

Asthma Mortality in Virginia, 1998-2001

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Introduction

The report describes mortality in Virginia for an underlying cause of death of asthma for the period 1998-2001. The project was conducted by the Department of Health Administration of Virginia Commonwealth University in cooperation with the Virginia Asthma Control Program of the Virginia Department of Health (VDH). It was funded through the Virginia Department of Health with funds provided by the Centers for Disease Control and Prevention.

The purpose of this report is to describe the number of asthma deaths for various demographic groups and geographies. The report will serve as a resource for VDH staff and regional asthma coalitions to gauge the impact of asthma mortality on various populations and localities.

The study objectives are to:

1. Describe the frequency of asthma deaths by race & age and sex & education for the Commonwealth of Virginia from 1998-2001
2. Describe the frequency of asthma deaths by race & age and sex & education for Virginia's Health Districts from 1998-2001
3. Describe the frequency of asthma deaths by race & age and sex & education for Virginia's Counties and Independent Cities from 1998-2001
4. Compute the 3-year average mortality rate for the Commonwealth of Virginia and Virginia's Health Districts

The report is organized into four sections: 1) The Introduction describes the reports objectives; 2) The Methodology and Data Quality section describes the methods and issues related to how the source data was collected, provided to the contractor, and analyzed and summarized for this report; 3) The Findings section provides a profile of asthma mortality by

demographic groups for Virginia, Virginia's Health Districts and Virginia's Counties and Independent Cities; 4) The Technical Notes section outlines some limitations and technical issues that users should consider when interpreting data in this report.

Methodology

Data Source

Mortality data for this report were originated with vital statistics data collected and disseminated by the Virginia Center for Health Statistics (VCHS) of the Virginia Department of Health. Federal law mandates collection and publication of all deaths and the use of standardized forms and definitions for classifying the underlying and contributing causes of death¹. This report includes asthma mortality data for the years 1998-2000.

Data Extraction and Analysis

Data extraction was done by VCHS staff using criteria suggested by VDH staff. Selection criteria used a standardized case classification for asthma mortality developed by the National Association of Health Data Organizations. A probable case of asthma mortality is defined as a death certificate with the underlying cause of death listed as ICD-9-CM Code 493.0-493.9 or an ICD 10-CM code of J45.0-J45.9. A possible case of asthma mortality is defined as a death certificate with the contributing cause of death listed as ICD-9-CM Code 493.0-493.9 or an ICD 10-CM code of J45.0-J45.9. Data for this report used only the probable case definition to select cases of asthma mortality.

VCHS prepared tables which presented asthma mortality count data by race & age group and also by gender and education level of the decedent. Race groups include White, Black, and Other. Age groups were 0-4, 5-9, 10-14, 15-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75

¹ See the National Center for Health Statistics web site for more information about the Vital Statistics System: <http://www.cdc.gov/nchs/about/major/dvs/desc.htm>

& up. Education was categorized as 0-8, 9-11, 12, 13-15, or 16+ years as well as education level “Unknown”. The tables included overall asthma mortality totals as well as totals by demographic category for every county/city and Health District and for the Commonwealth of Virginia as a whole.

Tables prepared by the VCHS were provided to the contractor. Tables 1-7 with counts of asthma deaths by demographic group and geographic region that appear in this report and for all cause mortality by age, race, and gender were formatted by the contractor but otherwise appear as prepared by VCHS staff or as found on the VCHS web site:

<http://www.vdh.state.va.us/HealthStats/stats.asp>. Total asthma deaths by Health District for the 1998-2000 for the period were merged with 2000 U.S. Census decennial population data. Three year average mortality rates by Health District with 95% confidence intervals were computed.

A rate ratio of Health District asthma mortality to the Virginia total asthma mortality rate was prepared to provide a tool for comparing asthma mortality among Virginia’s Health Districts. A Health District with a ratio greater than one suggests that its asthma mortality rate is higher than the state rate.

The total number of asthma deaths analyzed in this report, even when summed over three years, represent an exceedingly small number of events. Readers should use caution when using or interpreting rates based on a small number of events in the numerator². In general, rates with less than 20 events in the numerator are considered unreliable. See the Technical Notes and Limitations Section for more details.

² See the discussion in the Technical Notes Section of Hoyert, D. L., Arias, E., Smith, B. L., Murphy, S. L., & Kochanek, K. D. (2001). *Deaths: Final Data for 1999* (Rep. No. 49). Hyattsville, MD: National Center for Health Statistics

Findings

All cause mortality for Virginia for the period 1998-2000 was 164,906 deaths (Table 1). Asthma deaths in this period totaled 359 or .22% of all deaths. Using the 2000 U.S. Census decennial population figures for Virginia as a denominator, the average asthma mortality rate during the 3-year period was 1.69 deaths per 100,000 (95% C.I. 1.39-1.99). The U.S. asthma mortality rate for 2000 was 1.6 per 100,000.³

Tables 2-4 present the number of asthma deaths by race and age groups for 1998-2000 respectively for Virginia's counties & independent cities as well as by Health District. There were 143 asthma deaths in 1998 which declined to 109 in 1999 and 107 in 2000. The preponderance of deaths occurred in individual over 45 years of age (285, 79%). Sixty-one percent of the deaths were to whites and 37% were Blacks. Tables 5-7 present then number of asthma deaths by sex and education groups for 1998-2000. Seventy-two percent of the deaths in that 3-year period were to individuals with a high school education or less. Sixty-eight percent of the deaths were to females.

The City of Richmond Health District had the most total deaths in the 3-year period, 34 followed by Fairfax District with 26, Henrico District with 21, and Central Virginia District with 20 (Tables 8-9). The remainder of the 35 districts had less than 20 events for the entire period and over half of the deaths occurred in eleven Health Districts. This makes mortality rate calculations problematic. Rates have been calculated for all Health Districts but readers should keep in mind that all of these rates should be considered unreliable or marginally reliable at best. The wide confidence intervals around these rates clearly indicate the approximate nature of the point estimates. These rates have not been adjusted for differences in the age and race

³ National Center for Health Statistics, (2003). Asthma Prevalence, Health Care Use and Mortality, 2000-2001. Online at: <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm>. Accessed on 12/5/2003. Last Updated on: 1/28/2003.

differences in the population distributions of the Health Districts. Given the small number of deaths, further adjustment would only further confuse the interpretation of this data.

