



# The Burden of Asthma in Delaware

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Delaware Health & Social Services  
Division of Public Health



Department of Natural Resources  
and Environmental Control



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# Introduction

Asthma, as this report will show, creates a significant burden for Delaware, for many of its employers, and for many Delawareans and their families. Because asthma is a chronic condition, it requires lifestyle changes for asthma sufferers and their families. People with asthma usually adopt a regimen of self-management, with the help of a physician. Some uses of the organized health care system—especially inpatient stays and emergency room visits—may represent breakdowns in the management of asthma.

These same events also can represent gaps in the health care system. If some Delawareans have less access to care than others, or if the care provided to any person does not follow the most current evidence-based practice, then asthma symptoms may flare, requiring medical intervention.

This report seeks to answer a number of questions about asthma in Delaware:

- How many people have asthma? Does asthma affect some people more than others? Does Delaware differ from national trends in any way?
- How large a threat to health is asthma? How much do people with asthma use the health care system? How many deaths does it cause?
- How much does asthma consume of our health care dollar in Delaware?
- How much does asthma impact productivity and quality of life?
- Is there an environmental impact? Does air pollution impact asthma?

Answering these questions will help provide a context for action. If it is clear that some Delawareans suffer more than others, then efforts should be targeted to eliminate such disparities. Both the providers of care and those affected by the disease have some control over the outcomes highlighted in this report. Educational efforts targeting primary care physicians and their patients could potentially reduce the need to use hospital and emergency room resources.

Because environmental factors can trigger asthma symptoms, efforts to reduce smoking in public environments or in the home can make a difference. Continued monitoring of air quality and attempts to reduce airborne irritants also can have a widespread impact upon those with asthma and their families. Efforts to reduce other known irritants such as pet dander, dust mites, and some chemicals in homes and public places also can reduce the burden of asthma.

Comprehensive action will be needed. Asthma sufferers and their families, health care providers, the larger community acting through the government and the private sector—all can have a role in reducing the impact of asthma. While this report includes many numbers, it is important to remember what these numbers mean. People affected by asthma have to live with wheezing, coughing, and shortness of breath; and they live with anxiety about whether this attack will escalate into a real health emergency. For them, this vulnerability and anxiety are real burdens of asthma.

# Data Issues and Resources

## *How many Delawareans have asthma?*

Prevalence is the percentage of a population that has a condition at a specific point in time or time interval, usually a year. To the extent that prevalence data exist, we can answer these questions:

- How many Delawareans have asthma?
- Are some groups more impacted than others?
- Does Delaware differ from national rates or trends?

The following data resources reveal that there are multiple estimates of asthma prevalence, with both national and Delaware-specific rates. In many cases, it was possible to estimate prevalence rates by age, gender, race, and location.

### **National Health Interview Survey (NHIS)**

The National Center for Health Statistics (NCHS) conducts its National Health Interview Survey (NHIS) on a yearly basis. As a face-to-face household interview, the NHIS is not subject to some of the limitations of telephone interview surveys. To better estimate prevalence rates for minority populations and to provide a large enough pool of cases for separate analysis, both African Americans and Hispanics are over-sampled. To estimate prevalence rates by age group, parents are asked about their children and responses for each parent and child are entered separately. NHIS provides national estimates only. The sample of Delaware residents in this survey is not large enough to generate state-level estimates.

The NHIS captures prevalence rates for lifetime and for the current year by first asking, “Has a doctor or other health professional ever told you that you have asthma?” A “yes” to this question triggers a second question, “During the past 12 months, have you had an episode of asthma or an asthma attack?”

### **Delaware Behavioral Risk Factor Survey (BRFS)**

To assist states in monitoring public health problems and programs, the Centers for Disease Control and Prevention (CDC) sponsors the nation’s largest ongoing telephone survey, the Behavioral Risk Factor Survey (BRFS). This telephone survey interviews a random sample of residents 18 years or older. Since 2000, the annual sample in Delaware is about 4,000 Delaware adults. The Center for Applied Demography and Survey Research (CADSR), University of Delaware, conducts the survey for the Division of Public Health.

The survey questions used in this report are similar to those asked in the NHIS. First, respondents are asked, “Have you ever been told by a doctor . . . that you have asthma?” This question generates the lifetime prevalence rate. People who respond “yes” are asked, “Do you still have asthma?” and that response generates the current rate. Those who report current

asthma are asked whether they had an asthma attack or episode in the last 12 months. The results of this survey enable Delaware to estimate lifetime and current prevalence of asthma for its adult population.

### **Youth Risk Behavior Survey (YRBS)**

This survey of public high school students is sponsored by the National Center for Chronic Disease Prevention and Health Promotion, CDC. In 2003, questions were added related to asthma, similar to those in NHIS and BRFS above, and over 3,000 students in 32 Delaware public high schools (grades 9 to 12) responded. The survey is conducted for the Delaware Department of Education by the Center for Drug and Alcohol Studies of the University of Delaware.

### **Division of Public Health School Nurse Survey**

Quality Insights of Delaware (QID), on behalf of the Division of Public Health, Delaware Health and Social Services, conducted a survey in 2001 of school nurses in Delaware to ascertain the prevalence of a wide variety of chronic conditions. QID sent surveys to 277 public and private primary, secondary, and specialty schools in Delaware. One hundred fifty-four schools (63%) responded, representing over 82,200 children. Response rates varied by county, but these variances were not statistically significant. Nurses were instructed to include in their counts only physician-diagnosed conditions from the school records. Asthma was the condition that was most prevalent among the responding schools.

### **Health Care Utilization and Mortality**

National rates are insufficient to gauge the impact of asthma on Delaware's health care system. To answer the questions related to health care use and death, we must rely on a mosaic of statewide data sources.

In addition to the population characteristics noted above, it is important to attempt to track health care utilization at several points in the fragmented continuum of care—emergency rooms, physicians' offices, and hospital inpatient care. Given the importance of prescription drugs for the control of asthma, it is also necessary to secure data about medications.

Clinical data do not reside in a single database. Critical administrative data, such as insurance claims data, include information about diagnosis and utilization, but claims data belong to the payers who reimburse for the health care transactions reflected in the claims information. Such claims information is only available to the extent that payers agree to share it.

For purposes of this report, we were fortunate that the BRFS includes questions related to health care utilization. In 2002, the Delaware BRFS included the Adult Asthma History Module, with questions about utilization and occupational impact. Only the small sample of respondents who reported lifetime or current asthma answered these questions. Thus, while these people are statistically representative of the Delaware population, because of the structure of BRFS, numeric estimates projected from them might be inaccurate.

For hospital inpatient services—the most intense and costly encounter—the Division of Public Health collects and compiles hospital discharge information from all Delaware hospitals. Using these data, it is possible to estimate usage and charges for those discharges with a diagnosis of asthma.

To supplement these hospital data and to secure information about non-hospital services such as emergency room visits, physician office visits, and pharmacy usage, state staff secured aggregated claims and encounter data from the Medical Assistance (Medicaid) and state employee health plans. Although these programs are not representative of Delaware residents, they include a significant number of Delawareans—approximately a third of the total population. Access to the Medicaid data enables us to develop utilization rates for a population with a significant number of young children and minorities—populations with a high prevalence of asthma. In addition, the state employees program covers a large number of young dependents. Thus, these rates will provide useful indicators of health care use and impact.

Mortality data are recorded by the Division of Public Health’s Health Statistics Center. Data collected over a number of years are included in this report.

### **Health Care Costs**

Determination of health care costs is one of the most challenging aspects of this report. Most sources report health care **charges**, which may be quite different from real costs, because most payers secure discounts from charges. In addition, the fragmented payer system noted earlier prevents a single repository for charge data, except for inpatient stays. The hospital discharge data collection process noted above does capture charges.

The Medicaid and state employees programs’ charges provide some indication of trends and impacts, but estimating a total charge or cost is not possible. Even with these major limitations, it is possible to determine that asthma has significant financial impacts.

### **Productivity and Quality of Life**

Often called the “indirect” costs of asthma’s impact, these elements are nearly impossible to quantify. This report will present data from the BRFS that address some of these productivity and quality of life issues. Though these data were generated from a small sample of Delawareans, it is possible to make some approximate projections of asthma’s indirect costs.

### **Environmental Impact**



A number of environmental factors—cigarette smoke, particulate matter, ground-level ozone—impact people with asthma. The Delaware BRFS estimates smoking prevalence of adults. The Division of Public Health’s Youth Tobacco Survey provides smoking prevalence data from approximately 2,300 middle school and 2,500 high school students who responded to surveys taken at school in 2000 and 2002. It is known that smoking and environmental tobacco smoke aggravate asthma

symptoms.

The Department of Natural Resources and Environmental Control (DNREC) tracks and reports airborne pollutants that can cause increased distress for asthma sufferers. For such pollutants, the goal is to reduce them to acceptable levels. This report includes air quality levels by county and when air quality standards were not met in each county.

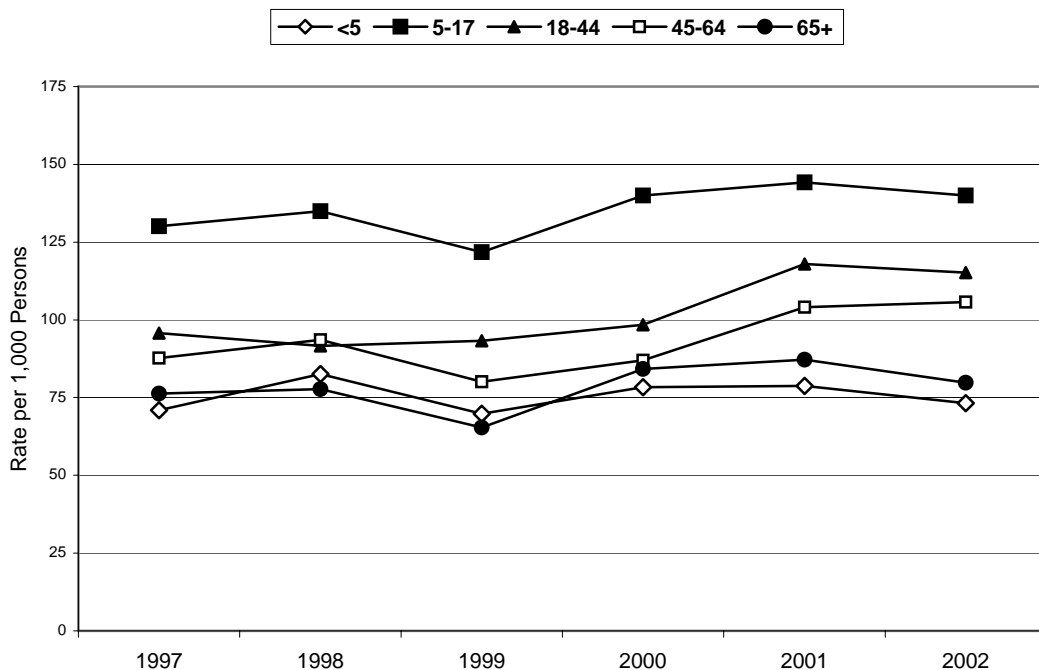


# How Many People Are Affected by Asthma?

## National Prevalence Estimates

To provide context, we first provide the national lifetime prevalence rates, per 1000 people, by age, as derived from the NHIS.

**Figure 1**  
**US Lifetime Prevalence of Asthma, by Age, 1997-2002**



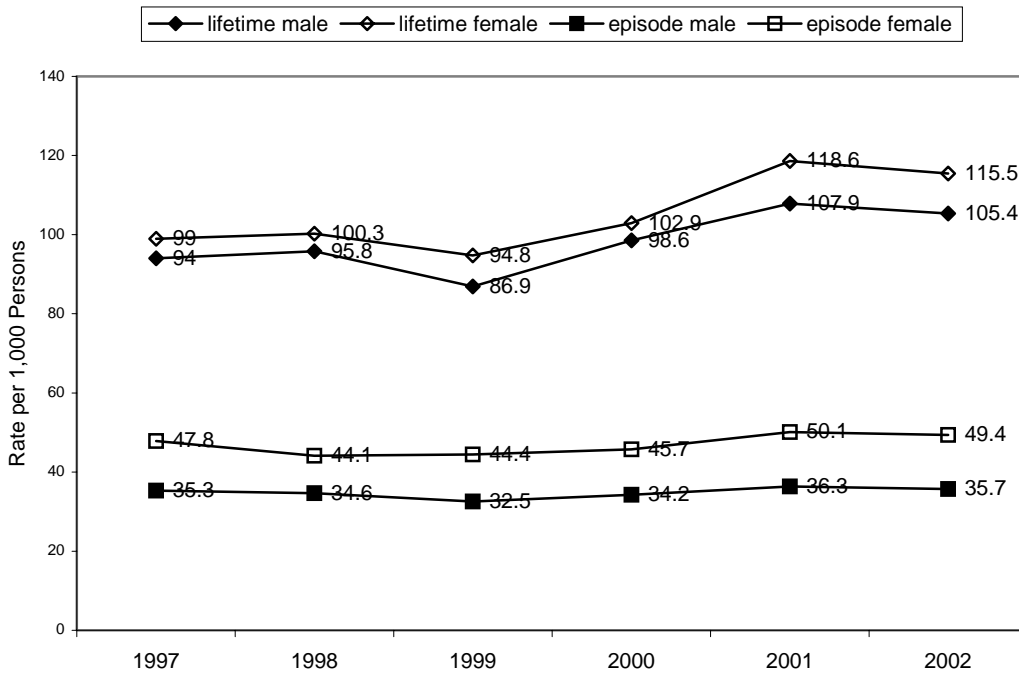
Source: National Health Interview Survey, National Center for Health Statistics (NCHS), CDC

The age differentials are striking. Prevalence appears to decrease with age, but this may be offset by increased diagnosis of asthma symptoms as Chronic Obstructive Pulmonary Disease (COPD) among older adults. In 2002, the prevalence rate was approximately 140 per 1,000 5-to-17-year olds, but just over 75 per 1,000 people age 65 or older. Further, the trends in the age groups with the largest number of people – the three middle age groups – appear to be slightly increasing over time. The rate for 18-44 year olds in 2000 was approximately 100 per 1,000; in 2001, it was about 120 in 1,000.

Figure 1 shows significant age differences in the prevalence of asthma. Are there other differences? As the following tables show, there are substantial differentials based on race and gender. These graphs track both the lifetime and current or episode prevalence rates.

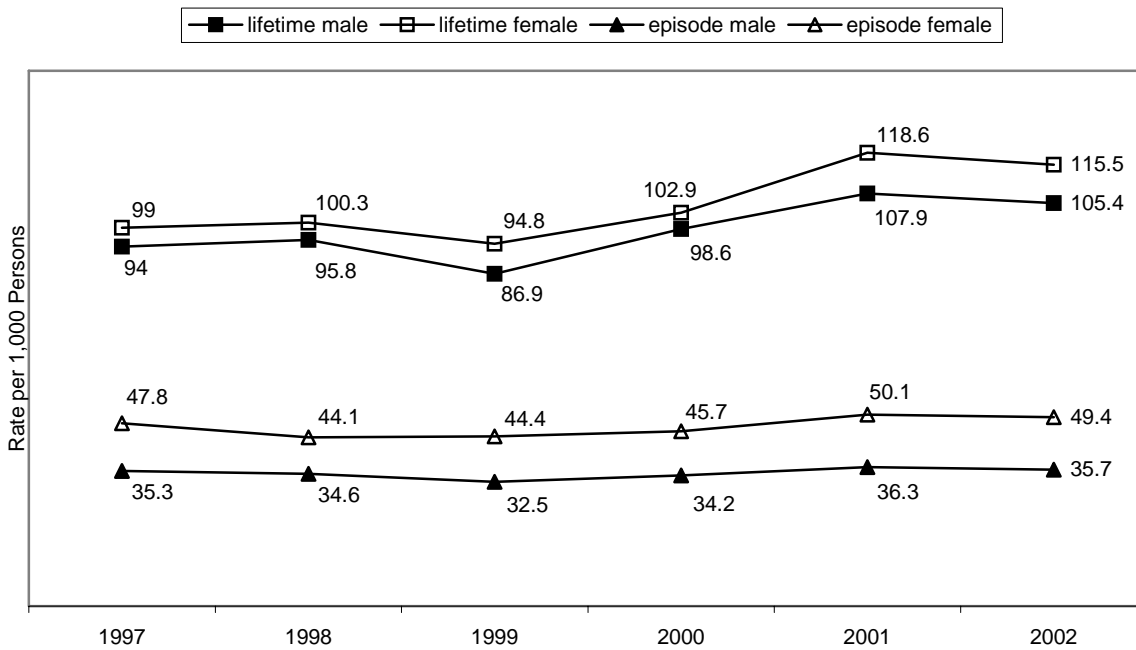


**Figure 2**  
**US Prevalence of Asthma Lifetime and Current,**  
**All Ages, By Gender, 1997-2002**



Source: National Health Interview Survey, NCHS

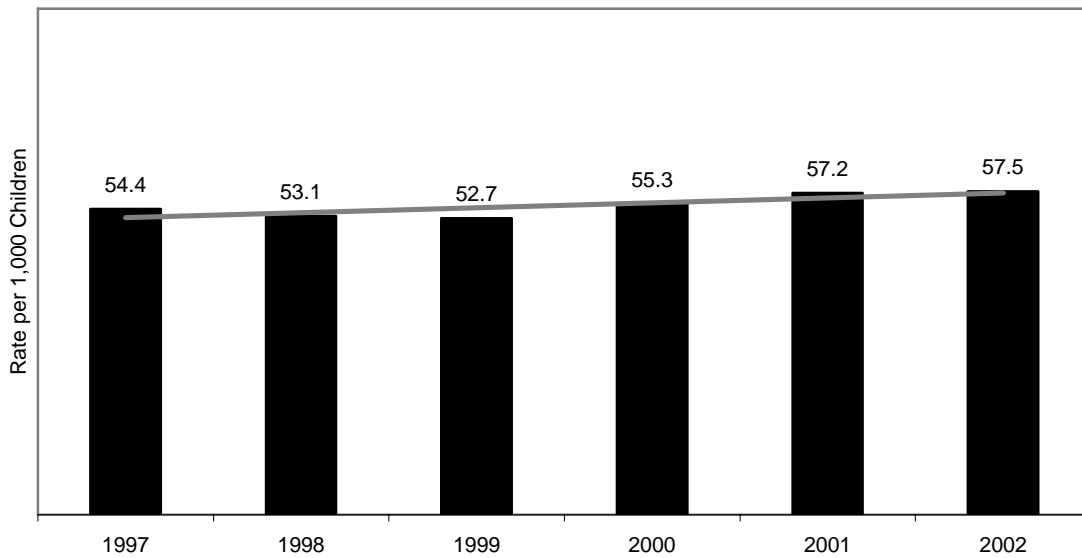
**Figure 3**  
**US Prevalence of Asthma Lifetime and Current**  
**All Ages, by Gender, 1997-2002**



