

Health Outcomes and Health Determinants In the Historic Triangle

A REPORT PREPARED FOR THE WILLIAMSBURG COMMUNITY HEALTH FOUNDATION

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Submitted by:

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Executive Summary

Information on the health of residents of the Historic Triangle is vital to policy makers, grant makers, and other community stakeholders. While quantitative data on residents' health and the factors affecting their health can be found in several readily-available publications, certain limitations may prevent decision makers from using this information. Importantly, most sources of data on health and health-related factors are not accompanied by an interpretation. In addition, there are dozens of measures available in various publications. As a result, there is a large volume of data that may be inaccessible to decision makers.

This report inventories and reviews existing data on health outcomes and health factors for the Historic Triangle of Virginia, defined here as the area consisting of James City County, York County, and the City of Williamsburg.¹ The most recent releases of the County Health Rankings (CHR) report and the Virginia Atlas of Community Health are assembled and reviewed and supplemented by city- and county-level data from state and federal agencies. This report includes a narrative that seeks to: 1) compare the health of the populations of Williamsburg, James City County, and York County to the health of the Virginia population as a whole, 2) compare the health of the populations of the three individual localities in the Historic Triangle to one another, 3) look for trends in population health over time, and 4) identify health issues where additional measures may be useful and where additional steps may be valuable for the community.

Summary of Health Outcomes Data

The review of health outcomes for localities in the Historic Triangle suggests that:

- 1) There are important differences in the health status of Historic Triangle residents compared to the state and across the localities that comprise the Historic Triangle. Among residents of James City County and York County, measures of premature death, overall mortality rates, and low birthweight are lower than the state as a whole. Among Williamsburg residents, measures of premature death, overall mortality rates, and low birthweight are higher than in the state as a whole.
- 2) Mortality rates have been declining in Williamsburg. Data from 1999 to 2009 show that Williamsburg rates for all-cause mortality and mortality from heart disease have decreased and have moved closer to state mortality rates.

¹ When referring to these three localities together, the term "Historic Triangle" will be used. When referring to the City of Williamsburg, "Williamsburg" will be used for brevity.

- 3) There are important differences in the health status of Historic Triangle residents by race, especially in Williamsburg. For example, the average five-year cancer mortality rate in Williamsburg in 2007 was more than twice as high in the black population than in the white population. Cancer mortality rates for the white population in Williamsburg show a slight decrease over time; however, cancer mortality rates for the black population in Williamsburg show a slight increase over time. The Virginia Department of Health also reports that the cancer mortality rate among the black population in Williamsburg was significantly higher than that of the state for 2005 through 2007. In both the populations of Williamsburg and James City County, the fraction of births that are low birthweight in Williamsburg over the period 1997-2010 was almost twice as high in the black population than in the white population.
- 4) Unlike mortality rates in Williamsburg, which show a downward trend over the period 1999-2009, there does not appear to be a downward trend in the fraction of births that are low birthweight in Williamsburg in the period 1997-2010.
- 5) Rates of early prenatal care use, which is thought to decrease the incidence of low birthweight, vary within the Historic Triangle. In York County, the rate of early prenatal care use is consistently higher than the state rate, while the low birthweight rate is consistently below the state rate. In James City County, rates of early prenatal care use are higher than the state rate in the early years of the period 1997-2010, but the rates of early prenatal care use declined in the later years only to become equal with the state in 2010.

Summary of Health Factors Data

The review of health factors data for localities in the Historic Triangle suggests that:

- 1) There are important differences in socioeconomic status of Historic Triangle residents compared to the state and across the localities that comprise the Historic Triangle. Compared to the population of Virginia, the populations of James City and York counties have higher levels of socioeconomic status as measured by median household income and poverty rates. Compared to the populations of the state, James City County, and York County, the population of Williamsburg has relatively low socioeconomic status. Data from multiple years and sources suggest that the gaps in socioeconomic status between Williamsburg and the other localities in the Historic Triangle are persistent and that large differences in socioeconomic status exist for population subgroups defined by race.
- 2) Differences in socioeconomic status by locality are very likely to explain some of the differences that exist in the health of the population of Williamsburg compared to that of

James City County or York County. Socioeconomic status is an important contributor to health; health rankings assign as much as a 40% weight to socioeconomic status measures, meaning that differences in socioeconomic status may explain up to 40% of the variation in health outcomes. While the data in this report do not permit analysis of causal relationships, the patterns in the data are suggestive evidence that the Williamsburg population's relatively low health outcomes (compared to James City and York counties) may be associated with its relatively low socioeconomic status. Further, the data show worse health outcomes among blacks in Williamsburg relative to whites and lower socioeconomic status among blacks in Williamsburg relative to whites.

- 3) It is not clear whether or not differences in health risk factors explain the differences in health outcomes among the localities of the Historic Triangle. For certain health risk factors that can be measured in all three localities (obesity and physical inactivity), measures for the Williamsburg population are very similar to measures for the populations of York and James City counties.
- 4) Existing measures of health risk factors have some limitations. Estimates of health risk behaviors by subgroups defined by race or socioeconomic status are not available in the CHR report or in the Virginia Atlas. Data from the Virginia Atlas of Community Health were not intended to be used to track changes over time. Data on certain health risk behaviors in the Williamsburg population are not published by County Health Rankings because of concerns about the validity of the underlying data.
- 5) Data on clinical care show that the population of the Historic Triangle has relatively high levels of access to health care and a relatively high quality of health care compared to the state of Virginia.
- 6) There is limited data on clinical care for subgroups of the local population defined by race or socioeconomic status. Existing data from the Service Area Needs Assessment show some evidence of racial disparities in clinical care measures within the Historic Triangle.
- 7) Several high quality sources of information on the clinical care of residents of the Historic Triangle are available; however, some improvements could be made in this area. Several existing clinical care measures in the County Health Rankings pertain to the Medicare population, so additional data on preventive clinical care in the non-Medicare population would be valuable. Several existing measures are based on treatment of ambulatory care sensitive conditions, so additional data on direct measures of outpatient care such as office visits would be informative. The limited data on inpatient use by race

suggest that there are important differences between whites and blacks, so additional data on preventive care by race could be worthwhile.

Recommendations

- 1) The overall population of the Historic Triangle is comparable to some of the healthiest localities in the state of Virginia according to the County Health Rankings, one widely-used measure of population health. That said, this review of community health data suggests that additional attention to some health outcomes or factors in some populations may be worthwhile. These include the percentage of births defined as low birthweight, adult cardiovascular disease hospitalizations, racial differences in mortality rates, and pediatric asthma hospitalizations.
- 2) A large share of Historic Triangle residents are age 65 and older. In James City County, more than one out of every five residents is age 65 or older. When students from the College of William & Mary are excluded from population counts, 23% of permanent residents of Williamsburg are age 65 or older. In comparison, 12.4% of the Virginia population is in this age group. Given the importance of Medicare for seniors' health, and the likelihood that important changes to these programs may occur in the years ahead, support for seniors in making decisions about private plan enrollment and in maintaining access to physicians may well be important to the community's health.
- 3) The funding for safety net clinics that provide integrated primary and specialty care and increase access to prescription drugs for residents of the Historic Triangle may contribute to the favorable health outcomes reported among residents of the Historic Triangle as a whole and may contribute to the particularly strong measures of clinical care reported in data from several sources. If so, continuing funding for clinical care in safety net clinics is valuable to the community.
- 4) Despite the relatively strong clinical indicators noted above, clinical care providers in the area should note that differences exist in preventable hospitalizations for both adults and children within the region. According to data from Virginia Health Information, the James City County population (defined to include residents of zip code 23185) has higher rates of hospitalizations for ambulatory sensitive conditions than the populations residing in Williamsburg and York County. This suggests that differences in access to or quality of outpatient care may exist within the Historic Triangle. Clinical differences may be more pronounced in the adult population under age 65 than in the age 65 and older population. Thus, clinical care targeted to residents of those zip codes used to define James City County, especially those under age 65, may be especially valuable to the community.
- 5) There are noticeable differences in socioeconomic status among the residents of the Historic Triangle. Low socioeconomic status may also contribute to noticeable

differences in health outcomes between whites and blacks and the differences in inpatient hospitalization rates by race reported in the 2008 Service Area Needs Assessment. A better understanding of the differences in socioeconomic status (SES) that exist within the localities of the Historic Triangle is valuable for the community's health. Further, targeting services toward low SES populations would be valuable to the community's health. Finally, support for programs that address the specific needs of the low SES population, even those needs that are not in the form of direct medical services, may be valuable to the community's health.

- 6) A better understanding of the behavioral health risk factors of the community is needed. Clear and concise information about the strengths and limitations of health risk factors data should be made available on the website of the Williamsburg Community Health Foundation on the Resources webpage where the link to the Virginia Atlas of Community Health is found. New information on health risk behaviors in the 2013 Virginia Atlas of Health should be closely examined when the data are published next year. Information from the SHIP program is a very valuable source of data on the health risks of the children of Williamsburg and James City County. Summary statistics on obesity, physical inactivity, and eating behaviors from the SHIP Student Surveys should be available on the Resources webpage of the Williamsburg Community Health Foundation.
- 7) Despite a large volume of community health data, there is a shortage of data pertaining to subgroups of the community defined by socioeconomic status (income, education) or by race. The Williamsburg Community Health Foundation should explore the use of the raw survey data from the Historic Triangle oversample of the 2011 Virginia Age Ready Indicators Benchmark Survey to examine subgroup differences more closely. Further analysis of these data may help to better explain the factors behind the racial differences in health as measured by cancer mortality or cardiovascular disease hospitalization.

1. Introduction

Information on the health of residents of the Historic Triangle is vital to policy makers, grant makers, and other community stakeholders. While quantitative data on residents' health and the factors affecting their health can be found in readily-available publications, certain limitations may prevent decision makers from using this information. Importantly, most sources of data on health and health-related factors are not accompanied by an interpretation. For example, the County Health Rankings report (hereafter, the CHR) shows large disparities between the health of the populations of James City County, York County, and Williamsburg, but further investigation is needed to understand what factors contribute to this difference. In addition, there are more than 200 different measures of population health, healthcare use, population traits, and the social and economic environment available in the CHR and the Virginia Atlas of Community Health (hereafter, the Virginia Atlas). As a result, there is a large volume of data that may be inaccessible to decision makers.

This report serves several purposes. The first is to inventory existing data on health outcomes and health factors for the localities of the Historic Triangle, which are defined in this report as the localities of James City County, York County, and the City of Williamsburg (or Williamsburg, for brevity's sake). This report assembles the most recent releases of the CHR and the Virginia Atlas and supplements these data with city- and county-level data from state and federal agencies. The second purpose is to highlight areas where additional measures may be useful. The third purpose is to provide a narrative to accompany the data. This narrative seeks to identify the health and health factors metrics for which localities in the Historic Triangle region perform better (or worse) than Virginia as a whole, how individual localities in the Historic Triangle perform relative to each other, what long-term trends exist in the data, and which differences warrant the most attention.

Several limitations of the analysis should be noted. First, data limitations do not permit formal tests for statistically significant differences between a local area and the state and within the local areas of the Historic Triangle, or differences over time. This report uses summary statistics (e.g., rates and percentages) obtained from other published reports that do not include the information needed to conduct tests for statistically significant differences over time or across areas (namely, variance in the rates or percentages and sample sizes). Second, some of the summary statistics in this report are based on small populations or small numbers of cases, and as a result, the estimates are subject to error.

Part 2 of this report describes the data sources used in the report and reasons for their selection. Part 3 describes data on health outcomes in the three localities of Williamsburg, James City County, and York County, and in Virginia as a whole. Part 4 describes data on health determinants in Williamsburg, James City County, York County, and Virginia. Part 5 summarizes key findings and offers recommendations for further analysis.

2. Data Sources

This report examines several different types of data on health outcomes and health determinants. Data were selected from readily available sources that provide locality-specific (e.g., city- or county-level) measures of health or health determinants describing a recent time period and preferably at least one other prior time period.² Each source is described below.

2012 County Health Rankings Data

This report uses data from the most recent release of the *County Health Rankings and Roadmaps* program, a joint effort of the University of Wisconsin Population Health Institute and the Robert Wood Johnson Foundation. Each year since 2010, the program releases the County Health Rankings, which rank the health of almost all counties or county-equivalents in the United States relative to other counties in the same state. The report also ranks counties based on their “health factors,” where health factors include important determinants of health. In Virginia, for example, the 2012 County Health Rankings report ranks 131 counties and cities. Fairfax County is rated first in health outcomes, and Loudoun County is rated first in health factors; the City of Petersburg is rated the lowest in the state in both categories.

In this report, the focus is not on the ranking, *per se*, but on the measures used to create the ranking. As Gerzoff and Williamson (2001) note, “while ranking based on public health indicators is an attractive and popular way of presenting public health data, caution and close examination of the underlying data are needed for proper interpretation” (p. 158). The County Health Rankings are created from the latest data on numerous health outcomes and health factors measures that are publically available and constructed at the county- (or city-) level. Health outcomes measures capture the length and quality of life, while health factors measures capture determinants of health organized in four areas: health behaviors, clinical care, social and economic factors, and the physical environment. A county’s overall ranking in each of the two areas (health outcomes and health factors) is calculated by applying statistical techniques to the underlying measures and using a weight scheme that allows some measures to have a larger impact on the ranking than others. For example, in calculating the health factors rank, adult smoking rates receive a weight of 10% and fast-food restaurant proximity receives a weight of 2%. These weights are based on evidence that individual smoking is roughly five-times more important for population health than is access to fast food.

² An excellent source of data on the Historic Triangle is the “Older Dominion Partnership 2011 Virginia Age Ready Indicators Benchmark Survey Historic Triangle Oversample Report” (Southeastern Institute of Research, 2011). One section of this report deals with measures of self-reported health, health behaviors and clinical care by 571 respondents age 50 and older in the Historic Triangle. Because these data are not broken out by specific locality within the Historic Triangle, they are not included in this report.

This report uses data from the 2012 County Health Rankings report which was released in April of 2012. That report contains five measures of health outcomes and 24 measures of health factors for Williamsburg, James City County, York County, and the Commonwealth of Virginia.³

Although two prior years of data from the CHR are available (for 2010 and 2011), this report focuses only on data from 2012. This is because health outcomes and health factors measures in each year are constructed by pooling multiple years of data. For example, in the 2012 CHR report, low birthweight rates are constructed by pooling Vital Statistics data from the National Center for Health Statistics for the years 2002-2008. In the 2010 CHR report, low birthweight rates are constructed by pooling 2000-2006 data from the same source. Thus, the 2010 and 2012 measures share data from five of the seven years of data used in their construction. Similar degrees of overlap exist for other measures. It should be noted that this is a strength, not a limitation, of the CHR data because pooling multiple years increases the precision of the estimates in any one year.

2012 Virginia Atlas of Community Health Data

This report also uses data from the most recent release of the Virginia Atlas, an online source of community health indicators for Virginia, which is produced and published by Community Health Solutions of Richmond (Community Health Solutions, 2012). The most recent release of the Virginia Atlas contains measures of health and health-related variables in seven areas: 1) demographic and economic data, 2) maternal and infant health, 3) mortality, 4) prevention quality, 5) health coverage, 6) adult health risks, and 7) child health risks.

This report uses data from the 2012 Virginia Atlas, which was released in April of 2012. The Virginia Atlas contains a total of 177 different measures of health and health-related traits in the seven areas listed above for Williamsburg, James City County, York County, and the Commonwealth of Virginia. Data from the 2006 Virginia Atlas were also examined.

2005-2007 Data on Areawide Quality Indicators from Virginia Health Information

This report also uses data on Areawide Quality Indicators (AQIs), a set of measures of healthcare quality that make use of readily available hospital inpatient administrative data. These indicators were constructed by Virginia Health Information (VHI) using inpatient hospital discharge records from Virginia hospitals in combination with specially-designed software from the Agency for Healthcare Research and Quality (AHRQ). The VHI website provides downloadable quality indicators in four areas: 1) Prevention Quality Indicators, 2) Inpatient

³ A full list of the measures is shown in Table 1 (health outcomes) and Table 3 (health factors) of this report.