Rate ratios were also computed which compare the Health District rate to the rate for Virginia. Again, most of these ratios should be considered approximations because of the lack of reliability of the underlying Health District rates. It seems clear though that there is something different about the City of Richmond Health District which has a rate over 3 times the state rate. Perhaps not surprisingly, 6 of the ten Health Districts with the most deaths are also in the top ten in number of hospitalizations in 2000 (Richmond, Fairfax, Henrico, Central Virginia, Norfolk, & Chesterfield). Three of the ten Health Districts with the most deaths are also in the in worst ten in hospitalization rates in 2000 (Richmond, Western Tidewater, & Piedmont).⁴

Conclusions

In summary, asthma mortality in Virginia is a relatively rare event. However, the deaths that have occurred in the 1998-2000 period disproportionately affect older individuals, those of Black race, and those with a high school education or less. The clustering of deaths in certain Health Districts probably relates partially to the population size in those districts but more probably to the clustering of older, less educated, and Black asthmatics in those areas.

While the number of deaths precludes accurate estimation of mortality rates, the mortality counts and rates in this report do provide some basis for targeting interventions. All asthma deaths are preventable given access to and utilization of appropriate medical care along with patient understanding of asthma self-care protocols and compliance with a physician's asthma management plan. The fact that over 100 people per year in Virginia die from asthma suggests

⁴ Carretta, H.J. (2003). Asthma Hospitalizations in Virginia 1995-2001. Virginia Department of Health, Richmond, Virginia.

there is room for improvement in how physicians and asthmatics manage the condition particularly for older and less educated asthmatics.

Technical Notes and Limitations

Data Quality

Collection of mortality data is regulated and standardized in the United States by cooperative agreements between the individual states and the National Center for Health Statistics. The National Center for Health Statistics has extensive information on data collection & data processing of mortality data, including copies of the standard death certificate and instruction manuals for completing death certificates and determining the underlying and contributing cause of death⁵.

Despite this high the standardization of the processes, there may be differences across medical examiners and physicians on assigning the cause of death or on how the underlying versus contributing cause of death is determined. In addition, education level, race, and age of the decedent may be provided by surviving family members and be subject to recall errors or a desire to provide social desirable responses. These types of errors may vary by socio-demographic and socio-economic status of the decedent and surviving family members. U.S. mortality data of the type used in this analysis is believed to be generally reliable and accurate.

There are some difference between the total number of asthma deaths proved by VCHS staff to the asthma program in Tables 3, 4, 6, and 7 (1999 & 2000) and the total number of asthma deaths available on the VDH web site. For example, Tables 3, 4, 6, and 7 report 108 and 107 total asthma deaths for Virginia in 1999 and 2000. The Quick Facts look up available at: <http://www.vdh.state.va.us/HealthStats/stats.asp> report 133 and 127 asthma deaths for those

⁵ National Center for Health Statistics, (2003). Mortality Data from the National Vital Statistics System. Online at: <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm>. Access on 12/5/2003. Last Updated on: 12/3/2003.

same years. Differences are probably attributable to records with missing values for age or education of the decedent which were dropped from the data for this reports analysis.

Rate Calculations

Mortality rates and rate ratios were calculated for all Health Districts without regard to the number of deaths in the numerator using the average number of deaths for the 3-year period, 1998-2000. Population denominators were extracted from the 2000 decennial census 100% count file (SF1) by county and aggregated to the Health District and state level. The 2000 census data was used as a proxy for the actual 3-year average population.

Reliability Indicators

All of the point estimates for Health District mortality rates presented in this report are based on a small number of discharges in the numerator. While this data constitutes the universe of asthma discharges in Virginia, and as such is not subject to sampling error, it is subject to random variation. Random variation can influence the reliability of estimates when the number of events in the numerator is small. The 95% confidence interval (C.I.) is a measure of the reliability of an estimate. The 95% C.I. is statistical concept that indicates that there is a 95% probability that the “true” measure of interest (in this case, the mortality rate) is captured within an interval computed from a single study. The wider the interval the less sure we are that the point estimate or rate in question is really the “true” rate. For this study, the 95% confidence interval was calculated using the following formulas:

Upper 95% CI= $(10000/n)(d+(1.96 \times \text{square root of } d))$

Lower 95% CI= $(10000/n)(d-(1.96 \times \text{square root of } d))$, where d=number of deaths upon which the rate is based and n=population denominator of the rate. In general, rates with wide confidence intervals should be used with caution.

Table 1. All Causes of Death for Residents by Age, Race, and Sex for Virginia, 1998-2000

Year	Race and Sex	Total	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	Age Unknown
1998	Total	53,629	695	104	66	92	297	343	435	549	918	1,252	1,555	2,035	2,533	3,334	4,574	6,378	7,741	7,754	12,966	8
1998	White Male	20,336	216	32	25	36	135	161	184	217	390	535	686	854	1,138	1,494	2,028	2,780	3,154	2,894	3,374	3
1998	White Female	21,517	153	33	11	24	64	57	91	125	210	276	362	584	723	958	1,428	2,229	3,025	3,491	7,673	
1998	Black Male	5,734	179	21	12	15	77	94	100	124	179	255	308	352	377	483	571	684	714	561	623	5
1998	Black Female	5,495	138	13	12	13	13	25	51	73	125	161	180	216	255	352	495	621	781	753	1,218	
1998	Other Male	287	6	3	4	3	3	3	6	3	10	15	10	15	23	31	34	27	37	21	33	
1998	Other Female	260	3	2	2	1	5	3	3	7	4	10	9	14	17	16	18	37	30	34	45	
1999	Total	55,182	685	109	63	90	302	374	417	543	908	1,271	1,630	2,092	2,714	3,377	4,757	6,378	8,093	8,041	13,329	9
1999	White Male	20,790	217	35	18	31	136	165	169	229	361	528	699	890	1,222	1,517	2,093	2,728	3,325	3,003	3,423	1
1999	White Female	22,024	162	33	17	29	52	50	72	105	211	306	354	569	742	980	1,466	2,201	3,182	3,635	7,857	1
1999	Black Male	6,036	156	22	14	16	82	110	128	122	197	236	335	361	399	456	615	762	754	607	663	1
1999	Black Female	5,690	128	18	12	12	20	37	39	77	126	177	213	217	302	380	532	616	758	714	1,307	5
1999	Other Male	327	9	1	2	2	6	10	6	6	9	15	13	31	29	21	26	34	41	34	32	0
1999	Other Female	315	13	0	0	0	6	2	3	4	4	9	16	24	20	23	25	37	33	48	47	1
2000	Total	56,095	676	115	63	89	325	385	402	555	894	1,318	1,730	2,259	2,790	3,433	4,561	6,338	7,929	8,234	13,997	2
2000	White Male	20,858	224	37	26	27	151	190	175	213	362	538	750	986	1,233	1,524	1,959	2,714	3,205	3,031	3,513	
2000	White Female	22,853	150	35	18	26	68	74	63	126	226	327	387	599	791	1,027	1,490	2,180	3,136	3,789	8,341	
2000	Black Male	5,952	159	21	9	25	67	81	102	143	177	251	326	381	410	474	595	705	760	593	672	1
2000	Black Female	5,762	117	16	10	10	27	33	48	61	109	178	231	256	297	366	469	650	747	755	1,381	1
2000	Other Male	368	17	2	0	0	10	4	10	9	15	13	21	22	31	25	29	52	37	29	42	
2000	Other Female	301	8	4	0	1	2	3	4	3	5	11	15	15	28	17	19	37	44	37	48	
Totals (1998-2000)		164,906	2,056	328	192	271	924	1,102	1,254	1,647	2,720	3,841	4,915	6,386	8,037	10,144	13,892	19,094	23,763	24,029	40,292	19
Average (1998-2000)		54,969	685	109	64	90	308	367	418	549	907	1,280	1,638	2,129	2,679	3,381	4,631	6,365	7,921	8,010	13,431	6