Source: National Health Interview Survey, NCHS

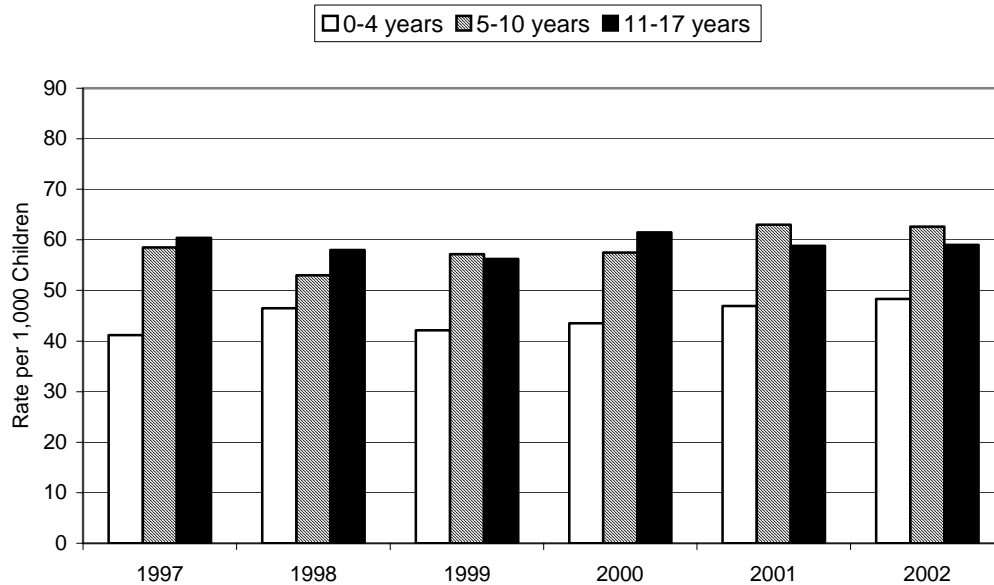
Because Delaware, like most states, has no complete data set relating to the prevalence of asthma among young children, this report presents in the following graphs the NHIS trends for those under 18 nationally. The first graph shows the overall current prevalence rate trend, the second shows the current rate trend by age, and the third by race/ethnicity.

**Figure 4**  
**US Prevalence of Asthma, Episode in Past 12 Months,**  
**Age <18, 1997-2002**



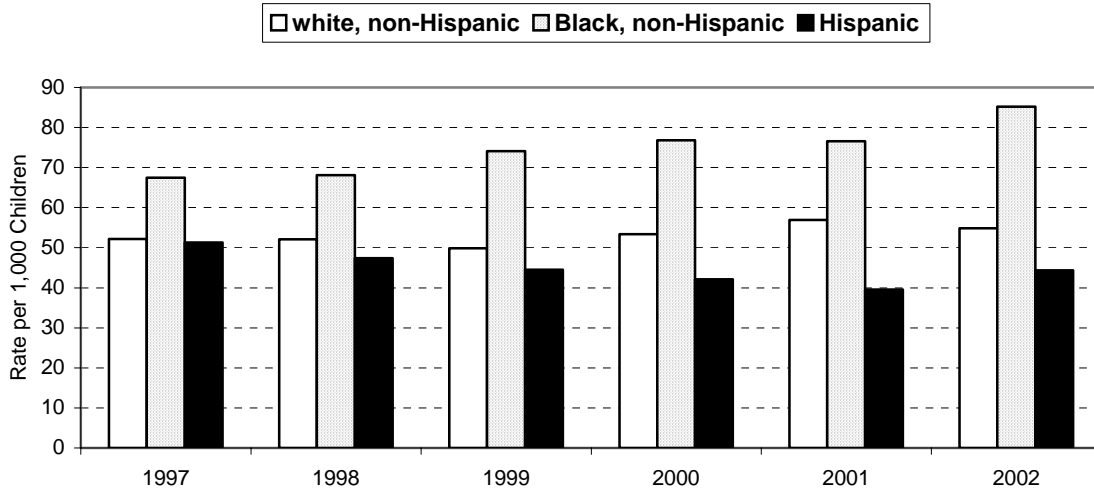
Source: National Health Interview Survey, NCHS

**Figure 5**  
**US Prevalence of Asthma, Episode in Past 12 Months,**  
**Age <18, by Age, 1997-2002**



Source: National Health Interview Survey, NCHS

**Figure 6**  
**US Prevalence of Asthma, Episode in Past 12 Months,**  
**Age <18, by Race/Ethnicity, 1997-2002**



Source: National Health Interview Survey, NCHS

These graphs show a number of key trends:

- There is a slow growth in the current prevalence of asthma, which is fuelled by increases in the 5-10 age group and among African-American children.
- Black, non-Hispanic rates are increasing more than any other group.
- Hispanic rates, from 1997 onward, are below both white and black populations.

The challenge will be to uncover data sources that can either confirm or modify these national trends, as they apply to Delaware.

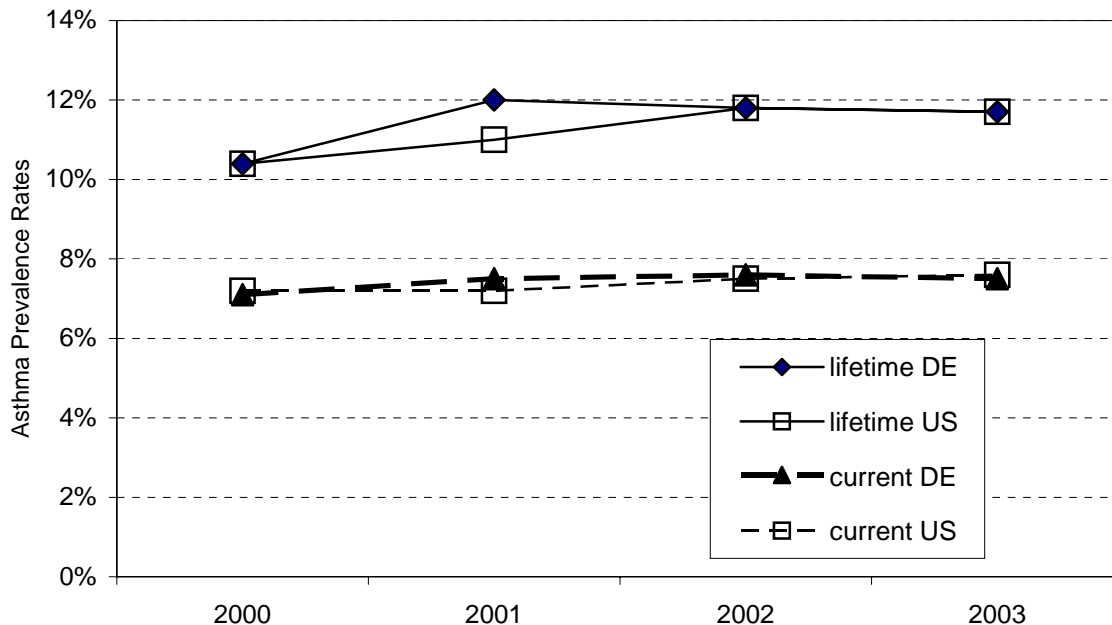
# Delaware Prevalence Estimates



## Adults

The Delaware Behavioral Risk Factor Survey (BRFS) includes a set of asthma questions, from which we can estimate asthma prevalence among Delaware adults (residents 18 years and older). Figure 7 shows these two rates for Delaware and the US. In this report, for consistency, we used primarily 2002 and 2003 BRFS data.

**Figure 7**  
**Lifetime and Current Asthma Prevalence Rates, Delaware Adults, 2000-2003**



Source: Delaware Health and Social Services (DHSS), Division of Public Health (DPH), Delaware Behavioral Risk Factor Survey, 2000-2003.

Note: US 2003 data: <http://apps.nccd.cdc.gov/brfss/display.asp?cat=AS&yr=2003&qkey+4417&state=US>, accessed 11/3/04

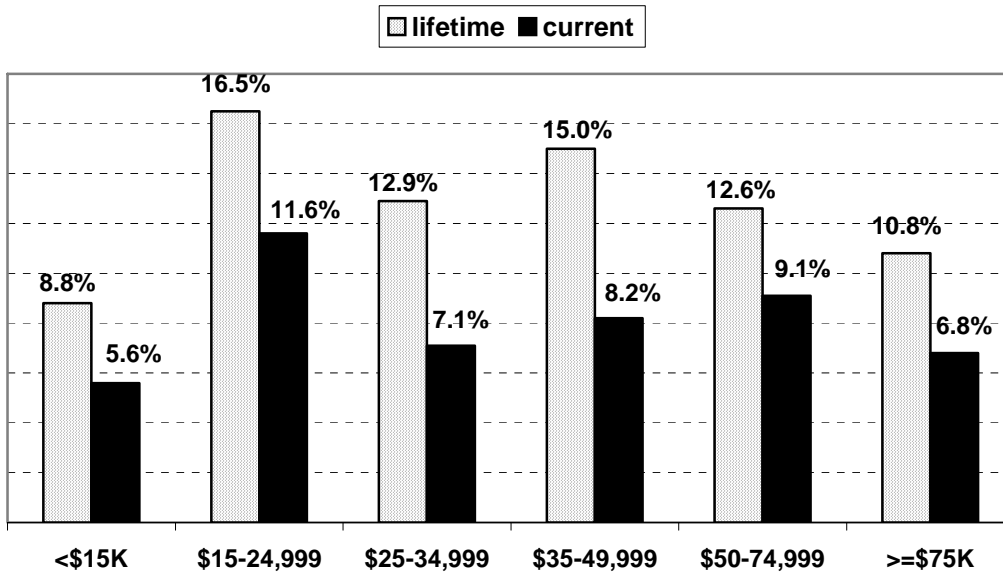
From this graph, it is clear that Delaware and U.S. rates—both lifetime and current—have tracked quite closely over this four-year period and are quite stable.

In 2003, 11.7% of adult Delawareans (about 72,000) reported having asthma at some time during their lives; and 7.5% (about 46,000) currently have asthma.

The 11.7% of adults with lifetime asthma is very close to the national estimate of 10.8% from the NHIS. Slight differences in prevalence estimates are expected, given the different sample populations and methodologies.

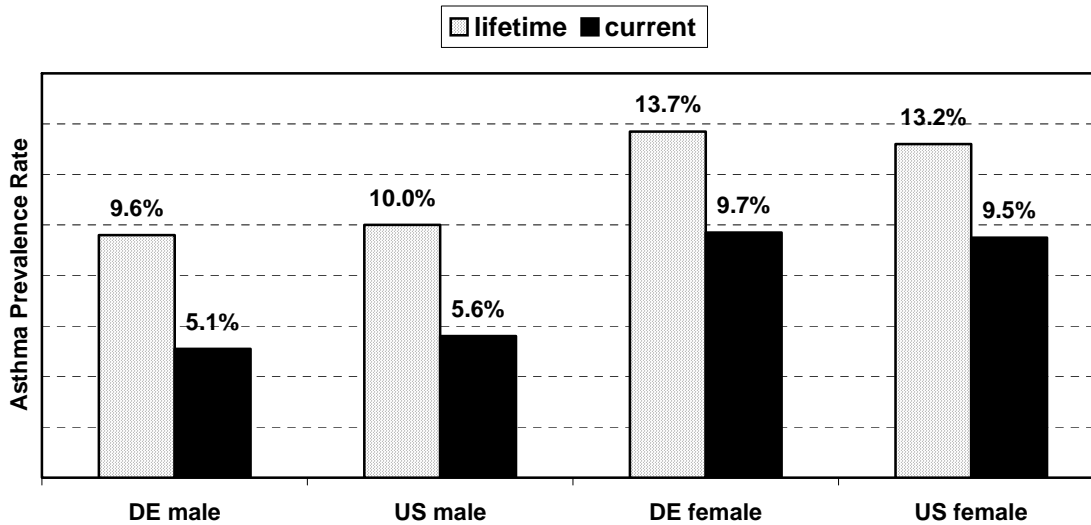
Because BRFSS data are collected using a statewide sample, it is possible to assess whether there are differentials within Delaware relating to income, gender, race/ethnicity, and location (county)—and whether those differentials diverge from similar differentials at the national level, where available. The following graphs present these differentials.

**Figure 8**  
**Lifetime and Current Asthma Prevalence by Income, Delaware Adults, 2003**



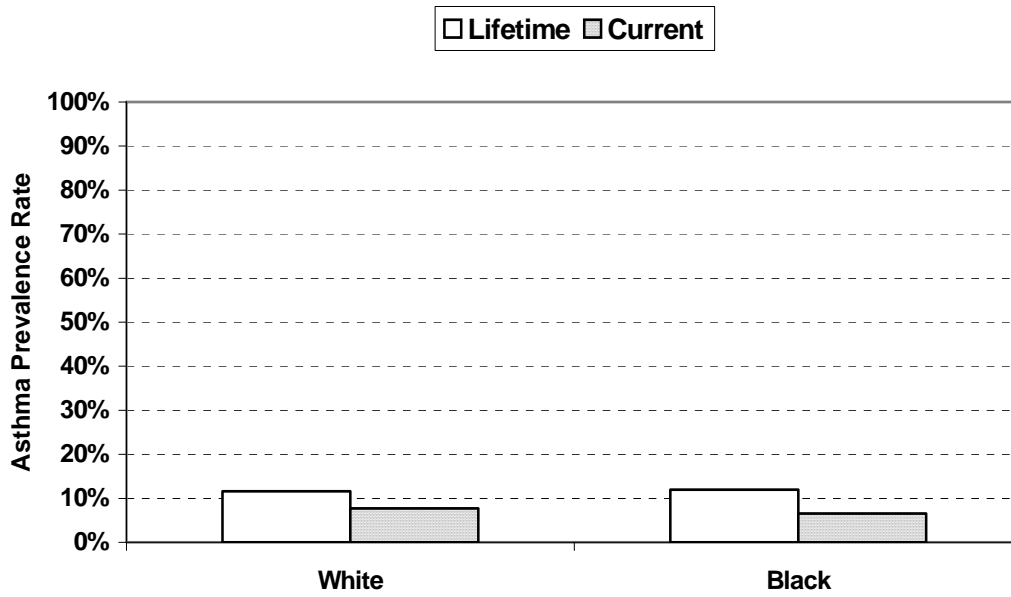
Source: Delaware Behavioral Risk Factor Survey, DHSS, DPH, 2003.

**Figure 9**  
**Lifetime and Current Asthma Prevalence by Gender, Delaware Adults, 2003**



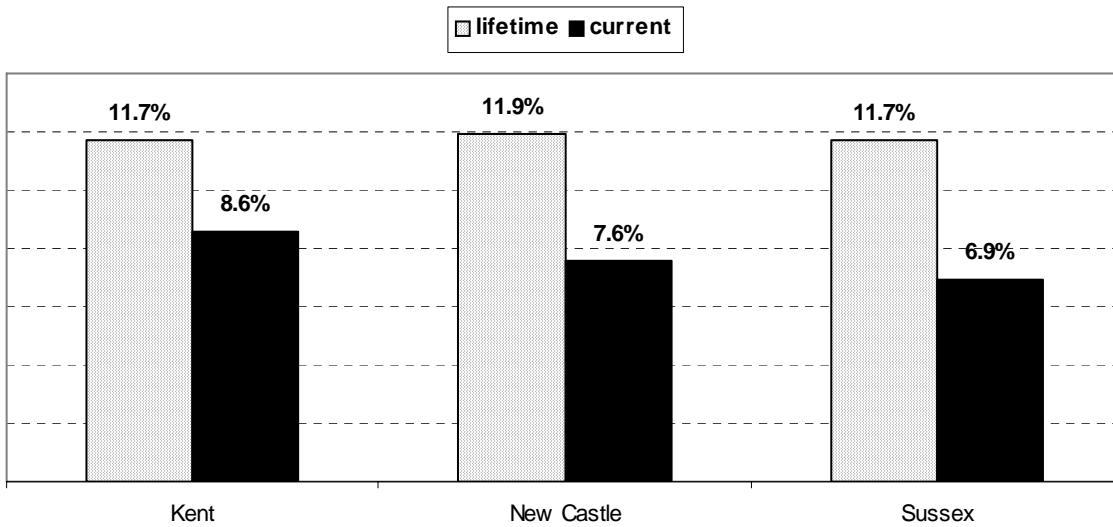
Source: Delaware Behavioral Risk Factor Survey, DHSS, DPH, 2003.

**Figure 10**  
**Lifetime and Current Asthma Prevalence by Race, Delaware Adults, 2003**



Source: Delaware Behavioral Risk Factor Survey, DHSS, DPH, 2003. Brackets indicate confidence intervals; see text below.

**Figure 11**  
**Lifetime and Current Asthma Prevalence by County, Delaware Adults, 2002**



Source: Delaware Behavioral Risk Factor Survey, DHSS, DPH, 2002.

These graphs present a number of differentials in asthma prevalence that deserve comment.

### **Income**

- The prevalence rate appears to decline with increase in income.
- The low-income—\$15,000 to \$24,999—category, when considered with other variables, may represent a key intervention target, given the spike in both lifetime and current rates for this group.