Quality Indicators, 3) Patient Safety Indicators, and 4) Pediatric Quality Indicators.⁴ All measures are available for Virginia localities and the state as a whole for 2005, 2006, and 2007. This report uses the Prevention Quality Indicators and Pediatric Quality Indicators.⁵

The Prevention Quality Indicators (PQI) provided by VHI are useful for identifying ambulatory care sensitive conditions which are defined as “conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease” (Virginia Health Information, 2012). An example is the rate of hospitalization for complications associated with diabetes; high rates of hospitalization for this condition may suggest that patients are not receiving sufficient monitoring or education on an outpatient basis. Thus, as VHI notes, the indicators are based on hospital inpatient data but they provide meaningful information on the healthcare system outside of the hospital setting. When localities have high values of PQIs (that is, high discharge rates for ambulatory care sensitive conditions), this may indicate problems in the quality of and access to outpatient care. This report includes all 17 PQI measures for different types of ambulatory care sensitive conditions for 2005 and 2007.

The 2012 Virginia Atlas also contains several of the Prevention Quality Indicators based on an analysis conducted by Community Health Solutions using hospital discharge records from VHI in calendar year 2010. These data are not directly comparable to the VHI downloaded data, most notably because of differences in risk adjustment (which accounts for population differences across area, like age and sex).

The other set of Areawide Quality Indicators included in this report are the Pediatric Quality Indicators (PDIs), which are similar to PQI measures but apply to children. Like the PQIs, these measures indicate potential problems with access to and quality of ambulatory care, and are based on hospital admissions rates for potentially avoidable conditions. An example is the rate of hospitalization associated with asthma; higher rates may suggest limited access to or lower quality of outpatient care for this condition.

⁴ This website is available at http://www.vhi.org/ahrq_intro.asp.

⁵ Patient Safety Indicators (PSI) are not examined in this report because the values of these indicators are usually very low in Williamsburg, James City County, and York County. To illustrate, one PSI is the rate at which foreign bodies are accidentally left inside the patient following surgery. In 2007, there were zero such cases in Williamsburg and York County and one case in James City County. Inpatient Quality Indicators from VHI are also not examined here. These include measures of utilization of four specific types of treatment where questions have been raised about misuse, underuse, or overuse (cardiac bypass graft (CABG) surgery, coronary angioplasty, hysterectomy, and laminectomy). These are hard to interpret out of context, as high rates may indicate adequate use of an underused procedure or overuse of a procedure.

VHI provides the following information regarding the construction of the Areawide Quality Indicators on its website:

The software and reports use population information that is updated annually by AHRQ. These population figures are estimates and by their nature, never exact. These data do not contain admissions of Virginians to out-of-state hospitals bordering Virginia. As a result some rates may be lower than reported. Some cities and counties have prisons, and those admissions may inflate rates for certain conditions. Patients are listed as admissions from cities or counties based on the zip code recorded by the hospital as their place of residence. The zip codes are mapped to cities and counties using codes called FIPS. Federal information processing standards codes (FIPS codes) are a standardized set of numeric or alphabetic codes issued by the National Institute of Standards and Technology (NIST) to ensure uniform identification of geographic entities through all federal government agencies. In Virginia, certain zip codes may be valid for both a city and an adjacent county. As a result sometimes the rates can be affected by these nuances (Virginia Health Information, 2012).

As stated above, VHI constructs locality-specific measures using the zip code of residence on a patient's discharge record. VHI defines AQIs for Williamsburg based on discharges of patients residing in zip codes 23186, 23187. James City County AQIs are based on discharges of patients residing in zip codes 23188, 23127, 23168, 23185, and 23081, and York County PQIs are based on discharges of patients residing in zip codes 23665, 23690, 23090, 23691, 23692, 23693, 23694, 23696. Because some portions of zip code 23185 reside in Williamsburg, the James City County AQIs measure will reflect the quality of care in Williamsburg as well as James City County.

Centers for Disease Control and Prevention WONDER Data, various years

This report uses additional mortality rate data from the Centers for Disease Control and Prevention (CDC) WONDER data.⁶ In particular, this report uses the Compressed Mortality File (CMF) to obtain county-level age-adjusted mortality rates. Age-adjusted rates allow for meaningful comparisons across populations with different population age characteristics. In addition, this report includes age-adjusted cause-specific mortality rates for deaths stemming from heart disease, cancer, and stroke from the Underlying Cause of Death files. These data are available for the period 1999-2009 for Williamsburg, James City and York counties, and Virginia.⁷

⁶ WONDER stands for Wide-ranging Online Data for Epidemiologic Research.

⁷ CDC WONDER data on mortality rates from other causes of death were also looked at, but were not used because the data are based on too few deaths to be deemed reliable by the CDC. Other age-adjusted death rates by cause are available from the Virginia Department of Health, at <http://www.vdh.state.va.us/HealthStats/stats.htm>. See the City/County Profiles on this page.

Vital Statistics Data from the Virginia Department of Health, various years

This report also uses data from the Virginia Department of Health (VDH). These data are used to augment the mortality and low birthweight data provided in the CHR data in two ways. First, VDH provides longitudinal data on cancer mortality, low birthweight rates, and early prenatal care use rates. Cancer mortality rates are available for each locality and the state from 2000 through 2007. Low birthweight and prenatal care use rates are available for each locality and the state for each year from 1997 through 2010. These data give a longer perspective on changes in cancer mortality and infant health in the Historic Triangle. Second, VDH provides race-specific estimates of cancer mortality and low birthweight for whites and blacks. These data are valuable for examining racial disparities in health in the Historic Triangle.

U.S. Census Bureau Data, various years

This report also uses data from the U.S. Census Bureau for various years but primarily from 2011 (the most recent year available) and 2000. These data include measures of the demographic traits of the population in the Historic Triangle relative to the state (e.g., age composition, sex composition, racial and ethnic make-up) and measures of economic traits (e.g., median household income, educational attainment, and percent of children in single-parent households).

Service Area Needs Assessment, 2008 (with data from prior years)

This report also uses data published in the Service Area Needs Assessment prepared for the Williamsburg Community Health Foundation by the Central Virginia Health Planning Agency in April 2008. Much of the data included in the needs assessment is similar (or identical) to the measures described above from the CHR, the Virginia Atlas, VDH, and Census, so the present report does not duplicate any measures of demographic and socioeconomic conditions or vital statistics. Instead, this report selectively uses inpatient utilization data reported in the needs assessment since these data are not available in the sources above. In addition to inpatient utilization measures defined for the total population, the needs assessment also provides important breakdowns of inpatient utilization by race.

How Students Are Treated in the Data

Williamsburg is home to the College of William & Mary, which enrolls more than 8,000 graduate and undergraduate students. In most of the data sources described above, students may affect the population estimates for localities in the Historic Triangle, especially Williamsburg. For example, students living outside of their parents' home while attending a U.S. college, either on-campus or off-campus, are counted by the U.S. Census Bureau "at the on-campus or off-

campus residence where they live and sleep most of the time.”⁸ In the VHI data, student discharges may appear in the counts of discharges used in the AQIs for Williamsburg, James City County, or York County, depending on how the zip code of residence was reported on the hospital discharge record. Students living in dormitories or fraternities and sororities are ineligible to participate in the Behavioral Risk Factor Surveillance System (BRFSS), which is used to construct certain health risk measures, but it is possible that students living in off-campus rental housing could participate in the survey.⁹ In mortality rate data, deaths are counted in one locality or another depending on the legal residence of the decedent; thus it is possible that college students could contribute to mortality rates in Williamsburg or James City County.

This may cause Census Bureau estimates of the Williamsburg population to reflect a lower average age and a higher poverty rate than the “permanent resident” (i.e., non-college student) population of the city. Data on mortality rates, AQIs, and risk factors may also reflect the health of college students residing outside of dormitories; if so, this might cause the populations of Williamsburg and James City County to appear healthier than the non-college student populations of these areas. However, data on mortality rates and AQIs are risk-adjusted for differences in population age across areas which partially addresses this concern.

Methods

The analysis contained in this report is descriptive in nature and cannot be used to draw inferences regarding causal relationships between specific health factors and specific health outcomes within the Historic Triangle. Further, tests for statistically significant differences across localities and over time cannot be applied to the data given that the published data do not include information on variance in the estimates and the underlying sample sizes. Finally, it must be cautioned that even large differences from one year to the next or across localities may not be informative given the small population sizes in the areas of the study, particularly in Williamsburg.

⁸ See http://www.census.gov/population/www/cen2010/resid_rules/resid_rules.html#EIGHT.

⁹ See <http://www.vahealth.org/brfss/methodology.htm>.

3. Health Outcomes In the Historic Triangle

This section describes data on health outcomes, beginning with the health outcomes data included in the CHR report. As described above, the focus in this report is not on the rankings, *per se*, but on the underlying data used to determine the rankings. The CHR data have several advantages. First, the measures are relatively well-known and often receive media attention. According to the CHR program website, more than 600 original news articles across all 50 U.S. states followed the release of the 2012 rankings.¹⁰ Second, the data are based on a careful methodology that increases the precision of the estimates. To construct each measure for a given year's release, the University of Wisconsin Population Health Institute pools several years of data to mitigate the problems caused by small sample sizes. Third, the particular measures used to create the overall ranking are given clearly-defined weights based on academic studies that indicate the relative importance of some health outcome or health factors measures over others.

Comparing health outcomes in the CHR data

Table 1 reports the measures of health outcomes in the 2012 CHR data, along with weights applied to these measures in calculating the rank of each locality. The CHR health outcomes measures include one measure of mortality and four measures of morbidity. Mortality is measured by premature death, which is defined as years of potential life lost before age 75 per 100,000 population, or the YPLL rate;¹¹ data on this measure are from U.S. Vital Statistics. Morbidity is measured by self-reported poor or fair health, poor physical health days, and poor mental health days (obtained from the Behavioral Risk Factor Surveillance System or BRFSS) plus low birthweight incidence, or the percent of live births weighing less than 2,500 grams (obtained from U.S. Vital Statistics).

Several patterns stand out in the data. First, in terms of mortality, the populations of York and James City counties are healthier (i.e., have lower premature death rates) than the state as a whole. The Williamsburg population is less healthy than the state population as a whole; the YPLL rate is 60% higher in Williamsburg than in Virginia.

¹⁰ See University of Wisconsin Population Health Institute (2012a), available at <http://www.countyhealthrankings.org/content/2012-rankings-receive-widespread-media-coverage>. Also see Tavernise (2012), available at <http://www.nytimes.com/2012/04/03/us/longevity-up-in-us-but-education-creates-disparity-study-says.html>.

¹¹ The CHR report provides these additional details of the YPLL rate: "Every death occurring before the age of 75 contributes to the total number of years of potential life lost. For example, a person dying at age 25 contributes 50 years of life lost, whereas a person who dies at age 65 contributes 10 years of life lost to a county's YPLL. The YPLL measure is presented as a rate per 100,000 population and is age-adjusted to the 2000 U.S. population." (University of Wisconsin Population Health Institute, 2012a).

Second, in terms of low birthweight, the populations of York and James City counties are healthier (i.e., have lower low birthweight rates) than the state as a whole. The Williamsburg population is less healthy than the state population as a whole; the low birthweight rate is 33% higher in Williamsburg than in Virginia.

Third, the populations of York and James City counties have health that is similar to or better than the statewide population for three other health measures (poor or fair health, poor physical health days, and poor mental health days). However, the CHR does not report these measures for Williamsburg because the sample sizes from the BRFSS are deemed too small to construct reliable estimates. According to the methodology published by the CHR program, the state's values are used in place of the locality's values in such instances.

Table 1. County Health Rankings (CHR), 2012: Health Outcomes Ranks and Measures

	Weight	Williamsburg	James City County	York County	Virginia
<i>Health Outcomes Rank</i>		111	7	5	
<i>Mortality Rank</i>		117	9	5	
Premature death (YPLL rate)	50%	10,893	5,269	4,735	6,729
<i>Morbidity Rank</i>		97	11	10	
Poor or fair health, %	10%	n.a.	8%	6%	13%
Poor physical health days	10%	n.a.	3.2	2.7	3.2
Poor mental health days	10%	n.a.	2.5	2.6	3.2
Low birthweight, %	20%	11.0%	6.8%	7.3%	8.3%

Table notes: n.a. indicates that locality-specific data are not available for a large enough sample for use in the CHR report. In these instances, state-level data on the measure are applied to the locality.

Source: University of Wisconsin Population Health Institute (2012a), available at <http://www.countyhealthrankings.org/#app/virginia/2012/compare-counties/830+095+199>.

Overall, these data suggest that there are large differences within the Historic Triangle for two very critical measures of health (mortality which receives a 50% weight, and low birthweight which receives a 20% weight). The Williamsburg population has worse overall health than the populations of James City and York counties and the state as a whole.

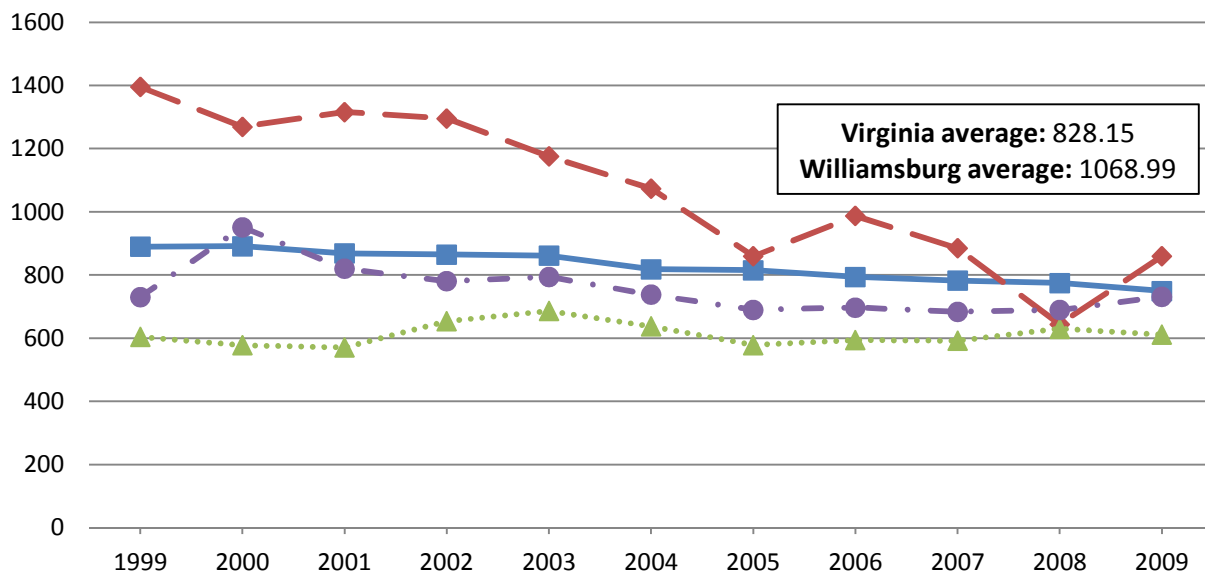
Trends in mortality in the Historic Triangle

Additional data on mortality were obtained for this report from the Centers for Disease Control and Prevention (CDC). Data on overall mortality and several cause-specific measures of

mortality were available starting in 1999 and through 2009. All mortality rates are age-adjusted or adjusted to account for the fact that localities with an older population will naturally have higher death rates. Thus, differences in mortality rates data are not the result of population age differences.

Figure 1 shows the overall death rates for the three localities in the Historic Triangle relative to the state. Like the CHR measure of years of potential life lost, mortality rates in the counties of James City and York are below the state rates in most years, whereas in Williamsburg, mortality rates exceed state rates in most years. But unlike the CHR data, which shows only one composite measure for the period 2002-2008, the CDC data suggest that there is a *trend of declining mortality* in Williamsburg. In the first three years of the period, the average mortality rate was 1,327 deaths per 100,000 population; in the last three years of the period, the rate had fallen to 796 deaths per 100,000 population. This decline brings the Williamsburg death rate closer to the state average.