Source: Quick Facts. <http://www.vdh.state.va.us/HealthStats/stats.asp>. Accessed on 12/3.2003

Buena Vista City	White	1		1			
Harrisonburg City	White	2			1		1
Lexington City							
Staunton City							
Waynesboro City							
Lord Fairfax District		6			3	1	2
Clarke County							
Frederick County	White	2			2		
Page County							
Shenandoah County	White	1					1
Warren County							
Winchester City	White	2			1		1
Winchester City	Black	1				1	
Alexandria District		1			1		
Alexandria City	Black	1			1		
Arlington District		3		2	1		
Arlington County	White	2		1	1		
Arlington County	Black	1		1			
Fairfax District		8	1	1	1	2	3
Fairfax County	White	5			1	1	3
Fairfax County	Other	2	1			1	
Fairfax City	White	1		1			
Falls Church City							
Loudoun District		1					1
Loudoun County	Black	1					1
Prince William District		5		1	1	2	1
Prince William County	White	2		1			1
Prince William County	Black	1			1		
Manassas City	White	2			1	1	
Manassas Park City							
Rappahannock/Rapidan District		2			2		
Culpeper County	Black	1			1		
Fauquier County							
Madison County							
Orange County	White	1			1		
Rappahannock County							
Thomas Jefferson District		4			2		2
Albemarle County	White	1					1
Fluvanna County							
Greene County	White	1			1		
Louisa County	White	1					1
Nelson County							
Charlottesville City	White	1			1		
Central Virginia District		10		1	1	1	2 5
Amherst County	Black	1		1			
Appomattox County	White	1					1

Bedford County	White	2				2	
Campbell County							
Bedford City							
Lynchburg City	White	5			1		4
Lynchburg City	Black	1			1		
Pittsylvania/Danville District		7		2	1		4
Pittsylvania County	White	1					1
Pittsylvania County	Black	1		1			
Danville City	White	3					3
Danville City	Black	2		1	1		
West Piedmont District		2					1 1
Franklin County	White	1				1	
Franklin County	Black	1					1
Henry County							
Patrick County							
Martinsville City							
Southside District		3	1	1			1
Brunswick County	Black	2	1				1
Halifax County							
Mecklenburg County	White	1		1			
Piedmont District		4				2	2
Amelia County	White	1					1
Buckingham County	White	1					1
Charlotte County							
Cumberland County	Black	1				1	
Lunenburg County	White	1				1	
Nottoway County							
Prince Edward County							
Chesterfield District		3		1		2	
Chesterfield County	White	2		1		1	
Powhatan County	Black	1				1	
Colonial Heights City							
Hanover District		3				1	1 1
Charles City County	Black	1				1	
Goochland County	Black						
Hanover County	White	1					1
New Kent County	White	1				1	
Henrico District		10	1	1		1	2 5
Henrico County	White	5					2 3
Henrico County	Black	5	1	1		1	2
Richmond City District		14	1	2		4	2 5
Richmond City	White	4				1	1 2
Richmond City	Black	10	1	2		3	1 3
Rappahannock District		1				1	
Caroline County							
King George County							
Spotsylvania County	White	1				1	

Stafford County						
Fredericksburg City						
Three Rivers District		3		1		2
Lancaster County	Black	1		1		
Northumberland County	Black	1				1
Richmond County						
Westmoreland County						
Essex County						
Gloucester County	White	1				1
King William County						
Mathews County						
Middlesex County						
Crater District		2		1	1	
Dinwiddie County						
Greensville County						
Prince George County						
Surry County	White	1		1		
Sussex County						
Emporia City	Black	1				1
Hopewell City						
Petersburg City						
Chesapeake District		3		1	1	1
Chesapeake City	White	1				1
Chesapeake City	Black	1		1		
Chesapeake City	Other	1				1
Norfolk District		3		1	1	1
Norfolk City	Black	3		1	1	1
Portsmouth District		3		1		2
Portsmouth City	White	1				1
Portsmouth City	Black	2		1		1
Virginia Beach District		5		1		3 1
Virginia Beach City	White	3				3
Virginia Beach City	Black	2		1		1
Western Tidewater		6		1	1	2 2
Isle of Wight County	White	1				1
Isle of Wight County	Black	2				2
Southampton County	Black	2		1	1	
Franklin City						
Suffolk City	White	1				1
Hampton District		5		1	2	2
Hampton City	White	1			1	
Hampton City	Black	3		1	1	1
Hampton City	Other	1				1
Peninsula District		4		1	1 1	1
James City County						
York County						
Newport News City	Black	3		1	1	1

Poquoson City	White	1	1
Williamsburg City			
Eastern Shore District		1	1
Accomack County	Black	1	1
Northampton County			

Table 3. Resident Asthma Deaths By Race and Age for Virginia, Virginia Health Districts, and Virginia Counties and Independent Cities, 1999

Health District and City/County	Race	Total Deaths	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65-74	Age 75+
Commonwealth of Virginia		109		1	2			6	9	18	16	21	36
Lenowisco District													
Lee County													
Scott County													
Wise County													
Norton City													
Cumberland Plateau District		3										2	1
Buchanan County													
Dickenson County													
Russell County	White	2										2	
Tazewell County	White	1											1
Mount Rogers District		5									1	2	2
Bland County	White												
Carroll County													
Grayson County													
Smyth County	White	1										1	
Washington County	White	1											1
Wythe County	White	2									1		1
Bristol City	White	1										1	
Galax City													
New River District		1										1	
Floyd County													
Giles County	White	1										1	
Montgomery County													
Pulaski County													
Radford City													
Alleghany District		2											2
Alleghany County													
Botetourt County													
Craig County	White	1											1
Roanoke County	White	1											1
Clifton Forge City													
Covington City													
Salem City													
Roanoke City District		1									1		
Roanoke City	White	1									1		
Central Shenandoah District		1											1
Augusta County													
Bath County													
Highland County													
Rockbridge County													

