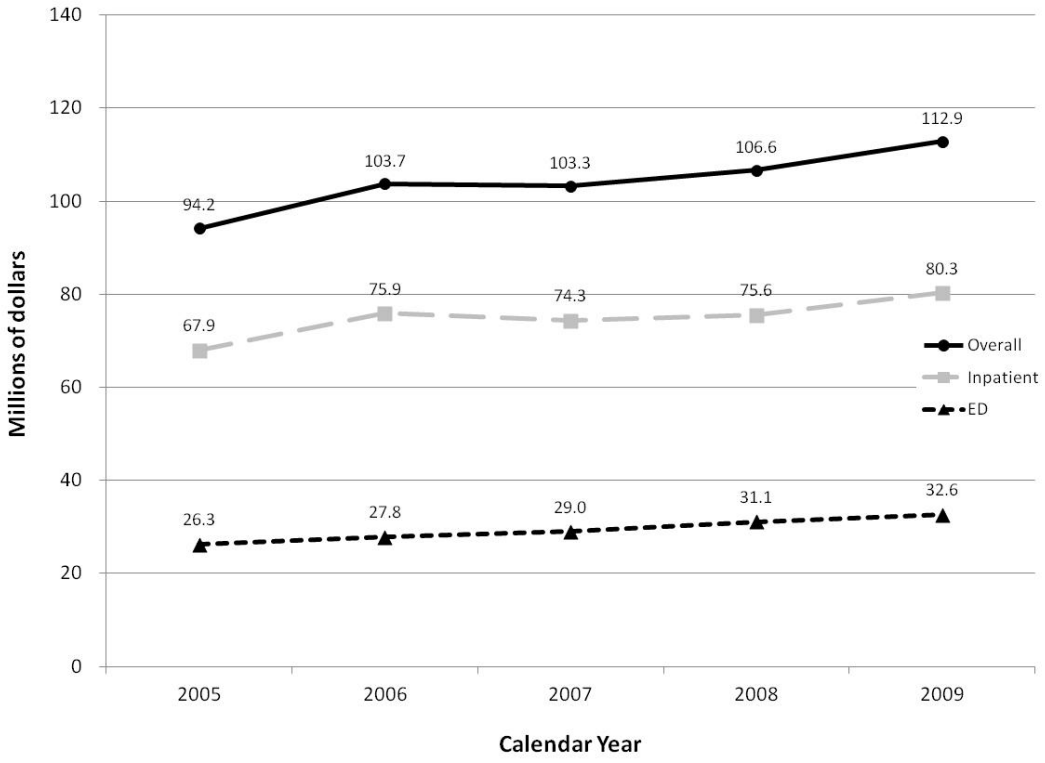


Table 10. Asthma Hospital Healthcare Charges for Children and Adults, Connecticut, 2005 – 2009

Year	Child (0 – 17 years)		Adult (18+ years)		Total	
	N	Inflation-Adjusted Charges	N	Inflation-Adjusted Charges	N	Inflation-Adjusted Charges
2005	8,028	$21,347,309	18,006	$72,852,499	26,034	$94,199,808
2006	8,690	$23,533,127	17,771	$80,168,547	26,461	$103,701,674
2007	8,436	$23,867,923	17,280	$79,406,596	25,716	$103,274,519
2008	8,716	$23,215,274	18,136	$83,413,544	26,852	$106,628,818
2009	10,054	$26,430,357	19,282	$86,423,988	29,336	$112,854,345

Figure 35. Asthma Inpatient Healthcare Charges by Age Group, Connecticut, 2009 – Comparison of charges within group and relative to overall asthma hospital healthcare charges