Figure 1. Total Age-Adjusted Death Rate per 100,000, 1999-2009



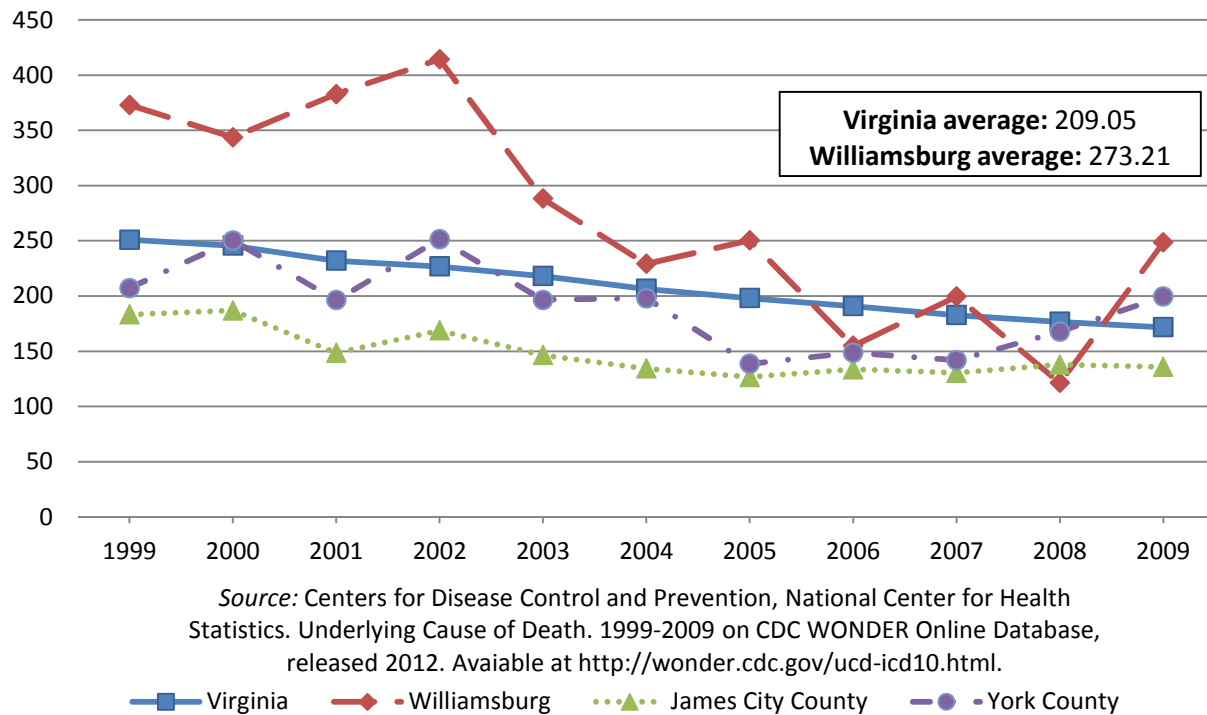
Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File.
Available at <http://wonder.cdc.gov/cmfi-icd10.html>.

—■— Virginia —◆— Williamsburg —▲— James City County —●— York County

Figures 2 through 4 illustrate cause-specific mortality rates for the three Historic Triangle localities relative to the state. Mortality rates for diseases of the heart, malignant neoplasms (cancer), and cerebrovascular disease (stroke) are reported; these were the three leading causes of

death in 2010, according to the U.S. National Center for Health Statistics, and together accounted for more than 50% of all deaths in that year.¹²

Figure 2. Diseases of the Heart Age-Adjusted Death Rate per 100,000, 1999-2009



Two of the three cause-specific mortality rates show a pattern similar to that seen for overall mortality. In general, mortality rates from heart disease and stroke in James City and York counties are below those of the state. In general, mortality rates from heart disease in Williamsburg exceed those of the state.

The data also show a pattern of declining mortality rates from heart disease in Williamsburg. Specifically, over the period 1999-2009 in Williamsburg, the three-year average heart disease mortality rate (calculated from the data plotted in Figure 2) fell from 366 to 190 deaths per 100,000.

¹² See National Center for Health Statistics (2011), available at <http://www.cdc.gov/nchs/data/hus/hus10.pdf>.

Figure 3. Malignant Neoplasms (Cancer) Age-Adjusted Death Rate per 100,000, 1999-2009

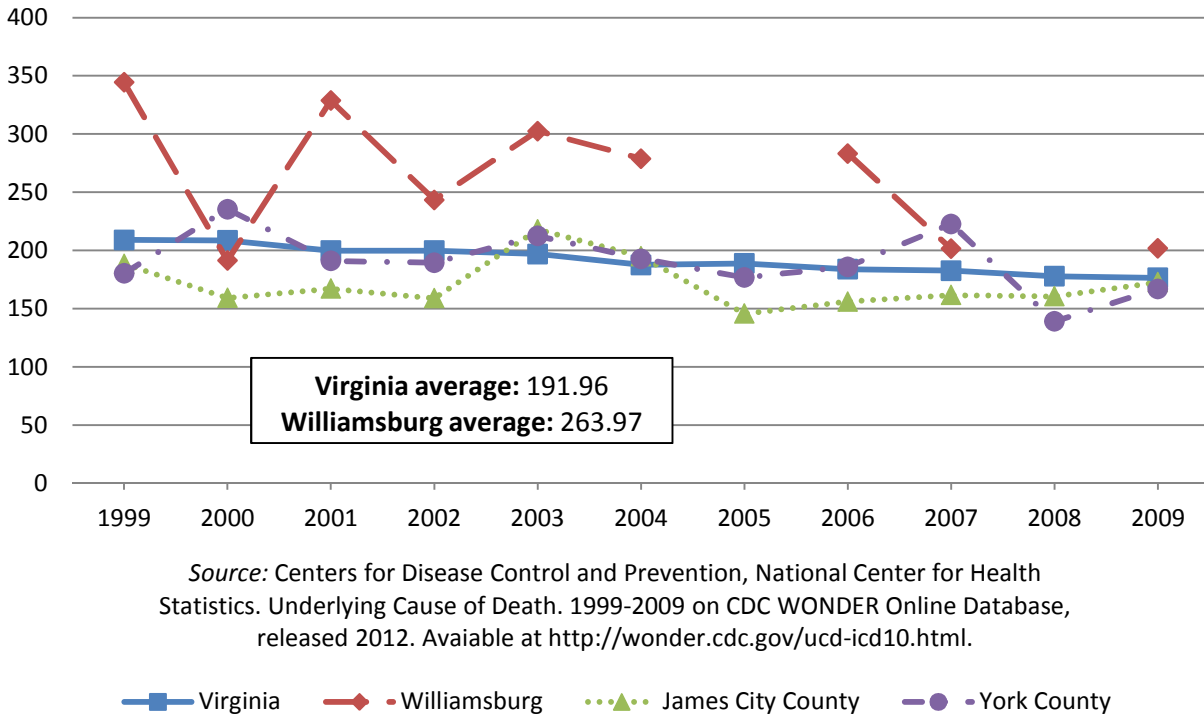
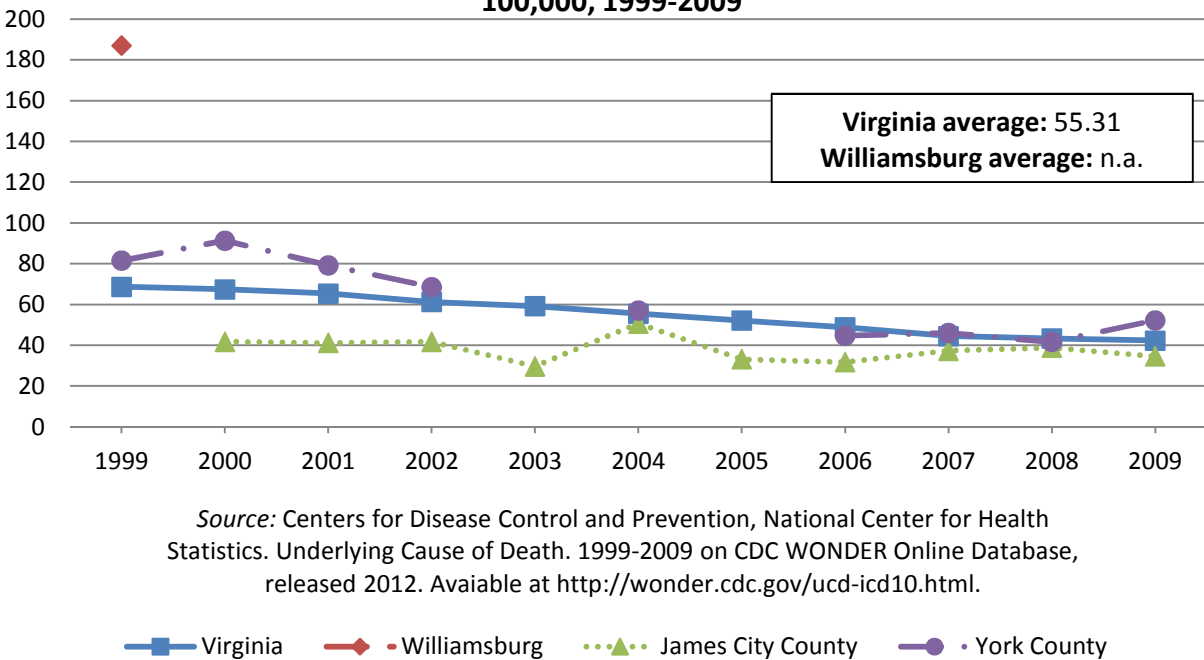


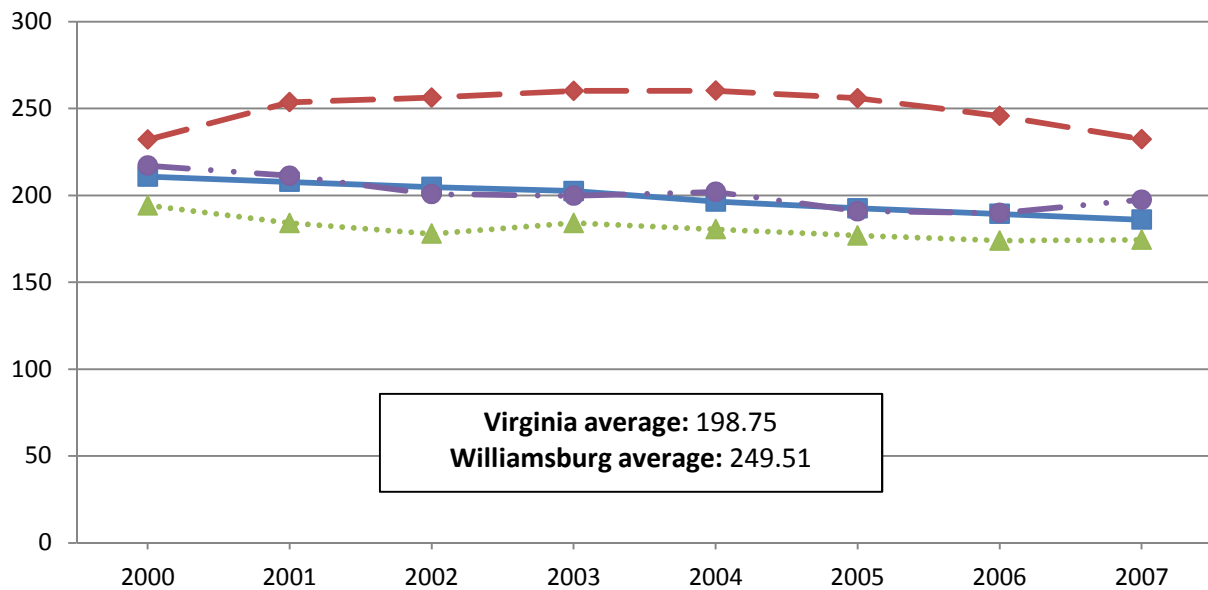
Figure 4. Cerebrovascular Disease (Stroke) Age-Adjusted Death Rate per 100,000, 1999-2009



Data on cancer and stroke mortality display a pattern similar to that seen for overall mortality and heart disease mortality rates. Cancer death rates and cerebrovascular disease death rates in James City County are generally below the state average, and cancer death rates in Williamsburg are typically higher than cancer death rates in the state. However, it is difficult to discern a clear trend in the Williamsburg data because several years' estimates of cancer death rates and all but one year's estimates of stroke death rates are not reported by the CDC because the estimates are deemed unreliable.

Another source of population health data are five-year average cancer death rates from the Virginia Department of Health. The data are available from 2000 through 2007 and are shown in Figures 5, 6, and 7. Each year's rate is the average cancer mortality rate over the preceding five years; for example, the 2007 data point shows the five-year average cancer mortality over the period 2003-2007. This aggregation enhances the reliability of the estimates for small subgroups.

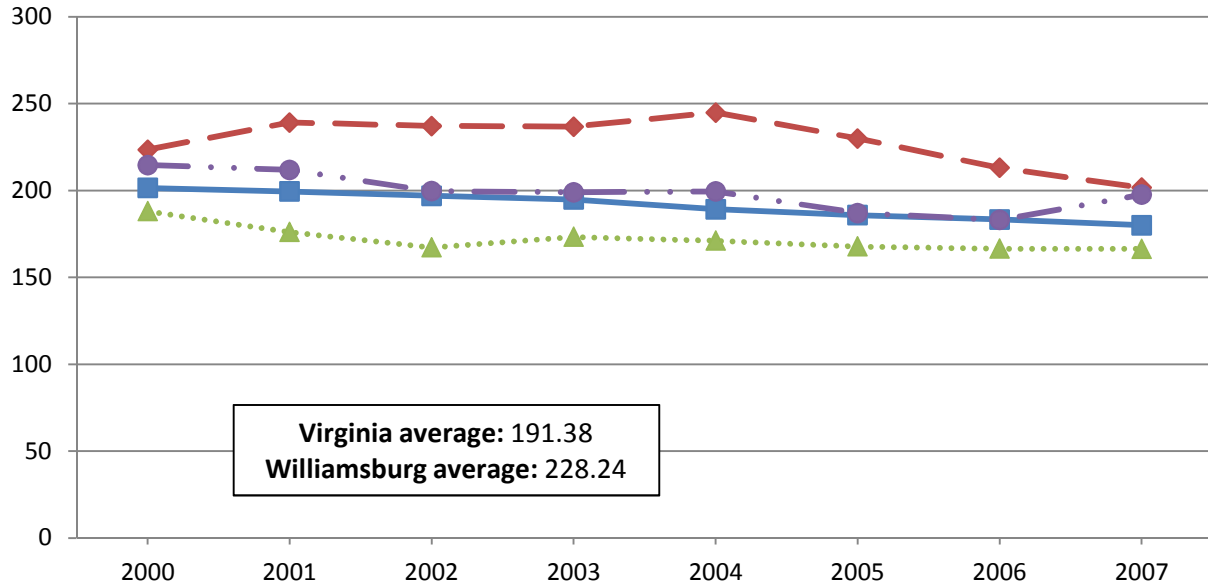
Figure 5. Five-Year Age-Adjusted Cancer Mortality Rate per 100,000, 2000-2007



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Cancer Deaths 5-year Aggregate Tables.