Rockingham County	White	1					1
Buena Vista City							
Harrisonburg City							
Lexington City							
Staunton City							
Waynesboro City							
Lord Fairfax District		5		1	2		2
Clarke County							
Frederick County	White	3		1	1		1
Page County							
Shenandoah County	White	1					1
Warren County							
Winchester City	White	1			1		
Alexandria District		3	1	1			1
Alexandria City	White	1					1
Alexandria City	Black	2	1	1			
Arlington District		2					2
Arlington County	White	1					1
Arlington County	Black	1					1
Fairfax District		8		3		3	2
Fairfax County	White	5		2		2	1
Fairfax County	Other	2				1	1
Fairfax City							
Falls Church City	Black	1		1			
Loudoun District		2					2
Loudoun County	White	2					2
Prince William District		2		2			
Prince William County	White	1		1			
Prince William County	Other	1		1			
Manassas City							
Manassas Park City							
Rappahannock/Rapidan District							
Culpeper County							
Fauquier County							
Madison County							
Orange County							
Rappahannock County							
Thomas Jefferson District		4			1		3
Albemarle County	White	2					2
Albemarle County	Black	1					1
Fluvanna County							
Greene County							
Louisa County							
Nelson County							
Charlottesville City	Black	1				1	
Central Virginia District		6		1	1	1	1
Amherst County	White	1		1			

Appomattox County	White	1							1
Bedford County	White	1				1			
Campbell County									
Bedford City									
Lynchburg City	White	2				1			1
Lynchburg City	Black	1						1	
Pittsylvania/Danville District		2							2
Pittsylvania County	Black	1							1
Danville City	Black	1							1
West Piedmont District		1				1			
Franklin County	White	1				1			
Henry County									
Patrick County									
Martinsville City									
Southside District									
Brunswick County									
Halifax County									
Mecklenburg County									
Piedmont District		4				1	1	2	
Amelia County	Black	1						1	
Buckingham County									
Charlotte County									
Cumberland County	Black	1				1			
Lunenburg County	White	1							1
Nottoway County	Black	1							1
Prince Edward County									
Chesterfield District		6				1	1	2	1
Chesterfield County	White	4						2	1
Chesterfield County	Black	2				1	1		
Powhatan County									
Colonial Heights City									
Hanover District		5				1		3	1
Charles City County									
Goochland County									
Hanover County	White	4				1		2	1
Hanover County	Black	1						1	
New Kent County	White								
Henrico District		5				2			3
Henrico County	White	3							3
Henrico County	Black	2				2			
Richmond City District		9				2	2	1	2
Richmond City	White	1							1
Richmond City	Black	8				2	2	1	2
Rappahannock District		2						1	1
Caroline County									
King George County									
Spotsylvania County	White	2						1	1

Stafford County							
Fredericksburg City							
Three Rivers District		2		1		1	
Lancaster County							
Northumberland County							
Richmond County							
Westmoreland County							
Essex County							
Gloucester County	White	2		1		1	
King William County							
Mathews County							
Middlesex County							
Crater District		3		2		1	
Dinwiddie County	Black	1		1			
Greensville County							
Prince George County	White	1		1			
Surry County							
Sussex County							
Emporia City							
Hopewell City							
Petersburg City	Black	1				1	
Chesapeake District		3		2		1	
Chesapeake City	Black	3		2		1	
Norfolk District		4		1	1	1	1
Norfolk City	White	2			1		1
Norfolk City	Black	2		1			1
Portsmouth District		3	1		1		1
Portsmouth City	White	1					1
Portsmouth City	Black	2	1		1		
Virginia Beach District		4	1	1		1	1
Virginia Beach City	White	1				1	
Virginia Beach City	Black	2	1	1			
Virginia Beach City	Other	1					1
Western Tidewater		6		1	2	1	1
Isle of Wight County	Black	2			1		1
Southampton County	Black						
Franklin City							
Suffolk City	White	2			1	1	
Suffolk City	Black	2		1			1
Hampton District		2		1			1
Hampton City	White	1					1
Hampton City	Black	1		1			
Peninsula District		3		1	1		1
James City County	White	1		1			
York County	Black	1			1		
Newport News City	White	1					1
Poquoson City							

Williamsburg City			
Eastern Shore District			
Accomack County			
Northampton County			

Table 4. Resident Asthma Deaths By Race and Age for Virginia, Virginia Health Districts, and Virginia Counties and Independent Cities, 2000

Health District and City/County	Race	Total Deaths	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65-74	Age 75+
Commonwealth of Virginia		107	1		3	2		6	11	16	17	19	32
Lenowisco District		2											2
Lee County	White	1											1
Scott County													
Wise County	White	1											1
Norton City													
Cumberland Plateau District		5							2	1	1		1
Buchanan County													
Dickenson County	White	1											1
Russell County	White	3							1	1	1		
Tazewell County	White	1							1				
Mount Rogers District		4						1			1	1	1
Bland County	White	1									1		
Carroll County	White	1											1
Grayson County													
Smyth County													
Washington County													
Wythe County	White	2						1				1	
Bristol City													
Galax City													
New River District		2										1	1
Floyd County	White	1											1
Giles County													
Montgomery County													
Pulaski County													
Radford City	White	1										1	
Alleghany District		1								1			
Alleghany County													
Botetourt County													
Craig County													
Roanoke County	White	1								1			
Clifton Forge City													
Covington City													
Salem City													
Roanoke City District		3				1			1			1	
Roanoke City	White	2							1			1	
Roanoke City	Black	1				1							
Central Shenandoah District		3									1	2	
Augusta County	White	1										1	
Bath County													
Highland County													

Rockbridge County							
Rockingham County	White	1					1
Buena Vista City							
Harrisonburg City							
Lexington City							
Staunton City	White	1				1	
Waynesboro City							
Lord Fairfax District		1				1	
Clarke County							
Frederick County							
Page County							
Shenandoah County	White	1				1	
Warren County							
Winchester City							
Alexandria District		3			1		2
Alexandria City	White	3			1		2
Arlington District		2				2	
Arlington County	White	1				1	
Arlington County	Black	1				1	
Fairfax District		10	1		3	2	2 2
Fairfax County	White	6			2	1	1 2
Fairfax County	Black	2	1			1	
Fairfax County	Other	1					1
Fairfax City	White	1			1		
Falls Church City							
Loudoun District		2					2
Loudoun County	White	2					2
Prince William District		3	1		1		1
Prince William County	White	2			1		1
Prince William County	Black	1	1				
Manassas City							
Manassas Park City							
Rappahannock/Rapidan District		3			2		1
Culpeper County							
Fauquier County	White	1					1
Fauquier County	Black	1			1		
Madison County							
Orange County							
Rappahannock County	White	1			1		
Thomas Jefferson District		1					1
Albemarle County	White	1					1
Fluvanna County							
Greene County							
Louisa County							
Nelson County							
Charlottesville City							
Central Virginia District		4			1		2 1