### **Gender**

- The prevalence profiles of both Delaware men and women very closely track national patterns.
- In Delaware, as in the nation, women have higher prevalence rates – both for lifetime and current asthma.

### **Race/Ethnicity**

- A statistically conservative approach is recommended, using the NHIS profile that shows an increasing prevalence rate for African Americans over time and higher rates for both lifetime and current asthma than whites (Figure 2).

### **County**

- The lifetime prevalence rate is quite consistent across all three counties.
- The current rate is highest for Kent County, followed by New Castle.

### **Children**

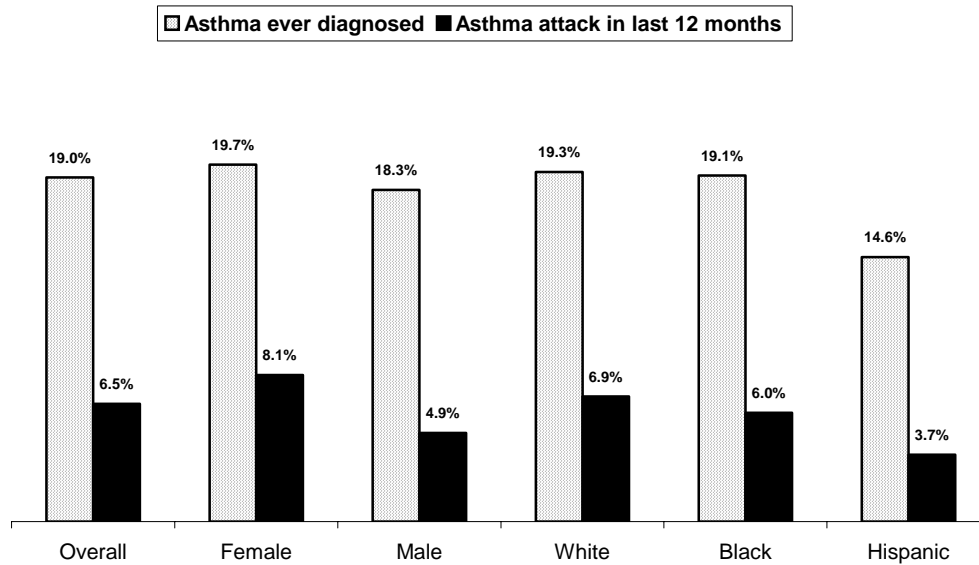
There is a shortage of Delaware-specific data on asthma prevalence for young children. The Youth Risk Behavior Survey (YRBS) provides prevalence data for public high school students. The YRBS asks two questions similar to those asked in the BRFS and NHIS, and it generates both lifetime and current estimates of asthma prevalence rates.



In 2001, the Division of Public Health requested Quality Insights of Delaware to survey school nurses on a wide variety of chronic conditions. Nurses were instructed to include in their counts only physician-diagnosed conditions from the school records. In this survey, asthma was the most prevalent condition. Race and gender data were included from 98 public schools in this study.

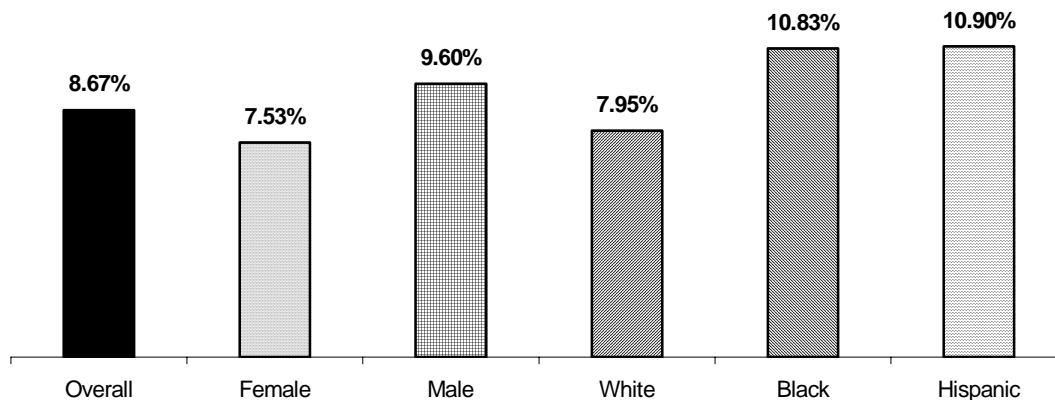
The graphs below represent some of the findings from each of these surveys.

**Figure 12**  
**Asthma Prevalence, Delaware High School Students**  
**Rates Overall, by Gender, by Race/Ethnicity**  
**2003**



Source: Youth Risk Behavior Survey, Delaware Department of Education  
 32 High schools, n=3,048 (77% participation)

**Figure 13**  
**Asthma Prevalence, Delaware Public School Students**  
**Rates Overall, by Gender, by Race/Ethnicity, 2001**



Source: Delaware School Nurse Survey, DHSS, Division of Public Health  
 98 Public schools of all types, n=~72,000

These two surveys produce seemingly different results. Much of the difference relates to how the data were collected for each survey and the purpose of each. The YRBS is a self-report survey; the school nurse survey relied on school records of physician diagnoses. Moreover, the school nurse survey *included all levels of school*, not just high school.

The School Nurse survey appears to track the differential between black and white students in a manner similar to the NHIS national survey, especially in the current prevalence rate. In



contrast, the YRBS shows similar lifetime prevalence rates across racial and gender groups—representing a variance from other data sources which deserves further exploration.

Despite the differences in these surveys, there is some convergence in overall *current* rates, with the YRBS rate (6.5%), the NHIS 11-17 age rate (5.9%), and the school nurse high school rate (7.6%, not shown above) representing only approximately a 750-student difference between the highest and lowest rate.

Given the fact that there are no data available in Delaware for pre-school children and somewhat conflicting data for school-age children, a conservative approach suggests that the NHIS survey data is the best source for estimating the number of children directly impacted by asthma in Delaware. **This estimate is approximately 23,400 children.**

In addition, data from the school nurse survey that involved a large number of schools of all types, shows a differential in rates—both lifetime and current—between African American and white students, with black students having higher rates. The YRBS differentials in gender and race seem to contradict national trends, but the survey focuses only on high school students. It will be interesting to see if future surveys reflect these same profiles.

There is also reason to think that there is a difference in prevalence rates for elementary school children, as reflected in the school nurse survey. This differential directly tracks the differential in the NHIS for the 5-10 age group evident in the past few years.

As children progress through school, the high male prevalence shown in the earlier grades and captured in the school nurse survey begins to flip. For adults, the female rate is higher (Figure 9).

For Hispanic students, the YRBS reflects the direction of rates in the NHIS. The school nurse survey shows a high rate of Hispanic prevalence, but this could be an effect of small numbers. Clearly, this is an area for further exploration.

In general, these data suggest that Delaware mirrors the national differentials in age, gender, and race/ethnicity, as reflected in the NHIS—**higher prevalence rates for African Americans (lifetime), for younger children, and for male children.**

## Health Care Impacts of Asthma

### ***How do people with asthma impact the health care system? How many deaths does asthma cause?***

People with asthma use physicians' offices, pharmacies, hospitals, and emergency departments to meet their needs. The preferred sources of treatment are the physician and pharmacy. Appropriate use of these sources can eliminate or substantially reduce the need for emergency room visits or hospital admissions. In fact, many emergency room and inpatient encounters can be viewed as provider and patient management breakdowns. Because these two service locations are the most expensive encounters, minimizing their use represents the most efficient use of the health care system.

Hospital utilization data for Delaware is available because the state collects and compiles hospital discharge data on a yearly basis.

Data on visits to emergency rooms, physicians' offices, and use of prescription medications are not routinely collected by the state. As noted earlier, claims data from a variety of payers would provide the needed data, but these payers have no legal mandate to share such data, much of which is considered proprietary. Aggregated claims data from the Medicaid and state employee insurance programs were available for this study. CDC publishes national data for hospital, emergency room, and physician office use.

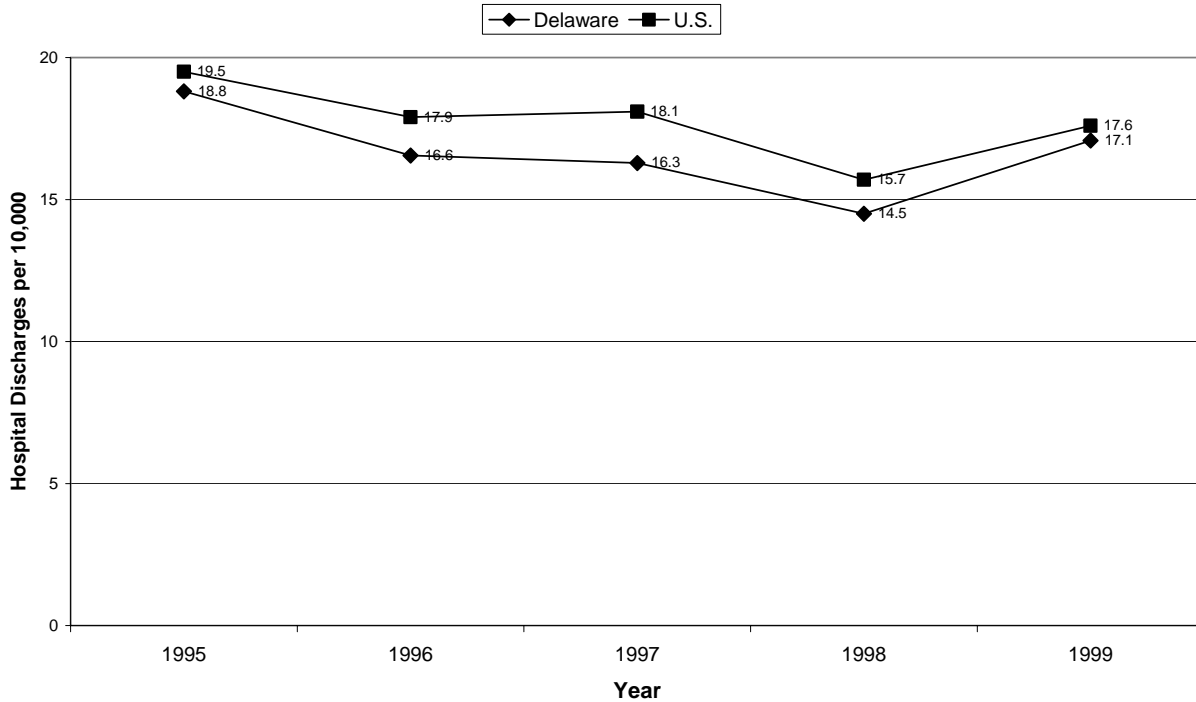
The BRFSS includes questions about health care utilization. Since these questions are asked only of those who answer "yes" to the "do you currently have asthma" question, only a small number of people—approximately 300—responded to them. These questions, however, provide a sense of *health care use frequency*, since BRFSS seeks answers to "how many times" questions.

### ***Hospital Inpatient Services: The Delaware Hospital Discharge File***

The following graphs highlight Delaware hospital discharge rates for asthma compared to national rates; rates for primary and non-primary diagnosis of asthma; and discharge rates by age, gender, race, and county.



**Figure 14**  
**Age-adjusted Hospital Discharge Rates for Primary Diagnosis of Asthma**  
**Delaware and U.S., 1995-1999**

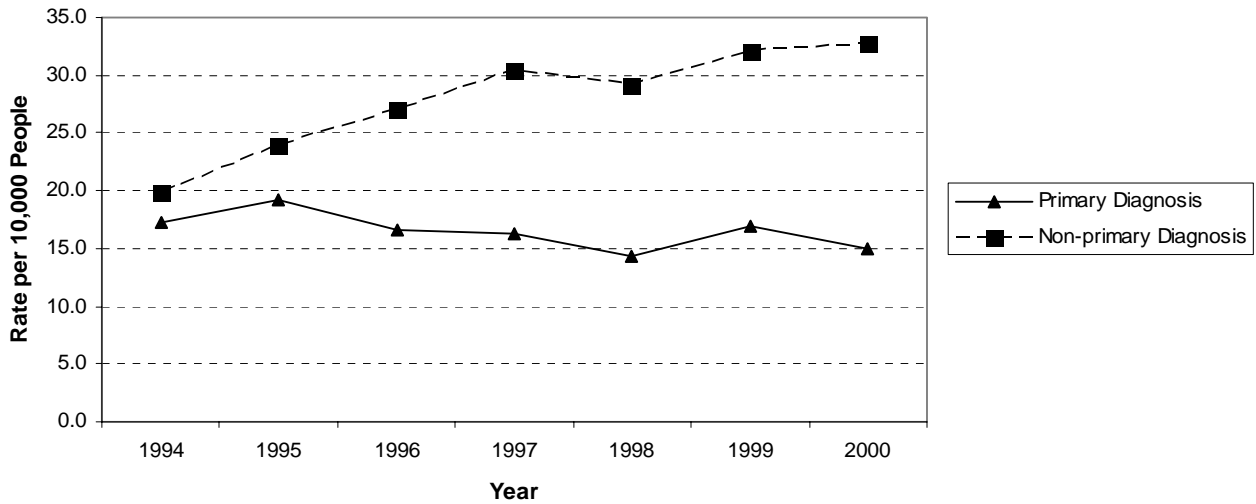


Source: Delaware Hospital Discharge File, DHSS, Health Statistics; US 2000 from NCHS Website

This graph suggests that Delaware's discharge rate per 10,000 people is comparable to the national rate and that both rates are relatively steady through 1999. These trends are good news, because they suggest that Delaware residents and health care providers are doing a good job of controlling hospital admissions related to asthma. It will be important, however, to continue this analysis and monitor the hospital discharge trend over a longer period.

The goal is to manage asthma in the more appropriate home and physician-office environments.

**Figure 15**  
**Hospital Discharges with Primary and non-Primary Diagnosis of Asthma**  
**Delaware Residents, 1994-2000**



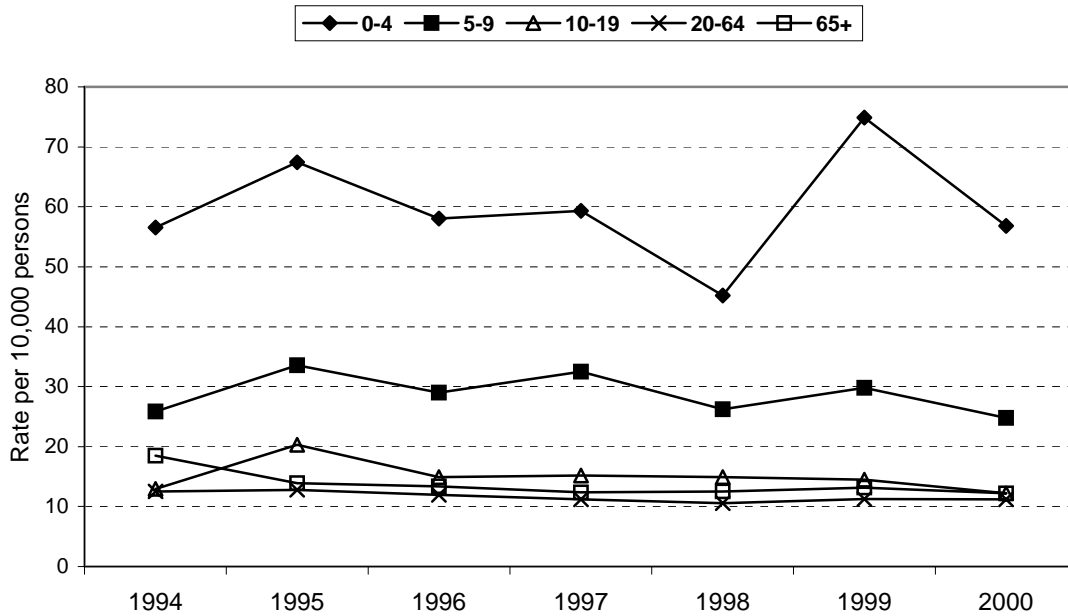
Source: Delaware Hospital Discharge File, DHSS, DPH, Delaware Health Statistics Center

To highlight an indirect impact of asthma upon health care utilization, this graph notes both asthma primary diagnosis and non-primary (usually secondary) diagnosis upon discharge.

While people with such multiple diagnoses may not have been admitted for their asthma, often the asthma co-morbidity represents an additional medical management problem when they are admitted into the hospital. This is particularly true for patients with heart or other pulmonary problems.

The increasing trend of these co-morbid discharges may represent increased health management pressures upon hospitals. Because listing co-morbid diagnoses may increase hospital payment, however, this rising trend of noting asthma as a non-primary diagnosis may simply be the result of more sophisticated billing processes by hospitals. This trend could be monitored as future years' data are available.