—■— Virginia —◆— Williamsburg ...▲... James City County —●— York County

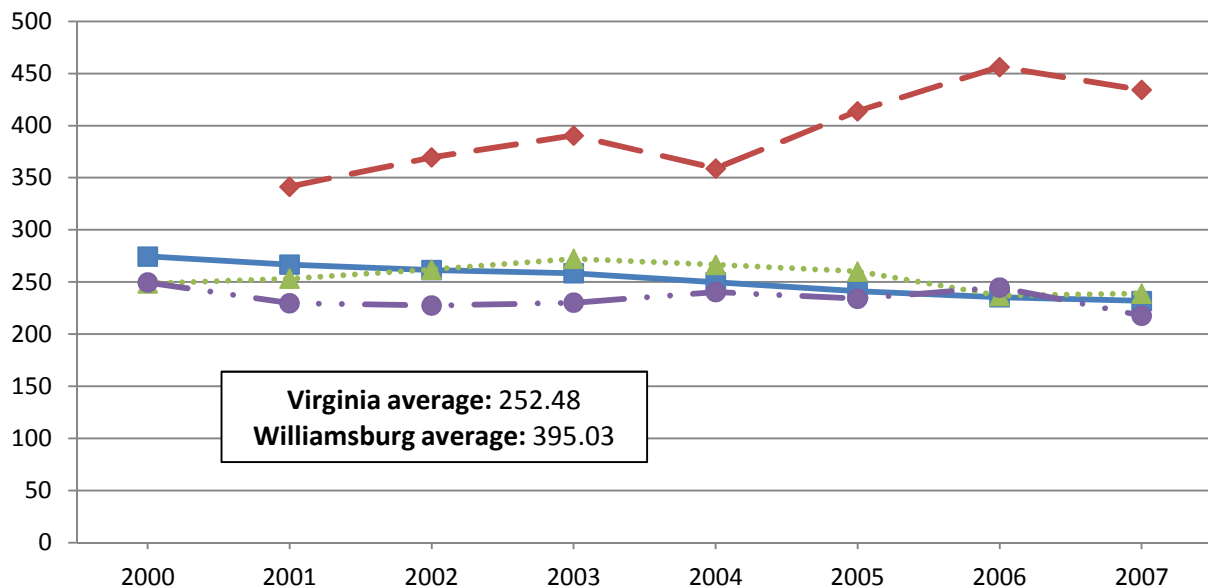
Figure 6. Five-Year Age-Adjusted Cancer Mortality Rate (Whites), 2000-2007



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Cancer Deaths 5-year Aggregate Tables.

—■— Virginia -◆- Williamsburg ...▲... James City County -●- York County

Figure 7. Five-Year Age-Adjusted Cancer Mortality Rate (Blacks), 2000-2007



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Cancer Deaths 5-year Aggregate Tables.

—■— Virginia -◆- Williamsburg ...▲... James City County -●- York County

The data in Figure 5 show a similar pattern to that seen for several other cause-specific mortality rates shown earlier. In the James City County population, rates are below the state; In the York County population rates are similar to the state. Among Williamsburg residents, rates exceed those of the state. However, mortality rates in Williamsburg are declining, at least in the period reflected from the 2004 data point and beyond.

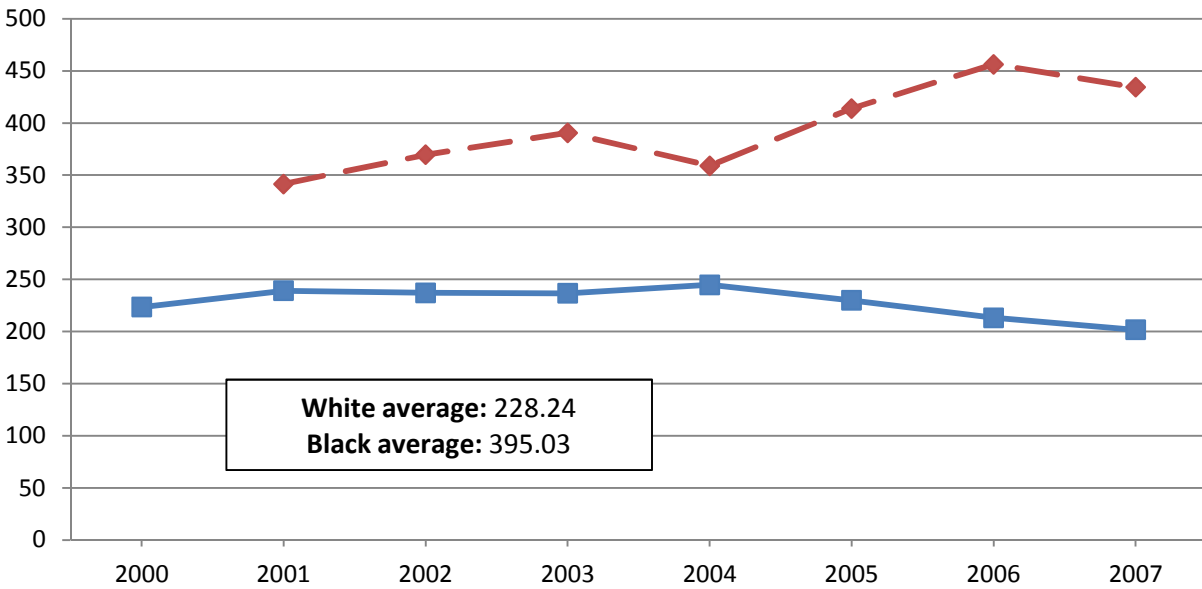
Figures 6 and 7 report data on five-year cancer mortality rates for whites and blacks respectively.¹³ These figures reveal several differences in cancer mortality rates by race. First, in all localities, the average black cancer mortality rate in the period exceeds the average white cancer mortality rate. For example, in Williamsburg, the cancer mortality rate for blacks averages 395 deaths per 100,000 population, while for whites, it averages 228 deaths per 100,000 population. Second, while Williamsburg mortality rates for both races exceed the state average, this difference is greater for cancer death rates among blacks than it is for cancer death rates among whites. Third, the trends in the cancer mortality rates in Williamsburg differ by race. For whites, the five-year cancer mortality rate shows a decline from 244.5 in 2004 to 201.7 in 2007. For blacks, the five-year cancer mortality rate increases from 341.5 in 2001 to 434.3 in 2007. Figure 8 displays the race-specific cancer death rates for Williamsburg in the same graph to more clearly illustrate the differences by race.

In addition to publishing the locality-specific cancer mortality rates shown in Figures 5 through 8, VDH also publishes information about which locality-specific rates are *significantly higher* or *significantly lower* than the state rate (VDH, various years (a)). The following significant differences are noted for the localities in the Historic Triangle:

- In Williamsburg, the cancer death rate among persons of all races is significantly higher than the state rate from 2002 through 2007.
- In James City County, the cancer death rate among persons of all races is significantly lower than the state rate from 2002 through 2007.
- In Williamsburg, the cancer death rate among black persons is significantly higher than the state rate from 2005 through 2007.
- In Williamsburg, the cancer death rate among white persons is significantly higher than the state rate for 2004 only.

¹³ The VDH website does not provide race-specific measures for any other mortality rate aside from cancer mortality.

Figure 8. Five-Year Age-Adjusted Cancer Mortality Rate in Williamsburg, by Race, 2000-2007



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Cancer Deaths 5-year Aggregate Tables.

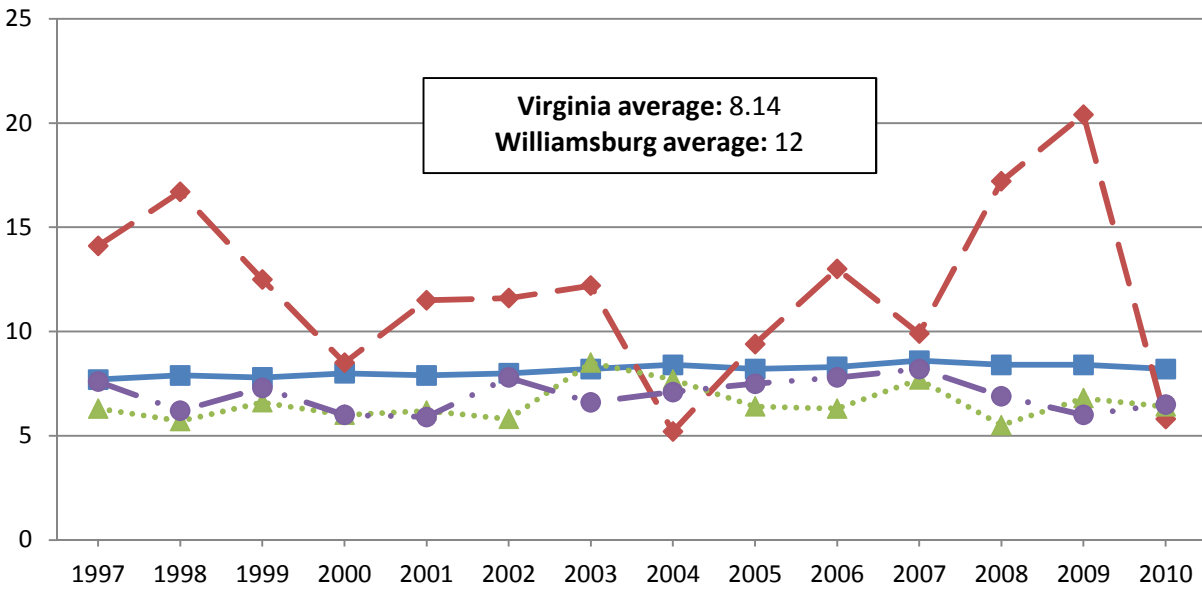
■ white ◆ -black

Trends in low birthweight in the Historic Triangle

The data in the CHR report suggest that there are large differences within the Historic Triangle for not only mortality, but also low birthweight. The Williamsburg population has a much higher percentage of low birthweight births than James City and York counties and the state as a whole. To further investigate patterns of low birthweight in the Historic Triangle, additional data were obtained from the Virginia Department of Health (VDH, various years, (b)).

Figure 9 shows the overall low birthweight percentages for the three localities in the Historic Triangle relative to the state from 1997-2010. Several patterns are apparent. First, low birthweight rates in James City and York counties are below the state rate, while the low birthweight rates in Williamsburg are above the state rate in most years (except 2004 and 2010). Second, the Williamsburg rates exhibit a lot of volatility over the period, and no clear trend emerges over the period 1997-2010.

Figure 9. Low Weight Live Births Under 2,500 Grams as Percentage of Total Births, 1997-2010

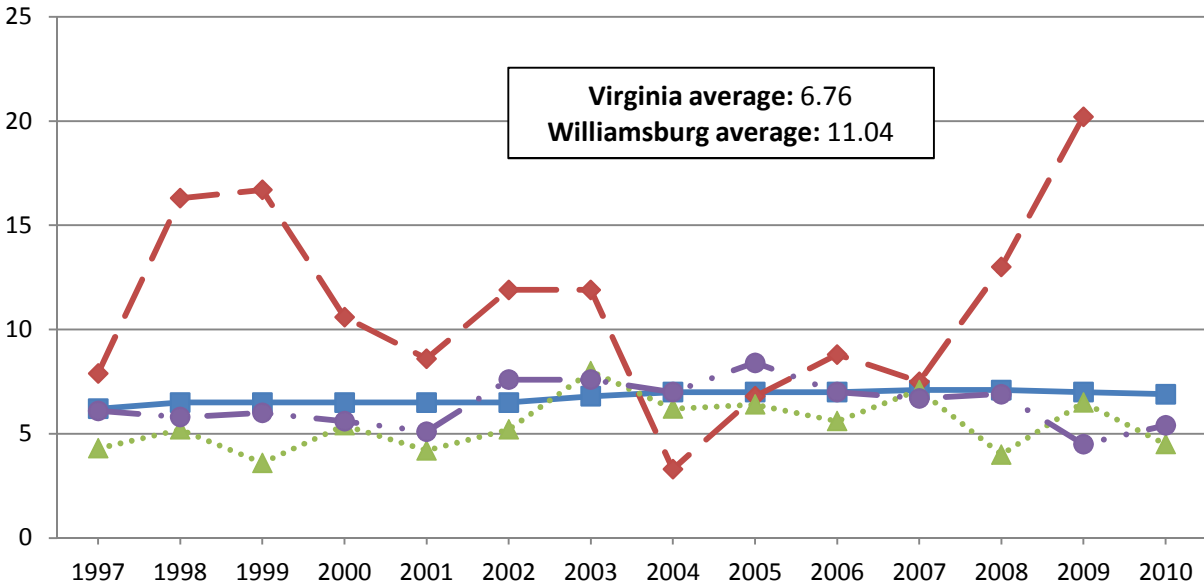


Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Low/Very Low Weight Births Tables.

■ Virginia ◆ Williamsburg ▲ James City County ● York County

Figures 10 and 11 present the low birthweight percentages for whites and blacks, respectively. For both whites and blacks, low birthweight rates in Williamsburg are higher than the low birthweight rates in the state for every year except 2004. Within all localities in the Historic Triangle, there are large differences in low birthweight rates for white and black mothers. In Williamsburg, for example, the average low birthweight percentage for whites in the period is slightly more than 11%, while it is close to 22% for blacks. The race-specific estimates also show volatility from one year to the next, which is expected given the smaller sample sizes used in subgroup estimates. Even with this volatility, there is some indication that low birthweight rates in Williamsburg may be trending upward in this period, beginning in 2004.

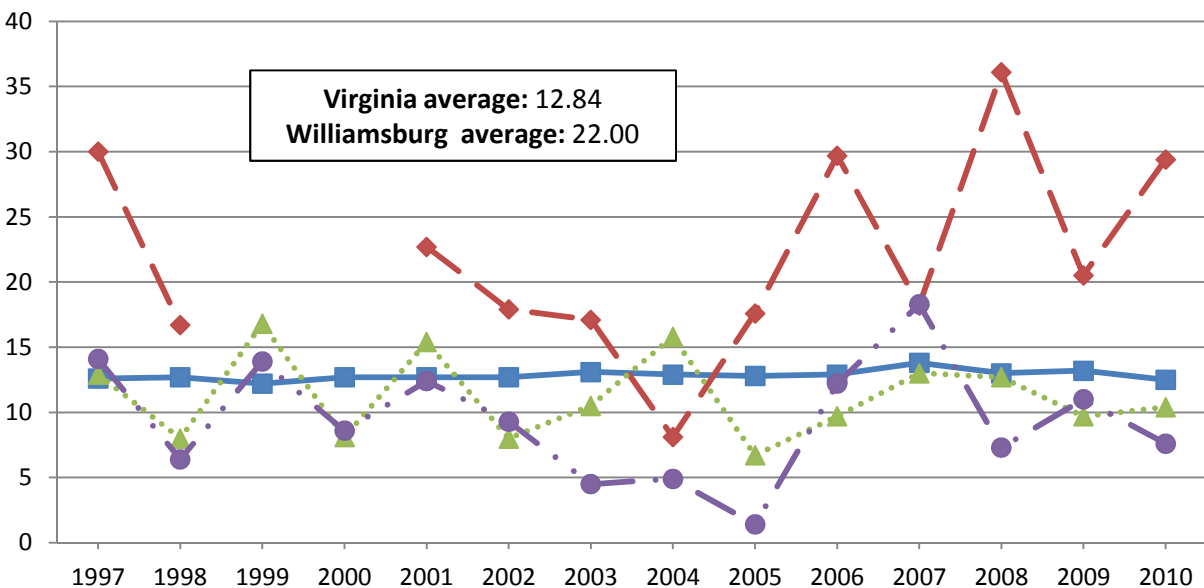
Figure 10. Low Weight Live Births Under 2,500 Grams as Percentage of Total Births (Whites), 1997-2010



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Low/Very Low Weight Births Tables.