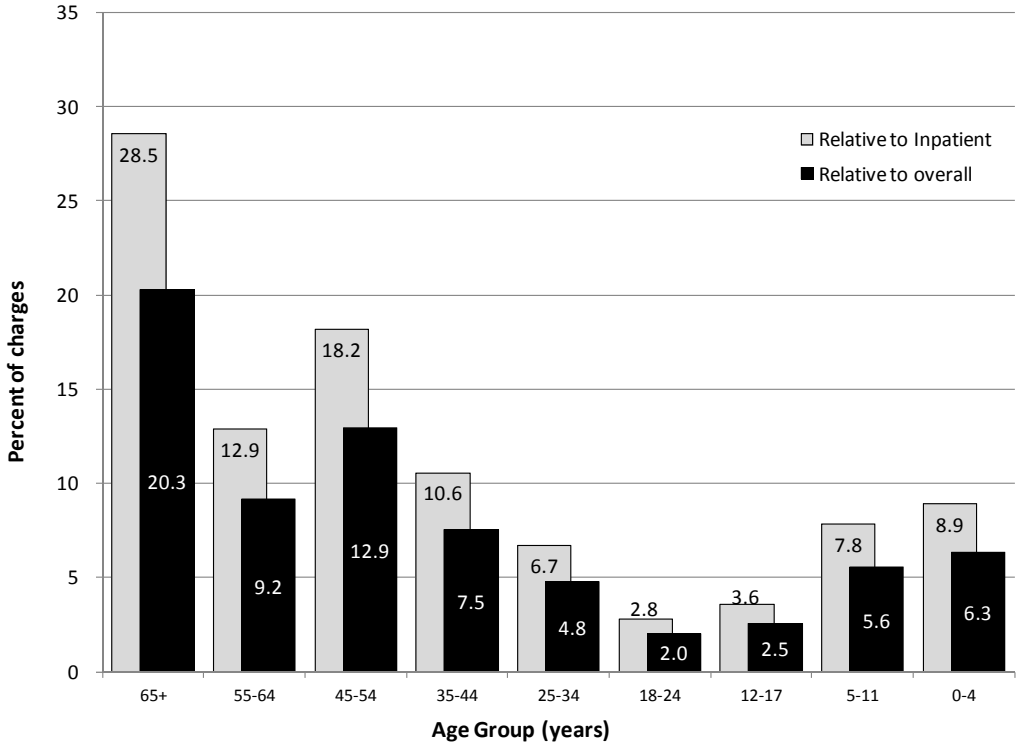
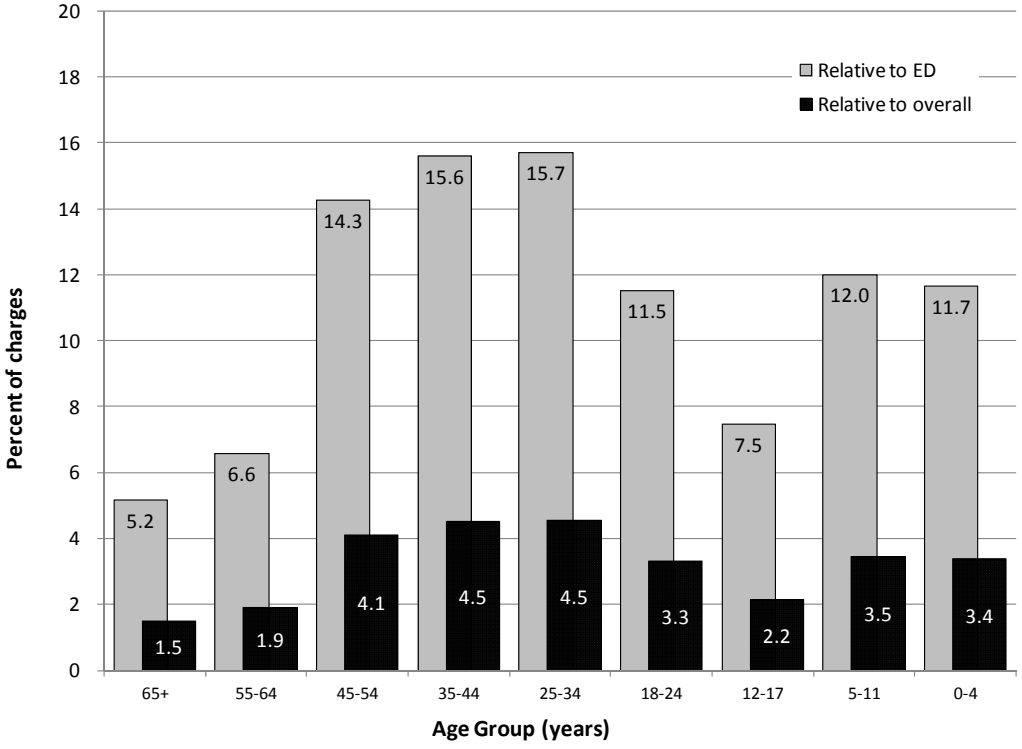


Figure 36. Asthma ED Visit Healthcare Charges by Age Group, Connecticut, 2009 – Comparison of charges within group and relative to overall asthma hospital healthcare charges



With regard to difference in charges by sex, in 2009, the asthma hospital healthcare charges for females were $71,905,436 and $40,948,909 for males. Charges for females receiving inpatient services were twice that for males ($53,293,649 for females and $26,966,750 for males). Charges for females receiving ED services were 1.3 times that for males ($18,611,787 for females and $13,982,159 for males).