**Figure 16**  
**Hospital Discharges by Age Group, Primary Diagnosis of Asthma**  
**Delaware Residents, 1994-2000**



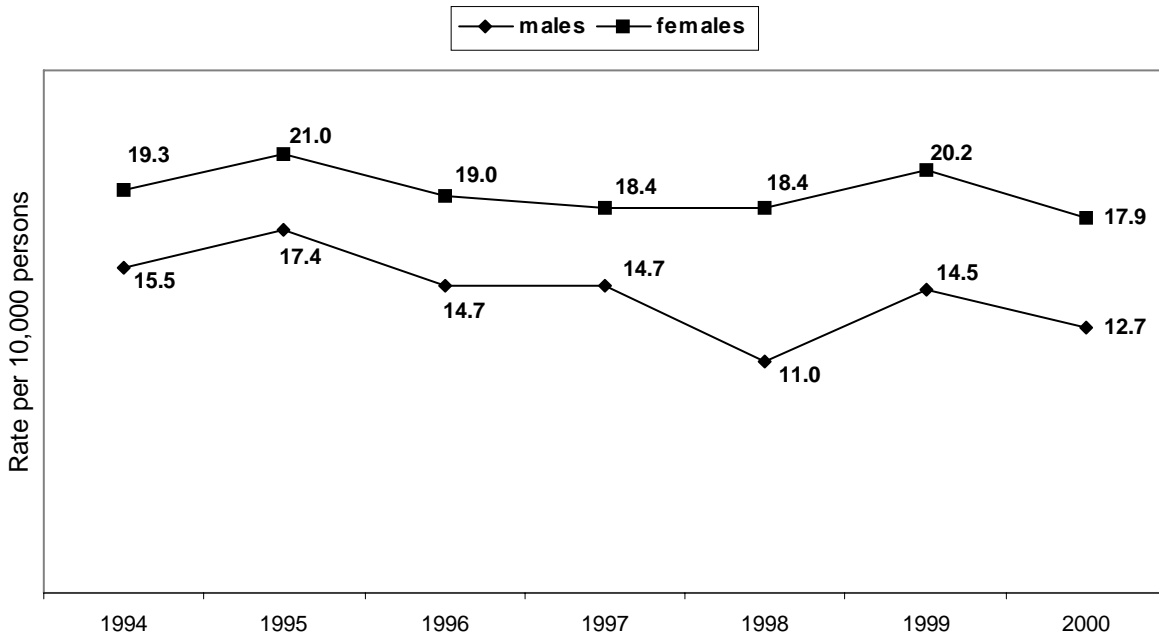
Source: Delaware Hospital Discharge File, DHSS, DPH, Delaware Health Statistics Center

This graph reveals variations in discharges by age. Clearly, younger children (through age 9) have asthma-related hospitalizations in greater proportion to their numbers than do older elementary children and adults. The convergence of the other age groups around 12 asthma-related discharges per 10,000 people is an interesting phenomenon.

The fact that children from birth to four years old are more than four times as likely to have an asthma-related hospitalization compared to all but the five-to-nine age group suggests that there is a need to develop and implement interventions for parents of this group and for the physician practices that are likely to serve them. While it is difficult to diagnose these very young children with asthma, it is likely that many of them experience breathing difficulties that could indicate asthma, and are being so diagnosed.

In addition, the hospital discharge figures begin to provide some quantitative sense of the impact of asthma on the youngest age group. While there are national prevalence rates for this group, no Delaware-specific rates are available. Figure 16 tells us, using census data, that there were **approximately 3,000 asthma-related hospitalizations involving these children in Delaware.** Even with the possibility of multiple admissions for some of these young people, this is a substantial number.

**Figure 17**  
**Hospital Discharges by Gender, Primary Diagnosis of Asthma**  
**Delaware Residents, 1994-2000**



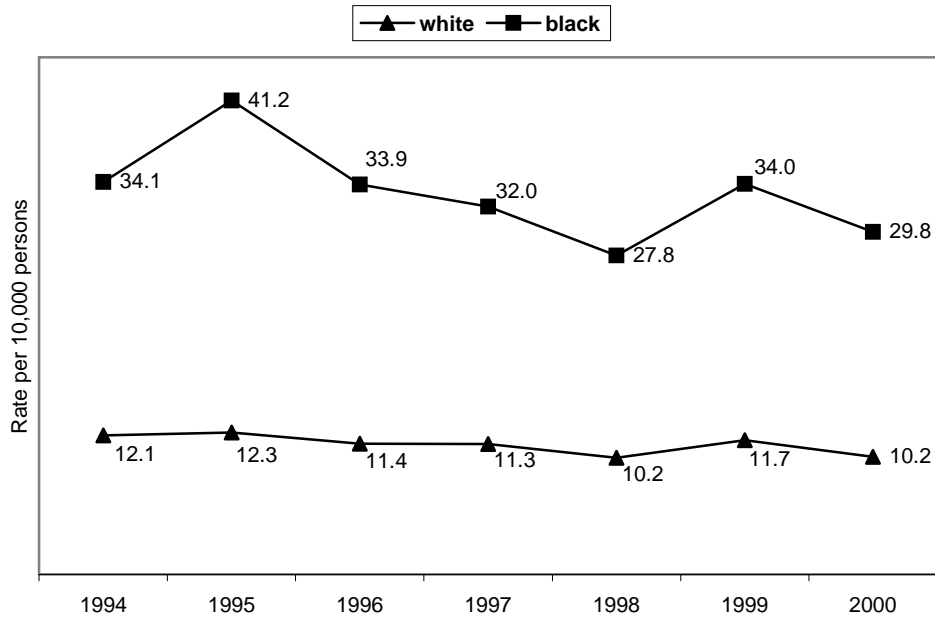
Source: Delaware Hospital Discharge file, DHSS, DPH, Delaware Health Statistics Center

Women with asthma use hospital inpatient services at higher rates than men in Delaware, reflecting national experience. Rates for both genders are declining slightly over time, although men’s rates are declining more, creating a widening gap.

This gap is larger in Delaware for 2000 than in the U.S., using CDC data calculations.

**In Delaware, women with asthma could become a primary intervention target, given this growing differential.** Because some of these women are likely to be mothers of children with asthma, such interventions might have a high impact.

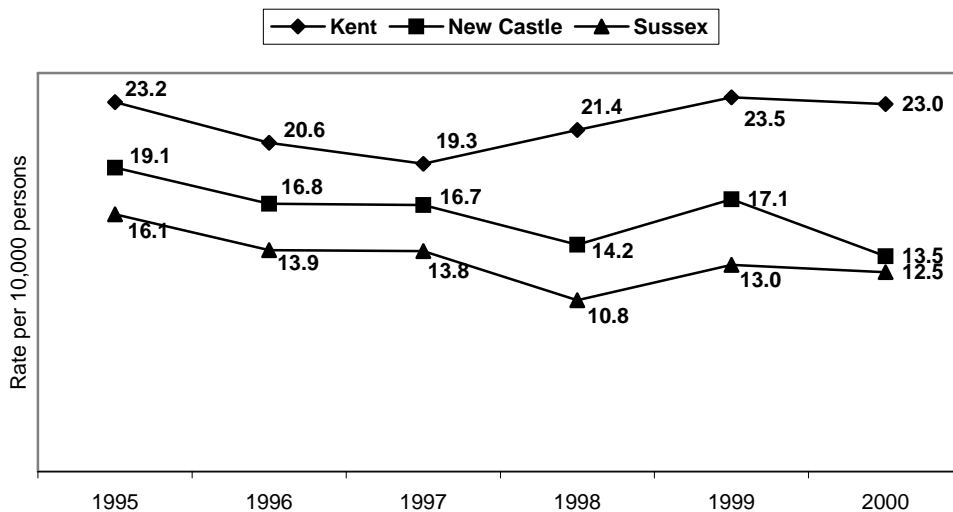
**Figure 18**  
**Hospital Discharges by Race, Primary Diagnosis of Asthma**  
**Delaware Residents, 1994-2000**



Source: Delaware Hospital Discharge file, DHSS, DPH, Delaware Health Statistics Center

**In Delaware, black or African American residents are hospitalized because of asthma at rates nearly three times greater than whites.** Since neither the lifetime nor current prevalence rates, as shown in Figure 10, have such a level of disparity, these disparate hospital discharge rates may suggest breakdowns in access to health care, in health literacy related to self-management, and in provider intervention practice.

**Figure 19**  
**Hospital Discharges by County, Primary Diagnosis of Asthma**  
**Delaware Residents, 1994-2000**



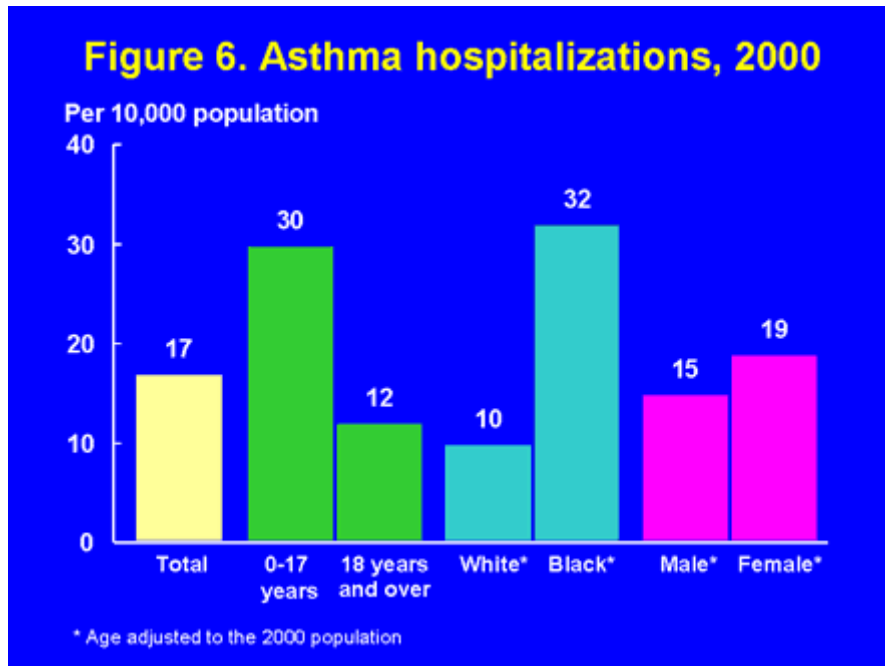
Source: Delaware Hospital Discharge file, DHSS, DPH, Delaware Health Statistics Center

Delaware appears to have a location-based disparity related to asthma hospitalizations. While asthma-related hospital discharges in Sussex and New Castle counties appear to be declining and converging in terms of asthma hospital discharge rates, **Kent County's rate is increasingly disparate**. Part of this trend may be explained by the fact that Kent County has the highest percentage of the 0-to-4 age group (7.2%), compared to Sussex (5.7%) and New Castle (6.7%); it is this group that has the highest discharge rate for asthma, as shown in Figure 16. These demographic differences, however, may not explain all the differences in the hospital discharge rate profile.

Income is another factor which may begin to explain this profile. Kent County had the lowest *per capita* income in Delaware in 2000 (\$18,662) – 8% lower than Sussex and 27% lower than New Castle. Figure 8 on page 12 revealed that the \$15,000-24,999 income group had the highest asthma prevalence rates in Delaware. The combination of a younger population and lower income levels may explain the Kent County asthma-related hospital discharge rates. Whatever the causes, Kent County could be a primary target for intervention, assuming that these hospital discharge trends continue unabated over time.

Given the asthma hospital discharge profile noted in the graphs above, how does Delaware compare with the national profile for such asthma hospital discharges? The graph below, from the CDC/NCHS website provides an indication of comparability.

**Figure 20**  
**US Asthma Hospital Discharges, per 10,000 People, 2000**



Source: CDC, NCHS website—[www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm](http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm). Accessed 7/8/04



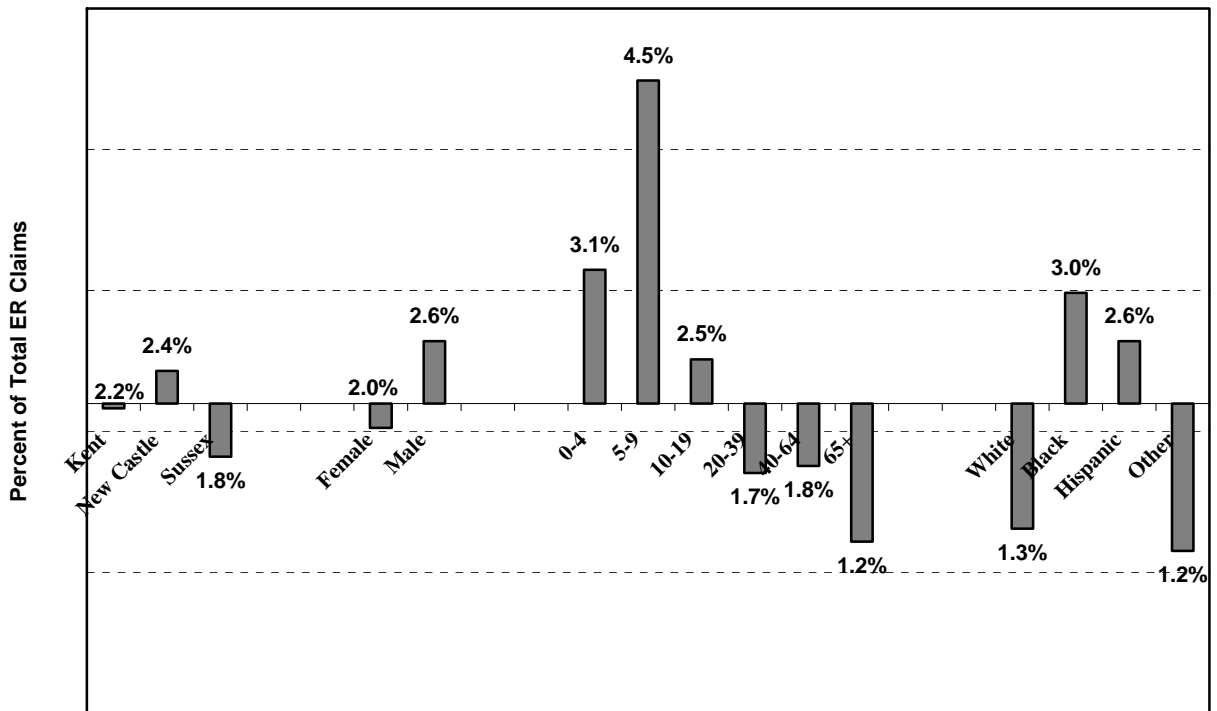
A review of this graph and those created from the Delaware Hospital Discharge file show that in the year 2000 **Delaware had an asthma hospital discharge rate lower than the national rate.** This suggests that Delawareans and their health care providers generally do a good job of managing the complications of asthma relative to other states.

**The national rate differentials by age, race, and gender are mirrored in Delaware, almost in the same proportions.** This suggests that the Delaware Hospital Discharge file is a very useful source for ongoing research and monitoring purposes and that Delaware reflects many of the disparities that exist throughout our country, particularly those related to race.

### **Emergency Room Services**

With no centralized repository of emergency room (ER) encounters in Delaware, this report uses aggregate Medicaid and state employee claims and encounter data to provide some estimates of ER use. Data from these sources provide some information on health care utilization involving nearly one-third of Delawareans.

**Figure 21**  
**Asthma-Related Emergency Room Visits as Percent of Total Claims;**  
**County, Gender, Age, and Race Compared to Overall Percentage (2.2%),**  
**Delaware Medicaid Members, 2003**



Source: Aggregated Medicaid File, 2003, compiled from EDS claims data

***Explanation:*** In the graph above—and the similar graphs throughout this report—those bars over the “crossover” line (2.2% in this graph) represent utilization greater than the overall average and those below this line utilization below the overall average.

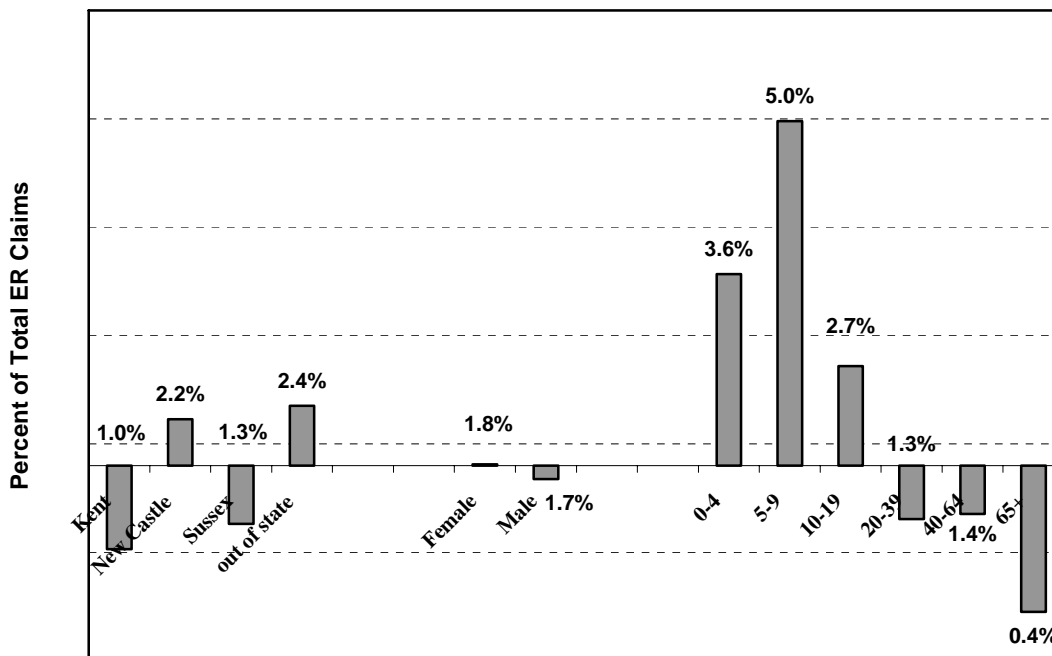
**The Medicaid asthma emergency room (ER) utilization rate is 73.0 admissions per 10,000**, involving 1,168 ER encounters in 2003. Overall, asthma ER claims represent 2.2% of all Medicaid ER claims. Figure 21 shows that the 5-9 age group, with a rate of 4.5% compared to the 2.2% crossover line, can be expected to have a utilization rate approximately double the overall state utilization rate, nearly 146 ER visits per 10,000.

To properly assess the Medicaid graphs, it is important to remember who are Medicaid members. By and large, this is a young population—children of low-income families—and their parents; disabled adults of low income; and some dually eligible elderly who, because of income, are eligible for both Medicare and Medicaid. The high use by young children and by males reflects the youth of this population, since in these early age groups, males have a higher prevalence of asthma. African American and Hispanic members have higher rates of use, relative to white members.

The relatively high use by New Castle County residents deserves further exploration, because this county is served by two federally funded health clinics. Kent County residents do not “overuse” ER services, unlike hospital services. This use pattern also deserves some further exploration, particularly in light of the higher asthma prevalence rate in Kent County (Figure 11).

Figure 22 illustrates the ER usage profile of a very different population – state employees and their dependents.