—■— Virginia -◆- Williamsburg ...▲... James City County -●- York County

Figure 11. Low Weight Live Births Under 2,500 Grams as Percentage of Total Births (Blacks), 1997-2010



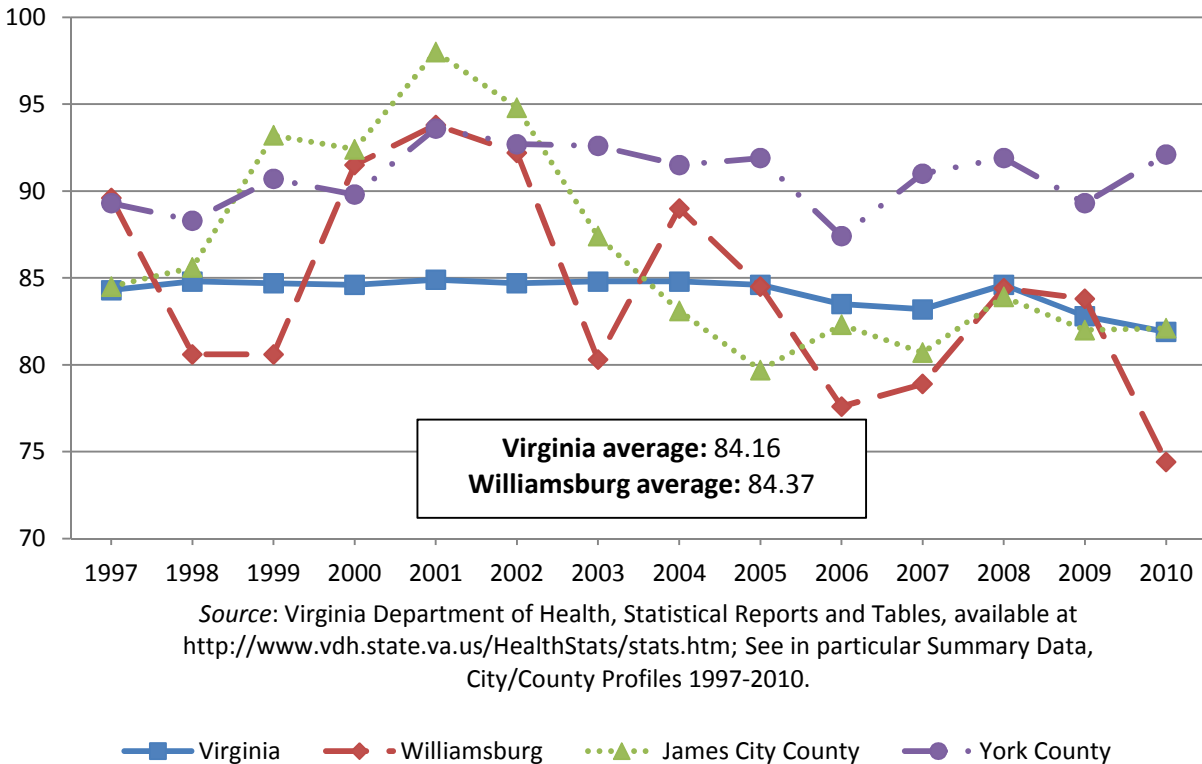
Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Low/Very Low Weight Births Tables.

—■— Virginia -◆- Williamsburg ...▲... James City County -●- York County

Trends in early prenatal care use

Early prenatal care use (or prenatal care that is begun in the first trimester of pregnancy) is often associated with favorable birth outcomes such as healthy birthweight. Data on the percentage of births in which mothers received early prenatal care was also obtained from VDH.

Figure 12. Prenatal Care, Percent Began Care in First 13 Weeks of Pregnancy, 1997-2010



Source: Virginia Department of Health, Statistical Reports and Tables, available at <http://www.vdh.state.va.us/HealthStats/stats.htm>; See in particular Summary Data, City/County Profiles 1997-2010.

Rates of early prenatal care use for each year from 1997-2010 are reported in Figure 12. In York County, rates of early prenatal care use are consistently higher than the state rates. The picture is more mixed for Williamsburg and James City County. In James City County, rates of early prenatal care use are higher than the state rates in the first half of the period, but rates then decline to reach a level similar to the state by 2010. Williamsburg has the most inconsistent pattern of early prenatal care use, exceeding or falling below the state rate in any given year.

On average, the Williamsburg and state rates are very similar (at 84.37 and 84.16 respectively). However, the trend in the state is fairly flat, while in Williamsburg early prenatal care use has been declining since its peak rate in 2001. Although caution is suggested when examining any one year, only 74.4% of births in 2010 were characterized by early prenatal care in Williamsburg. The comparable percentages in the state and in James City and York counties were 81.9%, 82.1% and 92.1%, respectively.

Summary of Health Outcomes Data

The review of health outcomes in the Historic Triangle suggests the following:

- 1) There are important differences in the health status of Historic Triangle residents compared to the state and across the localities that comprise the Historic Triangle. Among residents of James City County and York County, measures of premature death, overall mortality rates, and low birthweight are lower than the state as a whole. Among Williamsburg residents, measures of premature death, overall mortality rates, and low birthweight are higher than in the state as a whole.
- 2) Mortality rates have been declining in Williamsburg. Data from 1999 to 2009 show that Williamsburg rates for all-cause mortality and mortality from heart disease have decreased and have moved closer to state mortality rates.
- 3) There are important differences in the health status of Historic Triangle residents by race, especially in Williamsburg. For example, the average five-year cancer mortality rate in Williamsburg in 2007 was more than twice as high in the black population than in the white population. Cancer mortality rates for the white population in Williamsburg show a slight decrease over time; however, cancer mortality rates for the black population in Williamsburg show a slight increase over time. The Virginia Department of Health also reports that the cancer mortality rate among the black population in Williamsburg was significantly higher than that of the state for 2005 through 2007. In both the populations of Williamsburg and James City County, the fraction of births that are low birthweight in Williamsburg over the period 1997-2010 was almost twice as high in the black population than in the white population.
- 4) Unlike mortality rates in Williamsburg, which show a downward trend over the period 1999-2009, there does not appear to be a downward trend in the fraction of births that are low birthweight in Williamsburg in the period 1997-2010.
- 5) Rates of early prenatal care use, which is thought to decrease the incidence of low birthweight, vary within the Historic Triangle. In York County, the rate of early prenatal care use is consistently higher than the state rate, while the low birthweight rate is consistently below the state rate. In James City County, rates of early prenatal care use are higher than the state rate in the early years of the period 1997-2010, but the rates of early prenatal care use declined in the later years only to become equal with the state in 2010.

4. Determinants of Health in the Historic Triangle

This section examines potential factors behind the health outcome patterns that are described in section 3. These factors are sometimes called the determinants of health. In this section, various types of health factors are first described drawing on research on this area. This section then describes how rankings systems such as the CHR determine weights applied to health factors in determining the final score. Finally, this section presents data from several existing sources on health factors in the Historic Triangle. These are grouped into four areas: socioeconomic status and demographic factors, health behaviors, clinical care, and environmental factors.

Types of health factors or health determinants

The goal of examining health factors or health determinants is to understand key factors behind high mortality, morbidity, or poor health, however defined. In this process, various research questions have to be addressed, such as what factors should be deemed “health factors,” which factors matter more and which factors matter less, and how specific health factors should be measured.

Guidance on these matters comes from decades of scholarly research. The academic research in this area is too large to review here, but a few key findings are synthesized by Booske et al. (2010). In particular, they cite an influential study in the journal *Health Affairs*, which states:

...using the best available estimates, the impacts of various domains on early deaths in the U.S. distribute roughly as follows: genetic predispositions, about 30%; social circumstances, 15%; environmental exposures, 5%; behavioral patterns, 40%; and shortfalls in medical care, 10% (McGinnis et al., 2002, p. 83).

When it comes to measuring health factors, most studies or programs (like the CHR program) recognize the challenge of measuring the role of genetic predispositions. To address this, CHR subtracts the portion due to genes, and re-calculates the portions of the residual explained by the remaining factors. Booske et al. (2010) report the following revised estimates, shown in the first column of Table 2.

Table 2. Weights Assigned to Health Factor Categories in Community Rankings

Category	Booske et al. (2010) based on McGinnis et al. (2002)	Analytic Approach	County Health Rankings	America's Health Rankings	Rankings by WI, KS, TN	Rankings by NM
	(1)	(2)	(3)	(4)	(5)	(6)
Social and Economic Factors, %	21%	55%	40%	27%	40%	40%
Health Behaviors, %	57%	37%	30%	37%	40%	40%
Clinical Care, %	27%	21%	20%	27%	10%	15%
Environmental Factors, %	9%	-3%	10%	9%	10%	5%

Source: Booske, et al. (2010), available at <http://uwphi.pophealth.wisc.edu/publications/other/different-perspectives-for-assigning-weights-to-determinants-of-health.pdf>.

The estimates in the first column are based on a careful review of an extensive body of research. While there is general agreement at least about the selection of the four categories of social and economic factors, health behaviors, clinical care, and environmental factors (leaving genetic factors aside), not every study applies the same weights to each group. Disagreement exists especially with regard to the role of clinical care. As Booske et al. (2010) caution, their estimated role of clinical care represents “the contribution of medical care *deficiencies* to early deaths, rather than the positive contributions of medical care to avoiding mortality” (p. 4, italics added). Further, the newer studies have assigned greater weights to clinical care when assessing the causes behind more recent declines in mortality, in particular heart disease mortality (Unal et al., 2005; Cutler et al., 2006).

The remaining columns of Table 2 illustrate the variation that exists across alternative weighting systems. Column (2), labeled “Analytic Approach,” reports the weights defined from a comprehensive model-based analysis conducted by Booske et al. (2010). Columns (3) through (6) report the weights used in various other health rankings publications or programs, including County Health Rankings, America’s Health Rankings (published by the United Health Foundation), and several rankings schemes used by different U.S. states. While no consensus exists across all rankings schemes, these four groups of determinants appear in all of the rankings shown in columns (3) through (6). There also is some agreement about the weights assigned to health behaviors (30-40%), socioeconomic factors (27-40%), and environment (typically 5-10%). Clinical care shows the greatest range in weights from a low of 10% in one ranking to a high of 27% in another.

There is no clear consensus on how best to *measure* each of these four types of factors. This is illustrated in the measures used to represent environmental factors. America's Health Rankings uses occupation fatalities to capture the environment; County Health Rankings does not. The County Health Rankings program uses slightly different measures for environment from one year to the next (e.g., access to fast food restaurants is used in 2012, but not in 2011 or 2010). This may reflect the types of data available for particular areas or at different points in time.

Rather than debate the relative merits of the particular measures in these four groups, this report includes *any readily available data* that measure one of the four categories shown in Table 2 for the localities in the Historic Triangle and the state. Finally, it should be noted that many factors that have known effects on health are not included in this report because data on these factors were not available or because the factor's contribution to health outcomes is somewhat less well-known or smaller when compared to the other factors examined here.

The comprehensive view: Health factors in the 2012 County Health Rankings report

Several measures of health factors are used in constructing the County Health Rankings, a well-known source of data that is based on sound quantitative methods. Many of these health factors measures are derived from pooling multiple years of data in order to reduce the noise associated with using small numbers of observations for one locality in any one year. For example, the 2012 measures of adult behavioral risks from the Behavioral Risk Factor Surveillance Survey (BRFSS) are based on pooled data from 2004-2010. Other measures are based on a single year of data; for example, the 2012 measure for mammography screenings is based on 2009 data from Medicare claims.

Table 3 shows the complete list of 24 health factors measures organized in the four broad groups defined above (health behaviors, clinical care, social and economic factors, and physical environment). The order reflects the listing in the CHR documentation as opposed to the weight given to each group. In addition to local and state estimates of the 24 health factors measures, Table 3 also reports each locality's ranking within each of the four broad health factors areas and its overall health factors ranking.

Data on all 24 individual measures suggest that the populations of York County and James City County have very strong population health factors. York County is rated second highest and James City County is rated fifth highest in the state of Virginia. Both counties also have very strong health factors for each of the three broad categories of health behaviors, clinical care, and socioeconomic status.

Table 3. County Health Rankings (CHR), 2012: Health Factors Ranks and Measures

	Weight	Williamsburg	James City County	York County	Virginia
<i>Health Factors Rank</i>		59	5	2	
<i>Health Behaviors Rank (30%)</i>		36	5	7	
Adult smoking, %	10.0%	n.a.	13%	10%	19%
Adult obesity, %	7.5%	29%	27%	28%	28%
Physical inactivity, %	2.5%	24%	21%	23%	24%
Excessive drinking, %	2.5%	n.a.	12%	15%	16%
Motor vehicle crash death rate	2.5%	n.a.	10	8	13
Sexually transmitted infections	2.5%	697	173	249	398
Teen birth rate	2.5%	11	23	15	35
<i>Clinical Care Rank (20%)</i>		9	3	5	
Uninsured, %	5.0%	12%	10%	9%	14%
Primary care physicians	5.0%	n.a.	491:1	569:1	806:1
Preventable hospital stays	5.0%	45	46	47	60
Diabetic screening, %	2.5%	87%	88%	85%	84%
Mammography screening, %	2.5%	79%	78%	75%	67%
<i>Social & Economic Factors Rank (40%)</i>		110	13	4	
High school graduation, %	5.0%	87%	87%	94%	87%
Some college, %	5.0%	76%	72%	81%	65%
Unemployment, %	10.0%	15%	6%	6%	7%
Children in poverty, %	10.0%	23%	10%	7%	15%
Inadequate social support, %	2.5%	n.a.	10%	11%	18%
Children in single-parent households, %	2.5%	41%	24%	20%	29%
Violent crime rate	5.0%	247	124	122	252
<i>Physical Environment Rank (10%)</i>		22	46	58	
Air pollution-particulate matter days	2.0%	1	1	1	1
Air pollution-ozone days	2.0%	0	0	0	7
Access to recreational facilities	2.0%	8	16	15	11
Limited access to healthy foods, %	2.0%	6%	12%	6%	7%
Fast food restaurants, %	2.0%	22%	43%	54%	50%

Table notes: n.a. indicates that locality-specific data are not available for a large enough sample for use in the CHR report. In these instances, state-level data on the measure are applied to the locality.

Source: University of Wisconsin Population Health Institute (2012a), available at:

<http://www.countyhealthrankings.org/#app/virginia/2012/compare-counties/830+095+199>.

In terms of overall health factors measures, the Williamsburg population is less healthy than the populations of other localities in the Historic Triangle. However, in terms of clinical care health factors, the Williamsburg population has strong measures that are similar to the populations of James City and York counties.¹⁴ It is worth noting that several of the clinical care measures used by CHR (preventable hospital stays, and diabetic and mammogram screenings) are defined from Medicare claims. This may mean that the relatively strong measures of clinical care are more applicable to persons aged 65 and older than to the general population of the Historic Triangle.

In terms of health behaviors, the Williamsburg population is less healthy than the populations of York and James City counties, but is nonetheless in the top 30% of the localities in the state. Some of the difference between the Williamsburg population when compared to that of York and James City counties could be due to missing or unreliable data on smoking, excessive drinking, or the motor vehicle crash death rate. Missing or unreliable data for these measures led CHR to employ state data in lieu of actual data from Williamsburg in determining the population's health in these areas. Further, the relatively high rate of sexually transmitted infections no doubt lowers Williamsburg's ranking, but this is likely a reflection of the large college-student population.

In terms of socioeconomic status, the Williamsburg population has relatively low levels for several social and economic measures in the CHR, including children living in poverty, unemployment, single-parent households, and violent crime. The largest contrast between Williamsburg and the other localities of the Historic Triangle exists in the category of social and economic factors.

In terms of physical environment factors, Williamsburg-area measures are more favorable than comparable measures for James City County and York County. Thus, Williamsburg's lower overall health factors ranking is not driven by physical environment differences. Further, on measures of air quality, all three localities are comparable.

For several reasons, this report does not further explore the physical environment factors. First, the weight usually assigned to this set of factors is low, typically ranging from just 5-10% as shown in Table 2. Moreover, some of the scientific evidence linking the specific measures of physical environment in Table 3 to health is weak. Plus, specific measures reported in the CHR differ from one year to the next, reflecting limitations in these measures. Finally, the additional sources of data used here (the Virginia Atlas, the Service Area Needs Assessment, and data from

¹⁴ Clinical care measures might be even higher in Williamsburg if CHR had access to Williamsburg-specific data on primary care physicians. Because data on that measure were either missing or deemed unreliable by CHR, CHR instead applied the state's ratio of population to primary care physicians, which may well be much higher than Williamsburg's actual ratio, and may drive Williamsburg's ranking down to some extent.