Amherst County						
Appomattox County						
Bedford County						
Campbell County	White	3	1		1	1
Campbell County	Black	1			1	
Bedford City						
Lynchburg City						
Pittsylvania/Danville District		1	1			
Pittsylvania County	White	1	1			
Danville City						
West Piedmont District						
Franklin County						
Henry County						
Patrick County						
Martinsville City						
Southside District		1	1			
Brunswick County						
Halifax County	Black	1	1			
Mecklenburg County						
Piedmont District		5	1	1	3	
Amelia County	Black	1				1
Buckingham County	Black	1				1
Charlotte County						
Cumberland County	White	1		1		
Cumberland County	Black	1	1			
Lunenburg County						
Nottoway County						
Prince Edward County	White	1				1
Chesterfield District		2		2		
Chesterfield County	White	1		1		
Chesterfield County	Other	1		1		
Powhatan County						
Colonial Heights City						
Hanover District		1		1		
Charles City County						
Goochland County	Black	1		1		
Hanover County						
Hanover County						
New Kent County						
Henrico District		6		1	2	3
Henrico County	White	6		1	2	3
Richmond City District		11	1	4	1	2
Richmond City	White	3			1	2
Richmond City	Black	8	1	4	2	1
Rappahannock District		2			1	1
Caroline County	Black	1			1	
King George County						

Spotsylvania County								
Stafford County								
Fredericksburg City	White	1						1
Three Rivers District		5		2	1	1	1	1
Lancaster County								
Northumberland County	Black	1						1
Richmond County								
Westmoreland County								
Essex County								
Gloucester County	White	1		1				
Gloucester County	Black	1					1	
King William County	Other	1				1		
Mathews County								
Middlesex County	Black	1		1				
Crater District		5		1	1	1	1	1
Dinwiddie County								
Greensville County								
Prince George County								
Surry County								
Sussex County	White	1		1				
Emporia City	Black	1						1
Hopewell City								
Petersburg City	Black	3		1		1	1	
Chesapeake District		1		1				
Chesapeake City	White	1		1				
Norfolk District		9		1	2	1	3	2
Norfolk City	White	5			1		2	2
Norfolk City	Black	4		1	1	1	1	
Portsmouth District		5	1		1			3
Portsmouth City	White	4	1		1			2
Portsmouth City	Black	1						1
Virginia Beach District								
Virginia Beach City								
Western Tidewater		2		1				1
Isle of Wight County								
Southampton County								
Franklin City								
Suffolk City	White	1						1
Suffolk City	Black	1		1				
Hampton District								
Hampton City	White							
Hampton City	Black							
Peninsula District		2		1		1		
James City County	Black	1		1				
York County								
Newport News City	White	1					1	
Poquoson City								

Williamsburg City			
Eastern Shore District			
Accomack County			
Northampton County			

Table 5. Resident Asthma Deaths by Sex and Education for Virginia, Virginia's Health Districts, and Virginia Counties and Independent Cities, 1998

Health District and City/County	Sex	Total Deaths	Years of Education					
			0-8	9-11	12	13-15	16+	Unknown
Commonwealth of Virginia		143	41	29	36		29	8
Lenowisco District		4	3	1				
Lee County	Male	1		1				
Lee County	Female	1	1					
Scott County	Female	1	1					
Wise County	Male	1	1					
Norton City								
Cumberland Plateau District		1	1					
Buchanan County	Female	1	1					
Dickenson County								
Russell County								
Tazewell County								
Mount Rogers District		7	3	3			1	
Bland County	Female	1		1				
Carroll County								
Grayson County								
Smyth County	Male	2	2					
Smyth County	Female	1	1					
Washington County	Male	1					1	
Washington County	Female	2		2				
Wythe County								
Bristol City								
Galax City								
New River District								
Floyd County								
Giles County								
Montgomery County								
Pulaski County								
Radford City								
Alleghany District		1			1			
Alleghany County								
Botetourt County								
Craig County								
Roanoke County	Female	1			1			
Clifton Forge City								
Covington City								
Salem City								
Roanoke City District		2			1		1	
Roanoke City	Female	2			1		1	

Central Shenandoah District		6	2	2	2
Augusta County	Female	2		2	
Bath County					
Highland County					
Rockbridge County	Female	1			1
Rockingham County					
Buena Vista City	Female	1	1		
Harrisonburg City	Female	2	1		1
Lexington City					
Staunton City					
Waynesboro City					
Lord Fairfax District		6	2	3	1
Clarke County					
Frederick County	Female	2	1	1	
Page County					
Shenandoah County	Female	1		1	
Warren County					
Winchester City	Male	2	1		1
Winchester City	Female	1		1	
Alexandria District		1			1
Alexandria City	Female	1			1
Arlington District		3	1		2
Arlington County	Male	1			1
Arlington County	Female	2	1		1
Fairfax District		8	2	4	2
Fairfax County	Male	2	1	1	
Fairfax County	Female	5	1	3	1
Fairfax City	Male	1			1
Falls Church City					
Loudoun District		1		1	
Loudoun County	Female	1		1	
Prince William District		5	1	1	3
Prince William County	Male	1			1
Prince William County	Female	2	1	1	
Manassas City	Male	1			1
Manassas City	Female	1			1
Manassas Park City					
Rappahannock/Rapidan District		2	1	1	
Culpeper County	Male	1		1	
Fauquier County					
Madison County					
Orange County	Male	1	1		
Rappahannock County					
Thomas Jefferson District		4		2	2
Albemarle County	Female	1		1	
Fluvanna County					
Greene County	Female	1			1

Louisa County	Female	1				1
Nelson County						
Charlottesville City	Female	1		1		
Central Virginia District		10	2	2	2	4
Amherst County	Female	1				1
Appomattox County	Female	1		1		
Bedford County	Male	1				1
Bedford County	Female	1	1			
Campbell County						
Bedford City						
Lynchburg City	Male	1		1		
Lynchburg City	Female	5	1	1	1	2
Pittsylvania/Danville District		7	2	3	2	
Pittsylvania County	Male	1			1	
Pittsylvania County	Female	1		1		
Danville City	Male	1	1			
Danville City	Female	4	1	2	1	
West Piedmont District		2	1			1
Franklin County	Male	2	1			1
Henry County						
Patrick County						
Martinsville City						
Southside District		3	2		1	
Brunswick County	Male	2	2			
Halifax County						
Mecklenburg County	Female	1			1	
Piedmont District		4	3			1
Amelia County	Female	1	1			
Buckingham County	Male	1	1			
Charlotte County						
Cumberland County	Female	1	1			
Lunenburg County	Female	1				1
Nottoway County						
Prince Edward County						
Chesterfield District		3	1		1	1
Chesterfield County	Female	2			1	1
Powhatan County	Female	1	1			
Colonial Heights City						
Hanover District		3	1	1	1	
Charles City County	Female	1		1		
Goochland County						
Hanover County	Female	1	1			
New Kent County	Female	1			1	
Henrico District		10	4	2	2	2
Henrico County	Male	2			1	1
Henrico County	Female	8	4	2	1	1
Richmond City District		14	6	2	3	1 2