**Figure 22**  
**Asthma Emergency Room Visits as Percent of Total Claims;**  
**County, Gender, and Age, Compared to Overall Percentage (1.8%),**  
**Delaware State Employees and Dependents, 2003**



Source: Aggregated State Employee files, compiled from Coventry and Blue Cross claims data

State employee emergency room utilization is approximately one-third that of Medicaid members—**26.2 per 10,000 compared to 73.0 per 10,000** – representing only 264 ER visits for asthma in 2003. Remarkably, however, the profile is quite similar to the Medicaid graph (Figure 21). The county percentages follow a similar pattern, but Figure 22 shows even less ER use by Kent County members of the state employee plan. The gender pattern shows the most difference, with females using the ER more in the state employee plans, perhaps reflecting that this is an older population than the Medicaid one.

Even though the state employee program has an older membership, the utilization by age nearly mirrors that of Medicaid, possibly reflecting higher use by young dependents.

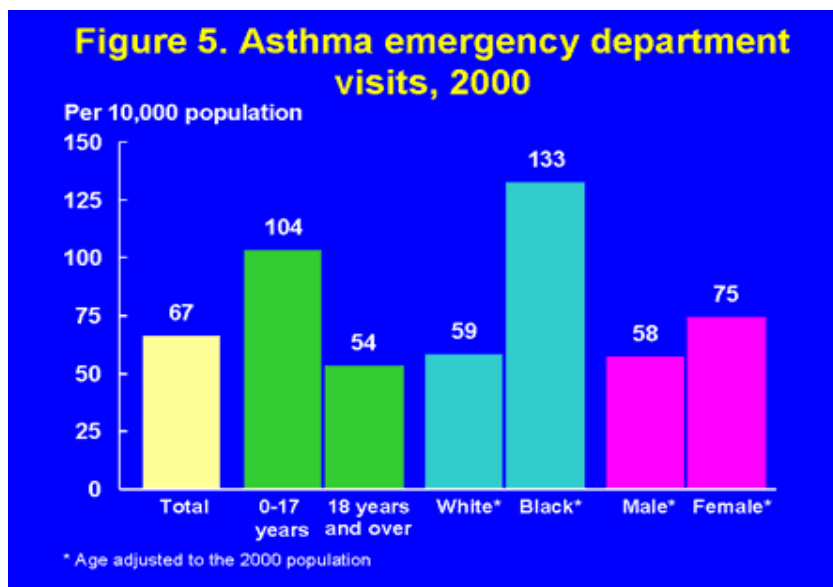
The state employee plan managers could not provide race/ethnicity data for the state employee plans, which would have been useful to compare this profile in both programs.

Data from these two sources indicate:

- Medicaid members are almost three times more likely to use ER services than members of the state employee program, with a rate of 73.0 per 10,000, compared to 26.2.
- Both plans had very similar patterns of age usage, with the 5-9 age group representing the highest rate in both plans and usage declining by age in older groups.

Figure 23, taken from the CDC website, provides a national overview of asthma-related emergency room visits.

**Figure 23**  
**US Asthma Emergency Room Visits, per 10,000 People, 2000**



Source: CDC, NCHS Website—[www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm](http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm)  
 Accessed 7/8/04

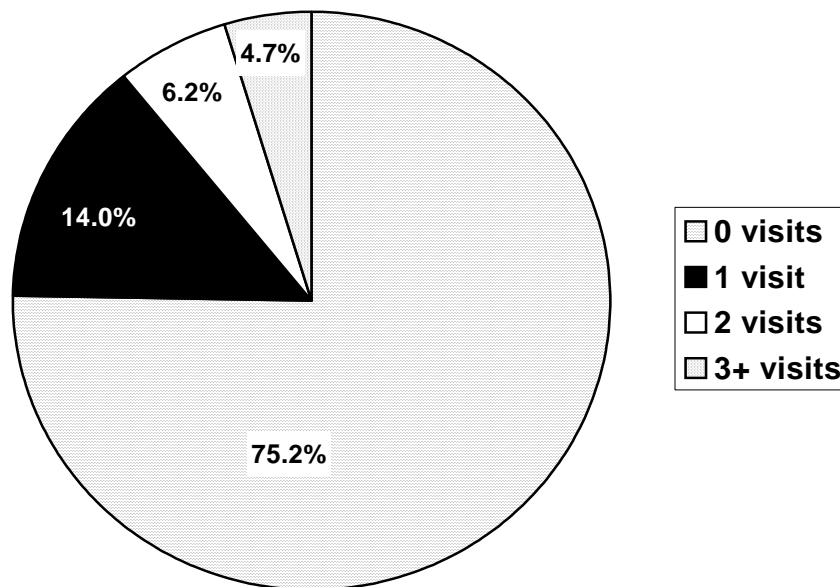
Considering the national total rate and the Delaware Medicaid and state employee rates, **it is possible that Delaware has a lower ER use rate than the national rate.** The missing payer claims data—Medicare and other commercial insurance plans such as Blue Cross—are likely to have lower ER usage than Medicaid. Medicare beneficiaries have lower asthma prevalence rates and people 65 and over have low utilization of the ER for asthma. Commercial insurances are likely to have profiles more similar to the state employee program than to Medicaid.

Delaware’s overall ER utilization rate for asthma probably fits the profile shown in Figure 23. The age distribution in Delaware – as reflected in both Figures 20 and 21 – clearly shows substantially higher use by younger populations, just as the national data show. It is important to remember that ER visits may indicate some breakdown in asthma management. Therefore, educational and treatment interventions should be targeted to people with multiple ER visits.

The Delaware Behavioral Risk Factor Survey (BRFS) provides some information on asthma-related urgent visits, but visits are significantly higher because the BRFS question covers urgent care centers as well as emergency rooms.

Figure 24 illustrates how often asthma sufferers need to access urgent care facilities.

**Figure 24**  
**Percent of Delaware BRFS Respondents with Current Asthma by Number of Visits To Emergency Rooms, Urgent Care or Health Centers in Last 12 Months, 2002**



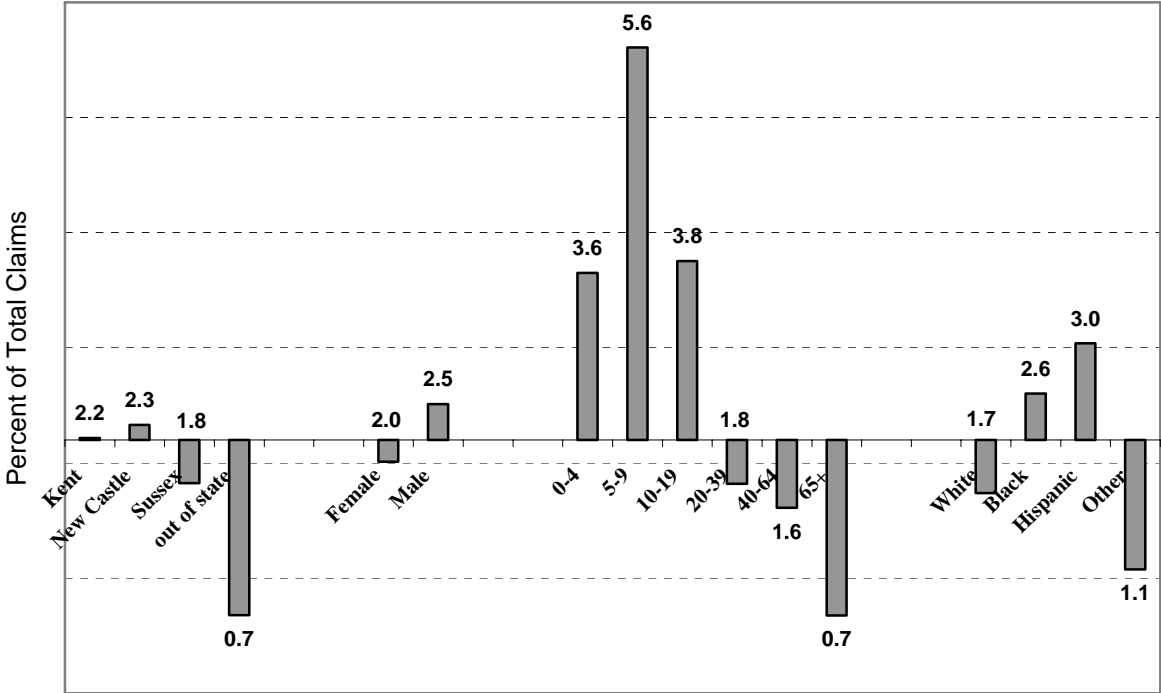
Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=301

Twenty-five percent of people with current asthma sought urgent care in a 12-month period and 11% had multiple visits. Projecting the visit rates shown in Figure 24 on the Delaware population with current asthma – estimated at slightly more than 45,000 – suggests a potential for up to 11,000 urgent care visits a year.

# Physician Office Visits

Since the physician’s office is one of the preferred sites of service for handling asthma management, the lack of reliable, centralized information related to such encounters represents a public policy challenge. Again, claims and encounter data from Medicaid and the state employee program provide some insight in physician-office utilization for Delaware. Graphs of physician office use are shown below, following the format developed for the ER visits.

**Figure 25**  
**Asthma Physician Office Visits as Percent of Total Claims;**  
**County, Gender, Age, and Race Compared to Overall Percentage (2.2%),**  
**Delaware Medicaid Members, 2003**

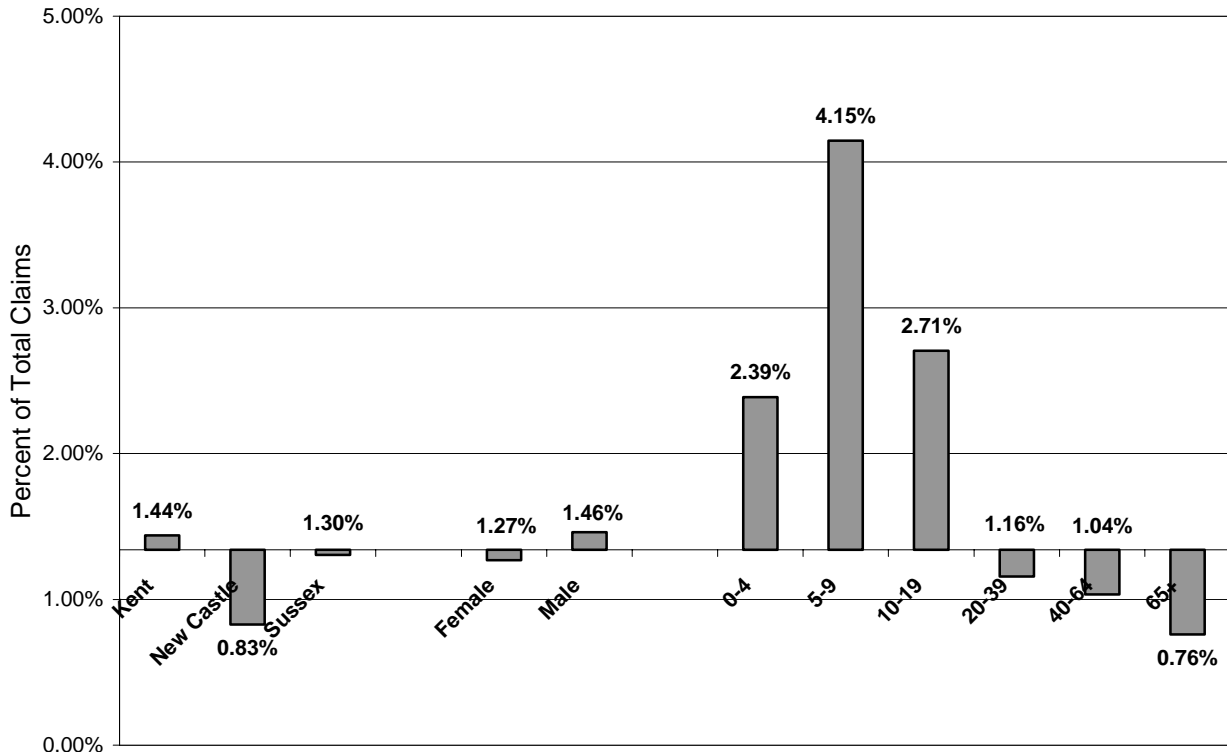


Source: Aggregated Medicaid Claims file, compiled from EDS claims files

Other than the county profile, this graph looks remarkably similar to the ER services graph for Medicaid (Figure 21), even to the point of having the same percentage of claims to total claims. At least for Medicaid members, Kent County residents appear to have access to primary care services, thus making their high hospital use (Figure 19) more perplexing and worthy of further research.

This primary care use profile represents very high utilization, with over 22,000 asthma encounters—a **visit rate of 1,379.1 per 10,000 Medicaid members**. Figure 26 on the next page shows state employee program physician visits.

**Figure 26**  
**Asthma Physician Office Visits as Percent of Total Number of Claims;**  
**By County, Gender, and Age, Compared to Overall Percentage (1.34%),**  
**Delaware State Employees and Dependents, 2003**



Source: Aggregated State Employee file, compiled by QID staff from Coventry and Blue Cross claims files

Comparing this graph with Figure 22 (the state employee ER visit profile), state employees in Kent County have high use of the physician offices and low use of the ER. This is a preferred profile, because it suggests that these asthma sufferers are avoiding the more costly ER by appropriately using their primary care physician.

New Castle County has high use of the ER, but low use of physician office visits. Since this is not a preferred profile, **this suggests that state employees in New Castle County might be a good population for an asthma disease management program, similar to one Medicaid conducted during 2003.** Sussex residents have slightly lower use of both the ER and physician offices, perhaps reflecting the county's lower current prevalence rate (Figure 11).

Gender and age patterns remained similar to the ER profile.

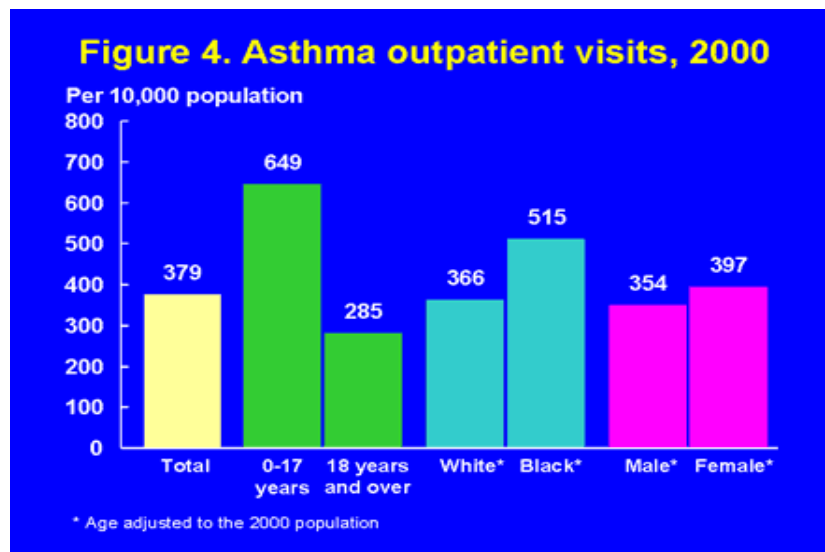
Comparing the profiles of these two very different insured populations in terms of physician office use highlights the following:

- The Medicaid physician office visit rate for asthma was nearly twice the State Employee rate—**1,379.1 visits per 10,000 people compared to 676.5.**

- The counties showed slightly different patterns in each payer group. State employee plan members in Kent County used primary care services more than Medicaid plan members did. Medicaid members in New Castle County had high use of primary care, while state employee plan members had low physician office use. Sussex County members of both plans had low use of primary care services. This deserves some further exploration to determine whether this is an access issue or if there is less demand/need for such services.

What is the national profile for asthma-related physician office visits? The graph below provides the context to answer that question.

**Figure 27**  
**US Physician Office Visits, per 10,000 People, 2000**



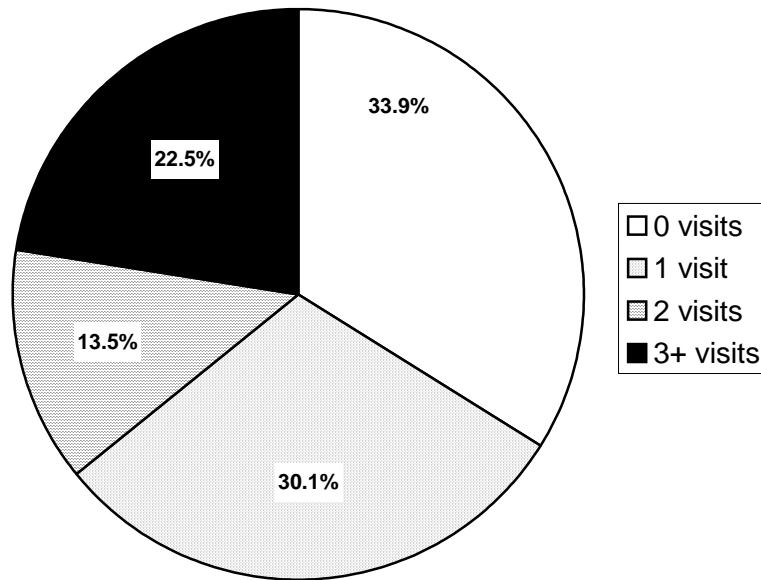
Source: CDC/NCHS website—[www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm](http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm)  
 Accessed 7/9/04

**Delaware data from Medicaid and state employee insurance plans suggests that Delaware may have higher use of physician office visits per 10,000 people than does the nation.** Physician office asthma visit data for the other commercial plans in the state and Medicare are likely to more closely resemble the state employee plan, rather than the Medicaid plan that has a younger, lower income, and higher minority population.

The BRFSS Asthma History Module, used in 2002, provides additional information on the use of physician office visits by asthma sufferers. For those Delaware survey respondents who answered “yes” to the question about currently having asthma, the BRFSS asked a series of questions that sought to gauge health care use, quality of life, and work impact.