VDH and Census) do not contain alternative measures of the physical environment.

In conclusion, the CHR data suggest the following for the Historic Triangle:

- In terms of *clinical care*, data from all three localities show that the local populations in the Historic Triangle have relatively high levels of access to care, relatively high rates of preventive care use, and relatively low rates of avoidable hospitalizations. This is especially the case for the Medicare population in the Historic Triangle.
- In terms of *health behaviors*, such as smoking and exercise, data from York and James City show that the populations in these areas are among the healthiest in the state. Data from Williamsburg reveal somewhat less positive health behaviors among its residents, but that may be an artifact of the methods used to construct the CHR rankings. If actual smoking rates, excessive drinking rates, and motor vehicle fatalities among Williamsburg residents were less than statewide rates, then the population of Williamsburg might rank higher in terms of health behaviors than it currently appears to rank.
- In terms of *socioeconomic status*, the Williamsburg population has a higher rate of poverty among children, a higher unemployment rate, and a higher percentage of children in single-parent households than the populations of York and James City counties.

In the sections below, this report uses additional data from other sources to explore these patterns in more depth. Social and economic factors, which receive a 40% weight in the overall health factors rank are discussed first, followed by health behaviors (which receive a 30% weight), and clinical care factors (which receive a 20% rank).

Socioeconomic and demographic factors in the Historic Triangle

To supplement the social and economic measures in the CHR, Tables 4 and 5 report additional data from the U.S. Census Bureau for 2011 and 2000.

As shown in Table 4, the share of the population in the age 65 and older range is highest in James City County at 21.5%. In Williamsburg and York County the elderly share of the population is comparable to the state (at 12.4 to 13%). However, when students from the College of William & Mary are excluded from population counts, 23% of permanent residents of Williamsburg are age 65 or older (Williamsburg Comprehensive Plan, 2012 draft).¹⁵ Compared to James City County and York County, Williamsburg has a higher proportion of non-white residents at 29.9% compared to 26.7% and 22.7% in York and James City counties respectively.¹⁶

¹⁵ Available at <http://www.williamsburgva.gov/index.aspx?page=1209> (see Chapter 3).

¹⁶ This share is calculated as the difference between 100% and the White, non-Hispanic share of the population.

Table 4. Demographic and Economic Traits, 2011

	Williamsburg	James City County	York County	Virginia
Population, 2011 estimate	14,444	68,200	66,134	8,096,604
Population, 2010	14,068	67,009	65,464	8,001,024
<i>Demographic Composition, 2011</i>				
Persons under 5 years, %	3.5%	5.0%	5.4%	6.3%
Persons under 18 years, %	10.5%	21.0%	25.3%	25.3%
Persons 65 years and over, %	13.0%	21.5%	12.4%	12.4%
Female persons, %	53.2%	51.7%	51.2%	50.9%
White persons, % (a)	75.9%	81.4%	77.1%	71.3%
Black persons, % (a)	14.9%	13.6%	13.9%	19.8%
American Indians/Alaska Natives, % (a)	0.4%	0.3%	0.4%	0.5%
Asian persons, % (a)	5.7%	2.3%	5.2%	5.8%
Native Hawaiian and Other Pacific Islander persons, % (a)	(c)	0.1%	0.2%	0.1%
Persons reporting 2 or more races, %	3.1%	2.3%	3.1%	2.5%
Persons of Hispanic/Latino origin, %, (b)	6.9%	4.8%	4.8%	8.2%
White persons not Hispanic, %	70.1%	77.3%	73.3%	64.5%
<i>2006-2010 ACS Estimates</i>				
Living in same house 1 year and over, %	57.2%	86.2%	84.1%	83.8%
Foreign born persons, %	8.5%	7.3%	7.1%	10.8%
Language other than English spoken at home, % age 5+	7.9%	8.9%	8.2%	14.1%
High school graduates, % of persons age 25+	93.5%	93.3%	94.5%	86.1%
Bachelor's degree or higher, % of persons age 25+	43.3%	45.0%	41.5%	33.8%
Veterans	904	8,660	9,956	749,609
Mean travel time to work (minutes), workers age 16+	19.5	25.3	22.0	27.1
Homeownership rate, %	49.5%	76.5%	78.6%	68.9%
Housing units in multi-unit structures, %	36.3%	16.9%	16.7%	21.4%
Median value of owner-occupied housing units (2010 dollars)	\$344,800	\$348,600	\$324,800	\$255,100
Persons per household	2.09	2.45	2.61	2.56
Per capita money income in past 12 months (2010 dollars)	\$22,851	\$38,162	\$35,823	\$32,145
Median household income (2010 dollars)	\$50,792	\$73,903	\$81,055	\$61,406
Persons below poverty level, %	16.5%	7.0%	3.9%	10.3%

Table notes: (a) Includes persons reporting only one race; (b) Hispanics may be of any race, so also are included in applicable race categories; (c) Value greater than zero but less than half unit of measure shown.

Source: U.S. Census Bureau (2011). *State and County QuickFacts*. Data derived from Population Estimates, American Community Survey (ACS), Census of Population and Housing, State and County Housing Unit Estimates, available at <http://quickfacts.census.gov/qfd/states/51000.html>.

In terms of economic traits, Table 4 shows substantial differences between Williamsburg and the other two localities. Median household income is 46% higher in James City County and 60% higher in York County than in Williamsburg. Per capita monetary income is 67% higher in James City County and 57% higher in York County than in Williamsburg. The poverty rate is *two to four times higher* in Williamsburg than it is in James City County and York County. In all these measures, Williamsburg values are worse than the state as a whole. Note that in other data (not shown here, but available from the Census' Small Area Income and Poverty Estimates (SAIPE) program), the percentage of children under 18 in poverty is higher in Williamsburg than in the surrounding counties. In 2010, 22.7% of children (or more than 1 in 5 children) were in poverty in Williamsburg. By comparison, the percentages of children under 18 in poverty were 10.3% and 6.8% in James City and York counties, respectively, in that same year.¹⁷ As shown in Table 5, which reports data from 2000, these gaps in socioeconomic status existed before the most recent economic downturn.

Table 6 supplements these data with two measures of economic and household traits that are available by race: median household income and the percentage of children living in single parent families.

The data in Table 6 show that for whites and blacks in both 2010 and 2000, median household income in Williamsburg was below that of the surrounding counties. In all localities, median household income for whites greatly exceeds that of blacks. Differences between the household income of whites and that of blacks are largest (in percentage terms) in James City County, and smallest in York County. For example, in 2010, white households in James City County had a median income that was 1.78 times that of black households. The comparable ratios for Williamsburg and York County are 1.75 and 1.43 respectively.

In summary, patterns in socioeconomic status data in the CHR data and Census data are consistent with the patterns in health outcomes presented earlier. James City and York counties rank relatively highly on socioeconomic measures and rank highly in terms of health outcomes. Williamsburg ranks relatively poorly in terms of socioeconomic status measures and in terms of health outcomes measures. Data from additional sources other than the CHR suggest that the gaps in socioeconomic status between Williamsburg and the other localities in the Historic Triangle are persistent. These data also suggest that population average data may obscure important gaps in socioeconomic status by race. Differences in socioeconomic status by race are likely to explain some of the gaps in health outcomes by race reported in Section 3.

¹⁷ See the U.S. Census Bureau (2010). *Small Area Income and Poverty Estimates Interactive Tables*, available at <http://www.census.gov/did/www/saipe/data/statecounty/index.html>.

Table 5. Demographic and Economic Traits, 2000

	Williamsburg	James City County	York County	Virginia
Population, 2011 estimate	14,444	68,200	66,134	8,096,604
Population, 2000	11,998	48,102	56,297	7,078,515
<i>Demographic Composition, 2000</i>				
Persons under 5 years, %	2.7%	5.6%	6.3%	6.5%
Persons under 18 years, %	9.6%	23.3%	29.1%	24.6%
Persons 65 years and over, %	11.7%	16.8%	9.1%	11.2%
Female persons, %	55.1%	51.6%	50.9%	51.0%
White persons, % (a)	79.5%	82.0%	80.0%	72.3%
Black persons, % (a)	13.3%	14.4%	13.4%	19.6%
American Indians/Alaska Natives, % (a)	0.3%	0.3%	0.3%	0.3%
Asian persons, % (a)	4.6%	1.5%	3.2%	3.7%
Native Hawaiian and Other Pacific Islander persons, % (a)	0.1%	0.0%	0.1%	0.1%
Persons reporting 2 or more races, %	1.5%	1.4%	2.0%	2.0%
Persons of Hispanic/Latino origin, % (b)	2.5%	1.7%	2.7%	4.7%
White persons not Hispanic, %	77.9%	81.0%	78.5%	70.2%
<i>Census 2000 Data</i>				
Foreign born persons, %	5.2%	4.1%	5.2%	8.1%
Language other than English spoken at home, % age 5+	7.7%	5.9%	7.2%	11.1%
High school graduates, % of persons age 25+	89.6%	89.3%	91.7%	81.5%
Bachelor's degree or higher, % of persons age 25+	45.0%	41.5%	37.4%	29.5%
Veterans	956	7,299	7,617	786,359
Mean travel time to work (minutes), workers age 16+	18.0	24.6	23.7	27.0
Median value of owner-occupied housing units (2000 dollars)	\$212,000	\$167,300	\$152,700	\$125,400
Persons per household	2.07	2.47	2.78	2.54
Per capita money income in past 12 months (2000 dollars)	\$18,483	\$29,256	\$24,560	\$23,975
Median household income (2000 dollars)	\$37,093	\$55,594	\$57,956	\$46,677
Persons below poverty level, %	18.3%	6.4%	3.5%	9.6%

Table notes: (a) Includes persons reporting only one race; (b) Hispanics may be of any race, so also are included in applicable race categories.

Source: U.S. Census Bureau (2000). *Census 2000 Summary File 1, Census 2000 Summary File 3*, available at <http://factfinder2.census.gov>.

Table 6. Economic and Household Traits by Race, 2010 and 2000

	Williamsburg	James City County	York County	Virginia
<i>Median Household Income, 2010 (a)</i>				
All races	\$50,794	\$73,903	\$81,055	\$61,406
White	\$56,484	\$79,638	\$84,897	\$66,357
Black	\$32,219	\$44,739	\$59,311	\$42,468
Asian	\$59,375	\$74,821	\$67,212	\$83,569
Hispanic/Latino	\$51,136	\$54,492	\$50,789	\$57,793
Native Hawaiian/Pacific Islander	n.a.	n.a.	\$79,395	\$70,218
American Indian/Alaska Native	n.a.	\$65,069	\$103,300	\$49,234
<i>Median Household Income, 2000 (b)</i>				
All races	\$37,093	\$55,594	\$57,956	\$46,677
White	\$39,258	\$60,224	\$61,390	\$50,530
Black	\$31,358	\$32,374	\$40,674	\$32,269
Asian	\$53,594	\$53,056	\$57,500	\$57,420
Hispanic/Latino	\$49,250	\$56,150	\$45,278	\$46,281
Native Hawaiian/Pacific Islander	n.a.	n.a.	\$102,264	\$51,553
American Indian/Alaska Native	n.a.	\$24,375	\$69,444	\$42,667
<i>% of Children in Single Parent Households, 2010 (c)</i>				
All races	34%	21%	18%	24%
White	23%	16%	16%	18%
Black	56%	45%	33%	46%
Hispanic/Latino	34%	29%	21%	25%
<i>% of Children in Single Parent Households, 2000 (d)</i>				
All races	34%	20%	15%	23%
White	20%	14%	12%	16%
Black	58%	43%	31%	44%
Hispanic/Latino	40%	21%	13%	21%

Table notes: n.a. indicates that these data are not available. Single parent households are defined as the number of households with at least one child under age 18 and with one parent divided by the total number of family households as defined by the County Health Rankings, available at <http://www.countyhealthrankings.org/health-factors/family-and-social-support>. This does not include children who may be living in households with non-relatives or in group quarters.

Sources: (a) U.S. Census Bureau (2006-2010). *American Community Survey*, available at <http://factfinder2.census.gov>; (b) U.S. Census Bureau (2000). *Census 2000 Summary File 3 (SF 3) - Sample Data*, available at <http://factfinder2.census.gov>; (c) U.S. Census Bureau (2010). *2010 Census Summary File 1 (SF 1) - Sample Data*, available at <http://factfinder2.census.gov>; (d) U.S. Census Bureau (2000). *2000 Summary File 1 (SF 1) - Sample Data*, available at <http://factfinder2.census.gov>.

Health behaviors

Adult health risks

As noted above, the County Health Rankings data on health behaviors have some limitations when used in the Historic Triangle. Namely, actual data on health risks by adults in Williamsburg cannot be used since they are based on too small of a sample to be deemed reliable by the CHR program; in addition, data on sexually transmitted diseases in Williamsburg may reflect the behaviors of its large student population more so than those of the permanent resident population.

To supplement the CHR data on health risk behaviors, Table 7 provides available data on adult health risks from the 2012 Virginia Atlas of Community Health. According to Virginia Atlas documentation, these measures are synthetic estimates based on the 2010 Behavioral Risk Factor Surveillance System (BRFSS), the same source that CHR uses to obtain data on smoking, excessive drinking, and physical inactivity.¹⁸

Table 7. Health Risks in Adults Age 18+, 2010

	Williamsburg	James City County	York County	Virginia
<i>Behavioral Risk Factors</i>				
Currently smoke, %	24.7%	21.4%	22.8%	22.1%
At risk for binge drinking, %	20.7%	13.6%	15.2%	14.8%
Overweight or obese, %	48.9%	58.9%	58.4%	58.3%
Less than 5 servings of fruits and vegetables per day, %	77.0%	76.3%	77.1%	76.6%
No physical activity in past 30 days, %	20.3%	23.6%	22.5%	23.3%
<i>Told by a Doctor or Other Health Professional That He/She Has:</i>				
Arthritis, %	20.4%	31.8%	27.9%	29.2%
Asthma, %	14.5%	12.5%	12.7%	12.8%
Diabetes, %	5.8%	8.9%	7.8%	8.5%
High Blood Pressure, %	20.3%	30.8%	26.8%	28.9%
High Cholesterol, %	21.7%	32.6%	30.0%	30.4%

Source: Community Health Solutions (2012), available at <http://www.atlasva.com>.

¹⁸ Community Health Solutions produced a number of indicators using ‘*synthetic estimation methods*.’ Synthetic estimation methods can be used when there are no readily available sources of local data to produce a community health indicator. Synthetic estimation begins with analysis of national and state survey data to develop estimates of the number of people with a particular health status (e.g. asthma, diabetes, uninsured) at the national or state level. The national and state data are then applied to local demographic data to produce estimates of health status in a local area. These estimates may differ from other sources of similar data. These kinds of estimates are subject to error; they are instructive for planning, but it is not possible for Community Health Solutions to guarantee their accuracy.

The first five rows in Table 7 report health risk behaviors. For the most part, these measures tell a similar story to the data on health behaviors in the County Health Rankings report. For risk factors such as smoking, obesity, and physical inactivity, populations in all three localities in the Historic Triangle are as healthy or are healthier than the state population as a whole. For a fourth risk factor, excessive drinking, the Virginia Atlas data show a much higher percentage of adults at risk for binge drinking in Williamsburg than in James City County, York County, or Virginia.

The remaining rows in Table 7 report data on chronic health conditions included in the adult health risk profile of the Virginia Atlas. For the most part, the populations of Williamsburg and York County are as healthy or are healthier than the state population as a whole. One exception is asthma prevalence, which is higher in Williamsburg than in Virginia. Rates of several of these conditions (arthritis, high blood pressure, high cholesterol) are a few percentage points higher in James City County than in the state as a whole. These rates do not appear to be risk-adjusted for age differences across populations.