Richmond City	Male	6	2	1	1	1	1
Richmond City	Female	8	4	1	2		1
Rappahannock District		1			1		
Caroline County							
King George County							
Spotsylvania County	Female	1			1		
Stafford County							
Fredericksburg City							
Three Rivers District		3		1		1	1
Lancaster County	Male	1					1
Northumberland County	Female	1		1			
Richmond County							
Westmoreland County							
Essex County							
Gloucester County	Male	1				1	
King William County							
Mathews County							
Middlesex County							
Crater District		2			1		1
Dinwiddie County							
Greensville County							
Prince George County							
Surry County	Female	1			1		
Sussex County							
Emporia City	Female	1					1
Hopewell City							
Petersburg City							
Chesapeake District		3	1			1	1
Chesapeake City	Male	2	1			1	
Chesapeake City	Female	1					1
Norfolk District		3		3			
Norfolk City	Male	2		2			
Norfolk City	Female	1		1			
Portsmouth District		3	1	1	1		
Portsmouth City	Male	1		1			
Portsmouth City	Female	2	1		1		
Virginia Beach District		5	1	1	2		1
Virginia Beach City	Male	2	1		1		
Virginia Beach City	Female	3		1	1		1
Western Tidewater		6	1	3	1		1
Isle of Wight County	Male	1	1				
Isle of Wight County	Female	2		1			1
Southampton County	Male	2		1	1		
Franklin City							
Suffolk City	Male	1		1			
Hampton District		5		1	1		3
Hampton City	Male	3		1			2

Hampton City	Female	2	1	1
Peninsula District		4	3	1
James City County				
York County				
Newport News City	Male	1	1	
Newport News City	Female	2	1	1
Poquoson City	Female	1	1	
Williamsburg City				
Eastern Shore District		1	1	
Accomack County	Male	1	1	
Northampton County				

Lenowisco District					
Lee County					
Scott County					
Wise County					
Norton City					
Cumberland Plateau District		3	1	1	1
Buchanan County					
Dickenson County					
Russell County	Female	2	1	1	
Tazewell County	Female	1			1
Mount Rogers District		5	1	1	2
Bland County					
Carroll County					
Grayson County					
Smyth County	Female	1		1	
Washington County	Male	1	1		
Wythe County	Male	1		1	
Wythe County	Female	1			1
Bristol City	Female	1		1	
Galax City					
New River District		1	1		
Floyd County					
Giles County	Female	1		1	
Montgomery County					
Pulaski County					
Radford City					
Alleghany District		2	1	1	
Alleghany County					
Botetourt County					
Craig County	Female	1		1	
Roanoke County	Female	1	1		
Clifton Forge City					
Covington City					
Salem City					
Roanoke City District		1		1	
Roanoke City	Female	1		1	
Central Shenandoah District		1		1	
Augusta County					
Bath County					
Highland County					
Rockbridge County					
Rockingham County	Female	1		1	
Buena Vista City					
Harrisonburg City					
Lexington City					

Staunton City						
Waynesboro City						
Lord Fairfax District		5	1	2	1	1
Clarke County						
Frederick County	Female	3		2	1	
Page County						
Shenandoah County	Female	1	1			
Warren County						
Winchester City	Male	1				1
Alexandria District		3	1	1	1	
Alexandria City	Male	2	1	1		
Alexandria City	Female	1		1		
Arlington District		2	1			1
Arlington County	Female	2	1			1
Fairfax District		8	2	4		2
Fairfax County	Male	3		2		1
Fairfax County	Female	4	2	2		
Fairfax City						
Falls Church City	Female	1				1
Loudoun District		2	1	1		
Loudoun County	Female	2	1	1		
Prince William District		2				2
Prince William County	Male	1				1
Prince William County	Female	1				1
Manassas City						
Manassas Park City						
Rappahannock/Rapidan District						
Culpeper County						
Fauquier County						
Madison County						
Orange County						
Rappahannock County						
Thomas Jefferson District		4	1	1	1	1
Albemarle County	Male	1		1		
Albemarle County	Female	2	1		1	
Fluvanna County						
Greene County						
Louisa County						
Nelson County						
Charlottesville City	Female	1				1
Central Virginia District		6		1	3	2
Amherst County	Female	1				1
Appomattox County	Female	1		1		
Bedford County	Male	1		1		
Campbell County						
Bedford City						
Lynchburg City	Male	1				1

Lynchburg City	Female	2	1	1		
Pittsylvania/Danville District		2	1		1	
Pittsylvania County	Male	1			1	
Danville City	Female	1	1			
West Piedmont District		1				1
Franklin County	Female	1				1
Henry County						
Patrick County						
Martinsville City						
Southside District						
Brunswick County						
Halifax County						
Mecklenburg County						
Piedmont District		4	3			1
Amelia County	Male	1	1			
Buckingham County						
Charlotte County						
Cumberland County	Female	1	1			
Lunenburg County	Female	1			1	
Nottoway County	Female	1	1			
Prince Edward County						
Chesterfield District		6	1	3		2
Chesterfield County	Male	3		1		2
Chesterfield County	Female	3	1	2		
Powhatan County						
Colonial Heights City						
Hanover District		5	2	2	1	
Charles City County						
Goochland County						
Hanover County	Female	5	2	2	1	
New Kent County						
Henrico District		5	1	2		2
Henrico County	Male	2	1	1		
Henrico County	Female	3		1		2
Richmond City District		9	1	2	3	2
Richmond City	Male	1		1		
Richmond City	Female	8	1	2	2	2
						1
Rappahannock District		2	1			1
Caroline County						
King George County						
Spotsylvania County	Female	2	1			1
Stafford County						
Fredericksburg City						
Three Rivers District		2		1		1
Lancaster County						
Northumberland County						
Richmond County						