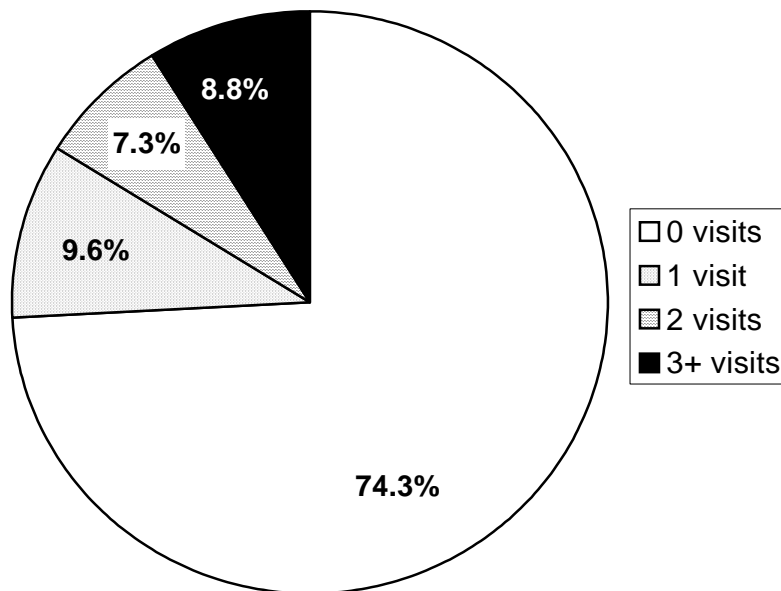
The graphs below provide information about how many adult Delawareans with asthma went to a doctor and how often they did so. Figure 28 deals with routine care, and Figure 29 with urgent care. The assumption is that greater use of routine care will reduce the need for urgent care.

**Figure 28**  
**Percent of Delaware BRFs Respondents with Current Asthma, by Number of Routine Physician Office Visits in Last 12 Months, 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=301

**Figure 29**  
**Percent of Delaware BRFs Respondents with Current Asthma, by Number of Urgent Physician Office Visits in Last 12 Months, 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=301

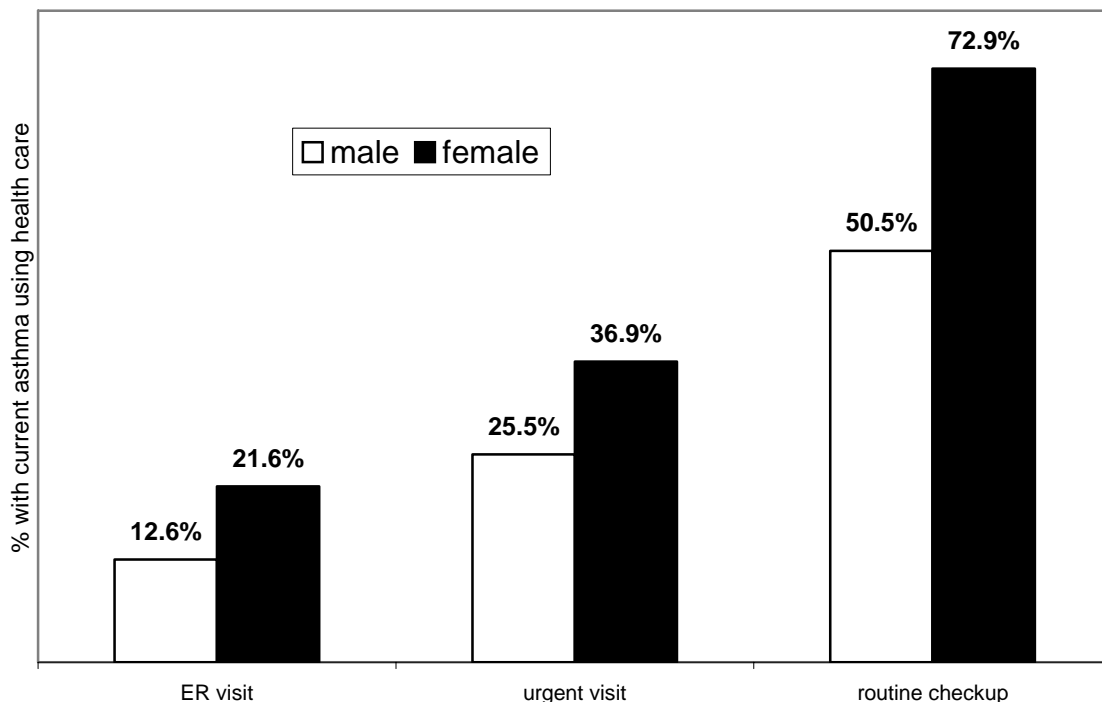


While the BRFs sample for this question is small, the overall survey population is statistically representative. Weighing these factors, the following deserve highlighting:

- A large number of this sample—**65%**—claimed to have at least one routine doctor’s visit in a year. Such rates would generate at least **29,000 physician visits a year** by adults.
- More than a quarter of this sample needed an urgent visit to a doctor to deal with asthma symptoms during the course of a year; and **16% needed more than one** such visit. This 25% mirrors the small proportion of BRFs sample—nearly 23%—that needed to go to an urgent care center or ER to treat asthma symptoms (Figure 24). Thus, depending on the overlap assumptions between these two groups, **at least 25% of those who report currently having asthma will need to seek some level of urgent outpatient or ER medical assistance each year.** This is a good statistic to track and to use as a public health target, with the public policy goal of reducing this percentage over time.

The BRFs Asthma History Module also provides useful data about health care utilization by those with active asthma symptoms:

**Figure 30**  
**Health Care Utilization by Delaware BRFs Respondents with Current Asthma in Last 12 Months, by Gender, 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=301

This chart shows the differences between the genders in using health care services for asthma, perhaps reflecting the higher prevalence of asthma among women (see Figure 9). Women may also be more likely than men to seek asthma treatment or management. This profile shows that Delaware's prevalence is similar to the national prevalence by gender, even though the results from the Medicaid and state employee data are ambiguous about this difference.

## ***Asthma Medication***

Hospital utilization and medication are the leading cost factors in the treatment of asthma, representing two-thirds to three-quarters of all direct costs. As hospital discharge rates seem to be declining in Delaware, it is likely that medication will represent a greater proportion of costs, reflecting both the decreasing rate of hospitalization and the major role medications play in controlling asthma. Because there is no analogue to the Delaware Hospital Discharge file for the other health care interventions, including medications, no comprehensive, publicly available data exist about medication usage and trends.

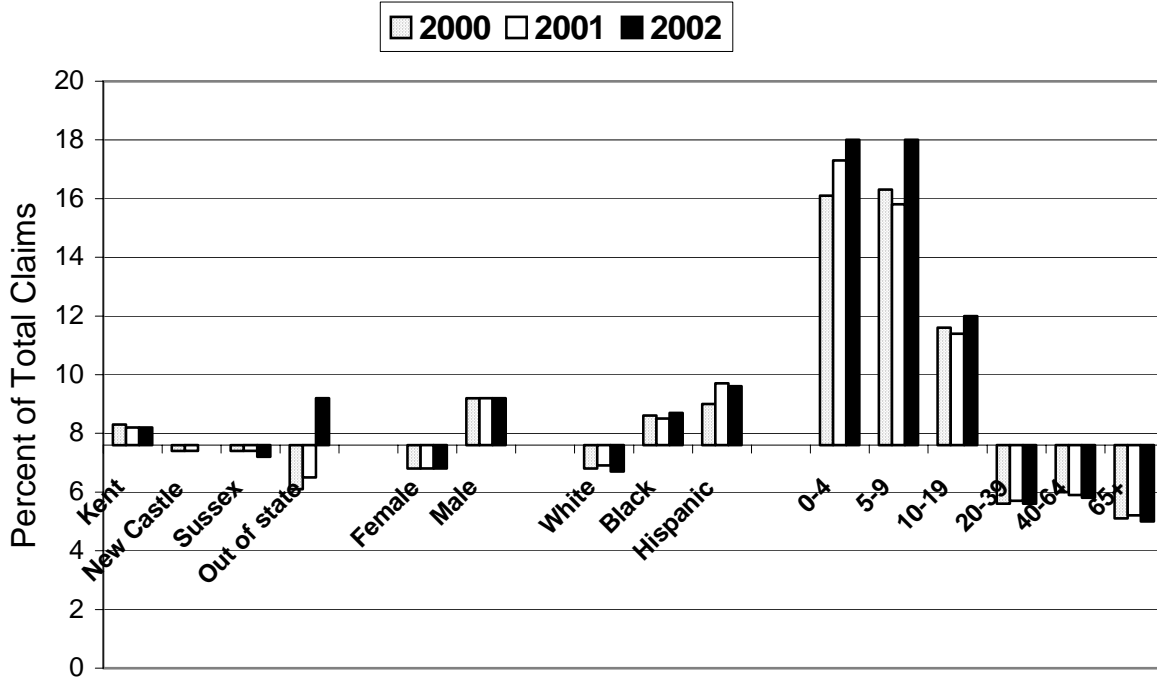


The state is a major purchaser of health care for its Medicaid beneficiaries and its employees. Thus, state staff were able to secure aggregated pharmacy data from these two insurance plans. While these data are not representative of the total population, they provide some indication of how asthma impacts the use of medications. Pharmacy charge data depended upon charges associated with specific medications used in the treatment of asthma in both instances. The lists of medications varied slightly between programs.

Figures 31 and 32 correspond to the format used for the preceding emergency room and physician office graphs. These graphs compare the percentage of asthma pharmacy claims for various subgroups to the overall (average) percentage. Because the overall percentage for the years 2000-2002 was the same, 7.6%, three years of data are combined on a single chart. The second chart represents the comparative percentages for 2003, which had a different overall percentage, 8.1%.

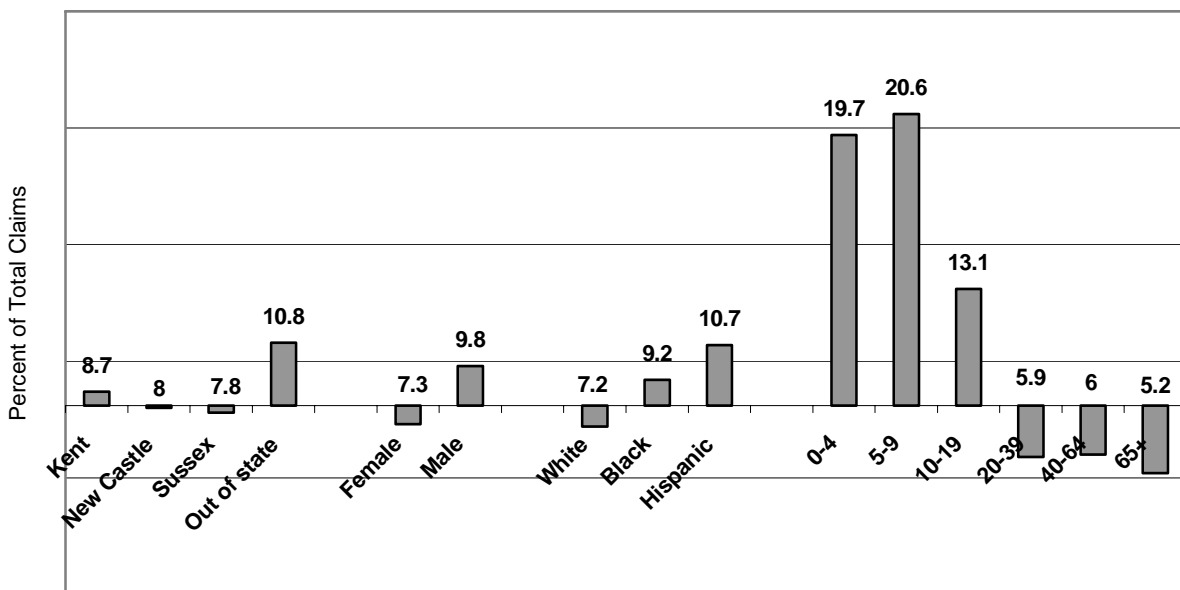
Figure 33 uses the same format to illustrate pharmacy data from the state employee plan.

**Figure 31**  
**Asthma Pharmacy Claims as Percent of Total Number of Claims;**  
**By County, Gender, Race, and Age, Compared to Overall Percentage (7.6%),**  
**Delaware State Medicaid Members, 2000-2002**



Source: Aggregate Medicaid Pharmacy file, compiled from EDS pharmacy claims

**Figure 32**  
**Asthma Pharmacy Claims as Percent of Total Number of Claims;**  
**By County, Gender, Race, and Age, Compared to Overall Percentage (8.1%),**  
**Delaware State Medicaid Members, 2003**



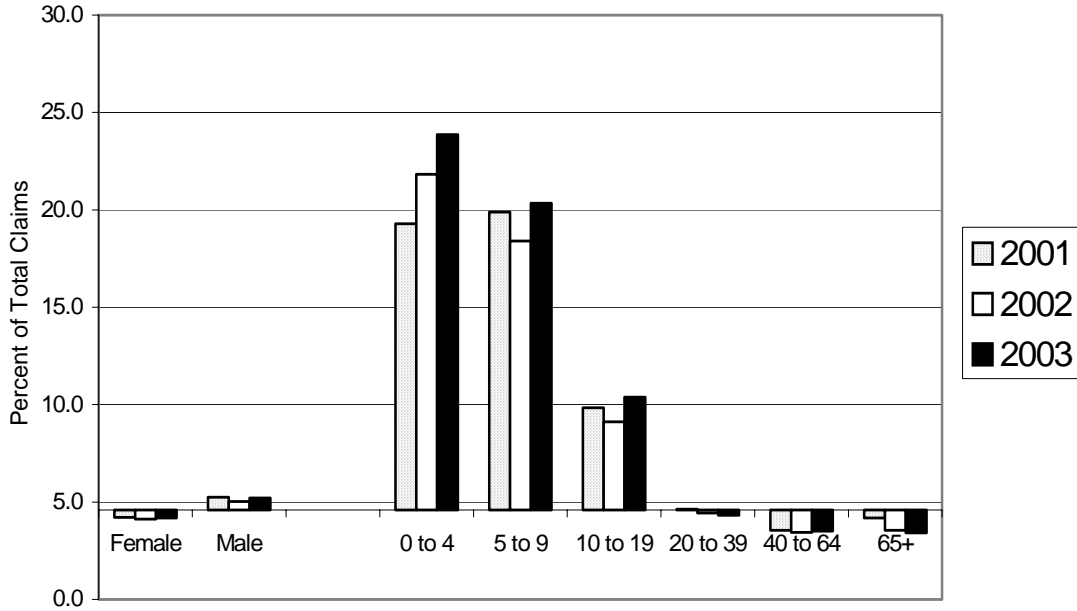
Source: Aggregate Medicaid Pharmacy file, compiled from EDS pharmacy claims

These two graphs mirror the pattern already clearly established in the previous utilization profiles from the Medicaid plan—the male differential in use, the relatively higher use by African Americans and Hispanics with asthma, and the high utilization by those under 18. A few patterns, however, deserve specific highlighting:

- The consistency of the percentage of asthma medication claims to total medication claims over a three year period is remarkable, showing a very stable pattern of asthma impact in the Medicaid population over the 2000-2002 period. The slight increase to 8.1% in 2003—representing over 150,000 total claims—may be the beginning of a new trend, one that should be welcomed, since medications can reduce the use of ER and inpatient services, as well as the number of urgent visits to physicians' offices.
- The consistency of gender differences in use of medications over this time period also reflects the stability of the asthma impact among Medicaid members.
- The increasing use of asthma medications for those 19 and younger suggests that efforts to manage asthma may be meeting with success. If the decline in hospital admissions starting in 2000 (see Figure 16) represents the beginning of a trend, then the substitution of medications for hospitalization could be perceived as a success. Continued monitoring of the hospital discharges is a key to determining the direction and scale of these trends.
- There is a continuing need to focus on African Americans—especially African American children—for asthma screening and intervention efforts.

The asthma pharmacy use profile for the State Employee plan (Figure 33) reveals some interesting differences and similarities with the Medicaid profiles.

**Figure 33**  
**Asthma Pharmacy Claims as Percent of Total Number of Claims;**  
**By Gender and Age, Compared to Overall Percentage (4.6%),**  
**Delaware State Employees and Dependents, 2001-2003**



Source: Aggregated State Employee Pharmacy Claims file, compiled by Express Scripts  
 Note: Used 4.6% as crossover value, even though 2002 had value of 4.5%; insignificant impact.

The male differential in claims from the state employee plan may be explained by the very high usage by dependents of state employees under the age of 18, a use on a percentage basis even greater than the Medicaid plan. This high medication utilization reflects the high prevalence of asthma for those under 18 and suggests that state employee dependents have good access to medical services. The apparent decline in asthma hospital discharges for this age group (Figure 16) may reflect an increased use of medications to control asthma symptoms. Thus, the medication usage pattern of the state employee plan—that had over 60,000 pharmacy claims in 2003—may be a success indicator.

It is important to note that the proportion of asthma-related pharmacy claims to total pharmacy claims for both Medicaid and the state employee plan is substantially higher than this proportion for other types of treatment. Utilization of asthma medications represents a greater proportion of total medication utilization than asthma-related hospital or physician office visits represent of their totals. This suggests the importance of medication as an intervention for asthma. The key role of medications will be reflected in the cost impact section below.