Community Health Solutions notes that the model used to construct the synthetic estimates was produced several years ago and is dated. Community Health Solutions also notes that the measures shown in Table 7 were not intended to be used to track changes over time. In 2013, Community Health Solutions plans to release new updated estimates of adult health risks.

Child health risks

Four of the health behaviors reported in the CHR – smoking, obesity, physical inactivity, and excessive drinking – apply to the adult population. The 2012 Virginia Atlas of Community Health contains some measures of child health risks from the 2010 Obesity Survey administered on behalf of the Virginia Foundation for Healthy Youth.¹⁹ These measures are reported in Table 8. Data for the three localities in the Historic Triangle are the same; this is because the data are estimates that apply to the southeastern region of the state. These data show no differences in most child health risks between the population of the state as a whole and the population of southeastern Virginia.

¹⁹ Virginia Atlas documentation includes this note on the construction of the child health risk measures: “Synthetic estimates by Community Health Solutions [are] based on: 1) statewide data from Market Decisions’ 2010 Obesity Survey commissioned by Virginia Foundation for Healthy Youth; and 2) city/county level demographic data from Alteryx, Inc.”

Table 8. Health Risk Behaviors in Children Age 10-17, 2010

	Williamsburg, James City County, and York County (Southeastern Region of Virginia)	Virginia
Overweight or obese, %	24%	22%
Drinking soda or eating chips/candy 1 or more days per week, %	92%	92%
Not meeting daily targets for fruits and vegetables, %	88%	88%
Not meeting physical activity targets, %	34%	34%
Playing video/computer games 3 or more hours per day, %	16%	16%
Watching television 3 or more hours per day, %	26%	24%

Source: Community Health Solutions (2012), available at <http://www.atlasva.com>.

As a final source of additional data on child health risk factors, several findings from the 2011 annual report on the Williamsburg-James City County Public Schools (WJCCPS) School Health Initiative Program (SHIP) are summarized below. In that report, evaluators from the Schroeder Center for Health Policy compared SHIP survey respondents in middle and high schools to respondents to the Virginia Obesity Survey. This comparison yielded the following findings:

- 1) Students in Williamsburg-James City County Public Schools were comparable to Virginia students in terms of their fruit juice, fruit, vegetable, soda, and breakfast consumption, and in terms of hours spent watching television.
- 2) Students in Williamsburg-James City County Public Schools were more likely than Virginia students to play video games or use the computer for non-school purposes on an average day, and less likely to have participated in organized sports activities in the past 12 months.

In summary, the findings from this review of health risk factors suggest that caution should be applied when examining health risk behavior from the 2012 Virginia Atlas of Health, especially since the state data in the Atlas do not match the state data from the BRFSS website. This review further finds that there is a clear need for additional local data on health risks, and that perhaps local programs, like SHIP and other programs, could provide valuable information to community organizations. If so, efforts to expand access to these measures would be worthwhile.

In terms of the broader question of whether health risk factors can explain the health outcomes differences presented earlier, the evidence is mixed. The CHR data shown in Table 3 (data that is of a higher quality than that reported in Table 7), in particular the obesity and

physical inactivity measures, are very similar across localities in the Historic Triangle. These similar rates are unlikely to explain the large gaps in health outcomes described in Part 3 of this report. It should also be noted, that as with other measures, rates in the overall population may mask important differences by race. However, other health risk factor data that could be important for explaining health disparities (e.g., smoking, excessive alcohol consumption) are not reported for Williamsburg in the CHR, and there are questions regarding the construction and quality of the health risk factors data in the Virginia Atlas.

Clinical Care

As noted earlier, the population of the Historic Triangle has very strong indicators of clinical care according to data published in the County Health Rankings report. The populations of all three localities in the Historic Triangle are among the top ten localities in the state according to the County Health Rankings for clinical care. This section presents additional data on clinical care to supplement the measures in the CHR.

Tables 9 and 10 provide statistics on the Prevention Quality Indicators or PQI released by Virginia Health Information for 2007 and 2005. Recall from the description of these data in Section 2 that all residents of zip code 23185 are included in the construction of the rates for James City County, not Williamsburg.

Table 9. Prevention Quality Indicators (PQI), Risk-Adjusted Rates per 100,000, 2007

	Williamsburg	James City County	York County	Virginia
Complications from Diabetes-Short Term	16.6	61.1	29.5	57.8
Perforated Appendix	n.a.	37.6	12.5	30.7
Complications from Diabetes-Long Term	0.0	85.5	36.9	119.9
Chronic Obstructive Pulmonary Disease	21.1	136.8	85.4	157.6
Hypertension	12.5	34.8	8.4	49.1
Congestive Heart Failure	136.3	415.0	238.5	431.7
Low Birth Weight	12.3	5.8	4.0	6.2
Dehydration	9.5	62.1	59.0	97.5
Bacterial Pneumonia	119.0	304.4	140.3	319.8
Urinary Infection	50.8	226.3	60.1	157.7
Angina Without Procedure	0.0	10.8	8.2	33.6
Diabetes - Uncontrolled	0.0	22.7	0.0	14.0
Adult Asthma	11.5	95.2	32.9	104.6
Lower Extremity Amputation	0.0	6.9	18.2	34.9
PQI Composite - Overall Rate	305.6	1159.2	577.8	1243.7
PQI Composite - Acute Conditions Rate	138.8	465.0	209.8	444.2
PQI Composite - Chronic Conditions Rate	164.4	693.5	367.4	833.5

Source: Virginia Health Information (VHI), available at http://www.vhi.org/ahrq_intro.asp.

Table 10. Prevention Quality Indicators (PQI), Risk-Adjusted Rates per 100,000, 2005

	Williamsburg	James City County	York County	Virginia
Complications from Diabetes-Short Term	16.9	78.7	21.7	56.2
Perforated Appendix	29.4	35.7	13.2	29.2
Complications from Diabetes-Long Term	25.9	73.6	38.8	118.1
Chronic Obstructive Pulmonary Disease	11.2	136.9	63.4	180.1
Hypertension	0.0	50.3	26.5	37.6
Congestive Heart Failure	87.2	461.6	249.8	390.7
Low Birth Weight	0.0	5.7	6.3	6.3
Dehydration	21.0	46.3	62.2	108.8
Bacterial Pneumonia	44.2	325.4	200.8	300.1
Urinary Infection	9.3	160.4	66.0	148.4
Angina Without Procedure	13.6	32.2	12.9	25.2
Diabetes - Uncontrolled	0.0	34.0	4.3	13.3
Adult Asthma	0.0	92.4	36.4	121.3
Lower Extremity Amputation	0.0	14.5	6.4	35.5
PQI Composite - Overall Rate	180.2	1185.6	637.2	1337.7
PQI Composite - Acute Conditions Rate	56.9	418.8	265.8	504.3
PQI Composite - Chronic Conditions Rate	124.5	768.4	371.9	799.7

Source: Virginia Health Information (VHI), available at http://www.vhi.org/ahrq_intro.asp.

The Prevention Quality Indicators or PQIs identify hospitalizations for ambulatory care sensitive conditions, which are “conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease” (VHI, 2012). When areas have high scores in a particular individual measure or in a composite (combined) measure, this indicates a high discharge rate for ambulatory care sensitive conditions, and suggests that outpatient care in the area may be difficult to access or lower in quality.

Tables 9 and 10 each contain 17 different PQI measures, including hospitalization for diabetes (both short term, long term, and uncontrolled), asthma, hypertension, angina, and others, and three types of composite measures. Several patterns are apparent.

First, compared to the state, the localities in the Historic Triangle have higher quality outpatient care. Each of the three PQI composite rates in both years is lower in Williamsburg and York County than in the state of Virginia, suggesting that outpatient care quality and access are higher in these localities compared to the state. In James City County, preventable hospitalizations for chronic conditions and for all types of conditions are lower than the state. Overall, these patterns in the PQI measures mirror the pattern in the County Health Rankings clinical care indicators.

Second, within the Historic Triangle, Williamsburg has lower rates for most of these potentially avoidable hospitalizations compared to York County and James City County. Looking at the PQI composite overall rate in 2007, for example, shows that the Williamsburg rate was 306 such hospitalizations per 100,000 population, while it was nearly twice as high in York County, and more than 3.5 times as high in James City County. There are a few exceptions (e.g., hypertension in 2007, low birthweight in 2007, perforated appendix hospitalizations in 2005, and angina without procedure in 2005), but most of the PQI measures indicate a higher quality of outpatient care in Williamsburg relative to other localities in the Historic Triangle. James City County residents (who include residents of zip code 23185) have higher rates of preventable hospitalizations related to complications from diabetes, congestive heart failure, and urinary tract infections than residents of the zip codes assigned by VHI to Williamsburg or York County.

More recent data on PQIs for 2010 are available in the 2012 Virginia Atlas of Community Health. There are slight differences in how data are constructed in the two different sources, so direct comparisons over time are not appropriate.²⁰ Nonetheless, the Virginia Atlas data for 2010 (shown in Table 11) display a very similar pattern as described earlier: compared to the state, Williamsburg and York County have higher quality or more accessible outpatient care. Within the Historic Triangle, Williamsburg has lower rates for all of these potentially avoidable hospitalizations than do York and James City counties. In future years, the Virginia Atlas should be a valuable source for updated data on outpatient care quality for the Historic Triangle.

Table 11. Prevention Quality Indicators (PQI), Age-Adjusted Rates per 100,000, 2010

	Williamsburg	James City County	York County	Virginia
Total PQI Discharge Rate	304.0	978.1	508.8	999.1
Adult Asthma	0.0	68.9	18.9	76.0
Adult Angina	0.0	11.8	4.4	9.6
Bacterial Pneumonia	75.0	167.3	133.4	184.5
Chronic Obstructive Pulmonary Disease	22.4	88.7	45.3	125.6
Congestive Heart Failure	99.5	242.7	143.5	238.1
Dehydration	0.0	32.2	17.2	44.2
Diabetes	32.9	137.1	57.3	134.0
Hypertension	8.4	25.7	21.2	34.6
Perforated Appendix	10.6	23.6	11.1	20.8
Urinary Tract Infection	55.2	180.3	56.5	131.8

Source: Community Health Solutions (2012), available at <http://www.atlasva.com/>.

²⁰ For example, the Virginia Atlas does not include the low birthweight PQI and it combines the three diabetes-related PQIs; the Virginia Atlas reports age-adjusted rates while VHI reports age- and sex- adjusted rates.

Table 12 reports Pediatric Quality Indicators (PDI) for the Historic Triangle and Virginia in the year 2007, as released by VHI. The PDIs include five measures of hospitalization for potentially avoidable pediatric conditions and three composite measures that reflect access to or quality of outpatient care for preventable conditions.

Williamsburg's PDIs should be interpreted with caution given the small size of the population and the fact that all PDIs are zero. In all instances except pediatric asthma, James City and York counties have lower PDIs than the state, suggesting that sufficient access to outpatient care or high quality outpatient care in the Historic Triangle results in lower rates of hospitalization for these avoidable pediatric conditions. Although not reported here, VHI data from 2005 reports a similar pattern for York County in 2005, with rates below (or better than) those of the state.

Table 12. Pediatric Quality Indicators (PDI), Risk-Adjusted Rates per 100,000, 2007

	Williamsburg	James City County	York County	Virginia
Pediatric Asthma	0.0	109.0	16.4	93.6
Pediatric Diabetes Short Term Complications	0.0	0.0	17.3	35.2
Pediatric Gastroenteritis	0.0	67.0	59.0	117.3
Pediatric Perforated Appendix	0.0	20.8	32.0	n.a.
Pediatric Urinary Tract Infection	0.0	0.0	15.0	27.8
PDI Composite - Overall Rate	0.0	86.9	50.8	135.9
PDI Composite - Acute Conditions Rate	0.0	65.6	17.0	92.7
PDI Composite - Chronic Conditions Rate	0.0	24.5	33.7	43.3

Source: Virginia Health Information (VHI), available at http://www.vhi.org/ahrq_intro.asp.

Another source of clinical care data is the 2008 Service Area Needs Assessment (Central Virginia Health Planning Agency, 2008). Selected measures of clinical care data from this source are reported in Table 13. These include 2006 data on inpatient discharge rates per 1,000 population by race, and 2005 data on inpatient discharges for cardiovascular disease (CVD) by race.

The data in Table 13 are useful for illustrating the racial differences in clinical care in the Historic Triangle. To quote the Service Area Needs Assessment:

[T]he overall service area's use rates are below the State rate for all racial/ethnic groups except for black persons. This type of difference could reflect racial disparities in care and/or access to primary care services by black persons in the service area (Central Virginia Health Planning Agency, 2008, p. 44, emphasis in the original text).

Table 13. Inpatient Use and Cardiovascular Disease Use by Race, 2006 and 2005

	Williams- burg	James City County	York County	Primary Service Area	Virginia
Inpatient (IP) Use, 2006					
IP Discharges per 1,000 persons, whites	109.8	99.0	79.6	91.9	108.2
IP Discharges per 1,000 persons, blacks	481.5	155.0	96.1	137.6	131.7
IP Discharges per 1,000 persons, Hispanics	106.4	99.7	19.8	64.0	77.0
IP Discharges per 1,000 persons, other	15.3	60.6	35.8	47.0	212.0
Cardiovascular Disease (CVD) Use, 2005					
CVD Inpatient Use Rate, total	2.6	25.0	10.6		16.2
CVD Inpatient Use Rate, white	2.4	22.9	11.1		16.5
CVD Inpatient Use Rate, black	5.3	38.9	12.2		19.4
CVD Inpatient Use Rate, other	0.0	24.6	2.8		8.2

Source: Central Virginia Health Planning Agency (2008). See pages 44 and 51.

Further, the CVD inpatient use rate is significantly higher among blacks than among whites in Williamsburg and James City County, and the CVD inpatient use rate is slightly higher among blacks than among whites in York County and Virginia. It should also be noted that rates of CVD inpatient use in James City County are higher for all races than in the state as a whole.²¹

Given the important role that public programs play in providing access to clinical care, Table 14 reports data on participation in the Medicare and Medicaid programs. Both Williamsburg and James City County have a larger share of residents enrolled in Medicare than does the state. This suggests that a larger share of Historic Triangle residents is affected by programmatic changes in Medicare. However, changes affecting Medicare Advantage and Medicare Part D do not differentially impact local residents than residents in the state. The Medicare Advantage penetration rate is slightly lower in the Historic Triangle compared to the state. Similarly, the Medicare Part D penetration rate is lower in James City County and York County compared to the state. Williamsburg has a similar Medicare Part D penetration rate compared to the average state penetration rate.

All three localities have a smaller share of residents enrolled in Medicaid than in the state. York County, in particular, has the lowest Medicaid share of all three localities (4.3%) compared to the state share of 12.3%. This is likely a reflection of the relatively high socioeconomic conditions in that county as evidenced by the Census data reported in Tables 5 and 6. Tables 5 and 6 also showed that Williamsburg residents had lower median household

²¹ The main report of the Service Area Needs Assessment does not include the zip codes used to construct locality specific estimates, and that information could not be located from the Central Virginia Health Planning Agency, which appears to have suspended operations in 2010. This information may be in an appendix to the main report, which the Williamsburg Community Health Foundation may have.

incomes and lower per capita incomes than state residents overall. The fact that Medicaid rates are somewhat lower in Williamsburg than in the state (while household incomes are also lower) could indicate differences in other household characteristics that determine Medicaid eligibility or could reflect lower take-up rates by eligible persons in the Williamsburg area.²²

Table 14. Medicare and Medicaid Program Data, various years

	Williamsburg	James City County	York County	Virginia
Medicare share of total population, %, 2007	17.7	19.0	13.4	13.5
Medicaid share of total population, %, 2005	6.7	7.4	4.3	12.3
Share of Medicaid population, 65+, %, 2005	10.1	8.7	10.7	11.1
Medicare Advantage penetration, %, 2009	9.9	8.4	8.2	14.1
Medicare Part D/PDP penetration, %, 2009	40.0	32.2	26.3	41.4

Source: HRSA (2010). Area Resource File, available at <http://arf.hrsa.gov/>.