Westmoreland County				
Essex County				
Gloucester County	Female	2	1	1
King William County				
Mathews County				
Middlesex County				
Crater District		3	2	1
Dinwiddie County	Female	1	1	
Greensville County				
Prince George County	Male	1		1
Surry County				
Sussex County				
Emporia City				
Hopewell City				
Petersburg City	Female	1	1	
Chesapeake District		3	1	2
Chesapeake City	Female	3	1	2
Norfolk District		4	2	2
Norfolk City	Female	4	2	2
Portsmouth District		3	1	2
Portsmouth City	Male	1	1	
Portsmouth City	Female	2	2	
Virginia Beach District		4	3	1
Virginia Beach City	Male	3	2	1
Virginia Beach City	Female	1	1	
Western Tidewater		6	4	1
Isle of Wight County	Male	1	1	
Isle of Wight County	Female	1	1	
Southampton County				
Franklin City				
Suffolk City	Male	2	1	1
Suffolk City	Female	2	1	1
Hampton District		2		1
Hampton City	Male	1		1
Hampton City	Female	1		1
Peninsula District		3	1	2
James City County	Female	1		1
York County	Male	1	1	
Newport News City	Female	1		1
Poquoson City				
Williamsburg City				
Eastern Shore District				
Accomack County				
Northampton County				

Table 7. Resident Asthma Deaths by Sex and Education for Virginia, Virginia's Health Districts, and Virginia Counties and Independent Cities, 2000

Health District and City/County	Sex	Total Deaths	Years of Education					
			0-8	9-11	12	13-15	16+	Unknown
Commonwealth of Virginia		107	27	19	32		24	5
Lenowisco District		2	2					
Lee County	Female	1	1					
Scott County								
Wise County	Female	1	1					
Norton City								
Cumberland Plateau District		5	2	1	1		1	
Buchanan County								
Dickenson County	Female	1	1					
Russell County	Female	3	1	1	1			
Tazewell County	Male	1					1	
Mount Rogers District		4	1	2	1			
Bland County	Female	1			1			
Carroll County	Female	1	1					
Grayson County								
Smyth County								
Washington County								
Wythe County	Male	1		1				
Wythe County	Female	1		1				
Bristol City								
Galax City								
New River District		2	2					
Floyd County	Female	1	1					
Giles County								
Montgomery County								
Pulaski County								
Radford City	Male	1			1			
Alleghany District		1	1					
Alleghany County								
Botetourt County								
Craig County								
Roanoke County	Female	1			1			
Clifton Forge City								
Covington City								
Salem City								
Roanoke City District		3	1 2					
Roanoke City	Male	1	1					
Roanoke City	Female	2		1	1			
Central Shenandoah District		3	2				1	
Augusta County	Male	1	1					

Bath County					
Highland County					
Rockbridge County					
Rockingham County	Female	1	1		
Buena Vista City					
Harrisonburg City					
Lexington City					
Staunton City	Male	1			1
Waynesboro City					
Lord Fairfax District		1	1		
Clarke County					
Frederick County					
Page County					
Shenandoah County	Female	1	1		
Warren County					
Winchester City					
Alexandria District		3	1	2	
Alexandria City	Male	1		1	
Alexandria City	Female	2	1	1	
Arlington District		2	1		1
Arlington County	Male	1			1
Arlington County	Female	1	1		
Fairfax District		10	2	1	1
Fairfax County	Male	3			3
Fairfax County	Female	6	2	1	3
Fairfax City	Female	1		1	
Falls Church City					
Loudoun District		2	2		
Loudoun County	Female	2	2		
Prince William District		3	1	1	1
Prince William County	Male	1		1	
Prince William County	Female	2	1		1
Manassas City					
Manassas Park City					
Rappahannock/Rapidan District		3	1	1	1
Culpeper County					
Fauquier County	Female	2		1	1
Madison County					
Orange County					
Rappahannock County	Female	1	1		
Thomas Jefferson District		1			1
Albemarle County	Female	1			1
Fluvanna County					
Greene County					
Louisa County					
Nelson County					
Charlottesville City					

Central Virginia District		4	1	1	2	
Amherst County						
Appomattox County						
Bedford County						
Campbell County	Male	1		1		
Campbell County	Female	3	1		2	
Bedford City						
Lynchburg City						
Pittsylvania/Danville District		1		1		
Pittsylvania County	Female	1		1		
Danville City						
West Piedmont District						
Franklin County						
Henry County						
Patrick County						
Martinsville City						
Southside District		1		1		
Brunswick County						
Halifax County	Male	1		1		
Mecklenburg County						
Piedmont District		5	2		3	
Amelia County	Male	1	1			
Buckingham County	Female	1	1			
Charlotte County						
Cumberland County	Male	1			1	
Cumberland County	Female	1			1	
Lunenburg County						
Nottoway County						
Prince Edward County	Male	1			1	
Chesterfield District		2			1	1
Chesterfield County	Female	2			1	1
Powhatan County						
Colonial Heights City						
Hanover District		1		1		
Charles City County						
Goochland County	Male	1			1	
Hanover County						
New Kent County						
Henrico District		6	1	1	3	1
Henrico County	Female	6	1	1	3	1
Henrico County						
Richmond City District		11	3	2	4	2
Richmond City	Male	6	1	2	2	1
Richmond City	Female	5	2		2	1
Rappahannock District		2	1		1	
Caroline County	Female	1	1			
King George County						

Spotsylvania County						
Stafford County						
Fredericksburg City	Female	1				1
Three Rivers District		5	1	1	1	1
Lancaster County						
Northumberland County	Female	1	1			
Richmond County						
Westmoreland County						
Essex County						
Gloucester County	Male	1				1
Gloucester County	Female	1		1		
King William County	Male	1				1
Mathews County						
Middlesex County	Male	1		1		
Crater District		5	2			3
Dinwiddie County						
Greensville County						
Prince George County						
Surry County						
Sussex County	Male	1				1
Emporia City	Male	1	1			
Hopewell City						
Petersburg City	Male	1	1			
Petersburg City	Female	2				2
Chesapeake District		1	1			
Chesapeake City	Female	1		1		
Norfolk District		9	2	6		1
Norfolk City	Male	3		2		1
Norfolk City	Female	6	2	4		
Portsmouth District		5	1	2		2
Portsmouth City	Male	2		1		1
Portsmouth City	Female	3	1	1		1
Virginia Beach District						
Virginia Beach City						
Western Tidewater		2	1	1		
Isle of Wight County						
Southampton County						
Franklin City						
Suffolk City	Female	2		1	1	
Hampton District						
Hampton City						
Peninsula District		2		1		1
James City County	Female	1		1		
York County						
Newport News City	Female	1				1
Poquoson City						
Williamsburg City						

Eastern Shore District			
Accomack County			
Northampton County			

Table 8. Total Asthma Deaths (descending order) and Three Year Average Asthma Mortality Rate and Rate Ratio for Virginia's Health Districts, 1998-2000