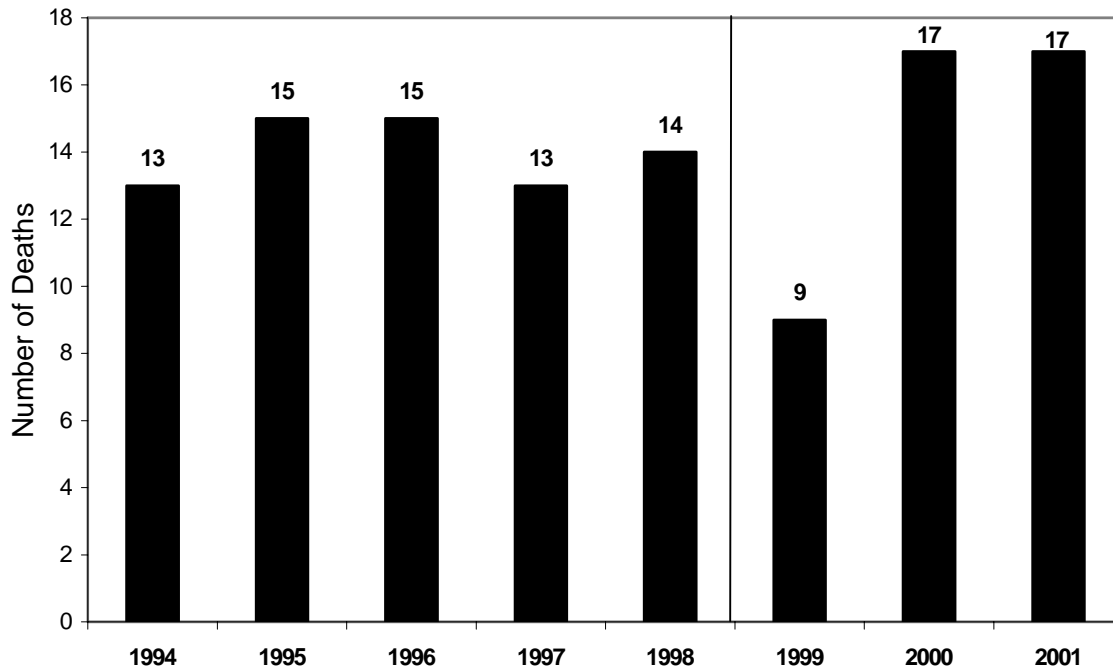
**Asthma Health Care Utilization Summary**

The Medicaid and state employee plans represent very different populations, but they do cover one-third of all Delawareans. The evidence that these seemingly disparate plans have remarkably similar utilization profiles suggests that this pattern captures the dynamics of the impact of asthma on the state’s health care system.

## ***Asthma's Ultimate Impact: Mortality Data***

Asthma mortality is rare, but it is important to monitor its occurrence, to establish trends, and to be alert for a proportional increase. In the chart that follows, we show the data for 1994-2001.

**Figure 34**  
**Asthma Deaths in Delaware, 1994-2001**



Source: DHSS, DPH, Health Statistics Center

In 1999, a change was made in the coding system for collecting these statistics. From that time forward, asthma was 11% less likely to be coded as the underlying cause of death. The dip in 1999 may result from this change. The increases in 2000 and 2001, however, suggest a need to systematically monitor this statistic. **Two years of data do not make a trend, but “asthma deaths per year” is a critical indicator to assess the health of the asthma management system in Delaware.**

Reviewing the table of these deaths by gender and race (Figure 35) reveals at least one of the factors key to these increases in deaths.

**Figure 35**  
**Asthma Deaths in Delaware, by County, Race, and Gender**  
**1994 to 2001**

	Total	Kent	New Castle	Sussex	White	Afr. Am.	Male	Female
<b>1994</b>	13	0	9	4	7	6	7	6
<b>1995</b>	15	2	11	2	14	1	7	8
<b>1996</b>	15	2	9	4	14	1	7	8
<b>1997</b>	13	3	9	1	11	2	2	11
<b>1998</b>	14	2	10	2	11	3	7	7
<b>1999</b>	9	0	6	3	9	0	2	7
<b>2000</b>	17	3	12	2	11	6	8	9
<b>2001</b>	17	4	11	2	9	8	6	11

Source: DHSS, DPH, Health Statistics Center

**The increase in deaths among African Americans in 2000 and 2001 points to a need for close monitoring in future years.**

Of the 113 deaths in this eight-year period, three involved a child under the age of 18. Slightly more than 50% (58) of these deaths involved a person over the age of 65. While people over 65 have a low prevalence of asthma in the nation (see Figure 1), they represent a vulnerable population because they are likely to have co-morbidities that interact to put them at risk.

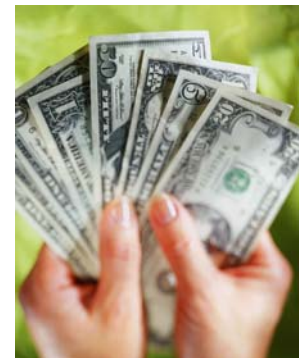
Seventy-seven deaths (68%) involved New Castle County residents, mirroring the proportion that this county represents of the total Delaware population. Men accounted for 46 of the 113 deaths (41%), reflecting the lower prevalence of asthma among adult males. Of the deaths, 86 were white (76%), reflecting the proportion whites represent of the population in Delaware, using state population projections.

## Economic Impact of Asthma in Delaware

What is the economic impact of asthma on the health care system in Delaware?

The short answer to this question is that it is impossible to tell.

All of the issues that made utilization such a challenge to measure are relevant—the fragmentation of costs, the inability to secure what is often proprietary data. This effort is made even more difficult because of discounting, which leads to questioning when a “charge” is really a “charge” in health care and what the underlying cost really is.



Using the Delaware Hospital Discharge file and the aggregated claims and encounter files from Medicaid and state employees plans, this report attempts to highlight trends in overall health

spending related to asthma and within the various treatment venues – *i.e.* the hospital, the emergency room, the physician’s office, and the pharmacy.

### ***Asthma Charges for Hospital Inpatient Services***

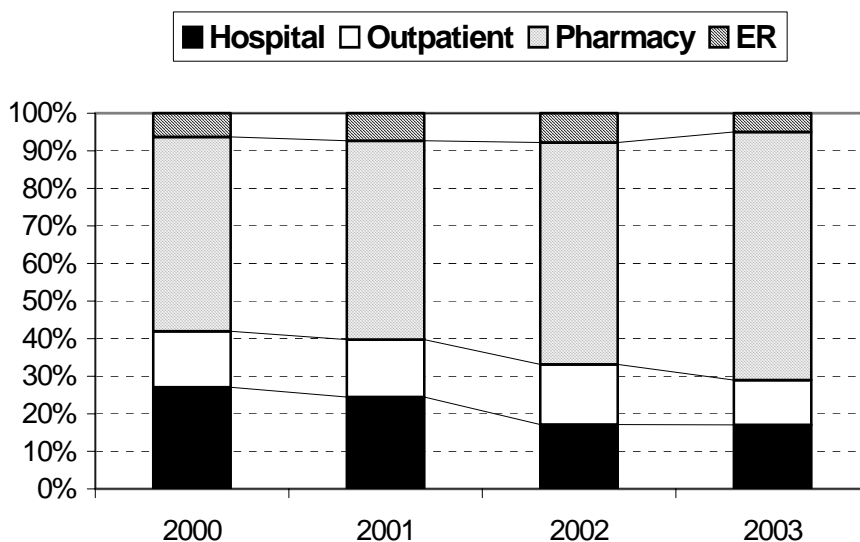
For this analysis, charge data were captured from the Delaware Hospital Discharge file and aggregated Medicaid and state employee claims files. These data provide a snapshot of salient variables relating to asthma hospital discharges.

- **The total charges for asthma-related hospitalizations in 2000 (\$6.7 million) are below the charges in 1994 (\$7.8 million).** Possible factors contributing to this decrease may be: declining average length of stay, a generally steady number of discharges each year, and a low health care inflation rate in the late 1990s.
- With short lengths of stay and few clinical complications, asthma patient hospital stays are generally less intensive in terms of charges. Thus, while asthma represented 1.3% of all inpatient discharges in 2000, it represented only 0.8% of the total inpatient charges.

### **Financial Impact on Medicaid**

Figure 36 presents an instructive context to assess asthma’s financial impact on Medicaid, because it shows the charges for relevant service sites. The stacked bars show the percentage of the total charges from each type of service site.

**Figure 36**  
**Percent of Delaware Medicaid Asthma Health Care Expenditures**  
**From Each Service Site 2000-2003**



Source: Aggregated Medicaid Claims files, compiled from EDS claims files

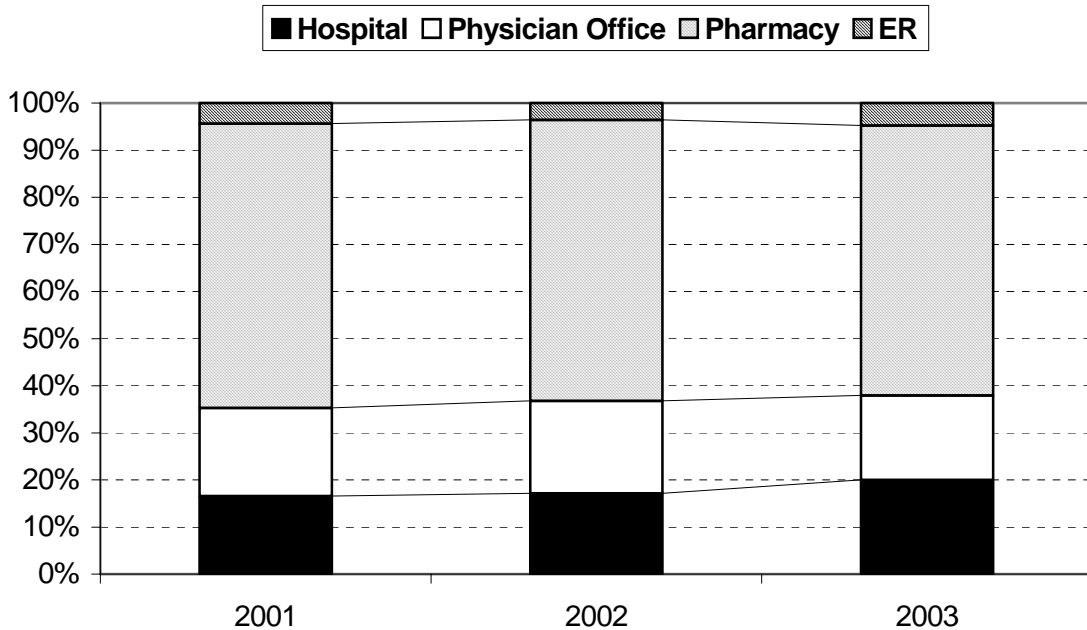


**Medicaid claims for asthma medications more than doubled, from \$4.4 million in 2000 to \$9.7 million in 2003.** There were more than 150,000 claims for asthma-related medications in 2003. Hospital services and ER services, while generally growing in dollar amounts, are shrinking in proportion to the percent of pharmacy charges. Physician office charges are shrinking in percent while growing in dollar amount. For 2003, ER claims were \$9.7 million, outpatient (physician) claims totaled \$1.7 million, and hospital claims were \$2.5 million. **Total asthma-related Medicaid claims in 2003 were \$13.9 million.** Hospital and medication costs represented almost 90% of the direct asthma Medicaid charges in Delaware in 2003.

The primary reliance upon medications to manage asthma for Medicaid members, despite a possible decline in physician office visits, is preferable to using hospital or ER services. Of course, such reliance is not without costs to the Medicaid program, as it merely shifts costs from less-desirable services to more-desirable ones.

Figure 37 shows this information for the state employee plan, covering the years 2001 to 2003.

**Figure 37**  
**Delaware State Employees and Dependents Asthma Health Care Expenditures,**  
**Percent of Each Service Site, 2001-2003**



Source: Aggregated Claims files, State Employee Plan, compiled by QID from Coventry and BCBS aggregated claims files

This graph presents a different profile from the Medicaid one. Most noticeably, the asthma-related pharmacy charges are decreasing as a percent of the total. However the amount of pharmacy claims increased from \$1.38 million in 2001 to \$1.5 million in 2003. While hospital charges have stabilized in amount and are decreasing in percent of the total for Medicaid, they are increasing in both for the state employee plan. Hospitalization charges increased from \$379,000 to \$528,500 over the three years. Physician claims from the state employee plan totaled \$472,900 in 2003, and ER claims were \$125,800. **Total asthma-related claims from the state employee plan in 2003 were \$2,627,200.**

For the state employee plan, hospital and medication charges represent slightly less than 80% of the total asthma-related claims for 2003. Whereas the Medicaid pharmacy charges grew nearly 120% over the four years shown, the state employee plan showed an asthma pharmacy growth of only 10% over the three years. Hospital charges, on the other hand, grew nearly 40% over the three years, while Medicaid asthma hospital charges essentially remained stable.

Medicaid in 2003, with only 50% more covered lives, had nearly six times the total charges for asthma. **Combined, these health plans had direct charges attributed to asthma of more than \$16 million.** Although these plans cover one-third of all Delawareans, it would *not* be reasonable to simply project these costs to the entire population of the state. The Medicaid program asthma charges represent a population unlike commercial plans or Medicare. The charges of the other commercial plans and Medicare are more likely to reflect the charge profile of the state employee plan. If this assumption is correct, then these other health plans could have asthma-related direct charges between \$10 million and \$15 million—**for a statewide estimated total direct charge of between \$25 and \$30 million.**

It is important to remember that these are health care **charges, not costs.** Actual costs to the health plans are probably at least 40% less. **If that is the case, asthma generates direct health care costs between \$12 and \$18 million a year.**

## Productivity and Quality of Life

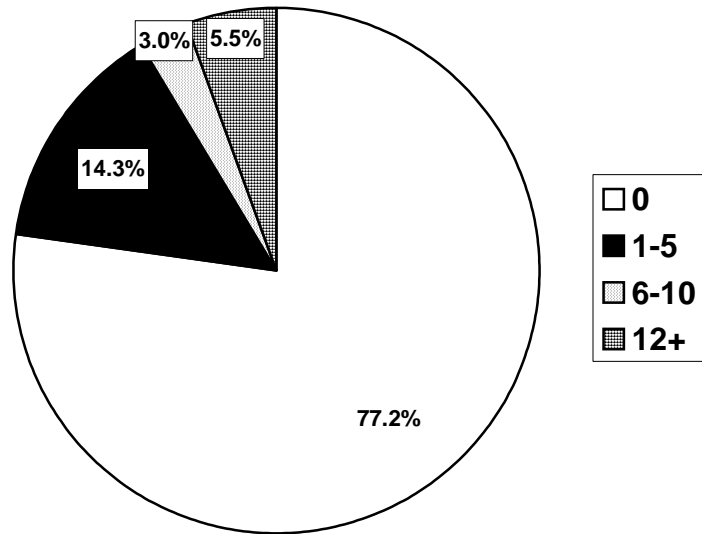
Productivity and quality of life are very difficult to measure. Nevertheless, asthma does have an impact. Lost days from work – due to asthma or care for a child with asthma – have physical and psychological costs. These are negative impacts of asthma.

Asthma also affects the productivity of children through lost days of school, difficulty participating in sports, or other restrictions on activities. While these incidents have a limited economic impact because children are not part of the working marketplace, they have a developmental cost. Growing up with a sense of limits and physical constraints leads to uncounted and unpredictable later cost.

The only systematic data available to begin to understand such costs in Delaware is the Adult Asthma History Module of the BRFSS. The sample is small because the module's questions are answered only by people who say they still have asthma. In 2002, the first time the Delaware BRFSS used the module, approximately 300 adult Delawareans out of a 4,000 sample, responded to these questions. This number represented a little over 7% of those taking part in the BRFSS in Delaware. This is roughly the reported current prevalence rate in Delaware (Figure 7).

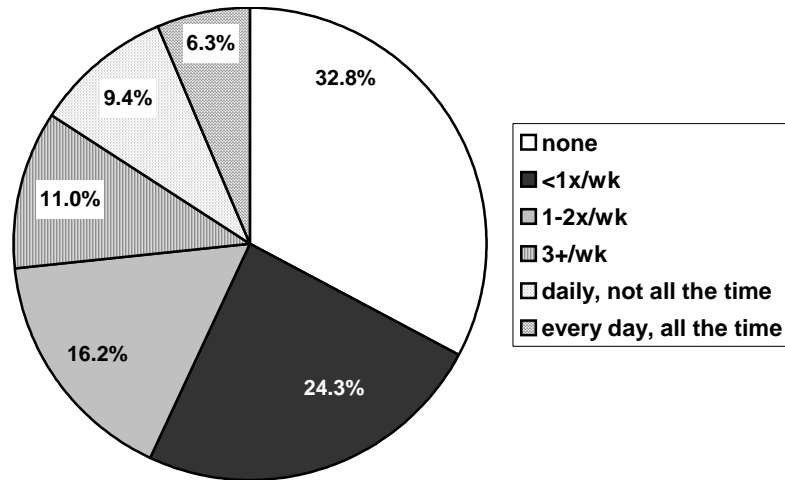
Figures 38 and 39 suggest some indirect costs of asthma in Delaware.

**Figure 38**  
**Number of Days Unable To Work Or Carry Out Daily Activities**  
**Because of Asthma in Last 12 Months**  
**By Adults Reporting Current Asthma in Delaware BRFS, 2002**



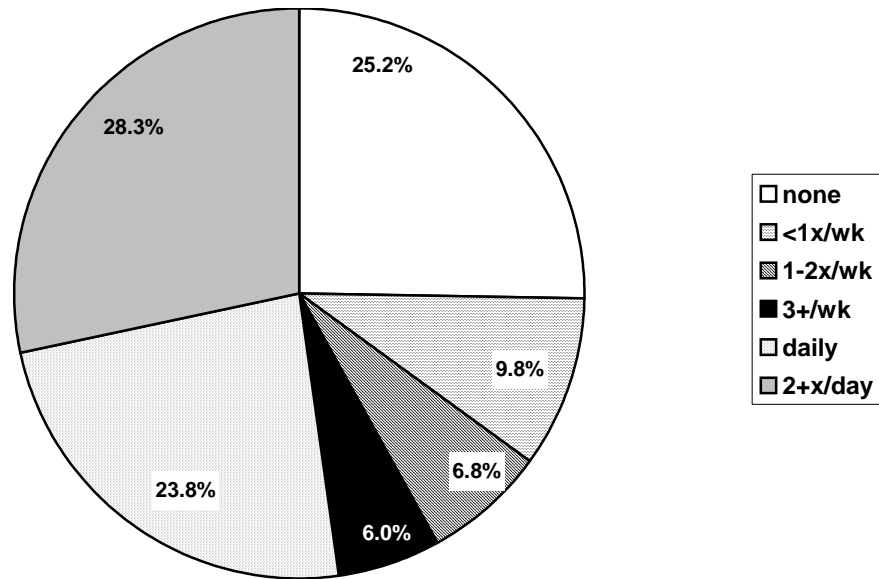
Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=295

**Figure 39**  
**Frequency of Asthma Symptoms in Last 30 Days**  
**By Adults Reporting Current Asthma in Delaware BRFS, 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=297

**Figure 40**  
**Frequency of Asthma Medication Use in Last 30 Days**  
**By Adults Reporting Current Asthma in Delaware BRFSS, 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 2002; n=298

**About 25,000 adult Delawareans suffered from an asthma attack within the past year.** This estimate was based on the 2002 adult current asthma prevalence rate from the Delaware BRFS, the 48.6% of the Adult Asthma History respondents who claimed to have an attack in the previous 12 months, and a weighted population projection.