In summary, the findings from the review of clinical care factors suggest the localities of the Historic Triangle have relatively strong measures of clinical care. This conclusion is supported by data from various sources, including data on outpatient care for ambulatory care sensitive conditions and data from the County Health Rankings report. The strength of the region’s clinical care indicators may contribute to the strong health outcomes reported for populations of York County and James City County and may counteract some of the detrimental health effects of low socioeconomic status in Williamsburg. Yet while the data suggest that the overall population in the Historic Triangle has access to high quality medical care, data from the Service Area Needs Assessment shows that disparities in some clinical care measures exist by race within the Historic Triangle.

Summary of Health Factors Data

The review of health factors data for localities in the Historic Triangle suggests that:

- 1) There are important differences in socioeconomic status of Historic Triangle residents compared to the state and across the localities that comprise the Historic Triangle. Compared to the population of Virginia, the populations of James City and York counties

²² Information on Medicaid take-up rates by county is not available from the Virginia Department of Medical Assistance Services.

have higher levels of socioeconomic status as measured by median household income and poverty rates. Compared to the populations of the state, James City County, and York County, the population of Williamsburg has relatively low socioeconomic status. Data from multiple years and sources suggest that the gaps in socioeconomic status between Williamsburg and the other localities in the Historic Triangle are persistent and that large differences in socioeconomic status exist for population subgroups defined by race.

- 2) Differences in socioeconomic status by locality are very likely to explain some of the differences that exist in the health of the population of Williamsburg compared to that of James City County or York County. Socioeconomic status is an important contributor to health; health rankings assign as much as a 40% weight to socioeconomic status measures, meaning that differences in socioeconomic status may explain up to 40% of the variation in health outcomes. While the data in this report do not permit analysis of causal relationships, the patterns in the data are suggestive evidence that the Williamsburg population's relatively low health outcomes (compared to James City and York counties) may be associated with its relatively low socioeconomic status. Further, the data show worse health outcomes among blacks in Williamsburg relative to whites and lower socioeconomic status among blacks in Williamsburg relative to whites.
- 3) It is not clear whether or not differences in health risk factors explain the differences in health outcomes among the localities of the Historic Triangle. For certain health risk factors that can be measured in all three localities (obesity and physical inactivity), measures for the Williamsburg population are very similar to measures for the populations of York and James City counties.
- 4) Existing measures of health risk factors have some limitations. Estimates of health risk behaviors by subgroups defined by race or socioeconomic status are not available in the CHR report or in the Virginia Atlas. Data from the Virginia Atlas of Community Health were not intended to be used to track changes over time. Data on certain health risk behaviors in the Williamsburg population are not published by County Health Rankings because of concerns about the validity of the underlying data.
- 5) Data on clinical care show that the population of the Historic Triangle has relatively high levels of access to health care and a relatively high quality of health care compared to the state of Virginia.
- 6) There is limited data on clinical care for subgroups of the local population defined by race or socioeconomic status. Existing data from the Service Area Needs Assessment show some evidence of racial disparities in clinical care measures within the Historic Triangle.

- 7) Several high quality sources of information on the clinical care of residents of the Historic Triangle are available; however, some improvements could be made in this area. Several existing clinical care measures in the County Health Rankings pertain to the Medicare population, so additional data on preventive clinical care in the non-Medicare population would be valuable. Several existing measures are based on treatment of ambulatory care sensitive conditions, so additional data on direct measures of outpatient care such as office visits would be informative. The limited data on inpatient use by race suggest that there are important differences between whites and blacks, so additional data on preventive care by race could be worthwhile.

5. Summary and Recommendations

This report describes local data on health outcomes and health factors in the Historic Triangle from a variety of sources. Below, several key findings of the analysis are highlighted.

Finding 1. Comparing commonly-used measures of population health status within the Historic Triangle, the populations of James City County and York County are healthier than the population of Virginia as a whole. The populations of York and James City counties experience lower rates of premature death, lower overall mortality, and lower rates of low birthweight than the state as a whole.

Finding 2. Comparing commonly-used measures of population health status within the Historic Triangle, the population of Williamsburg is less healthy than the population of Virginia as a whole. In terms of mortality, the years of potential life lost rate is 60% greater in Williamsburg than in the state of Virginia. The low birthweight percentage is 33% greater in Williamsburg than the state of Virginia.

Finding 3. The *overall population* of the Historic Triangle is healthier than the population of Virginia as a whole. The health of the overall population of the Historic Triangle can be defined by the population-weighted average premature death rate and the population-weighted average low birthweight rate using data from the three localities of James City County, York County, and Williamsburg. In terms of premature death rates, the Historic Triangle population is healthier than all but a small number of individual counties or cities in the state. In terms of the percentage of births that are low birthweight, the Historic Triangle population is healthier than two-thirds of the individual counties or cities in the state.

Finding 4. Mortality rate data from the years 1999 through 2009 suggest that age-adjusted all-cause mortality rates in Williamsburg are declining. Williamsburg rates of mortality from heart disease are also trending downward and moving closer to state mortality rates. Thus, existing trends suggest that the life expectancy of the Williamsburg population is increasing. Unlike mortality rates in Williamsburg, which have exhibited a downward trend over the period 1999-2009, there is no clear trend in low birthweight percentages over the entire period 1997-2010. There is some indication that black and white rates of low birthweight have been increasing since 2004.

Finding 5. The population of the Historic Triangle has relatively high levels of access to health care and a relatively high quality of health care compared to the state of Virginia. This is observed in data from various sources and for all three localities of James City County, York County, and Williamsburg. This pattern suggests that the lower health outcomes of the

Williamsburg population, relative to the populations of James City County and York County, are most likely attributable to something other than clinical care differences across these areas.

Finding 6. Differences in socioeconomic status by locality are very likely to explain some of the differences in health outcomes between the populations of individual Historic Triangle localities. Socioeconomic status is an important contributor to health; as much as 40% of the variation in health outcomes is thought to be explained by variation in socioeconomic status. While the data in this report do not permit an analysis of causal relationships, the patterns in the data are suggestive evidence that the relatively lower health outcomes of the Williamsburg population may be associated with the population's relatively low socioeconomic status, when compared to the populations of James City County and York County.

Finding 7. Data on health and health factors for the population as a whole may mask important differences across subgroups of the population defined by race or socioeconomic status. For example, the average five-year cancer mortality rate in Williamsburg in 2007 is more than twice as high in the black population than in the white population. Also in Williamsburg, the cancer death rate among black persons is significantly higher than the state rate from 2005 through 2007. The average low birthweight percent in Williamsburg over the period 1997-2010 is almost twice the percentage in the black population than it is in the white population.

Finding 8. The role of health risk factors in explaining the differences in the health outcomes across the localities of the Historic Triangle is unclear. On the one hand, health risk factors that are available for all three localities (obesity and physical inactivity) are very similar in Williamsburg, York County, and James City County. These similar rates are unlikely to explain the large differences in health outcomes across the localities. On the other hand, data on health risk factors like smoking and excess alcohol consumption are somewhat dated.

Finding 9. Additional information on two types of health factors – clinical care and health risk factors – would be informative. In the area of clinical care, additional data on preventive clinical care or other types of outpatient care such as office visits, especially pertaining to the non-Medicare population, would be informative. In the area of health risk factors, additional data would be valuable. Perhaps local programs, like the School Health Initiative Program, may be a source of valuable information on health risk factors in the community. Finally, additional data on clinical care and health factors by subgroups defined by race or socioeconomic status would be informative.

Recommendations

In light of these findings, this report offers the following recommendations to the Williamsburg Community Health Foundation. These recommendations are offered with some

caution since, as noted earlier, this report is not able to define cause-and-effect relationships in the data. That is, the causes behind strong health outcomes in one locality and weaker health outcomes in another locality cannot be determined from an analysis such as this.

- 1) The overall population of the Historic Triangle is comparable to some of the healthiest localities in the state of Virginia according to one widely-used measure of population health. That said, this review of community health data suggests that attention to some health outcomes or factors in some populations may be worthwhile:
 - a. *Percentage of births defined as low birthweight.* A key measure of population health, the low birthweight percentage comprises 20% of the health outcomes score in the County Health Rankings report. The percentage of births that are low birthweight is several percentage points higher in Williamsburg than in the other localities of the Historic Triangle and in the state (Table 1). In all three localities of the Historic Triangle (as in the U.S. as a whole), rates of low birthweight births are higher among black mothers compared to white mothers (Figures 10 and 11). Rates of early prenatal care appear to be declining in Williamsburg (Figure 12). This health outcome warrants some attention given the high medical costs of caring for low birthweight infants and the associations between low birthweight and health problems such as learning difficulties, vision and hearing loss, and even cerebral palsy.
 - b. *Adult cardiovascular disease (CVD) hospitalizations.* Heart disease is the leading cause of death in the United States. Looking at annual data from 1999-2009 shows that mortality rates for heart disease are generally higher in Williamsburg than in James City and York counties than in the state (Figure 2). Further, data on inpatient hospitalization for cardiovascular disease show that CVD hospitalization rates are substantially higher in James City County (which includes residents of zip code 23185) than in the other areas of the Historic Triangle and the state (Table 13). Within all three localities, inpatient hospitalization for CVD is higher among blacks than among whites. These data warrant additional attention given that nearly one in four deaths in the U.S. are associated with diseases of the heart.
 - c. *Racial differences in mortality rates.* Most data on the health of adult residents of the Historic Triangle pertains to the overall population. For one measure, cancer mortality, data are available for whites and blacks separately. These data show higher death rates in the black population than in the white population in all three localities of the Historic Triangle. These types of differences are also observed in national and state data. Their presence in the local data suggests a need to better understand and to better address racial health disparities in the local community.

Racial disparities are a long-standing challenge for many states and communities, and the Office of Minority Health and Health Equity at the Virginia Department of Health may be a source of valuable information on ways to promote health equity in the community.

- d. *Pediatric asthma hospitalizations.* For the most part, the clinical care data on preventable hospitalizations of children show that the ambulatory care for these conditions is better than or *on par* with the state as a whole. One exception is the 2007 rate of hospitalization for asthma in children, which was 15% higher among James City County residents (which includes residents of zip code 23185) than residents of the state as a whole (Table 12). Rates of pediatric asthma hospitalizations among James City County residents were below state rates in prior years; nonetheless, more information on this health issue, perhaps from safety net clinical care providers in the area, may be worth examining.
- 2) A large share of Historic Triangle residents are age 65 and older. In James City County, more than one out of every five residents is age 65 or older (Table 4). When students from the College of William & Mary are excluded from population counts, 23% of permanent residents of Williamsburg are age 65 or older (Williamsburg Comprehensive Plan, 2012 draft).²³ In comparison, 12.4% of the Virginia population is in this age group. Related to this, the shares of the population enrolled in the Medicare program are substantially higher in Williamsburg (17.7%) and James City County (19%) than in Virginia (13.5%) (Table 14). Given the importance of Medicare for seniors' health, and the likelihood that important changes to these programs may occur in the years ahead, support for seniors in making decisions about private plan enrollment and in maintaining access to physicians may well be important to the community's health.
- 3) The funding for safety net clinics that provide integrated primary and specialty care and increase access to prescription drugs for residents of the Historic Triangle may contribute to the favorable health outcomes reported among residents of the Historic Triangle as a whole and may contribute to the particularly strong measures of clinical care reported in data from several sources. For example, residents of Williamsburg have much lower socioeconomic status compared to residents of James City and York counties and Virginia as a whole, but despite this, the population of Williamsburg has relatively high clinical care indicators in the County Health Rankings. These indicators are almost as strong as the populations of James City and York counties, and stronger than the population of Virginia (see Table 3 of this report). Favorable health outcomes in the Historic Triangle may be partially explained by effective clinical care; if so, continuing funding for clinical care in safety net clinics is valuable to the community.

²³ Available at <http://www.williamsburgva.gov/index.aspx?page=1209> (see Chapter 3).

- 4) Despite the relatively strong clinical indicators noted above, clinical care providers in the area should note that differences exist in preventable hospitalizations for both adults and children within the region, as reported in recent data from the Virginia Atlas of Community Health and Virginia Health Information. These indicators show that the populations of all three localities have better quality clinical care for ambulatory sensitive conditions than the state, but that the population defined as residing in James City County has lower quality clinical care for ambulatory sensitive conditions than the populations residing in Williamsburg and York County. It should also be noted that the population of James City County, as defined by these sources, includes all residents of zip code 23185. Taken together with the data on preventable hospitalizations from the County Health Rankings, it appears that clinical differences may be more pronounced in the adult population under age 65 than in the age 65 and older population. Thus, clinical care targeted to residents of those zip codes used to define James City County, especially those under age 65, may be especially valuable to the community.

- 5) There are noticeable differences in socioeconomic status among the residents of the Historic Triangle. For example, the Williamsburg population has a higher rate of child poverty and a higher share of children in single-parent households than the state as a whole; child poverty rates and the share of children living in single parent households are lower in James City and York County than in the state as a whole. Low socioeconomic status may explain as much as 40% of the variation in health outcomes. Low socioeconomic status may also contribute to noticeable differences in health outcomes between whites and blacks in Williamsburg and the differences in inpatient hospitalization rates by race that were first reported in the 2008 Service Area Needs Assessment (Table 13).
 - a. A better understanding of the differences in socioeconomic status (SES) that exist within the localities of the Historic Triangle is valuable for the community's health. This may be done by examining data on poverty and household income at a finer geography in order to identify specific census tracts marked by low socioeconomic status, or by examining additional data that might identify other demographic traits of the low SES population. These steps may help target resources more effectively toward individuals of low socioeconomic status.

 - b. Targeting services toward low SES populations would be valuable to the community's health. This may be done by direct use of an individual's SES in determinations of program eligibility or through funding decisions about programs that are based on the socioeconomic status of the population served. Alternatively, this may be done through efforts that increase awareness of available programs and supports to the low SES population.

- c. Support for programs that address the specific needs of the low SES population, even those needs that are not in the form of direct medical services, may be valuable to the community's health. These programs might include human services related to food and housing, transportation services, or programs to address low literacy or low health literacy in the low SES population.
- 6) A better understanding of the behavioral health risk factors of the community is needed. On the one hand, some available data suggest that rates of adult obesity and physical inactivity are similar among the populations of the three localities of the Historic Triangle and the state of Virginia. On the other hand, there is a need for updated information on other adult health risk behaviors and on children's health risk behaviors.
 - a. Clear and concise information about the strengths and limitations of health risk factors data should be made available on the website of the Williamsburg Community Health Foundation on the Resources webpage where the link to the Virginia Atlas of Community Health is found. New information on health risk behaviors in the 2013 Virginia Atlas of Health should be closely examined when the data are published next year.
 - b. Information from the SHIP program is a very valuable source of data on the health risks of the children of Williamsburg and James City County. These data are much better for understanding the community's health than are the current child health risk data included in the 2012 Virginia Atlas. Summary statistics on obesity, physical inactivity, and eating behaviors from the SHIP Student Surveys should be available on the Resources webpage of the Williamsburg Community Health Foundation.
- 7) Despite a large volume of community health data, there is a shortage of data pertaining to subgroups of the community defined by socioeconomic status (income, education) or by race. The Williamsburg Community Health Foundation should explore the use of the raw survey data from the Historic Triangle oversample of the 2011 Virginia Age Ready Indicators Benchmark Survey to examine subgroup differences more closely. For example, responses to survey questions on nutrition and exercise might provide valuable information on differences in these risk factors by race, income or educational attainment. Related, the survey may provide important information on differences between routine preventive care and access to care between subgroups of the population defined by SES and/or race. Further analysis of these data may help to better explain the factors behind the racial differences in health as measured by cancer mortality (Figures 6 and 7) or cardiovascular disease hospitalization (Table 13).

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