Health Districts	Asthma Deaths 1998-2000	Population 2000	Average Unadjusted Rate per 100,000*	Lower 95% C.I.	Upper 95% C.I.	Health District to State Ratio
Richmond City District	34	197,790	5.73	2.393948	9.066018	3.39
Fairfax District	26	1,001,624	0.87	0.289189	1.441334	0.51
Henrico District	21	262,300	2.67	0.691699	4.645701	1.58
Central Virginia District	20	228,616	2.92	0.702474	5.129722	1.72
Mount Rogers District	16	190,020	2.81	0.424643	5.188801	1.66
Norfolk District	16	234,403	2.28	0.344239	4.206328	1.35
Western Tidewater	14	119,233	3.91	0.362805	7.465006	2.32
Piedmont District	13	97,103	4.46	0.260824	8.664407	2.64
Lord Fairfax District	12	185,282	2.16	0.043177	4.274565	1.28
Chesterfield District	11	299,177	1.23	-0.0289	2.480064	0.72
Portsmouth District	11	100,565	3.65	-0.08596	7.378095	2.16
Central Shenandoah District	10	258,789	1.29	-0.09472	2.67082	0.76
Crater District	10	150,232	2.22	-0.16316	4.600742	1.31
Pittsylvania/Danville District	10	110,156	3.03	-0.22252	6.274545	1.79
Prince William District	10	326,238	1.02	-0.07514	2.118633	0.60
Three Rivers District	10	133,037	2.51	-0.18425	5.195387	1.48
Cumberland Plateau District	9	118,279	2.54	-0.3338	5.406555	1.50
Hanover District	9	123,571	2.43	-0.31951	5.175016	1.44
Peninsula District	9	308,113	0.97	-0.12814	2.075479	0.58
Thomas Jefferson District	9	199,648	1.50	-0.19776	3.203047	0.89
Virginia Beach District	9	425,257	0.71	-0.09284	1.503754	0.42
Alexandria District	7	128,283	1.82	-0.51497	4.152758	1.08
Arlington District	7	189,453	1.23	-0.3487	2.811928	0.73
Chesapeake District	7	199,184	1.17	-0.33166	2.674554	0.69
Hampton District	7	146,437	1.59	-0.45113	3.637935	0.94
Lenowisco District	6	91,019	2.20	-0.84802	5.242706	1.30
Roanoke City District	6	94,911	2.11	-0.81324	5.027719	1.25
Loudoun District	5	169,599	0.98	-0.50925	2.47467	0.58
Rappahannock District	5	241,044	0.69	-0.35831	1.741182	0.41
Rappahannock/Rapidan District	5	134,785	1.24	-0.64079	3.11386	0.73
Alleghany District	4	169,630	0.79	-0.54818	2.12023	0.46
Southside District	4	88,154	1.51	-1.05484	4.079845	0.89
New River District	3	165,146	0.61	-0.5813	1.792353	0.36
West Piedmont District	3	140,039	0.71	-0.68552	2.113697	0.42
Eastern Shore District	1	51,398	0.65	-1.55312	2.850188	0.38
VIRGINIA TOTALS	359	7,078,515	1.69	1.387661	1.993463	

*Rates with less than 20 events in the numerator corresponding to a relative standard error of less than 22.36% are generally considered unreliable. Readers should use caution when interpreting these rates.

Table 9. Total Asthma Deaths and Three Year Average Asthma Mortality Rate and Rate Ratio (descending order) for Virginia's Health Districts, 1998-2000

Health Districts	Asthma Deaths 1998-2000	Population 2000	Average Unadjusted Rate per 100,000*	Lower 95% C.I.	Upper 95% C.I.	Health District to State Ratio
Richmond City District	34	197,790	5.73	2.393948	9.066018	3.39
Piedmont District	13	97,103	4.46	0.260824	8.664407	2.64
Western Tidewater	14	119,233	3.91	0.362805	7.465006	2.32
Portsmouth District	11	100,565	3.65	-0.08596	7.378095	2.16
Pittsylvania/Danville District	10	110,156	3.03	-0.22252	6.274545	1.79
Central Virginia District	20	228,616	2.92	0.702474	5.129722	1.72
Mount Rogers District	16	190,020	2.81	0.424643	5.188801	1.66
Henrico District	21	262,300	2.67	0.691699	4.645701	1.58
Cumberland Plateau District	9	118,279	2.54	-0.3338	5.406555	1.50
Three Rivers District	10	133,037	2.51	-0.18425	5.195387	1.48
Hanover District	9	123,571	2.43	-0.31951	5.175016	1.44
Norfolk District	16	234,403	2.28	0.344239	4.206328	1.35
Crater District	10	150,232	2.22	-0.16316	4.600742	1.31
Lenowisco District	6	91,019	2.20	-0.84802	5.242706	1.30
Lord Fairfax District	12	185,282	2.16	0.043177	4.274565	1.28
Roanoke City District	6	94,911	2.11	-0.81324	5.027719	1.25
Alexandria District	7	128,283	1.82	-0.51497	4.152758	1.08
Hampton District	7	146,437	1.59	-0.45113	3.637935	0.94
Southside District	4	88,154	1.51	-1.05484	4.079845	0.89
Thomas Jefferson District	9	199,648	1.50	-0.19776	3.203047	0.89
Central Shenandoah District	10	258,789	1.29	-0.09472	2.67082	0.76
Rappahannock/Rapidan District	5	134,785	1.24	-0.64079	3.11386	0.73
Arlington District	7	189,453	1.23	-0.3487	2.811928	0.73
Chesterfield District	11	299,177	1.23	-0.0289	2.480064	0.72
Chesapeake District	7	199,184	1.17	-0.33166	2.674554	0.69
Prince William District	10	326,238	1.02	-0.07514	2.118633	0.60
Loudoun District	5	169,599	0.98	-0.50925	2.47467	0.58
Peninsula District	9	308,113	0.97	-0.12814	2.075479	0.58
Fairfax District	26	1,001,624	0.87	0.289189	1.441334	0.51
Alleghany District	4	169,630	0.79	-0.54818	2.12023	0.46
West Piedmont District	3	140,039	0.71	-0.68552	2.113697	0.42
Virginia Beach District	9	425,257	0.71	-0.09284	1.503754	0.42
Rappahannock District	5	241,044	0.69	-0.35831	1.741182	0.41
Eastern Shore District	1	51,398	0.65	-1.55312	2.850188	0.38
New River District	3	165,146	0.61	-0.5813	1.792353	0.36
VIRGINIA TOTALS	359	7,078,515	1.69	1.387661	1.993463	

*Rates with less than 20 events in the numerator corresponding to a relative standard error of less than 22.36% are generally considered unreliable. Readers should use caution when interpreting these rates.