From Figure 39, we can estimate that about 30,200 adult Delawareans suffer from asthma symptoms in an average month. **Approximately 8,000 of these people suffer symptoms at least three times a week and as often as every day.** The result, shown in Figure 40, is that **probably 33,700 adult Delawareans use asthma medications sometime in a month and more than 23,400 of these use these medications daily.** These estimates do not include children who have the highest prevalence of asthma and who are high users of asthma medications (Figures 31 and 33).

The BRFS data projections provide a sense of **scale**, and in some cases **intensity**, which are key components of the impact of asthma. It is clear that asthma has real costs and directly impacts the quality of life of those who must cope with asthma.

# Environmental Factors

## Smoking and Airborne Pollution

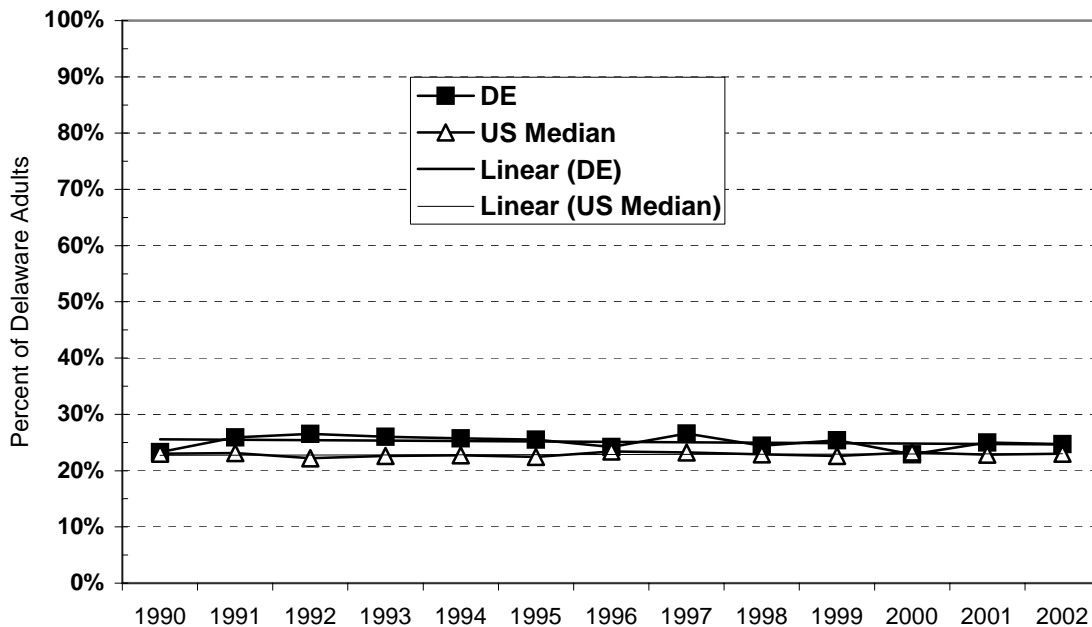
Smoking and environmental phenomena such as airborne pollution can trigger asthma symptoms, particularly among the group with “current asthma.” Thus, the public policy goal of reducing these external factors can reduce the impact of asthma in Delaware. Surveillance of these external factors is a critical part of any asthma control and prevention program. The hope is that these factors decline over time, benefiting more than 72,000 people in Delaware who are estimated to have been diagnosed with asthma at some time in their lives.



## Smoking

In the graphs that follow, we present the trends of some of these key environmental factors. The chart below tracks the percentage of Delawareans who smoke, compared to the national trend.

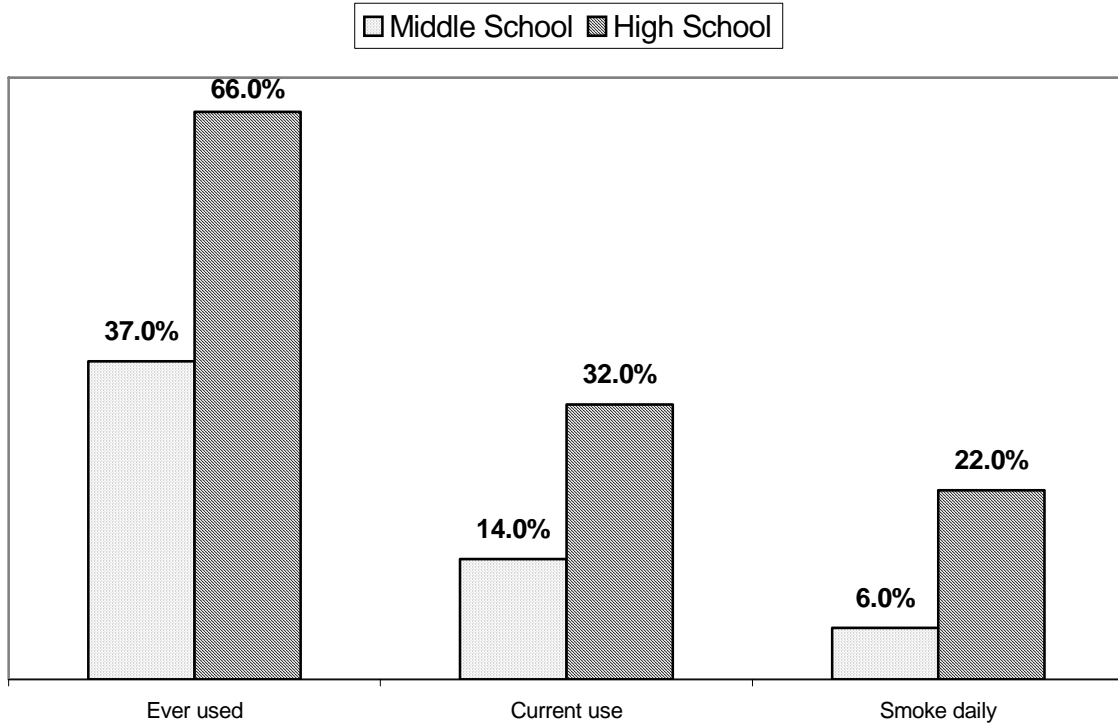
**Figure 42**  
**Percentage of Adults Who Smoke Cigarettes:**  
**US and Delaware, 1990 to 2002**



Source: DHSS, DPH, Behavioral Risk Factor Survey, 1990-2000

Figure 43 presents a snapshot of the smoking patterns of middle and high school students in Delaware. The Delaware Youth Tobacco Survey is administered in school on even-numbered years, alternating with the YRBS.

**Figure 43**  
**Cigarette Smoking by Delaware Middle and High School Students, 2002**



Source: DHSS, DPH, Delaware Youth Tobacco Survey, 2002; n=2,779 middle school, 2,517 high school students

The good news for Delawareans with asthma is that smoking prevalence in Delaware is declining among youth, young adults, and adult women. The Delaware Division of Public Health, and its partners in the IMPACT Delaware Tobacco Prevention Coalition, have developed comprehensive tobacco prevention and control programs during the past seven years. In addition, implementation of the Clean Indoor Air Act in 2002 made public places more hospitable for those with asthma; and may also encourage more Delawareans to stop smoking.

One strategy in dealing with smoking cessation and asthma sufferers is to target specific groups of smokers, those who, if they stopped, could materially impact asthma sufferers. The first group to target potentially, in this context, is those who smoke and have asthma. A second group is those parents who smoke and who have asthmatic children, especially young children. A third group includes family member or other people living in the households of people with asthma.

The Youth Tobacco Survey data suggest that agencies and organizations sponsoring youth smoking prevention and cessation efforts have had significant success—and should maintain or increase those efforts. The 6% rate for middle school students that smoke daily should not be overlooked, even though it is low in relation to all other rates on these charts. Middle school

involves children as young as 11 years old; public policy should be to drive this rate down as far as possible.

## ***Airborne Pollution***

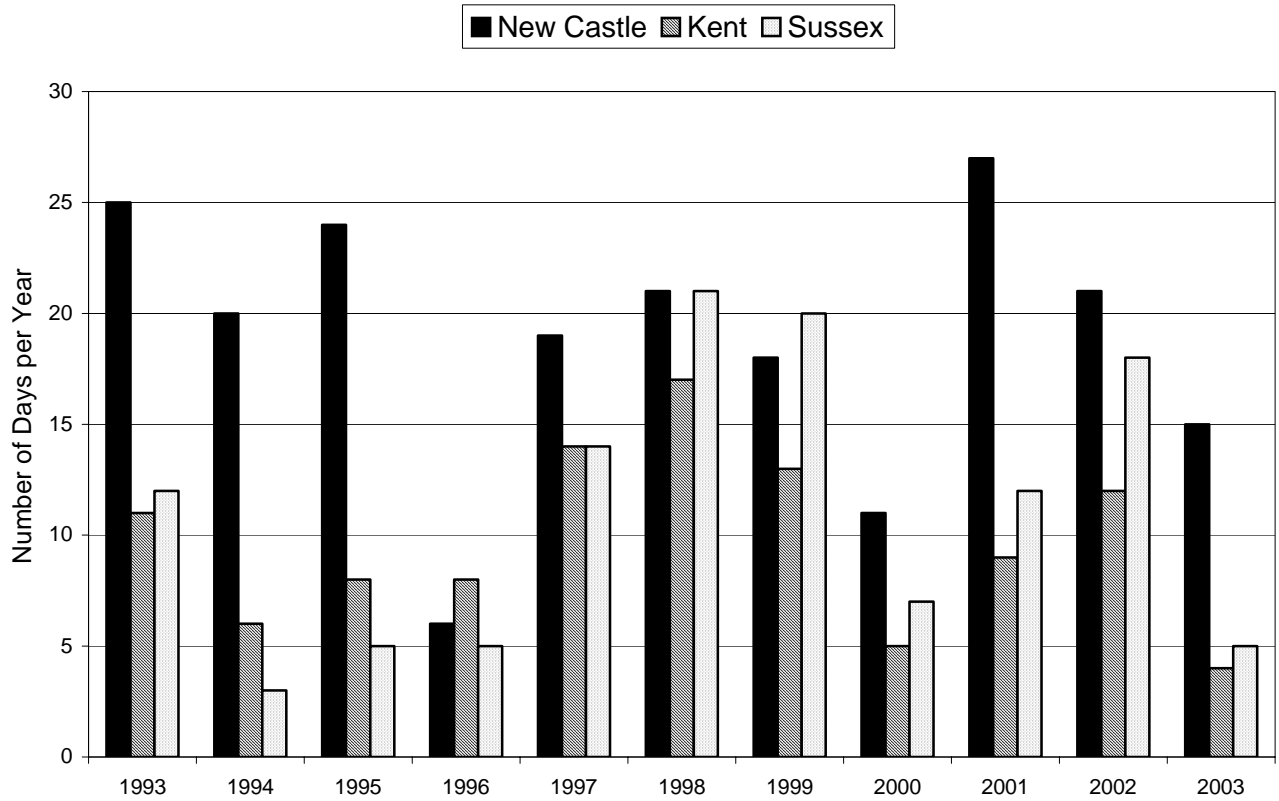
The Delaware Department of Natural Resources and Environmental Control (DNREC) systematically monitors air quality throughout the state. In accordance with the federal Clean Air Act, DNREC continuously monitors six pollutants – carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), and two types of particulate matter – particles smaller than 10 micrometers (PM<sub>10</sub>) and smaller than 2.5 micrometers (PM<sub>2.5</sub>). States provide the data values to the federal Environmental Protection Agency (EPA), using the Air Quality System database from which EPA compiles reports. DNREC also publishes an annual summary report and posts near-real time monitoring data on its website at:

[http://www.dnrec.state.de.us/air/aqm\\_page/aqm\\_nets.htm](http://www.dnrec.state.de.us/air/aqm_page/aqm_nets.htm)

The EPA has created a combined measure of all of these pollutants called the Air Quality Index (AQI) that it reports on its website and in a variety of reports. The AQI is a series of banded values, with higher values being detrimental. Because the AQI's definition has changed over the past ten years, it is not possible to provide reliable trend data. Below is the EPA data of the AQI for the three Delaware counties, for the top two bands only—*Unhealthy for sensitive groups* (which would include those with asthma), values 101 through 150, and *Unhealthy*, values above 151. This graph maps the number of days in each Delaware county for which the AQI was in these potentially adverse categories. According to DNREC's 2002 Annual Air Quality Report, ozone is the primary driver of these higher values.

The AQI is based on the pollutant that is the highest concentration on any given day. While ozone and particulate matter are the pollutants most frequently driving the AQI, other pollutants are present in lower concentrations. These other pollutants, such as sulfur dioxide (SO<sub>2</sub>), may be important triggers of asthma, even when not reflected in the AQI value for a particular day.

**Figure 44**  
**Number of Days per Year Air Quality Index Rated *Unhealthy to Sensitive and/or All Individuals*,  
 Three Delaware Counties, 1993 to 2003**



Source: EPA website—[www.epa.gov/air/data](http://www.epa.gov/air/data), accessed 6/8/04

Figure 44 clearly shows that New Castle County has the most days in categories defined as unhealthy, compared to the other Delaware counties; it is only below 15 days per year in two years. Sussex County reached 15-day level only three times in this 11-year period. Kent County reached this level only once (1998).

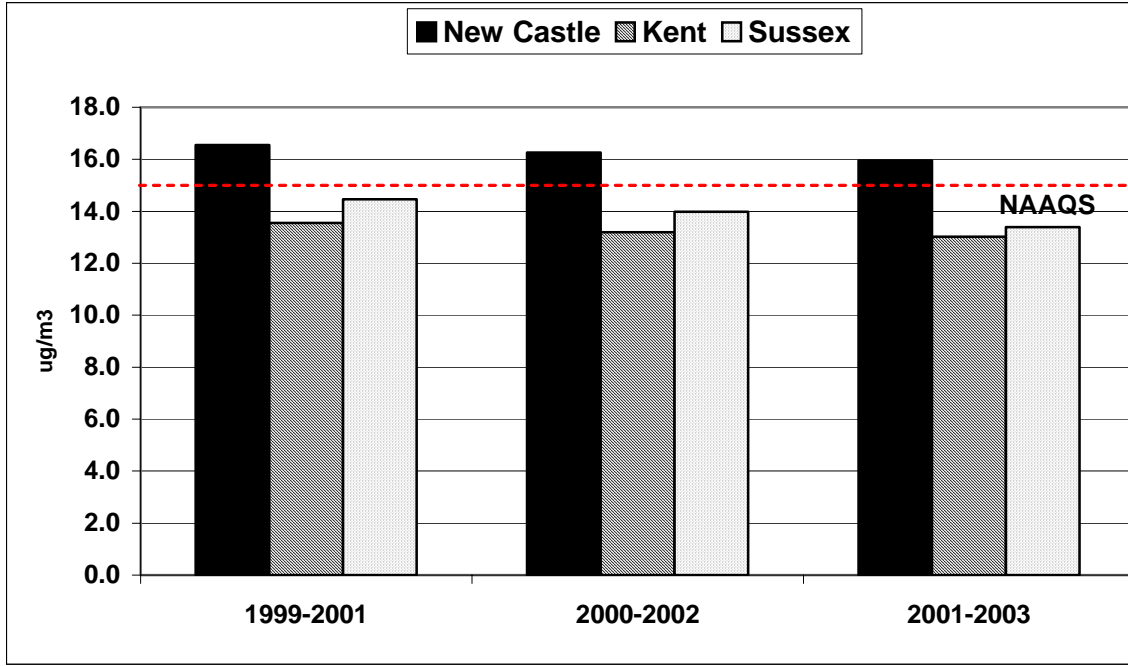
The Delaware Department of Natural Resources and Environmental Control (DNREC) also applies the National Ambient Air Quality Standards (NAAQS) for the same six pollutants. Particulate matter smaller than 2.5 micrometers is dangerous because it can penetrate more deeply into the lungs. The national standard for Fine Particulate Matter (PM<sub>2.5</sub>) is 15 µg/m<sup>3</sup> (micrograms per cubic meter\*) averaged over three years. Delaware has not attained the PM<sub>2.5</sub> standard. Figure 45 presents the values for the three counties relative to the 15 µg/m<sup>3</sup> cut-off.

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\* Micrograms per cubic meter is a measure of the concentration of a pollutant or chemical. 15 µg/m<sup>3</sup> means that there are 15 micrograms of the pollutant or chemical in a volume of air equal to one cubic meter.



**Figure 45**  
**NAAQS PM<sub>2.5</sub> Standard, Rolling Three Year Average, Delaware Counties, 1999 to 2003**  
**Highest Recorded Value Only**



Source: <http://www.epa.gov/air/data/monvals.html?st-DE~Delaware>, accessed 11/1/04

Figure 45 shows that New Castle County is the primary reason that Delaware has not attained compliance with this NAAQS standard. New Castle County is the only county with a rolling three-year average greater than the standard. Thus, both for ozone and PM<sub>2.5</sub>, New Castle County has the highest air quality problems. Kent County has the lowest air quality problems of the three Delaware counties.

With the wealth of data collected and compiled by DNREC, the state could consider the possibility of either conducting or contracting research that would test whether relationships exist between the environmental data and asthma clinical and health care administrative data, such as claims or encounter data. If such relationships exist, they could either point toward active environmental interventions that could reduce the impact of asthma in Delaware, or add more reasons to enhance our efforts to produce higher air quality.

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