In 2009, average asthma inpatient charges were $16,616 for non-Hispanic Whites; $14,894 for Hispanics; $14,811 for non-Hispanic Blacks; and $13,804 for non-Hispanic Others. Total asthma inpatient charges were highest for non-Hispanic Whites at $37,885,112. Average ED charges were $1,484 for non-Hispanic Blacks; $1,337 for Hispanics; $1,329 for non-Hispanic Others; and $1,301 for non-Hispanic Whites. Total asthma ED charges were highest for Hispanics at $10,624,952.

Asthma hospital healthcare charges in 2009 were highest among residents of the city of New Haven, for which the average charge per event were $6,064.70. Although Hamden was ranked 8th in asthma hospital healthcare charges, that city had the highest charges per event at $7,357.12. A list of the top ten cities for asthma hospital charges in 2009 is presented in Appendix J.

Excess asthma hospitalization healthcare charges

Earlier in this section, the numbers of excess asthma hospitalizations and ED visits for race/ethnicity groups in 2009 were calculated using the asthma hospitalization and ED visits rates for non-Hispanic Whites as the reference group. The race/ethnicity group-specific average charges were multiplied by the number of calculated excess events to determine the excess charges that result from racial/ethnic disparities in hospital healthcare utilization for asthma treatment (Table 11).

Overall, $15,114,800 (or 13.4% of the total asthma hospital healthcare charges in 2009) would not have occurred if non-Hispanic Blacks, non-Hispanic Others, and Hispanics had the same hospital healthcare utilization rates for asthma treatment as non-Hispanic Whites in 2009. This would have reduced the 2009 asthma hospital healthcare charges 15.5% from $112,854,345 to $97,739,545. The greatest potential avoidance of charges would have resulted from fewer asthma hospitalizations among Hispanics and non-Hispanic Blacks, and fewer asthma ED visits among Hispanics.

Sources of Healthcare Payment

In 2009, public insurance (Medicare or Medicaid), was the indicated payer for 73.8% of asthma hospitalizations, 60% of asthma ED visits (Table 12), and 69.6% of resultant asthma hospitalizations (i.e., inpatient hospitalizations that resulted from ED visits for which asthma was the primary diagnosis) in Connecticut. The average charges billed to public insurance for asthma hospitalizations and ED visits were higher than the average charges for services billed to private, self-pay/uninsured, or other insurances. The average cost of inpatient services billed to public insurance was $16,524 per hospitalization, $2,933 more than the average cost of inpatient services billed to private insurance.

Table 11. Excess Asthma Hospital Healthcare Charges by Race/Ethnicity, Connecticut, 2009

Race/Ethnicity	Relative Risk (Minority/ White) [a]	Excess [b] (Fewer) Events	Average Charges	Excess Charges [c]	Potentially-Avoidable Charges [d]
Inpatient					
White, Non-Hispanic	1	0	$1,301	—	—
Black, Non-Hispanic	4.7	1,024	$1,484	$15,166,464	+$4,087,802
Hispanic	4.7	1,081	$1,337	$16,100,414	+$4,349,345
Other, Non-Hispanic	1.4	52	$1,329	$717,808	+$1,932,651
ED					
White, Non-Hispanic	1	0	$16,616	—	—
Black, Non-Hispanic	3.7	3,208	$14,811	$4,760,672	+$1,748,713
Hispanic	5	6,358	$14,894	$8,500,646	+$2,124,306
Other, Non-Hispanic	1.2	144	$13,804	$191,376	+ $871,983

[a] "Relative risk" is estimated to be the ratio of the minority group to the non-Hispanic White group.
[b] "Excess events" are the ED visits that would not have occurred if the ED admission rate for the minority group was the same as the ED admission rate for the non-Hispanic White group.
[c] Excess Charges" are the result of multiplying excess events by the average charges.
[d] "Potentially-Avoidable Charges" are the result of subtracting the calculated excess charges from the actual charges.

Table 12. Asthma Hospital Healthcare Charges by Payor, Connecticut, 2009

Hospitalization Type	Payor			
	Public	Private	Self-pay/Uninsured	Other
Inpatient				
N	3,586	1,380	168	12
Average charges	$16,524	$13,531	$13,024	$12,076
Total charges	$59,254,691	$18,672,843	$2,187,958	$144,908
Percent of total charges	73.8%	23.3%	2.7%	0.2%
ED				
N	14,290	6,941	2,850	102
Average charges	$1,368	$1,311	$1,355	$836
Total charges	$19,546,626	$9,096,339	$3,860,336	$85,263
Percent of total charges	60.0%	27.9%	11.8%	0.3%